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A Consideration of Homeostatic Regulation of Eating from the Perspective of Maharishi Vedic Science

Le vrai voyage de la découverte consiste pas en cherchant de nouveaux paysages,

*mais en ayant de nouveaux yeux*

_The real voyage of discovery consists not in seeking new landscapes, but in having_

*_new eyes -* Marcel Proust

Hugh David Lovell-Smith

A thesis submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy.

The University of Auckland 2009
Acknowledgments

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Lastly and most importantly I would like to express my enduring gratitude to the late Maharishi Mahesh Yogi, whose unfathomably deep wisdom has been a guiding light to me for almost 40 years and whose insights first inspired me to become interested in how people could be helped to better health, easily and without strain, by regulating their eating.
Abstract

How humans regulate eating and why regulation fails in many people is not well understood. Obesity has reached unprecedented proportions. Diabetes and heart disease are among a range of illnesses associated with excessive caloric intake and poor energy balance.

A theory of food regulation is proposed within a paradigm sufficiently broad to encompass and integrate mind and body. The theory states that homeostatic eating occurs when the pleasure of eating fulfils the desire to eat. It is suggested that absent, unrecognised or misinterpreted eating sensations represent missing key afferent information in homeostatic eating such that eating is not fully pleasurable for some people. Externally oriented attention and recoded perception may account for the non-recognition of key eating sensations.

The theory offers an explanation as to why so-called normal eaters may suffer from disorders ranging from coronary artery disease to autoimmune diseases. The theory predicts that relatively simple means could alleviate many such diseases and suggests how to test this prediction. If upheld, the theory could assist people to maintain their own well being and could help to prevent and treat some of the major scourges of Western society.
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Appendices

Appendix 1  A summary of the main argument of the thesis


Appendix 3  A Unified Field Chart for Psychology

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<th>Description</th>
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<tbody>
<tr>
<td>ACC</td>
<td>Anterior cingulate cortex</td>
</tr>
<tr>
<td>BMI</td>
<td>Body mass index</td>
</tr>
<tr>
<td>CR</td>
<td>Conditioned response</td>
</tr>
<tr>
<td>CRP</td>
<td>C-reactive protein</td>
</tr>
<tr>
<td>CS</td>
<td>Conditioned stimulus</td>
</tr>
<tr>
<td>CSS</td>
<td>Comfortable, satisfied sensation</td>
</tr>
<tr>
<td>EHS</td>
<td>Empty hollow sensation</td>
</tr>
<tr>
<td>EHSMP</td>
<td>Empty hollow sensation meal pattern</td>
</tr>
<tr>
<td>ESR</td>
<td>Erythrocyte sedimentation rate</td>
</tr>
<tr>
<td>g/dL</td>
<td>Grams per deciliter</td>
</tr>
<tr>
<td>GE</td>
<td>Goûter eaters</td>
</tr>
<tr>
<td>H. pylori</td>
<td>Helicobacter pylori</td>
</tr>
<tr>
<td>HE</td>
<td>High excitation</td>
</tr>
<tr>
<td>IH</td>
<td>Initial hunger</td>
</tr>
<tr>
<td>IHMP</td>
<td>Initial hunger meal pattern</td>
</tr>
<tr>
<td>LE</td>
<td>Low excitation</td>
</tr>
<tr>
<td>ME</td>
<td>Medium excitation</td>
</tr>
<tr>
<td>mIU/L</td>
<td>Milli international units per litre</td>
</tr>
<tr>
<td>mmol/L</td>
<td>Millimoles per litre</td>
</tr>
<tr>
<td>MVS</td>
<td>Maharishi Vedic Science</td>
</tr>
<tr>
<td>NGE</td>
<td>Non-goûter eaters</td>
</tr>
<tr>
<td>NGNSE</td>
<td>Non-goûter non snack eaters</td>
</tr>
<tr>
<td>NGSE</td>
<td>Non-goûter snack eaters</td>
</tr>
<tr>
<td>pmol/L</td>
<td>Picomoles per litre</td>
</tr>
<tr>
<td>STR</td>
<td>Sensitivity to reward</td>
</tr>
<tr>
<td>UR</td>
<td>Unconditioned response</td>
</tr>
<tr>
<td>US</td>
<td>Unconditioned stimulus</td>
</tr>
<tr>
<td>VEHS</td>
<td>Vitiated empty hollow sensation</td>
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PART 1

Fundamental Considerations
Chapter 1 Introduction

We do not know what drives us to eat… Have these drivers changed in parallel with the obesity epidemic and are they modifiable? (Denney-Wilson & Campbell, 2008, p. 76)

Why do some people eat in excess of their energy requirements? Why do anorexic people eat below their energy requirements despite abundant sources of food? When people do eat within their energy requirements, how do they manage to regulate their intake? The trivial observation that people eat at certain times and leave off eating soon afterwards points to some form of regulatory mechanism. However, this mechanism seems to be failing as evidenced by a dramatic rise in the prevalence of obesity and other illnesses, related to over-consumption, in the last 20 years (Haslam & James, 2005; Hossain, Kawar, & El Nahas, 2007; Lobstein, Baur, & Uauy, 2004; Lobstein & Jackson-Leach, 2007; Plotnikoff, Lightfoot, Spinola, Predy, & Barrett, 2008). Dieting, although widely practised, has failed to curb what has been called an “obesity epidemic” (McLellan, 2002). Almost half of a surveyed population in Australia (Timperio, Cameron-Smith, Burns, & Crawford, 2000) and more than two thirds of a similar United States population are attempting either to lose weight or to avoid weight gain (Serdula et al., 1999) with high levels of weight concern also evident in the United Kingdom (Wardle & Johnson, 2002). Furthermore many overweight men are unaware of their weight problem (Timperio et al., 2000; Wardle & Johnson, 2002). A new generation of “diseases of comfort,” with obesity as a major cause, is predicted to put extreme pressure on health care systems this century (Choi, Hunter, Tsou, & Sainsbury, 2005). Obesity is associated with increased prevalences of diabetes, hypertension, coronary artery disease and several cancers (Hossain, Kawar, & El Nahas, 2007), as well as gall bladder disease, osteoarthritis,
endocrine disorders, sleep apnoea, social exclusion and depression (Lobstein, Baur, & Uauy, 2004). Diet is a key public health concern (Attree, 2006). A tantalising, yet poorly understood connection between the gut and auto-immune diseases such as rheumatoid arthritis has long been recognised (Darlington, Ramsey, & Mansfield, 1986; Tagesson, 1982), and inflammatory bowel disease may also be susceptible to dietary manipulation (King, Woolner, & Hunter, 1997). The need to better understand food regulation is acute.

The aim in eating research over the last 50 years has been to understand the biochemistry and neurophysiology of the food regulation mechanism (see for example: Berthoud, 2002; de Graaf, Blom, Smeets, Stafleu, & Hendriks, 2004; Janowitz, 1958; Lepkovsky, 1973; Woods, Seeley, Porte, & Schwartz, 1998). It was hoped that such an understanding would lead to drugs or surgical interventions that would help to correct faulty regulation. Much of this work is removed from the world of human experiences and focuses on what can be observed about the behaviour and neurobiology of laboratory animals. Ingenious but complex strategies have been developed as a consequence to model hunger, for example in the rat, and its relation to energy need (Davidson, 1993). Much progress has also been made in identifying regulatory molecules such as ghrelin (Abizaid et al., 2006; Cummings, Foster-Schubert, & Overduin, 2005; Cummings, Frayo, Marmonier, Aubert, & Chapelot, 2004; Cummings et al., 2001) and other peripheral meal-induced peptides such as cholecystokinin; gastrin releasing peptides; glucagon-like peptide; peptide YY; as well as hypothalamic peptide systems such as neuropeptide Y, orexins and melanocortins; (Erlanson-Albertsson, 2005; Halford, Cooper, & Dovey, 2004; Perez-Tilve, Nogueiras, Mallo, Benoit, & Tschoep, 2006) and leptin (Baile, Della-Fera, &
Martin, 2000; Bouret & Simerly, 2004; Ceddia, 2005; Collins et al., 1996; Farooqi et al., 2007; Mark, Rahmouni, Correia, & Haynes, 2003; M. W. Schwartz & Morton, 2002; Spiegelman & Flier, 2001). However, the biochemistry of food regulation involves a myriad of subtle chemical interactions and it would be optimistic to suggest that this work is close to yielding a satisfactory result. Indeed, during the time in which effort has been most intense, the Western world has seen the prevalence of obesity grow to unprecedented levels. How realistic is it therefore to persist only in the biochemical line of attack? Could another path be taken to reach more quickly the goal of understanding food regulation?

Few people routinely check their ghrelin or leptin levels before deciding to enter a restaurant. Still less do they concern themselves with the state of their prefrontal, anterior cingulate or insular cortices. Hunger and satiety are directly perceived. Statements such as: “I’m hungry!” and “I’d like to eat!” should be of interest to researchers in eating regulation; these statements indicate that the subject is experiencing cues that might in a short time result in the consumption of food. Perhaps progress could be made by asking people what they mean when they say “I’m hungry.”

Eating, and the customs and rituals that surround it, are tightly related to emotional security, feelings of closeness, belonging and the enhancement of personal and family relationships. The mere existence of gastronomy “the study of the relationship between culture and food” indicates that we eat for many reasons – cultural, social and personal pleasure – and not just for the nutritional value of food (Bar-On, 2006; de Castro, 2000; Macht, Meiningner, & Roth, 2005). That eating is a highly
pleasurable activity gains almost universal agreement (Berenbaum, 2002; Westenhoefer & Pudel, 1993). Ask overweight patients if they enjoy their food and their response is likely to be “too much!” accompanied by a rueful look. Yet, I have noticed that if one asks the same patients to really think about whether they enjoyed eating breakfast that morning their response is typically a shrug and the comment that they could “just as easily have skipped it.” This mismatch between what is thought to pertain, and what actually does pertain\(^1\) extends to the internal eating cues. Ask overweight patients about their appetite and they will say “too good.” Ask the same patients if they were hungry before breakfast that morning and they will frequently deny it. Ask them if they get hungry much and they will tell you they are “always hungry.” Ask what hunger means for them and they will look at you blankly.

It is commonly supposed that over-indulgence in food occurs when the pleasures of eating over-ride the natural homeostatic food regulatory mechanisms. This idea seems logical and it enjoys much support in the literature. The pleasure of eating is seen to be inappropriate in a food-rich environment and a threat to well-being. Thus:

… the attainment of pleasure is both desirable and dangerous. For the vast majority (Sic.) of human history and prehistory, the primary objective of seeking food was survival through the maintenance of energy homoeostasis. In modern times, among well nourished populations, most food consumption… appears to be driven by pleasure…

The authors of this statement go on to justify a distinction between homeostatic and hedonic eating

\(^1\) The mismatch between what is thought to pertain and what is actually experienced may result from faulty organisation or grouping (recoding) of interoceptive perceptual data. Recoding is explained in section 12.2.1.
…and to discuss the potential consequences of what, from a historical perspective, represents an unprecedented societal phenomenon: the constant availability and frequent consumption of highly palatable foods. (Lowe & Butryn, 2007, p. 432)

This thesis proposes that the hedonic attraction of food, far from being distinct from homeostasis, is the essence of homeostasis and that growing prevalences of obesity and other illnesses associated with over-consumption are not due to people liking food too much. To the contrary, people do not like food enough. According to this theory it is the relative absence of eating pleasure that subverts the homeostatic mechanism.

1.1 How the writer came to the field

Anomalous responses to questions about eating pleasure and the internal cues that prompt eating have fascinated me during 27 years of clinical experience as a general medical practitioner, the more particularly since I discovered that they extend beyond the overweight into the “normal” general practice population. It is not difficult to elicit such responses through a few well-chosen questions during a general practice visit. Here, for example, is a recent verbatim conversation during a consultation (29/1/09) with Mr K.M. a lean 60 year old man with type 2 diabetes.

DLS: Do you enjoy your food?
KM: Yes (said with emphasis). But… I guess it’s just a habit. I will have breakfast and lunch every day.
DLS: How was breakfast this morning?
KM: Breakfast is b….. boring usually.
Breakfast (touted by many as the most important meal of the day) seems to be a kind of duty for many patients. Here, on the same day’s list, is a conversation with another patient, Ms J.W. aged 46 and of normal weight (29/1/09):

DLS: Do you get hungry much?
JW: No.
DLS: Are you hungry now?
JW: No.
DLS: How do you know?
JW: Don’t have any tummy rumbles, don’t feel lethargic, feel energised.
DLS: Would you have the rumbling at every meal?
JW: No, evening meal and certainly lunch-time. I don’t feel anything for breakfast, but I consciously eat something because I know I have to start my metabolism for the day.
DLS: Do you enjoy that?
JW: No, but my brain knows that my metabolism needs to wake up and do what it has to do for the rest of the day.

I began to wonder whether lack of eating pleasure, in conjunction with the confusion that many patients express about their internal eating cues, could point to a new way of understanding eating regulation that could have application beyond those suffering from overt eating disorders. Perhaps an improved understanding of internal eating cues could help even so-called “normal eaters” regulate their eating. Such subjective self-management could be an elegant and cost-effective solution to the problem of food regulation since it would avoid the complexities and risks of intervening at the molecular level. This could reduce the vast sums involved in pharmaceutical research and administration at a time when health care resources must be carefully rationed.
(Baur, 2008) and when the costs imposed by the biomedical industry are rapidly outstripping the financial resources of even the wealthiest industrialised nations.

I must immediately acknowledge my debt to the late Indian sage and seer Maharishi Mahesh Yogi whose Vedic Approach to Health (or Maharishi Ayurveda, a revival of Ayurvedic medicine, the classical system of health from India) opened me to the importance of the inner world. Maharishi Mahesh Yogi was for some 50 years engaged in reviving the Vedic knowledge of ancient India, which forms the basis of Indian philosophy and much Indian culture. I have merely applied and extended some of the concepts presented in his Vedic Approach to Health that relate to the regulation of eating behaviour.

The guidelines for healthy eating regulation as recommended under Maharishi's Vedic Approach to Health owe nothing to biochemistry or neuro-anatomy and tend to be simple behavioural recommendations. For example:

1. Eat in a settled atmosphere
2. Never eat when anxious, angry or upset
3. Always sit down to eat
4. Eat only when hungry
5. Eat only once the previous meal is digested
6. Don't talk while chewing
7. Don't eat too slowly or too quickly
8. Eat to the point of maximum comfort
9. Sit quietly for a few minutes after eating
10. Food should please all five senses

11. Eat with full attention (not reading or watching television)

Compared to mapping the complex neurochemical pathways involved in the production of ghrelin, these recommendations may appear naïvely simple. Nevertheless, I have observed that when fully attended to each is remarkably effective in helping people to regulate their eating. Such simple advice has been largely overlooked by mainstream clinical medicine. It is encouraging that very recently a Japanese group has studied the effect on overweight of two of the above principles: numbers 7 and 8, eating quickly and eating until full (Maruyama et al., 2008).

The underlying emphasis of these instructions is that food is best assimilated when the eating process occupies full attention, including attention to the qualities of the food and the interoceptive signals from the body, and when it is pleasant, enjoyable and free from stress. In imparting these instructions, therefore, the Maharishi Ayurveda therapist is encouraged to emphasise the joy of eating, an approach that helps overcome the tension that can arise between prescription and freedom of choice. This thesis focuses on numbers 4, 5, 8, 10 and 11. (This is not to devalue the remaining points but space precludes a full examination of them all.) I discovered that the best way to know whether the previous meal has digested is to ascertain the unequivocal presence of a sensation of hunger. I also discovered to my surprise that, on close investigation, I, and most of my patients had no idea whether we were hungry or not pre-meal, although many patients were quick to report a desire to eat.

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2 Positive emotional states are increasingly recognised as health promoting (Salovey, Rothman, Detweiler, & Steward, 2000).
Thus, Ms SJ aged 17 (12/2/09):

DLS: Get hungry much?
SJ: Not often. I’m not hungry in the mornings. But if I haven’t eaten I start feeling sick. I just drink heaps of water.
DLS: Are you hungry now?
SJ: No
DLS: How do you know?
SJ: ‘Cos I just don’t feel like eating. No. Hunger for me is where my stomach is growly, and then I get a sick feeling.
DLS: When it is growly, what you feel?
SJ: Not sure to be honest.

Hunger is frequently identified as the presence of sensations, such as burning, whose appropriateness as a signal to start a meal is dubious. Thus, Ms HA aged 25 (20/11/08):

DLS: What is hunger for you?
HA: Don’t really know.
DLS: Are you hungry now?
HA: A little bit.
DLS: What is it like?
HA: Kind of like a pain. It feels like my stomach is tight. I feel acid up to my throat, as if I’m starting to digest my throat.

Or Ms UH (27/05/08)

DLS: What is hunger for you?
UH: I am hungry now!
DLS: How do you know?
UH: I feel it everywhere!
DLS: Everywhere?
UH: Yes, it’s a feeling that I need something warm.
DLS: Do you have any specific feeling in the body?
UH: I have an empty feeling. (After consideration) No. It’s not an empty feeling it’s more of a burny feeling.

Or Ms OH (27/05/08) who confused hunger with thirst and realised she was doing this during the conversation:

DLS: How do you know you are hungry?
OH: Often it is a feeling in my throat – a sort of dryness. I know I am hungry when I can’t concentrate. (After consideration). I thought I was hungry now but I know I am not because it is a feeling in my throat!
DLS: Would you sometimes eat on that cue?
OH: Yep! I know it’s thirst, but sometimes I subconsciously eat as well. It’s a sort of habit.

As I describe in Chapter 7, it has been long recognised that people with eating disorders are confused about or unaware of internal eating cues. The conversations so far quoted would therefore be unexceptional if the patients were obese. However five of the six patients so far quoted are of normal weight and none has an eating disorder. In my own case (I was not overweight and considered myself to be in reasonably good health) I found that quite frequently I was eating more or less mindlessly without any particular sense of hunger or pleasure. In fact the perceived pleasure often seemed to owe more to the memory of food past eaten. Old childhood treats such as ice-cream or fish and chips were associated with a kind of anticipatory pleasure that carried me through the meal. If one really asked oneself if one were enjoying the taste, smell and
texture of the food, the answer was frequently in the negative. This led me to investigate the nature of the hunger sensation in so-called “normal eaters”, its significance, how it relates to the desire to eat and why eating pleasure may or may not ensue.

I observed that certain subjective eating cues appear reliably and repeatedly, while other cues are equivocal or disappear over a short span of time. Teasing out the non-equivocal from the equivocal cues and helping patients maximise their eating pleasure, I began to notice encouraging improvements among them in a wide range of illnesses. These included conditions that might be expected to respond such as obesity, diabetes (Lovell-Smith, 1996), and gastritis. I found that some other workers were pursuing a similar line of thinking in treating the obese (Ciliska, 1990; Craighead & Allen, 1995; Hirschmann & Munter, 1988, 1995; Kratina, King, & Hayes, 2003; May, 2005; Satter, 1987, 1999). I also noticed unexpected improvements in illnesses such as rheumatoid arthritis (Lovell-Smith, 1992), inflammatory bowel disease and Graves’ disease, suggesting a wider role for this approach to eating regulation and a link between regulated eating and the proper functioning of the immune system.

1.1.1 The subjective approach

This thesis concerns itself with subjectivity, asking questions such as “what is it like to be hungry?” In the last 60 years, most scientists have veered away from subjectivity. The perceived stumbling blocks have been the variability in response between individuals and the absence of any objective “standard” by which internal experience can be calibrated. To such fidelity to objectivism can be attributed the
popularity enjoyed by behaviourism, which was an attempt by the “soft” science of psychology to appropriate some of the respect afforded to the “hard” science of physics. Emphasising mathematical precision and objective rigour the pure behaviourist thus regards feelings such as hunger or satiety as unfit subjects for scientific enquiry. A behaviourist avoids terms like hunger, preferring the term “eating behaviour” – behaviour that might indicate hunger, were it in fact to exist.

Serious problems arise with this approach, not the least of which is a kind of circular reasoning (see Mattes, Hollis, Hayes, & Stunkard, 2005). Hunger is defined as the tendency to indulge in eating behaviour, so if Jim eats he must be hungry. The behaviourist scheme seems to miss something important about hunger, namely the internal experience, or what it is like to be hungry. If subjective sensations are once admitted as legitimate elements in a causal chain, then the inadequacy of the behaviourist reasoning becomes obvious. Jim might be eating for reasons other than hunger.

Behaviourism is based on the underlying philosophy of materialism, the view that everything is made of matter (Honderich, 1995, p. 530) and reflects a concern with the external world, as opposed to the internal world of mind, thoughts, sensations and emotions. Behaviourism held sway for most of the latter part of the 20th century and influenced our understanding of everything that organisms do. It pervades the way we and our patients think. Perhaps my patients are confused about hunger because for many years their subjective feelings have been discounted by the prevailing scientific hegemony. In this thesis it is suggested that vagueness about internal eating prompts
is one of the roots of disrupted eating regulation. It would be ironic if behaviourism, used to explain poor eating regulation, had been itself contributing to the problem.

In the research arena the behaviourist star is waning. Workers in the field of eating regulation found it useful to invoke intervening variables such as drive and incentive (see Berridge, 2004) that map to subjective feelings such as wanting and liking. Now terms such as “eating in the absence of hunger” and “intuitive eating” have become rallying points for a large and growing literature on treatment of the overweight and obese. This literature recognises the importance of internally oriented attention. Unfortunately, the terminology for the feelings and sensations found there is confused and little agreement exists on the exact meaning of words such as hunger and satiety.

Leaving aside the semantic confusion, are the internal eating cues themselves so very variable? Can there be no agreement as to their nature? Cameron (2001) finds that

It is often said that nonpainful sensations are vague and emotionally colored, and anatomical localization often is diffuse. However, such sensations as those referable to the alimentary tract—for example, nausea, severe hunger, and overfed satiety—are typically very specific in sensory characteristics and intense, even though not painful. (p 706)

According to Hill et al.

The question of why we fail to trust what people say is central to the science of psychology. Part of the answer lies in the fact that we often ask the wrong questions, in the wrong way, and fail to understand the answers when we get them. The domain of human experience and motivation cannot be summarily
dismissed. Indeed, we may need to place more trust in what people say in order to appreciate the failure of appetite control (Hill, Rogers, & Blundell, 1995).

I have listened to many patients speaking about the sensations and feelings that prompt them to eat. I find that hunger does not need to be severe to be recognisable. Alimentary sensations exist that can be accurately described and occur repeatedly and predictably. It is timely therefore to re-evaluate the problem of eating regulation from the subjective point of view. This thesis attempts to examine the work undertaken so far, provide a more rational lexicon for the field and suggest a new theory of eating regulation based on a consciousness-based paradigm, which could add impetus to current understanding.

1.2 Why this thesis is theoretical

*It is also a good rule not to put overmuch confidence in the observational results that are put forward until they are confirmed by theory.* – Arthur Eddington

This thesis advances a theory as a necessary precursor to future empirical research. The thesis does not report new empirical data. Thousands of studies in the field of eating regulation have amassed a large body of observational and experimental data. I am attempting not to add to that literature but rather to see it with new eyes and with a view to more fruitful data-gathering and practical application in the years ahead. The theorisation of eating regulation is sufficiently complex to justify a focus here in its own right.
1.3 Synopsis: The thesis at a glance

The thesis comprises three parts. Part 1 provides a background to the problem of eating regulation. The intention is to prepare a foundation upon which to establish the theory. Part 2 presents the theory proper. Part 3 presents hypotheses and testable predictions and discusses the implications of the theory.

The logic of the main argument follows.

Some people do not eat in a homeostatic manner:

- Because eating is not fully pleasurable for them.
- Because they are not responding to internal eating cues.
- Because with externally oriented attention they tend to overlook them
- And because they recode their perception of internal cues.

The theory can be succinctly stated as follows:

Externally oriented attention and encoding of internal perceptions lead to non-awareness and misinterpretation of internal eating cues. As a result, eating is not fully pleasurable for some people. Since eating pleasure must cross a satisfaction threshold for the regulation of food intake to occur, some people eat in a non-homeostatic manner.

A summary of the logic of the main argument is presented graphically in detail in Appendix 1. A condensed version is presented here:
Chapter 1 Introduction

Why do some people eat in a non-homeostatic manner?

Introduction, Chapters 1 to 4. Eating not pleasurable for some people. Some people confused about hunger. Hunger a subjective experience not upheld by materialist paradigm. Maharishi Consciousness-based paradigm (Maharishi Vedic Science, MVS) is an alternative.

Chapter 5. No fundamental defect in human homeostatic food regulatory system, but in a food-rich environment….

Chapter 6. Common sense suggests hunger stimulates desire to eat, contentment after eating eliminates the desire but…

Chapter 7. Many people eat in response to stimuli that are not influenced by food intake.

Chapter 8. Hunger and satiety. The empty hollow sensation (EHS) as an important indicator.

Chapter 9. Eating desire. Eating pleasure is enhanced by the EHS. Eating in response to EHS helps fulfil desire to eat.

Chapter 10. Thus eating has not been fully satisfying for some people. Significance in food cravings and addictions.

Chapter 11. EHS supports homeostasis

Chapter 12. Why EHS has been overlooked. Externally directed attention and recoding.

Chapter 13. Hypotheses, predictions and implications

Chapter 14. Testing the predictions

Chapter 15. Limitations and objections

Figure 1 Synopsis: The thesis at a glance
Chapter 2 Objective and method

2.1 Objective

To generate theory to help explain why some people eat in a non-homeostatic manner.

2.2 Method

The author has attempted to generate theory through constant reference to data from as many relevant and available sources as possible. The process of theory development has involved a creative cycle of clinical experience, reading, discussion, reflection and insight, whose outcome is the formulation of two final hypotheses which in turn lead to predictions that can be tested. The creative cycle as suggested by Ridkey and Sheldon (cited in Katerndahl & Crabtree, 2006) describes this process and begins with initial motivation and preparation before proceeding to the combination and manipulation of ideas which, given time to incubate, yield illumination. New ideas are then evaluated providing the motivation for further iterations of the process.

My motivation and preparation, evolved during my study of Maharishi Ayurveda and in general practice as described in section 1.1. The manipulation and incubation of ideas have been supported by the thoughts and ideas of others in the field, data from existing studies, and ongoing experience with my patients. In the circle of constructivist enquiry (which can be taken as an extension of the creative cycle above) represented by Figure 2, new ideas are represented by invention and design. Data are
gathered and analysed to either support or refute these new ideas, leading to the generation of theory.

Figure 2  Shiva’s circle of constructivist enquiry

(after Crabtree & Miller, cited in Underwood & Murray, 1998 and reprinted with permission).

Theory can then be tested by experience in the field which might lead to anomalous results necessitating further invention and design. As Underwood and Murray put it:

Good researchers immerse themselves in their data, and from this immersion come interpretations and analyses central to greater clarification of original questions, sometimes spawning totally new ones …the data continually ‘reworks’ the question, which then produces more questions and more data, and so sets off a dynamic cycle of questioning, discovering and then questioning again (p174).
Thus where anomalous findings occur the cycle must continue to further refine the theory. Reflection, insight and the interpretation and critical analysis of data have been essential to the process. Critical analysis helps expose anomalous conclusions and leads to the purposive searching for new data and the posing of deniable hypotheses.

In quest of data to address my study objective, I accessed the literature using catalogues of the University of Auckland library and the electronic databases MEDLINE, PsychINFO, EMBASE, Google, Google Scholar, Philosopher’s Index and the grey literature – in particular Dissertation Abstracts International. Searches of the databases were restricted to the English language. I did not exclude any particular period as I was interested in early as well as recent thought. I did not select for human studies only since much of the biochemical work of food intake regulation has been performed on laboratory animals. I began with the terms “hunger” and “satiety” and searched titles and abstracts. The results of these searches led to further searches on the following terms: “pleasure” “homeostasis” “normal eating” “appetite” “absence of hunger” “consciousness” “awareness” “attention” “recognition” “interoception” “eating” “regulation” “normal” “fasting” “remission” “diet” “subjective” “assessment” “detail” “inattention” “blindness” “perception” “indigestion” “inflammation” “blood sedimentation” “stomach” and “electrogastrogram” and “gastrectomy.” As published articles came to hand, their reference lists proved an invaluable further source of articles.

Interpretation was greatly aided by discussion with expert colleagues in the field. In 2006 and 2007 I was helped most notably by Professor Mario Ciampololini from
Florence, Italy and Chris Harshaw from Florida, United States. I was also in touch by email with Professors Blundell and Hill from Leeds in the United Kingdom and spoke briefly to Professor Didier Chapelot in France. I was fortunate also to discuss in person the psychological section of the thesis with Dr Michael Dillbeck, in Holland in December 2007. In July 2008 I attended the annual conference of the Society for the Study of Ingestive Behaviour in Paris where I met and had discussions with leaders in the field including: Professors John Blundell, Kent Berridge, James Gibbs, Simon Thornton, Didier Chapelot, Hans-Rudolf Berthoud, Michael Hermanussen, Charlotte Erlanson-Albertsson, David Levitsky, Michael Lowe and Ruth Harris. Since the conference I have had email contact with all except two of these investigators. I also travelled to Italy where I was able to spend time with Mario Ciampolini and to Holland where I met and had several talks with Dr Walter Moelk, the leading spokesman on health in Maharishi Mahesh Yogi’s organisation.

I referred to my own library, in particular books on Western philosophy and Ayurvedic medicine. I also referred to my clinical files, particularly notes taken during general practice consultations, and notes taken at courses on Maharishi’s Vedic Approach to Health in India, Holland, Switzerland, Spain, Australia, the United States, Italy and New Zealand. Communications with other colleagues, my family and friends were helpful in organising my ideas.

2.3 Notes on presentation and style

References conform to the American Psychological Association standard (APA 5th). To help orient the reader, dates of birth and death are given for pre-twentieth century writers.
In the matter of quotations, it is customary in scientific writing to paraphrase rather than quote another author verbatim. Philosophical writing reverses the custom. The reason usually given for paraphrasing is to avoid the charge of lazy or unoriginal thinking, however I suspect also a desire to interpret original data *de novo* rather than accept the words of another interpreter. This thesis is both philosophical and scientific. The author feels that, where appropriate, advantages lie in giving a reader the “raw data” of another author’s words rather than through the filter of the present author’s mind. These data allow readers to make up their own mind on the relevance and import of a writer’s words. This external scrutiny is especially relevant when another author’s insights are, in effect, the data, or when the subject matter is contentious, unexpected or susceptible to the present author’s bias. Thus in this thesis verbatim quotations are employed, not just because another author may have put a point succinctly, but to give the reader the opportunity to see *exactly* what that author said.
Chapter 3 The Mind-Body Problem: In search of a paradigm

Introduction

In Chapters 3 and 4, a consciousness based paradigm, Maharishi Vedic Science (MVS) is invoked to overcome a fundamental difficulty in understanding the regulation of food intake – how the contents of the mind – subjective experience – influence the body and vice versa.

Eating research inevitably encounters both subjective and objective phenomena. The very physical act of eating food assuages the subjective phenomenon of hunger. Food is “physical stuff.” Hunger is “mind stuff.” How does the one influence the other? An unclear or confused philosophy on this question could lead to research initiatives that ask unclear questions, leading to years of wasted or unfruitful effort.

How food assuages hunger is one example of a more general philosophical problem, the mind-body problem, reformulated in 1994 by the Australian philosopher David Chalmers (Chalmers, 1996, 1997a, 2007) as the “hard problem of consciousness”. The materialistic paradigm that has prevailed in eating research over the last 60 years has tackled the problem by disallowing subjective phenomena in scientific discourse. However, excluding feelings of hunger and satiety denies understanding of highly salient features in food regulation. In a study in which correlations were calculated between reported hunger (“emptiness”), meal characteristics, the pre-meal intervals, the post-meal intervals, and stomach contents (as an indication of nutrient depletion), de Castro and Elmore (1988) found that hunger is not an epiphenomenon:
…the influence of subjective hunger was significant and salient… results suggest that the relationship of subjective hunger with food intake regulation is not epiphenomenal. They suggest that the subjective hunger of the subject is associated with an intermediary step in the regulatory process. (p. 164)

Hunger therefore appears to be a force to be reckoned with.

At present the “problem of consciousness” is the focus of intense philosophical inquiry. It has become, as Blackmore (2003, p. 1) puts it, of “mind-boggling, brain hurting” perplexity. Most of the pain at this stage is borne by philosophers of science rather than scientists themselves, who tend to operate within a version of pragmatic

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3 This correlative study asked subjects to rate their degree of fullness or emptiness on a 7-point scale (an unusual degree of subjective definition since most rating scales just use the vague word “hunger.”) The subjects then recorded their food intake for seven consecutive days. Using a file of over 3000 food items the investigators coded the meal characteristics. The caloric content of the stomach was estimated using a computer model. The reported intake was entered into the model and an estimated time taken to empty from the stomach found. Correlations were calculated between the reported hunger, the meal characteristics, the premeal intervals, the postmeal intervals, and the stomach contents individually for each subject.

Based upon consistent univariate correlations and multiple linear regressions, De Castro and Elmore suggest firstly that, rather unsurprisingly, the amount of hunger (emptiness) self-reported depended primarily upon the contents of the stomach. Both the longer it had been since a subject ate and the less food in the stomach at the time of eating correlated with the hungrier they reported themselves to be.

While acknowledging the problems inherent in identifying causation from correlation, they then addressed the question of causation. Is hunger, the subjective sensation, an epiphenomenon or does it play a determining role? Two possibilities exist. The first case (hunger epiphenomenal) can be depicted thus:

\[ \text{Hunger} \leftarrow \text{Premeal state of stomach} \rightarrow \text{meal size} \]

The second case thus:

\[ \text{Premeal state of stomach} \rightarrow \text{Hunger} \rightarrow \text{meal size} \]

If the first case pertains then when subjective hunger was combined with the premeal state of the stomach in predicting meal size, the influence of subjective hunger should disappear since the apparent influence of subjective hunger on meal size would depend only upon their mutual relationship with the premeal state of the stomach. De Castro and Elmore found that the opposite occurred.

When the predictors were combined, the premeal stomach contents influence on meal size became nonsignificant, while the influence of subjective hunger was a significant and salient. (p. 164)

This is an important finding since it suggests that subjective feelings cannot be dispensed with in the study of eating. They are part of the homeostatic process.
philosophers are returning to other solutions to the mind-body problem. These solutions include idealist theories in which the mind is held to be primary as well as dual-aspect theories, in which the mind and body are aspects of a third underlying fundamental substance. Dual-aspect theories variously posit this underlying substance to be consciousness (for example Leibnitz’s theory in the 17th century and Fechner’s in the 19th century) or information or experience as in the theories of William James (1890/2005) or Chalmers (1996).

A full survey of the mind-body problem would be a vast undertaking and is beyond the scope of this thesis. Nor is what follows intended to be a refutation of materialism. What follows is necessarily simplified and serves the present need to introduce a theory that seeks a) to admit subjectivity as a legitimate field of enquiry, b) to distinguish between elements within subjectivity (for example, sensations and emotions including pleasure) and c) to posit higher states of human consciousness. The task at hand is to find a paradigm that will allow a richer understanding of a sentence such as “Jim is hungry.” To test the suitability of each proposed solution to the mind-body problem in meeting this task, it helps to ask the following question:

How is it that when Jim eats food, his hunger disappears?

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4 At a recent conference attended by the author 75% of the 243 reports (comprising posters and lecture presentations) were biomedical in orientation (the title of 26% of these 243 reports referred to rats, mice or other laboratory animals) while the remainder focused mostly on observed behaviour (Society for Study of Ingestive Behaviour, 2008). These reports dealt almost exclusively with the material side of the mind-body divide. One investigator told the author that his overriding motivation was to “find out how things work” (Berthoud H, Personal Communication, 18th July, 2008). His remark illustrated the prevailing reductive attitude in which subjective correlates such as hunger or satiety are generally allowed, but considered either as epiphenomenal (occuring in parallel with biomedical processes but playing no causal role) or too vague or inconstant for reductive analysis and therefore unfit for serious scientific consideration.
At first sight the answer to this question might seem obvious. His hunger disappears because his stomach has filled! But that explanation only moves the problem back one step because then the question can be reworded: how is it that filling the stomach makes Jim’s hunger disappear? No matter how far back in the physical causal chain one carries the question, invoking perhaps afferent nervous impulses to the satiety centre of the hypothalamus, the question can be reworded and posed again. One could ask: how does the nervous impulse in the hypothalamus make Jim’s hunger disappear? At some point the mind-body divide has to be acknowledged.

Explaining this phenomenon requires questioning the materialistic paradigm. The word paradigm can be problematic. Before embarking upon an examination of the various solutions to the mind-body problem, its use here must be clarified.

**Definition and discussion of the term paradigm**

A paradigm in its original sense was what members of a scientific community uniquely share. Thomas Kuhn, who introduced the term, thus restricted its use to science. What a scientific community shares according to Kuhn (1962, p. 10) are “models from which spring particular coherent traditions of scientific research”. Examples of such traditions are Ptolemaic astronomy, Copernican astronomy, Aristotelian dynamics, Newtonian dynamics, and corpuscular or wave optics. The models, Kuhn holds, arise from the law, theory, application and instrumentation of scientific practice. Paradigms for Kuhn were peculiar to what he called normal science alone. He saw a difference between science and the humanities, being
…struck by the number and extent of the open disagreements between social scientists about the nature of legitimate scientific problems and methods. Both history and acquaintance made me doubt that practitioners of the natural sciences possess firmer or more permanent answers to such questions than their colleagues in social science. Yet, somehow the practice of astronomy, physics, chemistry, or biology normally fails to evoke the controversies over fundamentals that today often seem endemic among, say, psychologists or sociologists (Kuhn, 1962 viii).

Kuhn realised that a researcher within the social sciences has, before him or her, competing fundamental solutions to a problem, solutions that must be examined afresh for their suitability of application each time a problem is encountered. He or she could, for example, use a 19th century Husserlian phenomenological approach to a problem or take a Marxist approach to an economic problem. A scientist, once working within the current paradigm and practising normal science, would not be allowed comparable luxuries. A medical scientist would not, for example, be permitted to revisit the concepts of miasma or the presence of demons in the aetiology of schizophrenia since these are disallowed in the current scientific paradigm.

Thus the word “paradigm,” in the strict sense that Kuhn intended, should not be used in humanities or social sciences. Nevertheless, since the 1960s, “paradigm” has been applied in these areas. Its sense has changed from that originally proposed by Kuhn and the word now carries the sense of an overarching world-view. In this thesis a paradigm is taken to be a patterned, shared way of viewing the world, which organises the set of practices that define a scientific discipline during a particular time period.
**Why not remain within the current paradigm?**

A fresh approach may yield new directions for future exploration and testing. It might seem pedantic to dwell on the underpinning philosophical assumptions of commonplace reports such as “I feel hungry” or “I feel hunger” but these phrases are far from straightforward. “I feel hungry” differs in nuance from “I feel hunger”. What is feeling hunger? What is actually felt? What importance do we attach to the statement? Do we even believe it? The way we answer these questions or whether we ask them at all will depend upon underlying assumptions. It is therefore important to lay out the philosophical foundations upon which this thesis will be built.

Why has a different paradigm been chosen? Western contributions in the field of eating regulation have come from psychiatry, paediatrics, internal medicine, psychology, nursing and complementary medicine. Although generally in the background and accepted unconsciously, each discipline has its own theoretical framework. Many workers seem unaware of the fundamental uncertainties at the foundation of their discipline. The prevailing paradigm, Type-B materialism, has emphasised the biomedical aspects of eating regulation. The limitations of biomedicine have been well described (Engel, 1977, 1992, 1997). A full understanding of internal sensations in the regulation of eating is beyond its scope. The least that can be said about Type-B materialism is that it has neither prevented nor restrained an epidemic of unregulated eating. While it may be convenient to continue down its well trodden path, answers may be found further afield. A new understanding of the mind body problem is timely.

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5 Since the former could imply a disposition to eat while the latter implies a sensation.
**Does the theory stand or fall on acceptance of the new paradigm?**

A theory can be validated independently regardless of whether its underlying assumptions are accepted or not. What is desirable is that the theory be logically defensible and that its predictions are amenable to subsequent testing. Einstein’s theory of relativity was, for example, based on the most counter-intuitive of assumptions. The theory is now generally accepted not because the validity of the assumptions was acknowledged but because the predictions were empirically upheld. Chapter 14 offers suggestions for formal testing of the predictions of this theory.

**The Problem**

The mind-body problem can be expressed in the following diagram:

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MIND – RELATIONSHIP – BODY
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The conscious mind has a relationship to the body. But exactly how do they relate? Intuitively there seems to be a divide between what I as a conscious being experience subjectively and what another party might observe objectively. What I experience, the British empiricist John Locke (1632-1704) called sensations. Sensations give rise to ideas within the mind. For Locke a sensation was the connection between real existence and the mental idea.

*The knowledge of the existence of any other thing we can have only by sensation:* for there being no necessary connection of real existence with any idea a man hath in his memory… [and] any other being but only when, by actual operating upon him, it makes itself perceived by him (Locke, 1706/1961).
More recently the word *quale* (pl. qualia) has been used to extend Locke’s ‘ideas that arise from sensations’. Although the word has become a philosophical battleground, (since deciding upon its meaning strikes at the core of the mind-body problem), as Blackmore (2003, p. 25) points out, the basic idea is clear. It is intended to denote quality and “point to phenomenology”. A quale is, for example, what it is *like* to experience the colour red, what it is *like* to drink hot chocolate or smell coffee, what it is *like* to be hungry. Hunger is a direct and intimate experience. Chalmers puts it thus:

When we see, for example, we experience visual sensations: the felt quality of redness, the experience of dark and light, the quality of the visual field… Then there are bodily sensations from pains to orgasms; mental images that are conjured up internally; the felt quality of emotion and the experience of a stream of conscious thought. What unites all of these states is that there is something it is like to be in them. All of them are states of experience (Chalmers, 1997a, p. 10).

When I feel hungry an observer might identify the presence of ghrelin in my stomach or perhaps a particular pattern of nerve impulses in the insular cortex of my brain, but what I *feel* is neither ghrelin nor a nerve impulse nor anything like those things. What it is like to experience hunger seems to inhabit a realm completely removed from biochemical or neurological observations. Yet if I fill my stomach with food, the sensation of hunger disappears. It seems inescapable also that these apparently unrelated realms are somehow connected. This connected chasm, the yawning “gap that is not a gap” between what one feels inside and what is observed outside is at the heart of the mind-body problem. As the British philosopher Colin McGinn puts it:
You can look into your mind until you burst, and you will not discover neurons and synapses and all
the rest; and you can stare at someone's brain from dawn to dusk and you will not perceive the
consciousness that is so apparent to the person whose brain you are so rudely eyeballing (McGinn cited

It is deeply rooted in our Western culture that matter is a primary and fundamental
stuff of the universe completely discrete from mind. This is a notion for which René
Descartes (1596-1650) is usually held responsible, although it can be traced to
antiquity, for the Greeks were concerned about the divide between soul and body. For
the modern scientific world-view however, Descartes’ dualism is the point at which
the mind-body problem becomes relevant and pressing. Descartes recognised:

…only two summa genera of realities: intellectual or mental (cogitativarum) realities, i.e. such as
belong to a mind or conscious (cogitantem) substance; and material realities, i.e. such as belong to an
extended substance, a body (Descartes 1644/1970, p. 190).

For Descartes, the physical world, including our bodies, operates in a machine-like
manner within a realm of extended substance (res extensa) that can be described
mathematically. Mind or soul, he concluded, is made of a completely different entity,
a non-spatial and non-divisible thinking substance (res cogitans). 6

6 Why did Descartes’ dualism become so deeply rooted, or rather the monism that resulted from it –
since, as Wertheim (1999, p. 154) points out, his followers mostly ignored his notion of mind?
Bilodeau describes mind and body as “a convenient distinction which solidified into an axiom”
(Bilodeau, 1997, p. 217). Its convenience probably had to do with the politics of the time. Renaissance
curiosity had evoked a strong interest in the inner workings of the human body and the practice of
dissection had become popular. Such an invasion of the human temple sat uncomfortably with the
ecclesiastical mind and scientific activities were at risk of being suppressed by the church (at that time
a very powerful institution). Descartes’ philosophy of substance dualism allowed a convenient solution
to the impasse. An agreement was reached in which the church gave permission for early scientists to
practise dissection, in return for which it was understood that the Church retained the soul as its special
domain (Cassel, 1982; Engel, 1977, p. 13). The “Cartesian impasse” that the manoeuvre imposed upon
us has exercised philosophers and thinkers for centuries.
A representative sample of the various solutions to the mind-body problem will be briefly examined in a historical context. Returning to the Cartesian impasse:

**MIND (res cogitans) – RELATIONSHIP – BODY (res extensa)**

Proposed solutions fall into three main groups, dualistic, monistic and other:

1. **Dualistic.** These solutions accept two realms – mind and body – and hence a relationship between them. Such solutions proceed by:

   a. attempting to explain how the relationship functions (e.g. Cartesian interventionalism) or
   b. accepting the relationship without explaining it (e.g. parallelism, functionalism).

2. **Monistic**

   a. Materialistic monism. These proposals reduce the world in its entirety to the *res extensa*, and thereby deny a problem of relationship.
   b. Idealistic monism. These proposals reduce the world in its entirety to the *res cogitans*, and thereby deny a problem of relationship.
   c. Dual aspect monism. These proposals suggest an underlying fundamental substance of which mind and body are aspects.
3. Other solutions include those that attempt to frame the mind-body problem as a pseudo-problem (Churchland, 1997; Vacariu, 2005) or to suggest that the problem appears intractable only because our minds are not equipped to understand it (McGinn, 1989; Nagel, 1974).

Since the renewed interest in the mind-body problem stems from the difficulties originally raised by Descartes’ dualism, the dualistic solutions will be considered first.

3.1 Dualistic solutions

3.1.1 Interventionalism (Interactionism)

Descartes recognised that mind and body interact and even proposed a site for this interaction: the pineal gland. He chose this gland as it is a single structure among dual brain structures. A unitary organ seemed appropriate for the seat of the soul, since the soul would be expected to have an integrating function. This does not explain how the interaction works however. If cause and effect must have a necessary connection and be of a similar type, then the interaction that Descartes proposed is untenable. Causation according to Descartes is all to do with “push” – the mechanical contact of one thing moving another. An extended res extera could not “push” the non-extended res cogitans. A more satisfying answer was needed.

In the 19th century William Benjamin Carpenter (1813-1885) took up the interventionalist cause. Unfortunately, in Carpenter’s own words, about the actual mechanism whereby the interaction occurs, “we know nothing whatever”. Carpenter’s interventionalism thus amounted to little more than a precise restatement
of the problem. In the 20th century, Popper and Eccles proposed an interventionist dualist solution to the mind-body problem (Blackmore, 2003, pp. 13-14), however interventionists are rare in the 21st century.

### 3.1.2 Occasionalism

Promoted by Nicolas Malebranche (1638-1715) occasionalism does away with mind-body connectedness, holding no influence either of mind on body or of body on mind. The only causality is that occasioned by God. Thus, for example, if I decide to move my arm, that decision is an occasion for God to move my arm. If somebody walks into my room it is an occasion for God to produce a visual impression of that person in my mind. Occasionalism has not found great favour among later thinkers since it seems to simply resort to a Deus ex machina. Literally meaning “God from a machine” a *Deus ex machina* is an improbable dramatic device invoked for the sole purpose of resolving a plot. That God arranges for the cessation of my hunger at just the time I fill my stomach with food seems lacking in true explanatory power since it is not testable or refutable.

### 3.1.3 Parallelism

Parallelists accept that every mental event is correlated with a physical event but avoid assuming any causal connection between the two. Gottfried Wilhelm Leibniz (1646-1716) is recognised as an early proponent of parallelism (B. Russell, 1945, p. 588). On Leibniz’s view soul and body exist in a pre-established harmony as two clocks that agree perfectly. Leibniz argued that there could be only three possible ways in which this harmony could come about. Firstly, they could interact in some way (interactionism). This view Leibniz rejected because it is impossible to imagine
how the material could act upon the mind and *vice versa*. Secondly, a skilled technician could regulate the clocks and keep them in accordance (occasionalism, which view Leibniz also rejected for the reason given above). Thirdly they could have been set up in perfect harmony from the outset by God. This for Leibniz was the only acceptable explanation.

### 3.1.4 Pragmatic Parallelism

William James (1842–1910), in his *Principles of Psychology* finds himself at a loss to solve the mind-body problem:

What shall we do? Many would find relief at this point in celebrating the mystery of the Unknowable and the 'awe' which we should feel at having such a principle to take final charge of our perplexities. Others would rejoice that the finite and separatist view of things with which we started had at last developed its contradictions, and was about to lead us dialectically upwards to some 'higher synthesis' in which inconsistencies cease from troubling and logic is at rest. It may be a constitutional infirmity, but I can take no comfort in such devices for making a luxury of intellectual defeat. They are but spiritual chloroform. Better live on the ragged edge, better gnaw the file forever! (James 1890/1950, pp. 178-179).

James, at least at this point in his life, settled for a pragmatic parallelism, in which the problem is recognised, but not solved.

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James was a towering influence in the history of psychology. His compass was broad ranging from the most positivistic empiricism to investigation of almost every kind of available spiritual or paranormal experience. He was raised under the influence of Transcendentalism and drew on Emerson and Swedenborg. Much of his work appears to attempt to marry his early persuasions concerning the realisation of higher states of consciousness within the individual, with the rigorous empiricist principles of his age.
3.1.5 Dualism assessed

Today’s true dualist would be unable to answer the question “how is it that the intake of food makes the sensation of hunger disappear?” any more satisfactorily than Descartes could, since no satisfactory bridging mechanism between the physical and mental realms has ever been proposed. As Blackmore (2003) bluntly puts it:

Dualism does not work. Almost all contemporary scientists and philosophers agree on this. In 1949 the British philosopher Gilbert Ryle derided dualism as ‘The dogma of the Ghost in the Machine’ – a phrase that has entered into common use (p. 13).

I use the words “true dualism” because the most prevalent present-day paradigm, type-B materialism, blends James’ pragmatic parallelism and materialism. Its ability to answer the test question above will be considered under materialism.

Rather than explain the relationship between mind and body another mode of attack is to eliminate the relationship by denying any distinction between mind and body. This approach yields the three monistic solutions listed above. The most prevalent in the last 100 years has been materialism, which will be considered first.

3.2 Monism - materialism

This view, known to the Ancient Greeks, resurfaced in the 18th century and dominated during most of the 20th century. It holds that matter is fundamental, and attempts to solve the mind-body problem by doing away with mind. The most extreme position, eliminative materialism sees the human body as machine-like and survives in contemporary philosophy, for example in the work of philosophers such as Patricia
Churchland (1997) and Daniel Dennett (1997). Less extreme forms of materialism allow mental events but see them as causally dependent upon physical events. The causal efficacy of mental events is denied and free-will is taken to be illusory. This view can be traced to Julien Offray de la Mettrie (1709-1751) and was taken up by George Cabanis (1757-1808). In his work *L’homme machine*, La Mettrie suggested that voluntary activities are to be distinguished from involuntary processes only by the complexity of the mechanism from which they arise. This idea survives as the notion that a computer of sufficient complexity could become conscious and make conscious voluntary decisions (for a discussion see Blackmore, 2003, pp. 185-186).

One difficulty with materialism is the so called “veil of perception”. We do not apprehend a table directly; what we apprehend is the sight and touch of the table. Sense perceptions act as a kind of veil that obscures whatever might lie beyond them. Idealists query that there is any justification to posit a table at all. That there is anything “out there” beyond our perceptions is in the end, they suggest, an article of faith. Indeed, the commonsense belief that there is a physical world “out there,” could be described as a kind of superstition. An aphorism that appeared in the journal *Punch* (1855): “what is mind, no matter – what is matter, never mind!” aptly describes materialistic monism.

### 3.2.1 19th Century materialism

Shadworth Holloway Hodgson (1832-1912) introduced the term epiphenomenalism to express the idea that subjective experience is not causally efficacious but is, as it were, merely along for the ride. Thomas Henry Huxley (1825-1895) popularised the notion and suggested that consciousness appeared because it had evolutionary
advantage. Huxley suggested that states of consciousness are reducible to the effect of molecular changes in brain substance that have attained a prerequisite degree of organisation. Coupling Darwin’s theory of evolution with a materialistic view of the brain was a powerful move since it seemed to provide an explanation of life including our very thoughts, feelings and notion of self, which was rational, mechanical and physical and avoided the need to invoke metaphysical concepts such as soul. Such was the force of these ideas that they remain the core philosophy of most medical scientists of the 20th and 21st century.

3.2.2 20th century materialism in psychology - behaviourism

It seemed self-evident that while all human knowledge might derive from experience, there was an essential difference between the raw materials of physics and the raw materials of psychology. The raw materials of physics could be objectively demonstrated to anyone with a pair of eyes, while the raw materials of psychology being the “privileged knowledge” of the person experiencing them could not be demonstrated in such an evident way. This is a point that has been disputed (see, for example Hut & Shepard, 1997) but the spectacular success of physics in the late 19th century led to a mistrust of that which is introspected and for calls that psychology should eschew the mind altogether and focus only on what was objectively observable (Dunlap, 1912; Frost, 1912). What is observable, it was argued, is the behaviour of human and other organisms. John B. Watson (1878-1958), introduced behaviourism in 1913. He first treated consciousness as an epiphenomenon but later stated:

All schools of psychology except that of behaviourism claim that consciousness is the subject matter of psychology … Behaviorism claims that "consciousness" is neither a definable nor a usable concept; that
it is merely another word for the "soul" of more ancient times. The old psychology is thus dominated by a kind of subtle religious philosophy (Watson, 1913, p. 1).

Behaviorists such as Watson and Skinner, in common with positivist philosophers, embraced eliminative materialism, positing that mind or consciousness does not exist except in popular language. The word mind, the positivists said, is a verb, and refers to something the brain does. To think of it as a noun is to make a “category mistake”, a semantic confusion. For most of the 1940s through to the 1970s, “mind” and “consciousness” were understood to be off limits in scientific discourse (Blackmore, 2003, p. 18). How did behaviourists deal with the mind-body problem? As eliminative materialists they did not need to because without the existence of mind, there was no mind-body divide (see Blackmore, 2003, p. 20).

Hunger, desire, pleasure and so forth, being inhabitants of the inner worlds, were similarly banished from discourse or else “operationalised” – observed and measured indirectly. Thus hunger (according to the behaviourist) is “food seeking behaviour” to be operationalised as the number of hours since a subject last ate, or the avidity with which a rat finds its way through a maze to get at its chow (Young, 1949). A large behaviourist literature describes such “eating behaviour”. Behaviourist contrivances to operationalise human experience are now frequently seen as not only impoverished but unnecessarily convoluted. Invoking processes such as incentive is now seen by many to be a laudable act of parsimony (Berridge, 2004).

3.2.3 20th century materialism in philosophy

Although still very prevalent in the scientific workplace, materialism is fighting a rearguard action in philosophy. Chalmers divides current-day materialists into two
groups: Type-A and Type-B. Type-A materialism includes on the one hand behaviourism and eliminative materialism in which it is denied that consciousness exists, and on the other hand functionalism in which consciousness may exist but only if defined as reportability or some other functional capacity.

Either way, it is asserted that there is no interesting fact about the mind, conceptually distinct from the functional facts… (Chalmers, 1997b, p. 380).

Functionalism was intended as an improvement on behaviourism. As early as the 1950s, some psychologists had renewed their interest in such subjective elements as attention, thinking and planning. Known as cognitive psychologists, they suggested that information about conscious processes could be inferred from measurable physiological and behavioural events (D. W. Orme-Johnson, 1988). Thus pain or hunger might be accepted as real, but only insofar as they are constituted by their causal relations to sensory inputs, and behavioural outputs. According to functionalism, mental states could, in theory, be manifested in various systems, so long as the system performs the appropriate functions. If, for example, the neurons within the brain, which are associated with the feeling of hunger, could be replaced by a silicon-based device capable of performing exactly the same functions as the neurons, then the owner of the brain would feel hunger exactly as before. A robot with a silicon brain having all the functions of a human brain would not be a zombie. It would experience consciousness, it would not be as, Chalmers would have it “all dark inside” (Chalmers, 1996, p. 96 & 99).
Type-B materialism is a kind of pragmatic parallelism with materialistic leanings harking to the early William James. Type-B materialism wishes to have a foot in both camps. It allows the mind an existence over and above function, yet preserves the intuition that mind can be explained as a physically based phenomenon. The popularity of Type-B materialism according to Varela:

…rests on the acceptance of the reality of experience and mental life while keeping the methods and ideas within the known framework of empirical science (Varela, 1997, p. 340).

Statements which belie their origin in Type-B materialism abound in the literature of eating regulation since it is the predominant philosophical position. The following are examples picked at random in which conscious experience is allowed but explained within the known framework:

One of the crucial factors for human evolution was the tremendous expansion of the cerebral cortex. It allowed what is usually referred to as higher neural functions, such as cognition, language, planning, consciousness, and emotion …(Berthoud, 2004a, p. 786).

Traditional psychophysical assessment of sensations labelled satiating has been applied to distension of the stomach …(Booth, 1992, p. 21).

…two separate catecholnergic mechanisms control hunger (Castonguay, Applegate, Upton, & Stern, 1983, p. 103).

The direct activation of both the interoceptive cortex and the ACC …corresponds with the simultaneous generation of both a sensation and a motivation (A. D. Craig, 2003, p. 503).
Chalmers complains that whereas Type-A materialism seems not to take consciousness seriously, Type-B materialism attempts to get the best of both worlds:

The type-B materialist accepts that there is a phenomenon that needs to be accounted for, conceptually distinct from the performance of functions, but holds that the phenomenon can still be explained within a materialist framework (Chalmers, 1997a).

Chalmers (and the author) do not believe that such an explanation is possible:

Structure and dynamics at a low level can combine in all sorts of interesting ways to explain the structure and function of high-level systems; but still, structure and function only ever add up to more structure and function. In most domains, this is quite enough... as structure and function are all that need to be explained. But when it comes to consciousness, something other than structure and function is to be accounted for. To get there, an explanation needs a further ingredient (Chalmers, 1997b, p. 388).

Type-B materialists do not seem to have thought through their pragmatic position. I feel hungry. Should I rush to the glucometer to verify whether it is true? If my hunger is really to do with ghrelin, what do I trust – the subjective sensation or the objective measurement? If I trust the objective measurement over the subjective experience does that imply my experience of hunger is not real? In practice, most Type-B materialists are neither purely parallelist nor purely materialist. They steer an uneasy philosophical course, unconsciously veering between the two, with a tendency to slide towards their materialistic selves when questions of scientific respectability arise.
3.2.4 Materialism assessed

How do Chalmers’ Type-A and Type-B materialists fare in answering the test question? Type-A materialism fails miserably. Why does the ingestion of food assuage Jim’s feeling of hunger? Jim’s feeling of hunger did not exist in the first place. That it was perceived to disappear on eating reflects the way his stomach functions in the presence of food. Subtract the functions and nothing is left according to this philosophy. Considering that for most people hunger is an intensely real and frequent experience this explanation is profoundly unsatisfying. Indeed, for Chalmers, the fact that the philosopher Dennett has been able to examine his own phenomenology and find nothing other than functions is “daringly close to a simple denial” (Chalmers, 1997a, p. 383). Type-B materialism fares little better. The answer here amounts to: “We don't deny that hunger exists but who cares? The important thing is to find out how it works. Then (perhaps) we can tell you more about it!” Neither shade of materialism therefore is a useful foundation to examine the experience of hunger or the pleasure that accompanies eating.

3.3 Monism - idealism

If the universe were not fundamentally material then maybe it is “mind-stuff” or consciousness. An explosion of interest in consciousness occurred in the mid-1990s, perhaps because of dissatisfaction with the limitations of materialism and perhaps also related to interest in the higher states of consciousness that can result from meditation techniques. In 1994 at the first Tucson conference on consciousness Chalmers divided the problems of consciousness into a series of easy problems and one hard problem. Among the easy problems of consciousness Chalmers included:
…the ability to discriminate, categorise, and react to environmental stimuli; the integration of information by a cognitive system; reportability of mental states; the ability of the system to access its own internal states; the focus of attention; the deliberate control of behaviour; the difference between wakefulness and sleep…(Chalmers, 1997a, p. 10).

In principle, Chalmers thinks, these problems could be solved by understanding the underlying neural mechanisms involved. The hard problem, according to Chalmers is how physical processes in the brain give rise to subjective experience. But it is more than that. For Chalmers goes on to state that there is a really hard aspect to the hard problem, which addresses what it is like to be in a given mental state. As he puts it:

The really hard problem of consciousness is the problem of experience. When we think and perceive there is a world of information processing, but there is also a subjective aspect…there is something it is like to be a conscious organism. This subjective aspect is experience (Chalmers, 1997a, p. 10).

“The hard problem,” embodying both forms, quickly entered the philosophic and scientific lexicon and became a focus for a modern reincarnation of the mind-body problem. There is widespread agreement among philosophers that the hard problem is very hard indeed and can only be solved by radically rethinking our traditional reductive, materialistic ways of viewing the mind and body (see, for example McGinn, 1989; Nagel, 1974). As Chalmers puts it:

…you can’t explain conscious experience on the cheap. It is a remarkable fact that reductive methods—methods that explain a high-level phenomenon wholly in terms of more basic physical processes—work well in so many domains…It would be wonderful if reductive methods could explain experience, too; I hoped for a long time that they might. Unfortunately, there are systematic reasons why these
methods must fail ...Experience is not an explanatory posit but an explanandum in its own right ...(Chalmers, 1997a, pp. 18-19).

Realising this, philosophers are returning to solutions that had seemed counter-intuitive. Many, if not most, of the apparently new solutions are in fact reformulations either of idealism, or more frequently, of dual aspect theory, as suggested during the 17th century. Idealism will be reviewed first.

3.3.1 17th century - Berkeley

In his *A Treatise concerning the Principles of Human Knowledge* Bishop George Berkeley (1685-1753) took up the notion that beyond the veil of perception there can be no evidence that anything material exists. We cannot assume that anything is “out there”. For something to exist it must either be perceived or be the active mind doing the perceiving.

The table, I write on, I say, exists, that is, I see and feel it; and if I were out of my study, I should say it existed, meaning thereby that if I was in my study, I might perceive it, or that some other spirit actually does perceive it. There was an odour, that is, it was smelt; there was a sound, that is to say, it was heard; a colour or figure, and it was perceived by sight or touch. This is all that I can understand by these and the like expressions. For as to what is said of the absolute existence of unthinking things without any relation to their being perceived, that seems perfectly unintelligible. The *essi is percipi*, nor is it possible they should have any existence, out of the minds or thinking things which perceive them (Berkeley, 1784/1963, p. 114).

Doing away with the material world “solves” the mind-body problem. Many of his contemporaries found Berkeley's ideas deeply counter-intuitive and in practice,
science moved towards materialism. Idealism did not disappear completely however, and it later surfaced in the 19th century as mind-stuff theory.

3.3.2 Mind-stuff theory

Mind-stuff theory takes an atomistic approach to consciousness and harks back to an earlier idea of Leibniz's – his theory of monads and unconscious *petites perceptions*. According to this theory the higher properties of mind comprise mental elements or pieces of "mind stuff". Aggregations of such pieces demonstrate the higher properties of mind including consciousness, when a sufficient level of complexity is reached among them. Herbert Spenser (1820-1903) in 1870 suggested:

There may be a single primordial element of consciousness, and the countless kinds of consciousness may be produced by the compounding of this element with itself and the recomposing of its compounds with one another in higher and higher degrees; so producing increased multiplicity, variety, and complexity (cited in James 1890/1950, p. 152).

The notion that primordial elements of consciousness combine to form mind remained very popular during the 19th century. Mind-stuff theory was invoked by early 20th century physicists to explain their otherwise baffling observations (see for example Eddington, 1929/1985) and Alfred North Whitehead contended that concrete physical entities are constructed from ‘occasions of experience’: … each bearing a quality akin to feeling. so that even temporal events in the career of an electron have a kind of ‘protomentality’ (Whitehead A, cited in Hameroff & Penrose, 1997, p. 177).
3.3.3 **Introspectionism**

Wilhelm Wundt (1832-1920) wished to establish a rigorous system of psychology, as it were, from the inside – by studying people’s inner experiences as precisely as possible, a process known as introspectionism. Like mind-stuff theorists before him, Wundt hoped to be able to build a science of consciousness by identifying the simplest elements of consciousness. Wundt claimed that “objective” sensations, such as tones, heat or light, become joined with “subjective” elements, or feelings, to create a conscious experience. His work was taken up by the American, Edward Titchener (1867-1927), who gave it the name structuralism.

Idealism tends nowadays to be labelled panpsychism. For some philosophers the “threat of panpsychism” is seen as a kind of conceptual trap to be avoided. Others see it as a viable and indeed necessary solution to the hard problem. Seager finds himself sympathetic stating:

…I find it remarkable that a number of issues involving the question of consciousness get a surprisingly unified treatment under panpsychism. It does seem to me that the acceptance of the reality of the generation problem and the subsequent perception of its extreme difficulty leads quite naturally, as Chalmers notes, to the idea that consciousness is a fundamental feature of the world (Seager, 1997, p. 284).

The main perceived difficulty with idealism is what has been called the “combination problem”. How do small elements of consciousness combine to form the kind of consciousness experienced by humans?
3.3.4 Idealism assessed

How does idealism fare in answering the test question? It presents better than dualism, since the gulf between the realm of food and the realm of hunger is no longer present. Both realms are made of consciousness, so there seems no reason why consciousness should not interact with itself. The main problem for latter day idealism has been its combination with atomism. It has not been obvious how the small pieces of consciousness that produce, say, a slice of bread, could, in other circumstances combine to produce the kind of consciousness that human beings experience as satiety. Because the combination problem has seemed so difficult, rather than embrace pure idealism, many philosophers have turned to dual aspect monism or, in Chalmers’ case, a combination of dualism and dual aspect monism.

3.4 Monism - Dual aspect theory

3.4.1 17th Century dual aspect theory

This approach can be traced to Benedictus de Spinoza (1632 to 1677). The relationship between mind and body can be explained if they are different aspects of the same underlying substance. While agreeing with Descartes that mind and extension are separate, Spinoza did not see them as finite substances. He therefore rejected Descartes's substance dualism. Both mind and body are attributes of only one infinite substance which is the universal essence of everything that exists (B. Russell, 1945, p. 577). For Spinoza this was God.
3.4.2 19th Century dual aspect theory

In his version of what is now known as dual aspect monism Gustav Theodor Fechner (1801-1887) suggested that consciousness and matter can be seen as a single curve that at every point is either concave or convex. Whether it is perceived as concave or convex depends upon one's point of view. Thus a single series of psychophysical events can similarly be seen either from the subjective point of view as thoughts or from the objective point of view as brain activity. Fechner's life work attempted to establish an exact science describing the relationship between these points of view. He carried out classical experiments on actual and visual sensation and coined the term “just noticeable difference” – the point at which two sensations are distinguished. His famous principle that the intensity of a sensation increases as the log of the stimulus was seen by Fechner as a mathematical demonstration of the unity of mind and body.8

George Henry Lewes (1817-1878) in The Physical Basis of Mind, posited what came to be called neutral monism – the view that the one underlying substance is neither mental nor physical. One of Lewes’ contributions was to point out that the terms that are used to describe mental events cannot be used to describe physical events and vice versa. They are not intertranslatable. Thus, following Lewes, “hunger” refers to an experience, “what it is like” to feel something. The presence of ghrelin in the stomach, while it might well be prompted by the same condition within the underlying

8 Unfortunately Fechner’s philosophical message was largely ignored. His methodological and empirical contributions on the other hand, were taken up by Helmholtz, Donders and Wundt to form the basis of experimental psychology. Herman von Helmholtz (1821-1894) first measured the speed of conduction of nerve signals and argued that the interaction of physical and mental processes occurs in the brain.
substance that promotes hunger, is not itself hunger; it is simply ghrelin in the stomach.

So influential was William James’ *Principles of Psychology* that the views expressed therein are often taken as his final word. James however continued to develop his thinking. He reversed his position on metaphysics embracing a form of dual aspect monism, his theory of Radical Empiricism – empiricism because it accepted only what could be experienced and radical in that science should include not only physical phenomena but all that could be experienced through the mind. The "stuff", neither material nor mental that underlies the universe, James (1904) calls “pure experience”.

My thesis is that if we start with the supposition that there is only one primal stuff or material in the world, a stuff of which everything is composed, and if we call that stuff ‘pure experience,’ the knowing can easily be explained as a particular sort of relation towards one another into which portions of pure experience may enter. The relation itself is a part of pure experience; one if its ‘terms’ becomes the subject or bearer of the knowledge, the knower, the other becomes the object known (no page number given).

Thus, when one element of pure experience relates in a particular way with another, the element of knowing or consciousness appears. What James seemed keen to establish was that consciousness does not have an independent reality. It is not the absolute, underlying substratum. One cannot, according to James have “pure consciousness.” We cannot be simply aware, we must always be aware of something. For James then, pure experience stands behind knower and known. Thus, although James’ earlier work was influential in laying the foundations for modern materialistic parallelism, his later work leaned towards an experience-based dual aspect monism.
3.4.3 20th Century dual aspect theory

In the 1950s Bertrand Russell (1872-1970), echoing Lewes, suggested “neutral monism”. The French philosopher Maurice Merleau-Ponty attempted to re-orientate the mind-body problem by emphasising the essential interrelatedness of mind and body, essentially denying that a division exists. Merleau-Ponty’s well-known statement “I am my body” did not mean that he was adopting a materialist position. His position was that the mind is essentially inseparable from our bodily nature. It may be convenient and pragmatic for the purposes of scientific endeavor to adopt the traditional view of a detached consciousness observing the material world, but that is merely a convention. In reality the two are integrated. At root, Merleau-Ponty is expressing a dual-aspect monism in which both the mental and physical worlds are underpinned by a more fundamental existence, a “primordial layer” which cannot be approached by intellectual effort or empirical observation. For Merleau-Ponty, only by avoiding analytical reflection and scientific explanation is it possible to:

…rediscover, as anterior to the ideas of subject and object, the fact of my subjectivity and the nascent object, that primordial layer at which both things and ideas come into being (Merleau-Ponty, 1945/2002, p. 225).

Merleau-Ponty was a phenomenologist building upon the earlier work of Edmund Husserl (1859–1938). Husserl is often associated with the beginnings of phenomenology although he derived this term from Franz Brentano (1838 -1917). For Brentano, like James, consciousness could not be pure. Conscious experiences are of things, objects or events. Brentano called this necessary “aboutness” of consciousness, “intentionality”. By bracketing or suspending any preconceptions in conscious experience Husserl believed that we could get behind concepts and return
to the essence of things, the “things in themselves”. Such suspension of analytical
judgement (epoché) he called the phenomenological reduction (Welton, 1999, p. 84).
When all concepts were thus bracketed, consciousness could be experienced without
contamination, pure and absolute, to make possible the eidetic reduction. Husserl
states:

…consciousness as considered on its purity… must be reckoned as a self-contained system of Being, as
a system of Absolute Being… on the other side, the whole spatio-temporal world… has the merely

The notion of pure consciousness allows the mind-body relationship to be explained.
It will be returned to in section 4.1.

3.4.4 21st Century dual aspect theory

Chalmers has put forward a theory he calls naturalistic dualism, which introduces the
idea that consciousness is irreducible – a fundamental indefinable – because of its
characteristic feature, experience.

I suggest that a theory of consciousness should take experience as fundamental. We know the theory of
consciousness requires the addition of something fundamental to our ontology, as everything in
physical theory is compatible with the absence of consciousness. We might add some entirely new
nonphysical feature, from which experience can be derived, but it is hard to see what such a feature
would be like. More likely, we will take experience itself as a fundamental feature of the world,
alongside mass, charge, and space-time. If we take experience as fundamental, then we can go about
the business of constructing a theory of experience (Chalmers, 1997a, p. 29).
As Chalmers points out positing a new fundamental indefinable is not without precedent in science:

Although a remarkable number of phenomena have turned out to be explicable wholly in terms of entities simpler than themselves, this is not universal. In physics, it occasionally happens that an entity has to be taken as fundamental. Fundamental entities are not explained in terms of anything simpler. Instead, one takes them as basic, and gives the theory of how they relate to everything else in the world (Chalmers, 1997a, p. 19).

Chalmers describes his theory as qualifying as a variety of dualism because:

…it postulates basic properties over and above the properties invoked by physics but it is an innocent version of dualism entirely compatible with the scientific view of the world. Nothing in this approach contradicts anything in physical theory; we simply need to add further bridging principles to explain how experience arises from physical processes (Chalmers, 1997a, p. 20).

Chalmers’ theory at this point thus looks something like this:

![Figure 3 Chalmers’ theory of consciousness as dualism](image)
However, in a later development of the theory and despite his dualist claim, he adds information as an underlying substrate, hence making his theory into one of dual aspect monism which he describes as a “double aspect theory of information”. Space precludes following this train of Chalmers’ thought in detail, but a summary follows:

…information (or at least some information) has two basic aspects, a physical aspect and a phenomenal aspect. This has the status of a basic principle that might underlie and explain the emergence of experience from the physical. Experience arises by virtue of its status as one aspect of information, when the other aspect is found embodied in physical processing (Chalmers, 1997a, p. 27).

From information emerges experience on the one hand and the physical world on the other. Now Chalmers’ theory looks like this:

![Figure 4](image)

**Figure 4** Chalmers’ theory of consciousness as dual aspect theory

In this version information is the substrate underlying experience and world (mind and body).

Although Chalmers is apologetic about the speculative nature of his theory it has much to commend it. It has an excellent lineage, dating as it does to Spinoza’s dual aspect monism and Lewes’ and Russell’s neutral monism. It also has quite powerful
explanatory power as the following computer analogy (the author’s not Chalmers’) might help to demonstrate.

For a teenager playing a computer game the world conjured up on the screen – of avatars, trees, rocks and so forth – is a kind of reality, which could be compared to experience or at least to the Cartesian “theatre of the mind”. The screen receives that information from the hard disk of the computer, information which was placed there by the programmer. The hard disk, being a piece of metal coated with iron oxide looks nothing like the image upon the screen. Even if one were to take a microscope and, to paraphrase Gibbs, stare at the oxide patterns until one were blue in the face, it would not even faintly resemble the screen. Nevertheless the oxide is a representation of that information as surely as the screen is. What underlies both screen appearance and hard disc is information, or intelligence, capable of creating both the image upon the screen and the particular configuration of oxide. Furthermore, the pattern of information is itself abstract and formless – it transcends the medium within which it is contained. It could be expressed, for example in any number of programming languages, as a pattern of oxide, or as a configuration of plastic in a compact disc. Similarly when one looks at a long-playing record one does not hear music, but the music and the undulating groove in the vinyl are representations of an intelligence that transcends both music and groove. The point is that any particular piece of information, although formless in itself, can assume markedly different forms. The differences that we find among forms taken by information are strikingly reminiscent of the differences we find between, say, the first person experience of red and the third person observation of neural impulses proceeding from the retina to the visual cortex of the brain.
To return to the analogy, mind could be compared to the video screen while physical matter could be compared to the oxide pattern. While dramatically different in appearance, each representation is informed by one single and underlying, formless pattern of information, which, since it transcends all possible expressions, could be called pure intelligence. Thus, positing information as a basic substrate goes a long way towards explaining the apparent chasm between mind and body.

The analogy can be stretched a little further to encompass the problem of multiple selves if we imagine two or more teenagers playing the same video game together, each with his or her own screen (appearance) but informed by the same intelligence. Each would then “see” the same reality. It would not be correct to say that the underlying pattern is “real”, and independent of the separate realities of each player. There are not three worlds in this situation, just one underlying reality which, depending upon their position in the progress of the video game appears differently to each player. Each player, as it were, sees the one reality from his or her “point of view.” That we all seem to inhabit the same world but see it differently is thus explained by the underlying intelligence theory.

Yet does information really explain experience? Who experiences the information? In our analogy someone is watching the information appear on the video screen. If someone has to know the information, who knows that the knower is knowing it? We seem to be sliding into the well-known problem of infinite regress of interpretive homunculi (D. W. Orme-Johnson, 1988, p. 118): “I’m hungry?” Who is it that is in this state? If there is a homunculus (“little person” within) who assembles and knows
all incoming information then who knows that he knows? There needs to be a second little person within the first, and then a third within the second and so forth. Every posited interpreter has to have an interpreter and so forth ad infinitum. This problem strikes at the heart of any theory that pits experience against information.

A second problem is how experience emerges from information. By Chalmers’ own argument, experience – what something is like – is non-reductive. But has he not just reduced it to information? How could a pattern of information become that unique experience of what it is like to see the colour red or experience hunger? One could argue that Chalmers has simply moved the mind-body problem back a step so that now he has the experience-information problem. The question can still be asked how information yields experience. As Mills puts it Chalmers’ double aspect principle:

… asserts that informational states – which are understandable in purely physical terms – correspond to phenomenal states …But it says nothing at all about why these correspondences hold: it does nothing whatsoever to bridge the explanatory gap between physical operation and conscious sensation (Mills, 1997, p. 112).

Conversely, it says nothing about how experience might influence information in order to move things around in the world. In Chalmers’ world, underlying everything is a flux of information. It is not clear how experience (or an experiencing of being) could cause changes in this flux. Elsewhere Chalmers does address the problem of causation when he invokes an idea first suggested by Bertrand Russell:

For everything that physics tells us about a particle, for example, it might as well be a bundle of causal dispositions; we know nothing of the entity that carries these dispositions …Russell's insight …is that
…Perhaps the intrinsic properties underlying physical dispositions are themselves experiential properties, or perhaps they are some sort of proto-experiential properties that together constitute conscious experience. This way we locate experience inside the causal network that physics describes, rather than outside as a dangler …(Chalmers, 1997b, p. 405).

This is an important idea, but Chalmers is now proposing a different form of double aspect monism. He has made experience, or proto-experience rather than information, the fundamental substrate. If I have read him correctly, his theory now looks something like this:

![Figure 5 Chalmers’ theory of consciousness as dual aspect theory](image)

In this version proto experiences are the substrate underlying experience and world (mind and body).

Certainly, getting rid of information and replacing it with experience gets around the problem of how experience and information could interact. Presumably experience can interact with proto-experience. But now the “combination problem” rears its head, just as it did in mind-stuff theory. How do proto-experiences combine to form fully fledged experiences? As Chalmers, himself ponders: “would not these tiny experiences …add up to a jagged mess?” The combination problem, “surely the hardest” as Chalmers says, is the most difficult feature of panpsychic theories.
3.4.5 Quantum physics

If the state of Jim’s stomach and his experience of hunger are integrated at a fundamental level by information/intelligence/experience, then that level could be approached either by the mental route or the physical route. As the field of intelligence is approached the mind and physical world should merge. From the beginning of the 20th century some physicists and philosophers have realised that the physical route needs to involve not biochemistry but the more fundamental physical processes at finer time and distance scales. At fundamental distance scales (of the order of $10^{-33}$ cm) space no longer has the kind of meaning we attribute to it in the macroscopic world. It is in fact, nonlocal, just as is mind. As CJS Clarke puts it:

On the one hand, mind is inherently nonlocal. On the other hand, the world is governed by a quantum physics that is inherently nonlocal. This is no accident, but a precise correspondence: mind and the quantum operator algebras are the enjoyed and contemplated aspects of the same thing (Clarke, 1997, p. 175).

Shear describes the correspondence thus:

…matter and the usual contents of consciousness appear to emerge from an object-free, nonlocal, space-like ground state and to manifest their phenomena (matter and phenomenological contents, respectively) through wavelike fluctuations of this ground …Qualitatively speaking, then, the differences between these ultimate foundations becomes vanishingly small, if not simply non-existent (Shear, 1997, p. 373).
Chapter 3 The Mind-Body Problem

According to the quantum physicist John Hagelin:

…much of the objective character of macroscopic matter begins to disappear at microscopic scales. The concrete notion of a particle is supplanted in non-relativistic quantum mechanics by a more abstract and localised wave function… the concrete and objective nature of existence starts to become more tenuous at fundamental scales (Hagelin, 1987, p. 59).

Hagelin notes the progress physics has made towards a simple, geometric unified field, a goal to which Einstein devoted the later part of his life. He identifies three significant breakthroughs. The first is the principle of spontaneously broken symmetry:

The application of this profound, unifying principle has resulted in a successful unification of the weak and electromagnetic forces by physicists Glashow, Salam and Weinberg. In addition to the unification of the weak and electromagnetic forces, this unified electro-weak theory unites various matter fields into doublets, which include the electron and the neutrino, the up quark and the down quark …(Ibid p. 36).

The second is represented by grand unification theories:

…theories which unify the strong, weak and electromagnetic forces. They also automatically result in the unification of quarks with leptons. The simplest and in many respects the most compelling model of this type was proposed in 1974 by H. Georgi and S. Glashow (Ibid p. 41).

The third is the development of superstring theories which endeavour to accomplish the final unification of the strong, weak and electromagnetic forces with gravity. The goal of such so-called “Theories of everything (TOEs)” is to explain all physical
phenomena in terms of one unified field.\(^9\) The point to note from this line of enquiry is that at fine distance scales the physical world loses its “hard edges” and takes on characteristics suggesting a single substrate underlying both mind and body.

### 3.4.6 Dual aspect monism assessed

In dual aspect monism, how does the sandwich assuage Jim’s hunger? The sandwich is an elaboration of underlying intelligence. So is Jim’s hunger. That Jim loses his hunger is a matter of information flow. Hunger, rather than being regarded as an uninteresting parallel to the more interesting (and real) business of biochemistry, can now be seen as a direct route to the source of underlying information that flows to inform it (hunger), the biochemistry of the sandwich and the relationship between the two. Investigation of hunger, the experience, could entail a great deal less trouble and expense than of its associated biochemistry or the behaviour of particles at fundamental time and distance scales. A phenomenological investigation of hunger would then assume far greater importance than it has been until now accorded. This insight has inspired me to investigate the nature of the internal eating cues and in turn, produce this thesis.

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\(^9\) Hagelin implies that consciousness necessarily takes a fundamental position in such theories. Indeed, he discerns within matter at fundamental space-time scales qualities that have a distinctly subjective nature, qualities such as dynamism, intelligence, and attributes of self-awareness.

Dynamism … results from … the fact, that nature becomes increasingly energetic at more fundamental space-time scales. It may also be said that intelligence is more concentrated at fundamental scales. This can be seen, for instance, in the context of grand unified theories, in which the strong, electromagnetic and weak interactions become unified components of a single field, whose behaviour is governed by a single compact expression …an attribute of self-awareness can be seen in the non-Abelian property of self interaction present in unified, non-Abelian guage fields …a non-Abelian field, such as the gluon field of quantum, dynamics, a grand unified field or a super unified field, possesses the non-linear property of self interaction …As a consequence, a non-Abelian field responds dynamically to its own presence (Hagelin, 1987, pp. 38-39).
A diverse group of philosophers now advocates the direct subjective exploration of consciousness and its contents. This group has been loosely styled the phenomenologists, although not all those who explore consciousness would wish to be styled phenomenologists. Phenomenology should not be confused with introspection, the term usually applied to the attempts by Wundt to find atomistic elements of consciousness from which to build a theory of consciousness.

3.4.7 Phenomenology

Speaking for those who advocate direct exploration of the contents of consciousness, and against the obvious charge that subjective observations are non-public, non-verifiable and hence non-scientific, MacLennan states:

… it is worth remembering that all observation is ultimately private. Science has developed methods (such as measurement) that, in a context of shared training and experience, lead to general agreement among qualified observers (with varying theoretical commitments), and thus provide a reasonably stable body of public facts which may be used for support or critique of various theories. To bring consciousness under the scope of science will require a body of appropriate trained observers; the public facts necessary for a scientific theory of consciousness will emerge from their consensus (MacLennan, 1997, p. 251).

Eddington echoes the same point emphasising that the contents of the mind are directly known, whereas knowledge of the world “out there” is inferred:

It is difficult for the matter-of-fact physicist to accept the view that the substratum of everything is of mental character. But no one can deny that mind is the first and most direct thing in our experience, and all else is remote inference – inference either intuitive or deliberate (Eddington, 1929/1985, p. 187).
Chalmers also lends his weight to the idea:

… our judgements about experience can be wrong. I don't think this difficulty is as damming for phenomenology as it is sometimes made out to be; after all, our judgements about external data can be wrong, too, but science manages just fine. What is important is that our judgements about experience are accurate by and large, particularly when we are paying careful and patient attention. Our introspection must also be critical: we must take care to consider any ways in which it might be going wrong. But if our phenomenological judgements pass these tests, I think one is justified in taking them to be reliable (Chalmers, 1997b, p. 413).

Husserl’s method of bracketing was supposed to allow the investigator to suspend received claims about the experiencer and the object being experienced. Varela, a defender of phenomenology, states:

The Archimedean point of phenomenology is to suspend such habitual claims and to catalyse a fresh examination. Whence Husserl’s famous dictum: ‘Back to the things themselves!’, which for him meant – the opposite of a third person objectification – a return to the world as it is experienced in its felt immediacy (Varela, 1997, p. 343).

It is probable that pure Husserlian phenomenology never developed the following that Husserl would have wished. Beginning with his pupil Martin Heidegger (1889-1976), later phenomenologists seemed to find his methods, although theoretically of great interest and import, difficult to achieve in practice. As a consequence the “essence of things”, in particular the essence of consciousness or pure consciousness has remained an abstraction rather than an experience that can be discovered replicated and used.
3.4.8 Limits of cognition

One group of philosophers (unnecessarily styled the “new mysterians” by their detractors) has questioned whether such a subjective study is within our human ability. We might not be set up to understand what experience really is, let alone consciousness. This train of thought can be traced to William James who said:

Our intellect casts… no ray of light on the processes by which experiences get made (James 1909/2005, p. 63).

Its modern revival derives from an influential article published over 30 years ago by Nagel, entitled: “What is it like to be a bat?”

I want to know what it is like for a bat to be a bat. Yet if I try to imagine this, I am restricted to the resources of my own mind, and those resources are inadequate to the task. I cannot perform it either by imagining additions to my present experience, or by imagining segments gradually subtracted from it, or by imagining some combination of additions, subtractions, and modifications (Nagel, 1974, p. 439).

If only a bat can know what it is like to be a bat, then how can we ever understand experience in its totality? We will always see experience from a particular and limited point of view. For Nagel this fact bears directly on the mind-body problem:

For if the facts of experience – facts about what it is like for the experiencing organism – are accessible only from one point of view [then] ...It is difficult to understand, what could be meant by the objective character of an experience, apart from a particular point of view from which its subject apprehends it. After all, what would be left of what it was like to be a bat if one removed the viewpoint of the bat? (Ibid pp. 442-3).
To which McGinn (1989) adds:

It is deplorably anthropocentric to insist that reality be constrained by what the human mind can conceive (p. 366).

McGinn has had the insight that we somehow need to become independent of our cognitive powers, for these are, in fact, limiting factors. Cognition is the wrong tool to grasp our essential being.

… the bit of reality that systematically eludes our cognitive grasp is an aspect of our own nature. Indeed, it is an aspect that makes it possible for us to have minds at all and to think about how they are related to our bodies. This particular transcendent tract of reality happens to lie within our own heads. A deep fact about our own nature as a form of embodied consciousness is thus necessarily hidden from us (p. 366).

Indeed, says McGinn:

… if we knew [the nature of brain and consciousness] fully we would already have solved the problem (p.349).

Again the idea was anticipated by James:

Thought deals… solely with surfaces. It can name the thickness of reality, but it cannot fathom it, and its insufficiency here is essential and permanent, not temporary (James 1909/2005, p. 66).

These writers imply that it may be necessary to go beyond thought to understand consciousness.
3.5 Conclusion to Chapter 3

Some form of dual aspect monism seems to hold the most hope for explaining why Jim’s experience of hunger abates when he eats the physical substance, food. It seems most likely that something fundamental, be it experience or intelligence, lies at the foundation of both his hunger and his sandwich. Quantum physicists are searching for that fundamental at fine time and distance scales, taking as it were the physical route from the stomach. Some of the most influential of contemporary philosophers are calling for an exploration of consciousness, taking the mental route from Jim’s experience. Other philosophers warn that this route is not possible at least not using the limited cognitive powers we have used up until now.

If cognition is the wrong tool with which to grasp the essential nature of experience, then perhaps there is another, more appropriate one that goes beyond thought. Hut and Shepard point out that wherever we find this tool it cannot possibly be within the content of experience, for it would not be possible to find a whole among particulars. Experience itself cannot be expected among the particulars of experience.

It would be a category mistake to take particular elements from within experience… as fundamental. However abstract our notions of atoms, quantum fields, or more exotic constructs may be, all these notions are ultimately grounded in experience. As such they cannot even be considered as candidates for whatever it might be, if anything, that could be considered to underlie conscious experience. Such a candidate had better be far more pervasive (Hut & Shepard, 1997, p. 321).

The next section presents such a candidate.
Chapter 4 Maharishi Vedic Science, a consciousness based paradigm

Introduction

I regard consciousness as fundamental. I regard matter as derivative from consciousness - Max Planck.

In the last chapter a need for a non-cognitive route that would enable the apprehension of the fundamental substrate of intelligence or experience that underlies both Jim’s hunger and his sandwich was identified. As Travis et al. put it

To solve the hard problem, we need to explore the nature of inner self-awareness, independent of the processes and content that we are aware of and which define our waking stream of consciousness. As science uses instruments to explore deep into material objects, so we need technologies of consciousness to explore deep within individual awareness (Travis, Munly, Olson, & Sorfiaten, 2005, p. 124).

Maharishi Vedic Science (MVS) can be seen as a consciousness based paradigm based upon a “technology of consciousness”\(^\text{10}\) (transcending thought) that allows the experience of pure consciousness (whose existence was so strongly suspected by Husserl). While it differs from most other attempts to solve the mind-body problem, MVS allows for the validity of many of them. This is not as paradoxical as it may seem, for while this paradigm does not accept previous explanations as wholly correct, it does not reject all of them as wholly invalid. Some explanations can be

\(^{10}\) The phrase “technology of consciousness” may seem incongruous. It was frequently used by Maharishi Mahesh Yogi to describe mental techniques for attaining and utilising pure consciousness. He may have intended to emphasis that the techniques he taught were not vague or “mystical” but are as systematic and predictable in their effects as any technology.
embraced within this paradigm, as valid, albeit limited, points of view.\footnote{An oft-quoted analogy applies here. An elephant stands in a barn in a village whose inhabitants are unfamiliar with such beasts. A number of villagers are asked to put their hands through holes in the barn wall and describe what they think an elephant must be like. Those who feel the trunk declare that an elephant is in the manner of a snake, those who feel the ears are certain an elephant is like a piece of cloth, those who feel the side think an elephant is like a wall, whereas those who feel only the tail see an elephant as rope-like. Each villager’s perception corresponds to the many attempts to solve the mind-body problem. When the elephant is led out of the barn it is clear that all have been correct in a partial sense and all are wrong in an overall sense.}

Fundamental to MVS is the notion that, contrary to Hume, Brentano, James and others, consciousness does not have to have an object. Intentionality is not integral to consciousness. One does not necessarily need to be conscious of something, one can simply be conscious.

4.1 Pure consciousness

Husserl believed that through the epoché, a state of knowing could ultimately be reached that was post-conceptual and in which pure essence – the essence of everything – could be known.

In this experience intentionality disappears. The experience is not of anything. It is about the essence of all things. As Husserl puts it:

This is not a view, an interpretation of the world. Every view about, every opinion about the world has its ground in the pre-given world. It is from this very ground that I have freed myself (Husserl E, cited in Alexander et al., 1990, p. 318).

Discussing Husserl’s contribution Merleau-Ponty emphasises that pure consciousness gives a sense of “wonder” to worldly phenomena:
Reflection does not withdraw from the world towards the unity of consciousness as the world's basis; it steps back to watch the forms of transcendence fly out like sparks from a fire; it slackens the intentional threads which attach us to the world, and thus brings them to our notice; it alone is consciousness of the world because it reveals that world as strange and paradoxical (Merleau-Ponty, 2002, p. xv).  

For Husserl the “slackening of the intentional threads” allows the world to be witnessed in a disinterested way:

I reach the ultimate experiential and cognitive perspective thinkable. In it I become the disinterested spectator of my natural and worldly ego and its life… The transcendental spectator… watches himself and sees himself; also as the previously world immersed ego (Welton, 1999, p. 317).  

For Husserl, like Merleau-Ponty then, both the world and our conception of it, including mind and body, are abstract moments of a more fundamental reality which is consciousness in its purity.

Varela among other authors acknowledges that experiencing the essence of consciousness has been for thousands of years a specialty of Eastern traditions from which the West can learn (Varela, 1997, p. 354). The philosopher Jonathon Shear (1983, 1997; 1999) agrees and suggests that the experience of the simplest form (or essence) of consciousness can be approached using Eastern methods:

Merleau-Ponty again emphasises that pure consciousness is something to be experienced rather than talked about:

It is the office of language to cause essences to exist in a state of separation, which is in fact merely apparent, since through language, they still rest upon the ante-predicative life of consciousness. In the silence of primary consciousness can be seen appearing not only what words mean, but also, what things mean: the core of primary meaning around which the acts of naming and expression take shape. (Ibid. pp. xvi-xvii)

In Maharishi’s Vedic Science the ability to witness phenomena once firmly established in a state of pure consciousness is held to be a different process from intentionality and is a feature of a developed state of consciousness known as cosmic consciousness.
…it is widely accepted (in Yoga, Buddhism, Taoism etc.) that the surface phenomena of consciousness emerge from deeper structures of consciousness which can be experienced directly, and that these deep structures in turn emerge from an underlying ground of consciousness which is also experienceable. This ground, moreover is regularly described as the simplest state of awareness, consciousness devoid of all its discrete activities and contents. Thus as the Yoga sutras, the central text of Yoga puts it, it is qualityless ‘pure consciousness’, experienceable only when all the discrete wavelike fluctuations of mind have settled down, leaving consciousness alone by itself in a state of objectless samadhi. In Buddhism it is widely referred to as ‘shunya’ or the void as well as ‘pure consciousness’, experienceable in meditation when all the activities of mind have ceased. Taoism uses the term ‘wu’ or ‘nothingness’. And Zen (Chinese, Ch’an) uses all of these terms, as well as the symbol of an empty circle …(Shear, 1997, p. 370).

In each generation a few gifted individuals appear to experience pure consciousness naturally and have described it in their writings or poetry (for an anthology see Gélineau, 1984). William Wordsworth describes the experience very accurately:

– that serene and blessed mood
In which the affections gently lead us on, –
Until, the breath of this corporeal frame
And even the motion of our human blood
Almost suspended, we are laid asleep
In body, and become a living soul:
While with an eye made quiet by the power
Of harmony, and the power of joy,
We see into the life of things.

(From: Lines Composed a Few Miles above Tintern Abbey, on Revisiting the Banks of the Wye during a Tour. July 13, 1798.)
Pure consciousness could be described as an unbounded, unlimited unchanging state of Being (Maharishi Mahesh Yogi, 1966, p. 28). To differentiate it from the everyday experience of self, or ego, pure consciousness is usually referred to as the Self with a capital S. In pure consciousness, the subject has no particular object that can be differentiated from itself. The self simply is. Knowledge of all bounded things – people, trees, horses, and so forth – as well as mental objects such as perceptions and thoughts are transcended. Subject and object are one. Rich data on the experience of pure consciousness has been gathered by Travis et al. (2005, pp. 127-128). The descriptions given by two of their subjects are illustrative of the experience:

During meditation, my thoughts become less and less concrete, less and less absorbing, and often my mind becomes completely free of the grip of thinking and planning – then I am. It is not an experience, there is nothing I can report about this state. I am completely full, vibrant, and alive, but I am completely still. It is absolute silence.

Actually, it's not that I experience ‘Oh how great this is!’; but it's an inner peace that is very, very nourishing. It's a feeling of freedom, of no restraints. In this state boundaries do not exist. Time has no meaning. Space has no meaning. I feel right at home. It is normal functioning. Everything seems right.

4.1.1 As simplest state of consciousness

In MVS pure consciousness is said to be consciousness in its simplest, least complicated or least excited state, the ground state of awareness or Being. Pure consciousness seems the best candidate to fulfil Hut and Shepard’s requirement, for it

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14 Therefore to know does not necessarily imply thinking, according to MVS. Thoughts are not necessary to awareness or to knowledge indeed they are antithetical to pure consciousness (pure awareness, pure knowledge).
is indeed a state unconditioned by any particular cognitive perception. As Nagel and McGinn make clear, cognition, or intellectual enquiry, is an inappropriate tool with which to understand consciousness. Any discipline of thought can only analyse the content of thoughts and therefore remains within its own realm, which is thoughts. It fails to transcend its own activity. For this reason both phenomenology and introspection must fail. To understand the essential nature of consciousness, it is necessary to get beyond thoughts altogether. MVS employs a technique that transcends the thinking process itself (hence its name, Transcendental Meditation). A full explanation of Transcendental Meditation is beyond the scope of this thesis. What follows is a summary of points relevant to the theme of the thesis.

4.1.2 Transcending thought

Rather than assess the content of thoughts the technique of transcending thought employs the structure of the thinking process itself. A thought arises in the mind at first in a subtle or abstract way (the word “inkling” is apt), then evolves to become less abstract and more formed. At a certain point it is concrete enough to be appreciated on the conscious level. To regard thoughts as following one another in a kind of stream is, under MVS, to see them in only one dimension. Each thought has, as it were, a vertical dimension. It has “bubbled up” from pure consciousness. The two dimensions, horizontal and vertical, can be seen by referring to Maharishi’s well known “bubble diagram” below:

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15 One reviewer suggested that this was the antithesis of mindfulness. Actually it is the essence of mindfulness since thoughts constrain the mind rendering it less “full”.
PURE CONSCIOUSNESS

Figure 6 The “bubble diagram”

The origin of a thought is pure consciousness from which it rises to pass through all pre-conscious levels. A thought starts as a bubble starts from the bottom of a pond. As the bubble rises it becomes bigger. Only when it reaches the surface does it become large enough to be perceived. The subtle states of the bubble of thought below the level of the conscious state are not consciously appreciated. Transcendental Mediation allows conscious appreciation of the bubble of thought at all levels of development and at its source. This allows the small area of the conscious mind represented by W1 to become a bigger area represented by W2 and opens the mind to the full potential of pure consciousness (Maharishi Mahesh Yogi 1967, pp. 317-318 reprinted with permission).
Tracing the thinking process back to the source of thought is accomplished by transcending successive levels of thought, experiencing thought at more infant states of its development until finally the process of thinking is transcended altogether, and the subject is left experiencing pure consciousness.

4.1.3 Transcendental Meditation compared to other techniques

To the best of the author’s knowledge, Transcendental Meditation is unique among currently available meditation techniques not only in that it employs the structure of the thinking process itself, but also in that its modus operandus depends upon the mind’s natural tendency to move towards pleasure. (Maharishi Mahesh Yogi, 1966, p. 167). The technique therefore is easy to learn and practise. The mind experiences its own nature, which, as Wordsworth implies, is an experience of deep inner contentment or fulfillment. The practice of Transcendental Meditation requires no concentration, discipline, special abilities or particular spiritual aptitude. This sets Transcendental Meditation apart from other techniques most of which fall into one of two categories: 1) concentration techniques and 2) contemplation techniques. Concentration techniques are the meditation equivalents of dietary restraint, a method of forced dietary control that will be discussed in section 7.1.2. Concentration techniques require the subject to “clear the mind” or keep the mind focused upon a single thought, a candle flame or the like. The mind typically finds these practices unsatisfying and according to its tendency to seek pleasure, wanders off in search of it. Most people find concentration techniques unrewarding and difficult. Contemplation techniques focus on the meaning of a thought or phrase, such as “peace” or they might involve visualising a beautiful scene such as a waterfall or a lake. These techniques tend to keep the mind active. Thinking about peace is not the
same as experiencing peace, so that contemplation techniques, while perhaps having some value in creating a pleasant mood, do not allow for a deep level of mental settledness. As Maharishi puts it, the thought of Being is not the state of Being (Maharishi Mahesh Yogi, 1966, p. 238). Transcending thought should thus not be confused with concentration, contemplation or introspection. To be aware of any particular thing, as in introspection, consciousness must be in an excited state and therefore is not in its simplest form. The unique features and the origins of Transcendental Meditation have been well described by Domash (1977).

### 4.1.4 The literature on Transcendental Meditation

Comparative studies have demonstrated that Transcendental Meditation differs from resting (M. C. Dillbeck & Orme-Johnson, 1987; Travis & Wallace, 1999) reading (Travis, Olson, Egenes, & Gupta, 2001) and other meditation and relaxation techniques not only in form, but in effects also (Alexander, Robinson, Orme-Johnson, Schneider, & Walton, 1994; Eppley, Abrams, & Shear, 1989; D. W. Orme-Johnson & Walton, 1998; Travis & Arenander, 2004).

The author knows of no significant studies relating Transcendental Meditation directly to eating regulation. However a large literature supports the notion that Transcendental Meditation lowers mental and physical arousal. Early studies by Wallace and others found changes in oxygen consumption, respiratory rate, heart rate, skin resistance and EEG suggestive of a “wakeful hypometabolic state” (Wallace, 1970, 1972; Wallace, Benson, & Wilson, 1971). Subsequent studies have confirmed and extended these findings (M. C. Dillbeck & Orme-Johnson, 1987; Farrow & Hebert, 1982) and have been reviewed by Wallace (1986, 1993) and Jevning, Wallace and Beidebach (1992). These intra-meditation effects have been shown to extend
outside the meditation in the form of lowered anxiety (M. C. Dillbeck, 1977; Eppley et al., 1989) and lowered stress (Gaylord, Orme-Johnson, & Travis, 1989; Jevning, Wilson, & Smith, 1978). Transcendental Meditation’s stress-reducing effect probably accounts for improvements in blood pressure (Lovell-Smith, 2001) which have been studied in longitudinal randomised controlled trials (Alexander, Schneider, & Staggers, 1996; Barnes, Schneider, Alexander, & Rainforth, 2005; Barnes, Schneider, Alexander, & Staggers, 1997; Rainforth et al., 2007; Schneider, Alexander, Salerno, Rainforth, & Nidich, 2005; Schneider, Alexander, & Wallace, 1992; Schneider et al., 2001; Schneider et al., 1995). Improvements have been demonstrated in left-ventricular mass (Kondwani et al., 2005), carotid atherosclerosis (Castillo-Richmond et al., 2000) and the metabolic syndrome (Paul-Labrador et al., 2006). Alexander et al. (1996) found lower cardiovascular mortality among practitioners of Transcendental Meditation on long-term follow-up (15 years) and cost-effectiveness of Transcendental Meditation compared to drug treatment of hypertension has been demonstrated (Herron, Schneider, Mandarino, Alexander, & Walton, 1996).

Transcendental Meditation has been correlated with creativity in a longitudinal study (Travis, 1979). Appendix 2 provides a recent bibliography further indicating the range of effects attributable to Transcendental Meditation.

Travis et al. (Travis, Arenander, & DuBois, 2004; 2005; Travis & Pearson, 2000) have reviewed and discussed the physiological markers of Pure Consciousness. Briefly summarised, these fall into three categories: changes in breath patterns, skin conductance responses and EEG. Periods of prolonged breath quiescence (without compensatory overbreathing) that correlate with the experience of pure consciousness (as indicated by button press by the subject after the experience) were first reported by
Farrow and Hebert (1982) and replicated by Badawi, Wallace, Orme-Johnson and Rouzere (1984). Using more refined equipment Kesterson and Clinch (1989) found that many of these episodes were instances of slow, prolonged inspiration, a unique respiratory pattern that has not been reported elsewhere. Skin conductance is a marker of orienting and occurs at the onset of the above breath changes during Transcendental Meditation. It may mark the transition of awareness from active thinking to Pure Consciousness (Travis & Wallace, 1997). A third marker is increasing frequency of peak EEG power (Badawi et al., 1984; Travis & Wallace, 1997). Peak power increases with increasing levels of alertness, supporting the description of pure consciousness as “restful alertness”. Enhanced EEG coherence\(^{16}\) has also been noted during Transcendental Meditation (Travis & Arenander, 2006) and further studies are required to clarify this phenomenon in relation to Pure Consciousness.

The state of least excitation of consciousness is suggested to be the ground upon which more excited states of consciousness can occur including waking, dreaming and sleeping (Travis, 1994), and a substrate of experience that is distinct from the processes and content of experience (D. W. Orme-Johnson, 1988; Travis, 2006; Travis et al., 2004; Travis et al., 2005; Travis & Pearson, 2000; Travis, Tecce, Arenander, & Wallace, 2002). As Orme-Johnson puts it:

Whereas all mental phenomena —such as thoughts, percepts, and feelings, as well as behavior— constitute events, pure consciousness is not itself an event. It is the basis of events. Maharishi’s Vedic Psychology thus categorizes all mental and behavioral events as manifest, localized, specific forms of

\(^{16}\) In spectral EEG analysis, coherence is a term applied to similarity in frequency when EEG waveforms from two brain regions are compared.
the nonlocal, general underlying unmanifest reality of pure consciousness…(D. W. Orme-Johnson, 1988, p. 120).

In MVS pure consciousness is thus primary. The mind, its contents and all physical processes represent excited states of consciousness. The mind-body problem is thus turned around. It is no longer a question of how consciousness arises from the physical world, but rather how the physical world arises from consciousness.

4.2 From the inside out: Implications of MVS

Many writers have pointed out that to turn the question this way is perfectly legitimate. The philosopher Rosenberg sees the tendency to frame the problem from a materialistic viewpoint as a kind of habit:

… how difficult it is to dislodge the physical from its accustomed place of primacy in our worldview (Rosenberg, 1997, p. 289).

For Chalmers to ask “how [do] physical processes in the brain give rise to subjective experience” presupposes that they do. Rosenberg continues:

Even Chalmers … continues to pose the problem as one of how experience arises from physical processes. Such language pushes us to think of the physical as primary, with whatever aspect of nature consciousness is a part of viewed as a mere add on; it just arises. Are we to think of experience as an artist’s flourish? A more satisfying result would be a deeper view of nature, a view which somehow gets under physics (Ibid p. 289).

Clarke also suggests that perhaps the brain, or indeed the whole physical universe, arises in some way from experience:
…things would be different if we were to turn round our whole pattern of description. First we need to turn round physics so that we can see the local Newtonian picture as an especially disintegrated case of a fundamentally global reality…Secondly …by putting mind first. We would be in a position to understand how it was that mind could actually do something in the cosmos …(Clarke, 1997, p. 174).

Hut and Shepard point out that it is more logical to take mind as primary since mind and its contents are what is immediately given:

The standard approach builds upon an epistemologically weak foundation: what it takes for granted as a physical world containing the physical brain is composed of atoms, molecules, ions, electric fields, and so on. But what are directly given to any scientist are only the consciously experienced appearances (filled with ‘qualia’ and their relationships) that (on the basis of certain regularities and correlations) are interpreted as independently existing physical objects (Hut & Shepard, 1997, p. 307).

It is the physical world that is inferred:

Thus the biggest mystery is no longer consciousness but the objective physical world, which is never directly experienced but is only inferred on the basis of order and correlations within subjective experience. It seems to us more natural and epistemologically more justifiable to leave as inferred what is inferred and to take is given only what is given, than the other way round (Ibid. p309-310).

### 4.2.1 Overcoming the combination problem

Both Chalmers and James reached the point at which they were prepared to make experience (as the fundamental of consciousness) primary and non-reducible. Both foundered on the crucial problem of how experience could aggregate to form richer
experience. Chalmers noted that information could aggregate to form more complex information, but then the gap opens between information and experience.

These two great dual aspect theorists were circling yet failing to skewer a puzzling duality that lies at the very core of the mind-body problem. It could be called the knowingness-intelligence distinction. Looked at from the materialist point of view (outside-in) it is the combination problem. How do numerous elements of intelligence (experience, knowingness, consciousness) combine to form experience (knowingness, consciousness)? Looked at from the idealist point of view (inside out), it could be seen as an example of the “many from one” problem. If all is one unitary consciousness where do the subjective and objective phenomena of the world come from?

James himself was acutely aware of the dilemma:

Sincerely, and patiently as I could, I struggled with the problem for years, covering hundreds of sheets of paper with notes and memoranda and discussions with myself over the difficulty. How can many consciousnesses be at the same time one consciousness? How can one and the same identical fact experience itself so diversely? The struggle was vain; I found myself in an impasse (James, 2005, p. 55).

To this impasse MVS offers the following solution:

**Consciousness is that element that is capable of being one and many at the same time.**
At first sight, this may be a baffling statement, a contrivance even, or an admission of defeat. The intellect rebels against the very possibility that anything could be unitary and diverse at the same time. Nevertheless, if the mind-body problem is to be solved, it will be in a way entirely foreign to our habitual way of thinking, in Churchland’s words a “real humdinger of a solution” (cited in Blackmore, 2003, p. 33).

Perhaps it is the intellect that must be put aside. In an area in which it is recognised that cognition is not an appropriate tool, where the currency of the intellect – thought – must be transcended, then it might not be inappropriate to abandon, for this purpose, the tools of thought – the long traditions of logic and rationality. Another tool is needed to understand the nature of consciousness. James recognised this need and was finally ready to accept that logic must be discarded for this particular purpose:

For my own part, I have finally found myself compelled to give up the logic, fairly, squarely, and irrevocably. It has an imperishable use in human life, but that use is not to make us theoretically acquainted with the essential nature of reality … Reality, life, experience, concreteness, immediacy, use what word you will, exceeds our logic, overflows and surrounds it (James, 1890/2005, pp. 56-57).

This does not mean that logic is to be discarded. It is merely to define the boundaries of its usefulness. Logic becomes subsumed under reality rather as, in physics, classical mechanics became subsumed under quantum mechanics.17

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17 Maharishi offered the following reflection as an aid to understanding what may seem an unacceptably counterintuitive proposal. In a manner it is a kind of thought experiment, but of a very unusual nature, since it attempts to give a glimpse of reality that thought cannot encapsulate. The reader may wish to participate in it (it was intended to be a practical exercise).

Maharishi invites us to take a moment to experience our sense of self. He suggests that each one of us will experience our consciousness, our self, as unitary, or one. That is to say we each experience only one of ourselves. You know yourself as one. In this way, Maharishi gains agreement in the unitary nature of consciousness.
James identified the possibility of pure consciousness in theory but felt unable to build his world-view on what seemed to him an unattainable ideal. For others such as Husserl pure consciousness formed the rock on which their epistemology was built, but lacking a practical technique to achieve it, their writings remained theoretical.

Maharishi himself insisted that his was a practical teaching compatible with all beliefs and intellectual persuasions. He saw his message not for the purpose of fostering intellectual discussion (of which he felt there had been quite enough) but for the applied relief of human suffering. Maharishi nevertheless expounded various principles that are singularly helpful in establishing the epistemological roots of this theory. Three of them, (Maharishi Mahesh Yogi, 1972a, 1972b), are:

1. Knowledge is structured in consciousness
2. Reality is different in different states of consciousness
3. When existence becomes conscious, then intelligence becomes intelligent.

To these can be added the above principle that consciousness is that element that can be one and many at the same time.

Yet, says Maharishi, “See if you agree with me.” In knowing yourself, first, there is an element that knows. Then there is an element that is known. Finally, there must be a relationship between them. You know yourself. From one, three have appeared. What was experienced as one is now also experienced as three. How can this be? How can something be one and many at the same time? The intellect can only give up and accept that it is so, for that is your experience. Your awareness, your consciousness, your self, is that very special element capable of being one and many at the same time.

This exercise is provided here not as intellectual proof of the three-in-one nature of consciousness (such a proof is not possible to the intellect’s satisfaction) but as an experiential aid to understanding the Vedic solution to a major philosophical problem that bears directly upon scientific understanding and progress and has resisted all Western attempts to overcome it.
The first two principles imply that what we know depends upon our consciousness and in particular what state of consciousness we are in. What we know determines what we consider reality. As knowledge is structured in consciousness so therefore what we consider to be reality is structured in consciousness. It follows that in different states of consciousness, what we consider reality is correspondingly different. The third principle is less straightforward. It implies that consciousness is intimately related to intelligence. Consciousness contains the intelligence of the universe in its entirety. The state of being conscious or knowing (intelligent) is an activated state of underlying existence (intelligence). In Maharishi’s words:

Intelligence is the basic value of all creation, and of all processes of progress and evolution in creation. It is the fundamental of all existences. This field of pure intelligence, which is one, non-dual, by virtue of its perpetual, eternal, immortal existence, starts to regenerate itself through its own nature. By virtue of its own existence, intelligence becomes creative intelligence, and creates from its own substance (Maharishi Mahesh Yogi, 1972b).

The mind-body distinction in this model thus resolves to the distinction between conscious and existent, intelligent and intelligence. These seemingly subtle distinctions nevertheless allow resolution of the dilemma that flawed the dual aspect theory proposed by Chalmers, the combination problem.

Pure consciousness is given many names in the Vedic tradition, including pure intelligence, Being, the Self, the Absolute, or Samhita. The word Samhita means togetherness, reflecting the ability of consciousness to be singular, yet many at the same time.
Under this paradigm the trilogy:

MIND - RELATIONSHIP - BODY

is simply a specific instance of the more general form:

KNOWER - PROCESS OF KNOWING - KNOWN

These three elements, the diversity that springs from the unity of Samhita, combine and inter-relate to form the warp and weft of the phenomenal world, including those aspects which seem entirely substantial or material. Maharishi takes the trilogy to one further step of abstraction thus:

RISHI  DEVATA  CHANDAS

Rishi, the knower, refers to all instances of knowing. Devata refers to all processes of flow or change in which information passes from one area to another. Chandas literally means “that which hides” and refers to all all objects of perception. Being to do with the known phenomenal and apparently material world, Chandas therefore is the element least resembling its own nature. Its nature is consciousness but this is hidden since it looks like trees, rocks, and other material phenomena. By way of analogy, Chandas could be compared to the waves on a body of water. As patterns of intelligence, they appear to take on a form of their own, yet fundamentally they
remain water. In Husserl’s words these patterns are “concatenations of absolute pure consciousness”:

Reality and world are names here precisely for certain valid unities of sense, unities of “sense” related to certain concatenations of absolute pure consciousness, bestow sense and demonstrate sense-validity (Husserl, E cited in Welton, 1999, p. 84).

Contained in Samhita, as the seeds of the universe, are Rishi, Devata and Chandas in their most primordial form.

This can be diagrammed as follows:

![Diagram of Samhita, Rishi, Devata and Chandas]

**Figure 7 Samhita, Rishi, Devata and Chandas**

The process by which the oneness of consciousness becomes many is a property of its essential knowingness. Whenever there is knowingness, knowingness knows itself. From the knowingness, Rishi, Devata and Chandas inevitably emerge.

The combinations and recombinations of Rishi, Devata and Chandas become increasingly convoluted until they no longer resemble their true nature. The hiding quality of Chandas comes to the fore, and the diversity that results is experienced as the phenomenal world.
In its hidden form (as Chandas), that which was was conscious and intelligent, is now referred to as existence or intelligence. The knowing (Rishi) aspect of Samhita becomes hidden and what was conscious now assumes the appearance of intelligence or information (Chandas). In the process of elaboration of Rishi, Devata and Chandas, what was intelligent becomes intelligence, or information.

Intelligent  →  Intelligence

**Figure 8 The process of elaboration**

As One, James’ “identical fact” (which under the MSV can be called the absolute or Self) is conscious (knowing) and intelligent. As many, it is better called existence or intelligence, for the knowing aspect is hidden. That which is conscious is that which is intelligent, so another version of the process of elaboration might be:

Conscious  →  Intelligence

**Figure 9 Consciousness in the process of elaboration**

The difficulty in Chalmers’ model (section 3.4.4) in reconciling experience and information is thus overcome. Information is an elaborated form of the intelligent, knowingness that Chalmers calls experience. Experience and information are two aspects of underlying consciousness. They are not distinct.

Looked at in this way, the problem of combination is revealed to be a pseudo-problem. There is no problem of combination because there are no separate,
“atoms” of consciousness that must combine in some mysterious way. What appear to be separate and discrete are, in the end, patterns of information on a single body of consciousness. They do not need to combine because, in the end, they are fundamentally one consciousness, just as waves on an ocean are fundamentally water.

In the process of transcending the direction is reversed.

Intelligence  

Intelligent

Figure 10 The process of simplification

The process of transcending cuts a path from the convolutions of diversity to unity. Again there is no question of combination for there is nothing to combine. Transcending thought is, in fact, a process of simplification. In pure consciousness the subject experiences his or her simplest state of awareness. By way of analogy, there is no question of waves combining to form a flat lake. To create a body of water in its simplest state, it is only necessary for the waves to settle down.

In figure 10 moving from left to right is to move from diversity to unity, complication to simplification, information to knowingness. Hence Maharishi’s words: “As existence becomes conscious, then intelligence becomes intelligent” (Maharishi Mahesh Yogi, 1972a).

What we experience subjectively as the knowing self is conscious and intelligent. What we see objectively in the world is also the self, but it is elaborated. It is, in fact,
a pattern of intelligence and appears (to us) like solid matter. The entire physical universe under this paradigm is seen as a flow of intelligence brought about by the self knowing itself in a multiplicity of different ways.

Thus the “fundamental information” dual aspect theory of Chalmers is upheld on this model, but the difficult relationship between intelligence (information) and knowingness does not arise since ultimately information and knowingness are held to be one.

### 4.2.2 Pleasure integral to the universe

It is held in MVS that in the process of elaboration, as Samhita creates many from one, pleasure is generated. In the process of simplification, as Samhita returns to oneness, pleasure is again generated. The pleasure of elaboration is associated with excitement, while the pleasure of the return is associated with contentment or fulfillment. For the purposes of this thesis I intend to call the first type of pleasure “type-a pleasure” and the second, “type-b pleasure.”¹⁸ In general then, movement within Samhita invokes pleasure. Translated into human affairs, it is held that when the mind moves it does so to maximise pleasure. Pleasure can be gained by moving towards excitement as for example in eating a piece of chocolate, or moving towards contentment, as in the process of transcending thought. Pleasure is thus held to be a fundamental under MVS. It is not epiphenomenal, but is integral to the universe.

¹⁸ The terms “type-a,” “type-b” and “type c” with reference to pleasure and desire are the author’s, they were not used by Maharishi.
4.2.3 The Universe is integrated. The Unified Field Chart

It will be recalled that Rishi, Devata and Chandas represent knower, process of knowing and known, respectively. In MVS, Rishi, Devata and Chandas form a common thread that runs through all phenomena. A conceptual framework:

…describes how all the varied manifest examples in a domain are built from primitive elements, as few in number as possible (J. Russell, 2003, p. 146).

It follows that any particular phenomenon can be analysed in terms of Samhita along with its components Rishi, Devata and Chandas, the primitive elements or “building blocks”. Since the phenomenal world arises from Samhita, the intelligence behind this order resides, in seminal form, within Samhita. Samhita therefore is the ultimate co-ordinator of all phenomena. Samhita is frequently referred to as the Unified Field, since in Unified Field Theory quantum physics posits a very similar idea. This is the idea that one abstract field of intelligence underlies all manifest phenomena.


In a Unified Field Chart (see example, Appendix 3) the diversity of a particular discipline or field of study is laid out in a logical fashion so as not to lose sight of the essential connection between the phenomena under study and its ground within
Samhita and also to show how the phenomena relate to each other. The Unified Field Chart is a unique contribution from Maharishi’s Vedic Science. It is used as a teaching aid in almost all classes at Maharishi University of Management in Fairfield Iowa, since it is designed to show at a glance the flow of intelligence in a particular discipline or area to be studied.

At the base of every Unified Field Chart is the Unified Field, Samhita or pure consciousness, represented usually by a line running across the bottom of the chart. From Samhita emerge Rishi, Devata and Chandas, unfolding in a hierarchical manner to form layered elements of the field under study. Above these elements society is represented, indicating the manner in which this particular field of study supports society as a whole. Above that are seen the levels of government, culminating in the Head of State, whose ability to govern is considered to be supported by a society enhanced by the benefits accruing from the field of study. To the right of these elements a variant of the “bubble diagram” (figure 6), indicates that the fundamental ground of these phenomena can be accessed directly by the process of transcending thought.

4.2.4 The mind according to the MVS

The faculties of the mind (see figure 11 and level 2 on the Unified Field Chart, Appendix 3), can be identified as the following: senses (including interoception), mind (in a restricted sense), intellect and ego which in its full value is pure consciousness or Self. These faculties are

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19 Mind can also refer, in an expanded sense to the totality of senses, mind (restricted) intellect and ego in MVS.
…hierarchically structured in layers from gross to subtle: from highly active to settled, from concrete to abstract and from diversified to unified (Maharishi Mahesh Yogi cited in Alexander et al., 1990, p. 290).

Linking these layers are the emotions. Figure 11 presents this model.

![Diagram of Layers of the Mind](image)

**Figure 11  Layers of the mind**

The figure shows the relationship between the mental faculties. Note that Ego and intellect and mind and senses are linked by emotions, namely desires and feelings respectively (Alexander et al., 1990, p. 293 adapted with permission).
Feelings and desires, for which we may use the general terms affective processes or emotions, are intermediaries that motivate action within these fundamental mental structures. The emotions that link mind and senses are termed desires. Those that link ego and intellect and intellect and mind are termed feelings or intuitions. Desires generally refer to specific sense experiences (e.g. the desire to eat an apple), while feelings or intuitions are more diffuse (e.g. the feeling of joy). Nevertheless, feelings and desires lie on a continuum of emotion. They are not different in kind and all share the element of motivation to action. One may be motivated to jump for joy, for example. In this thesis therefore, the word “desire” will be used to indicate a subset of the category “emotion.”

Desire represents a movement of the mind towards pleasure, triggered by a stimulus – a particular sensation or perception. Desire for pleasure and motivation, the impulse to move, are intertwined not only in the Vedic model, but also in the English language. The words emotion (of which desire is a subset) and motivation both have as their root the verb “to move.” Related words include emote, movement, motile, motion, motor, mobile and promotion. In common parlance, the link between emotion and movement can be seen when we say: “He was moved to tears,” or “that music has moved me”. According to Partridge (1966, p. 418) “to move” can be traced to the Middle English movern which itself derives from the old French mouvoir and the Latin mouere both of which can be traced to the Sanskrit kamamutas, meaning to be impelled by desire. Desire then has, since ancient Vedic times, been linked to

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20 Thus there are numerous emotions that are not desires and not all desires are directed at specific sensory stimuli, such as, for example, the abstract desires for justice, beauty and truth. Deeply felt emotions and the more abstract desires are indicated in figure 11 as “feelings.” Feelings mediate between ego and intellect.
emotion, which in turn, is something that promotes motion. We feel the desire, the emotion and simultaneously the stimulus to act.

It can be seen from the foregoing discussion that emotions and sensations perform distinct functions in the Vedic concept of mind. Desire, for example, in quest of pleasure, provides the motivation that draws the mind towards the senses. The distinction between desire and sensation will be important to the theory of eating regulation and will be returned to in Chapter 8.

4.2.5 Reality depends upon point of view

Does MVS take an idealist, materialist, dualist or dual aspect position? Actually it is one or all, depending upon the point of view. It is idealist in the sense that Samhita is the entire universe. In this sense the model could be diagrammed thus:

![Figure 12 MVS as conforming to idealism](image)

It is dual aspect in that Samhita has two aspects, Conscious (knowing) and intelligence (hidden). Thus:
It could also be said to embrace both dualist and materialist models. Conscious knowingness and intelligence could be taken as the two sides of a dualist divide. Equally, intelligence in its diversity and seeming solidity, and the laws that can be identified within that field of intelligence, make the materialist model true within certain bounds. Whether one sees the world as a dualist or a monist depends upon the point of view.

In the language of MVS, the phrase “point of view” as used here does not refer to a particular intellectual orientation; it is intimately related to one’s level of consciousness. MVS identifies at least seven levels of consciousness of which the familiar sleeping dreaming and waking states form the first three, each with its corresponding physiological elaboration. Pure consciousness is the fourth major state.
of consciousness. A full description of the seven states of consciousness is beyond the scope of this thesis. Suffice it to say that full realisation of the Self is associated with the seventh state of consciousness known as Unity Consciousness. In Unity Consciousness the sense of Self expands to encompass the universe in its entirety.

4.3 Unity Consciousness

For most people, even in the waking state of consciousness, the sense of self extends vaguely into the body. Although one might speak of “my foot,” nevertheless if somebody stands on it one might equally exclaim “That’s me you are standing on!” This is not merely a figure of speech. What one perceives as oneself commonly extends to include the body even though the body forms part of the res extensa, as Merleau-Ponty pointed out. In Unity Consciousness, that perception of who one is expands until the entire universe is spontaneously and directly experienced as the Self. Although Unity Consciousness can be analysed and talked about, its deep inner experience must be distinguished from the type of intellectual understanding of it that has formed the foregoing pages of this thesis. Unity Consciousness is by no means an intellectual understanding. It is a state of Being. In Unity Consciousness, while subject and object can be discerned (to allow participation in the world), a spontaneous experience of Unity suffuses both.

Each state of consciousness before Unity Consciousness yields a reality that is unique to that state of consciousness and which only partially discloses an overarching reality
that embraces both the self and the phenomenal world.\textsuperscript{21} This overarching reality is not apparent until Unity Consciousness is experienced.

The following comments from advanced Transcendental Meditation practitioners taking part in a study by Travis, Arenander and DuBois (2004, p. 409) illustrate the experience of Unity Consciousness:

We ordinarily think of myself as this age; this colour of hair; these hobbies… My experience is that my Self is a lot larger than that. It's immeasurably vast… on a physical level. It is not just restricted to the physical environment (Subject L1).

I look out and see this beautiful divine intelligence. You could say in the sky and the tree, but really being expressed through these things. And these are myself (Subject L3).

In the absence of Unity Consciousness, the sense of selfhood is referred to as the “lower self” or “small self” (\textit{self} written with lower-case s). When operating from only the small self the individual's subjective experience is necessarily limited. As indicated in figure 14 the small self is a kind of subset of the higher Self. Since the higher Self is non-changing the participation of self in Self, even though not complete, is sufficient to give rise to that feeling of continuity of self that people commonly feel intuitively. For example, one feels “the same person” at age 50 as at age 9, despite obvious changes to the physical body.

This understanding of the small self explains how there could be multiple selves within the unitary Self of pure consciousness. Each self is a kind of island within the

\textsuperscript{21} Except deep sleep which supports no perception of reality.
large Self. This implies that with growing experience of pure consciousness the experience of self becomes more universal, accompanied by a sense of merging with all other selves. This appears to be what is experienced by advanced practitioners of Transcendental Meditation as expressed in the following statement:

When I say, “I’ that’s the Self. There’s a quality that is so pervasive about the Self and I’m quite sure that the “I” is the same “I” as everyone else’s ‘I’, not in terms of what follows right after: I am tall, I am short, I am fat, I am this, I am that. But the “I” part. The “I am” part is the same, “I am” for you and me (Subject L5) (Travis et al., 2004, p. 409).

In figure 14, the large circles represent the big Self, Samhita, the small circles small selves. The lines forming cone shapes represent the flow of intelligence as Rishi, Devata and Chandas combine in ever more convoluted ways to form the world experienced by the self or Self.
The small self is a subset of the large self. The cones emanating from the small circles (selves) are intended to represent the elaboration of consciousness by increasingly more complex combinations of Rishi, Devata and Chandas. Where the cones overlap, reality is shared (waking state of consciousness).

This unified concept of Self is, as the physicist Erwin Schrödinger pointed out, the only satisfactory way to explain the multiplicity of selves. The alternative is to posit each self occupying a separate world, as in James’ pluralistic universe or in what Schrödinger calls “Liebniz’s fearful doctrine of monads”. For Schrödinger

There is obviously only one alternative, namely the unification of minds or consciousnesses. Their multiplicity is only apparent, in truth, there is only one mind (Schrödinger, 1944/1992, p. 129).
In Unity Consciousness that one mind, the Self, is experienced directly as the essential nature of all that exists.

4.4 MVS assessed

The MVS model stands up well to the major criticism that has tarnished other dual aspect models, the combination (or generation) problem. It was natural that early panpsychists would attempt to aggregate atoms of consciousness in the same way that their colleagues in physics had been successful in aggregating physical atoms to explain the physical world. Yet this approach is to give consciousness an atomistic quality it does not possess. Once the diversity of consciousness is seen as an elaboration of pure consciousness and the movement from diversity to unity as a process not of aggregation but of simplification, the problem of combination disappears.

Some readers will not be content with the central “humdinger” solution presented here – that consciousness is capable of being one and many at the same time – demanding a solution with which the intellect can feel entirely at home. With respect to the suspension of intellect, the author refers them again to James. James had no process of transcending thought, no access to pure consciousness and did not believe in any kind of unitary “ground” or “absolute” (hence his pluralistic universe). Nevertheless he acknowledged that should there be an absolute; it would not restore logic to its throne:

… it transcends logic and is therefore still less rational in the intellectualist sense, so it cannot help us to save our logic as an adequate definer and confiner of existence (James, 1890/2005, p. 57).
Thus the resolution of the mind-body problem, for those of us who are not yet experiencing Unity Consciousness, is a leap of intellectual faith which necessarily involves suspending the intellect altogether, and vitally points a way out of the mind-body dilemma. It is necessary to come to terms in some way or another with the mind-body problem, for again to quote James:

Sincerely, this is the actual trilemma that confronts every one of us (Ibid p. 55).

As a theoretical tool Unity Consciousness is invaluable because knowing about it one can proceed to construct theory as if one has it. Theory can then be tested. This kind of reasoning has many precedents. For example irrational numbers in mathematics and 3 + n dimensions for the physical world in physics have contributed greatly to progress in these fields even though they must be considered “as if” they pertained.

One reviewer of this thesis raised the point that since “few people are practitioners of Transcendental Meditation”, how will a “growing experience of pure consciousness” take place, such that future consensus on the mind-body problem could occur. Practitioners of Transcendental Meditation constitute a small percentage of the world’s total population but in absolute terms they number several millions of people represented in nearly all countries. That in the space of about 50 years millions of people could have learnt Transcendental Meditation speaks for the ease with which the practice can be taught to people of all age groups, and occupations, its ease of practice being independent of belief, creed, educational accomplishment or intellectual ability. It is not difficult therefore to envisage that the experience of pure
consciousness could be accessible to anyone. In communities such as Maharishi University of Management, in Fairfield, Iowa, where thousands of students, staff and townspeople practise Transcendental Meditation as a routine, pure consciousness is a subject of informed consensus needing no further proof than the state of the weather, the position of the Town Hall or any other objective phenomenon.

Lest it be objected that consensus should be attainable immediately to anybody without prior training, it should be pointed out that even consensus on “objective reality” is only so attainable under certain conditions. Consensus on even simple measurements such taking blood pressure requires training. One needs to know, for example, the correct level of the mercury meniscus on the sphygnomanometer from which to take the reading. So lack of immediacy and the necessity for training are not valid arguments against the gaining of experiential consensus.

In the meantime, widespread obesity and ill-health leads to colossal usage of financial and health related resources, problems resulting from the daily over-consumption of food. If the foundational three-in-one nature of consciousness is accepted, then the mind-body problem can be addressed as if from the perspective of Unity Consciousness. This acceptance is not too high a price if it allows us to address the current health problems in a new and perhaps more fruitful light. As all other mind-body solutions have, to this author, shown themselves to be flawed or incomplete, it seems reasonable to take inspiration from the 5,000 year Vedic tradition, (accepting also the support of James, the acknowledged father of modern psychology).
It now remains to ask the test question: “How does eating food assuage Jim’s feeling of hunger?” Under MVS the entire universe is a flux of intelligence which itself is disguised consciousness, or Self. Food is intelligence of a certain configuration; hunger is intelligence of a different configuration. Hunger could be seen as that Devata process that informs Rishi (the self) that food (chandas) is necessary. Hunger then, is a flow of intelligence from one node of intelligence to another. There is no dichotomy: the whole is intelligence in motion. This much we knew from Chalmers’ model but now we have a place for Jim. Under Chalmers’ model it was unclear how information became experience. Now they are seen as one. As in Chalmers’ model hunger is a direct route to the source of information underlying hunger and biochemistry. The significance of hunger is increased. Hunger is information and information has meaning. Information is central to regulatory systems. The homeostatic systems that ensure constancy in osmotic pressure and body temperature rely on bodily sensations (thirst and the sensation of heat respectively). It will be argued that hunger similarly represents a vital afferent arm in food regulation.

MVS has at least two implications that will help generate theory in Part 2. They correspond to Wordsworth’s “power of harmony and the power of joy” and are:

1. The Universe is fundamentally integrated and regulated
2. Pleasure is fundamental to process

MVS implies that the universe is not a random affair, but is fundamentally regulated by an underlying field of intelligence. Both interoceptive and exteroceptive perceptions are ultimately intelligence communicating to the self. These may be best
studied from the inside out because the universe progresses from simplicity to complexity and it is easier to begin with the simple. Thus it is not that ghrelin “causes” hunger. Ghrelin is a complex elaboration of the simple experience of hunger. It will be simpler and less time-consuming to study hunger rather than ghrelin. A study of hunger will be attempted in chapter 8.

4.5 Conclusion to Chapter 4

MVS has been adopted to admit subjectivity as a legitimate field of enquiry. Despite its extreme diversity the phenomenal world is unified, integrated and regulated under MVS. This could imply that the digestive system, being part of the universe, might also be fundamentally regulated. This idea will be examined in Chapter 5. That eating regulation being a flow of intelligence (process, movement) within Samhita should involve pleasure will be explored in chapter 6.

Not all agree that people regulate their food intake. A well-represented body of opinion holds that nobody eats in a regulated manner – it has only seemed so when food is scarce. In a food-rich environment, any apparent regulation breaks down. A middle view states that people have the capacity to regulate their intake but in a food rich environment this capacity has reached its limits. Part of Chapter 5 will consider these views in the context of the sometimes controversial topic of homeostasis. I hope to show that the notion that eating is not regulated at all is a reaction to a limited and restricted view of homeostasis (set-point theory) in combination with a particular slant on evolutionary theory; and that these owe nothing to the founder of the concept of homeostasis, Walter Cannon (1871-1945), whose view of homeostasis was much broader.
Chapter 5  Is food intake regulated?

Introduction

Chapter 4 suggests that the universe is not fragmented, but fundamentally integrated by an underlying field of intelligence, in which the human body is grounded. This chapter explores evidence against and in support of the notion that food regulation occurs as an instance of that intelligence, i.e. that food regulation is “built into” the body. The expression “wisdom of the body” coined by Walter Cannon (1871-1945) is apt in this context as his concept of homeostasis embodies the idea of intelligent regulation. It is a logical starting point from which to begin.

5.1  Self-regulation and Homeostasis

5.1.1 Stability and Adaptability

The word homeostasis was introduced in 1925 by Cannon to mean the maintenance of a stable internal state. Cannon drew upon the earlier work of Claude Bernard (1813-1878) who in 1878 stated:

...tous les mécanismes vitaux, quelques variés qu’il soient, n’ont toujours qu’un but, celui de maintenir l’unité des conditions de la vie dans le milieu intérieur (... all of the vital mechanisms, however varied they may be have only one object, that of preserving constant conditions of life in the internal environment.)

and:
La fixité du milieu intérieur est la condition d'une vie libre et indépendante. (Usually translated as:
Constancy of the internal environment is the condition for a free and independent life.)

Woods and Ramsay, (2007) quoting Yates, point out that whereas the word fixité is
often translated as “constancy,” it is better rendered as “stability.” Constancy tends to
imply fixedness and has led to a misunderstanding of Bernard’s original intent which
was to allow for flexibility of the milieu intérieur, without which the organism could
not adapt. Cannon deliberately used the word homeostasis in preference to
homostasis as he wished to convey the same notion. In his words:

The use of the word “homeostasis” has been criticized as implying a fixed and stagnant state. “Stasis”
means that, but also means condition. "Homeo," the abbreviated form of "homoio," is prefixed instead
of "homo," because the former indicates like or similar, whereas the latter, meaning the same, indicates
rigidity (Cannon, 1929c, p. 283).

He also quotes Richet in similar vein:

The living being is stable. It must be in order not to be destroyed dissolved or disintegrated by the
colossal forces, often adverse, which surround it. By an apparent contradiction it maintains that
stability only if it is excitable and capable of modifying itself according to external stimuli, and
adjusting its response to the stimulation. In a sense it is stable because it is modifiable. The slight
instability is the necessary condition for the true stability of the organism (Richet, 1890 translation
cited in Cannon, 1932, p. 21).

The notion of slight biologic instability being necessary for adaptability is well known
in chaos theory and is at the basis, for example, of heart rate variability, now a
standard clinical diagnostic test. The loss of physiological variability of heart rate is a predictor of heart dysfunction.

Despite these elucidations, the word homeostasis has more recently been narrowly interpreted to imply the presence of a series of direct negative feedback loops each of which aims to create a fixed “set point” within a particular physiological variable in the manner of a temperature control of a room via a thermostat. Borrowing from cybernetic theory, the set-point value is compared to the physiological state. When a mismatch occurs an error signal is used to correct the physiological state (Berridge, 2004, p. 180). Proposed variables with set points are blood glucose (J. Mayer, 1953), free fatty acids (Mercer & Speakman, 2001), leptin (J. M. Friedman & Halaas, 1998), body weight (Bray & Campfield, 1975; Nisbett, 1972), body fat mass (Le Magnen, 1984), body temperature (Brobeck, 1948), CNS insulin (Woods & Seeley, 2000) and hypothalamic Neuropeptide-Y concentrations (Tomaszuk, Simpson, & Williams, 1996).

Some writers have attempted to use the inadequacies of set point theory to refute the notion of homeostasis (and hence self-regulated eating). The next section considers their view.
5.2 Self regulation - Can’t be done

5.2.1 Argument from set point theory

Booth, for example, relegates “homeostatic regulation” to:

…either a non-explanatory classification of… observations or the invocation of a misleading and dubious complex model. There is no evidence that ingestive behaviour, or indeed any other behavioural or physiological activity, is controlled by a pre-determined and measured “set point” of some physiological characteristic, such as blood glucose concentration or uptake rate, body fat mass or cell size, body water or sodium content, body temperature, or the like (Booth, 1985, pp. 22-23).

Could eating be an *ad hoc* process that just happens to look regulated some of the time? Arguing for this view and against homeostasis (actually against set-points, particularly blood glucose as a set-point), Pinel et al. state:

Eating in food-replete environments is usually initiated in the absence of deficits in blood glucose, and thus, a return of blood glucose levels to their setpoint could not possibly be the mechanism of satiety. Moreover brief bouts of eating are typically terminated well before the food is digested and absorbed into the bloodstream ...two major facts of body weight regulation are inconsistent with any mechanism whose primary function is the defence of a fixed, healthy body weight: First is the increasingly high incidence of obesity in modern industrialised society. Second, the body weights of many adults do undergo substantial and enduring changes during their lives (Pinel, Assanand, & Lehman, 2000, p. 1110).

Against Pinel et al., it could be argued that it is precisely because people are eating in the absence of deficits in blood glucose that the homeostatic mechanism is not allowed to perform its proper function. Effort should therefore be expended in
helping people to recognise when blood glucose is low. Bouts of eating terminated before any food is absorbed would be brief indeed (diabetics can forestall a hypoglycaemic attack within minutes by taking a sweet food or drink). Furthermore, consistent with Cannon’s definition of homeostasis, satiety need not necessarily involve blood glucose; the sensation of a full stomach could suffice as relevant afferent information. The increasingly high incidence of obesity in industrialised societies and the changing body weights among many adults in such societies does not necessarily argue for the non-existence of homeostatic eating regulation but could imply simply that such regulation had reached its limits. If this were the case then rather than conclude the non-existence of homeostatic regulation the appropriate course would be to attempt to extend, or if necessary repair, it.

For Pinel et al. internal cues such as hunger and satiety do not indicate bodily need because, as he claims, as people approach mealtime they are usually in metabolic balance and there are no substantial declines in blood glucose. Why do we get hungry then? On Pinel and his coworker’s view, the body responds to a scheduled mealtime (i.e. in response to the time of day, not to metabolic deficit). It begins to release insulin from the pancreas and extract glucose from the blood so as to reduce the expected increase in blood glucose resulting from the meal. We feel hungry, according to Pinel et al., not because we are experiencing an energy deficit but because it is that time of day when the body is used to secreting insulin. Eating is therefore not a homeostatic activity (on this view) – it actually disrupts homeostasis because blood glucose and metabolic rate are increased after eating. Thus for Pinel et

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22 Pinel et al. quote Woods and Strubbe (1994) in support of this lack of blood glucose decline, but Woods and Strubbe’s paper does not uphold their contention.
hunger is essentially an epiphenomenon, and homeostatic food regulation does not exist.

The claim that blood glucose does not decline as people approach a meal has been challenged (Campfield & Smith, 2003; Chapelot, Marmonier, Aubert, Gausseres, & Louis-Sylvestre, 2004; Ciampolini, Borselli, & Giannellini, 2000)). The question is whether people always experience hunger when they approach meal-time, for if blood glucose decline triggers hunger such a decline would only be expected if they were hungry. In the author’s clinical experience, many people do not experience hunger when they eat even though they may report hunger. This phenomenon will be examined in Chapter 7. If this observation holds in general then it is to be expected that blood glucose does not always fall before a meal time for many people. Furthermore, hunger may not always appear in response to the clock but can occur at times distant from meal times. Section 8.3.2 returns to this point.

Pinel claims that the obese have powerful feelings of hunger and he uses this claim as an argument against hunger in a homeostatic role. Although obese people commonly complain of feeling hungry, there is scant evidence that they have powerful *sensations* of hunger. Both Bruch and Schacter found the opposite (Bruch, 1961; Schachter, 1968). Coddington and Bruch found that nourishment introduced directly into the stomach by nasogastric tube is perceived much less accurately by overweight and underweight subjects than controls (Coddington & Bruch, 1970) suggesting that these subjects have difficulty identifying hunger and satiety sensations. On the other hand, anorexic subjects may feel hunger intensely. Owen et al. found that two anorexic
non-bulimic patients took very large quantities of nutrient under experimental conditions. They state:

These patients seem to have an enormous starvation hunger which, in the experimental situation, predominates over the psychological resistance to eating (Owen, Halmi, Gibbs, & Smith, 1985, p. 281).

In this author’s opinion Pinel fails to make a compelling case against homeostasis or against hunger taking a role in homeostasis. He does however raise an interesting question as to what exactly that role might be. His insight that hunger might be an indication of preparedness is valuable (he terms preparedness “anticipatory meal-compensatory changes”). Preparedness is incompatible with homeostasis only when homeostasis is defined narrowly under set-point theory (it is an example of feed-forward). The complex regulation of food intake may take into account both preparedness to digest efficiently and preparedness for later food deficit (food storage). These points will be returned to in section 8.3.4.

Controversy still exists over the exact role of set-points in homeostasis (Bradley, 1978; Cabanac, 1991; R. B. Harris, 1990). It appears most likely that the regulation of the milieu intérieur is less rigid than cybernetic set-point theory might imply (Carpenter, 2004). Berridge notes that set-point theory is not homeostasis as Cannon conceptualised it and allows that the notions of error detection and set-points were introduced some 15 years after Cannon, and that they are derived from cybernetics.

In retrospect, setpoint and homeostasis concepts never needed to be as tightly conjoined as they have been in the past half-century … Cybernetic setpoint concepts were stunningly elegant as explanations and, hence, were irresistibly seductive to brain scientists … However, in science, as in life, seductive
appearance is not necessarily a guarantee of lasting value. The trend in thinking now seems to be that set-points are misleading for understanding how brain systems of hunger or thirst really work (Berridge, 2004, p. 183).

Chapter 6 argues that while constancy among physiological variables is maintained within certain limits, a degree of flexibility also pertains. The whole is maintained in a hierarchy of homeostatic regulatory systems at lower levels of which provisional “set-points” may change to maintain constancy at higher levels.

### 5.2.2 Argument from evolutionary theory

Important as the struggle for existence has been and still is, yet as far as the highest part of man’s nature has been and even still is, there are agencies more important. For the moral qualities are advanced, either directly or indirectly, much more through the effects of habit, the reasoning powers, religion &c., than through natural selection. Charles Darwin (1809-1882), The Descent of Man.

Those who challenge the homoeostatic control of eating in toto also argue from an evolutionary framework. That our eating proclivities are determined by evolutionary selection and hence represented in our genetic makeup has been claimed by De Castro. In twin and other studies, De Castro has produced evidence that heritable factors influence meal size, meal frequency, choice of meal environment, degree of rated hunger and stomach fullness, and the number and type of people at the meal (De Castro 1999, 2006). A number of workers (for example Lieberman, 2006; Lowe, 2003; Pinel et al., 2000; Speakman, 2004; Zheng & Berthoud, 2007) posit that in an environment in which food is scarce, humans tend to eat more food than they require for short-term energy in order to avoid exhausting the energy stores later. Modern man has inherited this tendency owing to selective pressure. Eating is thus controlled
historically only by the non-availability of unlimited food. This inherited tendency to over-eat food when available is seen as maladaptive in a society characterised by the abundance of food. Since we are genetically not well “programmed” for our current environment, strong critics of homoeostatic theory are pessimistic that internal cues could be relied upon

...because there is no clear adaptive advantage for an organism to consume just enough food to maintain energy balance. Such a system would fail to protect against future gaps in food availability

...The tendency of modern humans to overeat and efficiently store the excess energy is testament to the strong selective pressure for this genotype. Unfortunately, this genotype is maladaptive in modern societies in which food is inexpensive, palatable and readily available. Thus, recommendations to become more sensitised to internal appetitive cues that guide food choices may not have the intended effect on energy balance and body weight (Mattes et al., 2005, p. S93).

At first sight, the argument that we are genetically fixed to eat whenever food is available and will do so in an ungoverned manner in the presence of abundant food seems daunting. However, as Darwin implied and others have since realised, genes cannot fully account for human development or behaviour. The way an organism develops and behaves is the result of a complex interaction among its genes, multidetermined molecular interactions among its cells and the experience of the organism with its physical and social environments (Gottlieb, 2002; Gottlieb & Lickliter, 2007; Lickliter & Honeycutt, 2003). The simple notion that understanding genes and their protein expressions is the key to understanding why we eat appears somewhat naïve in the light of these considerations. Moreover post-hoc rationalisations based on evolution can be constructed to explain almost any phenomenon. As Polivy and Herman state:
One of the glories of evolutionary thinking is its ability to account for just about anything that we encounter in living nature (Polivy & Herman, 2006, p. 33).

In response to what they see as essentially evolution-based speculation, they point out that it could equally be argued that the tendency to consume just enough to maintain energy balance would be advantageous while on an expedition or during winter, when food is scarce. The human tendency to gorge, on the other hand, would be advantageous when food was plentiful and likely to rot. In that case, it is advantageous to eat as much of it as possible before it spoils. A good case can be made for the adaptive advantages of each. Both of them maximise in their own way, caloric intake and our chances of survival and reproduction.

Those who, like Pinel hold that our inherited appetitive system is essentially unregulated suggest that it is best modulated by “healthy dieting” combined with exercise and with minimal exposure to palatable food stimuli (Stroebe, Papes, & Aarts, 2008); interventions that focus on portion size and composition of foods (Lowe, 2003, p. 44S); by fostering self-control (van den Bos & de Ridder, 2006); restricting the availability and marketing of highly palatable foods (Mela, 2006); or by pharmacologic or surgical means (Naslund, Hellstrom, & Kral, 2001).

Polivy and Herman on the other hand argue against self-control because of its poor record in yielding sustained weight loss. They affirm the importance of internal cues:

To avoid obesity in our ecology of plenty, the best answer may still be to eat the foods one likes in moderation, paying attention to satiety cues to avoid overeating (Polivy & Herman, 2006, p. 34).
The fact that humans do stop eating at a certain point and tend in general not to blow their stomachs out in the manner of a football bladder three times a day suggests that day to day regulation of some sort does occur for most people and that regulatory mechanisms exist. Most investigators do not subscribe to the strong “no regulation” view, but see a dual mechanism at work in which homeostatic and non-homeostatic influences play a part. The general name for such a dual mechanism for food intake is two-factor theory.

5.3 Self-regulation – sometimes done

On this view, two mechanisms determine eating, one homeostatic, the other not, hence the name two factor theory. Systemic depletion is responsible for the homoeostatic drive to eat. Other factors such as eating purely for pleasure (hedonic eating), and associated learnt expectations of pleasure, also determine eating but are non-homeostatic. Weingarten some 24 years ago wrote of “depletion induced hunger and incentive or expectation induced hunger, the latter representing an association between external stimuli and food (Weingarten, 1985, p. 394). “Incentive induced hunger”, which in this context can be regarded as synonymous with hedonic motivation, is related to palatability and can be referred to as “liking to eat”.

Weingarten suggested that whereas depletion induced hunger is homoeostatic, incentive induced hunger is not. Eating can be such an inherently pleasurable exercise as to bypass the homoeostatic mechanisms. This notion is echoed by Saper, Chou and Elmquist:
If feeding were controlled solely by homeostatic mechanisms, most of us would be at our ideal body weight, and people would consider feeding like breathing or elimination, a necessary but unexciting part of existence. However, humans will pay large sums of money for an excellent meal … and almost any mammal will eat beyond its homeostatic needs if presented with highly palatable food (Saper, Chou, & Elmquist, 2002, p. 203).

Problems such as obesity are thus seen as an over-emphasis on “liking to eat” for the exploitation of which the purveyors of highly palatable foods are often held accountable (Mela, 2006, p. 16). Against the notion that “liking to eat” is entirely uncontrolled is the everyday experience that the allure of a particular food or taste can pall if that food is imbibed to excess. Thus, chocolate, although highly palatable to most people, can become distasteful if eaten to excess. This phenomenon, called sensory specific satiety, can be seen as a homoeostatic mechanism to ensure a variety of nutrients are ingested and that no particular nutrient is taken to excess. Yeomans, Blundell and Leshem (2004) regard this as the traditional view of palatability which:

…reflected some underlying nutritional deficit and was part of a homeostatically driven motivational system (p. S3).

Some dual factor theorists see sensory specific satiety not as homoeostatic, but as a maladjusted mechanism in a world now replete with powerful and tempting flavours. An individual might experience sensory specific satiety in respect to one food type, yet be tempted by another. Thus Pinel et al. state:

…when the number of available foods is great, sensory-specific satiety has the effect of promoting very high levels of intake. Who has never been comfortably satiated after eating soup, salad, and a few too
many dinner rolls only to find him or herself half an hour later finishing a main course in some distress
and wondering whether or not to have ice cream on the pecan pie? (Pinel et al., 2000, p. 1112).

This line of thinking implies that fundamental defects exist in the homeostatic
regulatory system (Mela, 2006, p. 11) leading to conflict between the goal of eating
enjoyment and the goal of eating control (Stroebe et al., 2008). De Castro and
Plunkett argue that homeostatic theories suffer from the following weaknesses:

… their inability to account for the lack of adequate compensatory adjustments to intake on a
meal-to-meal or day-to-day basis, the striking increase in obesity over the last several decades, the
number of separate systems that appear to be involved, and the presence of very influential stimuli that

Other stimuli that influence intake but are not themselves affected by the intake
include eating with other people (Clendenen, Herman, & Polivy, 1994; de Castro,
1991b, 1994; de Castro & Brewer, 1992); social norms (Herman, Fitzgerald, &
Polivy, 2003); dietary restraint (de Castro, 1995; Ruderman, 1986); daily (peaks at
lunch and dinner) (de Castro, 1987), weekly (greater intake at weekends) (de Castro,
1991c), lunar (de Castro &Pearcey, 1995) and seasonal rhythms (de Castro, 1991a);
abundancy of food and food cues (Berthoud, 2007; Contaldo, Pasanisi, & Bellini,
2005); sophisticated food marketing (Lieberman, 2006); portion size (Kral, 2006); the
energy density of the food (Bell & Rolls, 2001; Duncan, Bacon, & Weinsier, 1983)
memory of what has been previously eaten (Rozin, Dow, Moscovitch, & Rajaram,
1998); and previous expectations about a particular food (Hurling & Shepherd, 2003).
DeCastro and Plunkett (2002) propose a general model of intake regulation in which multiple factors influence intake each weighted to reflect the effects of heredity. These weightings are to be discovered empirically by measuring the behaviour of free-living human beings.

5.4 Self-regulation – can be done

The list of powerful non-homeostatic stimuli may seem formidable and could be seen to imply that human homeostasis is fundamentally flawed, its weaknesses exposed by a food-rich environment. However the fact that behaviour is observed in free-living humans does not mean that such behaviour is inevitable. An alternative view is that homeostatic systems are intact and functioning but overridden by other sources of eating stimulation (Berthoud, 2004b) because they are at their present limits (Mela, 2006, p. 12). It follows then that human homeostatic systems might simply be in need of shoring up. To answer De Castro and Plunkett:

1. Meal-to-meal or day-to-day compensatory adjustments could be fostered if subjects had access to meal-by-meal feedback on energy balance. It has been suggested that, in many people, awareness of internal eating prompts represent a missing homeostatic “afferent arm.” Perhaps this afferent information could furnish that feedback.\(^{23}\)

2. The striking increase in obesity may thus be a result of missing afferent information.

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\(^{23}\) Feedback by external prompt may be of value also. Levitsky’s Tissue Monitoring System is one such method (D. A. Levitsky, Garay, Nausbaum, Neighbors, & Dellavalle, 2006).
3. With regard to the number of separate systems involved in the homeostatic regulation of food, this possibility is entirely consistent with Cannon’s concept of homeostasis in which redundancy is the norm. This will be discussed in Chapter 6 of this thesis.

4. It may thus not be necessary that those stimuli that are immune to intake, influential though they are, trump those that are affected by intake.

Two factor theory argues for the homeostatic regulation of food intake, fragile though the system may be. There seems to be room then to optimise the homeostatic mechanisms. It is proposed in this thesis that despite the attraction of palatable foods and other external factors self-regulation can be optimised. The apparent frailty of our homeostatic regulatory systems may owe to non-awareness of internal eating cues and consequent compromise of eating pleasure. This leads to lack of compensatory adjustment to food intake on a meal-to-meal basis and to non-homeostatic eating. It will be suggested that restoring meal-to-meal feedback supports homeostatic eating. Since the concept of homeostasis has dominated eating studies for the last 50 years the theory suggested here represents in some ways a return to the traditional view.

5.5 Conclusion to Chapter 5

Three views on homeostasis have been outlined. The first is that homeostasis has no role in the process of eating. The second is that it has a role but its defects are coming to light under an onslaught of aggressively promoted highly palatable food. The third (the author’s) is that homeostatic food regulatory systems are intact but function suboptimally. In particular meal-to-meal feedback needs to be enhanced. All views accept that many people eat in response to stimuli that are not influenced by food
intake. Chapter 7 will address this phenomenon. For now, the second implication of MVS – that pleasure is involved in food regulation – will be examined.
Chapter 6  A consciousness-based model of self-regulated eating

Introduction

This chapter addresses the second of the two features of MVS that are of direct relevance to eating regulation, namely that pleasure, far from being a hindrance to food regulation, is woven into the very structure of the phenomenal universe and might therefore be expected to play an important role in food regulation. A principle of MVS is that the mind moves spontaneously in the direction of greater pleasure. That notion will now be elaborated upon. The outcome of the chapter will be a pleasure-based regulatory system in an extended model of homeostasis that is not inconsistent with the model proposed by Cannon.

6.1 Homeostasis can be expanded to include consciousness (and therefore pleasure)

For Carpenter (2004) a rigid set-point notion of homeostasis in which only direct negative feed-back operates is impoverished. Woods and Ramsay (2007, p. 393) agree. Carpenter holds that the set-point only version of homeostasis has arisen among a generation of molecularly oriented biologists who, being unfamiliar with the details of Bernard and Cannon’s writings, have now invented new terms to cope with phenomena already embraced under the original one. He gives as an example the word allostasis. 24 Coined from the Greek allo, allostasis means “variable” or “remaining fixed by being variable” – Cannon’s intended meaning for homeostasis. Carpenter remarks:

24 To this example Woods and Ramsay add a raft of similar terms: predictive homeostasis, reactive homeostasis, homeorheusis, homeorhesis, homeokinetics, rheostasis, homeodynamic regulation, heterodynamic regulation, heterostasis, and allodynamic regulation.
One is struck in Cannon’s writing by his intuitive understanding of nearly all the varieties of homeostatic mechanism known to control engineers: internal feedback, feed-forward, prediction, parametric feedback, hierarchical control. He also discusses the existence of reserves, and their regulation through “overflow,” and the problems posed by eating and drinking—activities that are ultimately homeostatic, but cause temporary disturbance …there is a need to reassert the unitary nature of homeostasis and the variety of forms it can take, so that we are not obliged to reinvent what was common knowledge even 30 years ago …(Carpenter, 2004, p. 180).

In summary then, Cannon’s homeostasis should not be thought of as a collection of bodily thermostats – reflex acting feedback loops each with its fixed setpoint. Rather it was a broad concept embracing hierarchies of interlocking and redundant control systems of many kinds. These included non-feedback control mechanisms and systems that involve cognitive and behavioural elements. Cannon explored the notion of storage (a kind of feedforward mechanism) and "spillways," pointing out that a renal threshold exists not only for waste materials, but also for glucose. The renal threshold for glucose, being a kind of spillway, could in Cannon's view be seen as a method of homeostatic regulation.

6.1.1 Information flow among hierarchical control systems

Carpenter points out that homeostatic systems rely upon information flow. Information about the world (afferent information) is compared to information representing a desired outcome. Then action is taken to attempt to achieve that outcome.25 Biological systems rarely deal with the constancy of one variable in

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25 In more technical terms, in a generic control system an input x – information representing the desired outcome – is sent to a plant (or effector organ) which then generates an output y. The output of
isolation. Usually variables depend on each other in complex ways – the “set point” of one depends on the state of another. Carpenter points out that the body’s control systems are arranged in a hierarchical manner. The higher reaches of the hierarchy correspond to desired outcomes, while the lower hierarchical levels must vary to accommodate those outcomes:

…we control muscle length because what we really want to do is control arm position; we control arm position because what we really want to do is point a gun; we point the gun because what we really want to do is stay alive. Homeostasis means keeping things the same: but not keeping everything the same. There is an intrinsic hierarchy in the body’s parameters, and regulation of the more fundamental ones can be achieved only by deliberately allowing less fundamental ones to vary …(Carpenter, 2004, p. 184).

It is likely that the set-points of physiological variables including blood glucose might vary over time to reflect desired outcomes at more fundamental levels of the hierarchy. Thus, for example a manual worker might operate at a higher mean glucose level than a more sedentary worker.\textsuperscript{26}

\textsuperscript{26}Ciampolini reports some evidence in support of this as discussed in Chapter 11.
6.1.2 Purpose and desire in homeostasis

According to Carpenter, for a motile organism:

…homeostasis is frequently achieved not so much by adapting to an environment, as moving to a better one…When we are cold, we increase our metabolism and reduce heat exchange through the skin by vasoconstriction; but we also put on more clothes and move nearer the fire. (Ibid p.186)

The significance of this mechanism is far-reaching. Not only does it release homeostasis from the constraints of direct negative feedback, it legitimately transcends physiological and biochemical boundaries and opens the way for purpose and desire to enter into the homeostatic regulation of eating. The decision to put on more clothes and move nearer the fire is a conscious one. Furthermore it is a move from a less pleasurable to a more pleasurable state. Conscious input including pleasure may also be included within a broadened concept of homeostasis.

Carpenter does not acknowledge consciousness in homeostasis explicitly. He takes a traditional viewpoint, seeing the hypothalamus as pivotal in regulatory behaviour. Thus although conscious decisions involved in food-gathering and eating are seen by Carpenter to be part of a grand homeostatic system they are subservient to the hypothalamus. In fact Carpenter goes so far as to suggest that:

The whole of the brain may be regarded as a way of helping the hypothalamus to do a better job, by making better predictions of what is going to happen next ...(Carpenter, 2004, p. 187).
Zeng and Berthoud (2007) imply a greater role for consciousness, at least placing “executive control and decision making” at the apex of a distributed neural system controlling food intake. For them, both objective and subjective modulating factors contribute in a grand homeostatic loop.

It is now increasingly recognized that cognitive, hedonic, and emotional neural processes play important roles in energy intake and expenditure and the resulting energy balance. To acknowledge this apparent dichotomy, the terms ‘homeostatic’ and ‘nonhomeostatic’ controls and systems have also been used. However, realizing that the two systems are intimately linked to serve overall homeostasis in a given environment, such a distinction is no longer useful (p. 607).

Although it was probably not their intention, in bringing “hedonic neural processes” into homeostasis these writers help to set the scene for a pleasure-based homeostatic system. What goes on in the cerebral cortex (and hence the mind) is at the apex of homeostatic eating (being Type-B materialists they keep the relation between mind and cortex vague). If the cerebral cortex with its higher executive control and decision making stands at the governing level of the physical homeostatic hierarchy, then rather than the brain helping the hypothalamus to do a better job by predicting what is coming next, it seems more accurate to say that the cortex tells the hypothalamus what is to happen next. The cortex desires an outcome to which the hypothalamus must conform by re-setting a myriad of subservient control systems. I decide to take a walk in the snow. The hypothalamus must reset those mechanisms that conserve heat.

This reversal of viewpoint is an example of the “inside looking out” manoeuvre suggested in Chapter 3 in addressing the mind-body problem. Our thoughts,
motivations and desires operate at the highest level of the homeostatic hierarchy. The conscious self sets the scene. Intelligence carries out the order. Since regulatory systems are primarily about information flow, the indicators of the state of the subservient homeostatic mechanisms become, under this model, important. Hunger and satiety represent feedback (information flow), from “works” to “head office”. If such information has not been getting through, or if received but not properly interpreted, then eating regulation would be impaired. Perhaps the entire process of food regulation could be orchestrated at the level of consciousness if this information flow were better understood.

6.2 When is a system homeostatic?

Having broadened the concept of homeostasis it becomes necessary to re-define it and set limits to its scope. What does it mean for a system to be behaving homeostatically?

For Cannon, any control system that contributes to the maintenance of a stable (but not fixed) state of the fluid matrix of the body can be considered homeostatic. Thus a trip to the supermarket, based on internal models of what a supermarket is likely to provide, could be seen as part of a feedforward control system for glucostasis. However if, for example, while not at all hungry, I decide to eat a large breakfast in anticipation of a late lunch, can that also be regarded as feedforward homeostatic behaviour?

The language of behaviourism is frequently used to differentiate homoeostatic and non-homoeostatic behaviour. Homoeostatic eating is thus termed “unconditioned”
eating. Unconditioned eating refers to eating behaviour that is independent of any external initiating stimulus and is presumably therefore, an accurate reflection of homeostatic need. The term “compensated” eating (de Castro, 2004) conveys the same meaning. An organism acting in a homeostatic manner “compensates” for a nutrient lack by eating that nutrient in appropriate amounts. Conversely, non-homeostatic eating is a “conditioned” response to an external stimulus and may be called “uncompensated” since the organism eats in response to stimuli other than nutrient need. An advertisement for a hamburger might, for example, act as a stimulus that provokes the conditioned response of buying a hamburger and eating it in absence of metabolic need. Conditioned eating is thus seen as a disruption of homoeostasis, a kind of reflex behaviour which leads to energy accumulation.

Using this terminology, I suggest that my eating a large breakfast in a state of non-hunger might be regarded as non-homeostatic since my lack of hunger could be taken to indicate that I am not eating to meet metabolic or nutrient need. Not all would agree with this interpretation. Corwin and Hajnal would hold that eating non-homeostatically is in a way eating homeostatically because the body can cope with it:

It is quite normal… to overeat on some occasions and to undereat on others. It is regarded "normal" not only because of the consensus of our society, but also because homeostatic regulatory mechanisms for the short-term, and adaptive regulation for the long-term, compensate for deficits and excesses within a certain regulatory range (Corwin & Hajnal, 2005).

Corwin and Hajnal rather confusingly call this type of behaviour "compensated" non-homeostatic eating. They go on to state that when such behaviour compromises
mental or physical health it ceases to be "normal" and becomes "maladaptive". This seems unnecessarily complicated. For clarity, eating should be regarded either as homeostatic or not. If one overeats because the "wisdom of the body" judges that such eating is within a certain regulatory range and therefore will have no adverse consequences, the eating is homeostatic and therefore adaptive. If the eating exceeds the regulatory range or in some other way contributes to adversity, then it is non-homeostatic and maladaptive. To decide whether certain behaviour will or will not have adverse effects requires further criteria than adaptability within overall stability. In this thesis a further three conditions are suggested.

6.2.1 Hallmarks of a homeostatic system

These derive from five fundamentals of progress as proposed by Maharishi Mahesh Yogi and are:

Adaptability, Stability, Integration, Purification and Growth

Adaptability and Stability have been discussed. Integration implies connection and communication between the component elements of a homeostatic system. Integration is particularly important when redundant and hierarchical levels of homeostatic systems inter-relate as in the human body.

Purification is a term not usually associated with homoeostasis. Yet the elimination of material present in excess or not conducive to wellbeing is fundamental to the maintenance of the stable milieu intérieur. Excretion via liver or kidneys as well as
the "spillway" phenomenon should therefore be seen as part of the homeostatic process.

Purification can also be regarded as maintenance of optimal function (by elimination of impediments to such function). Purification can in this sense occur during the process of digestion – food may be more or less efficiently digested. Western medicine tends to regard digestion as a series of biochemical pathways that function more or less mechanically according to the laws of chemistry unless in the presence of some external agent such as, for example, Helicobacter pylori or Salmonella. In Western clinical medicine, symptoms of imperfect digestion that arise for less obvious reasons – symptoms such as indigestion, colic or epigastric discomfort – have traditionally been regarded as of minor importance and have been seen as not playing a major role in the maintenance of health or in the homeostasis of food regulation.

In the introduction to this thesis (Section 1.1) reference was made to Maharishi Ayurveda in which Maharishi Mahesh Yogi has integrated principles of Ayurveda, the classical system of health from India, with his consciousness-based Vedic Science. In Maharishi Ayurveda symptoms commonly regarded as minor in the West are held to be significant. Digestion is seen to be affected by a myriad of subtle factors including mood, stress, and external activities and distractions. Less than optimum digestion to even a small degree is seen as maladaptive and directly compromising to health. The Ayurvedic concept of ama is relevant here (Kasture, 1991, p. 34). Ama is a generic term and, while not directly translatable into Western terminology, can be regarded as toxic intermediate metabolites produced when the digestive process functions less than optimally. Examples of ama might include furry
deposits on the tongue, cholesterol or calcium deposits in the intima of arteries, ectopic fat deposits, gouty tophi or deposits within joints such as occur in rheumatoid arthritis. In the latter case, the body recognizes ama as foreign, and mounts an immune reaction to it, hence the inflammatory nature of rheumatoid arthritis. Ama is said to disrupt normal function, in particular of the immune system, and is regarded, under the Ayurvedic model as a necessary condition for most diseases. The manner in which food is ingested and digested and whether it results in useful (pure) tissue nutrition or (impure) toxic intermediate metabolites are therefore regarded as of prime importance. The relationship between efficiency of digestion and the accumulation of cholesterol is not established empirically but its accumulation is clearly a disruption of the milieu intérieur. Hence it is appropriate to include purification, the elimination of elements that disturb the milieu intérieur, as a defining characteristic of homeostasis.

Growth, in the sense of the ability of an organism to “rewire” itself in response to major changes of environment, has been suggested by Carpenter whose term “ultrastability” refers to the same concept. Growth here can also refer to the ability for an organism to mature, learn or evolve.

Eating according to homeostasis should conform to all five of these fundamentals. Planting broad beans in August because you know you will wish to eat them in November is an example of parametric feedforward, based on internal memory. It is homoeostatic. Eating a big breakfast in the absence of hunger, because you anticipate a late lunch would not qualify if it promoted inefficient digestion, since that would violate the conditions of purification and growth.
In summary, it is suggested that consciousness stands at the apex of homeostatic regulation which should be expanded to include purification. Rather in the manner that a monarch, by keeping informed of the state of his kingdom maintains governance yet does not attend to the detailed mechanics of running the kingdom, so consciousness is in a position to oversee the regulation of eating, by staying informed of the digestive state.

Is homeostatic eating an all or nothing phenomenon or does it form a continuum with non-homeostatic eating at one end of a scale and completely homeostatic eating at the other? This author suggests the latter. Eating can be more or less homeostatic depending upon the degree to which the above five fundamentals are met. Is completely homeostatic eating possible? This would require a state in which adaptability, stability, integration, purification and growth are optimal. The idea of perfect homeostasis corresponds closely to the notion of perfect health, which for many writers is an impossible ideal. Elsewhere (Lovell-Smith, 2002) the author has argued that perfect health is possible and that it necessarily implies higher states of consciousness. One characteristic of higher states of consciousness is that they are associated with deep inner happiness or “bliss-consciousness of absolute Being” (Maharishi Mahesh Yogi, 1966, p. 157). It is suggested in this thesis that pleasure is an integral part of homeostatic eating behaviour and this idea will be developed in the next section.
6.3 Pleasure-based homeostasis

The beginning and the root of all good is the pleasure of the stomach; even wisdom and culture must be referred to this. – Epicurus.

The final level in the hierarchy of homeostatic eating systems is the maintenance of happiness or pleasure. Therefore homeostatic eating can also be defined as eating to maintain optimum happiness.

In section 6.1.2 it was suggested that the higher reaches of the homeostatic hierarchy establish desired outcomes, and the lower hierarchical levels vary to accommodate those outcomes. What ultimately is the desired outcome of body/mind? What do we try to keep constant? For Cannon it was the milieu intérieur of the body. Borrowing from Carpenter’s example we might ask “Why do we eat?” since this is the clue to what we want to keep constant. The author suggests that we maintain our milieu intérieur mainly to preserve our tissue energy levels with a view to staying alive so that we might live fulfilled lives. In abbreviated form, we eat for fulfillment or pleasure.²⁷

In the two-factor view hedonic motivation is “the enemy” to homeostasis since it is held that the pleasure elicited by highly palatable food tempts people to eat in the absence of metabolic need. Indeed all emotion has long been seen to be disruptive to the integration of an individual. Carbanac quotes Young as saying in 1943:

…emotion is a disruption or disorganization of the total individual, and not an integrated process.

²⁷ Both the immediate pleasure of eating and other fulfillments that staying alive might allow.
Carbanac and others have put forward the opposing idea, adopted in this thesis, that emotion is ultimately a homeostatic response:

Contrary to that view, emotion is now seen as an integrative response the biological function of which is primarily homeostatic (Cabanac, 2002, p. 75).

Under this theory, pleasure is not an enemy to homeostatic eating, but is the driver and regulator of it. Ultimately, Carbanac suggests, decisions are made depending on whether greater or lesser pleasure is expected from each possible course of action.

6.3.1 Fundamental nature of desire

As mentioned in Chapter 3, in MVS a fundamental principle is that

The mind moves to maximise pleasure

The pursuit of pleasure is not foreign to Western philosophy. It can be traced to Epicurus and was taken up by James Mill (1773-1836) (B. Russell, 1945, p. 242 & 777). Aversion to pain and movement towards pleasure were suggested as motivating factors in human behaviour by the associationist and early psychologist Alexander Bain (1818-1903) (see Boakes, 1984, p. 9) and kept alive during the behaviourist period by Young (1967). Their views align with Cabanac’s. Pleasure, for Cabanac, is a mental “signal of usefulness” indicating what is best or most useful for the individual or as he puts it, is a “common currency” that allows the mind to optimise decision making (Cabanac, 1979, 1992, 1995; Cabanac, Guillaume, Balasko, & Fleury, 2002).
A system of food regulation could thus be hypothesised in which (type-b) pleasure is at the apex of homeostatic regulation. The levels of the homeostatic hierarchy might look like this:

**FULFILLMENT (Type-b pleasure)**

To enjoy maximally, it is necessary to be, among other things, 

**Healthy** \(^{28}\)

For which it is necessary to have

**Regulated tissue energy levels**

For which it is necessary to

**Maintain the milieu intérieur**

For which it is necessary from time to time to

**EAT**

Each level in the hierarchy is a necessary condition for the level above. It is not a sufficient condition. It is granted that there exist many means of gaining fulfillment and that different individuals gain pleasure from different sources. Eating in freezing conditions while lost in Antarctica might not be a sufficient condition for pleasure: it is a very unlikely set of conditions in which pleasure could occur. However, it does seem to be necessary to eat from time to time for if one did not the experience of pleasure (or any experience) would be severely compromised. \(^{29}\)

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\(^{28}\) I am suggesting that health is necessary for optimum pleasure. Health is not a necessary condition for pleasure *per se*. One can still enjoy life with a chronic illness however life without a chronic illness is likely to be more pleasurable.

\(^{29}\) Food deprivation is not generally pleasurable however the experience of fasting has been described by some individuals as pleasurable after a few days. This may have to do with the fact that Westerners
Homeostatic eating should maintain all levels. Homeostatic eating could therefore be defined as eating in such a manner as to maintain the milieu intérieur, regulate tissue energy levels, stay healthy and bring fulfillment. A hierarchical model avoids some of the criticisms that have been made of simple one-dimensional set-point models since it allows flexibility. Lower levels of the hierarchy can vary in this model, in defence of constancy at higher levels, and hence allow for adaptability.

6.3.2 A pleasure-output system of homeostatic food regulation

Hedonic principles in Vedic Science

To put the above hierarchy into control system terms, fulfillment is the desired outcome which the regulatory mechanism is to output by performing certain actions. Thus in the pursuit of pleasure:

DESIRE precedes ACTION

Which, if all goes well results in achievement:

DESIRE precedes ACTION which precedes ACHIEVEMENT

typically overeat. Cessation of eating in this situation may temporarily return the body to a more physiological style of function (until deprivation occurs) and could therefore generate transient feelings of well-being.

There have been historical and contemporary accounts of individuals who confound the above hierarchy completely by reportedly remaining alive for months or years apparently without food intake and apparently remaining perfectly content (inedia). I do not know exactly what to make of these accounts. Perhaps the theory presented here applies in certain limiting circumstances only. In any case these instances, if they occur, are sufficiently rare for the theory to hold for most people.
This fundamental sequence in human activity first suggested by Maharishi (see Maharishi Mahesh Yogi, 1966, p. 116) conforms closely to control theory. The action of the organism leads to the achievement of some result. Depending upon how well the “controller” (in control system terms) manages to match the result to the desired outcome the sequence will be more or less successful. If successful, a further element can be added which is a sense of fulfillment. The result might not match the intended outcome, in which case frustration, regret or guilt might result. This depends upon the initial strength of the desire. If all goes well:

DESIRE precedes ACTION which precedes ACHIEVEMENT which precedes FULFILLMENT

It will be suggested in section 6.3.4 that the above is a regulated system, since fulfillment feeds back in such a way as to eliminate the desire. However there is considerable confusion about the “desirability of desire.” Before embarking upon a system of regulation based upon desire it will be necessary to clarify this point.

6.3.3 Desire best not suppressed

Some systems for spiritual development, particularly certain interpretations of Buddhism, teach that desire is inimical to pleasure. It is held that each desire contains the seeds of future desire leading to a never-ending cycle that defies ultimate fulfillment. These systems advise that the only way to break this cycle is to suppress desire at its inception.

The more we pursue our desires, the more our desires grow; it's like drinking salt water….Recognise our desires for what they are: ways of keeping us stuck, attached and addicted (Lama Surya Das, 2001, pp. 233-234).
This appears to be a subtle misinterpretation of the teachings of Buddha. From the viewpoint of MVS desire is essential to motivation and useful action. Desire may lead to addiction. The addictions represent an extreme example of a cycle in which the mind desperately seeks remembered pleasure and experiences agony when transient joy is lost. The mind clings to the thought or memory of a pleasure, an uncomfortable phenomenon described by Maharishi as attachment and well known to anyone who has experienced unrequited love. It does not follow though that one should suppress desire, because desires are essential to making one’s way in life. In fact, the Bhagavad Gita, a Vedic text, contains the following verse:

He who sits, restraining the
organs of action, and dwelling
in his mind on the objects of
sense, self-deluded, he is
said to be a hypocrite.

Bhagavad Gita, Chapter 3, Vs 6 (see Maharishi Mahesh Yogi, 1967, p. 137).

The question is therefore how to manage desire, so that addiction does not occur. In the case of desiring chocolate, for example, restraint might seem the obvious course, but in practice the attempt to suppress desire is usually a frustrating experience. The mind feels thwarted of pleasure and the greater the pleasure of eating the greater the anxiety when it is denied (Appleton & McGowan, 2006). Like damming a river it requires the expenditure of energy to prevent the desire from spilling over. The force of desire strengthens, requiring an ever stronger dam to prevent it from bursting.
MVS posits two ways of managing a desire. The first is to fulfil the desire, in which case that particular desire is spent. The second is to replace it concurrently with another desire the fruits of which the mind likes better. This approach involves demonstrating to the mind that greater pleasure is to be gained by moving in another direction as suggested by the second desire. The first desire thus loses its force, in favour of the second.

In section 4.2.2 the terms type-a (excitement) and type-b (contentment or fulfillment) pleasure were introduced, and will be enlarged upon here. Desire that moves the mind in the direction of type-a pleasure will be known as type-a desire and that which moves the mind in the direction of type-b pleasure, as type-b desire. A type-a desire can be replaced by another type-a desire, or by a type-b desire.

A familiar example of replacing a type-a desire with another type-a desire is the strategy, known to most parents, of inducing a child to release an object it is holding by giving him or her, a more intriguing object. The child anticipates greater pleasure from the new object and loses desire for the initial one. Attempting to grab the first object from the child without presenting the second, however, is likely to lead to resistance, since the mind resents being deprived of pleasure.

To replace a type-a desire with a type-b desire, the mind must move away from diversity and in the direction of unity. This shift involves some form of mental

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30 Another similar desire might arise in the future, but that particular desire is extinguished.
31 Epicurus made a similar distinction between active and passive pleasures. Dynamic pleasures are to do with the attainment of a desired end whereas passive pleasures are a state of equilibrium (B. Russell, 1945, p. 144). Russell comments: “I think one may say that the satisfying of hunger, while it is in progress, is a dynamic pleasure, but the state of quiescence which supervenes when hunger is completely satisfied is a static pleasure.” This idea is developed in Chapter 9 of this thesis.
settling, which is powerfully achieved through meditation but could (less powerfully but still beneficially) involve a “workaholic” stopping for a cup of tea or taking a holiday. Thus replacing a type-a desire with a type-b desire is an effective strategy to release the mind from the addictive cycle of desire described by Lama Surya Das, above.\(^{32}\)

This process of replacing a self-gratifying type-a desire with a more universal (type-b) one is sometimes referred to as “refinement of desire”. The desire not to harm, or the desire to preserve one’s good reputation, is found by the mind to yield greater pleasure than more immediately self-gratifying desires. That this process appears to occur spontaneously when the mind is allowed to settle is supported by Nidich et al. (1983; S. I. Nidich et al., 2005) who found that practitioners of Transcendental Meditation performed better than controls on measures of principled moral thinking. That Transcendental Meditation can be of benefit in addictive situations is supported in the literature (Alexander, Robinson, & Rainforth, 1994; Bleick, 1994; Clements, Krenner, & Mölk, 1988; J. B. Marcus, 1974; O'Connell & Alexander, 1994; D. W. Orme-Johnson, 1994; Royer, 1994; Shafii, Lavely, & Jaffe, 1974, 1975; Staggers, Alexander, & Walton, 1994; Taub, Steiner, Weingarten, & Walton, 1994; Walton & Levitsky, 1994).

While it is correct that lasting pleasure cannot be found in the direction of greater diversity, this truism does not imply that the pleasures of diversity have no value or are to be shunned. On the contrary, there is no reason why enduring pleasure and the

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\(^{32}\) This simplified account precludes a full description of the role of past impressions (samskaras) in stimulating desire (see Maharishi Mahesh Yogi, 1966, p. 116), however the general principle that desire should not be suppressed, but rather fulfilled or replaced holds nevertheless.
pleasures of diversity cannot be enjoyed simultaneously. Lasting pleasure can be gained by moving in the direction of unity, by transcending thought. In the state of Unity Consciousness, having stabilised the experience of pure consciousness, the state or fulfillment is permanent. One does not lose type-a desire in this state however, for otherwise one could not continue to act in the world. In Unity Consciousness, an individual is said to have the advantage of both types of pleasure – a lasting state of fulfillment with superimposed temporary pleasures enhancing it. The desire for excitement and diversity remains but in modified form – it could be called type-c desire. The difference between type-a and type-c desire is that for the latter the “binding” effect is broken (see Maharishi Mahesh Yogi, 1966, p. 120). Desire is no longer like drinking sea water, in which satisfaction is never found. Because fulfillment is permanently available, like drinking spring water, one drinks until one has had enough and then one is happy to stop.33

Previous theories of motivation invoked the concept of “drive.” Under the hydraulic drive model proposed by Konrad Lorenz, a drive such as the sexual drive or the drive to eat was compared to hydraulic pressure increasing until an outlet is found for its relief (for a discussion of Lorenz's model see Berridge, 2004). According to Berridge, drive theories have now been largely abandoned in favour of incentive theories. Put simply, the mind, rather than being “pushed” by drive is now thought to be “pulled” by the anticipation of pleasure. We seek and consume food for the pleasure of eating

33 It might be objected that not everyone can achieve Unity Consciousness. Throughout his years of teaching, Maharishi remained adamant that Unity Consciousness is the birthright of all and that there is no reason why young people cannot be trained to reach this state before they reach the age of 25. While a full discussion of this interesting point is beyond the scope of this thesis, simply moving in the direction of Unity Consciousness can have a sufficiently beneficial effect to break the cycle of the more gross addictions.
it. Desire is vital therefore to the maintenance of life for without desire we would not eat.\textsuperscript{34} A philosophy reminiscent of misinterpreted Buddhism has been prevalent in the West in which the desire to eat has been seen as inimical to moderate eating leading some dietary authorities to recommend its suppression. This notion has entered deeply into the popular consciousness. As mentioned in the introduction to this thesis, when asked about appetite, many patients report that it is “too good” or they like food “too much” implying that they should not be experiencing the desire to eat, or at least not to such a degree. Nevertheless, restraining the desire to eat is now widely recognised as being counterproductive to the regulation of eating. This thwarting of desire is generally referred to in the literature as restrained eating and the theory that identifies the problems surrounding restrained eating, as restraint theory. Restraint theory will be briefly reviewed in Chapter 7.

\textit{6.3.4 Fulfillment feeds back on desire}

During the homeostatic consumption of food, when contentment appears the desire is fulfilled. Food that previously appeared delicious no longer appears so. It may appear flat, uninteresting or even repugnant. The desire to eat drops away. This sequence represents a negative feedback loop. Fulfillment feeds back negatively upon desire. A desire ceases to be a motivating force once it is fulfilled (Maharishi Mahesh Yogi, 1966, p. 297). Action need no longer flow. The desire to eat is extinguished and eating stops.

\textsuperscript{34} Sometimes people eat when they don’t desire food (for example, when sick) because they believe that the body needs nourishment. However in that case they desire to nourish the body, so the general point that desire is necessary for eating stands.
Certainly other eating desires may arise at a later time. But those are new desires that can be similarly dealt with. That particular desire is spent. A very similar one might arise some hours later.\textsuperscript{35} As Buddhists have noted, the fulfillment gained in the field of diversity is transient. In the case of eating, it typically lasts a few hours. Towards the end of this period (the inter-meal interval), another desire to eat arises and the cycle repeats. The point is that a system of eating self-regulation is built into the process that initiates eating. The principle that flows from this is that:

\textbf{6.3.5 Homeostatic eating desires are those that are fulfilled by eating}

This principle is represented schematically in the following figure:

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figure15.png}
\caption{Homeostatic eating desires are those that are fulfilled by eating}
\end{figure}

The fulfillment (type-b pleasure) that results from eating satisfies and extinguishes the desire to eat.

This simple schema might be described as the “common sense hedonistic explanation” (after Young, 1959) for a homeostatic pleasure-based food control system yet it conforms to the generic example furnished by Carpenter. Hunger stimulates the desire to eat. The desired outcome is fulfillment. The controller, which in this case is whatever plans are necessary to find and consume food, converts the

\textsuperscript{35} Desire that is not so extinguished and which contributes to addictions will be addressed in section 10.2
desired outcome into an action. The effector is whatever means a subject uses to achieve the consumption of food. The output is the fulfillment that results. That the output feeds back upon the input self-regulates this system. The contentment gained from eating extinguishes the desire to eat. Conversely a non-homeostatic eating related desire is not fulfilled by eating food, feedback does not occur and eating is non-regulated.

These principles hark back to de Castro and Plunkett’s (2002, p. 584) previously mentioned suggestion that powerful stimuli exist that influence food intake but those stimuli are not themselves affected by the intake. For example, the desire to belong to a social group is a known powerful stimulus for eating. That desire is fulfilled by belonging to a group, it is not itself fulfilled by eating, nevertheless eating commonly occurs in response to the desire. Eating in response to a stimulus that does not influence further food intake could be represented as follows:

![Diagram](image)

**Figure 16** Non-homeostatic eating desire is not fulfilled by eating food

Whatever fulfillment is gained from such eating, it does not feed back upon the desire to eat, so the eating is unregulated and non-homeostatic. Possible mechanisms to account for such eating are examined in Chapter 10.
The regulatory process is refined by the introduction of sensory specific appetite and sensory specific satiety. The absence of a particular taste or texture invokes a desire to eat food that can provide that taste or texture. Desire leads to action to gather, prepare and consume that particular food leading to fulfillment of that particular desire. Sensory specific appetite (“I’d like to eat that”) and sensory specific satiety (I’ve had enough of that) play important roles in homeostatic eating. Sensory specific satiety may be an indication that the body recognises it has had sufficient of the nutriments represented by the taste, smell and texture of the food in question.

6.4 Conclusion to Chapter 6

A simple regulatory system based on desire for pleasure and its fulfillment has been described. While it appears logical that eating desires should be so regulated, this thesis has yet to explain why many people choose to eat in response to external influences. Current theories to explain this phenomenon will be discussed in Chapter 7. Chapter 8 will examine the eating sensations. These two chapters will form a basis for Chapters 9 and 10 which take up again the regulatory system based on desire and its fulfillment.
Chapter 7 Eating in response to stimuli not influenced by intake

Introduction

Mr DR aged 44 (12/2/09)

DLS: Do you get hungry much?
DR: Yep!
DLS: Where do you feel it?
DR: In my stomach I suppose.
DLS: What does it feel like?
DR: Empty! Almost painful if it goes on too long.
DLS: Are you hungry now?
DR: I shouldn’t be. I had two bread rolls only two hours ago!
DLS: Are you feeling that empty feeling before every meal?
DR: No… During the day I work from home. Through the door from my office is the kitchen. Work can be boring. So you get up and stretch your legs…

Many people eat in response to stimuli not influenced by food intake. Why should this be, and what should be done about it (if anything)? This section of the thesis reviews the work that so far has attempted to answer these questions. Most work has been carried out in the eating disorders. Approaches fall into the following categories:

1. External prompts are nowadays more compelling than previously and they override internal prompts –Two factor theory (Chapter 5), “Externality theory” (Schachter, 1968).
2. Emotional or other psychological factors obscure internal prompts.

“Psychosomatic position” (Ceaser, 1979; Slochower, 1976; Slochower, Kaplan, & Mann, 1981; van Strien, 2000)

3. The significance of internal prompts is not innate knowledge and must be developed during childhood. Imperfect parental instruction leads to their non-development (Birch, Fisher, & Davison, 2003; Bruch, 1970b; Harshaw, 2008).

4. The significance of internal prompts is innate (intuitive) knowledge but forgotten during childhood development (Avalos & Tylka, 2006; Ciampolini, 2006; Satter, 1986).

It can be seen from these approaches that the question is typically framed in a two-factor theory context. It is accepted by the above authors that internal prompts such as hunger and satiety (a subset of interoceptive stimuli) are “physiological” or homeostatic, that is such prompts are influenced by the intake of food and hence yield regulated eating, and the focus has been to understand why the homeostatic food regulatory system has failed. Although the exact mechanism by which it occurs is debated, it has been demonstrated that aberrant awareness of interoceptive stimuli features in the personalities of those suffering from both extremes of eating disorder – anorexia and obesity – (Garner, Garfinkel, & Moldofsky, 1978; Killen et al., 1996; Leon, Fulkerson, Perry, & Early-Zald, 1995; Lilenfeld, Wonderlich, Riso, Crosby, &

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36 Several disciplines have converged on this question. Stanley Schachter and Richard Nisbett were psychologists interested in obesity while Hilda Bruch was a psychiatrist investigating anorexia nervosa. Mario Ciampolini is a paediatrician, Leann Birch a specialist in human development and Christopher Harshaw is a developmental psychobiologist. It is of interest therefore to find that there is general agreement among representatives of such diverse disciplines that internal eating prompts should be regarded as homeostatic and that deviation from internal eating prompts leads to non-homeostatic eating.
Mitchell, 2006) as well as maladaptive eating patterns (LeBel, Lu, & Dub, 2008), thus rendering such people prone to external non homeostatic stimuli. Some non homeostatic stimuli are listed in the following chart:

<table>
<thead>
<tr>
<th>Category</th>
<th>Cause</th>
<th>Homoeostatic eating desire?</th>
<th>Notes &amp; examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The sight or smell of food</td>
<td>No</td>
<td>“I didn't realise I was hungry until I saw all that lovely food”</td>
</tr>
<tr>
<td>2</td>
<td>Social context, time of day or other extrinsic input</td>
<td>No</td>
<td>Extrinsic theory</td>
</tr>
<tr>
<td>3</td>
<td>Memory e.g. of palatability</td>
<td>No</td>
<td>“This is ice-cream; it must be good!” The first plateful tasted good, maybe the second will be better</td>
</tr>
<tr>
<td>4</td>
<td>Learning</td>
<td>No</td>
<td>“Finish what’s on your plate;” “Don’t waste - think of the starving children in Africa;” “Eat a big breakfast: it’s the most important meal of the day.”</td>
</tr>
<tr>
<td>5</td>
<td>Intellect</td>
<td>No</td>
<td>It’s five hours since I ate so I must need food.</td>
</tr>
<tr>
<td>6</td>
<td>Deep-seated emotion unrelated to food</td>
<td>No</td>
<td>“I’ll feel happier if I eat.”</td>
</tr>
<tr>
<td>7</td>
<td>Absence of emotion</td>
<td>No</td>
<td>Response to parental coercion</td>
</tr>
<tr>
<td>8</td>
<td>Other interoceptive sensations</td>
<td>No</td>
<td>“I feel something – I must be hungry”</td>
</tr>
</tbody>
</table>

**Chart 1 Non-homeostatic causes of wanting to eat**

Expanding upon chart 1, non-homeostatic desire to eat can arise as a result of:

1. External sensations related to food (visual, olfactory, auditory). “I want to eat that” (because it looks so delicious etc.).

2. Other external sensations. “I want to eat” because I see my family eating or because the clock says 12.30 p.m. These important eating prompts have been studied extensively by Schachter and others and will be described below.
3. Memories of food: “I want to eat” because the eating experience was pleasurable in the past. Memory about food includes cultural knowledge (what is good food and what is not) as well as previous likes and dislikes and emotional associations, both positive and negative. The memory of sweets for example might have a positive emotional charge if one had been offered sweets as a child as a means of reward. A negative emotional charge might accompany food that one was forced to eat such as spinach. Other memories may relate to previous hunger: “I want to eat,” because I remember that last time I missed breakfast I was hungry by 10am.

4. Learning. “Breakfast like a king” “Clean up your plate” are admonitions imbibed early in life that can stimulate the desire to eat.

5. Intellectual considerations. “I want to eat” because it is 4 hours since breakfast. I want to eat because if I don’t eat now the cafeteria will close and I might get hungry later. “I want to eat” because I need to stoke up for the day. In this case, no hedonic motivation is experienced. The impulse is intellectual, as a prediction of greater happiness (I will be happier if…). Conversely the intellect can promote the idea that “I don’t want to eat now” perhaps because eating will spoil my appetite later or because I am fasting.

6. Emotions. Anxiety, fear, sadness or “soul-emptiness.” “I feel a lack of some kind and I want to eat in an attempt to meet that lack.” This important motivation to eat is further examined in section 10.2.4. It may not necessarily spring from the perception of a sensation in the present. It may arise from a deeper-seated emotion triggered by sensations stored in memory, such stored sensations being conscious or subconscious. It is therefore not necessarily related to food or any particular environmental occurrence in the present. In
Vedic psychology these deeper emotions mediate between ego and intellect. They may therefore relate closely to the sense of self or self-esteem.

7. Absence of perceived emotion. In some subjects eating becomes a passive exercise. In cases of ahedonia, for example during clinical depression, in which affect is flat, patients may will themselves to eat in the absence of any hedonic emotion – “I should eat.”

8. Symptoms of intestinal dysfunction (e.g. burning pain) are frequently misread as hunger.

The four approaches to answering why people eat in response to stimuli that are not influenced by eating will now be briefly reviewed.

7.1 External stimuli over-ride internal stimuli

7.1.1 Obesity

In the 1960s and early 1970s, Schachter and Nisbett led the development of the “internal-external” theory of obesity (Goldman, Jaffa, & Schachter, 1968; Nisbett, 1968a, 1968b; Nisbett, Hanson, Harris, & Stair, 1973; Schachter, 1968, 1971; Schachter, Goldman, & Gordon, 1968; Schachter & Gross, 1968) however they acknowledge and cite the previous work of Stunkard and Bruch. This theory holds that obese individuals, relative to those of normal weight, are over-responsive to external cues (and food cues in particular) and under-responsive to internal cues (including feelings of hunger and fullness). Thus obesity-prone individuals are likely to overeat and gain weight in food-replete environments. The theory remains
current, and was instrumental in the development of restraint theory (Herman & Polivy, 2008; Stroebe et al., 2008, p. 176).

Both Schachter and Nisbett take a type-B materialist approach to internal prompts by referring to physiological control mechanisms that might be expected to lead to subjective sensations. Thus Schachter speaks of “physiological symptoms” and states:

Current conceptions of hunger control mechanisms indicate that food deprivation leads to various peripheral physiological changes such as modification of blood constituents, increase in gastric motility, changes in body temperature, and the like …(Schachter, 1968, p. 751)

Nisbett explicitly defines internal factors as identical to physiological states:

Internal factors are defined as those visceral, physiological states varying with food deprivation such as gastric motility, blood sugar concentration, and tissue needs of various sorts (Nisbett, 1968b, p. 107).

Schachter identifies a loss of afferent information among some people:

…however, one may ask, when this biological machinery is activated, do we necessarily describe ourselves as hungry, and eat? For most of us raised on the notion that hunger is the most primitive of motives, wired into the animal and unmistakable in its cues, the question may seem far-fetched, but there is increasing reason to suspect that there are major individual differences in the extent to which these physiological changes are associated with the desire to eat (Schachter, 1968: 751).
By external factors Nisbett means:

…those which, while affecting food intake, are unrelated to nutrition. These include cognitive and sensory cues such as taste properties of food, social stimuli, and habit (Nisbett, 1968b).

In a series of classic studies Schachter and Nisbett demonstrated that obese people are more responsive to external cues and less responsive to internal cues than the non-obese. Some of the external cues studied will be considered in the following paragraphs:

Taste

Nisbett (1968b) gave normal, overweight and underweight subjects "good" (vanilla) and "bad" (vanilla adulterated with quinine) ice-cream and observed them for quantities eaten. Subjects were in either a low or a high food-deprived state. It was expected that underweight subjects when food deprived, would feel hungry and show low responsiveness to taste (i.e. eat whatever was available). Overweight subjects were expected to feel less hunger on food deprivation and be fussier about the taste of their ice-cream. The responses of normal subjects were expected to fall somewhere between these two groups. These expectations were mainly supported except that no deprivation effect was found among normal subjects. This result is perhaps unsurprising since, as Nisbett himself comments, ice-cream, being rich (and cold) is a poor choice of food with which to “fill up” when one is hungry.
Time

By the use of doctored clocks, Schachter and Gross (1968), manipulated the external, food-relevant cue, "dinner time," so that some subjects when presented with crackers believed that it was later than their regular dinner time and others believed it was before dinner time. Obese subjects ate more when they thought that they were eating after their regular dinner hour than they did when they thought that they were eating before their dinner hour. Normal subjects did not show this effect, indicating that they ate according to cues that arose physiologically.

Having established in the laboratory that taste and the passage of time stimulate eating behaviour in obese subjects to a greater extent than in normal subjects, Schachter’s group (Goldman et al., 1968) carried out three ingenious experiments in the field. They reasoned that obese people would be more likely to tolerate fasting (because they would feel less hunger), less likely to tolerate mediocre food (because external stimuli are more salient to them), and more likely to adjust to time zone changes (because they are less guided by an internal “clock”) than are non-obese people.

Gaining the cooperation of a Jewish community, a dormitory cafeteria, and Air France they concluded that the obese:

… prove to be more likely to fast on Yom Kippur, fat students to be more intolerant of dormitory food, and fat fliers to more easily adjust to time-zone changes than do their normal counter-parts. (p117)
Fear

Schachter et al. (1968) developed a hypothesis first suggested by Bruch that people with eating disorders have never learnt properly to associate their symptoms of hunger with the need for food. They reasoned that if the state of fear leads to the suppression of gastric movement and the loss of the sensation of hunger in non-obese people, then obese people, being out of touch with their sensation of hunger, should be unaffected in their eating habits by fear. In their words:

They should eat just as much when their stomachs are full as when they are empty and just as much when they are frightened as when they are calm. Normal subjects, on the other hand, should… eat less with full stomachs than with empty ones and should eat more when they are calm than when frightened (p. 92).

These workers were able to produce findings which support this hypothesis by promising obese and non-obese subjects an electric shock using an “8-foot high, jet-black console loaded with electrical junk” as part of a bogus experiment, then covertly observing their subsequent eating, while they waited for the experiment to begin.

Passivity

In a study on obese children undergoing starvation treatment Nathan and Pisula (1970) found that obese children had great difficulty identifying and expressing their own feelings. Furthermore when asked to draw a human figure their concept of the human body appeared to be primitive and lacking in detail.
The global and unarticulated figure drawings of these obese children appear to be at least partially the result of a lifestyle of extreme passivity and lowered motility which deprives them of the kinesthetic sensations necessary for a well-articulated body image (p.736). The tendency of obese subjects to eat in response to external signals rather than internal physiological cues seems to be one aspect of the passive orientation (p. 735).

Thus Nathan and Pisula suggest that the obese may never have learned the “body awareness” necessary to be aware of homeostatic internal eating prompts.

Following these studies it became generally accepted that the obese do not read internal symptoms well and have only a vague idea of why they eat. The following comment from Schachter et al. echoes the author's experience (except that the author commonly notes such remarks among those of normal weight):

…interviews with the obese centered on the theme, "What do you feel when you say, 'I'm hungry?'" more often than not terminate with an exasperated "I don't know, I just feel like I want to eat." All of which has led to serious consideration of the possibility that internal state is irrelevant to eating by the obese, and that external, food-relevant cues trigger eating for such people (Schachter et al., 1968, p. 97).

Why is the internal state irrelevant to obese people? Are they obese because they do not read internal symptoms well, or is obesity the cause of their not doing so? In an earlier study Nisbett concluded the former (Nisbett, 1968b) but he later (1972) entertained the idea that the obese, in trying to maintain a set point in weight below what is normal for them, are in fact in a state of chronic hunger and therefore are overriding their perception of internal eating cues. He pointed to the fact that both
obese and hungry individuals are more taste responsive, more emotional, less active and have lower libido. Their behaviour pattern also resembles, according to Nisbett, that of a rat afflicted with a ventromedial hypothalamic lesion. The notion that obese people are actually hungry people does not appear to have flourished, but that attempting to maintain a low set point in weight could be detrimental took root. It can be seen as the impetus that led to restraint theory, the boundary model of eating and an explosion of interest in the negative effects of dieting.

Coddington and Bruch’s remarks (in respect to obese subjects) sum up the degree of inaccuracy some people display in accessing their internal states of hunger and satiety.

Considerable difficulty was encountered when subjects were asked whether they were “hungry” indicating how poorly defined this concept is, or how many people have difficulties with their internal perception. A few felt “hungry” at the start and not at the end ... A few subjects (all of them of abnormal weight) described a variety of sensations … but no awareness of hunger or satiation (Coddington & Bruch, 1970, p. 573).

These observations are entirely in accord with the author’s except, again, the author has found that they extend to include many so called “normal” eaters. This observation receives recent support from Herman and Polivy who state “people generally do not have a clear sense of how hungry or sated they are except at the

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37 Nisbett’s theory should not be discounted out of hand however since it represents a potentially important line of enquiry. The taxonomy of eating sensations and emotions might be helpful in elucidating it. While it is very unlikely that the obese are ‘hungry’ in the sense of experiencing the sensations of physical hunger, it is very likely that they are ‘hungry’ in the sense of having an unfulfilled desire to eat. That they would share this unfulfilled desire with food deprived people and show similar emotional and behavioural characteristics to them would be entirely consistent with the theory to be presented in part 2 of this thesis.
extremes of hunger and satiety” (Herman & Polivy, 2008, p. 727). Attention veered away from external cues as a factor in the control of human food intake during the 1980s but is again attracting attention (Herman & Polivy, 2008).

### 7.1.2 Restraint theory and the boundary model of eating

As noted in section 6.3.3, the notion of restraint has been prominent in dietary circles. The term dietary restraint refers to a “general tendency to restrict food intake, either to promote weight loss or to prevent weight gain” (Mitchell & Brunstrom, 2005). The concept of dietary restraint led to Restraint Theory (Heatherton, Herman, Polivy, King, & McGree, 1988; Herman & Mack, 1975; Herman & Polivy, 1975; Polivy, 1996; Polivy, Herman, & Warsh, 1978; Polivy, Herman, Younger, & Erskine, 1979; Vartanian, Herman, & Polivy, 2006). Restraint Theory postulates that following ingestion of food a personal diet boundary may be crossed, leaving the individual feeling that self-control is no longer worth pursuing and leading to increased eating. Restraint Theory derives directly from the “internal-external” theory of Schachter and Nisbett as the following passage indicates:

…eating, in the undisturbed organism, is triggered and terminated by interoceptively detected signals associated with the phenomenal states of hunger and satiety. But …there is an intermediate condition between hunger and satiety in which the organism is indifferent …Within this zone of indifference, eating may be under the primary control of social, environmental, and cognitive factors; these factors are naturally less effective in the control of eating when the organism is hungry or sated (in which case, physiological demands take precedence) (Polivy & Herman, 1987, p. 640).

This reasoning led to the Boundary Model of Eating which could be illustrated thus:
Within the boundaries identifying the zone of indifference the individual may be susceptible to external social, environmental, and cognitive factors. Polivy suggests that for dieters, deliberately interposed between the hunger and satiety boundaries, is a third boundary: the diet boundary. This represents the dieter’s attempt to restrain eating before reaching satiety. The chronic self-imposed effort required to attend to an arbitrary external diet boundary increases vulnerability to external factors with an associated loss of attention and sensitivity to internal factors.

Thus:

Diet boundary

HUNGER |____________ZONE OF INDIFFERENCE|__________| SATIETY

Herman and Polivy do not go so far as to suggest, as did Nisbett, that the diet boundary falls within the hunger zone. Polivy does suggest however that restrained eaters experience psychological “deprivation” effects similar to those of persons who do go hungry. That a subject should feel deprivation effects while in a zone of

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38 In this thesis it is suggested that during the intra-meal period, when one proceeds from hunger to satiety, if hunger is genuinely experienced premeal, then the zone of indifference disappears since the desire to eat is immediately replaced by its fulfillment. This is explained in greater detail in Chapter 9.
indifference seems contradictory, however this is probably a semantic difficulty. Perhaps “zone of vulnerability” might have been a more apt term. Certainly the imposition of the artificial diet boundary, in which the desire to eat is thwarted, does appear to have unfortunate consequences in the regulation of eating. For some, even the thought of going on a diet can precipitate overeating (Urbszat, Herman, & Polivy, 2002). Perception of food cues such as the sight or smell of a pizza, or others eating, tend to arouse heightened thoughts of eating pleasure. When the diet boundary is breached, a kind of bursting of the dam can occur, in which the dieter throws caution to the winds, a phenomenon sometimes called the “what the hell effect” that leads to weight regain (Papies, Stroebe, & Aarts, 2007). Restrained eaters avoid foods perceived to be fattening, eat small portions and stop eating before reaching satiety. Successful dieting thus typically involves ignoring or mistrusting one’s inner signals of hunger and satiety to which one becomes relatively insensitive, depending instead upon external references such as diet prescriptions for allowed and not allowed foods, calorie counting, weighed or measured portion sizes, and overall cognitive control. Dietary restraint has been associated with such negative consequences as low self-esteem, anxiety, depression, feelings of rebelliousness or defiance and a preoccupation with thoughts concerning food and weight (Kahan, Polivy, & Herman, 2003, p. 165; Ogden & Wardle, 1991; Omichinski & Harrison, 1995). Restrained eating may be encouraged by diet advertisements promoting unrealistic expectations about dieting (the false-hope syndrome) (Trottier, Polivy, & Herman, 2005) or by “consumption stereotypes” in which food intake is seen to pertain to social or gender appeal (Vartanian, Herman, & Polivy, 2007).39

39 More recently, with the development of the Three Factor Eating Questionnaire (TEFQ), the concepts underlying restraint theory have been clarified under the constructs of disinhibition and hunger (Bryant, King, & Blundell, 2008). Disinhibition maps partially to eating in response to external stimuli and has
While the external-internal theory, restraint theory and the boundary model of eating identify clearly the influence of external stimuli in eating and establish beyond any reasonable doubt the difficulties involved in restraining eating when influenced by those stimuli, this cluster of related theories less clearly identify solutions than problems. The answer to the question “If not restraint, then what?” is not answered.

### 7.2 Emotional factors obscure internal prompts

The widely held “psychosomatic hypothesis” pre-dated Schachter and Nisbett’s work and proposed that eating by obese individuals can be an attempt to cope with anxiety or other emotional disturbance (Abramson & Wunderlich, 1972; Ganley, 1989; Kaplan, Kaplan, & Leder, 1957; Slochower, 1976) and that anxiety is also a factor in anorexic subjects (Heilbrun & Worobow, 1990). Also claiming support from Bruch, Sclochower sees overeating as an anxiety-reducing mechanism that stems from early emotional experiences. She found that anxious obese subjects ate more when they could not identify the cause of their anxiety (provoked by being led to believe they were hearing their own heartbeat) than when a cause (or at least a label) was known. Normal weight subjects ate more when hungry than when full and were relatively unaffected by anxiety.

Thus Schachter found that eating among obese people was unaffected by fear, while Sclochower found that the obese eat more when anxious, a result taken by Sclochower been called ‘opportunistic eating.’ It also occurs in response to internal cues such as negative affect which may predict poorer long-term weight loss (Niemeier, Phelan, Fava, & Wing, 2007). Examples of disinhibition include eating in response to others eating, food palatability, emotional upset and not being able to resist stimuli to eat. Disinhibition occurs in the absence of hunger signals. The hunger factor in the TEFQ refers to the extent to which hunger is perceived and acted upon.
to support a dichotomy between the psychosomatic position and the internal-external position. Van Strien (2000) attempted to resolve the perceived conflict between the psychosomatic position and externality theory by using well-validated eating instruments such as the Dutch Eating Behavior Questionnaire (DEBQ). The DEBQ contains scales for emotional and external eating behaviour corresponding to the two theories. In a study on ice cream eating by non eating-disordered women ice-cream consumption was best predicted by eating for emotional reasons, supporting the psychosomatic position. However, a statistically significant association with external cue based eating was also found, leading van Strien to admit the necessity for “broader theories” that incorporate elements of both externality and psychosomatic theory, for example, the theory proposed by Heatherton and Baumeister (1991) which sees binge eating as an escape from self-awareness (self-consciousness). It appears therefore that both external stimuli and emotional signals may act to over-ride homeostatic internal eating cues.

Latter-day adherents to the psychosomatic position have focused on the effects upon overeating of stress and negative emotions such as rejection (Ganley, 1989; Macht & Simons, 2000; Spence, Gordon, & Rabkin, 1966) and how different emotions contribute to changes in eating patterns (Macht, 1999). In a one year self report study of individuals at risk of a cardiovascular event, low baseline and decreased psychosocial distress have been associated with healthy eating behaviour (low fat diet) (Danhauer, Oliveira, Myll, Berra, & Haskell, 2004). Depression has been associated with weight regain (McGuire, Wing, Klem, Lang, & Hill, 1999).
In summary, many stimuli, both internal and external can over-ride or obscure the internal eating prompts, thus rendering eating non-homeostatic.

**7.3 The significance of internal prompts is not innate knowledge and must be learnt**

Ms L.H., a woman with bulimia in remission (30/10/07):

I used to feel hunger all the time, deeply empty. Even when I ate I never filled up. If I ate a lot I just vomited it straight up. I didn't associate the empty feeling with hunger. It was just how I felt. I took it as a normal feeling.

It has been generally assumed that the significance of thirst, hunger and satiety, being vital to survival, is innately known and genetically inherited. However this assumption is not evidently valid for all species. The dove must learn to drink (W. Craig, 1912). In a comprehensive and thoughtful review Christopher Harshaw states:

Converging data and theory from both comparative and human domains …supports the conclusion that the phenomena of hunger, thirst and satiety are not innate but rather emerge probabilistically as a function of experience during individual development (Harshaw, 2008, p. 541).

Harshaw does not question the innate nature of the interoceptive sensation of hunger, (Harshaw C, personal communication 26\(^{th}\) April 2007) but he does suggest that the maturing child must learn to interpret such sensations. Harshaw's thesis, in essence, is that in the absence of appropriate feedback from caregivers, the developing child cannot know the significance of hunger, thirst and satiety. For Harshaw the quality of such feedback determines:
1. Sensitivity to and/or accuracy for recognition of internal feelings and states (i.e., interoceptive awareness)

2. The ability to correctly interpret and/or reason about internal feelings and states (i.e., interoceptive competence)

3. The ability to describe and/or communicate internal feelings and states (i.e., expressive competence).


Bruch was the first to argue this position (Bruch, 1961, 1969b, 1970a, 1973).\textsuperscript{40} She stated that

…hunger awareness, and that of other biological needs, is not innate biological knowledge but that learning is necessary for them to become organized into recognizable patterns …discriminating awareness of hunger itself is not present at birth and develops, accurately or distortedly, through reciprocal transactional feedback patterns of experience (Bruch, 1969a, p. 93 & 97).

Bruch suggested that some children learn to pair too broad a range of interoceptive sensations with hunger and the need for food, thus leading to obesity, while future anorexic subjects learn to eat irrespective of interoceptive signals. A number of subsequent studies support Bruch’s suggestion (Fassino, Piero, Gramaglia, & Abbate-Daga, 2004; Silverstone & Russell, 1967). A child’s ability to report physiology-generated desires (for example the link between not eating for a long time and a desire

\textsuperscript{40} Echoing Bruch, Schachter, Goldman, and Gordon in 1968 stated that:

…attaching a particular label to any particular internal or visceral syndrome is a learned, cognitively and socially determined act …Whether or not the label ‘hunger’ is applied to the feelings associated with this physiological symptom has …little to do with the symptom itself, but is a good part determined by the individual’s developmental feeding history. If feeding is usually coincidental with these symptoms one can reasonably anticipate that the label ‘hunger’ will be applied to this set of feelings and that the individual will behave in a manner appropriate to this coincidence of label and symptoms. If feeding is chronically inappropriate to physiological conditions, there is probably little reason to anticipate that the label ‘hunger’ will be applied … (Schachter et al., 1968, p. 91).
for food) is thought to appear in 3 to 5 year olds and appears later than desires affecting attitudes (for example, the desire to avoid a dog that has previously bitten) (Moses, Coon, & Wusinich, 2000). Whether they can report them or not and whether they understand their significance or not, infants do manifest characteristic signals indicating their internal sensations, but they may be reliant on caregivers for the appropriate feedback necessary for learning their significance. Caregivers may commonly miss or misinterpret these cues (Wright, 1986).

7.3.1 Anorexia nervosa

Studies that followed Bruch’s suggestion present a mixed picture in anorexia nervosa. Garfinkel (1974) found that patients with anorexia may have disturbed perception of satiety but not hunger. B.J. Rolls et al. (1992) found that they report low hunger before eating and this report changes little with eating compared to controls. These authors comment that “it is not clear whether the anorexics deny hunger or are unable to experience hunger.” Silverstone and Russell (1967) found that gastric contractions in anorexic patients were not markedly different from normal subjects but that while some subjects were able to sense the contractions they did not interpret them as hunger. More recently, Fassino et al. have demonstrated altered interoceptive awareness in anorexic patients indicating difficulties in discriminating hunger and satiety (Fassino et al., 2004). As mentioned in section 5.2.1, in an earlier study on a limited number of participants Owen et al (1985) reported that two anorexic patients showed “starvation hunger” that emerged in the experimental situation. They were able to report this hunger and perceived satiety very clearly (see figure 19) yet after receiving treatment and gaining weight (the details of the treatment were not specified) their internal perception of hunger and satiety became confused (figure 20).
Whatever the treatment consisted of it did not appear to foster perception of the significance of internal stimuli. It is likely to have involved the opposite – encouragement to eat according to external prompts such as mealtimes or in accordance with weight or body shape.

Figure 19 Anorexic patient pre-treatment

Hunger and fullness move reciprocally. The same pattern was seen in control subjects.
Figure 20  The same anorexic patient after “treatment”

Considerable uncertainty as to hunger and fullness appears.

Figure 21  A bulimic patient

The patient perceived hunger after food intake, but described it as “brain hunger” as opposed to “stomach hunger” (figs 19, 20 & 21 from Owen et al., 1985 reprinted with permission).
Thus after treatment, ratings of hunger and satiety after a meal were erratic. A bulimic patient (see figure 21) rated hunger as high at the end of the meal commenting that

…while she felt full and did not feel “stomach hunger” after the meal, she did experience what she termed “brain hunger” (Owen et al., 1985, p. 284).

Such distinctions have been frequently encountered by the author among his patients (instead of brain hunger patients may speak of “mouth hunger” or “head hunger” or admit that really their hunger is “all in the mind”). This distinction will be developed in Part 2 of this thesis. Overall, since B. I. Rolls et al relied on reported hunger it appears likely that anorexic subjects do experience physical hunger but deny it, suppress it or do not interpret the sensation correctly (see also Ms L.H., section 7.3 above).

7.3.2 Eating in the absence of hunger

“Eating in the absence of hunger” (disinhibited eating) is a phrase generally associated with attempts to establish a link between restrictive or coercive child-feeding practices or other influences suspected to promote the non-learning of internal prompts among children (Birch et al., 2003; Carper, Fisher, & Birch, 2000; Costanzo & Woody, 1984; Cutting, Fisher, Grimm-Thomas, & Birch, 1999; Faith et al., 2006; Fisher & Birch, 1999; S. L. Johnson, 2000; S. L. Johnson & Birch, 1994; M. D. Marcus & Kalarchian, 2003). Some posit that some parents having never learnt the significance of hunger themselves are incapable of passing on such knowledge to their children (Cutting et al., 1999; Francis & Birch, 2005).
In one study, Fisher and Birch (2002) gave young girls aged 5 a substantial meal (to ensure hunger was absent), then left them in a room containing toys and snack foods. The children were instructed that they could play with the toys or eat any of the foods while the experimenter did some work in the next room. Estimations were made of weight, eating (in the absence of hunger), and parents’ reports of food restriction in the home. The girls who ate in the absence of hunger at age 5 years were 4.1 times as likely to eat in the absence of hunger at age 7 years. For each unit increase in the parents’ reports of restriction in child feeding at age 5 years, the girls were 2.1 times as likely to eat in the absence of hunger at age 7 years. Rather than restricting foods, Fisher and Birch conclude:

Children should be encouraged to focus on their own hunger and fullness as a guide to when eating begins and ends (Fisher & Birch, 2002, p. 230).

Recently Tonofsky-Kraff et al. have developed a questionnaire to assess eating in the absence of hunger in children and adolescents (Tanofsky-Kraff et al., 2008). These investigators can be seen to be continuing the work of Bruch. While, as in restraint theory, more attention seems to have been paid to quantifying the problem of eating in the absence of hunger than to correcting the problem, the work of Johnson (2000) in teaching children to self-regulate by attending to hunger and satiety is an encouraging advance.
7.4 The significance of internal prompts is innate knowledge but is forgotten during childhood

That the significance of internal cues needs learning and that hunger is an undifferentiated feeling having no inherent “food-needing label” seem compelling, however there may be an alternative explanation of the observed behaviour. Infants clearly express their hunger state. In the “feeding relationship” (Satter, 1986) caregivers can differentiate infant hunger cues from more general states of distress, suggesting that infants know that at least they are feeling something very different from other forms of distress. By contrast even “normal” adults (those without eating disorders) frequently have difficulty reporting whether they are hungry or not. Is this because, as Harshaw, following Bruch, would suggest, they have never learnt properly what the hunger sensation stands for? Or in some visceral sense do infants know about the significance of hunger, but forget it or re-learn its significance incorrectly, given an inappropriate caregiver response? Perhaps inadequate caregiver feedback “over-writes” innately known homeostatic eating. In 1985, Weingarten wrote:

...newborns may be the only true depletion-driven eaters. This view is consistent with the intuitions of many parents who perceive that their newborns are truly “hungry” at feeding times and who identify a distinct hunger cry. After the neonatal period, with increased experience with food, feeding, and rituals associated with eating, an incentive-based hunger system becomes established which, for the remainder of lifespan, interacts with depletion signals to control both hunger and eating. (Weingarten, 1985, p. 397).
Davis in the 1920s demonstrated that children when allowed to choose food freely ate in a manner appropriate to their needs. Davis studied three infants of weaning age in a self-selected diet experiment, two for periods of six months each and one for a period of a year.

They were able from the first to select their own foods from a list of simple natural ones and in quantities sufficient to maintain themselves with apparently optimal digestive and good (as far as immediate results could be judged) nutritional results (Davis, 1928, p. 679).

The children adjusted their diet in a way that overall met their caloric needs – a manner of eating that could be seen as homeostatic:

They were omnivorous and in eating were governed not only by their caloric needs, but showed definite preferences, which however, changed from time to time, and were unpredictable (Ibid p. 679).

Outside an expanded homeostatic framework, Davis’ findings seem paradoxical since the children ate irregularly. Davis states that tastes changed unpredictably:

…refusing as we say "to stay put," while meals were often combinations of foods that were strange indeed to us, and would have been a dietician's nightmare (Davis, 1939, p. 260).

That the children nevertheless showed normal healthy development led Davis to suggest
…the existence of some innate, automatic mechanism for its accomplishment… They achieved the goal, but by widely various means, as Heaven may presumably be reached by different roads (Ibid p. 260).

This observation would be inexplicable from the set-point theory of homoeostasis point of view, and supports the idea that children may innately know to eat within the compass of a broader notion of homeostasis. These early findings of Davis are supported by Birch et al. who similarly found that although children’s food consumption is variable from meal to meal, daily energy intake is relatively constant (Birch, Johnson, Andresen, Peters, & Schulte, 1991).

In rebuttal of Bruch’s theory that if hunger is not learnt in infancy it will not be found in later life Ceaser describes an anorexic patient whose hunger returned after she left her parents’ home, which she found oppressive. Ceasr suggests that:

…hunger awareness can be restored …through therapy or changes in life circumstances by a lessening of the defective sense of self and of primitive drive states (Ceaser, 1979, p. 980).

Mario Ciampolini has reported that infants request food when blood glucose is at the low concentration that in trained adults correlates with hunger, but that untrained adults no longer recognise low blood glucose (Ciampolini, 2006). Ciampolini at first

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41 Or, as Harshaw points out it could be that they have everything they need to rapidly learn efficient energy regulation (Harshaw C, Personal Communication, 22nd April 2009).

42 Ceaser states:
…four months into therapy, the patient left her parents’ home for a 3-day trip with her lover. She later recalled that “For the first time in years I wasn't preoccupied with food and I actually felt hungry?” She described her hunger as a desire to eat and to respond to an empty “growling” feeling in her stomach. Upon returning home the patient immediately “felt drawn into that bubble again,” and her pleasant experience of hunger disappeared. After her parents had gone to bed she resumed gorging and then vomited. The experience of hunger did not return while Ms. A stayed with her parents (Ceaser, 1979, p. 979).
trained caregivers to recognise those particular food requests that correlate with low blood glycaemic concentration. Caregivers were trained to interpret toddlers’ food requests by pairing measurements of blood glucose concentrations with the child’s spontaneous food requests, thus forming a stable association between the nature of the food request and blood glucose concentration. Requests for food and measurements higher than 4.5 mmol/L (85 mg/dL) were regarded as conditioned requests, the nature of such requests was noted, and food was not given. Characteristic signals taken to indicate hunger included crying (in the first months of life), mood changes such as loss of enthusiasm for playing, gestural or verbal requests, or searching for food without any external stimulus. Caregivers developed two strategies:

(1) Evaluation of metabolic feelings (manifestations); (2) planning the next emergence of metabolic hunger to maintain previous habits ...The planning was carried out by matching energy dense food in the meal to the needs of the planned time interval (Ciampolini et al., 2000: 289).^43^ 

Thus caregivers were trained to adjust the meal size and content so that children were likely to request food at around the next meal time. Food intake was substantially reduced in these children indicating that the signals that infants gave in the low glucose state were appropriate cues for feeding and that the administration of food in the absence of such prompts had been resulting in overfeeding. This finding suggests that the infants “knew” when feeding was homeostatically appropriate.

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^43^ Elsewhere Ciampolini offers more detail on this planning:

The offering of energy dense items was omitted later in the meal as soon as satiation could be presumed. The caregivers learned to observe three daily aspects of the subjects’ behaviour in order to reach this decision: 1) normality of inter-meal activity; 2) intensity of preprandial food request manifestations; 3) velocity of consumption of abundant fruit [or vegetables] at meal onset. (Ciampolini, Bini, Giommi, Vicarelli, & Giannellini, 1994, p. 18).
In a further study on 24 toddlers, Ciampolini abandoned glucose measurements and simply asked mothers to delay food administration until the infant requested it. Daily energy intake decreased, while energy expenditure fell approximately 16% indicating homoeostatic eating pertained in toddlers. He did not find this result with adults. The title of Ciampolini’s abstract is: “Infants do request food at the hunger blood glucose level, but adults don’t any more” which implies that infants have an innate ability to recognise hunger, while adults have lost that ability. The “trust model” of child management is another formulation of this view (Satter, 1996) as is intuitive eating. Intuitive eating will be examined in the next section.

### 7.4.1 Intuitive eating

“Intuitive eating,” (see also section 11.3) is a concept firmly rooted in the tradition that the significance of hunger is innately known, but forgotten. Intuitive eating posits that adults can regain their innate knowledge. Tylka and Wilcox list three components of intuitive eating:

(a) unconditional permission to eat when hungry and what food is desired, (b) eating for physical rather than emotional reasons, and (c) reliance on internal hunger and satiety cues to determine when and how much to eat (Tylka & Wilcox, 2006, p. 474).

Intuitive eating is considered to be “stifled” by external factors:

Intuitive eating is believed to be an inborn characteristic that is disrupted by the environment. Young children exhibit intuitive eating but may change to dieting behavior as a result of parental concern and restriction of food intake …(Ibid p.483)
Tylka makes the important point that most study in the regulation of eating has focused on disorders of eating such as anorexia nervosa and obesity. The disease model of medicine has been to the fore, and the general aim has been to eliminate eating disorder symptoms.

As a result, the study of eating behaviours is disjointed, and much remains unknown about positive eating behaviours (Tylka, 2006, p. 226).

By contrast, proponents of intuitive eating emphasise “adaptive eating.” Adaptive eating maps to homeostatic eating and helps to define psychological well-being – “the affirmative presence of strengths.”

...as clients in treatment learn about their [eating disorder], they may benefit from learning not only how abstaining from disordered eating behaviors improves their health and well-being but also how adopting certain intuitive eating behaviors (i.e., eating for physical rather than emotional reasons, reliance on internal hunger/satiety cues) could further contribute to their ability to flourish and thrive (Ibid p. 483).

The intuitive eating movement has stimulated “undieting” (“non-dieting”), an approach that posits that health and well-being can be achieved without weight loss (size acceptance, “Health at Every Size”) in the overweight and as a step towards learning to trust inner signals of hunger and satiety (Goodrick, Poston, Kimball, Reeves, & Foreyt, 1998; Hawley et al., 2008; Katzer et al., 2008; Omichinski & Harrison, 1995; Polivy, Coleman, & Herman, 2005; Polivy & Herman, 1992; Rapoport, Clark, & Wardle, 2000). This approach has met some resistance as described by (Satter, 1996). Lowe and Levine (2005) question the movement mainly
on the grounds that, in their view, there remains no feasible alternative to dieting if weight is to be lost. Lowe (2003, p. 45S) cites trends in the 1970s and 1980s that fuelled concerns about dieting, leading to what he calls a ‘full-fledged “anti-dieting” movement.’ Dieting became fashionable (moving Polivy and Herman to state that “normal” eating in the United States had become restrained eating (Polivy & Herman, 1987)). Bulimia nervosa was identified increasing concerns about dieting. “Yo-yo dieting” was also recognised – most overweight individuals who lose weight through restraint fail to maintain the loss. Coupled with these trends, achieving an unrealistically thin body became a feminist issue. Certainly emphasis moved from helping people regulate their eating to helping them unlearn what they had understood about dieting. What they had not to do was clear: diet. What they needed to do instead was left unclear. Lowe, like Mattes and others, takes the view that if there is little an obese person can do to regulate food intake then stopping dieting is not necessarily progressive. As seen in section 7.1.2 it is generally accepted that restraint-type dieting does not work. However an alternative is suggested in part 2 of this thesis.

7.5 Conclusion to Chapter 7

Chapter 5 examined the idea that food intake is regulated. It was decided that it can be, at least partially, and that the possibility of optimisation of the regulatory system remains open. Chapter 6 expanded the idea of homeostasis to include subjective elements including desire. A very simple model of the regulation of homeostatic eating desire by its fulfillment through eating was proposed and difficulties associated with the suppression of desire were identified. Chapter 7 examined work so far in explaining why many people with eating disorders eat in response to stimuli that are
not influenced by food intake. Four schools of thought were described. As a common thread they all identify internal eating cues as homeostatic, but posit that such cues are variously over-ridden, stifled, never learnt, forgotten, or otherwise not taken cognisance of, leading to non-homeostatic eating. Whichever is the case, it seems the solution might well lie in relearning, unburdening, remembering, recognising, or in some way gaining greater clarity about the internal eating cues. Of the approaches considered the most promising are those of Ciampolini and the “intuitive eating” group since they not only identify the problem, but suggest methods to overcome it. The methods suggested in this thesis based on Maharishi Ayurveda have much in common with these two approaches except that greater clarity is offered about internal eating signals and a deeper understanding of the role of pleasure in eating regulation. These innovations will be discussed in part 2 of the thesis.
PART 2

The Theory: Externally oriented attention and recoded perception mean that eating is not fully pleasurable for some people. Hence some people eat non-homeostatically.
Chapter 8  What is hunger?

Introduction

So far the simple regulatory system proposed in Chapter 6 involves only fulfillment and desire. A dynamic interplay exists between desire and its fulfillment and the physical state of the metabolism. MVS does not hold that the physiology underlies desire as a kind of substrate. Both emotions and physiology are seen as states of intelligence or information. In section 4.4, it was suggested that hunger is information signaling to the self the body’s preparedness to take on more food. Hunger, as information, has meaning. Desire could be seen as a channel for communication of that information into action. The whole process is one of information flow as indicated in the following diagram:
Hunger gives rise to desire leading to food consumption and satiety is associated with fulfillment of the desire. Ideally, satiety eliminates hunger and fulfillment eliminates desire (as indicated by the blue dotted arrows). After some hours, hunger returns and the cycle repeats.

Regulated eating must fulfil the following conditions:

1. The sensations of hunger and satiety need to occur.
2. The mind needs to be able to “read” the state of the body to know when hunger and satiety have occurred (interoceptive awareness).
3. The mind needs to know the significance and what to do about hunger and satiety (interoceptive competence).
4. Fulfillment must be sufficient to extinguish desire.
Each of the four groups of investigators reviewed in Chapter 7 has recognised that eating disordered subjects have difficulties with interoceptive awareness and competence and as a result fall prey to other eating stimuli. If interoceptive awareness and competence are to be improved it seems desirable to help people recognise key eating sensations. It also seems necessary to help people recognise what those sensations mean – to, as it were, pick up where their early care-givers left off. Intuitive eating proponents talk of “physical hunger”, however just “what it is like” to experience hunger and satiety does not appear to have been addressed in any detail. In section 4.4 it was suggested that investigating hunger could be a much more direct, less complicated and less expensive route to understanding the regulation of food intake. That route forms the main focus of Chapter 8. Chapters 9 and 10 return to the cycle of desire and fulfillment armed with that knowledge. Chapter 11 examines evidence in support of the theory so far, and Chapter 12 paves the way for the suggested clinical method to be presented in Chapter 14.

**Hunger vs satiety**

It has seemed logical until now to place prime importance on satiety as a regulatory signal. The mechanisms of satiety, the contributions of oral and gastric sensations, and the satiating effects of various foods have thus been extensively studied (see for example, Albro Houpt, 1982; Hill, 1999; Jordan, 1969). In restraint-type dietary systems patients are advised “not to overeat”. In this thesis it is suggested that, without belittling the importance of satiety, it is at least as important to take

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The author has found that in response to the injunction “don’t overeat” patients commonly report feelings of rebelliousness, loss of autonomy and restriction of pleasure. The instruction: “Eat as much as you are comfortable with as long as you are hungry for each meal” imposes fewer boundaries and does not generate such reports. Satiety as a “comfortable satisfied sensation” is however a useful guide in the termination of a meal and is mentioned in this chapter.
cognisance of pre-meal prompts, because they may be a more reliable guide to homeostatic eating and be more easily complied with.\textsuperscript{45} Thus Chapters 8 to 11 are concerned mainly with the pre-meal state.

### 8.1 “Hunger” has been a conflation of sensation and desire

#### 8.1.1 Sensation and desire in the Vedic context

The desire to eat may arise for many reasons apart from the sensation of hunger, yet typically, patients and professionals alike confuse the desire with the sensation, both being meanings of the word hunger in common parlance. Thus: “eat when you are hungry” is frequently misinterpreted as “eat when you want to”. When asked to describe their hunger, patients will often say “well, I know I want to eat something” which is the expression of a desire as distinct from a sensation. Desires are taken here to be a subset of emotions (see section 4.2.4) and, in the Vedic model of the mind, emotions and sensations are distinct. Referring again to figure 11 in section 4.2.4, it can be seen that desire mediates between mind and senses.\textsuperscript{46} Mind, desire and sensation are distinct and play separate and important roles.

Cannon and his contemporaries Anton Carlson (1875-1956) and Edwin Boring (1886-1968) were very clear that the desire to eat (appetite) was an emotion whose origin Cannon believed was located in the central nervous system. These workers were

\textsuperscript{45} Satiety may not reliably predict energy balance. De Castro has found that weight and volume of food as opposed to energy content controls short-term food intake implying that satiety is a function of stomach filling independent of energy consumed (de Castro, 2005) (although hormones such as insulin, leptin and other peptides are also involved (Erlanson-Albertsson, 2005)). Chapter 11 describes new evidence that hunger pre-meal reliably predicts energy balance (Ciampolini et al., 2008).

\textsuperscript{46} Mind has a Rishi (knowing) function. Desire motivates the mind and can be thus seen to take a Devata role to the object of knowledge, in this case sensation, which takes a Kapha role.
equally certain that the sensation of hunger is of peripheral origin and related to the stomach. The desire to eat and hunger as sensation, have not always been as clearly differentiated as this in the Western literature. In fact a strong train of thought would prefer to regard all emotions and sensation as belonging to the same category of phenomena. This conflation of hunger the sensation and hunger the emotion has, in the author’s view contributed to the manifest confusion in terminology that has bedeviled the field of eating regulation and been the source of unnecessary debate over several decades. The view which holds that emotion and sensation are one and the same has a long history and is currently enjoying a revival. It will therefore be necessary to address it.

8.1.2 Emotions and sensations in historical context

In 1884 and 1885 respectively, both William James and Carl Lange independently put forward theories that were later linked as the James-Lange theory of emotion. These were entirely peripheral theories of emotion in which emotion and physical sensation are joined. According to these theories, what we call emotion is nothing other than sensation from, in Lange’s view, the circulatory system and, in James’s view, all viscera, arriving via nervous channels to the brain. Without such nervous input the experience of emotion would not be possible. Thus, according to James:

“Our feelings of the… changes as they occur IS the emotion (James, 1884, p. 190).

For James, we do not cry because we grieve, we grieve because we cry, or to represent him still more accurately, grief IS crying. James argued that if we try to
imagine an emotion and then separate from it the bodily symptoms that characterise that emotion:

…we find we have nothing left behind, no “mind-stuff” out of which the emotion can be constituted, and that a cold and neutral state of intellectual perception is all that remains (Ibid. p.193)

A conceptual paradigm is a powerful force in guiding the currents of thought that derive from it. On the consciousness-based Vedic paradigm emotions and sensations are distinct. It is instructive to consider upon what paradigm James based his thought. From his side James espouses no particular philosophy at all, “in my mind the theory has no philosophic implications whatever of a general sort” (Ibid. p.522) but this seems unlikely since no theory can exist in isolation of its parent paradigm.

In 1884 James subscribed to pragmatic parallelism. As mentioned this can be seen as an early version of Type-B materialism, which allowed mental phenomena, but assumed that they would eventually be explained in terms of physical phenomena. This James displays in his concern to find a “brain-seat” of the emotions. It suited James to push the emotions into the realm of sensation which could be strongly associated with the physical apparatus of the peripheral nervous system. James wished to save a hypothesis that was at that time in vogue which was that the cortex was the surface of ‘projection’ for sensory and motor function. If it could be shown that the

…emotional brain processes not only resemble the ordinary sensory brain processes but in very truth are nothing but such processes variously combined (Ibid. p 188)
then the ‘projection’ theory could be upheld and no further role be required for the cortex or any other part of the brain in generating emotion. It was, therefore, by his own admission, partly a desire to preserve the prevailing hypothesis that led James to propose his theory.

It is an easy slide from parallelism into materialism, particularly when one has the chance to reduce the contents of human consciousness, and indeed consciousness itself, to nervous impulses travelling to and within the brain. James was certainly charged with this by his contemporaries.

This view of emotion is seen to form part of a system of purely physical determinism, in which the unity of self and organism are alike set at naught … The whole difficulty arises … from the delusion that it is treating Psychology ‘as a natural science’, to deny it the assumptions its subject-matter demands, and to found it on those of Physics (Irons, 1894, p. 92).

In a somewhat airy dismissal of Irons’ charge, James reveals himself to be of the same school as the Scottish philosopher David Hume (1711-1776), who famously found no evidence for the self or personal identity on introspection stating that he was aware only of a series of perceptions (Hume, 1888, p. 252). James wrote:

Now whenever I myself have sought to discover the mind-stuff …it has always seemed to me to be additional sensations often hard to describe, but usually easy to identify and localised in divers portions of my organism … Such organic sensations being also presumably due to incoming currents, the result is that the whole of my consciousness …seems to me to be outwardly mediated by these (James, 1894, p. 523).
Consciousness, sensations and the emotions are fitted somehow into the materialistic side of the mind-body divide. Despite criticism, the arguments put forward by James and Lange were widely accepted during their time. Walter Cannon in the 1920s quotes Dunlap describing their theory as “strongly entrenched in scientific thought” and Perry as stating “This famous doctrine is so strongly fortified by proof and so repeatedly confirmed by experience that it cannot be denied substantial truth” (Cannon, 1927, p. 106). Nevertheless Cannon (1927, 1931) countered the James-Lange theory. He took issue with James not on the nature of consciousness, but on the origin of emotions within the nervous system. He argued that the seat of emotion is not in the peripheral autonomic nervous system or in the cortex, but in the thalamus. Bodily changes such as palpitations or sweating that might accompany emotion were on his view a response to emotion already felt. Thus whereas for James the butterflies we feel in our stomach are our nervousness – there is nothing else – for Cannon the butterflies result from our feeling nervous. The feeling of nervousness originates centrally in the thalamus whereas the sensation of butterflies is generated in the stomach. Feelings and sensations are distinct.

Cannon marshalled a number of arguments to support his case. For example, he pointed out that the autonomic nervous system has a limited number of all or none responses, whereas we have an infinite array of feelings. Cannon also observed that feelings can remain after an autonomic response has subsided and that visceral changes are too slow to be a source of instantaneous emotional feelings. He noted that human beings with spinal cord or vagus nerve transections retain their emotional sensation.
Cannon’s view prevailed and the notion that emotions and sensations are distinct, having separate neuro-anatomical seats, held sway for at least 50 years. In support, neuroanatomists identified brain structures just inferior to the cortex known as the limbic system that appear to be involved in emotional-motivational behaviour. According to most accounts the limbic system includes the fornix, the stria terminalis and the cingulate, dentate and hippocampal gyri. It is also sometimes considered to include the amygdala which is strongly implicated in the registering of emotions. In spite of these findings, the debate did not disappear. Later workers tried to develop the James-Lange theory in the so-called peripheral theories of emotions, notably Schachter and Singer (1962). More latterly, workers have correlated interoceptive neural signals and cortical processing of emotional stimuli (see, for example Pollatos, Gramann, & Schandry, 2007; Pollatos, Kirsch, & Schandry, 2005). Anatomical proximity of appetitive and emotional brain centres have been cited in James’ support. Harshaw referring to work by Grossman suggests:

Were Cannon to have known that both appetitive and emotional centers would eventually be found to be collocated within the ventromedial hypothalamus… the history of the field would perhaps have been written otherwise (Harshaw, C Personal Communication 4th April 2008).

It seems unlikely that Cannon would have been perturbed by the finding. Appetite, for Cannon, was an emotion not a sensation. He would have viewed a central site for emotion closely associated with the centre for appetite as strengthening rather than weakening his case. Grossman (S. P. Grossman, 1966) noted that the ventro-medial nuclei of the hypothalamus ‘is a major “centre” for both affective reactions… and feeding behaviour’. He proposed that the reason rats with lesions of this
hypothalamic area ate more than their non-lesioned counterparts owed more to “modifications of the rat’s affective reactions” than modifications of hunger or satiety.

Animals with lesions in the ventro-medial area of the hypothalamus may eat more of a preferred diet not because they are hungrier or because satiety signals are somehow blocked, but because an exaggerated reaction to the pleasant taste overrides other considerations such as stomach distension, etc. (p. 9)

Thus lesioned rats ate more because they gained more pleasure from the food, not because they were experiencing greater hunger sensations. Eating pleasure and hunger were distinct.

Advances in understanding the neuroanatomy of interoception (afferent visceral sensation) (Vaitl, 1996) have led to a rekindling of interest in the possible interdependence of sensations from the body and the emotional state of the individual. It has become apparent that the emotion-associated brain centres are linked to centres receiving afferent impulses from nearly all parts of the body including the alimentary system. This has led to a revival of interest in the James-Lange theory sometimes with uncritical acceptance of its tenets. In the next few paragraphs I allude to new interoceptive pathways described by Craig (2003). I discuss his interpretation of his data to illustrate that the conflation of sensation and emotion can lead to dubious conclusions.

Small-diameter fibres originating from all areas of the body project superiorly to form a hierarchy of feedback loops described by Craig as homeostatic at spinal and brain stem levels, all modulated by the hypothalamus. Information modified by these feedback loops arrives at the cortex, mainly the anterior cingulate cortex (ACC) and
the insula, giving the organism information about what its nutritional and other needs of the moment are, and generating the motivation to behave in such a way as to fulfil those needs. The animal receiving, for example, data that indicate lack of nutrition is motivated to seek food while the animal whose afferent input indicates a higher than optimum temperature is motivated to seek a colder position.

According to Craig, a set of fibres which exists only in primates, bypasses the hierarchy of intermediate homeostatic loops allowing the “raw data” of primary afferent activity direct access at thalamo-cortical levels. Primate frontal lobes therefore receive not only modified information but also primary, unmodified afferent data on what is actually going on at the tissue level sent directly to the ACC and the insula and as well to a specialised group of cortical cells known as the interoceptive cortex.

Since this recently discovered system of fibres is either rudimentary or absent in non-primates, Craig suggests that non-primate mammals cannot experience sensations from the body in the same way that primates do. From this, Craig concludes that primates can experience “homeostatic emotions” whereas non-primates cannot.47 This contentious view conflicts with the observations of other workers who believe that non-primates indeed experience emotion (see, for example Balcombe, 2006, 2008; Ramos & Mormede, 1998). Craig seems to be saying that whereas animals other than primates simply feel motivated to behave in such a way as to restore

47 In Craig’s words:
The emotional behavior of non-primate mammals suggests the anthropomorphic inference that they experience feelings from the body in the same way that humans do. However, the neuroanatomical evidence indicates that they cannot, because the phylogenetically new pathway that conveys primary homeostatic afferent activity directly to thalamocortical levels in primates is either rudimentary or absent in non-primates (A. D. Craig, 2003, p. 501).
homeostasis, primates, including humans, feel an actual sensation at the same time.
Since (following James) sensation IS emotion, only primates can feel emotion.

The direct activation of both the interoceptive cortex and the ACC by the distinct homeostatic modalities corresponds with the simultaneous generation of both a sensation and a motivation.

The sensation coupled with motivation, for Craig, is emotion (or at least what he terms “homeostatic emotion”). In the sentence that follows the one above, he abandons the term sensation, substitutes the word feelings for the sensation/motivation complex, then identifies feelings as emotions:

Thus, these feelings constitute emotions that reflect the survival needs of the body. Pain, temperature, and itch are homeostatic emotions that drive behavior, just as hunger and thirst are (A. D. Craig, 2003, p. 503).

Pain, temperature and itch are undoubtedly sensations. For Cannon and his contemporaries, so were hunger and thirst. Not for Craig. On the basis that the interoceptive cortex generates sensation and motivation simultaneously, sensation, motivation, feeling and emotion are one and the same.

Simultaneity does not necessarily imply identity. There seems no particular reason why the cortex could not distinguish between direct afferent impulses and impulses from the homeostatic hierarchy in which case sensation would be differentiated from its attendant motivation. It appears that Craig reaches his conclusion because he has begun from a neo-Jamesian position – the sensation IS the emotion. Therefore as only primates have sensations only primates feel emotion. Do his recent
neuroanatomic findings justify this return to the Jamesian viewpoint? In fact they add nothing further from a theoretic point of view than was already known at the time of Cannon – afferent impulses of various kinds inform the brain of the state of the body. The question as to whether the lurch in the stomach upon hearing bad news IS the emotion associated with bad news or whether the lurch is consequent upon a centrally generated emotion is left unaltered by the finding that new afferent pathways associated with sensation have a common cortical endpoint with homeostatic afferent pathways, interesting though the association might be.

Since Craig adduces no further evidence to support it, we do not need to accept the James-Lange position that sensation is emotion. Nor is it necessary to accept Craig’s reasoning that only primates can feel emotion.48

The move in the Jamesian direction has had a profound effect on thinking in the field of eating regulation. The general trend has been towards the intertwining of the terms used to denote emotion and sensation. The meanings of the verb “to feel” are broad in any case. “I feel” could mean “I think” or “I believe” or “in my opinion.” Mayer et al. (2006) offer three meanings for the word “feelings.” The first includes satiety, abdominal pain and discomfort. These they allow “can be regarded as sensations”. Secondly feelings can be associated with an emotional condition such as anxiety or

48 Undaunted, Craig nevertheless states that the information from ACC, insula and interoceptive cortex proceeds to the Right Anterior Insula of the cortex where a meta-representation of the state of the body is constructed. This, Craig identifies as the subjective awareness among humans of the “feeling self.” For Craig self-awareness is intimately connected to, and indeed may be nothing other than, an awareness of the body, the “emotional self”. Craig’s interpretation of the neuroanatomic findings provides an interesting example of a kind of conceptual sleight of hand in which new findings are implied to add support to an old idea whereas in fact they do no more than allow a restatement of it. The finding that afferent information aggregates in the Right Anterior Insula of the cortex gives a fascinating new insight into the mechanics whereby the brain receives information about the body. But to suggest that the “feeling self”, self-awareness, or consciousness is thereby nothing other than afferent information from the body is eliminative materialism dressed in 21st century clothes.
contentment. Thirdly feelings can be associated with strong emotions such as anger, sadness and happiness. Emotions:

…describe a neurobehavioral state adapted for the attainment of a particular goal or the resolution of particular conditions … It is characterized in humans as a motivation accompanied by a characteristic feeling and autonomic sequelae (E. A. Mayer et al., 2006, p. 1296).

Thus an emotion is a feeling plus a motivation (but the feeling can be a sensation). Homeostatic emotions are:

…changes in the body’s physiological condition and with the autonomic responses and behaviors that occur in order to restore an optimal balance. For example, if your body is hypoglycemic, you feel hunger and you are motivated to eat (Ibid. p. 1296).

Hunger, unequivocally a sensation for Cannon and his contemporaries, is now a component of a type of emotion – homeostatic emotion. The clarity with which sensations, feelings and emotions were distinguished has been lost.

A continued fascination with James’s principles and the obvious fact that emotions and bodily sensations are related in some way has yielded a large literature attempting to clarify that relation (Lang, 1994). What appears to have become blurred is that for James the relationship was simple – it was that of identity. Damasio and colleagues for example have proposed the ‘somatic marker’ theory of emotion and express the commonly held view that the body is a necessary condition for emotion:

…the body is the main stage for emotions either directly or via its representations, and somatosensory structures of the brain (Damasio 2000, cited in Pollatos et al., 2005, p. 949).
However, to state that the body is the “main stage” for emotions is not quite the same as saying that bodily sensations ARE emotions. The body could, for example function as a “main stage” in the sense of amplifying or “reverberating” (to use Cannon’s term) with emotions of central origin, or sensations could act as stimuli that trigger centrally generated emotions.

Many workers have attempted to relate sensitivity to bodily sensations to the experienced intensity of emotions. Justifying this Pollatos states:

James stated that feelings originate from the perception of bodily states. Following this assumption, one may conclude that the extent of a person's sensitivity to bodily signals, (“introspective awareness”, “visceral perception”) should be related to the experienced intensity of emotions (Pollatos et al., 2005).

In fact James did not state that feelings originate from the perception of bodily states. He stated that feelings ARE the perception of bodily states. Nevertheless, a large literature attempts to evaluate individual differences in visceral self perception and relate it to emotion (Barrett, Quigley, Bliss-Moreau, & Aronson, 2004; Critchley, Wiens, Rotshtein, Ohman, & Dolan, 2004; Ferguson & Katkin, 1996; Pollatos et al., 2008; Vianna, Weinstock, Elliott, Summers, & Tranel, 2006; Wiens, 2005; Wiens, Mezzacappa, & Katkin, 2000). The most convenient measure of visceral self perception has proven to be perception of the heartbeat. Such studies then, generally attempt to relate perception of the heartbeat to emotionality. Results are mixed. Whatever the results, an enterprise that feels the need to relate physical sensation with emotionality immediately suggests the two are distinct. To be properly Jamesian, the perception of the heartbeat IS the perception of an emotion; there should be no need
to seek correlations.\textsuperscript{49} This corpus of the literature thus appears to support the contention, argued here, that sensations and emotions are distinct.

This is not to imply that hunger exists in the absence of emotion. Emotions are indeed found in association with bodily sensations and may be triggered, amplified and enriched by them. The hunger sensations and the eating emotions generally occur simultaneously and it is clear that hunger is a sensation that can be associated with strong emotions. As Cannon puts it:

\begin{quote}
On the same plain with pain and the dominant emotions…is the sensation of hunger. It is a sensation so peremptory, so disagreeable, so tormenting, that men have committed crimes in order to assuage it. It has led to cannibalism …It has resulted in suicide. And it has defeated armies …(Cannon, 1915, p. 232).
\end{quote}

Nevertheless it is equally clear that Cannon differentiates between the sensation of hunger and the emotions. They are not the same they are “on the same plain”. Hunger can be pleasant in an anticipatory way at first but disagreeable later. The emotions that accompany sensations are not identical to the sensation, but vary depending upon context.

In summary then, I suggest that the Vedic notion that sensations and emotions are distinct subjective experiences is upheld. The motivation to run them into each other, which has occupied the energies of many latter day workers, arose partly to save a

\textsuperscript{49}To be fair to these authors, there is logic in studying heartbeat in this way in that if a subject is proficient at perceiving heartbeat (which is not an emotion), then perhaps that subject will also be good at perceiving those sensations that, according to James, are emotions. But this does not resolve the issue Cannon had with James. If I am proficient at perceiving both heartbeat and emotion-related sensation does that mean that my emotions ARE my emotion-related sensations? Cannon could still argue that when I see a tiger approaching, the lurch in my stomach is distinct from and follows the feeling of fear, even if I am very good at feeling a lurch in my stomach (and my heartbeat).
now discredited hypothesis: that the cortex exists as a projection of motor and sensory information only and partly owing to the materialistic leanings at the time of James, its main protagonist. There seems no particular reason to remain with the early James, nor any good reason against a return to the clarity afforded by distinguishing between the eating sensations and emotions exemplified by Cannon and Carlson. In subsequent chapters the eating-related sensations and emotions will be distinguished according to the following chart:

<table>
<thead>
<tr>
<th>SENSATIONS</th>
<th>EMOTIONS</th>
</tr>
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<tbody>
<tr>
<td>Hunger sensations</td>
<td>Satiety</td>
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<tr>
<td></td>
<td>Thirst</td>
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<td></td>
<td>Dysfunction</td>
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<tr>
<td></td>
<td>indicators</td>
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<tr>
<td></td>
<td>Appetite</td>
</tr>
<tr>
<td></td>
<td>Other</td>
</tr>
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**Chart 2 Eating-related sensations and emotions**

Having thus distinguished between appetite (emotion/desire) and hunger (sensation), in the next section hunger is examined in a historical context. This will lead to a classification of the various sensations that have been grouped under the word hunger. A key eating sensation recognised by Cannon and other earlier investigators, the “hunger pang” has been largely overlooked in the last 60 years and will be revived.
8.2 “Hunger as sensation” – a historical review

The Shorter Oxford Dictionary (1993, p. 1280) offers three meanings for the word hunger. The first is: “the uneasy or painful sensation caused by lack of food; Craving appetite. Also, the exhausted condition caused by lack of food” The second meaning is “a famine”. This is a much broader use of the word and is related to shortages of food, malnutrition and actual starvation as seen in such countries as Somalia or Ethiopia or during "the Great Hunger" of Ireland in the middle of the 19th Century. Slogans such as “help stamp out hunger” also illustrate the use of the word in this context, as well as Malthusian concerns about world hunger. The third meaning is “a strong desire or craving”. Hunger in this sense could be a desire for almost anything, fame or love, for example. Of these definitions only the first is relevant to this discussion and the word hunger is not intended to convey the second two meanings.

In scientific discourse, “hunger” is used in a number of overlapping ways. It may denote, according to Wardle (1987):

…a bodily state in which available metabolic resources are low. In that sense, it is operationalised either in terms of the duration of food deprivation or the energy content of a preload ...(p.577).

This is hunger in strictly behaviourist terms. More recently, psychologists have seen hunger as a motivational construct with the logical status of an intervening variable (a variable which cannot be directly measured but which is inferred from other measurable events) and which accounts for food seeking behaviour (Berridge, 2003, p. 577; Blundell, Hill, & Rogers, 1988). In each case, understanding the sensation of hunger – what it is like to be hungry – is regarded as neither necessary nor useful. As
indicated in the preceding section, a further sense in which the word hunger is commonly used by the lay is “the desire to eat.” Most, but not all, writers in the field reserve the word appetite for the desire to eat, particularly as it relates to tastes and flavours and as indicated, this convention will be followed in this thesis.

Hunger is assessed in most studies by one of three methods:

1. Subjectively
2. Questionnaire-based
3. Rating scale-based

Reports describing the nature of hunger based on subjective experience flourished from the 18th century until the mid-20th century when, following the behaviourist trend of the time, subjective reports became unfashionable. By the 1960s subjective reports had given way entirely to questionnaires (mostly closed) which were then followed by hunger rating scales. I have found no reports of in-depth interviews that might elicit from people the nature of their hunger and satiety sensations, the difficulty or ease with which they are able to report these sensations, or the context in which particular sensations are experienced. Within an extensive literature on hunger this is surprising as in-depth interviews are a source of rich and contextual data. The three methods will be dealt with in turn:
8.2.1 Subjective reports

There is no woman's sides can bide the beating of so strong a passion
As love doth give my heart; no
So big, to hold so much; they lack retention.
Alas, their love may be called appetite, -
No motion of the liver, but the palate, -
That suffer surfeit, cloyster and revolt;
But mine is all as hungry as the sea,
And can digest as much; make no compare
Between that love a woman can bear
And that I owe Olivia.


Bray (1993) quotes Carlson as finding no specific theories concerning hunger or appetite in the works of Hippocrates or Galen. Reports on “the appetites” appear in the 18th and 19th centuries, and continue into the first half of the 20th century. They were, according to Cardno (1956), the “scene of theoretical battles”. In the perspicacious passage above, Shakespeare, as early as the 16th century, indicates that he had no doubts about the distinction between appetite and hunger. Shakespeare associated appetite and hunger with emotion, for the Duke’s subject is love. Nevertheless appetite, says Shakespeare, is to do with the palate, not with the digestive organs, and changes readily with “surfeit, cloyster and revolt”. Hunger, on the other hand, evokes the capacity of the sea. Hunger is physical, powerful and efficacious. It carries with it the capability, the readiness, to digest.

Albrecht von Haller (1708-1777) in the 18th century was one of the first writers to propose a theory of hunger based on stomach contractions, although he believed the
immediate cause to be grinding or rubbing of the villous folds of the gastric mucosa against each other as the stomach contracted, aided also by diaphragm and abdominal muscles. Haller also proposed that chemical stimulation of nerves in the gastric mucosa could play a role. Against Haller others such as Erasmas Darwin (1731-1802) and Johannes Muller (1801-1858) held that hunger was a negative sensation brought about by the absence of contractions in the stomach, a view that did not take hold (Bray, 1993).

In the 19th century, physiologists such as Karl von Vierordt (1818-1884) explained hunger as “sudden and strong contractions of the empty stomach completely obliterating the gastric cavity, giving rise in part to the sensation we call hunger” a notion later taken up by Cannon. As to “what it is like” to be hungry, Cardno has analysed the writings of the two 19th century writers, Alexander Bain and George Henry Lewes “in whom description may be expected to reach its highest level.” Cardno finds that:

There is general agreement [among early writers] that hunger “may be reckoned a pleasure in its first rise”, or “commences as a pleasant feeling” …Lewes traces a sequence from present “appetite” to an uneasy sensation, positive pain, and a feeling as if “the stomach were being torn by pincers.” He then proceeds to mention, progressively, general exhaustion, feverishness, headache, and lightheadedness, “often flaming into madness.” …Lewes' colourful remarks about the pincers appears in Bain as “oppressive gnawing pains referred to the region of the stomach” (Cardno, 1956, p. 267).

Distinct from these sensations arising from the stomach area Bain identifies the “faintness arising from want of nourishment to the tissues”, the general feeling of “inanition.” This aspect of hunger is perhaps what Hippocrates (c. 400 BC) was
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referring to when he wrote of hunger as entailing a “great loss of strength, trembling, and want of spirits … vertigo, lowness of spirit, and inactivity.”

Bain in somewhat similar vein to Shakespeare distinguishes the hedonistic quality associated with the taste of food “the proper gustatory sensibility” aroused by “an agreeable contact” from the physiological need, the “more voluminous, though less discriminating sensibility of the stomach”. Although Bain and Lewes differ on details and in general approach, common themes emerge in the subjective experience of hunger, themes that appear repeatedly in later authors:

1. Hunger as a sensation is agreeable at first
2. The sensation becomes more urgent, even in some sense painful with a gnawing quality associated with an emotive tone.
3. Systemic symptoms such as exhaustion and light-headedness (inanition) may be associated with hunger.
4. The gustatory sensations are distinct from those sensations of hunger felt generally in the stomach area.
5. While both appear to be related to pleasure the latter relate more closely to the preservation of life or physiological needs.

The classification proposed here is partially a return to the clarity of semantic definition exemplified by these early workers. Cannon similarly describes hunger clearly and straightforwardly:

Hunger ...is a dull ache or gnawing sensation referred to the lower mid-chest and the epigastrium ... not satisfied, (it) is likely to grow into a highly uncomfortable pang, less definitely localized as it becomes
more intense. It may exist separate from appetite, as, for example, when hunger forces the taking of food not only distasteful but even nauseating. Besides the dull ache, however, lassitude and drowsiness may appear, or faintness, or headache, or irritability and restlessness such that continuous effort in ordinary affairs becomes increasingly difficult. That these states differ with individuals — headache in one, faintness in another, for example — indicates that they do not constitute the central fact of hunger, but are more or less inconstant accompaniments, for the present negligible. The dull, pressing sensation is the constant characteristic, the central fact to be considered in detail (Cannon & Washburn, 1912, p. 441).

The five themes listed above reappear except that Cannon introduces the word appetite. On the distinction between hunger and appetite Cannon saw them as belonging to quite different categories:

Hunger and appetite are so intimately interrelated that the discussion of either requires each to be clearly defined. According to one view, the two experiences differ only qualitatively, appetite being a mild state of hunger. Another view, better supported by observations, is that the two experiences are fundamentally different (Ibid. p. 410).

For Cannon, like Shakespeare, appetite is to be considered in the context of gustatory sensations and is to do with a desire for food, coupled with “associations delightful or disgusting.”

Appetite is related to previous sensations of the taste and smell of food; it has, therefore, as Pavlov has shown, important psychic elements. It may exist separate from hunger, as, for example, when we eat delectable dainties merely to please the palate. Sensory associations, delightful or disgusting, determine appetite for any edible substance, and either memory or present stimulation can thus arouse desire or dislike for food (Ibid. p. 441).
For Cannon then, appetite was closer to pleasurable emotion than sensation and could exist entirely separately from hunger. Hunger he saw clearly as an epigastric sensation. Early workers noted that upon the taking of food, hunger pangs quite quickly disappear yet the desire for food continues. This resultant desire was seen as the archetype for appetite.\(^{50}\) Boring and Luce, in the context of a meal, noted that their observers had no difficulty in differentiating between hunger, and the ‘desire for food’ or appetite (Boring & Luce, 1917, pp. 446-447). They conclude, in concurrence with Bain, Lewes, Cannon and Carlson, that appetite is not hunger. Appetite, they say, can be:

…adequately described only as a food-seeking attitude or meaning, a reaching-out-after-food … the most constant and characteristic feature of which is an oral, deglutitory attitude, which involves sniffing, free movement of the mouth and tongue, copious salivation, and relaxation of the throat (Boring & Luce, 1917, p. 452).

One subject although reporting a strong desire to eat, was rarely hungry in the sense that the word hunger was used by these earlier experimenters, i.e. a distinct discrete sensation, pressure pain or pang. Thus hunger is not a necessary condition for appetite – appetite might be compelling but it could occur in the complete absence of hunger when hunger is so defined.

\(^{50}\) Carlson concurred with Cannon in that appetite is related to previous sensations of food but suggested at first that appetite might have a sensory component. Appetite, Carlson suggested might be:

…merely the memory of past experience (sight, taste, smell) with food. Appetite is therefore a pleasant subjective process or sensation while hunger is built into the very framework of the animal machine… (Carlson, 1931, p. 79).

Boring and Luce were unable to find in a laboratory setting a set of epigastric sensations specific to appetite and different to hunger, even after following the instructions of Carlson (Boring & Luce, 1917).
Despite the clarity of these early writers and perhaps influenced by the more general writing on emotion and sensation by James and Lange many contemporary writers regard appetite and hunger as qualitatively the same. Mattes et al., for example, regard hunger, satiation and satiety as the three components of appetite (Mattes et al., 2005) while for Bray hunger is one kind of appetite (Bray 1993). Others, such as Castonguay et al. (1983) concur with Cannon. Appetite is for them primarily to do with gustatory sensations and is:

…that set of signals that guide selection and consumption of specific foods and nutrients… “What do I want to eat?”

However Castonguay et al. do not share Cannon’s theoretical framework as regards hunger. For them hunger is:

…that set of internal signals that stimulate the acquisition and consumption of food. “Is there anything to eat?”

The acquisition and consumption of food are observed behaviour from which a set of internal signals is inferred. Cannon might well have agreed that hunger generates the question “Is there anything to eat?” but he did not define hunger according to behaviour. Interested in the subjective sensation, he sought to understand the physiological basis of the gnawing dull ache, “the constant characteristic, the central fact to be considered in detail.” In this his contemporary (Carlson, 1931) concurred:

…the epigastric sensation of varying degrees of pain is the indispensable subjective element (p. 77).
In the meantime this sensation will be called, following Cannon, the hunger “pang”.

### 8.2.2 Peripheral or central origin of hunger?

The controversy as to whether hunger is of peripheral or central origin was linked to the emotion-sensation debate discussed in section 8.1.2, with Cannon arguing that appetite (emotion) is central and hunger (sensation) is peripheral. The issue became complicated when some of Cannon’s contemporaries decided that “hunger as sensation” was insufficiently broad to encompass all they wished to associate with the word. They argued that hunger is of central origin because it is to do with food regulation and the desire to eat. Lack of nutrition, they said, is probably sensed by the central nervous system, and the motivation to eat is also to do with central portions of the brain. Had they retained Cannon’s clarity of terminology then the word appetite could have assumed emotional and regulatory roles (as they did for Cannon). Unfortunately this did not occur, leading to difficulties in terminology.

Cannon realised that the hunger pang could originate in the brain and simply be referred to the stomach area. He set out to settle this question by reasoning that, if the hunger pang originates in the periphery, then some physiological event should be observable in the periphery that coincides with the pang. In a series of experiments in which his medical student colleague Washburn swallowed a soft rubber balloon, Cannon was able to measure the pressure within the stomach before during and after Washburn experienced the sensation of a hunger pang. Washburn's perception of hunger pangs coincided almost exactly with the contractions of the stomach. Figure 23, taken from Cannon and Washburn’s (1912) paper shows the correspondence.
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Figure 23  Stomach contractions during hunger pangs

The top record represents intragastric pressure (the small oscillations due to respiration, the large to contractions of the stomach); the second record is time in minutes (ten minute intervals); the third record is Washburn's report of hunger pangs; the lowest record is respiration registered by means of a pneumograph about the abdomen.

Contemporaneous workers were repeatedly able to confirm Cannon and Washburn's findings. Carlson reached the same conclusions as Cannon and Washburn after studying a patient with a gastric fistula into which Carlson inserted a tube with an attached balloon from which recordings could be made (Carlson, 1918, 1993). Stomachic contractions and reports of hunger were recorded, sometimes for several hours. Carlson noted that if the balloon in the stomach was rather suddenly distended this could produce strong contractions in the previously quiescent stomach and that these were recognised by the subject as hunger pangs identical with those that occurred spontaneously. For Carlson this was indisputable proof of the:

…peripheral genesis of hunger, as the subjective state clearly is induced by the peripheral change.

Boring and Luce (1917) reported little difficulty in getting “records of typical hunger contractions with contemporary introspective accounts of the hunger complex”, further confirming Cannon’s findings. From introspective accounts Boring and Luce considered that they had obtained descriptive norms for hunger. Thus, for Cannon, and his contemporaries on the peripheral side of the debate, hunger was defined precisely in terms of its subjective quality as a distinct “pang” and when so defined, appeared well correlated with the physiological marker of stomach contraction.

Frederick Hoelzel, who acted as a subject for Carlson’s experiments (Carlson, 1918) and later worked in Carlson’s laboratory, developed ideas at variance to those of Carlson. Hoelzel noted that periodic gastric contractions increase with starvation and that graphic records of them were obtained on a subject into the 40th day of fasting. He notes:

But the sensations due to these contractions were found to change, decrease or even disappear. At the same time, the desire to resume eating more or less progressively increased … The increasing tendency to resume eating, rather than the epigastric sensations which are ordinarily regarded as hunger, therefore seems to point to the true nature of hunger. Considered in this light, hunger … is not a sensation at all but rather a condition involving a more or less compelling tendency or urge to do something – to eat (Hoelzel, 1927, p. 667).

Hoelzel also found that if he fasted during the day, then ate to stomach fullness, he continued to have (not pangs) but a desire to eat, confirming his notion that hunger is something triggered centrally and related to need for nutrition. Hoelzel also quoted Carlson as having stated 40 years earlier that after fasting for 5 days he noted hunger pangs with a full stomach and therefore hunger without gastric contractions (Hoelzel,
1957, p. 659). Hoelzel’s conclusion that the “indispensable phenomenon” of hunger is a state of need, the pangs being incidental to that state, implies only that he opted for a broadened definition of hunger. For Carlson hunger was a gastric pang, for Hoelzel it was a desire to eat, known otherwise as appetite.

In the author’s view, the debate over the peripheral or central origin of hunger was at root a semantic difficulty. The debate turned upon the definition of hunger and in the absence of an agreed definition those taking part spoke at cross-purposes with protagonists spanning the 19th and 20th centuries. Cannon in the 20th century took issue with the earlier physiologist François Magendie (1783 – 1855). Each used identical observations to defend their position. Magendie had held that hunger was of central origin:

… since the gastric sensations and general feelings of weakness that many associate with hunger have been observed to pass away without an individual partaking of food (Bray, 1993, p. 490).

Magendie’s line of reasoning was: “If the gastric sensations have passed away and the person has not taken food he must still be hungry, therefore hunger is not the gastric sensation.” Arguing for the peripheral perception of hunger in the stomach, Cannon (1912, p. 442) accurately described Magendie’s thesis:

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51 It is difficult to assess Carlson’s reputed unpublished early experience (which occurred 40 years before Hoelzel reported it. Hoelzel’s report appeared about a year after Carlson had died and Carlson was thus unable to speak for himself). Perhaps after prolonged fasting, strong stomach contractions continue in the presence of food in the stomach. Carlson himself had noted the opposite can occur – contractions in the absence of pang. Carlson found that the rapidity of development of the contraction phase was important in initiating a subjective pang and that:

…the stomach may thus exhibit slow tonus undulations of considerable magnitude without any attendant hunger state (Carlson, 1993, p. 505).
...the consideration that, as time passes, food substances disappear from the blood, and consequently the nerve cells, suffering from the shortage of provisions, give rise to the sensation. In support of this view the increase of hunger as time passes has been pointed out.

He then put forward the following argument against it:

There is abundant evidence, however, that the period of increase is short, and that during continued fasting hunger wholly disappears after the first few days. On the theory that hunger is a manifestation of bodily need, we must suppose that the body is mysteriously not in need after the third day, and that therefore hunger disappears. The absurdity of such a view is obvious.

The observation is the same as Magendie's – that without food, hunger passes away after a few days. The problem is one of semantic definition. When Cannon used the word hunger, he meant the pang whereas Magendie defined hunger as lack of nutrition. Consequently the same data led them to opposite conclusions.

Janowitz and Grossman were among those who argued that Cannon’s notion of hunger as “essentially a problem of sensation and one of local sensation” was incomplete since it did not take into account the regulatory role of hunger:

The problem of hunger and appetite is an analysis of the factors involved in the adjustment of the intake of required nutritional materials to bodily needs (Janowitz & Grossman, 1949, p. 232).

This is a pertinent point since the adjustment of intake must be accounted for. Cannon had argued forcefully that hunger is not based upon “general bodily need” stating that blood studies had shown that “sugar, fat, and protein in the blood stream remains within the common range of variation even at times when hunger may be
prominent,” that, in any case, the cells of the brain are insensitive to chemical stimulation, that in times of great bodily need for nutrition, such as fever or illness, hunger is diminished rather than augmented and that the swallowing of indigestible materials such as leather, moss or clay abolishes hunger but does not satisfy nutritional requirements (Cannon, 1929b, pp. 435-436). It raises the question as to what indeed Cannon had in mind as to the role of hunger, if not the manifestation of bodily need. In the theory presented here, the author suggests that Cannon’s hunger pangs have a special significance that has not been generally recognised. Hunger pangs represent an indication of the body’s preparedness to digest. In the epigastric sensation the body is “all as hungry as the sea, and can digest as much”. Support for this idea can be found (not only in Shakespeare) but from Cannon himself:

Hunger ...is normally the signal that the stomach is contracted for action ...eating starts gastric secretion, distends the contracted organ, initiates the movements of gastric digestion, and abolishes the sensation. Meanwhile pancreatic and intestinal juices, as well as bile, have been prepared in the duodenum to receive the oncoming chyme. The periodic activity of the alimentary canal in fasting, therefore, is not solely the source of hunger pangs, but is at the same time an exhibition in the digestive organs of readiness for prompt attack on the food swallowed by the hungry animal (Cannon & Washburn, 1912, p. 454) (My italics).

For Cannon, “readiness for prompt attack on the food” does not imply a regulatory mechanism in the sense of indicating a physiological need. It was not, in Cannon’s view, that the local epigastric sensation was a kind of final common pathway for the expression of metabolic deficit. He explicitly denied that, at least in his 1929b paper.
Hunger, for Cannon, was a manifestation of readiness. The pang therefore is to do with regulation but it is not in response to deficit. It is to do with timing.\(^\text{52}\)

Since it seems obvious that hunger is in some way connected with metabolic deficit, it is understandable that Janovitz and Grossman should attempt to include it. They defined what they called the “hunger state”:

The hunger state is the physiological state resulting from the privation of food of a specific or general type – and abolished by the ingestion of these foods (Janowitz & Grossman, 1949, p. 232).

To their credit they retained the distinction between hunger and appetite, agreeing with previous workers that:

Appetite is the desire to eat, and specific appetites are the desires to eat specific foods (Ibid. p. 233).

Unfortunately, they reserved no special place for Cannon and Carlson’s local epigastric sensation. In their view Cannon had given it undue prominence to the neglect of other sensations.\(^\text{53}\) Thus it was lumped together with a complex of sensations, which were held to be:

\[\text{\ldots the mental correlative (the psychic adjuncts) of the hunger state (Ibid. p. 233).}\]

\(^\text{52\)\ Or more probably both. In the end, Cannon was equivocal on this point in spite of his clarity in the 1929b paper (see section 8.3.4). The author believes that need + readiness to digest \(\rightarrow\) hunger pang. Further work is necessary to fully clarify this point.}

\(^\text{53\) Janowitz and Grossman considered they were taking a “holistic” point of view and that hunger was logically best considered as “an overall state and in terms of physiological needs and nutritional requirements” (p. 232). Although they identified physiological, behavioural and conscious aspects to food regulation they neglect conscious aspects in their discussion. These writers explicitly noted that the field of hunger and appetite did not “suffer from lack of terms”, and they felt that no new words need be invented.}
These included feelings of generalised weakness, fatigue, dizziness irritability, nausea, headache, feelings of emptiness, hollowness, epigastric tension, distress, pang cramp and pain. Hunger pangs they claimed, are rare, even in people experiencing what they call normal hunger, under ordinary habits of eating. In the author’s view it is unfortunate that they did not retain Cannon’s hunger pang. It may be rare in some populations but it is not insignificant. By blurring it into the sensation complex, the unique role of the pang was lost. Their seminal paper sets the direction taken by most workers in the field of eating regulation for the next 60 years.

Summarising so far, broad agreement can be found between the 19th-century writers and some of the early 20th century ones that hunger pangs are a discrete sensation felt in the epigastric area and that appetite, by contrast, is a disposition to eat sometimes related to gustatory sensations and salivation. Debate then ensued when some investigators wished to broaden the concept of hunger.

**8.2.3 Lassitude and weakness**

Complicating the picture was the weak, faint, exhausted, light-headed experience often associated with hunger, dismissed by Cannon as being among its “inconstant accompaniments”. The experience will now be discussed. Carlson writes that:

Frequently …there is a feeling of general lassitude or weakness. Sometimes headache, nausea, nervous irritability, restlessness and even fainting may appear …Strictly speaking, a certain degree of nervous excitability is a necessary effect of hunger of even moderate intensity … (Carlson, 1931, pp. 77-78).

Are such systemic symptoms i) hunger, ii) part of a hunger symptom complex or iii) symptoms that are not hunger but commonly occur in association with it? For
Carlson in this quote “a certain degree” of such symptoms are necessary to hunger. For Cannon it appears that the third option pertains. Although systemic symptoms may appear in association with hunger, for Cannon, hunger, the “central fact to be considered in detail”, is a pang felt locally. Weakness is experienced systemically. While the latter may frequently appear as an accessory to hunger, particularly if the imperative of hunger is not obeyed, it is not “the peculiar dull ache of hungriness”.

He addresses this point in the following passage:

The peculiar dull ache of hungriness… is likely [if not obeyed] to grow into a highly uncomfortable pang or gnawing; less definitely localized as it becomes more intense …Besides the dull ache …lassitude and drowsiness may appear or faintness, or violent headache, or irritability and restlessness such that continuous effort in ordinary affairs becomes increasingly difficult (Cannon & Washburn, 1912, pp. 441-442).

In 1919 one Ivy Campbell was treated for “stomach trouble” through the expedient of a duodenal tube inserted into her stomach to give the stomach a “complete rest.” She kept a diary of her experiences and her insights are of value. She quotes Hurst as a proponent of the idea of option ii) above that hunger per se extends beyond the localised sensation of emptiness or gnawing to necessarily include the feeling of inanition. The feeling of inanition Hurst terms “hunger of the starved tissues.” It is distinct from hunger of the empty stomach (Campbell, 1921, p. 30). Campbell also finds herself in agreement with the previously quoted writers on appetite:

When appetite was felt there was decided “mouth consciousness,” i.e. kinaesthetic images of tongue movements, pressure images of “pucker,” what seemed to be sensation from increased salivation …There seemed to be no gastric component present ...the writer believes that hunger and appetite are separated conscious states or attitudes. (Ibid. pp. 33-4)
Thus at this point, broad agreement is found in both appetite and weakness being distinct from hunger. Again the question is not so much a dispute over fundamentals as over the attribution of terminology. In this thesis, the faint, weak, tired sensation often accompanied by loss of concentration will be called inanition. It is the systemic component of hunger and corresponds to Hurst’s “hunger of the starved tissues.” In this theory it will suggested that inanition is an indication of need for, but not readiness to digest, food.

8.2.4 Perception and reporting of hunger

Apart from the struggle to find agreement in terminology, a characteristic that emerges in introspective reports on hunger is the difficulty subjects have in describing their experiences. In the clinical setting, patients frequently struggle to find words. In the only study the author was able to find soliciting self-reports of hunger that employed open-ended questionnaire the two most frequent reports are the vague descriptors “stomach growls” and “stomach aches” (Mattes & Friedman, 1993). More precise terms such as emptiness, hollowness, and gnawing do not seem to have occurred to the 83 university students who were surveyed, although in a closed questionnaire study emptiness was reported by 60% of subjects (A. Harris & Wardle, 1987). In the author’s opinion this reflects the general external orientation of many people and unfamiliarity with identifying and/or reporting internal perceptions (poor interoceptive awareness).
Frequently the word “pain” is used to describe hunger although it seems evident that it does not quite fit the experience the speaker is attempting to depict. Boring and Luce’s subjects describe for example:

…a little bright, burny thing at the base of the stomach. It is a pain, although it would not ordinarily be called so (p. 445).

…a vague mixture of pressures and a peculiar sort of ‘pain’ in the region of the stomach (p. 447).

Hunger has a similarity to pain in that it motivates the person who experiences it to action. Most would agree though (and Boring and Luce’s first subject admits) that hunger feels quite different from pain. Pain is from the first disagreeable. For this reason when interpreting introspective reports the use of the word pain should be treated with reserve. Pang is a more fitting word than pain.

Not only do people have difficulty in describing internal sensations, but also it quickly became apparent that some people have difficulty even in recognising them. In 1959 Albert Stunkard reported that some obese women reported experiencing no hunger during the time that gastric contractions were being measured, in contrast to non-obese women. Stunkard found that whereas the correlation between gastric contractions and reported hunger was strikingly high among non-obese women, there was no such correlation among the obese subjects of his study. This was undoubtedly a finding of the utmost significance, for it raised the possibility that non-perception of hunger could account for disturbances in the regulation of eating. This led to the internal/external theory of Schachter and Nisbett (section 7.1.1). Stunkard was
inclined to interpret the failure to report hunger in a manner that now seems somewhat judgemental. He more or less dismissed it as denial:

For convenience, the failure to report “hunger” in the presence of gastric motility will be designated as “denial of hunger.” This term evades the question of whether the failure to report hunger is due to a lack of awareness of the hunger experience, or whether it simply results from a disinclination to report it. If the denial of hunger is due to a lack of awareness of the experience, at least two mechanisms might achieve this. The women might correctly perceive sensations of abdominal emptiness, and might recognize their desire to eat, but still be unable to code these experiences as hunger. On the other hand their denial might be so profound as to extend to these raw materials of the hunger experience. This latter appears to be the case. The denial of hunger – was evidently not a result of a failure to interpret correctly perceived sensations and impulses. It arose rather from a denial of those very sensations and impulses. (p287) …The suggestion is made that denial of hunger occurs in persons with a conflict over eating who are simultaneously subjected to strong social pressures in this regard (Stunkard, 1959, p. 288).

Denial suggests a degree of psychopathology that may not be appropriate in the case of the obese. A disability in one of the three necessary abilities for reporting of hunger as suggested by Harshaw (2008, p. 550) appears to provide ample scope to explain the non-reporting of hunger without needing to invoke denial. Those abilities, listed in section 7.3 are: interoceptive awareness (sensitivity to internal sensations), interoceptive competence (the ability to correctly interpret them) and expressive competence (the ability to describe and communicate them).

As indicated in Chapter 7, the need for these three abilities had been recognised by other workers, in particular the psychiatrist Hilde Bruch who recognised that without signals from caregivers to know when to eat and when to stop a child’s inner
awareness would not be “programmed correctly”. They will not be able to recognise when they need food or differentiate that state from other sensations and feelings of discomfort.

On systematic inquiry, an amazing number of fat or thin people will answer with an immediate recognition that this is exactly what they have suffered from all their lives. Their cognitive perception of their nutritional state must be considered to be inaccurate (Bruch, 1961, p. 54).

Bruch’s concept of hunger was consistent with that of Cannon Carlson and Boring:

…the complex, unpleasant, and compelling sensation an individual feels when deprived of food, resulting in searching, even fighting for food to relieve its torment. In the more pleasant form of desire for a particular food it is called “appetite” and it plays an important role in our eating habits (Bruch, 1969a, p. 91).

Stunkard however like Hoelzel adopted a widened version of hunger that includes “desire to eat” – something other workers had carefully distinguished from hunger as appetite. He justifies the decision as follows:

In an effort to delineate the components of the hunger experience, 200 obese and nonobese persons were asked what they meant when they said they were hungry. The only replies regularly associated with a report of “hunger” focused on sensations of “emptiness” in the upper abdomen, or a “desire to eat,” or both (Stunkard, 1959, p. 282).

Janowitz and Grossman had already extended hunger to include other sensations besides the pang. By including desire to eat into the general category “hunger” Stunkard invited further difficulties in terminology that are yet to be resolved in both research and clinical settings:
The failure to distinguish between the need for food (hunger) and the desire to eat (appetite) is probably the most common source of confusion between physicians and patients (Mattes & Friedman, 1993, p. 74).

Stunkard departed from Cannon’s protocol in that, instead of asking subjects to depress a key on experiencing a hunger pang and correlating key depressions with gastric motility he asked his subjects, at 15 minute intervals, whether they were feeling hunger (according to their conception of it). He then attempted to correlate their response with gastric motility. Unsurprisingly, given these changes, the correlation between hunger (so interpreted) and gastric motility was not entirely constant. What is perhaps surprising is that Stunkard regarded his changes and subsequent findings as a clarification in the understanding of hunger. Speaking of Cannon and Carlson's method, he admits that: “…excellent correlation was established between key presses and individual gastric contractions” yet goes on to say:

Such virtuosity in the recognition of visceral sensations may, however, be quite different from reporting “hunger” during a prolonged period of gastric motility, particularly when reporting during the gastric quiescence between 2 contractions. The current study, then, with its questions at 15-minute intervals, measured a different response from the earlier ones, and a response which may be more relevant to the problem of hunger. It further clarifies the nature of the association of gastric motility and the experience of hunger. A casual reading of Cannon and of Carlson may leave the impression that gastric motility is a constant correlate of the hunger experience. Carlson, indeed, maintained that gastric contractions determined not only the experience of hunger, but even the regulation of food intake. The current study makes it clear that among the control subjects gastric motility and reports of “hunger” were associated in a statistical and not in an absolute sense. No
subject's responses were wholly within the motility – “hunger” and no-motility-no-“hunger” boxes (Stunkard, 1959, p. 288).

Re-defining the word hunger, thus, in Stunkard’s words, measuring “a different response”, set the enquiry into hunger on quite a new path. The question: “What sensations are you feeling right now?” or: “Could you please press a key when you are feeling that dull gnawing ache?” are quite different from the questions “Are you hungry?” or “Were you hungry over the last 15 minutes?” since the latter rely on the respondent’s interpretation of the word hunger. Cannon, Carlson and Boring asked the former type of question, Stunkard the latter. His study could be seen to mark the end of fidelity to subjective sensation, and the beginning of an era in which the word’s meaning was left to whatever a given subject perceived appropriate. Given that Stunkard’s own study and the contemporaneous findings of Bruch suggested that some people are confused about what hunger is to them and thus might produce a variety of *ad hoc* answers, this seems a particularly unfortunate development.

Summarising the significance of Stunkard's 1959 paper, one could say that by showing that obese people fail to recognise hunger he contributed vastly to an understanding of its role in the regulation of eating, but in confounding hunger with the desire to eat he muddied the waters. To be fair to Stunkard, a widening of the definition of hunger and abandonment of Cannon’s definition was consistent with the trend begun by Janowitz and Grossman some 10 years earlier (see section 8.2.2) and the use of “yes/no” questionnaires was probably in keeping with the behaviourist disdain for rich subjective detail that prevailed during the 1950s and 1960s. Nevertheless these changes contributed to widespread abandonment of that precision
so carefully established by earlier investigators. An acceptance grew that the question “Are you hungry?” was sufficiently precise in itself and needed no further elaboration. This led directly to the development of questionnaires, and later to hunger rating scales, (again spearheaded by Stunkard), the latter now widely used.

8.2.5 Questionnaires

In 1967 Monello and Mayer evidently disturbed by this turn of events and seeking greater subjective precision wrote:

Very little attention has been paid …to the individual's subjective experience of hunger and satiety. When does the individual become aware of physical sensations of hunger and how does he know they are 'hunger' sensations? ...This paper presents the results of a study in which a large number of adolescents and adults of both sexes verbally describe their subjective experiences of hunger and satiety (Monello & Mayer, 1967, p. 253).

Their aim seems promising. In fact, however, their subjects did not have the opportunity to verbally describe their subjective experiences, since the test they were given was written and multiple-choice. Furthermore, they were expected to rely on memory since they did not report at the time of their experiences. 603 adolescents and adults were given a checklist of possible symptoms representing two broad categories among subjective eating experiences: physical sensations and feelings. Physical sensations were related to the stomach, mouth, throat, head and the body generally. Feelings included mood, the urge to eat and preoccupation with food.

They were asked to recall and describe their feelings during extreme hunger (operationally defined as “the hungriest you can ever remember being”); during
ordinary hunger (operationally defined as 2 hr before and 0.5 hr before a major meal on a typical weekday); at the beginning of the meal (immediately upon sitting down to eat and after a few bites of food); and at the end of the meal.

The source of the checklist is not described. This is unfortunate since it possibly had its origins in open questions (perhaps even in-depth interviews). It would have been of interest had this rich data, including the context in which the symptoms were experienced, been reported. Since the particular set of physical symptoms used by Monello and Mayer became a norm for subsequent studies it is worth reproducing a portion of their Hunger-Satiety Questionnaire here:

<table>
<thead>
<tr>
<th>In the STOMACH?</th>
<th>none</th>
<th>some</th>
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<tbody>
<tr>
<td>empty</td>
<td></td>
<td></td>
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<tr>
<td>rumble</td>
<td></td>
<td></td>
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<tr>
<td>tense, tight</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ache, pain</td>
<td></td>
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<tr>
<td>nausea</td>
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<tr>
<td>relaxed</td>
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<tr>
<td>full</td>
<td></td>
<td></td>
</tr>
<tr>
<td>distended, bloated</td>
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</table>

<table>
<thead>
<tr>
<th>In the MOUTH?</th>
<th>none</th>
<th>some</th>
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<tbody>
<tr>
<td>salivation</td>
<td></td>
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<tr>
<td>dry</td>
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</tr>
<tr>
<td>empty</td>
<td></td>
<td></td>
</tr>
<tr>
<td>tight, tense</td>
<td></td>
<td></td>
</tr>
<tr>
<td>unpleasant taste</td>
<td></td>
<td></td>
</tr>
<tr>
<td>pleasant taste</td>
<td></td>
<td></td>
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<tr>
<td>relaxed</td>
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</table>
Chapter 8  What is hunger?

Monello and Mayer did not actually state that these were the symptoms of hunger; they simply put them forward as possibilities from which subjects could choose. It appears likely that, rather than defining in advance a particular sensation as hunger, they wished to explore the total range of what the word hunger could mean to some people. Based on their results, it is evident that the range of possible interpretations of the question “are you hungry?” is very large. From the Monello and Mayer's findings it appears that for many people the word does not connote just gastric gnawing (Cannon) plus a desire to eat (Stunkard), it encompasses other stomach related symptoms (Janowitz and Grossman) plus a whole raft of feelings from four localised areas in the body as well as the body overall. If this broad range of symptoms are what many people regard as hunger, then it is truly unsurprising that Stunkard's respondees showed a lower correlation with gastric contractions than did...
Cannon’s.

Among the physical sensations, in spite of this diversity of options available to their subjects, Monello and Mayer found that gastric sensations predominated:

Specific sensations in the stomach, mouth, or throat appear to be more salient during hunger than the diffuse over-all sensations, and of all specific sensations, gastric ones appear to be the most intense and most sensitive indicators of hunger (Ibid. p. 255).

Of the gastric sensations, emptiness appears to have been the most important since it is the one that figures mostly in their tables. Nevertheless mouth, throat, and overall body sensations are included (and reported by subjects) as components of hunger. Following Monello and Mayer’s study it became generally accepted that the word hunger means different things to different people, and the use of the word in general parlance is far wider than the more circumscribed description of Cannon and his contemporaries.

Monello and Mayer’s checklist became a standard instrument in assessment of hunger. For example, Garfinkel, (1974) compared 11 patients with anorexia nervosa with 11 matched controls (female undergrad students). All subjects fasted for 12 hours then completed a modified Mondello and Mayer questionnaire on hunger, ate a standard meal then completed a questionnaire on satiety. Ten out of 11 in each group reported hunger as a feeling of gastric emptiness. Eight controls and 6 patients reported “rumbling”, while a few from each group reported other assorted symptoms. This might be seen as evidence for the importance of gastric emptiness as a cardinal
symptom for hunger, but Harris and Wardle (A. Harris & Wardle, 1987) in a subsequent paper do not interpret it in this way:

Garfinkel (1974) found a low frequency of positive responses for physical sensations, with only three symptoms (emptiness, rumbling and restlessness) being endorsed by more than half of the 11 subjects and in Blundell and Rogers’ (1980) group of 12 subjects, tested after a 12 hours fast, only one symptom (emptiness) was endorsed by more than half of the subjects (p. 153).

For Harris and Wardle the fact that only a few of the symptoms on Monello and Mayer’s checklist were reported by more than half the subjects is an indication that hunger is ill-defined on subjective reports, in defiance of almost all subjects reporting one cardinal symptom (emptiness). Blundell and Rogers (1980) studied the effects of the drugs fenfluramine and amphetamine on hunger compared to placebo, again using Monello and Mayer’s checklist to assess hunger sensations. Emptiness was reported by 9 out of 12 subjects during the placebo phase.

In seeking emptiness rather than hunger, de Castro and Elmore’s (1988) study appears to have been one of the last to ask for an actual symptom rather than rely upon the subject’s interpretation of the word hunger. De Castro and Elmore may have been thinking of hunger according to Cannon’s conception of it for interestingly they comment:

The fact that the subjective state of hunger is so strongly related to the stomach content is not very surprising. Since the pioneering work of Cannon and Washburn, the relationship between stomach activity and subjective hunger have (sic.) been firmly established (de Castro & Elmore, 1988, p. 163).
Harris and Wardle (1987) attempted to redress perceived deficiencies in Monello and Mayer’s study by employing a larger sample size. They also, laudably, employed direct reporting of symptoms so that subjects completed their questionnaires at the time of experiencing the symptoms. Their stated aim was to investigate further the structure and organisation of the subjective experiences associated with normal levels of hunger. They did not attempt to solicit new or contextual data through open questioning, but chose to use the same hunger symptoms identified by Monello and Mayer in a closed questionnaire format. They conclude:

Again there was a strikingly low rate of responding to most of the symptoms. Even in the pre-meal condition, only 60% of subjects reported emptiness (compared to 24% of post-meal subjects) and only 36 percent reported hollowness (20 per cent of post-meal subjects. The results …confirm previous findings indicating that neither food deprivation nor reported hunger necessarily imply the perception of bodily sensations, and they have replicated previous reports of a low level of symptom endorsement. *It proved impossible to identify a specific subset or constellations of hunger symptoms* which were characteristically experienced by hungry people and no evidence was found for a dimensional structure to hunger (my italics) (A. Harris & Wardle, 1987, p. 154).

“Food deprivation” in this study did not imply fasting, but was simply the pre-meal condition before lunch – not a situation guaranteed to elicit hunger in all subjects. Given the above analysis of the difference between appetite and hunger sensations, both described in common parlance as hunger, and the difficulties that were emerging in the degree to which some subjects are able to recognise and describe their physical sensations, it is not surprising that hunger was not always reported as bodily sensations. Indeed, that in spite of these limitations fully 60% of subjects did report emptiness in the pre-meal condition should be regarded as highly significant.

Nevertheless, following the publication of Harris and Wardle’s damning conclusion
as italicised above, there was little or no subsequent interest in identifying the essential symptoms characteristic of hungry people. It appears to have been generally accepted that hunger symptoms, being subjective, are unreliable, protean and relative to the experiencer alone. In a later study Wardle (1987) aimed to

…track hunger over time using a range of subjective, behavioural and physiological measures, while nutritional state was manipulated by high and low calorie preloads (p. 578).

Wardle concludes the study by stating:

The motivational state of hunger may best be regarded, like fear, as a loosely coupled system, with covariation between behavioural, physiological and subjective response systems under some conditions, and relative independence under others (p. 581).

Castonguay et al. summarise the prevailing attitude that ensued:

Today, Cannon's question “What is hunger?” is translated into “What are the physiological, psychological and cultural factors that determine the initiation of a meal?” (Castonguay et al., 1983, p. 103).

Interest swung away from “what it is like to be hungry,” to a multitude of measurable reasons why people might be found to be eating.
8.2.6 Rating scales: The “black box”

In 1971 Stunkard and Fox wrote:

Both Cannon and Carlson viewed … “gastric hunger contractions” as determinants not only of the experience of hunger, but also of the regulation of food intake, through their putative role in converting changes in the interior milieu into an experience which motivated food-seeking behavior (Stunkard & Fox, 1971, p. 123).

As noted earlier in this section, Cannon had described gastric contractions not as the manifestation of bodily need as prompted by changes in the milieu intérieur but an indication of readiness to digest: “an exhibition in the digestive organs of readiness for prompt attack on the food.” Stunkard and Fox go on to diminish (at least to their satisfaction) any possible role for gastric contractions and their associated sensations.

Gastric motility has been allotted a more modest role since gastrically denervated animals have been shown to regulate food intake, and since it has been demonstrated that removing the entire stomach in man does not abolish all hunger sensations or the ability to regulate food intake. Despite this evidence, ill-defined epigastric sensations are associated with the desire to eat, and are relieved by eating; this occurs frequently enough to provide popular support for the role of gastric motility in the experience of hunger (Ibid pp. 123-124).

Cannon’s unequivocal “gnawing sensation referred to the lower mid-chest and the epigastrium” has been reduced to “ill-defined epigastric sensations …associated with the desire to eat,” a sensation, Stunkard and Fox seem to imply, that occurs frequently enough to mislead the popular mind into giving it a physiological status. This 1971 paper purports to be “a series of studies designed to ascertain the relationship of
gastric motility to hunger in man.” They again abandon Cannon’s method. This time the question “Are you hungry?” comes in the form of a rating scale. Somewhat ironically, Stunkard and Fox adopted the rating scale because they recognised that data from Stunkard’s earlier questionnaire was deficient in richness. The rating scale was an attempt to reinstate it.

In previous studies, we forced a yes-no discrimination as to the presence of hunger, with the consequent loss of information about this complex phenomenon. The present study, by contrast, assessed hunger (but not recognition of gastric contractions) by means of a rating scale of intensity of hunger which we had previously used with success. The scale consisted of a 6-inch line anchored only at each end with not at all hungry to as hungry as you have ever felt (Ibid p. 124).

It is immediately apparent that Stunkard’s rating scale measures something different from hunger as Cannon or even Monello and Mayer conceived it, for Stunkard found some people feeling hungry almost immediately after a meal is consumed. This either means that these people for some unlikely reason chose not to eat to satiety, and therefore did not extinguish the sensation of hunger or that they did extinguish the sensation of hunger, and were now reporting something else, probably an ongoing desire to eat that was not in any way related to any sensation of hunger (cf. Hoelzel section 8.2.2). The author has encountered a number of patients who at the time of interview report feeling hunger even though they have just eaten a meal. Invariably on close interrogation, these subjects were not experiencing any epigastric sensation, but rather a desire to eat so in the absence of further data, the second explanation seems the more likely.
In the author’s experience, as for Cannon, the onset of the gnawing sensation is an acute event of sharp onset (Cannon & Washburn, 1912, p. 443). Hoelzel agrees, stating that:

…epigastric sensations are often disagreeable and usually develop suddenly while hunger due to central factors is not inherently disagreeable and the exact time of its onset defies introspective analysis (Hoelzel, 1927, p. 669).

Monello and Mayer asked their subjects to report what they felt at 2 hours before and 0.5 hours before a major meal on a typical weekday, implying that they also considered hunger to be an event that occurs relatively acutely before meals. Yet for Stunkard and Fox:

…temporary increases in hunger, which loom so large in short-term studies, appear as little more than fine-grain fluctuations in an overall trend which begins almost as soon as a meal is finished, and which continues until the next meal (my italics) (Stunkard & Fox, 1971, p. 126).

Their conclusion, which was influential, is that:

…the common belief that stomach contractions play a part in the experience of hunger has basis in fact, but that the relationship is a weak one (Ibid. p. 134).

Re-conceptualise hunger, then measure it differently, and it seems hardly surprising that new results emerge. Such results may be valuable in their own right. The difficulty is that Stunkard and Cannon were talking about different things. Although its meaning varied, the word hunger stayed confusingly the same.
Stunkard and Fox made one further change to Cannon’s method in their 1971 study in that they dispensed with the soft rubber balloon and substituted a pressure transducing catheter. Greater sensitivity of the more sophisticated equipment has been held to account for Stunkard’s findings being at variance with those of Cannon a supposition that appeared to be upheld by a study by Penick and coworkers (Penick, Smith, Wienke, & Hinkle, 1963).54 This cannot be assumed, as both Stunkard and Penick et al. changed two variables at once – that of the pressure measuring device (from balloon to catheter or, in the case of Penick et al., telemetry transensor) and that of the hunger measuring device (from enquiry into specific sensation to rating scale or questionnaire). A study using pressure transducing catheter or telemetry while otherwise remaining faithful to Cannon’s methods in assessing hunger has not been conducted to the best of the author's knowledge. However Stunkard’s earlier study, in which he changed the hunger measuring device but retained Cannon’s pressure measuring device, also produced results at variance with Cannon’s. This tells against the argument that the pressure measuring device is the significantly changed variable.

54 The findings of Penick et al. appear prima facie to contradict Cannon’s findings since they compared balloon with transducer and found the balloon method showed a consistently higher rate of contractions, leading the experimenters to conclude that stomach contractions observed by Cannon et al. were an artefact of the balloon. The contractions were measured during a two hour period following “fasting”, first with the balloon, then on another occasion with the transducer, in the same subjects. Subjects were not asked to report whether the “pang” was present it was assumed that after just 5 hours “fasting” (little more than the duration of a normal inter-meal interval) subjects would be “hungry”. This was taken to be confirmed by questionnaire and the subject’s hunger was assumed to be “uniform” on the two occasions – two dubious assumptions since questionnaires are prone to all the difficulties of definition that have been discussed so far in this thesis. Subjects were deliberately not asked to report their epigastric symptoms, so it is not known at what times the pang was present – it may have been serendipitously more frequent during the period when the balloon was in place, or it may be that contractions in the absence of the pang occur at varying frequencies in any case during intermeal intervals. Carlson had himself noted that contractions occur in the absence of the pang and suggested that the rapidity of development of the contraction phase was important in inducing the subjective feeling (Carlson, 1912/1993 p. 505). Rapidity of contraction was not reported by Penick et al. It seems clear that whatever Penick et al. were studying it was not the epigastric pang – the main subject of Cannon and his contemporaries’ enquiry.
Stunkard’s statement that “removing the entire stomach in man does not abolish all hunger sensations or the ability to regulate food intake” does deserve closer inspection. This phenomenon was also referred to by Janowitz and Grossman in 1949 in their argument for a broader conception of hunger and it appears to argue powerfully against Cannon, Carlson and Boring’s findings.

The findings of Bash (Bash, 1939a, 1939b) might prima facie suggest that afferent sensation is irrelevant to eating regulation since he found that 7 of 14 rats whose afferent neural pathways from stomach and lower oesophagus had been destroyed thus isolating the stomach from the central nervous system, maintained eating and increased their weight. However 7 rats could not be induced to eat for 5-12 days after the operation which Bash considered could not be accounted for by the effects of the operation alone. Two of these rats perished in spite of efforts to force-feed them. Of those remaining for experimentation, Bash noted a changed eating pattern commenting that the temporal rhythm of both feeding and activity was lost. Pre-feeding activity was significantly diminished and post-feeding activity increased. Bash infers that

…gastric sensations having been abolished, feeding is no longer followed by satisfaction or satiation; the pattern is incomplete, and the act, regarded as a whole, is unfinished (Bash, 1939b, pp. 129-130).

Locomotor action pre-feeding among birds and animals had been observed by Carlson who regarded it as an expression of hunger (Carlson, 1912/1993, p. 502). It could be surmised then that these rats did not experience hunger or satiety in the usual way and that this interfered with the timing of their feeding, but not (for half of the rats), with their actual impulse to eat. This supports Cannon’s notion discussed in section 8.2.2
that the sensation that emanates via afferent nervous impulses from the stomach is to do with timing.

Grossman and Stein (M. I. Grossman & Stein, 1948) had the opportunity to perform essentially the same studies upon vagotomised humans. They found that:

1. Spontaneous gastric contractions that had been present pre-operatively were abolished post vagotomy (as expected) among fully vagotomised subjects.
2. Gastric contractions that were stimulated by insulin pre-operatively were also abolished post-operatively.
3. Pre-operatively some patients experienced the hunger pang and this was found to be synchronous with stomach contractions.
4. Post-operatively these patients no longer experienced the pang. “One component of the complex set of sensations associated with hunger was absent (p. 265)”
5. Those patients who did not experience the hunger pang pre-operatively, continued to experience the usual feelings of weakness and emptiness that they associated with hunger along with their “general affective response to hunger.”

The feeling of emptiness experienced by these latter patients was evidently not the pang for:

When… asked to describe their hunger sensations they usually were somewhat at a loss. Most frequently, they stated that they had a sensation of emptiness. This was not localised to the epigastrium, but usually was diffusely localised to the entire abdomen. Often the patients were
unwilling to localise the sensation of hunger and said that they “felt hungry all over.” In addition, most of the patients complained of a sensation of weakness. Both the sensation of weakness and that of emptiness was associated with a desire for food (p. 265).

These findings clearly support those of Cannon and Carlson, namely that hunger as they had defined it (the pang) is associated with gastric contractions and is of peripheral origin. That they could be interpreted as telling against Cannon and Carlson’s position seems almost perverse. Nevertheless Grossman and Stein take their findings to support the broadened concept of hunger and conclude that:

In most individuals, the extra-gastric components predominate in the sensation-complex of hunger. Elimination by vagotomy of the gastric component of the hunger sensation complex (hunger pangs) has no significant effect on the manifestations of the extra-gastric components … (p. 269).

An investigation into Stunkard and Fox’s sources, along with more recent reports lends further support to the notion that gastrectomised patients do not experience the hunger pang in the sense Cannon defined it. Stunkard and Fox quote Macdonald et al. who state:

When the first patient to survive total gastrectomy was studied 50 years ago, it was noted with surprise that she regained her appetite (MacDonald, Ingelfinger, & Belding, 1947, p. 887).

In fact a report by the operating surgeon Schlatter, while noting in detail the patient’s continuing ability to eat and digest food, mentions neither appetite nor hunger (Schlatter, 1898). Macdonald cites Paterson who similarly makes no mention of either hunger or appetite in his 1906 report to the Lancet of a series of gastrectomised patients apart from quoting one father of a patient who states that his son has a “good
appetite” post gastrectomy (Paterson, 1906, p. 578). This does not specify what the boy was feeling. Given the wide variation noted above in the use of such words in common parlance, it could simply mean that he was observed to eat. Against this single non-specific description must be placed more recent reports. Olsson, Bergbom & Bosaeus (2002) report in detail the loss of hunger sensation found among gastrectomised patients:

Most of the patients … stated that they did not have any appetite after their operation, and that they did not feel hungry … One patient said that he had to force himself to eat. The loss of hunger affected his life and he felt unhappy about not feeling hungry any more. “Hunger is a good feeling. It makes your meals taste better” … Patients said that they were aware of the necessity to eat and drink and they therefore tried, or even forced themselves, despite their lack of appetite or feelings of hunger. “I have lost all my appetite. It feels as if I have to force myself to eat” … Even if they did not feel hungry, some patients reported that in spite of this, they ate and appreciated the taste of food … One patient said “There is nothing really wrong with my appetite. It is just that I don’t feel hungry any more; but when I eat, it tastes really good” ...(p. 148).

Some of these patients distinguish between loss of hunger and loss of appetite in a manner that supports the traditional distinction between the two. Finer distinctions between the “appetites” are also supported. Not having the desire to eat but liking the taste of food supports the notion that the emotions of “wanting to eat” and “liking to eat” are distinct experiences. This will be explored in sections 9.1.1 and 10.2.3. That hunger is a “good feeling” supports the notion that hunger is pleasant “at its first rise” (section 8.2.1). That it “makes your meals taste better” will be examined in section 9.1.3. It seems very likely that these patients do not experience the sensation of hunger as conceptualised by Cannon and his contemporaries. It appears that Stunkard (and Macdonald) have assumed, as did the behaviourists, that the fact that
post-gastrectomised patients are observed to eat means that they are experiencing the sensation of hunger.

Stunkard and Fox’s 1971 paper seemed to finally confirm the broadened concept of hunger. This non-specific cluster of symptoms associated with the pre-meal condition should have been called something else and Cannon’s pang retained as hunger, or vice versa. Instead, the emerging non-specificity supplanted Cannon’s pang without remark, tending to be seen as a clarification or a deeper understanding based on wider knowledge. The epigastric pang was accordingly seen as somehow primitive or preliminary and superseded in the light of better evidence gained from more sophisticated measuring techniques. Thus Janowitz (1958, p. 328) had dismissed the pang as “dispensible” among the complex of hunger sensations, Stunkard and Fox (1971, p. 133) describe the rating scale as “far more powerful” than measures used in previous studies while Mattes and Friedman (1993, p. 69) go so far as to refer to “early pre-scientific theories” on hunger. Reinforcing this idea was the growing recognition that people eat for a variety of reasons including cultural social and emotional ones. According to behaviourists hunger is inferred from the fact people eat, so these observations further widened the scope of what could be called hunger.

These considerations led to a loss of confidence in Cannon’s “essence of hunger” and the usefulness of the subjective hunger symptoms in scientific enquiry generally. A mind-set emerged in which Harris and Wardle could elicit data that supports hunger as emptiness, yet interpret it to favour hunger as protean, variable, subject-specific and of limited interest. Although ratings of hunger using fixed-point scales or visual analogue scales are objective measures of a subject’s perception of hunger only (the
perception itself being entirely subjective), nevertheless with their veneer of “objective” respectability such scales replaced self-report and questionnaire almost universally. In the physical sciences, a “black box” refers to a phenomenon whose inner workings are not understood, but whose effects or behaviour can be measured. In effect, hunger became a "black box", considered useful when rated using the scales, but in its similarity to that of Pandora, better left unopened.

**8.2.7 Limitations of hunger ratings**

The validity of hunger ratings is defended mainly on the grounds that they vary in the predicted direction with fasting and re-feeding and after administration of anorectic drugs. De Castro and Elmore, for example, found that the pre-meal interval, estimated pre-meal stomach content, and self-reported hunger significantly correlated with meal size (de Castro & Elmore, 1988). Stubbs and coworkers reviewed the reliability and validity of visual analogue scales and concluded that they correlate with, but do not reliably predict energy intake to the extent that they could be used as a proxy of energy intake, however they do predict meal initiation in subjects eating their normal diets in their normal environment (Stubbs et al., 2000). Parker and coworkers also demonstrated that in older adults, the size of a meal is most closely related to rated appetite just before the meal (Parker, Ludher, Khai Loon, Horowitz, & Chapman, 2004). Similarly Flint and coworkers found that visual analogue scores are reliable and that within-subject comparisons are more sensitive and accurate than between-subject comparisons (Flint, Raben, Blundell, & Astrup, 2000) although Mattes et al. (2005, p. S88) point out that in a laboratory setting their correlation between prelunch ratings of appetite and subsequent food intake was “only weak to moderate”. Against these conclusions Mattes (1990) found in a study of 24 normal
subjects that eating often occurred when hunger ratings were low and that few individuals displayed a significant correlation between hunger ratings and number of eating occurrences.

How useful then are rating scales? They measure perceived hunger, a concept that is subject-specific. It is unsurprising therefore to find that according to Hill and Blundell, the currently used methods to assess perceived hunger are “insensitive measuring devices.”

…it is often stated that human feeding behaviour can be fully described in terms of a simple relationship between perceived hunger and consumed calories. This crude measurement of subjective experience and behaviour fails to illuminate the processes which underlie the varied forms of human eating and the accompanying perceptual profile. The problem has arisen from a weak conceptualisation of the relationship between behaviour and experience, and from the use of insensitive measuring devices (Hill & Blundell, 1982/83, p. 203).

Stubbs et al. (2000) discuss the complexities in measuring a concept such as hunger. They acknowledge the word hunger does not describe every detailed sensation underlying the expressed motivation.

For instance, we do not say ‘I feel tired, empty, unable to concentrate, irritable and impatient to eat’, we say ‘I'm hungry’ (p. 407).

Hill et al. (1984) comment in similar vein:

What do subjects communicate when they rate their hunger by making a mark on a visual analogue scale? …hunger rating is influenced by external as well as internal stimuli …the hunger rating can be
viewed as a compound variable with the contribution made by each source of information varying depending on the circumstances in which it is made (Hill, Magson, & Blundell, 1984, p. 369).

Thus the mark on the visual analogue scale gives no indication of the range of information that inputs into the compound variable being represented. This is a serious limitation of these scales. As Mattes and Friedman put it:

…they generate ratings of intensity, not quality of experience, except as indicated by the scale descriptors (anchors) …it cannot be assumed that responses across individuals or within individuals over time, reflect the same quality of experience (Mattes & Friedman, 1993, p. 66)

The validity studies while they may reflect the reproducibility and reliability of visual analogue scales therefore do not address the issue of what is being measured. What a subject perceives to be hunger could include the desire to eat (appetite), is known to derive meaning ranging across many organs in the human body and has been shown to gain further meaning from environmental, social and even genetic contexts. These studies merely demonstrate that people who think they are hungry tend to eat.

Mattes, Hollis, Hayes and Stunkard (2005) describe a set of questions devised as an attempt to overcome this problem. These include the following: How hungry are you right now? How strong is your desire to eat right now? How much could you eat right now? How full are you right now? How strong is your desire to consume something sweet right now? How strong is your desire to consume something savory right now? How thirsty are you right now? However as Mattes et al. remark, the degree to which people understand the subtle differences between these questions is
uncertain. Furthermore, the actual sensations of hunger are not elicited by these questions or by rating scales as Friedman, Ulrich and Mattes point out:

People attribute a variety of bodily sensations to the experience of hunger ranging from vague feelings of restlessness or emptiness to acute ‘‘hunger pangs’’ in the abdominal region …However, in typical rating scales this physical dimension of the experience of hunger is reflected only in the ratings of fullness; ratings of the desire to eat, the amount that could be eaten, or of hunger do not refer explicitly or specifically to a bodily sensation. (M. I. Friedman, Ulrich, & Mattes, 1999, p. 396).

Thus while there is some agreement that rating scales can be shown to correlate with gross changes in feeding behaviour, they are a blunt instrument which fails to measure hunger sensations directly.55

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55 Friedman et al., recognising the limitations of the instruments in use and wishing to “provide a more complete picture of the experience of hunger,” had subjects mark on a drawing of a human figure where they felt hungry, first under imagined conditions of slight to extreme hunger, then during a 22 hour fast. They also attempted to correlate these markings with the subject’s reported hunger sensations. It is interesting that the authors, in taking this innovative pictorial approach to hunger reporting, did not ask patients to report their sensations in their own words at the time that they were actually experiencing hunger. Instead, prior to the experiment, they asked open ended questions on imagined hunger. These questions yielded eight descriptors (stomach growling, headache, thirsty, nausea, weakness, dizziness, anxiety, stomach aches and dry mouth). These descriptors did not include emptiness, the most frequently reported symptom in previous studies and the closest to Cannon’s gnawing sensation. Subjects were then later asked to choose among these eight descriptors to indicate what they were feeling at the time of hunger. The ability of some subjects to report hunger, even when it is present, may be marginal as Stunkard and Bruch found. That both Monello and Mayer’s and Friedman et al’s study relied upon reports of imagined hunger, even though they were interrogating “normal” eaters, must be seen as a serious weakness of design.

Friedman et al’s study showed that the intensity of those sensations most often associated with hunger, (physical sensations from the stomach, headache dizziness and weakness) increased with fasting and decreased with re-feeding in line with other studies. Pictorially, most subjects referred hunger to the abdomen, although head and throat were also represented. The size of the area of hunger sensation did not necessarily correlate with the degree of hunger as assessed by standard rating scales. Lowe, Friedman et al. (Lowe, Friedman, Mattes, Kopyt, & Gayda, 2000) repeated Friedman’s study, this time comparing obese and non-obese subjects in a 22 hour fast. They reported that correlations between and within the verbal hunger measures (including rating scales) and the pictorial measures were generally few in number and modest in size. Referring to the pictorial scales, normal weight subjects were found to experience more bodily hunger than overweight subjects initially but experienced less hunger than obese subjects after a prolonged period of food deprivation. Overall, while they take an interesting approach, these two studies serve to underline the difficulties that ensued when hunger became a black box. The pictorial representation appears to be an attempt to open the box, which unfortunately adds little to our understanding of the nature of hunger.
The Intuitive Eating Scale (IES) is a 21 point questionnaire (using five point rating scale from strongly disagree to strongly agree) designed to assess intuitive eating that includes such questions as “I find myself eating when I am lonely, even when I’m not physically hungry” and “I can tell when I am slightly hungry”. Although this scale is a significant step forward from hunger rating scales and although an attempt has been made in the use of the words “physically hungry” to separate the hunger sensations from the hunger emotions, the subjective nature of hunger remains poorly defined. Perhaps the proponents of intuitive eating consider that if the significance of the hunger sensation is innate, then it does not need to be defined, however the confusion in the literature regarding the nature of hunger suggests that any questionnaire that uses the word hunger is open to widely differing user interpretations.

8.3 Classification of hunger, satiety and the key eating sensations

From the above it should be clear that simply asking people if they are hungry is unlikely to provide useful data. The author believes it is possible to achieve far greater clarity in subjective reports of hunger and appetite, that certain subjective hunger sensations are distinct and recognizable, and that this partially involves a return to the concepts developed by early workers culminating in the work of Cannon and his contemporaries.

It is bold to suggest that the subjective experiences associated with eating are distinct and recognisable. According to Janowitz many have advocated that the terms “hunger” and “appetite” be banished for “the sake of linguistic peace” (1958, p. 327). Grossman expressed his perplexity at the “babel of terms” (1955, p. 77) while Mattes and Friedman mused that the uses of the word hunger seem nearly as varied as the
food used to satisfy it (1993, p. 65). The author suggests that this linguistic mélange has arisen as a result of a disinclination to attend to subjective phenomena in any detail. The confusion is not necessarily indicative of a fundamental difficulty in defining subjective experiences. Since clarity of terminology is necessary for the generation of testable theory, a suggested classificatory system is presented here.

Eating-related sensations are divided into hunger, satiety, thirst and the taste sensations. Hunger sensations are further divided into two main groups according to subjective features. One group of sensations indicates the body’s need to ingest food, while the other group indicates the body’s preparedness to ingest food. The proposed classification will be first presented in summary form.

8.3.1 Summary

- Hunger

It is suggested that hunger takes three forms:

1. The empty hollow sensation (EHS)
2. The vitiated empty hollow sensation (VEHS)
3. Inanition

In each of the three above sensation groups the intake of food tends to abolish the sensation and the associated desire to eat. These sensations thus comply with de Castro’s criteria for homeostatic stimuli, in that they are stimuli for food intake that are affected by food intake. However, as indicated in Chapter 6, homeostatic eating is
a continuum rather than a dichotomous state. It is suggested that eating in accordance with the EHS defends the milieu intérieur more effectively than eating in response to either the VEHS or inanition.

Other important subjective eating sensations are:

- **Satiety**

- **Thirst**

- **Indicators of intestinal dysfunction**

- **Somatic sensations of psychic distress**

  (Not related to intestinal function but included here because patients commonly confuse psychic distress with intestinal dysfunction).

### 8.3.2 The empty hollow sensation (EHS)

From the 1980s very little research interest in “what it is like to be hungry” can be found until the 21st century with the work of Ciampolini (for example Ciampolini et al., 2000; Ciampolini, Giannellini, & Butte, 2001). As a starting point then, the 1967 checklist of physical and emotional symptoms provided by Monello and Mayer (1967) (see section 8.2.5) will be used.

Monello and Mayer begin by grouping all physical sensations. Hence:
About 90% of all subjects report two or more physical sensations during extreme hunger as compared to 44% at 2 hr before the meal, 60% at 0.5 hr before the meal and 58% after a few bites at the meal (p. 255).

This is relevant since it underlines the fact that physical sensations are a major feature in the eating process at least in these subjects. However, since the reported sensations are widely diverse ranging from a rumble in the stomach to a tired sleepy sensation of the whole body, further subdivision was clearly necessary. Monello and Mayer found that gastric sensations indicate hunger most clearly.

Apart from emptiness, gastric sensations range from those that indicate distress such as nausea or “bloated” to those that indicate comfortable satiety such as “full.” It is unfortunate that Monello and Mayer in the text presentation and analysis of their results chose to report these sensations as a group. However in their accompanying table, of all the physical sensations relating to the stomach, only two, emptiness and fullness, they found prevalent enough to include. The study confirms earlier findings discussed in section 8.2.5 that emptiness is a cardinal sensation in hunger, while fullness is important in satiety. Other sensations appear to be of lesser importance. For that reason, emptiness will be considered in detail in the following section. The other sensations will be addressed together subsequently under the headings “Indicators of intestinal dysfunction” and “satiety”.

**Emptiness**

Emptiness is a common and recurring reported hunger symptom. As indicated in section 8.2.5 emptiness features prominently not only in the study by Monello and
Mayer, but also those of Garfinkel (1974), Blundell and Rogers (1980), de Castro and Elmore (1988) and Harris and Wardle (1987). Emptiness and hollowness appear to have similar connotations. At the very least they have more in common with each other than they do with terms such as “nausea,” “distended” and “tense.” It seems reasonable therefore to group them in the way that they have been grouped in the past as the hunger pang.

The author proposes to rename Cannon’s hunger pang the *empty hollow sensation* (EHS). Since the word hunger has been co-opted mainly for biomedical or

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56 The EHS is a term suggested by the author. It does not derive from Maharishi Ayurveda. The author is aware that the choice of terminology is crucial to the proper understanding and utility of the concept and has accorded careful deliberation to it. The word “sensation” earns a place to clearly differentiate the experience from a motivation or desire. Both Cannon (1929 p. 236) and Carlson (1931 p. 77) expressed difficulties with the word “empty” claiming that the word does not describe (in Cannon’s words) a “distinct datum of consciousness”, but rather expresses an inference about the condition of the stomach. Cannon stated that the “feeling of emptiness” should be “eliminated from further consideration” and in fact the word *empty* is conspicuously absent from his writings. In the author’s view omitting this word was a mistake which may have contributed to the demise of Cannon’s concept of the hunger pang. He was left with the words “dull pressing sensation” which to this author’s mind are far from descriptive. Carlson appears to agree, stating that

The hunger sensation can be correctly described as painful epigastric tension and pressure, but this, too, is unsatisfactory (1931 p. 77).

The professional concern of both authors for precision may have made them unduly cautious. From the viewpoint of communication with lay persons, and with the results of studies such as that by Harris and Wardell in mind in which the word *empty* figured prominently, it seems to this author that this word like the word *hollow* is descriptive and valuable. In practice, both are understood to refer to “what it is like” to be hungry and any connotations that suggest knowledge of the state of the stomach are unlikely to cause significant confusion, particularly now that the central-peripheral debate is no longer at the forefront of attention. Descriptors of alimentary interoceptive sensations are rare in the English language and the fact that “empty” and “hollow” seem to point to the same experience is felt by the author to be an advantage, since they reinforce each other. The word *gnawing* was considered. Although a very useful word, particularly when *empty* and *hollow* seem to be puzzling a patient, this too was rejected in naming the experience since it merges into the aversive stimulus VEHS whereas the EHS is anticipatory and not unpleasant. Thus:

The peculiar dull ache of hungriness, referred to the epigastrium, is usually the organism’s first strong demand for food; and when the initial order is not obeyed, the sensation is likely to grow into a highly uncomfortable pang or gnawing, less definitely localised as it becomes more intense (Cannon 1929 p.235).

As Cannon observes, gnawing is a later phenomenon. One reviewer of this manuscript suggested that *empty* and *hollow* are too close and that *pang* should be re-introduced. *Pang* is of value especially since it provides a substitute to the commonly used, but in this context, wholly unsatisfactory word *pain*. “Empty hollow pang” was nonetheless rejected as it did not seem sufficiently to place the
behavioural purposes it seems timely to reinstate the pang as a legitimate subjective sensation. It is hoped that the EHS will come to be seen, as it was for Cannon, a distinct subject for study in its own right.

**Other features of the EHS**

The EHS may have a mild gnawing quality although the word gnawing can imply an aversive stimulus whereas the EHS has an anticipatory quality and is “pleasant in its first rise.” The EHS is not experienced in any part of the body other than the epigastrium.

In section 8.2.2, Cannon (1912) was quoted as identifying the hunger pang as signifying the body’s readiness to digest. The proposed significance of the EHS then is primarily that the body is prepared to undertake digestion on a background of physiological need. It thus primarily indicates digestive timing.

When patients’ attention is drawn to the experience of the EHS it is frequently a revelatory experience for them. They express a sense of novelty or they may describe the EHS as a sensation they once had in their teens or many years earlier.

experience in the class of sensations (one can have a pang of remorse or a pang of conscience, both of which are feelings).

Finally, the concept of readiness or preparedness is important to the notion being expressed. “Ready to eat” in common parlance is commonly used to express the desire to eat and hence the word ready is not suitable. The “empty, hollow, prepared sensation (EHPS)” was a strong contender, but was eventually rejected as being less intuitively accessible.

Thus “empty hollow sensation” was chosen, with “readiness,” “pang” and “gnawing” as useful ancillary descriptors. The author feels that together, the words go a long way in restoring to view this distinct and important sensation which had become submerged under a welter of other bodily symptoms, rating scores, measured external stimuli and biochemical and neurological control systems all subsumed under the general word hunger.

57 This may not necessarily imply nutrient deficit. The homeostatic mechanisms that result in the EHS are likely to be complex and involve feedforward to ensure energy storage.
Patients frequently express amazement that what they had thought was hunger was in fact a sensation of intestinal dysfunction. Ciampolini trains subjects to avoid eating until sensations of hunger are apparent. That set of sensations, whatever they may be for any given individual, Ciampolini calls “initial hunger (IH)” (Ciampolini & Bianchi, 2006). Ciampolini (Ciampolini M, Personal Communication, 27th June 2007) has likewise commented on the experience of novelty when hunger sensations are explored. His criteria for unconditioned hunger sensations are:

1. Arise spontaneously
2. May appear novel on first recognition
3. May arise outside usual mealtimes on first experience

Both IH and the EHS conform to these criteria, indicating that they are not conditioned by external stimuli. If these sensations are unconditioned, then it seems likely that they represent a physiological signal to initiate a meal. The EHS is abolished by eating.

**8.3.3 The VEHS**

The vitiated empty, hollow sensation (VEHS) is suggested to be a deterioration of the EHS. The VEHS commonly occurs when the EHS is left unattended in which case it is experienced as more urgent, less agreeable, and even in some sense painful with an unpleasant gnawing quality. The VEHS can also occur when the empty hollow sensation is accompanied by other sensations such as nausea or burning. The proposed significance of the VEHS is that the optimum state of preparation for digestion has either passed or has been otherwise impaired.
Ciampolini has also recognised the concept of VEHS since he uses the term initial to
distinguish IH from the more painful experience that may arise from if a meal is not
forthcoming. It may be that it is the experience of the VEHS rather than the EHS that
prompts people to commonly report hunger as a “pain”. It is suggested that since the
EHS indicates the optimum timing for eating, the VEHS, indicates that the optimum
time has passed. It is therefore suggested that eating in response to the VEHS is less
homeostatic than eating in response to the EHS.

8.3.4 Timing in homeostasis

It is logical to think that we get hungry only because we need food and that the EHS is
triggered only by metabolic need. Clearly the EHS is related to metabolic need in
some way but it may also have a feedforward function in that it appears to regulate
energy storage. What then, is the exact relation between the EHS, readiness to digest,
energy balance and energy storage? Various authors including Cannon (1912, p. 443)
have pointed out that nutrient stores are not in a state of absolute deficiency when
hunger is present. What then triggers the EHS? Is it readiness to digest only? Is it
some indicator of metabolic need perhaps mediated by ghrelin or blood glucose? Is it
the need to replenish energy reserves? Or all of these at various times? The answers
to these questions on the physiological level are not known. The author suggests that
it is a combination of these things, but the EHS is a newly revived concept and more
studies are needed to clarify these points (see section 13.2.2). It is however,
suggested that whatever other conditions must be met before the EHS is experienced
at a given time, the EHS will not be triggered unless the digestion is ready. The
readiness of the digestion to carry out its task is a necessary condition for the EHS. It
may be that the EHS is the final common pathway in a complex feed-forward system that ensures the body does not get into metabolic substrate deficit, ensures maintenance of adequate (but not excessive) energy reserves and ensures that food metabolism proceeds at maximum efficiency.

According to Maharishi Ayurveda it is not what one eats but what one digests that is of metabolic importance. Timing is related to digestive efficiency, since the digestion can be more or less ready at different times. Evidence that rats whose stomachs were isolated from the central nervous system showed loss of the temporal rhythm of eating has been discussed in section 8.2.6 (Bash, 1939a, 1939b). Cannon was well aware that timing is of importance in maintaining internal constancy as evidenced by the following passage:

“The regulating system which determines a homeostatic state may comprise a number of cooperating factors brought into action at the same time or successively.” This statement is well illustrated by the elaborate and complex reactions in the blood itself ...and also by the arrangements for protection against a fall of temperature in which the defensive processes are awakened in series, one after another. (Cannon, 1932, p. 300).

To the best of the author’s knowledge Cannon did not develop this concept in relation to food intake regulation. He appears to have held two ideas simultaneously with respect to hunger for even in the 1912 paper in which he suggested hunger is a sign of readiness to digest (and argued against hunger as a sign of metabolic need) he is able to state:

Hunger… is the organism’s first strong demand for nutriment ...(p. 441).
while in his book “Wisdom of the Body” published in 1932, he appears to regard hunger as a kind of emergency signal to prevent starvation:

Insofar as an assurance of supplies of food and water is concerned, appetite, or the habitual taking of these substances, is the prime effective agency. If the requirements of the body are not met, however, in this mild and incidental manner, hunger pangs and thirst arise as powerful, persistent and tormenting stimuli which imperiously demand the ingestion of food and water before they will cease their goading. By these automatic mechanisms the necessary supplies for storage of food and water are made certain (Cannon, 1932, p. 76).

Whatever Cannon’s final thoughts on the matter, the notion of readiness to digest implies that there is an optimum time for food intake and that digestion can be more or less capable of efficiently carrying out its task at various times. This is not a familiar concept, at least in Western medicine. As mentioned briefly in section 6.2.1, digestion in Western medicine is regarded as a sequence of catalysed biochemical reactions which, given appropriate physical conditions such as temperature and hydration, will proceed in an expected and mechanical way. Nevertheless it is commonly experienced that symptoms of gastric discomfort can follow if food is eaten too quickly, taken when angry, anxious or upset or taken when attention is diverted by reading or watching television, for example. Although such symptoms of mild indigestion imply that the digestive system is at least under strain, they are generally not taken very seriously in the West. A patient who presents to a Western physician complaining of mild epigastric discomfort is likely to be screened for serious or treatable pathology such as, for example, the presence of in infective agent such as Helicobacter pylori or the presence of peptic ulceration. In the absence of
such pathology, the patient will in all probability be told there is “nothing much the matter,” given an antacid and dismissed.

The ontological theory of disease, strongly adhered to in the West may be partly responsible for this. Under the ontological theory, disease has being. Having being, a disease either exits or it does not. Thus, a person has inflammatory bowel disease or he or she does not, a person has a peptic ulcer or he or she does not. The idea that there could be a continuum of function in the gastrointestinal system, ranging from normal to overtly diseased, is rudimentary in Western medical culture. Eating is generally allowed more or less indiscriminately during sickness or in health, at various times of the day (frequent snacks are even encouraged among insulin dependent diabetics) and before, after or during exercise. In Maharishi Ayurveda, on the other hand, digestion is thought to fluctuate in efficiency according to a host of factors including time of day, the emotional state of the subject while eating and posture while eating (sitting or standing) to name a few. The Ayurvedic notion of digestive efficiency will now be discussed.

**Digestive efficiency**

*It is obvious that that the body tissues cannot be nourished and developed when food is not properly digested by agni.* Charaka Samhita, Chikitsa Sthana 15:5

Mild symptoms of indigestion are taken very seriously in Ayurvedic medicine, since they represent an early stage in a six-stage system of pathogenesis of disease. A tenet of Maharishi’s Vedic Approach to Health is that “Hunger is a sign of health”.

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58 Many animals starve themselves when they are sick. Perhaps this implies an instinctive knowledge of digestive capacity.
In Maharishi Ayurveda a concept known as *agni* is central to digestion. Agni could be compared to enzymatic function although cross-cultural correlations among terms cannot be exact. There are thirteen agnis seven of which take responsibility for each of the seven major *dhatus* or tissues of the body.\(^5^9\) The word *agni* literally means “fire.” Agni can exist in four states: *Manda, Tikshna, Visham* and *Sama*. Manda, Tikshna and Visham all refer to states of the digestive process that are less than optimal. Manda means dull. Manda agni refers to digestion that is slow and incomplete and is sometimes compared to a fire burning in a slow or dull manner. Patients who suffer from Manda agni typically complain of food sitting in the stomach for hours, or that food that was consumed the evening before is still remaining upon waking. Tikshna means sharp. Tikshna agni refers to digestion that is over sharp or acute. It can be compared to a fire that is burning very brightly. Patients might complain of burning or “acidy” epigastric sensations, waterbrash or the rapid development of the VEHS. Visham means irregular. Visham agni refers to digestion that is uneven and can be compared to a fire that is flickery. Here patients tend to complain of erratic hunger sensations, bloating, intestinal gas, transient colicky pains and constipation. Sama means even. Sama agni refers to digestion that is functioning in a smooth, balanced and efficient manner and can be compared to a fire that is burning efficiently.

It is held in Ayurveda that during the process of digestion and metabolism food passes through a step-wise metabolic process. The result of each of the final seven steps is

the formation and nourishment of one of the seven dhatus. Space precludes a full discussion of Ayurvedic metabolism, but the point of interest is that each dhatu has its dhatu agni. Should a particular dhatu agni not be functioning well, it is held that the corresponding tissue is not formed properly. Instead: 1) the accumulation of toxic intermediate metabolites is said to occur. As mentioned in section 6.2.1 these intermediate metabolites are collectively known as ama. 2) A backlog of nutrient material causes over-production of the dhatus preceding the afflicted agni. This particularly affects medha dhatu, or fat tissue. Thus when an obese person states that their appetite is “too good,” from the point of view of Maharishi Ayurveda this is incorrect. An excess of fat tissue accumulates when one of the dhatu agnis “down the line” is dysfunctional.

According to Maharishi Ayurveda, hunger indicates that the agnis are functioning properly and in concert. The author has not been able to glean a precise definition of the subjective experience of hunger among the expert Ayurvedic practitioners he has encountered. As in Western medicine, it seems to be expected that the subject will know when they are hungry. The EHS is thus a notion of the author’s and not specifically taught in Maharishi Ayurveda.

Although the general quality of the EHS is sufficiently invariable among individuals to allow its easy differentiation from other sensations, it is probable that not all people experience the EHS to the same degree of intensity even when in health. Whereas in the West, medical protocols tend to treat the human physiology as a fairly standard biochemical mechanism, with some allowances for genetic variation and differences among children, adults and the aged, in the Vedic paradigm, individual physiology is
held to vary considerably. A full explanation of this important area of Ayurvedic medicine, known as Tri-doshic theory, is beyond the scope of this thesis and it will be sketched in outline here only as it relates to the experience of the EHS. For more details the reader is referred to reviews of Ayurvedic medicine by Schneider and Fields (2006), Sharma and Clark (1998) and Kasturi (1991) and to the Caraka Samhita, one of the classical Ayurvedic texts (Bhagwan Dash, 1977).

**Tri-dosha theory**

Three metabolic principles exist according to tri-doshic theory, known as the *doshas*. These are Vata, the principle of movement, Pitta the principle of energy transfer and Kapha, the principle of structure. Each dosha has five subdivisions, the *subdoshas*, each subdosha having a particular function in the body. Each individual is born with a certain preponderance of the doshas and subdoshas known as the *prakriti* or “nature” of the individual. If owing to external stimuli a dosha is present in excess or diminished, the individual may feel discomfort. Such doshic imbalance is called *vikriti*. Severe and prolonged doshic imbalance is associated with the signs and symptoms of disease.

Tri-dosha theory allows individual differences to be taken into account in diagnosis and therapy in a more subtle manner than is possible in orthodox Western medicine. One important application of the theory is in food choice. Particular foods suit particular doshic combinations. Although the “personal factor in diet” has been recognised in the West (Macalister, 1907; van den Bree, Przybeck, & Robert Cloninger, 2006) and genetic influences are recognised (see, for example Rodin, 1985), the reductive philosophy underlying molecular biochemistry (in which all
humans tend to be reduced to the actions of the same set of biochemical moeities) has taken attention away from individual differences in metabolism.

The relevance of tri-doshic theory here is that the experience of hunger varies according to the prakriti and also in accordance with vikriti. In general, those of Vata predisposition tend towards Visham agni particularly when Vata is in excess. The EHS can be strong for one meal then less so for the next. These individuals need to cultivate the EHS carefully, a process that could be compared to “kindling the fire.” People who are strongly Pitta have a tendency to experience Tikshna agni. Patients may describe their hunger pangs as “like a furnace” or “cavernous” degenerating into pain if not met with food. Kapha types tend to experience Manda agni. In general those of Vata disposition tend to experience inanition early when food is delayed or missed. Pitta individuals experience the VEHS with great intensity and feel angry or irritated when food is delayed, whereas Kaphas can fast for long periods with little discomfort.

Within these doshic variations, the author suggests that the appearance of the EHS is a signal of sama agni and its absence a sign of the presence of ama. Eating in such a way that the EHS appears at mealtimes should result in less ama which in Western terms amounts to a lower likelihood of disease. Since, when it is first encountered, the EHS appears spontaneously and often far from meal hours, a pattern of eating in which the EHS appears regularly before mealtimes needs to be cultivated. This pattern will be discussed in the introduction to Chapter 11.
8.3.5 **Indicators of intestinal dysfunction**

These symptoms include nausea and indigestion. Indigestion includes abdominal pain as well as colicky pains and epigastric burning sensations. These indicate intestinal distress and a state of non-readiness to digest. Eating during this state is non-homeostatic.

With the possible exception of “rumble,” the remaining gastric sensations in Monello and Mayer’s list appear to have a greater relationship to dysfunction of some kind than with hunger *per se*. While it is true that prolonged hunger might be associated with distress (VEHS), it is possible to experience such symptoms as “tense” “tight” “ache” “pain” and “nausea” in the complete absence of hunger. They should therefore be grouped separately under the category of dysfunction symptoms. To these can be added other terms that have been associated with intestinal dysfunction, such as burning, reflux, heartburn, gripes, stomach-ache and colic. These can be differentiated from the VEHS although there is obviously a graded relationship between them. VEHS could be regarded as partially homeostatic indicating an urgent need to eat, whereas symptoms of intestinal distress indicate frank intestinal dysfunction.

8.3.6 **Satiety**

Two degrees of satiety can be differentiated:

1. Repletion. The author suggests the term comfortable, satisfied sensation (CSS) to indicate this degree of satiety. This term implies a combination of
type-b pleasure (contentment, satisfaction, fulfillment) and the comfortably full sensation.

2. A “bloated” “distended” feeling. This typically indicates that eating has been in excess and is associated with distress.

Monello and Mayer’s word relaxed perhaps indicates the degree of satiety that the author calls the CSS.

8.3.7 The “rumbling tummy” - borborygmi

Patients frequently report “rumbling” as a cardinal indication of their hunger. By rumbling patients are presumably referring to borborygmi. A borborygmus is an abdominal gurgling sound often accompanied by a characteristic abdominal sensation attributable to the passage of fluid and gas within the intestines. It is enhanced when gastrointestinal motility is increased, e.g. in obstructive conditions and in irritable bowel syndrome, and when excessive flatus is present. Classically, borborygmi begin at a low pitch and get louder and of increasing pitch over approximately 5-30 seconds.

Borborygmi may be associated with the EHS and indeed Cannon states that listening to the sounds of his own abdomen and correlating them with the hunger sensation was, for him, initial evidence of the peripheral nature of hunger (Cannon, 1929a, p. 232). Many patients thus take borborygmi as an indication that they are hungry. On close questioning during the sensation however, patients are not able to associate rumbling tummy with the EHS invariably. Borborygmi can be heard or felt in the absence of hunger sensation as Carlson notes in a footnote to his 1912/1933 paper (p. 501). Furthermore borborygmi can indicate flatus in the small or large intestine.
arising from bacterial action upon non-digestible carbohydrates or from other sources (Marteau & Flourie, 2001). Borborygmi should therefore be clearly differentiated from the EHS. The question arises whether borborygmi indicate some other level of hunger or some other form of hunger which might be useful to consider in itself. In the author's opinion, this is doubtful. It is difficult to see why the movement of air in the stomach or presence of flatus in the small or large intestine should be an indication for homoeostatic eating. Borborygmi might at times indicate the stomach is being emptied to make way for a new bolus of food, but since they also imply movement in the lower intestine, their appearance does not seem to be sufficiently specific to be a reliable indicator for food regulation.

8.3.8 Inanition

Monello and Mayer’s symptoms listed under “in the head” – “headache, dizzy and faintness” – are frequently reported by patients as indications of hunger often accompanying the symptoms “weak” “tired” and “sleepy.” These sensations can be grouped as “general physical sensations” to which may be added restlessness. These correspond to the feelings of inanition identified by earlier workers and which Hurst termed “hunger of the starved tissues.”

The Compact Oxford English Dictionary (2003, p. 562) defines inanition as “exhaustion due to lack of nourishment.” Systemic symptoms of inanition include tiredness, light-headedness, faintness, weakness and loss of concentration. Patients often use the word hunger when on closer interrogation they mean inanition. It is proposed that the symptoms of inanition signify that the body urgently needs (but is not necessarily prepared) to ingest food.
It is suggested here that eating in response to inanition is homeostatic insofar as regards need, but not as regards timing. In the presence of EHS the subject eats in timely fashion. Food is thus taken and absorbed before inanition need occur. Inanition is thus suggested as a late sign of food need, a kind of “emergency signal.” It need not occur if the system represented by the EHS is functioning efficiently.

In clinical practice both Ciampolini and the author have independently advised subjects to eat only lightly (for example, fruit, steamed vegetables, light soups) in response to the inanition prompt. Subjects must tread a narrow path between alleviating the nutrient lack and the risk of overloading the unprepared digestive mechanism. Should overloading occur the consequent improperly digested material violates the homeostatic condition of purification.

Ciampolini describes two sensation clusters (he terms them metabolic perceptions) that occur commonly at lower blood glucose levels:

…gastric pangs and feelings of emptiness, or mental activity impairment (no enthusiasm, difficulty in sustained mental concentration, irritability) (Ciampolini et al., 2000, p. 290).

These amount to a combination of the EHS and the feeling of inanition as described in this thesis. The EHS is therefore not identical to IH but is rather, a subset of it.

Although the majority of Ciampolini’s subjects experienced the sensation of

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60 This is the opposite interpretation to that of many patients who see inanition as an early sign of nutritional need and the EHS as the “emergency signal”. In the author’s view inanition that appears before the EHS indicates inefficient digestion. Such early appearance of inanition occurs commonly in patients who are strongly Vata in doshic type or who have Vata vikriti. In that case careful “kindling” of the EHS is required by taking light foods only.
emptiness, he prefers to leave the question open as to what exactly a person should be feeling. Whatever a person feels “at first rise” is the salient experience for them, to be noted, remembered and acted upon before future meal times.

**8.3.9 Thirst**

Thirst can be described as a parched feeling of the mouth and throat. Thirst indicates the need for fluid.

**Other mouth symptoms**

Here Monello and Mayer list “salivation, dry, empty, tight, tense, unpleasant taste, pleasant taste and relaxed.” Dry is more correctly associated with thirst than with hunger. Tight and tense appear to be symptoms of distress, to which might be added the symptom of unpleasant taste. Relaxed is an unexpected symptom in this context, and one wonders on what basis Monello and Mayer included it. A relaxed feeling of the mouth does not immediately spring to mind as a symptom of hunger. Similarly, a pleasant taste prior to the intake of food is difficult to fathom. The author cannot recall a single patient report of either a relaxed feeling of the mouth or a pleasant taste prior to eating. An unpleasant sensation in the mouth may prompt one to eat in order to relieve that sensation, but this should not be called hunger.

Salivation might reasonably be included *a priori* as a genuine symptom of hunger since clearly salivation is an important part of the ingestion of food. Some patients refer to “mouth hunger” to differentiate salivation from gastric symptoms. It should be noted though that salivation can be stimulated by the sight, smell, or even mention
of particular foods (Wooley & Wooley, 1973). The arbitrary nature of such stimulation rather tells against salivation being an intrinsic part of a homoeostatic pathway for eating regulation. Salivation can occur in the presence or absence of EHS. It appears then that mouth symptoms such as salivation and lip smacking may be better identified as associated with the desire to eat, which may or may not be homeostatic and thus associated with the term appetite, rather than hunger. As will be discussed in Chapter 9, two senses of the word appetite can be distinguished, wanting to eat and liking to eat. Salivation appears to arise with liking to eat.

**In the throat**

The symptoms listed here are “dry, empty, tight, tense, unpleasant feeling, pleasant feeling, relaxed and nausea.” The groupings of these terms are similar to those of the mouth. Dry is logically associated with thirst. Tight and tense are logically associated with distress. Unpleasant pleasant and relaxed are, as before, non-specific symptoms. The symptoms empty and nausea in association with the throat are of interest, since they have been frequently reported to the author. Rarely, however, do they stand up to close scrutiny on the patient's part. On closer inspection of their symptoms, patients generally resolve such symptoms into the category of psychic distress – deciding for example that what they first perceived as emptiness, they now perceive as tightness or tenseness or a kind of “soul emptiness” that indicates a deeply felt need of some kind (see section 10.2.4).

The author has never encountered the symptoms cold and warm in reports of hunger. It would seem that in spite of suggesting the terms to their respondents, neither did
Monello and Mayer since these symptoms do not appear in their table of results reporting hunger sensations. Perhaps they deliberately introduced ‘false’ options in the questionnaire as a means to assess the validity of their findings.

8.4 Conclusion to Chapter 8

At the conclusion of Chapter 7 it was suggested that a disturbance in the desire/fulfillment, hunger/satiety cycle might be a reason many people eat in response to stimuli that are not affected by eating. Hunger was recognised as information flow. Information (as opposed to data) has meaning, thus hunger has meaning. Chapter 8 sought an answer to the question: “What is hunger?” with a view to understanding the meaning of hunger. Since hunger the sensation and hunger the emotion (appetite) are frequently confused, the chapter began by differentiating them. It was found that within hunger distinct sensations can be recognised and classified. It was suggested that the characteristic empty hollow pang of hunger recognised by early workers from Bain to Cannon is worthy of study in its own right and it has been renamed the EHS. It is suggested that the meaning of the EHS is that the digestive process is ready and able although it also has significance in energy regulation including storage. The VEHS was defined as impaired EHS and inanition an “emergency signal” that nutrition is required. Inanition does not occur if food is taken in timely fashion in response to the EHS, suggesting that the EHS participates in a feedforward system that ensures an “energy buffer”. Other sensations are frequently included with, or acted upon as if, hunger. These include burning sensations and pain which were classified as indicating digestive dysfunction and also include somatic symptoms of psychic origin. Food taken in response to such symptoms is non-homeostatic. It may cause further intestinal distress on the one hand and do nothing to finally relieve
psychic distress on the other. The significance to homeostasis and therefore health in differentiating among the various symptoms outlined in this Chapter should therefore be clearly seen.

Whereas Chapter 8 dealt with “hunger as sensation,” Chapter 9 deals with appetite, or the desire to eat.
Chapter 9 Eating desires

Introduction

In Chapter 6, a simple “common sense” food regulation system was proposed in which hunger stimulates the desire to eat and eating fulfills the desire. In this chapter, the eating desires will be examined in relation to the eating sensations identified in Chapter 8, in particular the EHS. The twin themes of this chapter and Chapter 10 are “Food tastes wonderful when you are hungry!” and “Well begun is half done.” This chapter confirms that the desire to eat that arises in response to the stimulus of the EHS supports homeostatic eating.

9.1 Desire to eat

The stimuli that can invoke the desire to eat are protean. These are summarized in the following figure.
Stimuli affected by intake

- EHS
  - When to eat
- Inanition
  - Need to eat
- Palatability
  - What to eat

Stimuli not affected by intake

- External, emotional and other stimuli (Chapter 7)

**Figure 24 Stimuli to the desire to eat**

Only the desires that arise from interoceptive sensations are affected by intake (homeostatic).

Chapter 7 dealt with those stimuli that are not affected by food intake. This Chapter and Chapter 10, address two sets of stimuli that are affected by food intake. These stimuli are interoceptive sensations and are 1) those related to palatability (taste, smell and texture) and 2) the hunger sensations, EHS, VEHS and inanition. Of the latter the EHS is the more homeostatic and therefore the more important.
9.1.1 Wanting and liking

Before discussing palatability, a distinction should be made between appetite as “liking” in the sense that Shakespeare (and most writers) used the term, and appetite as “wanting” to eat, a sense used by Berridge and his co-workers (2004). The former use is related to palatability and the gustatory sensations, the second to the motivation towards eating. For clarity it is preferable to avoid the word appetite and adopt either the term desire to eat which implies both wanting and liking or if they are to be distinguished, then “liking” to eat and “wanting” to eat. These common language words may seem imprecise, but Berridge justifies their use as more immediately conveying the distinction between affect and incentive than the more precise but technical terms such as the affective process or sensory pleasure (liking); and incentive salience, or the non-affective (but motivational) processes that translate affect into action (wanting) (Berridge, 1996, p. 4). Liking to eat and wanting to eat generally move together. Their dissociation will be addressed in Chapter 10.

9.1.2 Palatability

Palatablity can be defined as pleasantness of taste and is to do with pleasure and liking to eat. Liking to eat is a response to the taste, smell and texture of food. Liking to eat has sometimes been called “mouth hunger” since it is associated with the gustatory apparatus. As indicated in Chapter 8, it may be associated with salivation or lip smacking. Since the sensory pleasure associated with food can change or reverse to become dislike or even disgust under certain physiological conditions, palatability should properly be seen as a response to food rather than an intrinsic property of the food. This point has been the source of some confusion and will be briefly discussed.
Given the intense effort displayed by food manufacturers to find that set of ingredients that maximises the palatability of their products (see for example Hermanussen, Gonder, Stegemann, & Hoffmann, 2008) and the popularity of fast foods (Isganaitis & Lustig, 2005), it might seem _prima facie_ likely that there is something about some foods which make them more immediately attractive than others not only for humans but for laboratory animals as well. Rat chow can be manipulated to be more or less attractive to the majority of rats. Shared details among facial responses have been noted in humans (including neonates) (Greimel, Macht, Krumhuber, & Ellgring, 2006), apes, Old World Monkeys, Prosimians and rodents (Berridge, 2004) allowing an objective measure of “taste reactivity.” Facial responses to the sweet taste appear to consistently express pleasure across species, while the bitter taste elicits dislike, suggesting that sweet foods are inherently agreeable while others are not. It is tempting to postulate that these observations reflect an objective property inherent in the food. Should they be so interpreted or should they be seen as a predilection that arises from the way the shared mammalian brain is structured rather than a property of the food itself?

Leading a series of articles on the subject Ramirez (1990) voiced concern that investigators: “failed to distinguish different possible meanings of the statement: ‘palatable foods increase intake’.” Ramirez charged Kissileff (1986) with adhering to the view that palatability is an objective property of food. If palatability is an objective property of foods, he says, then according to this view
...there is a correct answer to the question "which is more palatable, vanilla or chocolate ice cream?," just as a red traffic light is still red, even if seen as green by a colour blind person (p. 159).

Kissileff (1990) responds by denying that palatability is an objective property of food, and introduces the term 'intrinsic palatability' meaning "the rating a subject gives to an item when asked 'how much do you like or dislike' the item in question?" This property of the food he distinguishes from 'learned palatability' which, he suggests is a response-based prior association between a food and its post-ingestional consequences. In denying that palatability is an objective quality of food Kissileff is in accord with most other writers including Le Mangen:

Palatability of food… is not (as is often believed) the sensory properties of a food but the ingestive response to these sensory properties, according to the state of the systemic stimulation (Le Mangen, 1985, p. 28).

As Berridge puts it:

The pleasantness of taste changes with physiological need or satiety. In a sense, it is a “response” by the brain to a configuration of physiological stimuli and associative cues, as well as to the taste itself (Berridge, 1996, p. 2).

Palatability will be regarded here not as a property of food, but as a response to it. That response can change according to the physiological condition, a phenomenon known as alliesthesia, which will be discussed in the following paragraphs.

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61 That previous learning plays a part in the perception of palatability is supported by a recent study by Yeomans, Chambers et al. (2008). Subjects were asked to rate a novel kind of ice cream. Those who were not told of the constituents of the ice cream rated it as pleasant. Those who were told that it was salmon ice-cream (as in fact, it was) rated it as highly unpleasant.
9.1.3 Alliesthesia

If we are truly starving, even ordinary food becomes especially delicious (Berridge, 2004, p. 183).

Enough, no more: ‘Tis not so sweet now as it was before.

The term alliesthesia, originally proposed by Cabanac (1971), refers to the “change in the pleasantness of a constant physical stimulus as a consequence of a change in physiological state” (Berridge, 1996, p. 2). That hunger elevates and satiety depresses the pleasantness of foods is a familiar experience and was recognised by Aristotle who said

…Savours are qualities of nutrient matter, the odours connected with these are agreeable as long as animals have a hunger for the food, but they are not agreeable to them when sated and no longer in want of it. (Aristotle, in: Parva Naturalia).

The association has been formally demonstrated in humans (Cabanac, 1971, 1979; Cabanac & Fantino, 1977; Fantino, 1984; Laeng, Berridge, & Butter, 1993; Looy & Weingarten, 1991), while a comparable phenomenon has been found in rats by observing behavioural affective reactions (Berridge, 1991; Cabanac & Lafrance, 1990, 1992a, 1992b). Alliesthesia extends to other sensory modalities and can be either positive or negative. During hypothermia, a warm stimulus can seem pleasant, yet the same stimulus when the body is hot appears unpleasant, an example of negative alliesthesia (Cabanac, 1979). Sensory specific satiation, or as it is more generally known, sensory specific satiety, is another instance of negative alliesthesia, in which an individual, being sated with one particular food, loses his or her desire for
that food (B. J. Rolls, 1986; B. J. Rolls, Hetherington, & Burley, 1988; B. J. Rolls, Rolls, Rowe, & Sweeney, 1981; B. J. Rolls, Van Duijvenvoorde, & Rolls, 1984; E. T. Rolls, Rolls, & Rowe, 1983). “Sensory specific appetite,” sometimes known also as “food specific response” or “sensory-specific stimulation,” is the converse of sensory specific satiety. It is the predilection for a particular food and is seen, for example, when a new taste is presented towards the end of a meal.

In man, the use of a sweet dessert, i.e. of the most palatable food at the end of an ordinary meal, which then can be eaten as a result of a minimal residual hunger signal, is good evidence for this process (Le Magnen, 1985, p. 43).

Berridge recognises that physiological deficit motivates an animal to find food by making food more attractive thus implying that alliesthesa has a homeostatic role.

Food reward is focused upon the taste, smell, sight, and feel of food and of the act of eating. Physiological deficit cues act largely by modulating the value of incentive stimuli (Berridge, 1996, p. 2)

This notion was first put forward by Richter who suggested that animals are sensitive to specific metabolic needs and secure the nutrients that are needed. Richter demonstrated that adrenalectomised rats will seek out salt and parathyroidectomised rats will take more calcium (Richter & Eckert, 1937). The phenomenon of pica (craving for non-edible items) may represent an extreme and distorted version of motivation by physiological deficit (Pelchat & Schaefer, 2000, p. 353) whereas sensory specific appetite is the more everyday example.
While it is well recognised that food tastes very good if one is hungry, the fact that one feels particularly satisfied when food is finally taken, more so than if food were taken in the absence of hunger, appears to have been overlooked. Thus it is suggested that the EHS enhances not only type-a pleasure, but also type-b pleasure. The author suggests that the full implications of hunger in the homeostatic regulation of food intake have not been recognised.

This is not to suggest that the intake of food is not pleasant at all in the absence of the EHS (it is pleasant to a lesser degree), nor is it to suggest that other factors such as setting, social interactions and the nature of the food being eaten do not also play a part in the overall enjoyment of eating. These factors are clearly interwoven with eating pleasure. What is suggested in this thesis is that eating in the absence of hunger (in particular the EHS) denies many eaters as much enjoyment of both type-a and type-b eating pleasure as they might otherwise have experienced. For them, eating is pleasurable, but could be more so. This phenomenon will be addressed in section 9.2.2.

The heightened pleasures of eating during the EHS have particular and salient qualities. Since they are intimate to the theory being presented these are deserving of their own terminology which will be presented in the following section. Their role in homeostatic eating will then be outlined.

Rogers (1990) has identified the need for a distinction between the pleasantness of taste of food and the pleasantness of ingesting that food. The two categories below (savour and relish) fulfil this need when eating in response to the EHS.
9.1.4 Enhanced eating pleasures during the EHS

Savour

The term Savour (savouring) is suggested for the heightened enjoyment of pleasure derived from the taste, smell and texture of food, which occurs spontaneously during the EHS. Although extreme hunger (VEHS) suppresses taste responsiveness (one tends to eat anything when hunger is extreme) less extreme states of hunger are recognised to increase responsiveness to taste (Kauffman, Herman, & Polivy, 1995). In its most refined form, called here simple appreciation, savour is the enhanced appreciation of simply prepared, even bland foods, together with a loss of appreciation of highly worked, complex foods, processed foods or foods that have not been prepared from fresh ingredients.

Savour should be differentiated from epicurean appreciation, which refers to the discrimination of taste among gourmets and connoisseurs of fine foods. The crucial distinction between this learnt ability, comparable to the skill of a wine taster, and savouring is that the latter is spontaneous and non-intellectual arising from enhanced awareness whereas epicurean appreciation is a learnt process. It is possible to enjoy both, and each complements the other.62

62 The word savour can be either a verb or a noun. The verb to savour refers to the act of perceiving a taste (or other experience). It carries the idea of dwelling upon a taste, extracting every last modicum of interest from it. As a noun savour refers to the sensation itself, the “essential virtue or quality, interest, power to excite” as in “all the savour of life is departed” (The New Shorter Oxford English Dictionary, 1993, p. 2696). In this context savour is intended as a verb.
Relish

Relish is defined here as the heightened pleasure taken in filling the stomach in response to the experience of the EHS, as opposed to the less intense enjoyment of filling the stomach in the absence of the EHS. The word relish, (apart from meaning a piquant sauce) can refer to enjoyment of the taste or flavour of something, but has also the figurative sense of “pleasure obtained from something agreeable; a liking, a zest; keen or pleasurable anticipation” (The New Shorter Oxford English Dictionary, 1993, p. 2538). The suggested use of the term has an historical precedent. According to Cardno (1956, p. 272), for Bain, relish was a “rich, luxuriant, satisfying sensation,” the voluminous feeling associated with repletion or satiety, and which could be experienced in mouth or stomach. If in the stomach, Bain referred to it as “stomachic relish.” For purposes of present-day clarity, the use of the word relish will be confined to the stomach.

9.2 An expanded pleasure-based regulatory system

9.2.1 Anticipatory and consummatory components to the eating-related desires

Referring again to figure 15, (section 6.3.5) illustrating the sequence of desire, action, achievement and fulfillment it could be said that in the general case, eating-related desires have two phases: anticipatory and consummatory, corresponding to desire as initially experienced and its fulfillment respectively. The anticipatory component of an eating-related desire usually implies the seeking of type-a pleasure (the stimulation of a particular taste or food texture, for example). The consummatory phase is the
experience of type-b pleasure, or contentment that follows the consumption of that food. The terms sensory-specific appetite and sensory-specific satiety correspond exactly in the case of savouring. Relish also has anticipatory and consummatory phases. The following chart clarifies this point:

<table>
<thead>
<tr>
<th>During meal</th>
<th>Anticipatory</th>
<th>Consummatory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Savouring</td>
<td>“I’d like to eat that”&lt;br&gt;Identification of a particular gustatory sensation as salient (enhanced sensory specific appetite).</td>
<td>“That hit the spot”&lt;br&gt;Fulfillment gained by experiencing that particular sensation (enhanced sensory specific satiety).</td>
</tr>
<tr>
<td>Relish</td>
<td>Pleasurable anticipation of filling the stomach in presence of EHS. “I’m starving” (colloquial)</td>
<td>Contentment&lt;br&gt;Comfortable satisfaction of repletion (the CSS) “That feels better!”</td>
</tr>
</tbody>
</table>

**Chart 3 Pleasure, anticipatory and consummatory, associated with the EHS**

It is suggested here that savour and relish have specific roles in eating homeostasis. Savouring guides what to eat. Sensory specific appetite is enhanced, allowing better identification of particular tastes likely to bring satisfaction. Feedback upon the anticipatory desire occurs when the desire to eat that particular taste or texture is satisfied. Relish guides when to eat and when to end eating such that the timing of the digestive process is optimised. The desire to fill the stomach disappears with the experience of contentment. Since relish guides when to eat, liking to eat should attend upon relish.

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63 It should be noted that there is another layer of alliesthesia implicit in anticipation which is to do with expectation. Hunger plus the expectation of eating is pleasant, but hunger with no expectation of eating is unpleasant. This thesis aims to help improve homeostatic eating in the food-rich environment.
During relish and savouring both wanting and liking to eat are increased. Thus the EHS reinforces both eating motivation and pleasure in an integrated way. This idea was anticipated by Carlson who wrote:

…in normal health, the hunger pains, the desire for foods, and pleasant memories of the taste and smell of foods are ordinarily present simultaneously; they mutually reinforce one another, and lead to a common goal, the taking of food (Carlson, 1912/1993, p. 506).

9.2.2 Knowing when to stop

The more pleasure the more fulfillment

As indicated in the introduction to Chapter 8, it is logical to assume that satiety, in the sense of a feeling of epigastric fullness, is the important physiological indicator to consider in the homeostatic cessation of eating. That fullness is important is not disputed. However this theory posits that the pre-meal eating sensations are more important to the cessation of eating than has been hitherto suspected. It is suggested that knowing when to stop depends upon knowing when to start. The indicator for when to stop eating is given not only by feelings of stomach fullness, but by the context in which those feelings are felt, namely the stomach sensations that were present at the time of meal initiation. This is so because pre-meal sensations bear upon the degree of contentment that accrues from eating (the “satisfied” component of the CSS). This notion is examined in this section.
In section 6.3.2 it was suggested that the strength of a desire indicates the degree to which action will result in achievement and fulfillment. The pleasure of fulfilling a strong desire is greater than that of fulfilling an indifferent desire. Thus only when the desire to eat is strong and the pleasure of eating is high can the level of contentment reach threshold for the desire to be fulfilled. In the presence of the EHS, the desire to eat is strong, the pleasure of the first bite intensely pleasurable, and the level of satisfaction gained from eating is enhanced. The new idea being suggested here is that eating in the presence of the EHS helps ensure that eating pleasure is sufficiently high to fulfil the desire. When eating in response to the EHS the following phenomena occur in sequence: 1) the EHS decreases in intensity, 2) food tastes overall progressively less palatable,\(^64\) 3) an increasing feeling of contentment overcomes the desire to eat and 4) the CSS (satiety) appears.\(^65\) Eating ceases once that desire is fulfilled, regulating the eating process. The degree of contentment depends upon how much pleasure the meal has provided. Some evidence supports

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\(^64\) Not all individuals notice this but that may be because they do not attend to it. A study by Mook and Votaw (Mook & Votaw, 1992) is often quoted as providing evidence against the “strong hedonic hypothesis” the hypothesis that lowered palatability is the immediate, proximate cause of meal termination. Subjects in their study reported overwhelmingly that they usually stop a meal when they feel full, not when “the food stops tasting good” (or “the food tastes less good” in a replication). Pre-meal hunger was not considered. If they were not in the habit of experiencing the EHS, then not all the 36 subjects (if any) would experience the dynamics depicted in figure 25, their experience would correspond to figure 26 in which fullness alone terminates the meal. Furthermore subjects relied upon memory – they were not questioned during a meal. Attention is an important factor in meal cessation. Poothullil studied nine “hungry” women who were asked to eat cereal 1) until the pleasantness of the flavour subsided 2) until the stomach felt full and 3) while watching television. These conditions were compared to “baseline” in which the subjects were asked to eat until satisfied. Subjects ate similar amounts of cereal to baseline under condition 1 and significantly more than baseline under conditions 2 and 3, suggesting that pleasantness of flavour is a significant factor in satiety when subjects are asked to attend to it (Poothullil, 2002). In another study Poothulli demonstrated significant suppression of cereal intake after both maltose and glucose ingestion suggesting in important role for “oral satiation” in meal cessation (Poothullil, 1995).

\(^65\) The feeling of stomach fullness usually coincides with the feeling of contentment (the term CSS is intended to convey a combination of comfortable full sensation and satisfaction) however the coincidence of fullness and contentment may not necessarily occur. One could feel satisfied before the “full” epigastric sensation. In prolonged fasting, in which the EHS may have been present for some time (or degenerated to the VEHS), stomach fullness could occur before contentment. This is one reason the author does not generally recommend fasting. It is suggested that eating soon after identification of the EHS allows for optimum timing and optimum contentment in initiation of a meal.
this contention. Hill et al. (1984, p. 367) have demonstrated a highly significant effect of eating food upon positive feelings and moods but they note that increased relaxation and contentment occur only after eating a highly preferred (i.e. pleasurable) meal. Thus pleasure must be high for fulfillment to occur. A simple pleasure-based regulatory system was proposed in section 6.3.5. That process can now be charted in more detail as the process of eating in response to the EHS (figure 25).

66 Cabanac and Duclaux (1970) have shown that in a group of obese subjects, ingestion of 50g of glucose did not cause negative alliesthesia, i.e. the taste of a sucrose sample to change from pleasant to unpleasant as occurred in non-obese subjects. Obese people seemed to feel little difference in pleasure between before and after glucose load conditions. The lack of contrast supports the idea that a “fulfillment threshold” had not been reached, probably because the initial pleasure was not high. In another study Frankham, Gosselin and Cabanac (2005) showed that obese subjects who lost weight over a 3 month period achieved negative alliesthesia more quickly than they had before losing weight, suggesting again that in the obese condition the normal pleasure-based regulatory mechanisms do not operate properly. The obese seem to be blunted not only to internal prompts such as hunger, but to pleasure and displeasure as well.
The figure shows relations between the intensity of eating pleasure, contentment as a result of eating, and the eating sensations during a meal. The enhanced eating type-a pleasure (relish) resulting from the EHS leads to an enhanced sense of fulfillment (contentment, type-b pleasure). Crossing a certain level of contentment (the contentment threshold) fulfills the desire to eat. The EHS (straight red line) declines more rapidly than eating pleasure (eating pleasure continues after cessation of the EHS). Nevertheless, since pleasure was intense at the outset, contentment (type-b pleasure) is strong, there is no “zone of indifference” and the eating desire is fulfilled. Sensations of satiety (fullness, blue straight line) increase during eating. When food is taken soon after the onset of the EHS satiety sensations (CSS) augment the feeling of contentment such that stomach fullness and contentment coincide.

Thus in the presence of the EHS, the pleasure of eating, both type-a and type-b are enhanced leading to fulfillment of eating desire. When the initial pleasure is low (as for example when eating in the absence of the EHS) the threshold will not be reached.
and the desire will remain unfulfilled. Figure 26 charts the situation in which the EHS is absent.

**Figure 26  Eating in the absence of the EHS**

Eating pleasure is less intense in the absence of the EHS. The level of fulfillment does not cross the threshold for extinguishing desire, hence eating continues at a low level of pleasure despite the sensation of fullness. Feelings of fullness still occur but do not augment contentment since contentment is largely absent. Since the desire to eat continues, eating may extend beyond the CSS and into discomfort (bloating).

Since savouring and relish are absent, the fulfillment gained from eating is diminished. If sufficiently diminished, it will not cross the threshold that would allow fulfillment of the eating desire. Eating therefore continues into the zone of discomfort and is non-homeostatic. Some supporting evidence is provided by Marmonier et al. These workers showed that a snack consumed in a satiety state (i.e. in the presumed absence of the EHS) has poor satiating efficiency. Poor regulation of food intake
follows – a snack taken in the satiety state has been demonstrated to have no impact on energy intake during the subsequent meal (Marmonier, Chapelot, Fantino, & Louis-Sylvestre, 2002; Marmonier, Chapelot, & Louis-Sylvestre, 2000).

The sensations of the EHS and the degree of pleasure taken in eating in its presence appear to establish a kind of baseline from which it is easier to gauge satiety. In everyday language, it is easier to know how to get to a place when you know where you have started from, or “well begun is half done.”

9.3 Conclusion to Chapter 9

This chapter extended the simple desire-based food regulation scheme of Chapter 6 to include the concepts of alliethesia (“Food tastes wonderful when you are hungry.”) and threshold pleasure for satiety. The key point is that eating in response to the EHS (and, to a much lesser degree inanition) increases both type-a and type-b pleasure and supports homeostatic eating. The fulfillment gained from eating in response to the EHS satisfies the eating desire so that eating is regulated. Type-b pleasure (contentment) is thus important to homeostatic eating. The next chapter further examines the consequences of eating in the absence of type-b pleasure and eating in states of low mental arousal during which type-b pleasure predominates. The following chart summarises the eating-related emotions and sensations, their location, nature, significance, possible neural mediators and associated studies.
<table>
<thead>
<tr>
<th></th>
<th>Significance</th>
<th>Subjective experience</th>
<th>Location of subjective experience</th>
<th>Possible neural mediators</th>
<th>Associated studies</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EMOTIONS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Liking to eat</td>
<td>Homeostatic in respect to food type, esp. in presence of EHS</td>
<td>Enjoyment of taste enhanced with EHS i.e. savouring)</td>
<td>Mainly localised to tongue, mouth, nose</td>
<td>glutamate, opioids, benzodiazepines, endocannabinoids</td>
<td>Palatability studies and debate on palatability</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Enjoyment of filling stomach enhanced with EHS i.e. relish</td>
<td>Localised to epigastrium</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wanting to eat</td>
<td>Incentive to eat. Motivation</td>
<td>Generalised wanting</td>
<td>Generalised</td>
<td>dopamine pathways</td>
<td>Dependence studies</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cravings if disassociated /sensitised</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>SENSATIONS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inanition</td>
<td>Need to eat, but not necessarily ready to digest (partially homeostatic)</td>
<td>Faint, weak, lightheaded and other systemic symptoms</td>
<td>Generalised</td>
<td>? Low glycaemic levels. Probable stomach quiescence “hunger of the starved tissues.”</td>
<td>Some subjects in Ciampolini’s studies.</td>
</tr>
<tr>
<td>EHS</td>
<td>Homeostatic timing. Ready to digest. Implies need for food. (homeostatic)</td>
<td>Empty hollow sensation. Pleasant on “first rise” can become pressing with gnawing urgent quality if left (VEHS)</td>
<td>Localised to epigastrium</td>
<td>Probable stomach contractions. Low glycaemic levels. Insulin, leptin, NPY, AgRP, MSH, CART, GLP-1, orexins, ghrelin, PYY, and other peptides along with serotonin pathways and other aminergic systems may be involved.</td>
<td>Majority of subjects in Ciampolini’s studies. EHS has not been specifically studied since Cannon and his contemporaries</td>
</tr>
</tbody>
</table>

**Chart 4 Summary of the significance of the hunger-related sensations and emotions**
Chapter 10  Inner directed attention favours pleasurable (homeostatic) eating

Introduction

In Chapter 9 it was suggested that the EHS favours homeostasis because food yields more pleasure (savour and relish) when taken in response to the EHS and particularly, more fulfillment (type-b pleasure). It could be said that the increased type-b pleasure provides a “better alternative” to the mind than continued seeking of type-a pleasure from food or other stimuli. Thus it is the increased type-b pleasure of eating in response to the EHS that regulates eating, and people eat in a non-homeostatic manner because eating, if it consists mainly of type-a pleasure and lacks type-b pleasure is not fully pleasurable for them.

When the threshold of satisfaction is not reached, unregulated eating may lead to over-eating or under-eating, to poor energy balance, and, in extreme cases, to food cravings, food addictions and eating disorders. Eliciting the EHS involves a 180 degree turn of attention from external stimuli to the internal stimuli that arise interoceptively within the body. In Chapter 6 it was suggested that the progression from diversity to unity was associated with type-b pleasure. Eating in the presence of the EHS can be seen as a minor move in that direction. A more effective way of eliciting type-b pleasure is in transcending thought. The theme of this chapter then is that not just the EHS, but inner directed attention in general, with its attendant low mental arousal and type-b pleasure is favourable to homeostatic eating, while its opposite, externally directed attention, can lead to dangerous cycles of food
dependence, cravings and addictions. The substance of this Chapter can be summarised as follows:

1. A review of high arousal (externally oriented) and low arousal (internally oriented) pleasure.
2. Methods of turning within to lower arousal.
3. A further discussion of type-a pleasure (section 10.2). The mind may become trapped in a cycle of external “excitement seeking” alternating with ahedonia. In either excitement or ahedonic phase fulfillment is not forthcoming so food regulation does not occur.
4. Further discussion of external stimuli that are not affected by intake (an explanation of the phenomena first presented in Chapter 7). By a process of associative conditioning, food can become imbued with the hedonic qualities of such stimuli.
5. Wanting can become disassociated from liking fuelling non-regulation of eating.
6. A presentation of arousal alliesthesia. The search for type-a pleasure leads to the intake of food-types that fail to satisfy. Again eating is unregulated because the process of eating is not pleasurable enough for fulfillment to occur.

The outcome of the chapter is to establish that unregulated eating is the result of outer directed attention. It is suggested that outer directed attention leads to high mental arousal, the restless seeking of type-a pleasure, the disassociation of liking and wanting, the susceptibility to external eating stimuli and the intake of non-satisfying
foods. Thus it follows that inner directed attention and low mental arousal should favour homeostatic eating. It is suggested that inner directed attention on the somatic level allows identification of the EHS and that inner directed attention on the psychic level allows for the attainment of low mental arousal and type-b pleasure.

10.1 High excitation and low excitation pleasure reviewed

To recap, two broad ways for the attainment of pleasure were outlined in Chapter 4. Pleasure occurs in association with progression or change either from unity to diversity or from diversity to unity. These primordial hedonic movements are reflected in the human psyche. Whenever the mind feels pleasure it is either moving in the direction of greater diversity – externally oriented – or (less commonly in our society) towards greater unity when it is internally oriented. Pleasure gained in the direction of diversity is termed here “type-a pleasure” while pleasure gained in the direction of unity is termed “type-b pleasure.” Pleasure from these two sources has been recognised by Cabanac:

…it is possible to recognize two elements in the pleasure/displeasure of global consciousness: positive and transient joy, and indifferent but stable happiness (Cabanac, 2002, p. 74).

Pleasure gleaned from diversity is transient while pleasure gained from movement in the direction of unity is more enduring.

Mental arousal is taken here to mean a high prevalence of sensations, thoughts or emotions. Mental arousal is, therefore, associated with greater mental excitation, diversity and activity. Mental arousal is associated with the mind’s search for
pleasure among greater diversity. Since this type of pleasure is ephemeral the mind must keep searching as each burst of pleasure wears off. Where, in the search for pleasure, mental arousal strains and fatigues the mind it can be identified with the concept of mental stress (see section 10.2.1).

General eating methods for lowering mental arousal and generating type-b pleasure while eating can involve turning the attention to the food and could include eating in a calm and settled environment, eating with full attention to the food, avoiding eating while reading or watching television and avoiding eating when anxious angry or upset. It is suggested that the most profound method for attaining low mental arousal is to orient attention in the direction of pure consciousness. Profound experiences of type-b pleasure in Western society are not prevalent because typically Westerners have high levels of mental arousal and lack systematic methods of attaining lower levels.

When consciousness is established more or less permanently in a state of lesser excitation (lesser arousal) a state of background pleasure becomes the norm. Cabanac calls it “indifferent but stable happiness” and there is a degree of equanimity associated with this mental state. Low mental arousal does however not preclude “positive and transient joy.” The converse is in fact the case. It is perfectly possible and indeed the norm for positive joy to be superimposed upon a stable background of happiness. The contented mind being more or less saturated in pleasure requires little stimulation for the attainment of an increment, or “burst” of joy and extracts intense (type-c) pleasure from even the most simple of everyday experiences. According to Maharishi (1972c), in and beyond the 5th state of human awareness (known as Cosmic
Consciousness) perception of any kind brings a wave of “immeasurable joy.” To review section 6.3.3, the difference between type-a pleasure and type-c pleasure is that whereas type-a pleasure is transient and leaves the mind desiring more, type-c pleasure, being underpinned by type-b pleasure, leaves the mind in its (type-b) state of fulfillment. In Vedic terminology type-a pleasure may lead to “attachment” to further desire whereas type c pleasure does not (see section 6.3.3 and the analogy in which attachment to desire is compared to drinking salt water).

This has implications for homeostatic eating. Firstly it implies that while the settled mind extracts pleasure from food, it is not dependent upon food for pleasure and is thus fully open to ceasing eating once the desire to eat is fulfilled.67 Thus the development of pure consciousness through Transcendental Meditation should, under this theory, foster homeostatic eating. This notion will be examined in the next section, section 10.2.

The second implication is that the unsettled mind will be open to food addiction, for (as noted in section 6.5), type-a pleasure is ephemeral and unfulfilling. This idea will be examined in section 10.3.

The third implication of the settled mind for homeostatic eating is that the settled mind should be able extract pleasure from simple, even bland food. Thus savouring, as described in section 5.4 can occur not only in the presence of the EHS but in a state

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67 A person enjoying pure consciousness permanently (cosmic consciousness) still experiences physical sensations and still experiences desire e.g. the desire to eat that is stimulated by the EHS. On eating he or she would experience type c pleasure, its diminution while eating and the fulfillment of the eating desire with type-b pleasure just as a person in waking state experiences type-a pleasure, its diminution while eating and the fulfillment of the eating desire. In cosmic consciousness though there is no risk of becoming “attached” to the food because type c pleasure being underpinned by type-b pleasure is not “binding”. Attachment is the root of food addiction.
of low mental arousal as well. The need to seek stimulating or intensely tasty food in order to gain pleasure is reduced or even eliminated. This also has implications for food regulation and will be addressed in section 10.4 under the heading arousal alliesthesia.

10.1.1 Transcendental Meditation and low mental arousal

There could be many means to lower mental arousal. Some, including eating in a settled environment, avoiding stressful arguments or conflicts at the table, and paying full attention to the food have been mentioned. It is suggested that the experience of pure consciousness represents a state of least mental excitation or lowest mental arousal. There could be many paths to pure consciousness. As mentioned in section 4.1.2 some individuals experience it naturally. For most, a technique is desirable, if not essential. Transcendental Meditation is an effective technique that is readily available. A short summary of the literature on Transcendental Meditation was

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[68] Arthur Koestler (1970, p. 221) presents an interesting progression in which he suggests that escape from the “bondage of mental habits” can occur according to the following trilogy:

HAHA - AHA - AH

In the “HAHA” experience, a reaction to humour, mental settling occurs when the tension between incongruous elements is integrated in an unexpected way bringing an increment of pleasure. The AHA experience occurs at the point of realisation of a creative idea. The pieces of a puzzle fall into place and diversity becomes unified in the formulation of a hypothesis, for example. The “elegance” of the theory brings with it a sense of pleasure. The AH experience is the deeply settled feeling that may occur while regarding, for example, a beautiful piece of scenery such as a lake or forest. Koestler describes it as a “self-transcending emotion” which carries with it a feeling of integrative participation that transcends the boundaries of the self.

All three experiences represent a settling of the mind into itself and all are associated with pleasure. The author suggests one further step:

HAHA - AHA - AH - A

The open sound A is the first letter of the Rig-Veda and taken by Maharishi to represent Samhita, or the cosmic psyche. The immensely fulfilling experience of pure consciousness is thus the final step in the settling process by which consciousness, having transcended thought completely, comes out of diversity and finds itself in unity.
provided in section 4.1.2 and a recently compiled bibliography is available in Appendix 2.

10.2 Food craving, “attachment” and addiction

10.2.1 The excitement treadmill

In a popular presentation of the two types of pleasure the psychiatrist Harold Bloomfield (1976) suggests the term “high mental temperature” for increased mental arousal. According to Bloomfield, because the excited mind cannot access the pleasure that accrues from the settled state it can become trapped in a vicious cycle in which it finds pleasure only in ever greater excitement, a process he describes as the “excitement treadmill” (figure 27). Excitement brings a burst of ephemeral pleasure, only to fade and leave the mind restless and bored. The subject enters a stage of apathy or depression from which a still greater level of excitement is needed to achieve the next small increment of pleasure. Finally the stressed mind, unable to sustain further excitement collapses into a state of exhaustion.
Bloomfield presents this cycle as a model for addictive behaviour. The exciting stimulus could be mild, such as highly palatable food or more sinister as exposure to an addictive substance. In its milder forms this treadmill could be interrupted by the company of good friends or family (but not stressful social situations), a day off work, a week’s holiday, listening to music or simply watching a light or amusing movie. However, Transcendental Meditation, Bloomfield suggests, represents a profound lowering of mental temperature, during which process the mind finds pleasure of a more permanent and fulfilling kind.

The literature on emotion is complex and beyond the scope of this thesis. Nevertheless, the idea that arousal (excitation, activation, intensity) and pleasure are two important dimensions in emotion is prevalent to the extent that one psychologist
has used the word consensus (J. Russell, 2003, p. 153). Russell regards activation and pleasure as the “two primitives” of what he calls core affect.

Figure 28  Core affect
At any given time, an individual is at a point somewhere within the circle and moving in response to both internal and external events (J. Russell, 2003 adapted with permission).
The characteristics of core affect (a similar concept to mood) are summarised in figure 28. Core affect is seen to affect decision-making and is involved in motivation, reward and reinforcement. High excitation (type-a) and low excitation (type-b) pleasure can be seen in figure 28 as the upper and lower segments of the right side of the figure. Excited, ebullient, elated and happy describe the transient pleasures of high mental arousal whereas serene, contended placid and calm describe low arousal pleasure, or fulfillment. In the left side of the figure are the symptoms that occur when transient pleasure cannot be sustained. At first the subject becomes tense or jittery, then upset and distressed. These descriptions of withdrawal symptoms must be familiar to those who deal with addicts of all kinds. Russell could also have included the word bored, since this usually precedes the tense or jittery phase. In a manner similar to the “excitement treadmill”, the mind circles between right upper segment and left upper segment driven at each cycle towards ever intensified sensory stimulation in an attempt to gain pleasure at ever higher levels of arousal. Finally the mind collapses to the left lower segment to remain there until it can rouse itself and enter the right top segment again. This cycling will continue until a way is found into the right lower segment. This is a useful model to understand many addictions including addiction to nicotine, alcohol, work, food and romantic love. Addiction to food may lie on a continuum with frank addiction at one end and non-homeostatic eating including over-eating in so-called normal individuals at the other.

Robinson and Berridge’s (1993) model of addiction is not incompatible with the foregoing. They propose that wanting to eat, or incentive motivation, is an outcome.

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69 The two dimensional nature of core affect has been criticised as being simplistic and failing to account for the variety among emotions (anger, disgust, fear etc). Cabanac (2002, p. 73) proposes a more complex four dimensional model however core affect is a useful model with which to become orientated in a complex field.
of a three-stage process. Firstly the neural substrates for pleasure are activated by the consequences of a particular object, act, event or place. Secondly, pleasure is associated with that object, act, event or place. This corresponds to the excitement phase of the above model. Thirdly and by a separate neural system salience is attributed to subsequent perceptions and mental representations of the object (T. E. Robinson & Berridge, 1993, p. 280).

The word salient means “most noticeable or important” (Compact Oxford English Dictionary, 2003, p. 1009). The salience now attributed to the object, act, event or place causes it to become incentivised – attractive and “wanted,” thus yielding motivated behaviour. “Wanting” can become disassociated from “liking” keeping the subject on the treadmill during the boredom phase when pleasure is no longer forthcoming.

Robinson and Berridge (Berridge & Robinson, 1995; T. E. Robinson & Berridge, 2003, 2008) propose that among individuals who repeatedly use addictive drugs, the neural system underlying the second stage of the above three-stage process becomes hypersensitive to the drug, transforming ordinary ‘wanting’ into drug craving. They, and others, (Davis & Fox, 2008; Davis et al., 2007; Davis, Strachan, & Berkson, 2004) have suggested that the mechanism for food craving is essentially the same as for drug craving. Although food may not act upon the dopaminergic neural system as directly as drugs, nevertheless the “excitement” (or type-a pleasure) of eating highly palatable foods sensitises the subject to the pleasure of food. This phenomenon is termed sensitivity to reward (STR) or “reward eating” (Erlanson-Albertsson, 2005) and is thought to involve the opioid system. Sensitivity to reward is in psychological
terminology very close to what in Vedic Science is known as attachment to desire. One does not want to let go of the desired object, one wants it, and therefore one stays upon the excitement treadmill. While on this vicious cycle the mind feels trapped since it cannot find pleasure in any way apart from type-a pleasure. A way out of the cycle is the introduction of type-b pleasure, either via experience of the EHS, or on a far more encompassing level, by allowing the mind to proceed in the direction of unity.

10.2.2 Associative conditioning in overeating

In Chapter 7 stimuli that promote eating but are not themselves affected by eating were discussed. It seems likely that not only food palatability acts to sensitise the system to reward but other stimuli such as those listed in Chapter 7 or “mental constructs” representing desired stimuli with which food becomes associated may also precede reward eating. This suggests a powerful mechanism for overeating, food cravings and addictions both mild and severe, that Berridge calls the Bolles-Bindra-Toates theory of incentive motivation (Berridge, 2004, p. 193).

Behaviourist learning theory stresses the classical Pavlovian association between a conditioned stimulus (CS) and an unconditioned stimulus (US). Thus, for example, the US of food presentation might result in an unconditioned response (UR), say salivation in a dog. If the US is paired with the ringing of a bell a number of times (reinforcement) the dog will be found to salivate on hearing the bell alone, in which case the bell has become a CS, producing a conditioned response (CR).
According to Berridge, the biopsychologist Robert Bolles, having rejected drive and drive-reduction theories of motivation, developed the idea that individuals are motivated by expectation of pleasure (incentive expectancies). One could say, interpreting Bolles that people are “pulled” rather than “pushed” to carry out actions. Applied to the above example, Bolles’ point was that the dog expected the pleasure of food when it heard the bell. However expectation in itself does not explain motivation. The psychologist Dalbir Bindra therefore extended Bolles’ idea (Bindra, 1978). He proposed that, in essence, not only does the bell produce an expectation, but it causes the dog to perceive the bell as a hedonic reward towards which the animal is as motivated as it would have been towards the food itself. The dog comes to like and want the bell. The conditioned stimulus (bell) takes on the motivational properties that belonged to the unconditioned stimulus (food) itself.

However the dog might not be particularly hungry. Under the Bolles-Bindra concept the dog should like and want the bell whether it is hungry or not, which, critics pointed out, would be unlikely. Thus Frederick Toates suggested that physiological depletion states could enhance the incentive value of a stimulus. The dog likes and wants the bell more when it is hungry. This is the concept of alliesthesia already discussed in section 9.3 but now applied to conditioned stimuli and sometimes called “occasion setting” in behaviourist terminology (Davidson, 2000). In support of this extension of alliesthesia, Berridge and Schulkin (1989) note numerous studies that demonstrate that animals that have previously experienced salt in a particular location will return to that place when depleted of salt, indicating that location and salt taste can be associated. In this case location is a CS for the anticipated pleasure of salt. Pairing quinine or citric acid with salt Berridge and Schulkin (1989, pp. 135-136)
were able to show that these tastes became attributed with the hedonic properties that had been previously attributed to salt.

To place this line of thinking in a familiar context, consider a worker who enjoys a morning tea break. Morning tea being relief from work routine and a chance to socialise evokes pleasure. During morning tea biscuits are served, which at first, the worker finds not particularly palatable. Over the course of a few weeks, the pleasure of the break from work becomes associated with the biscuits which then assume, according to associative conditioning, the hedonic properties of stopping work and socialising. Furthermore, according to the third stage of the above process they assume incentive salience. Biscuits not only provide an expectation of happy times, they become imbued with the liking and wanting that was associated with the happiness of stopping work and socialising and they are wanted and liked as much. In times of loneliness the worker finds himself wanting biscuits, having long ago forgotten about their association with morning tea breaks. If asked if he were hungry he might well say “Yes, I would love to eat a biscuit right now.”

It is not difficult to imagine numerous enjoyable situations in which the pleasure inherent in the situation could be transferred by association to food – childhood birthdays, family gatherings and festive occasions spring to mind, as well as the joy of preparing food for loved ones. In plain language, the food is wanted for the wrong reasons.

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70 This hypothetical example was checked by Professor Berridge (Berridge K, Personal Communication 18th February, 2009).
10.2.3 Wanting dissociated from liking

So far the reasoning has explained why the worker likes biscuits and it is possible to see how eating in response to a CS (loneliness) will not be affected by his eating. Eating biscuits will not fulfil his loneliness. Berridge and Robinson in their modified Bindra-Toates, or incentive salience model, suggest that wanting and liking can become disassociated. Thus the worker may continue to want the biscuits even if he no longer likes them. The biscuits have become salient and he is motivated towards them irrespective of pleasure. Since wanting is unaffected by pleasure, on this theory fulfillment will not occur and such eating will be unregulated.

Usually liking and wanting occur together. Indeed, early theories of motivation considered wanting and liking to be synonymous. Separating the two has been a matter of some ingenuity (Berridge, 2004, p. 194) and arose from findings that suggest that liking and wanting have distinct neurological elaborations. Before returning to the worker and his biscuits, these findings will be briefly reviewed.

The pleasantness of food (liking to eat) is thought to be mediated mainly by the opioid system while the incentive or reinforcing value of food (the degree to which anticipated pleasure is translated into action) is related to changes in the dopaminergic system. Blundell (1980) first presented pharmacological evidence that these processes operate independently. He found that amphetamine and fenfluaramine exert different effects on ratings of hunger and on various subjective feelings and bodily sensations. These sensations included emptiness and fullness of the stomach. Feelings of emptiness decreased in the presence of amphetamine, whereas
fenfluramine exerted little effect on feelings of emptiness. Nevertheless fenfluramine gave rise to greater inhibition of food consumption than did amphetamine, suggesting that distinct pharmacological mechanisms underlie different motivations for food, including the feeling of emptiness. In a later study on obese subjects d-fenfluramine suppressed reported hunger but had no effect on the appreciation of the pleasantness of food (Blundell & Hill, 1987).  

Subsequent studies have demonstrated that opioid antagonists such as nalmafene and naltrexone reduce the pleasantness rating (liking) of palatable foods but have no effect on reported hunger or general energy intake in humans (Yeomans & Wright, 1991) and laboratory animals (Hemby, Smith, & Dworkin, 1996; Rodefer, Campbell, Cosgrove, & Carroll, 1999). Conversely, dopamine antagonists reduce the incentive value of food (wanting) but do not alter hedonic reactivity (liking) (Berridge, 1996; Berridge, Venier, & Robinson, 1989; Treit & Berridge, 1990; Wyvell & Berridge, 2000). 

Apart from dopamine, the “wanting to eat” system appears to involve insulin, leptin, NPY, AgRP, MSH, CART, GLP-1, orexins, ghrelins, PYY and other peptides, as well as serotonin pathways. Apart from opioids, the “liking to eat” processes are likely also to be mediated by glutamate, benzodiazepines and endocannabinoids in a neural network which includes the nucleus accumbens, ventral pallidum, parabrachial nucleus and nucleus of the solitary tract (Blundell & Finlayson, 2004, p. 22). 

“Wanting to eat” processes occur in the mesolimbic dopamine system with its  

71 In the second study the d-isomer was used whereas the first study used the racemic form. This probably accounts for the apparent discrepancy between the two studies in the effect of fenfluramine. (Blundell J, personal communication, 3rd December 2008).
projections from the ventral tegmental area to the nucleus accumbens, along with the prefrontal cortex, amygdala and hypothalamus (Berthoud, 2004b; T. E. Robinson & Berridge, 1993, 2003).

That wanting can be completely dissociated from liking is also demonstrated by the motivation of drug addicts towards drugs they do not find pleasurable. Lamb et al. found that morphine addicts were prepared to work for a dose of morphine they rated no more pleasurable than a control substance containing no morphine (Lamb et al., 1991). As Robinson and Berridge point out:

…addicts will sometimes report that they are miserable, that their life is in ruins and that the drug is not even that great anymore - but they still want it! (T. E. Robinson & Berridge, 1993, p. 253).

Other workers (L. H. Epstein, Truesdale, Wojcik, Paluch, & Raynor, 2003; Hetherington, Pirie, & Nabb, 2002), have attempted to disassociate the two systems methodologically either by food deprivation (increasing the subjects’ hunger and hence their motivation or “wanting”) or by stimulus satiation (repeated presentation of a particular food and hence decreasing pleasantness or “liking”). Epstein et al. ascertained ratings for pleasant (chocolate milk), unpleasant (lemon juice) and neutral (water) (the “liking” aspect), then increased the “wanting” element by depriving non-obese, non-dietary restrained female subjects of food. They found food was more reinforcing for the deprived than a fed control group, but no influences were observed on subjective or objective hedonic measures. Hetherington et al. found that in conditions of chocolate satiation although subjective ratings of pleasantness of chocolate declined, the intake of chocolate remained unaffected. These support the
notion that sensory pleasure and the reinforcing value of food are separate processes in humans, and that they may independently influence eating behaviour in eating disordered individuals. A more everyday example mentioned in the introduction to this thesis, is that of wanting a meal that has pleasurable associations from the past, perhaps fish and chips, but not particularly liking it when it arrives. Berridge makes it clear that for full reward, both wanting and liking are necessary.

‘Wanting’ without ‘liking’ is merely a sham or partial reward, without sensory pleasure in any sense ...Hedonic ‘liking’ by itself is simply a triggered affective state—there is no object of desire or incentive target, and no motivation for reward …‘Liking’ and ‘wanting’ are needed together for full reward. Fortunately, both usually happen together in human life (Berridge, 2004, p. 195).

“Full reward” can be taken to correspond to what in this thesis has been called “fulfillment of desire”. It can therefore be said that:

**Desire can be fulfilled only when wanting and liking are integrated.**

Integrated is intended to mean that both wanting and liking move together. When one wants, one likes, and when one likes, one wants. The corollary of this principle is that:

**The disassociation between liking and wanting leads to non-fulfillment of desire.**

In food addiction, or even mild over eating, it is suggested that wanting and liking are to a greater or lesser degree, disassociated. A person who overeats might be motivated to eat, but not because he or she derives any great pleasure from the
experience (Mela, 2006, p. 12). This furnishes a further reason why, as suggested in the title of this thesis, eating is not fully pleasurable for some people. Because, as explained in Chapter 9, a high degree of pleasure is necessary at initiation of eating to reach threshold for fulfillment of desire, eating in the absence of pleasure will not properly trigger the homeostatic satiety mechanism. Based on a study on subjects with the very rare condition of congenital leptin deficiency, it has been suggested that low blood leptin concentrations might underlie the disassociation of wanting and liking, since after leptin treatment well-liked food is wanted only in the fasted state, whereas before treatment liked food was wanted even after the subject had just eaten (Farooqi et al., 2007). As a type-B materialist one might be tempted to seek some form of leptin-based therapy. However in non-leptin deficient individuals it might be a simpler and more direct route to take the mental rather than the physical direction. This will be considered in the following section.

### 10.2.4 Clarification of desire

Following the progress of the worker, what, under MVS, can be done to help? It is important to note that the reward that accrues from the CS does not modulate the motivation towards it. The lonely worker wants the biscuits but eating them does not stop him from wanting more. Why? Because he is still lonely. The converse is not the case. The worker who finds a congenial circle of friends no longer feels the compulsion for biscuits. However in the absence of such friends, one could imagine the worker eating ever greater quantities of biscuits, wanting them, by now not particularly liking them, but never realising that his motivation originally bore no relation to biscuits or even eating.
It is suggested that, if when the worker becomes aware that he desires a biscuit he seeks the EHS and finds it absent, this can be useful information for him. He may not remember the association between morning tea and biscuits, but he can understand that in the absence of the EHS, the desire to eat may not be fully satisfied by eating. This can help him decide whether or not he wishes to choose to eat. Seeking the EHS could thus be seen as “clarification of desire.” The multiple and powerful associations we all have between stimuli of all kinds and food are complex and often so deeply buried (incentive salience is not necessarily consciously appreciated) that an intellectual attempt to untangle them would be very difficult. It is suggested that if a subject identifies the EHS then the subject can be sure that the desire to eat will be fulfilled by eating. In the presence of the EHS the desire to eat has not arisen by association with other extraneous stimuli.\(^{72}\)

The author has found this strategy invaluable in the clinical setting. Often, in their exploration of epigastric symptoms in search of the EHS, patients will have insights that bear upon much wider psychological issues involving multiple non-food related stimuli. This can be revelatory for them. Here, for example are verbatim accounts of two recent consultations:

Mr MM aged 57, overweight (19/2/09).

DLS: What is hunger for you?

MM: A feeling I get in my mouth and a hollowness in my tummy – but I have to say, I focus more on my mouth.

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\(^{72}\) Or if there are two desires present, the desire stimulated by the EHS and another by a conditioned stimulus of some kind, then at least the subject will be protected from eating in the absence of hunger, if he or she chooses to eat.
DLS: Is the hollowness there before every meal?

MM: No, I have to say I go mainly by the taste. I eat for comfort.

DLS: Are you hungry now?

MM: I could eat something like yoghurt or a banana, but the hunger is not in my stomach. It's in my mouth. It's like a dryness there.

DLS: Are you feeling anything in your stomach?

MM: There is a sensation there. It's more of an acid feeling. A kind of acid reflux. It also comes on at night. Sometimes I'll have to sit up at night. [Somewhat incredulously, after being invited to bring his awareness to the abdominal area for a few minutes]. It feels like there is a football-like hollowness there. I can even give it words. It is saying I want more out of my life. I'm not working from my core. I feel I'm living a half life at the moment. I still want more. I am surrounded by women all day in my work but I don't have a partner. I suppose I eat because that's the way I can have more. I know I can be more. I want more - but it wasn't about food.

Mrs IH aged 76, overweight (19/2/09).

DLS: What is hunger for you?

IH: I don't have hunger.

DLS: What prompts you to eat?

IH: Boredom, habit. I make a cup of coffee and automatically have a couple of biscuits with it.

DLS: Can you think back to last time you were hungry?

IH: No. As a child yes, but that was because food was not always available. If I misbehaved, I was shut in the wash-house and missed the next meal. I would be given the razor-strop or the broom.

DLS: What was hunger like then?

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73 Mr MM’s report of “hollowness” and his attempt to redress it with food is not uncommon among both obese and lean subjects. Patients frequently confuse this symptom (in Chapter 7 the author has called it “soul emptiness”) with hunger. When patients report the words empty and hollow they should therefore not be taken at face value but their connexion with a localised physical sensation established before the therapist assumes the presence of the EHS. Irvin D Yalom in his book Love’s Executioner: & Other Tales of Psychotherapy (1989) includes a chapter called ‘Fat Lady’ about a woman who describes her psychological state as ‘empty’. Yalom comments: “Psychological ‘emptiness’ is a common concept in the treatment of those with eating disorders” (p. 99).
IH: I can't remember anything physical. I just felt very lonely. I was a very sad lonely child, absolutely terrified of my mother. It was just a sad loneliness really. I often wonder whether I eat (pause)… whether it was the food of love. When you didn't get food, you felt unloved.

These two rather moving conversations illustrate the process of food craving by association with other stimuli, on the one hand the pleasure of having a partner (a situation very similar to the hypothetical worker above), on the other the pleasure of being loved. Even the search for the EHS (without actually finding it) in a few minutes, helped them clarify their wanting of food.

To return to Vedic principles, in section 6.3.3 two ways were suggested to eliminate a desire. The first is to fulfil it. The second is to replace the desire with a more fulfilling one. When the EHS is present, the worker can happily go ahead and eat. He desires to eat, and in the presence of the EHS, that desire will be taken care of by eating. However he has a mixture of desires and he may find that he still desires congenial company. Although, by identifying the EHS, he avoids allowing the latter desire to compromise his digestion, that desire persists. Congenial company would fulfill it and also take care of his associated desire for biscuits. If such company is not forthcoming however, then he might consider the second option. The most effective way to replace one desire with another, the author suggests, is to replace a specific desire with the universal desire for unity. This can be done by introducing the process of transcending thought. The deep level of fulfillment gained from the experience of pure consciousness (or even a taste of it) appears to release the mind from the “wanting” or attachment associated with desire. This strategy represents the “direct route” to underlying intelligence par excellence and is represented by the cone shaped device to the right of the Unified Field Chart for psychology (Appendix 3). Studies
have demonstrated the successful use of Transcendental Meditation for addictions to alcohol, cigarettes and drugs of abuse (see section 6.3.3) providing a body of evidence to support this notion. Given that similar mechanics are most likely operating in addiction to food, it seems likely that Transcendental Meditation would be beneficial in food addiction as well.

It is suggested then, that the hypothetical worker, and the patients above, would be advised to seek type-b pleasure both on the somatic level (EHS) or psychic level (by learning to transcend thought). The author has used these strategies in the clinical setting (see, for example, section 11.4). In neither of these interventions does the patient need to explore in any detail the causes of their loneliness or lack of love as they might be encouraged to do in psychotherapy. They might benefit from so doing, but there are advantages in sparing the psychology its miseries, especially if they can be alleviated, as it were, automatically.

It is suggested here that the hypothetical worker might well discover, on experiencing pure consciousness on a regular basis, that his wanting for biscuits not only becomes less compelling but is also supplemented or even replaced by a desire for more simple foods – perhaps staples such as lentils and rice (for example). The increased pleasure derived from food \textit{per se} that occurs in the presence of the EHS has been discussed in section 9.1.3. It could be called \textit{readiness alliesthesia}. A change also occurs in the desirability of food (palatability) at lower levels of mental arousal that I propose to call \textit{arousal alliesthesia}. This will be discussed in the following section.
10.3 Arousal alliesthesia: Low, moderate and high excitation foods

According to the concept of alliesthesia, food palatability varies according to the physiological status of the eater. The concept can now be revisited in the light of high or low mental arousal. It is suggested that mental arousal is a factor that significantly affects the palatability of food. In low mental arousal foods that satisfy (yield type-b pleasure) are more palatable than in high mental arousal.

In the Vedic consciousness-based paradigm, both the subject of eating (the eater) and the object of eating (the food) represent excitation states of the fundamental field of consciousness, linked by the process of eating. Either eater or food can be in a state of greater or lesser excitation. In the eater, a state of high mental excitation is represented by numerous thoughts and internal distractions or by mental agitation. It is suggested here that food of high excitation is represented by intensity of taste. Such highly stimulating (high excitation) foods correspond to the Vedic notion of Rajasic food. Rajasic foods are said to be excessively salty, sour or spicy or otherwise intense in taste. It is suggested that in a state of high mental excitation, high excitation food appears palatable, whereas low excitation food appears bland and tasteless. In a state of low mental arousal the situation is reversed. Low excitation food appears interesting and satisfying, whereas high excitation foods appear shallow, overwrought, cloying or in other ways unfulfilling. Thus low levels of mental arousal require only low levels of sensory excitation from food to elicit a significant degree of eating pleasure. Conversely, high levels of mental arousal require high degrees of sensory excitation to elicit a significant amount of pleasure. This phenomenon could, in the language of information science, be compared to the “signal to noise ratio”. At
high levels of mental “noise” (arousal) a strong sensory signal (tasty, highly stimulating food) is needed to be detectable and vice versa. A simpler example might be the need to shout to make oneself understood at a party.

The reason to delineate these food types is that they bear on the degree to which eating pleasure is either of type-a or type-b and hence the degree to which eating pleasure will extinguish eating desire. It is suggested that they thus play an important role in eating regulation. For example, HE foods yield predominantly type-a pleasure and have a distorting effect upon the regulatory dynamics outlined in figure 25, section 9.2.2. The characteristics of low, moderate and high excitation foods will now be further described.

10.3.1 Low excitation (LE) foods

The author suggests this category includes such staples as bread, rice, pulses (dahls), potatoes and yams. Low excitation foods are not generally regarded as “tasty” and a defining characteristic is that while they are not greatly palatable in the absence of the EHS, they tend to become palatable when the EHS is present. Using Kissileff’s terminology, the intrinsic palatability of these foods is therefore low. LE foods tend to promote sensory specific satiety relatively early during the eating process, probably because the immediate pleasure from eating them for most people is low, however evidence exists that such staple foods are resistant to monotony (Meiselman, deGraaf, & Lesher, 2000). It could be postulated then, that the pleasure provided by such foods

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74 This role could tested. This thesis focuses mainly on the role of the internal eating sensations and desires, hence the two hypotheses in Chapter 13 are concerned with internal conditions. Nevertheless, the interplay of internal states with LE, ME and HE foods could provide scope for further useful study.

75 These food categories are the author’s. Maharishi Ayurveda defines three somewhat similar food types satvic, rajasic and tamasic (wholesome, excessively tasty and unwholesome respectively) but they do not map exactly to LE, ME and HE foods.
is more enduring and less transient than that of high excitation foods. This notion mirrors the idea that pleasure at high levels of mental excitation is also transient whereas pleasure at low levels (type-b pleasure) is less so.

The notion of eating monotony has a long history in the literature (see, for example Schutz & Pilgrim, 1958) and is differentiated from sensory specific satiety. Sensory specific satiety occurs during the intra-meal interval, whereas monotony refers to the degree of pleasure gained from a particular food over the course of multiple meals. Monotony has been described as a “cognitive state which reflects a negative response to repeated exposure to a stimulus” (Hetherington et al., 2002, p. 20). Hetherington remarks that:

Clearly a feature of monotony emerging from the present and previous studies is that certain foods like bread are accepted, even if less preferred than foods like chocolate, on an everyday basis (Hetherington et al., 2002, p. 27).

Chocolate is here regarded as a high excitation food and would therefore be expected to be associated with pleasure that is transient and less enduring whereas bread would be of lesser excitation and associated with more enduring pleasure.

### 10.3.2 Moderate excitation (ME) foods

ME foods are neither particularly tasty nor bland and include many items of a balanced Western diet, such as both root and leafy vegetables, fish, poultry and meats.
This group also includes the important category of spices and herbs and includes also salt in moderation.\textsuperscript{76}

\subsection*{10.3.3 High excitation (HE) foods}

HE foods contain substances that are intensely stimulating in taste ("over delicious") such as high quantities of sugar, high quantities of salt or very stimulating spices such as chilli. Such foods as chocolate, potato crisps, biscuits, sweets, excessively spicy foods and foods containing monosodium glutamate are included in this category. Intrinsic palatability is high. Many subjects will report a tendency to eat such foods compulsively and in the absence of EHS. Producers of convenience foods have developed a sophisticated understanding of the necessary ingredients for high intrinsic palatability converging upon what one investigator has described as a Common Optimum Taste:

Modern food technology maximizes palatability by novel combinations of all prototypical tastes, thereby converting well-known traditional dishes into "over delicious" and largely indistinguishable creations with a Common Optimum Taste (COT) that influences appetite regulation (Hermanussen et al., 2008, p. 1).

About chocolate Hetherington states:

Frequent consumption of a highly liked food such as chocolate appears to reduce liking and influences its status as a pleasurable food (Hetherington et al., 2002, p. 27).

\textsuperscript{76} Herbs used in Ayurvedic recipes to stimulate digestion include ginger, cumin, turmeric and coriander.
Chocolate then, unlike the staple foods, creates transient pleasure that does not endure.\footnote{In section 10.2.3 reference was made to a study by Epstein, in which he found no change in hedonic rating for pleasant (chocolate milk), unpleasant (lemon juice) and neutral (water) foods among food-deprived subjects (who were presumably experiencing the EHS) when compared to non food-deprived subjects. This appears to contradict one of the basic tenets of the theory being presented in this thesis, that food evokes more pleasure when taken in the presence of the ESH. The contradiction can be resolved by reference to the three excitation categories of food. Chocolate milk is a HE food. Under the present theory, hedonic rating for HE food would not be expected to rise in the presence of the EHS. Since chocolate milk is already at the high end of the excitation scale it would be expected to either elicit no change in pleasure or even less pleasure since it might have a cloying quality. No LE or ME foods were included in Epstein’s study. It would have been interesting to know what effect were to be found in the case of these foods.} For some people, ever increasing quantities may be found necessary to attain the degree of pleasure first encountered. Chocolate could thus be an entry point to the “excitement treadmill” described in section 10.2.1. The distorting effect of HE food is depicted in figure 29.
The promise of pleasure intensifies desire but HE food tends not to yield type-b pleasure. Hence the desire is not fulfilled and eating continues at a low level of eating pleasure.

The EHS and low mental arousal achieve, to differing degrees, the same end, which is to lower the pleasure from eating HE food and raise the pleasure from eating LE food. Thus the distorting and addictive effects of HE foods are minimised. The associations between LE, ME and HE foods in the presence and absence of EHS or in the presence or absence of low mental arousal are summarised in the following chart.
### Chart 5 LE, ME and HE foods in the presence and absence of EHS or low mental arousal

When eating during the EHS less external stimulation from food is needed owing to the increased pleasure that accrues. Thus the tendency to seek ever increasingly palatable food is attenuated or absent. This effect is also found when eating in a state of low mental arousal.

#### 10.3.4 The “cardboard effect”

The cardboard effect occurs when food which would be regarded as palatable in the presence of the EHS or low mental arousal, tastes bland and uninteresting (as if eating cardboard), in the absence of the EHS or in a state of high arousal. The cardboard effect is particularly noticeable when a subject who has been experiencing eating in response to the EHS pre-meal decides to eat in its absence. The effect can therefore be useful in training subjects to eat in a homeostatic manner since it provides positive reinforcement for eating in the presence of the EHS.
10.3.5 Automatic eating and “overshooting”

Automatic eating occurs when there is a strong belief based upon previous
associations that a particular foodstuff will bring (or “contains”) pleasure or when
liking and wanting have become disassociated. When, in the absence of the EHS, the
anticipated pleasure does not occur to the expected degree, the mind, irrationally,
seeks more of the same foodstuff, thereby “overshooting” the amount needed to
satisfy energy requirements. Overshooting can occur in so-called “normal” eaters.
Thus an individual feeling vaguely dissatisfied with his first plateful of trifle, yet still
believing that trifle equals pleasure, accepts a second helping in the hope that pleasure
will yet be found. Trifle has become caricaturised into a mental construct that the
mind associates with pleasure and refers to instead of referring to the real thing.
Automaticity will be further discussed in section 12.2.5.

Overshooting can also occur without automatic eating when eating in the presence of
the VEHS, during which the desire for food may have become desperate. Food may
be “wolfed” down without attention to its satiating effect. Fulfillment of desire goes
unnoticed until more food than necessary has been consumed.

Automatic eating and overshooting overlap with food addiction as described in
section 10.2 and may be very widespread even in so-called normal eaters. Automatic
eating describes the globally observed phenomenon in which highly advertised food
creates a notion of food that becomes associated with a degree of pleasure that the
product cannot possibly fulfil, especially since the food is usually HE food and hence
not sustaining or ultimately satisfying. Advertising and skilled marketing creates an
aura of pleasure around the whole activity of consumption which can make certain
foods salient. In discussing “McDonaldization and the Australian Food Culture”

Finkelstein, quoting Bauman states:

…consumption has an attractive and exuberant dimension that animates and transforms everyday life…
“life turns into a shopping spree.” At the same time, [Bauman] recognises the pleasures of acquisition as being less about the actual objects and services and more about the expression of desire itself. 
Shopping is more about feeling purposive and active; it is a means of avoiding passivity and boredom, and it gives expression to a sense of agitation …(Bauman, cited in J. Finkelstein, 2003, p. 188).

Consumption provides excitement and exuberance. A hamburger, for example, becomes salient by association with the excitement of the trappings of the market and its purchase and consumption incentivised. The actual pleasure of buying and eating the hamburger can fall well short of the imagined pleasure, yet STR has occurred by association with the thrill of shopping. Rather like eating the trifle in the example above, the perceiver continues to “want” and behaves as if the actual pleasure were present. Between bouts of consumption, passivity and boredom intervene. In this circumstance, the homeostatic pleasure cycle, in which the desire to eat a hamburger should be extinguished by eating the hamburger, does not operate, because the anticipated pleasure is to do with shopping. Yet, because of the association and the incentive salience that has transferred to the hamburger, the desire to eat continues. The subject eats, feels little pleasure or satisfaction yet eats again.

10.4 Relationship to depression and anorexia

It will be recalled that in the cycle of eating addiction, a phase of boredom and depression occur. It is well known that clinically depressed patients characteristically complain of appetite disorder, usually suppressed appetite (Dess, 1991). Depression
tends to be strongly associated with eating abnormalities the causes of which are not well understood (Devlin & Walsh, 1989; Harshaw, 2008; Paykel, 1977; Polivy & Herman, 1976). Impaired serotonin function has been implicated in depression (Cowen & Cowen, 2008). Ninety-five percent of the body’s serotonin is found in the GI tract where it participates in gut motility. It may mediate between gut and brain (Kim & Camilleri, 2000; Taniyama et al., 2000).

The association between depression and anorexia could be explained on this model in that in the depression phase of the excitement “treadmill” neither wanting nor liking is sufficiently intense for the subject to continue, or else that a “ceiling” has been reached at which no foods can be found that are sufficiently pleasurable to allow the cycle to continue. The depressive patient, in effect, becomes “stuck” on the third stage of the treadmill. Food at this point has lost its appeal, and pleasure, at least from food, is minimal. The subject loses any incentive to eat.

According to Berrios and Olivares (1995) anhedonia is a symptom that might reflect a number of underlying biochemical conditions. Anorexia nervosa could also be seen as a condition in which the subject is arrested in the anhedonic phase of the excitement treadmill, albeit in a more narrowly focussed manner in which the lack of hedonic valence applies only to food (and is not generalised as in clinical depression). The idea that anorexia and bulimia are addictive disorders has received considerable attention in the literature (Davis & Claridge, 1998; Davis et al., 2008; Davis & Woodside, 2002; Marrazzi & Luby, 1986). The addictive mechanisms discussed here could thus explain both over-eating and under-eating and the suggested solutions may be useful in both.
10.5 Conclusion to Chapter 10. Why some people eat in a non-homeostatic manner

Upon watching an obese family systematically devour the contents of a food trolley that he was hoping to eat from himself, the popular writer Bill Bryson observed:

It is a curious thing, but even the greediest and most rapacious fat people …never look as if they are enjoying themselves. It is as if they are merely fulfilling some kind of longstanding obligation to maintain their bulk (Bryson, 1998, pp. 88-89).

With the acute eye of the writer Bryson noticed that these people were not experiencing pleasure. Two factor theorists see hedonic motivation as the driver of overeating. In that model a subject eats because the mind finds food too pleasurable. It has been suggested here that the mechanisms for poor intake regulation, overeating, food craving and food addiction are not driven by pleasure, but by its lack. In Chapter 9, eating in response to the EHS was suggested as one way to increase eating pleasure and break the cycle of unsatisfying eating. The present chapter links with Chapter 7. It attempts to explain why many people eat in response to stimuli that are not affected by eating, by involving the more complex dynamics of food craving in which associative conditioning and incentive salience muddy the waters of desire. In all cases it is suggested that eating is non-homeostatic when the eating experience is not fully pleasurable. It seems we eat for pleasure, but if the pleasure of homeostatic eating is not forthcoming, then we fall prey to non-homeostatic eating.

“Well begun is half done”. The remedy is to ensure that eating begins in such a way that the process will be intensely pleasurable so that the desire to eat will be fulfilled.
In Chapter 9 the EHS was suggested as one means to this end. This chapter explored low mental arousal as another preparation for homeostatic eating and an escape from food craving automatic eating and food addiction.
Chapter 11  Existing evidence that Transcendental Meditation and the EHS support energy balance

Introduction

If, as suggested in the preceding chapters, the EHS and transcending thought, by intensifying type-b eating pleasure, support homeostasis then it should be possible to glean evidence for improved energy balance by using these interventions. While the EHS is a newly revived concept and studies still need to be done on its direct effect, there is a body of indirect evidence in support of the claim that both eating in response to the EHS and low mental arousal improve homeostatic food regulation.

Transcendental Meditation

Insulin sensitivity is an indicator of energy balance and homeostatic eating. Paul-Labrador et al. in a randomised study of 103 patients with stable coronary heart disease patients assigned to 16 weeks of Transcendental Meditation practice, demonstrated improvements in insulin sensitivity when compared to patients receiving a health education programme (Paul-Labrador et al., 2006). Insulin sensitivity was calculated using an algorithm based upon fasting plasma glucose and fasting plasma insulin.

The EHS meal pattern

The independent variable in any study to evaluate the EHS in promoting homeostasis should be a pattern of eating in which intake is adjusted meal-by-meal so that the EHS is consistently experienced pre-meal. It is proposed to call this pattern the EHS meal
pattern (EHSMP). The EHSMP allows subjects to continue eating at the standard meal times thus avoiding social disruption. The studies whose protocol is closest to the ideal of the EHSMP are those by Ciampolini. Ciampolini trains his adult subjects to plan for IH to be present pre-meal for all (or nearly all) meal times. Initial hunger is a broad term that includes any symptoms that occur upon fasting. It can be taken to mean any or all of the symptoms of inanition or of the EHS. As stated in section 8.3.2 the EHS is thus a subset of IH. Nevertheless, since the EHS is included within IH the findings on IH in promoting homeostasis provide some evidence that eating in response to the EHS supports homeostasis.

The pattern of eating in which IH is present pre-meal at most meal times Ciampolini, at the author’s suggestion, styles the initial hunger meal pattern (IHMP). This, subjects accomplish through the judicious intake of energy dense food if IH sensations are strong, or less energy dense foods such as fruit and vegetables, if IH is absent or weak. Other factors that help in this planning are avoidance of snacks and undertaking physical activity. This establishes a meal pattern in which IH is present for most meals, pre-meal.

11.1 Ciampolini’s studies

Ciampolini has demonstrated that subjects can be trained to reliably and accurately estimate their blood glucose concentration, by referring to their symptoms of IH (Ciampolini & Bianchi, 2006). An illustration of this is provided in figure 30.
Figure 30  Estimation of blood glucose by hunger sensations

The red circles represent the estimations of trained subjects, the black circles those of untrained subjects. The lines of “best fit” indicate the considerably higher accuracy of the trained subjects (Ciampolini & Bianchi, 2006 reprinted with permission).

This finding is startling because while it is well established that the brain can recognise and respond to gross variations in blood glucose, the ability of the brain to recognise physiological changes in blood glucose has been much less certain (Levin, 2001) and the existence of any relationship between hunger and blood glucose in food regulation has been questioned (for example Pinel et al., 2000). Ciampolini and Bianchi’s finding has implications for the role of glucose in food regulation. This role is usually associated with the glucostatic hypothesis of Mayer. A brief review follows.
11.1.1 Mayer’s glucostatic hypothesis

The glucostatic hypothesis, first proposed by Jean Mayer, posits that blood glucose concentration is the defended variable in the homeostatic control of eating. Bulatao and Carlson (1924) had previously reported that hypoglycaemia induced in dogs by intravenous glucose administration inhibited normal gastric contractions as measured by intragastric balloon. They concluded that:

Under ordinary conditions gastric tonus and contractions increase parallel with the reduction of tissue glycogen (p. 115).

Building on this and other work Mayer (1952, 1953; 1960), proposed that “metabolic hypoglycaemia” is a point at which cells no longer utilise glucose as an energy substrate and switch over to fatty acid utilization. On this model, metabolic hypoglycaemia is monitored by specialised cells known as glucoreceptors in the hypothalamus which leads to perception of hunger and its associated food seeking behaviour. The reasons Mayer gave for choosing glucose in the regulation of eating behaviour remain relevant today:

The crucial role of carbohydrate in the economy of the central nervous system, the lack of its storage, its preferential utilisation, the thoroughness of its regulation, and its role, in turn, as the central regulator of overall metabolism are telling arguments for claiming that a regulation based on carbohydrate, and only such a regulation can successfully be integrated with energy metabolism and its components (J. Mayer cited in Van Itallie, 1990, p. 5).
Mayer tested this hypothesis by injecting animals with glucose, fructose and adrenalin to increase blood glucose levels and insulin to decrease it.

Results were clear-cut: increases in blood sugar levels caused decreases in food intake, and vice versa (J. Mayer, 1952, p. 44).

Mayer was concerned that the theory did not adequately explain the hyperphagia (abnormally increased appetite) commonly observed in uncontrolled diabetes mellitus. In this pathological condition patients suffering from diabetes are observed to eat compulsively in the presence of very high blood glucose concentrations. On Mayer’s hypothesis a high blood glucose concentration should shut down eating so diabetic hyperphagia was an anomaly. To explain this phenomenon he developed the concept of Δ-glucose in which glucose utilisation rather than glucose concentration is the monitored variable in food regulation. Δ-glucose is the arteriovenous glucose difference, and is a measure of the rate of tissue removal of glucose. Mayer found that Δ-glucose correlated closely with caloric intake, and with hunger feelings. Values above 15mg/dl were never associated with hunger. Values near zero or negative were invariably associated with hunger. In diabetic hyperphagia or “hunger diabetes” venous glucose levels were found to have reached very high values before Δ-glucose became appreciable, confirming that in diabetes transport of glucose to the cell is impaired. The “effectiveness” of the blood glucose to the cell, in particular those neurons that are sensitive to Δ-glucose for the purposes of initiating the hunger signal, is low. In this way Mayer was able to modify his theory to accommodate diabetic hyperphagia.
An upsurge in interest in the glucostatic hypothesis in both humans and laboratory animals followed. Results were not consistent. As examples, in support of the hypothesis, Stunkard et al. found that in humans, intravenous administration of glucagon, a hormone that releases glucose from the liver and hence increases $\Delta$-glucose, also abolished gastric hunger contractions (Stunkard A, cited in Van Itallie, 1990). Oomura and Kita (1981) found areas in the hypothalamus sensitive to insulin, one of which was facilitated by the simultaneous application of glucose and insulin but inhibited by insulin alone. It appeared therefore that the combination of glucose and insulin was necessary for high glucoreceptor activity. Reasoning that if glucoreceptor activity prevents further feeding in the food sated animal then localized removal of insulin from the ventromedial hypothalamus should reinstate feeding, Strubbe and Mein (1977) injected a specific antibody against insulin into rat hypothalami. This caused transient hyperphagia, consistent with the theory. A loss of eating regulation was also noted in rats with lateral hypothalamic lesions (A. N. Epstein & Teitelbaum, 1967). Another finding that appeared to support the theory was a fall in blood glucose that was observed before meal onset in free-feeding rats (Louis-Sylvestre & Le Magnen, 1980). Transient premeal declines of blood glucose have also been shown in humans (Campfield & Smith, 1990; Campfield, Smith, & Rosenbaum, 1992; Melanson, Westerterp-Plantenga, Campfield, & Saris, 1999b; F. J. Smith, Driscoll, & Campfield, 1988).

Against these findings other workers found that neither a low blood glucose concentration nor a low $\Delta$-glucose consistently correlates with “appetite” or food intake (L. M. Bernstein & Grossman, 1956; Grinker, Cohn, & Hirsch, 1971). Nicolaïdis and Rowland (1976) found that rats receiving continuous intravenous
infusions of nutritive substances over long periods did decrease their oral food intake, but not sufficiently to prevent energy accumulation and weight gain. Interestingly the less nutritionally balanced the infusion, the lower the reduction in food intake, suggesting that some of the residual oral feeding may owe to a specific appetite for missing food elements. Other studies that detracted from the glucostatic hypothesis include those of Woo et al. who found that post-prandial insulin levels are not likely signals of satiety in humans (Woo, Kissileff, & Pi-Sunyer, 1984), and studies that showed that gastric filling is the principal signal of satiety (Jordan, 1969; Wirth & McHugh, 1983). A study that showed that for an individual on a single day, energy intake and expenditure are not related, as one might expect if they were tightly controlled by glucose metabolism also cast doubt upon the theory (Edholm et al., 1970). More recently, studies have found no change in appetite ratings when blood glucose is kept constant at concentrations held to represent physiological pre-prandial and post-prandial conditions by insulin-glucose clamp (4 mmol/L and 8 mmol/L respectively) (Andrews, Rayner, Doran, Hebbard, & Horowitz, 1998).

With these and other studies, Mayer’s glucostatic hypothesis fell out of favour from about the mid-1970’s (Campfield & Smith, 2003, p. 28). It did not disappear completely however. During the 1980’s the physiologist Jacques Le Mangen was able to write

There is now considerable body of evidence for a role of glucose homoeostasis and rate of glucose utilisation in generating the hunger signal. It turns out that the feeding mechanism is linked to the complex mechanism which controls the supply of glucose to the tissues and maintains a constant blood glucose level (Le Magnen, 1985, p. 30).
Le Mangen’s finding that the start of each meal is preceded by a fall of 6 to 8% in the blood glucose level (at least in rats) was later confirmed in humans by Campfield & Smith (2003, p. 33) who now posit that transient preprandial declines in blood glucose are signals in the form of patterns that are detected and recognised by the central neural network that controls feeding behaviour.

The apparent paradox of diabetic hyperphagia, which so exercised Mayer has since been addressed in ways that do not require the invocation of $\Delta$-glucose, yet allow the glucostatic hypothesis to stand, at least as regards meal initiation. It is now generally accepted that if the action of other hormones on the regulatory area on the hypothalamus is taken into account, then the paradox disappears. Since high blood concentrations of insulin have been associated with satiety, insulin deficiency is a likely trigger for diabetic hyperphagia (Hernandez & Briese, 1972), however in the last 10 years the role of leptin has also received attention (Hidaka et al., 2001). Diabetic hyperphagia probably thus represents the loss of satiety that is normally promoted, not by hyperglycaemia, but by insulin or leptin or both (Niswender & Schwartz, 2003).

It seems likely then that the glucostatic hypothesis holds for the initiation of meals but not necessarily for the cessation of them. Low blood glucose concentration probably stimulates eating, but other factors such as insulin and stomach filling are involved in satiety and the cessation of eating.
11.1.2 Implications of the inside-looking-out approach

To the best of the author’s knowledge, Ciampolini is the first investigator since Cannon and his contemporaries to specifically refer his research subjects to their subjective symptoms rather than asking them non-specifically about their “hunger” or their “desire to eat.” Ciampolini’s method involved asking subjects to forget about meal-times until they became aware of spontaneous sensations of hunger. Only then did they measure blood glucose (which was almost always found to be lower than around 4.5 mmol/L (~81.8 mg/d/L)).

In a different context Cannon did likewise. He established the hunger “pang” as the “essential element,” and only then did he seek the physiological correlate (in this case contraction of the stomach). Since Cannon’s time, and until Ciampolini, all investigators have taken the “outside in” approach. A particular biochemical state is established, then the subjects asked by questionnaire or rating scale what they are experiencing, thus inviting all the uncertainties of interpretation as outlined in section 8.2. For example, Bernstein and Grossman found low blood glucose did not correlate with appetite, but they used a hunger questionnaire which ranged from “No desire to eat” at one extreme to “Extremely hungry” at the other. Thus they incurred the difficulties of the measuring instrument, mixed the desire to eat with the sensation of hunger, and assumed that all instances of low blood glucose are associated with hunger (it seems more likely that a certain threshold of low blood glucose must be crossed and that this threshold varies from person to person). Bernstein and Grossman’s paper was instrumental in diverting interest from the glucostatic hypothesis (Van Itallie, 1990). Ciampolini’s findings are therefore highly significant
and will perhaps revive a theory that for the reasons given by Mayer above would be expected to play a large part in food regulation. After all as Van Itallie states:

Although the theory may seem unsophisticated and oversimplified in the light of knowledge cumulatively acquired since 1955, the basic proposition of the glucostatic theory, which ties energy balance regulation to the body's supply of available carbohydrate, is still viable, albeit in a modified form …(Van Itallie, 1990, p. 8).

Ciampolini’s viewpoint parallels the “looking from the inside out” approach taken by Hut and Shepard in tackling the mind-body problem. The subjective sensation is given primacy. This could lead research into new and fruitful directions. Research questions that could now be asked might include for example, do hyperphagic diabetics experience the EHS? “What is it like” to be a diabetic during hyperphagia? The author has not had the opportunity to interview a diabetic during a bout of hyperphagia, but he has yet to meet a diabetic patient who experienced the EHS on a regular basis before training in its recognition. For most diabetic patients, the EHS is unknown or a distant memory. It seems unlikely then that the EHS is experienced during diabetic hyperphagia. More likely these patients experience a compulsive desire, an intense “wanting to eat” perhaps mediated by similar dopaminergic pathways to those discussed in section 10.2.3.

Already, using this approach, Ciampolini was able to formulate a hypothesis that would not have been accessible under the “outside in” method. He surmised that perhaps people could provide themselves with meal-by-meal feedback on their energy status by referring to their sensations of IH. Instead of relying on infrequent measures of a slowly changing variable such as weight, perhaps subjects can estimate before
each meal whether they are in energy debt or surplus. This would answer Edholm et al. above (and De Castro and Plunkett, section 5.4) since it would show that people can regulate energy intake on a daily basis. Ciampolini was able to confirm this hypothesis by demonstrating that with adequate training in the IHMP, subjects can achieve better energy balance and improved insulin sensitivity compared to control subjects as described in the following section.

11.1.3 Metabolic outcome: evidence for improved homeostasis and efficient digestion

Normal weight subjects typically eat less under the IHMP than before training. In one study (Ciampolini, Vicarelli, & Chiesi, 1992) normal weight adults showed a significant decrease of 27.7% in energy intake, yet weight and skinfold thickness were preserved, indicating that post-training energy intake was sufficient for normal daily activity and had probably been excessive previously. Overweight subjects lost weight. The decreasing-weight group in the same study showed a significant 48.1% decrease in energy intake and a significant reduction in weight. These findings support the hypothesis that people can regulate energy intake on a daily basis. That when energy intake decreased overweight people lost weight and normal weight people preserved weight supports the notion that they were eating in a more homeostatic manner.

In a recent report in which the author collaborated, (Ciampolini et al., 2008) 120 adult subjects were trained in the recognition of IH. Over 5 months, normal weight subjects with good insulin sensitivity preserved energy balance. Normal weight subjects with insulin resistance, and overweight subjects entered negative energy balance as
indicated by decrease of metabolic risk factors (glucose tolerance, insulin sensitivity, and HbA1c), as compared to controls. Analysis of the findings suggests a temporal sequence in which training produced a decrease in energy intake, which decreased average blood glucose and glycated haemoglobin, which in turn produced a negative 5-month energy-balance leading to decreased insulin resistance. Diastolic blood pressure and the total to HDL cholesterol ratio also improved. In a separate report on an extended group of subjects, loss of weight and decreased skinfold thickness was found among overweight and normal weight with insulin resistance subjects (Ciampolini & Lovell-Smith, 2008). These findings provide further evidence that eating in accordance with IH is homoeostatic compared to not eating according to hunger. These latter two reports have been submitted for publication.

Health benefits of improved metabolic balance

Ciampolini’s concept of IH among adults arose from his investigations into optimal feeding of infants and children. He suspected that the prevalence of non-specific diarrhoea that occurs at weaning might be related to the increase in energy intake that often also occurs when children are offered energy-dense foods ad libitum. Using a paediatric version of his method in which caregivers recognised children’s hunger signals (see section 7.4), in controlled, randomised studies Ciampolini et al. showed that energy intake was lower in the experimental groups than in the control groups and that the number of days with diarrhoea were significantly fewer in the experimental groups compared to controls. Nevertheless, weight increased normally after 7 months, and after 4 and 12 years of age in the experimental group, suggesting that a “substantially higher energy intake than was necessary” may have accounted for
the diarrhoea (Ciampolini et al., 1994; Ciampolini, Vicarelli, & Seminara, 1990). They also showed that not only diarrhoea, but steatorrhea and total serum IgE decreased using the same strategy (Ciampolini et al., 1991; Ciampolini et al., 2001).

In a longitudinal study, Ciampolini et al. (2000) reported that the infectious agent, Helicobacter pylori (H. pylori) correlated with the child’s feeding schedule, blood glucose levels at feeding time and the occurrence of gastrointestinal problems. H. pylori is a bacterium that may colonize the lining of the stomach. H. pylori has been associated with the genesis of cancers (Amieva, El-Omar, Amieva, & El-Omar, 2008; Hecht, 2007; Hsu et al., 2007; Suzuki, Hibi, & Marshall, 2007) and has been classified as a Class I carcinogen by the World Health Organization (Williams & Pounder, 1999).

Ciampolini et al. (2000) measured serum antibodies to H. pylori among healthy infants (negative for H. pylori) at baseline and at 4, 8 and 12 year follow-ups. Seropositivity for H. pylori was found to be 4.7% in the intervention group compared to 30.2% in controls. In a recovery study, children and young adults (60 months to 25 years) positive for anti-H. pylori were recruited and assigned to an intervention or a control condition. At one year 62.5% of subjects in the intervention group had lost seropositivity for H. pylori compared to 13% in the control group.

Overall, Ciampolini’s studies support the hypothesis that the meal-by-meal feedback on energy status given by IH yields improves metabolic outcome and that this improved metabolic outcome is associated with improvements in chronic pathogenic infection of the gut, perhaps mediated by improved insulin sensitivity. The
relationship between insulin sensitivity and immune function is examined in section 13.2.2.

11.1.4 Is glucose a hunger marker?

Given the evidence that subjects are able to estimate when blood glucose is low, does it really matter from which vantage one looks, inside or out? Could one not simply measure blood glucose, ensure it was low pre-meal and achieve the same homeostatic result? It might be tempting to assume that one could do that. This would only be the case, however, if a one to one correspondence existed between the subjective experience under study (IH) and the associated biochemical marker. However, as implied in the discussion on Bernstein and Grossman’s paper in section 11.1.2 such a simple correspondence is unlikely. It is more probable that IH (and the EHS) are associated with a number of metabolic fuels including fatty acids (Van Itallie & Hashim, 1960) and are the result of a complex interplay between them and orexigenic hormones such as ghrelin (Olszewski, Schioth, & Levine, 2008).

Thus while it might be true that low blood glucose concentration necessarily occurs in the presence of the IH, it does not follow that the IH necessarily occurs in the presence of a particular low blood glucose concentration. Other factors besides low blood glucose may need to be present before either the EHS or IH is experienced. From a theoretical point of view also, a one-to-one correspondence between the EHS and low blood glucose concentrations would be unexpected because the EHS is postulated to represent not just metabolic need, but the readiness to digest, whereas

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78 This also receives support from Friedman and Stricker who state …while it is true that several different conditions of cytoglucopenia can lead to increased feeding, it does not seem to be the decrease in glucose utilization per se that elicits hunger, but rather, a general decrease in the utilization of all metabolic fuels for energy production (M. I. Friedman & Stricker, 1976).
low glucose might logically be taken to represent metabolic need alone. It may therefore be more accurate to state that the EHS is a marker for low blood glucose, than that low blood glucose is a marker for the EHS. In evidence of this, some of Ciampolini’s subjects did not experience IH at glucose levels at 4.5 mmol/L (it appeared at a lower concentration) and in all subjects it was not the case that IH suddenly appeared at a particular blood glucose concentration. IH appeared over a range of concentrations that varied both from subject to subject. Some situations in which low blood glucose concentrations may be present in the absence of the EHS or IH which have been identified by Ciampolini (and some cases also by the author independently) appear below. Generally in these situations the sensations of inanition will be present in place of the EHS:

1. Digestive inefficiency
2. Acute physical demand
3. High ambient temperature
4. Severe illness, fever, cachexia

Acute physical demand depletes liver glycogen stores. In support of our observation that neither IH nor the EHS appear in the period immediately after exercise, Melanson et al. found that the relationship between hunger and transient declines in blood glucose “representing a physiological feature of food intake regulation” operates only within a normal physiological range of carbohydrate status and not when glycogen stores have been depleted by exercise (Melanson, Westerterp-Plantenga, Campfield, & Saris, 1999a).
Van Itallie mentions:
...growing evidence that apart from the body's need to replenish its supply of energy, carbohydrate and protein consumption also may be regulated aspects of eating behaviour (Van Itallie, 1990, pp. 8-9).

Ciampolini acknowledges there may be other important biochemical processes involved in homoeostatic eating among which glucose concentration is only one (Ciampolini, M. personal communication 19th February 2009). An example of the manner in which glucose operates in association with other humoral factors, is furnished by Rayner et al. (in this case relating to satiety). These workers injected an infusion of cholecystokinin (CKK), a regulatory hormone secreted by the small intestine and associated with satiety (Pi-Sunyer, Kissileff, Thornton, & Smith, 1982), in healthy human volunteers while keeping blood glucose concentrations constant at either 4mmol/L or 8 mmol/L. They found that stomach antral pressure waves (as measured by a pressure transducer) decreased in the presence of CKK when glucose was held at 8 mmol/L but not at 4 mmol/L. They found a similar effect on food intake but not on hunger ratings. They conclude that small intestinal nutrient stimulation and blood glucose interact in the regulation of food intake, but that physiological hyperglycemia has only a modest effect on food consumption without a prior nutrient stimulus to stimulate the release of CCK (Rayner, Park, Doran, Chapman, & Horowitz, 2000).

There may be physiological situations in which the EHS is present in the absence of low blood glucose. Under certain circumstances a physiological blood glucose concentration higher than the population mean might be necessary to serve the requirements of presiding hierarchical levels. In fact, Ciampolini et al.’s findings
suggest this might be the case. A group of subjects involved in heavy manual labour apparently experienced IH at higher pre-meal mean blood glucose concentration than did other subjects and higher than Ciampolini’s “cut off” value of 81.8 mmol/dL the glucose concentration that best demarcated those who experienced IH and those who did not (Ciampolini et al., 2008). Energy is stored (feedforward) for future use in the form of glucose in the blood, glycogen in the liver and fat in fat cells. These workers may have responded to physical demand by increasing their “front-line” blood glucose energy storage. Blood glucose concentration is tightly controlled within a certain range, but rather than defend a fixed blood glucose set-point below which hunger occurs, the blood glucose concentration at any particular moment is the result of varying factors, some of which, like including physical demand, emanate from higher levels in the homeostatic hierarchy.

Taken together, these findings support the notion that while the EHS maps to glucose, glucose should not be seen as a “hunger marker.” Hunger sensations are the final common pathway in a complex feed-forward homeostatic regulatory system that operates in concert with other homeostatic control systems defending not just blood glucose but other nutrient fuels such as amino acids and free fatty acids. “Normal” blood glucose is a continuum, a “shady zone influenced by weight, age, other metabolic substrates, sex, and other factors …” (Arky, 2005, p. 1151). Low blood glucose concentration is likely to be just one of a number of biochemical factors in the biochemical elaboration of hunger.
**11.1.5 Subjective symptoms provide best homeostatic feedback**

IH and the EHS may be better indicators of homeostatic eating than blood glucose. As noted in the introduction to this thesis, few people measure glucose, ghrelin, weight, or any other biomedical measurement before deciding whether to sit down to table. Hunger, and particularly the EHS is a less complicated and accessible source of feedback information and may be more accurate than biochemical measurements.

Evidence that hunger provides energy balance feedback superior to blood glucose concentration measurements is provided by Ciampolini’s data (Ciampolini & Lovell-Smith, 2008). One group of obese subjects already at baseline showed low mean pre-meal blood glucose concentrations (<4.5mmol/L), and therefore under Ciampolini’s definition were already eating homeostatically. It is difficult to reconcile obesity with purported homeostatic eating. Furthermore, these subjects

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79 As a type-B materialist it might be tempting to take low glycaemic level as the real arbiter of homeostatic eating, considering subjective sensation a helpful guide to allow the subject to estimate whether his or her sugar concentration has fallen to homeostatic levels. After all, blood glucose plays a crucial role as an energy source and low blood glucose concentration pre-meal might be expected to have a positive influence on energy balance by avoiding high glucose swings. In this view, the experience of hunger would perform no other role than to allow a subject to estimate his or her blood glucose concentration. However in the light of the above discussion 1) blood glucose concentration is likely to be only one biochemical elaboration of hunger – other biochemical factors may also be important, and 2) blood glucose concentration is low in the homeostatic hierarchy and may vary (within a certain range) according to the demands of higher levels in the hierarchy. Therefore, this author suggests that it is the sensation that counts. Initial hunger and more specifically the EHS, represent final common pathways among many factors and may appear within a range of blood glucose concentrations, depending upon other variables such as physical demand, efficiency of digestion and ambient temperature.

80 Ciampolini et al. (2008) and also Levitsky (2005) have pointed out that weight is a poor indicator of energy balance partly because of its slow rate of change relative to eating occasions and partly because fluctuations in daily weight are determined not only by increases and decreases in real tissue mass (which in turn reflect energy balance), but also by changes in body water content, gastrointestinal contents, and body glycogen stores. Levitsky has achieved success with an interesting technique called the Tissue Monitoring System in which subjects’ daily weight measurements are corrected statistically for these confounding variables then conveyed to the subjects as energy balance feedback (D. A. Levitsky et al., 2006), however identification of the EHS may be give more direct feedback.
lowered their food intake and lost weight after training in the recognition of IH. Thus
the IHMP allowed these subjects to eat in a more homeostatic manner than they had
been able to before. This implies that the symptoms of IH provide more sensitive
feedback on homeostatic eating than pre-meal blood glucose measurements. These
subjects might have been experiencing IH at baseline, and probably were to a degree,
but the fact that training improved their metabolic profile without any other
intervention suggests that training allowed them to experience IH more regularly and
in a more systematic manner.

The sensations of IH (and, it is suggested here, more particularly that subset of them
known as the EHS) should therefore be taken as a more sensitive indicator of
homeostatic eating than low blood glucose or weight. Ultimately Cannon’s “wisdom
of the body” is found within the contents of consciousness.

11.2 Chapelot, Marmonier et al.

Further evidence that eating in the presence of (in this case undefined) hunger is
associated with a favourable metabolic profile is provided by Chapelot, Marmonier et
al. in their differentiation between a “snack” (food eaten in the absence of hunger) and
a meal (Chapelot et al., 2004; Marmonier et al., 2002; Marmonier, Chapelot, & Louis-
Sylvestre, 1999). Previous writers have noted that snacks tend to be consumed when

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81 At first glance this contention appears to be supported by a study by Pittas et al. who measured
interstitial blood glucose and found that while the absolute interstitial blood glucose concentration was
a significant predictor of energy intake in nonobese women, the desire for a meal and reported hunger
(visual analogue scale) were quantitatively more significant (Pittas et al., 2005). The problem with the
study is that 1) The subjective hunger experience was not specified and 2) It is not known whether
these women were eating in a homeostatic manner. The study may do no more than demonstrate that
people who think they are hungry are likely to be found eating, irrespective of their interstitial blood
glucose concentration.
people are not hungry (Castonguay et al., 1983) and many studies have implicated snacks in the aetiology of obesity (see de Graaf, 2006 for review). Chapelot et al. exploited the French institution of goûter, a mid-afternoon light eating occasion habitually eaten by some, but not all French people. Habitual goûter eaters (GE) report being hungry for goûter, while non-goûter eaters (NGE) report that a lack of hunger prevents them from taking goûter. NGE subjects were offered food at the usual goûter time. Those who did not accept were designated non-goûter non-snack eaters (NGNSE), while those who did accept were designated non-goûter snack eaters (NGSE). The word goûter was therefore differentiated from the word snack, the latter being reserved for food taken in the absence of hunger, in this case by the NGSE group. According to earlier studies, (Chapelot, Aubert, Marmonier, Chabert, & Louis-Sylvestre, 2000; Marmonier et al., 2002; Marmonier et al., 1999) snacks were found to have poor satiating efficiency. The snacker’s energy and macronutrient intakes at the following meal (dinner) were unaffected by the snack. This led the authors to conclude that a snack consumed in the state of satiety would favour energy storage (Marmonier et al., 1999).

A later study (Chapelot et al., 2004) confirmed the above findings and showed that the goûter was preceded by high hunger scores and a linear decline in plasma glucose and insulin concentrations, features not observed before the snack. The following meal (dinner) was requested later in the case of GE and was smaller when compared to NGNSE, indicating homeostatic regulation on the part of GE subjects, whereas the snack altered neither time of request nor energy intake at dinner in the NGSE group, indicating that this group was eating in a non-homeostatic manner.
Although the EHS is a newly revived concept and not at this stage generally recognised, the greater clarity afforded by the identification of the EHS should allow better definition of eating in the absence of hunger in studies such as these. The point at which non-homeostatic motivation overshadows homeostatic motivation may now be defined as *that moment when the subject decides to eat in the absence of the EHS.*

These studies and the studies by Ciampolini provide evidence that eating in the presence of hunger (even when hunger is ill-defined) is associated with improved carbohydrate metabolism, is homoeostatic and favours energy balance. It is significant that subjects can be trained to eat in a way that has been shown to produce an improved metabolic outcome. In effect these subjects are enjoying the benefit of a low carbohydrate diet without the associated dietary restriction (see section 13.2.2).

### 11.3 Intuitive eating

Intuitive eating, (section 7.4.1) has been described as eating in accordance with hunger and satiety signals, the adoption of sustainable health behaviours, and improved psychological well-being and body image regardless of body weight. Hunger is not precisely defined but “physical” hunger is differentiated from wanting to eat. The term physical hunger most likely therefore overlaps with the EHS and studies on intuitive eating can be taken as preliminary evidence for the efficacy of eating in accordance with the EHS. Early studies (Carrier, 1994) have been followed by several randomised trials of intuitive eating which have demonstrated sustained maintenance (but not loss) of body weight for at least one year using the intuitive eating regime (Bacon et al., 2002; Bacon, Stern, Van Loan, & Keim, 2005; Ciliska, 1998; Goodrick et al., 1998; Hawley et al., 2008; Nauta, Hospers, & Jansen, 2001).
The study by Hawley et al. is particularly relevant to the theory presented here because these workers not only investigated intuitive eating but also included the effect of an intensive relaxation therapy on body weight in their protocol. In their randomised intention-to-treat trial, 225 obese or overweight New Zealand women were assigned to two supervised programmes and a programme delivered by mail. Each group received instructions on “non-dieting” emphasising the regulation of eating by attention to body signals (hunger and satiety) and awareness of the “triggers to eating that are unrelated to physical hunger”. One group was given instruction on mind-body techniques including progressive relaxation, abdominal breathing, meditation, mindfulness, hatha yoga and visualisation. Outcomes included weight, measures of psychological distress, a Harvard Medical Symptoms Checklist and systolic and diastolic blood pressure. Over a two year period mean weight remained unchanged in all three groups. The relaxation group showed reductions in psychological distress and medical symptoms after one year and greater reductions in these scores than the second supervised group after two years.

That these women, all of whom were concerned about their weight did not increase in weight could be seen as a positive finding. That they were able to do this and improve their psychological profile is encouraging. With the more powerful conceptual tools delineating hunger presented here and the efficacious method of achieving low mental arousal represented by Transcendental Meditation it may be possible to achieve better results than those already found. Ciampolini’s results, for example, suggest that not only maintenance but loss of weight should be achievable.
11.4 Illustrative cases

Generally, since most Westerners eat in excess, when patients become aware of the EHS and enter a meal pattern in which the EHS is predominantly present pre-meal, they spontaneously reduce their calorie load leading to similar improvements to those noted by Ciampolini. As indicated in the introduction to this thesis, I have observed improvements in dyspepsia, migraine, type 1 and 2 diabetes, rheumatoid arthritis (Lovell-Smith, 1992), inflammatory bowel disease and Graves’ disease. Two case studies from my clinical practice are briefly reported to illustrate the efficacy of the EHSMP in clinical practice.

11.4.1 Crohn’s disease

Master B.B. presented in August 2005 aged 14 complaining of fatigue over the previous 6-8 weeks necessitating his absence from school. A keen cross country runner and rugby player he complained of feeling nauseous after exercise and of abdominal pain after eating certain foods. His mother remembered that he had passed blood per rectum lasting about 3 days 6 weeks previously but she had put this down to haemorrhoids. She thought he had lost about 2 kg in the previous month. He was found to have a mild microcytic anaemia with elevated inflammatory markers (the erythrocyte sedimentation rate (ESR) was 47 mm/hr and C-reactive protein (CRP) was 40mg/L).

I referred him to a paediatrician who diagnosed Crohn’s disease, an inflammatory disease of the digestive system. Biopsy indicated extensive involvement of the colon and small intestine. The paediatrician advised potent anti-inflammatory medication
including prednisone “because of the extreme nature of his condition”. B.B. was advised that he would require this medication indefinitely.

His parents, having consulted the internet about the long-term effects of these drugs, the “natural history” of Crohn’s disease and the possibility that bowel surgery might become necessary received the news in some distress and asked for time to consider. A few days later, after B.B. had eaten a late night pizza with his rugby friends he became acutely unwell with severe abdominal pain, vomiting and further rectal bleeding. The paediatrician was unavailable and they returned to my surgery the next day.

It transpired that B.B. frequently ate in the absence of any sensation that could be related to hunger. When I enquired as to what hunger meant for him he replied that the stomach “aches a little.” He also described a sour taste during hunger (probably oesophageal reflux). When asked if he was hungry at that moment he replied that he was, but that if he ate he knew he would be sick.

I asked him to close the eyes and become aware of the body. I suggested he direct his attention to the abdominal area and to report to me what was “actually there”. It quickly became obvious that the symptoms he was ascribing to hunger were actually symptoms of abdominal dysfunction or distress. I suggested to him that if the digestive system is distressed then perhaps that is not a good time to introduce food and he agreed. I then described the EHS. He stated that he knew what that experience was, but that it was a long time since he had felt it. I suggested to him that before each meal he should close the eyes and become aware of the abdominal area.
If he discovered that the EHS were not present he should just take very light soup or even just a cup of hot water. When the EHS appeared he should eat normally at the next meal time, but should avoid excessively spicy, sour or salty food.\textsuperscript{82} I asked him to avoid snacking in between meals and advised that food should be eaten in a settled contemplative manner free from distractions such as television or reading. I also suggested he re-start his practice of Transcendental Meditation which he had allowed to lapse.

Since that consultation B.B. has had only one episode of (mild) abdominal pain, no vomiting and no rectal bleeding. The loose stools persisted for about two weeks and have recurred mildly only a few times since. The ESR has been within the normal range since. The CRP which like the ESR, fell precipitously (see figure 31) has been within acceptable range, although not completely normal, rising, at one point, to 13 mg/L (October 2007). Episodes of higher CRP coincide sometimes with a return of loose stools, on one occasion with abdominal pain, and invariably with a lapse in his eating in accordance with the EHSMP. Revision of his eating skills is followed by an improvement in CRP (see arrows, figure 31). B.B. has put on weight. He was 51.5kg soon after presentation. His present weight is 70.3kg. He has resumed his studies and runs and plays rugby.

\textsuperscript{82} In Maharishi Ayurveda cold food and drink are considered inhibitory to digestive function (one could speculate that digestive enzymes need to operate within an optimum temperature zone) hence the instruction to take hot water. B.B showed signs of Pitta excess. Excessively spicy, sour or salty foods are Pitta aggravating. Ayurvedic medicine is a very large field and space has not permitted a full explanation of Maharishi Ayurveda in this thesis.
CRP fell precipitously soon after Mr B.B. resumed Transcendental Meditation and adopted the EHSMP. CRP reached the normal range within 2 months (normal range is less than 5 mg/L as indicated by the dashed line). Since then it has been within an acceptable range. The improvements seen in September 2006, November 2007 and January 2009 (arrows) coincide with revision of his eating skills.

Is B.B. cured of Crohn’s disease? From a Western point of view the illness has been sufficiently improved to remove the overt signs and symptoms that would constitute a diagnosis of Crohn’s disease and to release him from danger of further complications. The paediatrician understandably expressed concern that “in the long term his quite severe Crohn’s disease is going run a frequently relapsing course and have the high risk of developing complications such as strictures etc.” B.B. is now more than three years post-treatment without significant relapse. In view of the slight elevation of CRP B.B. is under three monthly follow-up. Six stages in pathogenesis are described.
in the Vedic system. Only in the last two stages do signs and symptoms recognisable as disease appear. From the viewpoint of Maharishi Ayurveda, B.B has not been fully cured but he has been moved from the very dangerous stage six (disruption of function), to stages one to four in which signs and symptoms are non-specific.

B.B. is one of a number of cases from my practice in which inflammatory bowel disease has responded to recognition of the EHS and avoidance of spicy and salty foods. His case is used here for illustrative purposes. A great deal more work is needed before the encouraging results seen in this case could be generalised. What can be said with certainty is that had B.B. not had the opportunity to make use of the EHSMP as outlined above, he would certainly by now have been exposed to high and frequent doses of prednisone, mesalazine and azathioprine and would very likely have become a candidate for surgery.

11.4.2 Graves’ disease

Mrs J.V. presented in January 2003 aged 55 years complaining of loose stools and faecal urgency and feeling hot, tense and anxious with a constant feeling of urgency “as if late for a bus”. She complained also of feeling as if something were stuck in the throat at about the level of the thyroid cartilage. She was found to be thyrotoxic. She was referred for specialist opinion and in the meantime advised in dietary skills essentially identical to those given to Mr B.B. Within a month she had noticed that she could sleep under a bed cover for the first time in many years and that the throat symptoms had disappeared.
Since May 2003 to the time of writing (March 2009) she has been euthyroid. Carbimazole, a drug that reduces the production of the thyroid hormones, was exhibited for a month in March 2003 after she went into atrial fibrillation. However she reverted to sinus rhythm before the drug had time to exert an effect and has had no further episodes. The drug was withdrawn when T4 came into the normal range. TSH increased to a normal level 8 months after dietary skills were instigated.

![Thyroid function Mrs JV](image)

Free thyroxine (T4) fell to within the normal range after 4 months of following the EHSMP and practising Transcendental Meditation (upper limit of normal for T4 is 23 pmol/L as indicated by the dashed line). T4 has remained within the normal range.

The progression of her free thyroxine (T4) is shown in figure 32. This is an uncommonly quick remission for one of her age group and cannot be accounted for by just one month of carbimazole. According to the specialist’s letter: “at least 12 and probably 18 months of low dose carbimazole would be appropriate to see if she goes into long term remission…radioiodine would be appropriate if she does not remit”
(Brownlie B, personal communication 11th April 2003). About 10-20% of all patients with Graves’ Disease may have a spontaneous remission within the first year of diagnosis, however the remission is frequently not permanent. Therefore a five year remission while not impossible is very uncommon. The patient’s symptoms have largely resolved. A feature of this intervention is the positive enhancement of well being that accompanies the resolution of the symptoms, a feature that cannot be adequately accounted for by the alleviation of the disease and is unlikely to have occurred to such degree with more conventional treatment. After six weeks of treatment the patient stated:

I feel so good now. I wake up in the morning feeling really good, really ready for the day. I did not realise you could feel that good.

These two case studies suggest also that a relationship exists between over-eating, digestive inefficiency and the immune system. This will be examined in Chapter 13.

11.5 Conclusion to Chapter 11

Chapter 11 presented the evidence so far available that the EHS supports homeostasis. The most relevant evidence is that provided by Ciampolini’s studies with studies by Chapelot’s group and workers in the intuitive eating field also providing support. The contribution of Ciampolini’s findings to the glucostatic theory of food regulation was evaluated, a new way forward for research discerned and metabolic improvements resulting from the IHMP outlined. Illustrative examples from my practice were presented.
Eating in ignorance of internal eating cues is now widely accepted to be detrimental. So far in this thesis outwardly directed attention has been implicated. The next section of this thesis considers stages in childhood development and suggests that halted development at an intellectual stage promotes “recoding” of internal perceptions that also disallow full appreciation of the EHS or its differentiation from inanition, satiety and intestinal dysfunction indicators.
Chapter 12 Recoded experience vs. “seeing what is there”

Introduction

So far externally oriented attention has been cited in explaining why some people eat in response to stimuli that are not themselves affected by eating. This chapter suggests recoding of perception that occurs as a function of childhood development may also lead to impaired interceptive competence. The chapter introduces the clinical method used by the author in helping patients overcome their recoding habits and identify the EHS. The method will be described in Chapter 14.

12.1 The Vedic “lifespan model”

Childhood development theories constitute a large literature (see for example review by Fischer, 1980). Their full examination is beyond the scope of this thesis and will not be attempted here. Alexander et al. (1990) have proposed a “lifespan model” that puts into Vedic context the generally accepted trends in cognitive development and to provide an extended model capable of embracing the adult development of higher states of consciousness. This model is presented here as an aid in understanding the mechanism behind loss of interoceptive awareness and competence.
Figure 33 Levels of the mind in relation to periods of development according to Maharishi’s Vedic Science

The arrow represents the dominant locus of awareness at each stage of development. The movement of awareness through progressively more fundamental levels of the mind (from senses to Self) is held to be the mechanism underlying the appearance of the commonly observed periods of development. Transcending thought allows the experience of the Self, opening the possibility of developing higher states of consciousness (Alexander et al., 1990, p. 293 adapted with permission).
Figure 33 illustrates the relationship between the faculties (levels) of the mind and the commonly observed major developmental periods. Although all levels of mind function simultaneously, according to this model, awareness predominates in certain mental domains corresponding to the child’s maturity. This “dominant level of awareness” is represented by the arrow sloping downwards from left to right in the figure. The awareness of the maturing child begins with the most concrete sensations in the sensorimotor and early representational periods. As the child matures, the dominant level of awareness moves sequentially, to focus first upon concrete thinking then abstract reasoning. Later stages of development may lead to higher states of consciousness as indicated in the figure.

Soon after birth, during the sensorimotor period, infants demonstrate the ability to discriminate. For example their own mother’s voice is differentiated from that of others suggesting that the “capacity of representation is not constructed but inherent within the organism” (Alexander et al., 1990, p. 301). During the early representational period spanning the second to fourth years of life the child knows only perception and desire, so action tends to be egocentric and impulsive as commonly observed amongst “toddlers.” In the concrete thinking period between the ages of around five to seven, the process of classification begins in which the mind organises and learns to apprehend, remember, compare and conceptually organise perceptions. During the latter two periods perception of detail is acute and children may show fascination with the minutiae of quite mundane objects. As discussed in section 7.3 it is probable that a child at this age is open to interoceptive perception (Moses et al., 2000; Wright, 1986). Interoceptive perception may well be subject to the same acuity as exteroceptive perception. Context appears to be intuitively known.
Children’s artwork tends to be uninhibited yet remarkable in the harmonious placing of artistic elements. As the artist Betty Edwards states:

Children seem to start out with a nearly perfect sense of composition which they often lose during adolescence and regain only through laborious study (Edwards, 1981, p. 69).

This attention to detail and sense of context that adults tend to lose (as evidenced by the artistic efforts of untrained adults) is very likely lost in interoceptive perception also. It may be that internal cues such as hunger and satiety are apprehended in detail and in context at an early age, only to be lost later on. If this is the case then therapy could be styled towards regaining this perceptual detail.

At age around seven years or beyond the child enters the abstract reasoning period in which the reflective intellect dominates. The primary locus of awareness moves from concrete thinking to reflection. The intellect gains the ability to reflect consciously on the contents of the mind, rendering thoughts as possibilities, rather than actuality.

The resulting identification of invariant principles or rules is of obvious utility in mastering the complexities of the phenomenal world. It is at the basis of mathematics and scientific progress. While the intellectual realm is of undoubted value, it has limitations. The primary constraint of the intellect is that it can never know (in the sense of experience) the object of perception (the “thing in itself”) directly. For the intellect, symbols stand in for the “thing in itself.” Overuse of the intellect can thus bring a sense of detachment from the richness of life. In an attempt to compensate the intellect tends to artificially ascribe a sense of reality to what in fact are merely
symbolic representations. This tendency to “mistake the map for the territory,” is called in MVS *pragya aparadh*, which means “mistake of the intellect.”

Pragya aparadh provides another way to understand why the mind should want food when it is not actually giving pleasure as found when wanting and liking are dissociated and in the phenomenon of “overshooting”. Overshooting was described in section 10.3.5 and related to dopamine dysfunction in section 10.2.3. The intellect has a “notion” that pleasure accrues from a particular type of food, and operates according to that notion rather than the actual incoming food-related sensations of taste, sight, smell and texture.

The development of higher stages of consciousness involves merging the ego with the transcendental value of the unbounded self or pure consciousness. As the process continues the ego becomes all encompassing allowing the more complete illumination and coordinated integration of the more peripheral mental structures. However in the absence of such development the mind remains in the upper left section of figure 33. From the point of view of MVS the mind looks “through a glass darkly.” Attention is externally orientated (since focused mainly on objects of experience) but experience is also recoded or “chunked” into symbolic representation by the intellect (section 12.2.1).

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83 Pragya aparadh runs deep in the structure of things, being considered to arise during the fundamental separation of Rishi, Devata and Chandas from Samhita. It is a consequence of the fact that Chandas looks nothing like consciousness, leading to the apparent separateness of Chandas from Samhita. In forming a symbolic representation the intellect loses memory of the connection between Chandas and Samhita and ascribes an independent reality to Chandas.
12.1.1 Adverse effects of dominant intellect

In societies that lack a technique to transcend thought, continued maturation to higher states of consciousness is rare. For the vast majority of Western people the locus of attention settles at the intellectual or abstract reasoning level leaving deep levels of feeling, intuition and ego less than optimally developed. In common parlance this leaves many Westerners “living in their heads.” It is beyond the scope of this thesis to comment in detail on the sense of dislocation that overemphasis on the intellectual faculty has caused in Western society.

Referring to symbols rather than sensations the mind loses touch with the real-time data needed for homoeostatic food intake regulation. In particular, the EHS is either overlooked or its significance unrecognised. The deeper emotions and intuitions tend to be less integrated, type-b pleasure is less forthcoming, and non-homoeostatic eating results. Regarding the question posed in Chapter 7 as to whether the significance of interoceptive eating sensations must be learned, or is innate and later forgotten, it is proposed that

1. The eating-related sensation most important to homeostatic eating, the EHS, occurs innately (interoceptive awareness).

2. That children have an innate sense of context suggests that they may know the significance of these sensations (interoceptive competence), but caregiver feedback seems to be important in full development of interoceptive competence. (Thus both schools of thought are partially correct – the
significance of interoceptive signals is innately known but must be reinforced by caregiver feedback).

3. Caregivers can infer from childrens’ behaviour when the EHS is present (children have expressive competence).

4. The sensations may be recoded and thus masked or even obliterated during development to maturity.

5. Thus the significance of the sensations may be forgotten, denied, misattributed or overlooked.

Thus some reasons why a person might be found eating in the absence of the EHS are:

1. The EHS is never present (obliterated – probably the case in obesity)
2. The EHS is present from time to time but the subject is unaware of it (lack of interoceptive awareness)
3. The EHS is present from time to time but the subject is unaware of its significance (lack of interoceptive competence – may be the case in anorexia nervosa).
4. The EHS is present from time to time but is denied or deliberately overlooked (probably the case in anorexia nervosa).
5. The person thinks they are eating in the presence of the EHS but they are not. (A recoded mental construct or symbol stands in for the EHS – probably common in so called “normal” eaters).

For whichever of these reasons, in the absence of direct perception of the EHS, appropriate eating desires tend not to arise. The mind in its search for pleasure then falls prey to whatever other non-eating related stimulus might prompt the desire to
eat. It is proposed here that large sections of the population have only a vague perception of the EHS. This is related to chronic mental over-arousal (outwardly oriented attention) and halted development beyond the intellectual level. The results are “mistakes of the intellect.” Three types of mistakes are outlined in the following section. They are 1) inattentional blindness, 2) premature closure and 3) misattribution.

12.2 Attention, inattentional blindness, premature closure and misattribution

The importance of attention with respect to eating cues is well recognised in the literature. Words such as “attending to,” “awareness” “attention,” “disattention” and “ignored” occur frequently in eating research as the following examples illustrate:

…their own inner awareness has not been programmed correctly (Bruch, 1961).

…[denial of hunger] evades the question of whether the failure to report hunger is due to a lack of awareness of the hunger experience, or whether it simply results from a disinclination to report it. ((Stunkard, 1959)

Hunger awareness can be restored… (Ceaser, 1979)

…task performance can provide a measure of attention to dietary control (Mitchell & Brunstrom, 2005).

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84 Thus during the sensorimotor and representational periods of development the EHS is clearly perceived by the child. Later, probably owing to inappropriate care-giver feedback, its significance is either not learned, or learned and later forgotten or blurred. With neglect the sensation itself recedes into non-salience. The dominant intellect recodes the sensation. It no longer refers to the “territory” (sensation), but merely refers to the “map” (symbolic representation) of hunger. Thus while many adults have “an idea of what hunger is” this may no longer bear any relation to the hunger sensations themselves.
Chapter 12 Recoded experience vs “seeing what is there”

…awareness of a recent eating episode may be an important factor influencing appetite (Higgs, 2005).

Many studies have shown that eating, even among “normal” eaters, is influenced adversely (usually overeating) when attention is diverted. Heilbrun and Worobow report two studies on 100 normal female college students in which the Eating Disorder inventory (which includes a scale of Interoceptive Awareness) and the Stress Symptom Checklist were administered. This was in an effort to identify “whether heightened and stress-related inner stimulation could interfere with the at-risk woman’s sensitivity to hunger sensations, thereby decreasing her motivation to eat.” The authors conclude:

The female, unable to resolve the stress-provoking problems, will come to deal with these discomforting sensations by ignoring them through disattention. Efforts to ignore turbulent inner sensations also will decrease her sensitivity to hunger sensations (Heilbrun & Worobow, 1990, p. 471).

In other studies in which attention has been diverted in various ways, eating regulation has been shown to be adversely affected by advertising (Lieberman, 2006), television (Poothullil, 2002; Stroebele & de Castro, 2004), other people (Birch, Zimmerman, & Hind, 1980; Herman, Roth, & Polivy, 2003) cognitive load (Mitchell & Brunstrom, 2005; Ward & Mann, 2000), music (Stroebele & de Castro, 2006), recall of a previous meal (Higgs, 2005), how much others have eaten (Pliner & Mann, 2004) and time scarcity (Jabs & Devine, 2006). These studies suggest that diverted attention impairs interoceptive perception which usually results in higher food intake. Hunger has been shown to draw attention to food-related stimuli (Mogg, Bradley, Hyare, & Lee, 1998) (and therefore presumably, away from distracting stimuli).
however very few studies have focused on fostering the interoceptive perception of hunger \textit{per se}. The studies by Ciampolini and the studies on intuitive eating are the exceptions.

Describing dieters (restrained eaters) Tylka states:

These individuals’ internal signals have been weakened as a result of being ignored, numbed, and replaced with external cues as to when, what, and how much to eat; consequently, these individuals may be unable to tell when they are hungry or sated...Because hunger and satiety signals are often ambiguous, these individuals may interpret their emotional distress as cues that they are physiologically hungry (Tylka, 2006, p. 236).

The three “mistakes of the intellect” could be seen as a lack on attention – not attending to or “seeing” what is there:

1. Inattentional blindness means not “seeing” what is there.
2. Premature closure means “seeing” what is not there.
3. Misattribution means misinterpreting, what is “seen.”

\textit{12.2.1 Recoding}

In all cases, the mind lumps sets of incoming data into categories then proceeds to refer to the categories without further examination of the data. This process of “recoding” was first described by Miller (1956/1994).\footnote{Describing recoding Miller uses the example of a person learning Morse code who at first hears each \textit{dit} and \textit{dah} as a separate ‘chunk’ of information. Later he or she organises (recodes) these sounds into letters and deals with the letters as chunks. Still later the letters organise themselves into words and the words into whole phrases. The process} Rensink refers to recoding as
“chunking” of data, a kind of data aggregation which he sees as a necessary function of high level cognitive interpretation (Rensink, 2000, p. 1477).

12.2.2 Use of the word “see”

There is no word in the English language specifically for the perceptual act of alimentary interoception. The word *feel* could be used but has emotive connotations which for the sake of linguistic precision should be kept separate from interoceptive perception. Although *listen* could also be used I have chosen *see* in the colloquial sense of “seeing what is actually there” in the gastric area.

12.2.3 Illustrative dialogues

The following dialogues with normal weight patients recorded verbatim in my consulting room, are typical of many such conversations and illustrate the above three perceptual errors in “seeing what is there”.

Mr N W aged 33 14/9/06

DLS: What is hunger for you?

NW: Very close to an ulcerative colitis flare up

DLS: How do you feel now?

NW: Feel absolutely starving! And also full – no not full, bloated, a cross between starving and bloated. [After being asked to close his eyes and become aware of body and stomach area], [This

...is to group the input events, apply a new name to the group, and then remember the new name rather than the original input events (Miller 1956/1994, p. 350).

Although this procedure has obvious advantages in handling large amounts of information, it is dependent upon the accuracy of the original data reorganisation. This thesis suggests that many people refer to the concept hunger rather than the interoceptive input, having either never recoded hunger properly or having forgotten the original coding.
sensation] is not the same as normal hunger because it doesn’t move. [In normal hunger] I can feel the movement (he described this as “peristaltic”).

DLS: Are you feeling that feeling now?
NW. No.

Ms T B aged 37 9/10/06

DLS: Are you hungry now?
TB: I have an empty "churny" feeling in my stomach.
DLS: Can you point to where you feel it?
TB: No. I've never really thought about it. I just tend to eat.
DLS: Do you get that empty "churny" feeling before each meal?
TB: No. Gee, I don't know - never really put any thought into this. Maybe 50% [of meals].
[After being asked to close eyes and become aware of body and stomach area]
DLS: Are you feeling anything from the stomach at the moment?
TB: No just a little unsettled.”

Mr D.B Aged 59. 5/10/06

DLS: Are you hungry now?
DB: I feel that my stomach is demanding food.
DLS: Are you able to describe that feeling?
DB: It is a hollowness. [After being asked to close his eyes and become aware of his body and stomach area] No there is nothing there, just a feeling of fullness.
DLS: What happened to the hollowness?
DB: It isn't there.
DLS: Would you have eaten on that cue?
DB: Yes, if someone had brought me a packet of chips I would have eaten it.
DLS: And would you eat it now?
DB: No.
All have misinterpreted what they “see” in the stomach area as hunger. For Mr N.W. it is like a flare up of his ulcerative colitis. In describing this sensation he used words usually reserved for extreme hunger and extreme satiety respectively. For Ms T.B., hunger is an empty “churny” feeling, for Mr D.B. it is a hollowness. When asked to really “look”, they realise that they did not “see” what was actually there. What was actually there was a slightly unsettled feeling for Ms T.B. and a feeling of fullness in the case of Mr D.B. Mr N.W. recognised that whatever he experienced it was not hunger after all. All therefore demonstrate inattentional blindness and misattribution. However, not only did the latter two subjects miss what was actually there – they also constructed a perception that they fully believed was present (premature closure). They “saw” something that on closer inspection turned out not to exist – the “churny” feeling and the feeling of hollowness, respectively.

Two significant conclusions arise from this. One is that had they been offered food before inspecting their sensations more closely, they would in all likelihood have eaten it. Mr D.V. specifically confirms this. In that case, they would have eaten for reasons unrelated to any interoceptive eating sensation. Whatever the desire to eat, it would not have been satisfied by eating. Therefore they would have eaten non-homoeostatically. The other conclusion is that, had they been asked to indicate their hunger level on a hunger rating scale, they almost certainly would all have given hunger a high score. If the experiences of these patients are a general phenomenon (and in the author’s experience they are typical), then that would call into serious question the findings of any study in which hunger rating scales have been used.
What these patients were asked to do is to become interoceptively aware. This is an unfamiliar experience for many. The relationship between poor interoceptive awareness and the eating disorders has been commented upon in section 7.2. It is clear that these so-called normal subjects were struggling, firstly to interpret and secondly to express their interoceptive experience. Their experience is similar to that of alexithymia which reflects problems in finding words to express emotional experiences. It is not surprising that alexithymia has been found to be associated with poor interoceptive awareness (Taylor, Parker, Bagby, & Bourke, 1996; van Strien & Ouwens, 2007).

However, these patients were having difficulty not only in describing what they perceived (expressive competence), but also in knowing the significance of what they perceived (interoceptive competence). Understanding what these patients were facing could perhaps be aided by examining in more detail the results of faulty recoding of interoceptive data.

**12.2.4 Inattentional blindness**

“It is against state policy to pave over a deer,” said . . . an engineer for the department. “If in fact the deer was in the work area, it should have been removed before the work was done.”—Associated Press, August 22, 1996, reporting on road workers who failed to see and thus paved over a dead deer.

Although when we regard a scene we feel as if we are taking in all aspects of it simultaneously, the human brain is not equipped to attend to all things at once. In fact, the brain can attend to only a few objects, thoughts or concepts at a time, while others recede into the background or are filtered out altogether. The illusion we have
of a constant and stable reality “out there” when, for example, we walk into a room is the result of perceptual sleight of hand – “tricks” the brain plays.

Since the brain attends to only one or two things at a time, when attending to a particular object or event observers often fail to report the appearance of irrelevant, unexpected items. Inattentional blindness is thus described as a failure to represent unattended items (Rensink, 2000) or “looking without seeing” (Mack, 2003). It appears that we perceive only that to which we attend (Noë & O’Regan, 2000) and fail to notice stimuli that are in front of us when we our attention is distracted or if they are not in accordance with our attentional goals (Most, Scholl, Clifford, & Simons, 2005).

Inattentional blindness explains why observers intent on a tennis match failed to perceive a figure dressed in a gorilla suit running on to the court (Simons & Chabris, 1999) or why a road crew in Pennsylvania accidentally paved over a dead deer (Most et al., 2005). It may also explain why patients such as those quoted above missed sensations that on closer inspection they decided were actually present.

Two possibilities might render a person “blind” to an internal stimulus such as the EHS, given its presence. These are firstly that it is indeed perceived, but that in the absence of attention it is not registered or remembered. One writer has suggested that inattentional blindness should be renamed inattentional amnesia (Rensink, 2000, p. 1474). The second possibility is that stimuli are registered but that their significance has never been learned or reinforced properly. Learning is necessary even to differentiate a stimulus from its background. The term “figure-ground” refers to the
ability humans have to separate salient elements from a picture or diagram. What contrasts a figure from its ground needs to be learned. As Harshaw comments:

...often we do not perceive what we have not been taught (or taught how) to perceive, even if it is right in front of us for years ... An expert and a novice can look at the same exact thing visually, for example, and see completely different things (much that is there is simply invisible to the novice or untrained person, but will pop out as clear as day if the person undergoes training). Given what we know about how exteroceptive perception works it is thus difficult to say what exactly someone who has not been raised appropriately experiences (or perceives) interoceptively or not. (Harshaw C, personal communication May 16th 2007).

In the absence of such learning a figure would merge into the background. In this way, internal eating cues while experienced might never fully emerge from the background of bodily sensation if they have never been pointed out during early learning as distinct and salient experiences.

On the other hand, there are situations in which we commonly perceive a good deal more than we notice. Driving is an example. An experienced driver can reach a destination without noticing detail, even although considerable detail must have been perceived. A chiming bell might be noticed on the third chime. Once noticed it could be recognised as the third chime even though not noticed at first. Thus we can be sensitive to perceptual information in the absence of attention, the brain is able detect a stimulus and even act upon it, without the necessity of experiencing it consciously. This could be a desirable or undesirable phenomenon as will be discussed in the next section.
12.2.5 Automaticity

Since the conscious mind is equipped to attend to only a few items at any one time, to
avoid mental overload the mind creates “subroutines” that when called upon function
outside conscious awareness (automaticity). It is thought that a considerable amount
of mental processing and even perception takes place outside of consciousness and
that this takes place more efficiently than conscious thought (Bargh & Chartrand,
1999; Dijksterhuis, 2004).

… the nonconscious or automatic processes… are unintended, effortless, very fast, and many of them
can operate at any given time. Most important, they are effortless, continually in gear guiding the
individual safely through the day (Bargh & Chartrand, 1999, p. 476).

It is not uncommon for a driver to reach a destination without a clear idea of even the
route taken, yet quite complex manoeuvres have been efficiently performed in the
process. However, one cannot drive a car in an automatic way until one has gone
through the process of learning to drive. At the time of learning one is intent on each
stimulus and the correct patterns of behaviour in response to each stimulus are
scrutinised consciously. It is the role of a driving instructor to ensure the novice
driver has learned the significance of the various stimuli from the road and that the
reactions will be appropriate. As learning progresses, the action of driving becomes
automatic. Should the significance of the various road stimuli be inaccurately
learned, then bad driving habits will similarly become automatic. It may be that
interoceptive competence is reinforced to varying degrees among individuals then
relegated to the domain of automaticity. This would help to explain the mechanism
behind automatic eating as described in section 10.3.5.
12.2.6 Premature closure

It is well known from Gestalt psychology that our minds react to patterns that are familiar, even though we often receive incomplete information. Thus we tend to see complete figures even when part of the information is missing. This is one way in which the mind maintains perceptual constancy and is the mechanism that allows us, for example, to continue to see a plate as round even though our perception at a given time might be in fact elliptical. Similarly we continue to see a garment as blue even though our perception is black when we see it in a darkened room. The mind constantly compares incoming stimuli with known patterns. Often it assumes a “fit” before full information is available. This explains, for example, the familiar experience of seeing someone one knows well, perhaps even waving to them, then realising it is someone else, or seeing a figure in the distance that turns out to be a tree or rock. “Seeing” what is not there and misinterpreting what is seen are both examples of premature closure. Inattention to internal eating cues has been well recognised in both obesity and anorexia nervosa, but restoring attention to eating cues has not been widely promoted as a solution. Rather it has been assumed that if those factors that are distracting attention from internal cues are removed then proper attention to the cues will automatically be restored. The next section examines an approach to effectively undo the effect of recoding and return exteroceptive perception to the apprehension of detail characteristic of the young child during the sensorimotor and early representational periods.
12.3 Learning how to “see”

In her perceptive books on the art of drawing (Edwards, 1981, 1988), the artist Betty Edwards suggests that categories can so entrap the mind that “what is actually there” is not seen clearly enough for a person to represent it in a drawing.

…we have learned to see things in terms of words: we name things, and we know facts about them. The [brain] doesn’t want too much information about things it perceives – just enough to recognize and to categorise …to take a quick look …right, that’s a chair (or an umbrella, bird, tree, dog, etc) … There’s symbol for each. To sum up, adult students beginning in art generally do not really see what is in front of their eyes … (Edwards, 1981, pp. 76-78).

What applies to exteroceptive perception can equally be applied to interoceptive perception. It is proposed here that the interoceptive perception of “hunger” is for many people a category closed early in the representational period of development and not re-examined. Incoming interoceptive data is recoded or “chunked” into symbols. The brain takes a quick look and decides hunger is present or not, based on various stimuli. These may be hunger stimuli but they may equally be intestinal dysfunction stimuli or the perception of a social obligation. Hunger may therefore be “seen” when it is not actually there rather in the manner of seeing the tree or rock in the distance and perceiving it as a person. Very few adults have the ability to draw accurately unless trained. There seems no reason to expect greater facility in the interpretation of interoceptive information. The prevalence of so called normal adults unable to correctly identify the EHS may well be of the same order of those unable to draw accurately, or at least there seems no reason to believe otherwise.
Edwards demonstrates that she is able to take novice artists producing crude and childish drawings and train them to create impressively accurate and artistic representations within a few lessons. Her methods essentially overcome categorisation by tricking the brain into seeing things afresh. It is not an intellectual process that she advocates, but rather a series of perceptual experiences. The solution to inadequately learned eating routines is similarly not an intellectual exercise. Stunkard commented on the unsatisfactory nature of the intellect compared to intuitive knowledge:

…book-learning compares unfavorably in precision of regulation with the wisdom of the body. And when conscious control of food intake supersedes automatic regulation, it appears extraordinarily difficult to return to automatic regulation (Stunkard, 1959, p. 288).

That thinking too much can interfere with the quality of preferences and decisions that are better made intuitively is well recognised (Wilson & Schooler, 1991). The solution to returning to automatic regulation of food intake is not intellectual but perceptual, involving a redirection of attention from the dominant intellectual realm back to the direct sensory experience enjoyed during the sensorimotor and early representational periods. “Seeing what is actually there” is the factor that is common to Betty Edwards’ artistic success, to the experience of the EHS and to the heightened awareness of food represented by savour and relish.

The author has developed a method of body awareness derived from Maharishi’s Vedic Approach to Health to assist patients in “seeing what is there” in the interoceptive domain which will be outlined in section 14.1.3. In essence this
involves a return to the innocent and uncategorised, yet detailed, perception of the young child. In the author’s experience, it is not difficult to help patients in this way.

12.4 Prevalence of impaired awareness of internal eating cues - the continuum hypothesis of eating disorders

Many people may suffer from impaired awareness of internal eating cues, not just those who suffer from obesity and anorexia. According to the continuum hypothesis the differences among individuals with eating disorders who meet the Diagnostic and Statistical Manual of Mental Disorders criteria and individuals with milder forms of eating disorders are a matter of degree and not of kind extending to include “normal” eaters at one pole and highly disordered over and under eaters at the other, with subclinical forms of eating disorders at intermediate points (Scarano & Kalodner-Martin, 1994).

A study performed 21 years ago suggested that only 33% of a sample of US college undergraduate women could be said to have normal eating habits, where “normal” is defined as the absence of chronic dieting, binging or purging or subclinical bulimia (Mintz & Betz, 1988). Polivy has suggested that “normal” eating for North American women is now characterized by dieting (Polivy & Herman, 1987) with an

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86 Debate continues as to whether all eating disorders indeed lie on the continuum (Tylka & Subich, 1999; Tylka & Wilcox, 2006) or whether some, for example binge eaters, are qualitatively different from others (Lowe et al., 1996). The continuum hypothesis nevertheless provides a useful conceptual framework to integrate and understand many diverse phenomena. Of particular interest in the context of this thesis is the suggestion that “normal” eaters also lie on this continuum.
“atrophy of hunger and satiety signals” (or ability to respond promptly to them) among obese individuals.

Subjects who do not show any signs of eating disorder appear at the “normal” end of the continuum. However the atrophy of hunger and satiety signals referred to by Polivy probably continues well into this non-eating disordered population. Although no formal studies have been performed on the prevalence of non-awareness of internal eating cues, in the author's experience it is a widespread phenomenon, by no means limited to the obese, the dietary restrained or the eating disordered.

12.5 Conclusion to Chapter 12

In summary, the experience of internal eating cues (interoceptive awareness) is probably innate. Their significance may also be apparent to the infant but this may need to be reinforced by caregivers to avoid faulty ascription. During the stage of development during which the intellect dominates, the eating sensations are recoded. Symbolic representations tend to replace the experience of interoceptive eating sensations (internal eating cues). Familiarity with the EHS may thus be lost. According to Tylstra research might usefully focus on

…determining the best way to help individuals who have developed an external orientation to food intake (e.g., those who chronically diet) work toward eating according to their internal hunger and satiety signals (Tylka, 2006, p. 236).

In the author’s opinion this is best done by the effective guidance of attention. The “mistakes of the intellect” outlined in this chapter can be corrected by “seeing what is
there.” This involves bringing conscious awareness to the abdominal area and in effect returning the attention to sensations that had dominated in early childhood.

**Conclusion to Part 2**

This chapter concludes part 2 of the thesis. The objective of the thesis is to generate theory to explain why some people eat in a non-homeostatic manner. The theory can now be summarised in a series of principles:

1. Desire and pleasure are integral to eating regulation (Chapters 6 and 9)
2. Eating pleasure (type-b) must reach a threshold for regulation to occur (Chapter 9)
3. Eating pleasure is enhanced when eating is in response to the EHS (Chapters 8 and 9).
4. Externally oriented attention and recoded perception mean that the EHS is not recognised or interpreted properly (Chapters 10 and 12).
5. In the absence of the EHS and in states of high mental arousal the required threshold may not be reached (Chapters 9 & 10).
6. Hence for some people eating is not fully pleasurable
7. Hence some people eat in a non-homeostatic manner.

In part 3 the implications of the theory are considered.
PART 3

Implications
Chapter 13 Hypotheses and predictions

Introduction

In part 1 the ground was laid for a new look at eating regulation via a paradigm that offered an explanation for the mind-body divide. This paradigm carried certain implications, namely that the universe is fundamentally integrated by an underlying field of intelligence, that pleasure accompanies the flow of intelligence, and that the flow of intelligence could be understood directly by study of mental phenomena. This led to the idea that eating could be regulated by pleasure in concert with the subjective phenomena of hunger and satiety. These ideas were explored in Chapters 5 and 6. In Chapter 7 the fact that many people eat in a non-regulated manner was acknowledged and in part 2 the notion advanced that this occurs because they do not enjoy their food sufficiently. Lacking pleasure from food eaten in a homeostatic manner, the mind seeks it by eating in a non-homeostatic manner. In particular type-b pleasure or contentment from eating is relatively lacking. While contentment from any source could in theory contribute to eating regulation it was suggested that eating in response to the EHS and the process of transcending thought are two simple methods to increase the type-b pleasure of eating and improve food regulation whose effects are susceptible to measurement.

An elaborated statement of the theory is

Non-awareness of, or non-recognition of the significance of internal eating cues is the result of recoded perception and externally oriented attention. The absence of the key eating cue EHS means that eating is not fully pleasurable for some people. Since
eating pleasure must cross a satisfaction threshold for the regulation of food intake to occur, some people eat in a non-homeostatic manner. Recognition of the EHS and lowered mental arousal represent “uncoded” experience. They restore (type-b) eating pleasure and support homeostatic eating.

This section of the thesis presents two hypotheses that arise from the theory and the predictions that flow from them. It then considers the possible implications of these predictions.

13.1 The hypotheses

13.1.1 That the EHS meal pattern (EHSMP) yields improved measures of homeostatic eating.

This hypothesis flows from the principle outlined in Chapter 9, that the EHS supports homeostatic eating.

13.1.2 That the regular practice of Transcendental Meditation yields improved measures of homeostatic eating.

This hypothesis flows from the principle outlined in Chapter 10 that low mental arousal favours homeostatic eating.
13.2 The Predictions and their implications

Referring to the homeostatic hierarchy outlined in section 6.3 eating in a homeostatic manner would predict:

1. Greater eating pleasure
2. Better health (Improved well-being and alleviation of illness)
3. Regulated parameters of tissue energy levels

Thus, if the theory is correct these advantages should follow the adoption of the EHSMP or the regular practice of Transcendental Meditation or both together. The implications of each prediction will now be discussed.

13.2.1 Greater eating pleasure

Since both interventions are held to increase type-a and type-b pleasure it should be possible to show that greater eating pleasure follows from both the EHSMP and the regular practice of Transcendental Meditation. If this proves to be the case, it would appear that the difficulties involved with dietary regimes based upon restraint and described in section 7.5 could be overcome. As mentioned in section 11.3, the advantages of a non-restrictive approach in which emphasis is on enjoyment and lifestyle are well recognised by the proponents of intuitive eating and non-dieting however studies so far have demonstrated only partial success (weight maintenance rather than loss) through the methods so far employed (Goodrick et al., 1998 and see section 7.5; Hawley et al., 2008) With the improved conceptual clarity about hunger
presented in this thesis and the efficacy of Transcendental Meditation, it is hoped that greater success could be achieved.

13.2.2 Alleviation of illness and regulation of energy parameters

Implications of raising the caloric intake when it has been too low

Anorexia nervosa

It appears that anorexia nervosa sufferers do experience hunger, perhaps to extreme degrees (Owen et al., 1985), but either deny it or do not appreciate its significance. This lack of interoceptive competence has been related to the evident loss of awareness of body image and body weight these patients exhibit (Garfinkel, Moldofsky, Garner, Stancer, & Coscina, 1978; McCabe, McFarlane, Polivy, & Olmsted, 2001; McFarlane, McCabe, Jarry, Olmsted, & Polivy, 2001). Bruch found psychotherapy to be unhelpful and the value of cognitive therapy, although widely used has been questioned (Zandian, Ioakimidis, Bergh, & Södersten, 2007).

The addiction model of anorexia appears to be a useful one (Davis & Claridge, 1998). Zandian et al. (2007) have suggested that the addictive process begins because it is initially rewarding (pleasurable) to eat less food. The process is maintained since anorexic behaviour becomes a conditioned response to this pleasurable stimulus. This group reported encouraging results of a training regime for eating using a scale connected to a computer upon which the patient places her plate. The computer then plots a curve of eating rate, giving the patient feedback. This kind of behaviour modification therapy appears to be a continuation of that originally suggested by Stunkard (1972).
Of interest is that Zandian et al. posit that the psychiatric symptoms often exhibited by anorexics (such as obsessive compulsive disorder) are not causally related to the illness, they are epiphenomena resulting from starvation. In defence of this they point to descriptions of voluntary and involuntary food deprivation in which psychiatric symptoms emerged in previously normal individuals. If this idea is correct then the problem is greatly simplified. It then resolves to treating one condition (anorexia) rather than a raft of difficult psychiatric disorders.

The author has not had clinical experience in using either of the suggested interventions in anorexia nervosa although anecdotal reports suggest improvements after instruction in Transcendental Meditation (Scurfield L, personal communication 2002). The possibility that an anorexic is stalled in the anhedonic phase of the excitement treadmill as outlined in section 10.3 suggests that the induction of type-b pleasure by either of the suggested interventions might yield improvements and at least offers a new avenue for research.

**Implications of lowering the caloric intake when it has been too high**

A body of illnesses prevalent in industrialised countries are widely believed to be the result of excessive caloric intake. These illnesses include obesity, heart disease and diabetes but could also include the spectrum of inflammatory and autoimmune diseases. Since caloric intake is expected to decrease with the practice of the EHSMP in most people, measurable improvements could be expected in these disorders. The full spectrum of disorders likely to be benefited may however be larger. It is well documented in animal studies, if not yet in humans, that restricting energy intake is
associated with beneficial consequences including extension of life span and retardation of age-related chronic diseases including cancers. (Hagopian et al., 2005; Heilbronn & Ravussin, 2003; Higami et al., 2006; Mattson, 2005; Roberts et al., 2001; Vasselli et al., 2005). In a human cohort on 3834 human subjects followed up after 50 years, a positive association between energy intake during early life and later mortality from cancers other than those related to smoking was found. An increased energy intake of 1 MJ/day was associated with a 20% increased risk of mortality from such cancer (Frankel, Gunnell, Peters, Maynard, & Smith, 1998).

Furthermore, and in support of Ciampolini’s findings, low mean blood glucose has been found in a longitudinal study to be associated with a lower risk of developing type 2 diabetes mellitus (Tirosh et al., 2005). 13,163 subjects whose baseline fasting plasma glucose levels were less than 100mg/dl were followed between 1992 and 2004 (74,309 person-years). The authors found a progressively increased risk of type 2 diabetes in men with fasting plasma glucose levels of 4.83 mmol/L (87 mg/dl) or more, as compared with those whose levels were in the bottom quintile (less than 4.83 mmol/L).

**Alternate day fasting**

As outlined in section 7.5 restricting energy intake by restraint is difficult since it runs counter to the hedonic eating impulse that most humans experience. Some workers have focused on alternate day food restriction in an attempt to partially overcome this difficulty in both humans and laboratory animals (Anson et al., 2003; Heilbronn, Smith, Martin, Anton, & Ravussin, 2005; J. B. Johnson, Laub, & John, 2006). In a preliminary report J.B. Johnson et al. speculate that widespread benefits could ensue from calorie restriction:
…we have experimented with alternate day calorie restriction, one day consuming 20-50% of estimated daily caloric requirement and the next day ad lib eating, and have observed health benefits starting in as little as two weeks, in insulin resistance, asthma, seasonal allergies, infectious diseases of viral, bacterial and fungal origin (viral URI, recurrent bacterial tonsillitis, chronic sinusitis, periodontal disease), autoimmune disorder (rheumatoid arthritis), osteoarthritis, symptoms due to CNS inflammatory lesions (Tourette's, Meniere's) cardiac arrhythmias (PVCs, atrial fibrillation), menopause related hot flashes. We hypothesize that other many conditions would be delayed, prevented or improved, including Alzheimer's, Parkinson's, multiple sclerosis, brain injury due to thrombotic stroke atherosclerosis, NIDDM, congestive heart failure (p. 209).

Alternate day fasting, while showing interesting results, still involves restraint (required every second day) with its attendant problems. The EHSMP offers a viable alternative to fasting that, being pleasure-based, is likely to meet with greater patient compliance.

The immune system disorders - Implications of improving insulin resistance

The ramifications of insulin resistance are wide and extend well beyond glucose homoeostasis (Biddinger & Kahn, 2006, p. 124; Bloomgarden, 2005). Insulin-resistance syndromes are common to the point of “pandemic proportions” (Cook, Aitman, & Naoumova, 2005). It is a clinical commonplace that healing is poor in uncontrolled diabetics, suggesting that immune competence is a function of insulin sensitivity. This is supported by evidence that chronic subclinical inflammation is part of the insulin resistance syndrome (Bastard et al., 2006; Bloomgarden, 2005; Gustavsson & Agardh, 2004; Vozarova et al., 2002). The inflammatory marker CRP is found to be raised in many inflammatory conditions and
has an emerging diagnostic role as risk factor for cardiovascular disease (Bloomgarden, 2005). CRP shows a strong negative association with insulin sensitivity and has a positive correlation with the body mass index (BMI) and blood pressure as demonstrated in the Insulin Resistance Atherosclerosis Study (Festa et al., 2000b). The inflammatory effects of impaired insulin sensitivity could also explain the mechanism of urinary microalbuminuria often found in diabetic subjects (Festa et al., 2000a). As outlined in section 11.1 Ciampolini has demonstrated a direct effect of restricted caloric intake using a paediatric adaptation of his method on Helicobacter pylori. This can be taken as evidence of improved immune competence. Based on the findings of Ciampolini it might be expected that the EHSMP could lead to an improved immune profile, as indicated by inflammatory markers such as ESR, CRP, white blood count and differential white blood count. The successful treatment of patients in my practice suffering from rheumatoid arthritis (Lovell-Smith, 1992), as well as the patients in the case studies in Chapter 11 who were suffering from Graves’ disease and Crohn’s disease could also be explained in terms of improved insulin sensitivity with improved specificity in immune function. Pathogenic T cells activated by microbial antigens are now recognised to play a role in Crohn’s disease. It has been suggested that H. pylori is just one of a number of intestinal pathogens resulting from a deficient immune response that may be related to insulin resistance. Other pathogenic bacteria might account for such disorders as irritable bowel syndrome (Azpiroz et al., 2007), colorectal cancer and obesity (Hecht, 2007). Ciampolini et al. have shown that in children with irritable bowel syndrome and coeliac disease, the bacteria count (mainly streptococci and staphylococci) per gram of mucosa for all subjects was 24 times higher after a 20 hour fast than after a 26 hour
fast and for coeliac sufferers, 39 times higher. In these subjects bacteria persisted longer than the intermeal interval (Ciampolini, Bini, & Orsi, 1996).

Both the author and Ciampolini suspect that a vicious cycle can appear in which subclinical inflammation provokes anorexia and eating with anorexia provokes subclinical inflammation (Ciampolini M, personal communication 30th October 2008). The cycle can be broken by avoiding eating in the absence of hunger. It is of interest that the erythrocyte sedimentation rate (ESR), another inflammatory marker, was noted, in a cross-sectional study, to be low in a group of practitioners of Transcendental Meditation with 20% of subjects showing the unusual reading of zero (compared to 3% of control subjects) (D. E. Smith, Dillbeck, & Sharma, 1997). This suggests that low mental arousal may also serve to break the above vicious cycle.

It has been long recognised that fasting is beneficial in rheumatoid arthritis, (Muller, de Toledo, & Resch, 2001). Authors tend to conclude their reports by remarking that while fasting is effective in rheumatoid arthritis it is not possible to fast forever and that most patients relapse on reintroduction of food making food restriction an “impractical management strategy” (Kjeldsen-Kragh, 1999; Stamp, James, & Cleland, 2005). The EHSMP is, in effect, a controlled fast in which the subject fasts just long enough to allow the EHS to appear. This allows for the benefits of fasting without the disadvantages. The EHSMP could have broad implications for a wide spectrum of auto-immune and inflammatory disorders.
Are diabetes and heart disease digestive disorders?

Diabetes mellitus has traditionally been thought of as an endocrine disease. If, as the author's clinical experience and the findings of Ciampolini and Chapelot et al. suggest, it is possible to significantly improve insulin resistance by attending to hunger cues then diabetes might be a disorder resulting from inefficient regulation of the digestive process. Similarly if insulin resistance is a predictor of immune system disorder and if CRP is associated with heart disease, it may be fruitful to regard cardiovascular disorders similarly as having a digestive origin. The human body functions in a holistic manner. Traditional disciplinary boundaries may need to be revised, since they risk imposing artificial hurdles to communication and impeding interdisciplinary progress.

Other implications of an easily achievable low mean blood glucose

A relationship between high carbohydrate intake and obesity has been suspected since the 19th century (Strandberg, 2005). Despite initial concerns about their popular dissemination and the absence of fully documented efficacy and safety (Harper & Astrup, 2004) as well as popular concerns about “hypoglycaemia” (Benton, 2002), low carbohydrate (and hence high protein) diets are gaining acceptance (Brehm & D'Alessio, 2008). Insulin resistance may promote maladaptive brain function (Cobain & Foreyt, 2005). “Modified Atkins” (low carbohydrate) (Kossoff & Dorward, 2008) and low glycaemic index (Pfeifer, Lyczkowski, & Thiele, 2008) diets have been decisively shown to be superior to the ketogenic diet in controlling refractory epileptic seizures in children and are now regarded as mainstream therapy for children and adults with intractable epilepsy. Benefits are said to be likely to extend to other
Other implications of alleviating the cycle of food addiction

An association between sensitivity to food reward, Attention-Deficit/Hyperactivity Disorder (ADHD) and obesity has been discussed by Davis et al. (Davis, Levitan, Smith, Tweed, & Curtis, 2006). It is possible that ADHD and food addictions share a common basis in disturbance of dopamine in the mesocorticolimbic system. The interventions suggested here could represent a new approach to this disorder.

Encouraging results in the treatment of ADHD using Transcendental Meditation have been found in a preliminary study (Grosswald, Stixrud, Travis, & Bateh, 2008).

13.3 General research implications

Clear delineation of the EHS raises a number of points that could usefully inform further research. Some of these are:

1. Qualitative research methods could gather further rich data on whether people experience the EHS in various lifestyles and during various illnesses. This would be of interest in so-called “normal eaters” including manual workers, sportspeople and athletes as well as in diabetes mellitus for example, during hyperphagia.
2. Greater clarity would be gained if when linking biomedical markers (such as ghrelin) to hunger it is specified to which subjective element of hunger the link is being made i.e. EHS, VEHS, inanition or appetite (desire to eat) alone.

3. Revision of the significance of all studies that have used hunger questionnaires and rating scales is called for. For most normal individuals a questionnaire or rating scale response that indicates “no hunger” probably indicates lack of all sensations and desire, however this is almost certainly not true for anorexics. A response that indicates that hunger is present could refer to EHS, inanition, intestinal dysfunction or the desire to eat in the absence of sensation and is, the author suggests, a non-specific and non-useful piece of information.

4. Revision of studies that have relied upon preloads to assess energy regulation is also indicated. As Marmonier et al. (2002) have shown a preload taken in a state of hunger has a more favourable metabolic outcome than one taken in a state of non-hunger. The more clarity that can be achieved about the actual state of hunger the more useful will be the results of such studies.

5. The EHS could have application in the specification of normal values. For example “fasting blood glucose” is currently taken to be the blood glucose concentration after an overnight fast and the normal value has been arbitrarily set at 6.1 mmol/L (it has been higher in the past) (Alberti & Zimmet, 1998). The time period is also arbitrary and does not account for individual variations in disposal of glucose to the tissues. Ciampolini’s data suggest that IH appears for most people below 4.5 mmol/L and it is possible that the EHS appears at a still lower concentration. Although it has been stated that there is not a one to one correspondence between blood glucose and the EHS, an unequivocal experience of the EHS could be a better standard with which to seek a “normal
range” for fasting blood glucose. Similarly the normal range of random blood glucose concentration may need to be revised in light of the improved insulin sensitivity that might accrue from the EHSMP. This line of thinking needs further investigation and could have important application in more accurate prevention, diagnosis and control of diabetes mellitus and the prevention of a wide range of diseases associated with insulin resistance.

6. As described in section 11.1.3, however, it cannot be assumed that blood glucose concentration below Ciampolini’s mean of 4.5mmol/L maps perfectly to the EHS in all individuals. Some subjects may experience the EHS at a concentration slightly above 4.5mmol/L while others will not experience the EHS until the blood glucose concentration is significantly lower. It would be of interest to know the range of blood glucose concentrations at which the EHS appears in a population.

7. The relationship of the EHS to insulin needs to be better understood. Is insulin necessary for the experience of the EHS or is the EHS solely related to stomach contractions?

8. Cannon’s quest to relate the hunger pang to stomach contractions needs to be revisited and finally resolved.

9. What is the prevalence of the EHS? How many people experience it premeal for every meal? How many cannot remember ever experiencing it? Can this be correlated with the health status of a population? Perhaps prevalence of EHS in a population could become a useful marker of population health.

10. Perhaps the development of higher states of consciousness might contribute to greater perceptual awareness and improved perception of internal cues, as suggested by Weldon and Aaron (1977). Useful research could focus on
identifying whether practitioners of Transcendental Meditation are able to identify the EHS more readily than non-practising controls.

11. The suggested increased palatability of LE foods and non-palatability of HE foods in states of low mental arousal could be tested

12. The role of LE, ME and HE foods in food regulation could similarly be tested.

13. Since Ciampolini’s studies were concerned with IH and not the EHS, it could be useful to repeat his studies using the EHS as the independent variable.

14. What, physiologically speaking, triggers the EHS? If the EHS represents readiness to digest and has a feedforward function in ensuring energy reserves are maintained, then what relationship does the EHS have to absolute metabolic need? What, physiologically speaking, decides how much glycogen and how much fatty tissue to set aside as reserve? Ciampolini and Lovell-Smith have shown people lose weight when eating in response to hunger sensations ((Ciampolini & Lovell-Smith, 2008) and see Chapter 11), so physical hunger must in some way be involved with maintaining energy balance and moderating energy reserves perhaps mediated by leptin. Now that the EHS concept has been restored, the way is open for further studies to clarify these questions.

Attending to these points could open up fruitful new lines of research.

13.4 Conclusion to Chapter 13

In Chapter 13 two hypotheses were presented and the predictions that flow from them. The implications of these predictions are broad for two reasons: 1) Existing evidence suggests that these two interventions could alleviate a wide spectrum of the most
prevalent diseases in Western society, including not only diabetes, obesity and associated heart disease, but also some auto-immune and neurological disorders.

2) Since the interventions are pleasure-yielding, compliance is likely to be high, in contrast to restraint-type dieting and concentration (restraint) type meditation.
Chapter 14 Testing the predictions

Introduction

In chapter 13 it was predicted that the EHSMP and regular practice of Transcendental Meditation could yield greater eating pleasure, alleviation of illness and regulation of tissue energy parameters. In this chapter suggestions are made for testing the predictions.

14.1 Independent variables

14.1.1 Regular practice of Transcendental Meditation

In any experimental design it is necessary to define the independent and dependent variables. Independent variables are those selected and controlled by the experimenter. The object of an experiment is to determine the relationship of the independent variables to an observed phenomenon (the dependent variable). Suggested dependent variables will be presented in section 14.3. In this section the regular practice of Transcendental Meditation and the EHSMP are discussed as independent variables novel to the field that could be used in for example, a randomized controlled trial (RCT) to assess their effect upon a dependent variable of interest. The RCT is generally regarded as the “gold standard” for assessing the effects of such variables.

Many studies indicate that Transcendental Meditation creates a state of “restful alertness” in which mental arousal is lowered without sacrificing alertness (see section 4.1.2 and Appendix 2). Transcendental Meditation is standardised in its
teaching and practice. Regular practice of Transcendental Meditation could therefore act as a surrogate variable for lowered mental arousal.

14.1.2 The EHSMP

In the author’s experience the EHSMP is not difficult for most subjects to achieve. Eating pleasure increases in the presence of the EHS so eating in this manner is self-reinforcing. Subjects can be trained to ensure that the EHS is present pre-meal by adjusting their food intake in food content (increased vegetables and fruit, less protein), in portion size or in food timing (delaying or missing meals). The EHS can also be elicited more frequently by increasing physical exercise during the inter-meal interval (but not immediately pre-meal). The author has used this training process in many patients over the last 20 years in the clinical setting. It is similar to that described by Ciampolini in ensuring that IH is present pre-meal for each meal except that whereas Ciampolini uses measured blood glucose concentration as a guide to help train subjects to “zero in” on their subjective sensations, the author relies upon subjective discernment.

While eating in response to the EHS once recognised is not difficult, care needs to be taken in training subjects. In the author’s experience training must be thorough but should also be light and presented in a way that is consistent with its overall aim – to increase eating pleasure. The author has found it fruitful to avoid injunctions. Rather than tell subjects that they “can only eat in response to the EHS” it is more useful to encourage them to ask “what in fact, am I experiencing. Is it the EHS?” then make their own decision accordingly. It should be remembered that the EHS is a
physiological feedback signal carrying useful information and it is recognised by patients as such.

With respect to identifying the EHS, subjects vary in their facility to grasp what seems for many an entirely new concept (although as discussed in Chapter 12 it has probably been forgotten or never fully discerned). It is by no means sufficient to simply describe the EHS to patients either verbally or in written form. Nor is it adequate to assess the presence of the EHS by questionnaire or rating scale because subjects frequently commit the perceptual errors of inattentional blindness, premature closure, and misattribution. “Show, don’t tell” seems to be the best strategy and involves taking the subject through at least the following steps:

1. Turning the attention away from external perceptions to the body’s interoceptive sensations
2. Becoming aware of the abdominal area
3. “Seeing” (perceiving) what is there
4. Interpreting what is there (EHS, VEHS, inanition, distress etc)
5. Identifying the EHS or its absence

Once the subject is aware of the EHS the subject can be encouraged to ensure the EHS is present before each meal and so achieve the EHSMP. Patients may need to be gently taken through these steps more than once or as many times as necessary until the investigator is satisfied that the EHS is being experienced. Although this process is more time-consuming and cumbersome than administering questionnaires or rating scales, as used in intuitive eating studies, it has the advantage in a research setting that
the independent variable is defined with greater precision. This should yield more consistent and useful outcomes than have so far been achieved. Section 14.1.3 is intended to give an outline of the kind of interview process that is necessary to ascertain whether a subject is experiencing the EHS or not.

### 14.1.3 The Author’s clinical method

The author has developed a number of key questions to help elicit what the subject is actually feeling and to help the subject recognise the EHS. While it is never possible to finally know what a subject is experiencing subjectively, all perception suffers from the same defect. It is never possible to be absolutely sure what a person is experiencing in response to objective phenomena (see section 4.4). Despite these limitations, careful interviewing can elicit a useful degree of certainty as to whether a subject is experiencing the EHS. Key questions include:

- Do you get hungry much?
- Where do you feel it?
- What does it feel like?
- Are you hungry now?
- How do you know that?
- What words would you use to describe it?
- [If they feel unable to describe it] Can you give me a few clues – something to go on?
- Can we check that?

If the patient agrees to the latter question, the patient is asked to close the eyes and become aware of the body. The attention is thus drawn to the abdominal area. It can
be helpful to have the patient rest the hand lightly on the abdomen to help draw the attention in that direction. The patient is simply asked to experience what is there.

The results can be revelatory for many subjects. As demonstrated in previous examples, patients who were adamant they were hungry commonly report the complete absence of hunger sensation, or the presence of other sensations such as anxiety, indigestion, or nausea. Like Mrs OH in the introduction to this thesis, the following patient realised that what she had for years thought was hunger was in fact, thirst (verbatim case notes Ms JS 1/6/2007):

For many years I was not tuned in, I am sure I was eating for comfort. I had my wires crossed with thirst. I would get a bodily sensation and without stopping to think what it was I would start to eat. When I wanted to lose weight, I realised how good it was to have your thirst slaked. It was so satisfying. It was then I realised I was eating on the thirst prompt. I was making myself sandwiches and stuff.

The following is intended to illustrate the use of the above questions by way of hypothetical conversations with patient Jim. They have been developed as a guide to therapists in eliciting the EHS. Questions are followed by typical responses that a subject might give in answer. In the first, the subject believes he is hungry.

DLS: You feeling hungry Jim?
Jim: Yes, too right!
DLS: How do you know that?
Jim: How do I know that? Well because I just am. You know when you’re hungry! I feel I could eat something! It’s a long time since breakfast!
DLS: So you feel you could eat something?

Jim: Yes!

DLS: And what do you refer to, when you feel you could eat something?

Jim: Not sure what you mean there.

DLS: I mean, where do you feel the hunger? In the body, I mean.

Jim: “Oh in the body! In my stomach I guess!”

DLS: “Can you show me whereabouts?

Jim: “Hmm ...I’d have to think about this. I guess it’s about here (indicates abdomen).

DLS: And what does it feel like?

Jim: “What does it feel like? I don’t know, I’ve never thought about it. I think it is a kind of
gurgling really.

DLS: Shall we check that? I’d like to take you through a little procedure to see what is really there.

The subject might on the other hand not believe he or she is hungry. The interview
might then proceed as follows:

DLS: You feeling hungry Jim?

Jim: No, not really,

DLS: How do you know that Jim? I mean, what did you refer to?

Jim: Well, it’s only an hour since breakfast.

DLS: Yes but I mean, what did you refer to in the body?

Jim: Oh, in the body! Um, I’m not sure. My stomach I guess!

DLS: So there’s nothing going on in the stomach right now?

Jim: I don’t think so.

DLS: Shall we check that? I’d like to take you through a little procedure to see what is really there.
The procedure:
The subject is asked to close the eyes for a few seconds, then open them again.

DLS: Do you feel any sensation in the body?
Jim: No.

DLS: Yet I’m sure you felt the chair against your back? And if I ask you to become aware of your left big toe, I am sure you can notice whether it is hot or cold or whether it is scrunched up in the shoe?
Jim: Well yes, I notice that.

DLS: The point I’m making is that the body is giving us messages all the time, but some of the time our brain filters these out. You did not think it was important to tell me about the chair against your back so your brain filtered that sensation out. Unfortunately the brain is also inclined to filter out some very important information coming from the stomach area.

The subject might notice a sensation:

Jim: Yes, I’ve got a headache at the moment.

DLS: So the body is giving you a message – things are not quite right in that area. The body is giving us important information all the time and one of the most important areas is the stomach.

In either case:

DLS: So this time I would like you to put the hand again just below the rib-cage – that’s just to draw our attention a little to that area – and notice what is actually there.
After a few minutes the subject is asked to open the eyes. Generally they will volunteer what they noticed, which might be nothing:

Jim: Nothing!

DLS: Well, that’s a very important piece of information! There is no signal coming from the stomach. That means that the body does not require anything. It is quite comfortable and doesn’t require food or any other attention. So I suggest to you that if you feel nothing, then the body is not asking for food and it would not be good to eat at that time. Does that make sense to you?

If Jim originally said yes to hunger being present, then:

DLS: By the way, Jim, what happened to the hunger?

Jim: I guess I wasn’t really hungry after all!

DLS: Well, that’s a very important insight! You thought you were hungry but now you’ve decided you are not. Do you think before you might have eaten?

Jim: Yes I probably would have!

Sometimes subjects will report that they notice nothing in the stomach area but still wish to report hunger. Thus:

Jim: Well there’s nothing in the stomach. I still feel hungry though.

DLS: Where do you feel it?

Jim: Um, I think it is in my throat.

DLS: What words would you use to describe that feeling, Jim?

Jim: (thinks about it): Really it is a sort of pressure. A kind of anxious feeling.
DLS: An anxious feeling? Would you say that’s hunger?

Jim: No, not really.

DLS: Sounds like the body is telling you something, but it’s not to do with hunger.

Jim: Yes. Wow, that’s incredible, I’ve never realised this before. (Often such an experience is a revelation).

DLS: Do you think you might have eaten on that prompt?

Jim: Yes I probably would have!

DLS: So maybe it would be good not to eat when you have that feeling?

Jim: Yes, that makes sense.

Frequently subjects will report an empty feeling. It is good to have a high index of suspicion about this report, especially in overweight or unhealthy subjects and to continue to gently probe into the nature of the experience. Thus:

Jim: I feel hungry.

DLS: Good! You feel an actual sensation?

Jim: Yes, think so.

DLS: What words would you use to describe that sensation, Jim?

Jim: Well it’s a bit hard to describe really. Sort of empty.

DLS: Shall we go back and check it out again? (close eyes again).

(After opening eyes) DLS: Can you give me a clue as to what you are feeling there?

At this point many subjects will say that the sensation disappeared or was not there after all, or in fact it was another sensation – a tightness or feeling of anxiety. In the author’s experience, only occasionally will a vivid description of the EHS emerge in a general practice population. The EHS can be verified by asking the subject to recheck
after about 10 minutes. A genuine experience of the EHS persists in the epigastrium and, while it may fluctuate at first, over time it becomes more intense, while other sensations which might be mistaken for the EHS, such as nausea “rumbling” or anxiety, tend to move or diminish in intensity.

If the therapist is satisfied that the subject is not feeling the EHS, the next step is to find out whether he or she ever experiences it or has any memory of it.

DLS: Can you think back to when you were really, really hungry? Maybe when you've been tramping?

Jim: Yes.

DLS: What words would you use to describe that feeling?

Rather than putting words into his or her mouth, it is better to encourage the patient to volunteer descriptive words. If words like “empty” “hollow” or “gnawing” are offered spontaneously it gives reason to believe that he or she has had an experience of the EHS at some point. This experience can then be used by the patient as a reference point.

If the patient does not volunteer these words then after a few attempts it may be necessary to say:

DLS: Jim for me, hunger is an empty, hollow, sometimes gnawing sensation right here just below the rib cage. It is not felt anywhere else and it generally gets stronger and stronger until the meal time. Can you think back to a time when you have experienced that?

Jim: Oh yes.
DLS: How often would you say you feel that sensation? Would you say at every meal?

Jim: No, more like once or twice a week (this is the commonest response).

DLS: I’d like to suggest it would be good to feel it before every meal. Does that make sense?

The patient might say that he or she does have this experience at every meal. Again a high index of suspicion is indicated:

DLS: Could we check that? At home could you please do this closing the eyes and hand on stomach thing before each meal? Maybe write down the times when you feel that empty hollow sensation?

Frequently the patient will deny ever having felt the EHS:

Jim: I don’t think I ever feel that.

DLS: Not even when you were a teenager? Can you think back to those days?

Jim: Yes, I think I did then.

DLS: Let’s get back to those days! I’d like to suggest it would be good to feel that empty hollow feeling before every meal. Does that make sense?

If the patient still denies ever having felt the EHS, it can be quite some time before the sensation is recognised and the patient will need ongoing encouragement and support.

Generally the author ends the consultation by dictating some instructions:

DLS: Jim, I’d like you to write a few things down so that you’ve got something to take away from this consultation. I’ll dictate and you write:
Before I eat anything ask myself if I feel the empty hollow sensation (close eyes and put hand just below the rib cage).

If the answer is “No”, then you might choose not to eat. You might like to just have a cup of hot water with a little fresh ginger, or maybe something very light such as some watery soup.

If the answer is “Yes”, then eat something delicious and enjoy it!

If I do not feel the empty hollow sensation, but I feel, faint light-headed, weak and losing concentration, then I should eat something light – some sweet juicy fruit or watery soup.

Not all patients will immediately understand the distinction between the EHS, and other sensations (false hunger). Some patients will require several and varied iterations of the above instructions before the therapist can be sure the EHS is being experienced. The author recalls a well-educated middle aged male patient, Mr G.L., a manager with a long history of dyspepsia, who insisted during two consultations that he was hungry and that he was indeed experiencing an empty hollow sensation. On arriving at the third consultation he reported with some incredulity that during an eyes-closed session at home he had become aware that the sensation he was calling empty and hollow was neither of those, but a tight sensation. On being encouraged to further examine this tightness he described it as a “knot in the stomach” and associated with anxiety. He then volunteered that during his childhood his parents were frequently at odds and that family meals were invariably tense anxious affairs. Since a tight feeling in the stomach was all that he had felt at mealtimes for as long as he could remember, he had attributed the word “hunger” to this sensation. Because intellectually he associated emptiness and hollowness with hunger, he was quite certain that he was experiencing emptiness and hollowness.
This case is instructive for it not only demonstrates all three perceptual errors, inattentional blindness, premature closure and misattribution but it also shows how dominant is the intellect and how powerfully it recodes perception in some individuals. This patient was adamant that the sensation he had named hunger had the qualities that logic would suggest. From his perspective the experience was hunger, so therefore it must have the qualities of hunger – an empty and hollow feeling. It was not until the intellect was put aside and he attended to “what is actually there” that he was able to form a more accurate perception.

The above is a basic description of how patients can be brought to perceive “what is there.” There are many refinements to the technique and many questions that patients ask as they become familiar with what, for most, is entirely new territory. A commonly asked question is what to do when the EHS arises at times outside normal mealtimes. In response the patient is encouraged to either wait for the next meal time if it is within 40 minutes or so, or the patient could take a light snack consisting of juicy fruit such as pear, peach apple or melon. This is a common phenomenon that tends to resolve as patients become familiar with the EHS and learn to adjust their food intake so that it will be present for each meal. In contrast to restrained eating, eating in accordance with the EHS is self-reinforcing. The increased pleasure that accrues when eating in the presence of the EHS is a powerful positive reinforcement that obviates the need for restraint.
14.2 Dependent variables:

Tests of homeostatic eating

14.2.1 Eating pleasure

Visual analogue scales have been devised to assess anticipated pleasure, intra-meal (type-a) pleasure and consummatory (type-b) pleasure. Hill et al. used a 100-mm scale with anchor words at each end, and required subjects to rate, for example, a) “How strong is your desire to eat?” (Very strong–Very weak). This and other scales measure what Hill et al. call prospective consumption which maps to anticipated pleasure. They also required subjects to rate on four occasions during and immediately after the meal: (a) “How pleasant have you found the food?” (Very pleasant – Not at all pleasant) and (b) “How satisfying have you found the food?” (Very satisfying – Not at all satisfying). These measure intra-meal and consummatory pleasure (Hill et al., 1984, p. 363).

Either of the independent variables could then be tested against the outcome of eating pleasure, ideally when compared against randomly assigned controls. Subjects could also be required to rate ongoing desire to eat during a meal.

14.2.2 Health

Well-being

Validated well-being scales have been used in the work on intuitive eating. The Symptom Checklist 90 R is said to have international acceptance and is used as a
standard instrument to assess psychological change (Schauenberg & Strack, 1999). A 23 item Medical Symptoms Checklist has been developed by Harvard Medical School to evaluate the mind-body interventions (Katzer et al., 2008). Other quality of life scales are the SF 36 and EuroQol measures (Garratt, Schmidt, Mackintosh, & Fitzpatrick, 2002; McDowell & Newell, 1996).

**Alleviation of illnesses**

As mentioned in Chapter 13, clinical experience and studies so far suggest that the spectrum of illnesses susceptible to Transcendental Meditation and the EHSMP could be wide, ranging from anorexia nervosa to diabetes, obesity and the inflammatory and auto-immune disorders. Outcome measures for each illness exist. Space precludes listing them however the inflammatory markers ESR and CRP are useful outcome measures for assessing both clinical and sub-clinical levels of inflammation.

**Regulated tissue energy levels**

Blood glucose concentration is a reliable index of energy availability to body cells. Mean and SD blood glucose concentration pre- and post-intervention as well as the Glucose Tolerance Test (glucose area under the curve and insulin area under the curve) provide endpoints for study as used by Ciampolini et al. (Ciampolini et al., 2008). Insulin sensitivity is measured directly by assessing whole-body glucose disposal under euglycemic insulin clamp. As this is not practical for most studies, various algorithms to calculate insulin sensitivity from the results of oral glucose testing have been developed that give a better indication than the raw data of glucose and insulin areas under the curve (Matsuda & DeFronzo, 1999).
14.3 Controls

When Transcendental Meditation is the independent variable, then control subjects are those who have not yet learned the practice. When the EHSMP is being tested, the control subjects should ideally be people who do not experience the EHS. However in practice this could be difficult to achieve as probably many people experience the EHS for some meals. Since the EHS is most probably not experienced by most people as regularly as would be achieved under the EHSMP this might not matter, however some effort would need to be made to assess the prevalence of the EHS in all subjects at baseline to confirm that the two groups did not significantly differ in this respect. Another type of control group could be subjects trained in the IHMP. This group would eat at the appearance of any physical sensation and could usefully distinguish effects that could be attributable to the EHS alone.

14.4 Conclusion to Chapter 14

This chapter identified the independent and dependent variables in testing the predictions made in Chapter 13 and included a brief presentation of the author’s clinical method in eliciting one of the independent variables, the EHS. These variables, presented in outline only, could form the basis for developing formal testing of the hypotheses.
Chapter 15 Limitations, objections and responses

A doctoral thesis attempts to penetrate deeply into a field and to contribute at its forefront. This is a strength and a limitation, since the “searchlight” beam of attention risks missing the “big picture.” One limitation of this thesis is that in concentrating on the sensations and emotions that regulate eating, other important strategies in the regulation of eating, such as the other Maharishi Ayurveda strategies outlined in the introduction, or promising external feedback systems (D. A. Levitsky et al., 2006; Zandian et al., 2007), have not been given equal attention. It was not intended that the methods discussed in this thesis should be taken to be the only methods in assisting eating regulation.

Another limitation is a quality of earnestness inherent in a scholarly work. This, the author fears, may have obscured the essentially enjoyable nature of the instructions for eating deriving from Maharishi Ayurveda. Maharishi’s techniques are characterised by effortlessness, practicality and pleasure and it would be unfortunate if the intellectual nature of this tract were to obscure that.

The author is aware that objections may have arisen in the reader’s mind. In this section I try to anticipate some of these and attempt to respond to them.87

Objection: Cannon knew about the EHS. Aristotle knew food gives more pleasure when you are hungry. Ayurveda is a 5,000 year old tradition. What are the innovations in this thesis and how significant are they?

87 Some have also been suggested by reviewers of early drafts of the manuscript.
Response: Cannon knew about the EHS but later generations ignored it. To revive the concept is new. Cannon wished to prove his point that emotions are central and the sensation of hunger is peripheral. He appears to have been ambivalent about the significance of the hunger pang. In this thesis I suggest that the EHS signifies readiness to digest as part of a feed-forward system coupled to physiological nutrient deficit signals (which in the absence of the EHS eventually present to consciousness as inanition). I suggest the EHS supports digestive efficiency and maintains nutrient reserves while maintaining energy balance. This is a new suggestion.

That food gives more pleasure when you are hungry is common knowledge but its significance to eating fulfillment and food regulation has not been discussed to the best of the author’s knowledge. In indigenous cultures diseases such as heart disease, diabetes and hypertension are virtually unknown (Denton, 1997). In these cultures people can probably eat what they like when they like because they are generally healthy and the food that is available to them is what has been called in this thesis LE food. The abundance of easily available HE food in our Western culture is unprecedented and most likely never seen in the 5,000 year tradition of Ayurveda. With Maharishi’s help I hope that I have made at least a modest contribution to adapting the ancient knowledge in a way that might allow us to cope with the problems of our time. To the best of my knowledge, the identification of the EHS and clarification of other hunger symptoms, their significance, their relation to eating pleasure and their relationship with current Western medical knowledge has not been attempted before either in Ayurveda or in the West.
This theoretical thesis did not set out to innovate by way of new data nevertheless I do bring informal data to the field in verbatim reports of clinical consultations. In an extensive search of the literature I could find no evidence that anyone has ever asked patients to describe in detail what they are actually experiencing at the time they are reporting hunger. What my patients’ responses indicate, and what seems to be a new idea, is that confusion over internal eating cues is widespread and not limited to the eating disorders. That the interventions suggested in this thesis could prevent and alleviate a very wide spectrum of disorders including inflammatory and neurological disorders and that “normal eaters” could benefit in disease prevention are new insights.

**Objection:** Why is there so much *philosophy* in this thesis? Was it really necessary to take such a long excursion into the mind-body problem? Could we not have gone straight to the practical application?

**Response:** A building that is erected on a shaky foundation will always be problematic, no matter how well the superstructure is constructed. When a problem such as obesity resists 60 years of effort among some of the best medical minds of the age and in fact is intensified during that time, then it is logical and timely to question the fundamental assumptions that have been made. As Kuhn (1962, p. viii) points out, in the natural sciences, such questioning of fundamentals is not part of the prevailing scientific culture. The tendency among what Kuhn calls “normal scientists” is to assume that the truths upon which their discipline is founded were properly established a long time ago and no longer need to be examined. Thus just one of many possible solutions to the mind-body problem has become entrenched and
persists unquestioned in the world of empirical science. The mind-body problem itself appears to have been forgotten, thought unimportant, or assumed to have been solved. Although the methods of empirical science are very well developed, they might not be the correct tools to solve the problems of food regulation. The situation is akin to the drunk looking for his dropped half-crown under the street lamp “because there is more light there.” The missing coin could well be somewhere else. Thus a re-examination of fundamental assumptions is timely.

**Objection:** You seem to give short shrift to the materialist position. Materialists have lots of arguments against idealism and dual aspect theory, you know.

**Response:** The object here was not a complete refutation of materialism nor was it a defence of dual aspect monism against the materialist attack. Such an enterprise would be well beyond the scope of this thesis. The object was to examine fundamental assumptions with a view to finding new ways to address the question of the regulation of food intake.

**Objection:** But do we really need to do that?

**Response:** The materialist school of thought has had many years in which to find solutions. Billions of dollars and many years of effort have not prevented a very high and increasing prevalence of obesity. There seems no particular reason to continue with the materialist line simply because it has been the dominant paradigm in recent times. Type-A materialism wishes to eliminate the contents of consciousness from scientific study while type-B materialism tries to include the mental realm “on the
cheap” (to use Chalmers’ phrase). Type-B materialists revert to physical phenomena when questions of ultimate reality arise. Therefore neither is in a good position to study what it is like to be hungry, thirsty or satiated.

**Objection:** I don’t see how it makes any difference in this case. Your message seems to be to tell patients to wait until they are hungry before they eat. I could tell them that while remaining a materialist.

**Response:** Well, that is not quite the message. Rather that they might benefit from adopting the EHSMP. Yes you could tell them that, but to fully understand why, you would need to understand the basic assumptions that have led to that instruction. Otherwise you run a grave risk of misrepresenting, trivialising, or changing the method in ways that might seem fully acceptable to you as a materialist but in fact compromise the efficacy of the treatment. You might lead your patients astray. Anybody can learn to use a computer, but to fix it when it goes wrong or program it to make important changes requires a deeper level of expertise. Without such expertise unintended effects could occur.

**Objection:** Sounds very fine, but I still don’t see how it applies in this case. What practical application came out of the Maharishi consciousness-based paradigm? Surely we could have managed without all that material on Unity Consciousness?

**Response:** On the contrary. Here (chart 6) are some new principles that arise directly from MVS alongside the corresponding “old principles” of materialism. They are
followed by their implications for eating regulation in a form in which they might well be conveyed to a patient, either consciously or unconsciously:
<table>
<thead>
<tr>
<th>Old principle</th>
<th>Implications of old principle</th>
<th>New Principle</th>
<th>Implications of new principle</th>
</tr>
</thead>
<tbody>
<tr>
<td>The universe is fundamentally matter and energy.</td>
<td>As long as you provide the body with matter and energy it has all it needs. Here is a diet sheet with all the daily essential nutrients.</td>
<td>The universe is fundamentally intelligence.</td>
<td>Your body (being part of the universe) is a flow of intelligence. You can read that intelligence by listening to its promptings. Internal cues will tell you when and what to eat on a meal-to-meal basis.</td>
</tr>
<tr>
<td>The universe is fundamentally fragmented.</td>
<td>Your body is fundamentally made of molecules. If we understand the molecules we understand the body.</td>
<td>The universe is fundamentally unified.</td>
<td>Your body is integrated and one with the rest of the universe. By seeking to understand the universe we understand the body.</td>
</tr>
<tr>
<td>Fragments interact randomly.</td>
<td>It is a fluke your body is here at all. It can’t be trusted. At any time it could go wrong.</td>
<td>The universe is fundamentally integrated.</td>
<td>Your body is fundamentally integrated. You can trust your body. If you listen to its prompts and act accordingly, it is more likely to go right than go wrong.</td>
</tr>
<tr>
<td>Subjective phenomena are vague, woolly and changeable.</td>
<td>Subjective phenomena have a place in the realm of poetry and myth but not in science.</td>
<td>Subjective phenomena are as real as any other phenomena. They can be systematically studied.</td>
<td>Your subjective feelings are real and important. You have permission to honour your inner perceptions and intuitions.</td>
</tr>
<tr>
<td>Subjective experiences are epiphenomena.</td>
<td>Hunger has no meaning.</td>
<td>Subjective experiences are information.</td>
<td>Hunger has meaning.</td>
</tr>
<tr>
<td>Only objective phenomena are real and only they are open to spontaneous consensual validation.</td>
<td>Go by what is real – biochemistry and neuroanatomy. Even if it is very complicated and costs billions of dollars it is worth it to reach the truth.</td>
<td>Objective phenomena are complex elaborations of consciousness. Subjective phenomena are less complex elaborations of consciousness. They are each open to consensual validation.</td>
<td>It is simpler and more direct to study subjective phenomena. They are just as real.</td>
</tr>
<tr>
<td>Biochemistry and neuroanatomy are highly complex, subtle and elusive fields of knowledge.</td>
<td>Only doctors who have studied for years know about your body. You will have to do as I say.</td>
<td>Subjective phenomena are simple and attainable.</td>
<td>You are empowered to help yourself.</td>
</tr>
<tr>
<td>There is no Self, only a flux of impressions.</td>
<td>The Self is a mirage. You have no Being.</td>
<td>The universe is one great Self, of which you are part.</td>
<td>You belong, you have a place here.</td>
</tr>
</tbody>
</table>

Chart 6 Materialistic principles vs. MVS principles
I suggest that in the therapist-patient interaction, the implications of deeply held assumptions represented by the above principles are conveyed either consciously or unconsciously to the patient. This might be explicit (as in telling the patient they can trust their body) or implied (as in handing the patient a diet sheet). It could be implicit also in the manner of the therapist’s delivery, through tone of voice or non-verbally through body language. I contend that it would be impossible to convey fully the message as to why one listens to one’s feelings of hunger unless the new principles were understood. Furthermore, without such understanding, it is unlikely that further progress could be made in developing the techniques suggested here. The tendency of the materialist to revert to the study of biochemical “markers” since they are thought to be more “real” than subjective phenomena would tend to inhibit that. An understanding of MVS leads to “research into consciousness” in which whole new areas of subjective experience can be studied in their own right.

**Objection:** Yet you seem to chop and change between paradigms. Long sections of the thesis are devoted to existing research which is materialistic based.

**Response:** In section 4.2.5 the point was made that the different approaches to solving the mind-body paradigm emerge as differing viewpoints that can be embraced within the explanatory framework of MVS. Materialism is the logical viewpoint of the waking state of consciousness – it is the lived experience of a person who is in that state of consciousness. For reasons of space limitation, a full exposition of the seven states of consciousness was not possible in this thesis, but suffice it to say that dualism is the lived experience of the fifth state of consciousness, known as Cosmic Consciousness, while consciousness as a field underlying both mind and body is the
lived experience of a person enjoying Unity Consciousness. Each state of consciousness creates its own reality from the basic “stuff” of pure intelligence. The fact that MVS is able to encompass these viewpoints within its compass does not invalidate the findings of each viewpoint. Each viewpoint relates to phenomena within its range. The results, for example, of a study performed under materialist assumptions have their value and can be used as evidence to support a position or argument, as long as their limitations are recognised.

**Objection:** Are you saying we all need to get to Unity Consciousness? Not everybody can attain that.

**Response:** I am not suggesting we all need to get to Unity Consciousness, although the path in that direction is now very much easier than it was before the advent of a pleasure-based meditation system. The point is we can have the advantage of knowing about Unity Consciousness before having the experience of it, because knowing about it offers a way out of the mind-body impasse. One way or another, the mind-body problem has to be addressed. It simply does not wash to ignore it, as does the Type-B materialist. Sooner or later we will trip upon the “mind-body tangle” (Young, 1959). Young rejected “the common sense hedonistic explanation …that subjective feelings of pleasantness and unpleasantness influence behaviour” in favour of a materialistic explanation specifically to avoid the mind-body problem. Materialistic monism avoided the tangle, but has not come up with a satisfactory explanation as to why people eat in a non-homeostatic manner. In this thesis I suggest that the common sense explanation be revisited, and that that necessarily requires a different approach to the mind-body problem, one in which subjective feelings
including pleasure can be embraced. The notion of Unity Consciousness is at the very least a powerful conceptual tool with which to make sense of a hitherto intractable problem. It allows us to progress.

**Objection:** You seem to assume that I eat in response to either an internal or an external stimulus. But I just like eating. I don’t think I’m responding to anything. I just enjoy it!

**Response:** You probably don’t enjoy eating when you are ill or when you are feeling bloated after Christmas dinner. Your sense of eating pleasure changes depending upon the stimuli presented to the mind. Although it may seem as if you just like eating, I suggest your sense of pleasure will always be in response to a stimulus even if that stimulus is only the past memory of food enjoyed or a conditioned stimulus standing in for that memory. Therefore I think that the four groups of independent researchers whose work was outlined in Chapter 7 were correct to focus on stimuli both internal and external that prompt people to eat.

**Objection:** I enjoy eating chocolates. I derive great pleasure from them. Unless I am very careful I will eat far too many of them. Do you really mean to say I eat those chocolates because they do not please me enough? I love them!

**Response:** It sounds counter-intuitive, but yes, according to the theory if you did over-indulge in chocolate it would indicate a lack of eating fulfillment. In the clinical setting I would advise a patient not to restrain the eating of chocolate, but to increase the awareness of the eating process to overcome automatic eating. This could involve
always sitting down to eat and eating at a prepared place at table, in a quiet environment free of distractions. Then the taste of the chocolate should be savoured, perhaps with eyes closed to further decrease distraction. Whilst eating, the patient would be encouraged to ask him or herself if she is enjoying the chocolate. The response may well be “no” in which case sensory-specific satiety has been achieved and no further desire will be experienced, at least at that sitting. If the response is yes, then another chocolate could be taken. In most instances in which people eat a whole box of chocolates in one sitting, the action is done mindlessly. The subject discovers to their chagrin that they have done it. The key is in the degree of attention that can be brought to bear on the process. The process is much aided if mental arousal is low, since chocolate is a HE food and will cloy earlier in the presence of low mental arousal. The attainment of the EHSMP will also help, since the mind finds greater enjoyment in ME and LE foods when eating in this pattern and therefore experiences a lesser tendency to rely upon HE foods for pleasure.

**Objection:** To equate pleasure only when you eat in response to the EHS is as artificial and disconnected with reality as to say that real sexual pleasure only occurs when a baby is conceived. I think there can be legitimate pleasures from these activities per se.

**Response:** Undoubtedly eating can be pleasurable in the absence of the EHS and usually it is, unless the subject is ill or sated. That is not being denied. It is being suggested here only that it is more pleasurable to eat in response to the EHS, sufficiently pleasurable that the eating desire is fulfilled. The alternative for the obese person, dietary restraint, involves self-control, restriction, loss of freedom, ongoing
desire and frequently, guilt. The EHSMP appears to have every advantage. In non-obese people, the EHSMP still has advantages since positive energy balance is likely to be avoided, with all the preventive health advantages of low caloric intake as outlined in section 10.3.2. In the end it is the individual’s choice, but at least the individual should be aware of the issues so that the choice can be informed.

The analogy with sexual pleasure is tenuous since whereas the EHS can be regarded as the afferent arm to a homeostatic feedback mechanism, there is no such mechanism that allows participants to know whether a child is being conceived. However, the two situations are parallel in that an informed choice is always preferable.

**Objection:** Your argument is that homeostatic eating maximises eating pleasure – *but at what cost?* There are other pleasures associated with food. Food can be an expression of social togetherness or it can be the way a mother expresses her love for her family, for example. Why should eating pleasure trump these pleasures? Your theory is asocial. Indeed much of your discussion focuses on internal sensations decontextualised from external influences on eating. Is the mother to be denied the pleasure of expressing her love for her children simply because her children don’t happen to be feeling hungry? Must I be prepared to be impolite by not eating (owing to the absence of EHS) in social situations where eating is expected? Should I refuse to sit down with my family at table because I don’t happen to be feeling hungry? Am I to be denied the pleasure of eating with my family? Are they to be denied the pleasure of eating with me or must they be made to suffer by waiting for me to get hungry? I can see all sorts of social difficulties here.
Response: There is no need for one pleasure to trump another because there is no reason why one could not fulfill all the desires mentioned. What type-b pleasure allows is an escape from their discordant association. Bernstein et al. have raised the concern that meals scheduled according to social and time considerations over-ride physiological regulatory mechanisms (I. L. Bernstein, Zimmerman, Czeisler, & Weitzman, 1981). It does not seem desirable that one has to compromise one’s digestive capacity and future health in order to enjoy the company of other people, nor to compromise others’ digestive capacity in order to express one’s love for them. Why should social interaction be at the expense of health? The first step is to disentangle the eating desires from the non-eating desires. The eating desire can then be fulfilled by eating. The social desire can be fulfilled by meeting and being with people. This is greatly facilitated by identifying the EHS, because when the EHS, or at least inanition, is present, then a person can know that the desire to eat will be fulfilled by eating and is therefore homeostatic. The second step is to ensure that these desires coincide temporally, that is to say, to ensure that one feels hungry at the meal-times at which friends and family are gathered and eating is expected. This is the purpose of the EHSMP. In practice, one becomes attuned to one’s digestive capacity such that one can gauge food intake to ensure the presence of the EHS at the next meal in most cases. Sometimes one fails to predict accurately and the EHS might be late in arrival, for example. On those occasions patients have found that sitting with friends or family at table sipping a drink and joining the conversation fulfills the social obligation and allows the desire for company to be fulfilled. Generally other eaters are happy to have one’s company and do not particularly notice that the other is not eating.
**Objection:** Not in my family! If I didn’t eat, my father would think I was ill or sickening for something. He would tell me to eat up! My mother would feel hurt and blame her cooking.

**Response:** If that is the case, then when eating with your parents but in the absence of the EHS, you should take something, enough to be polite and to meet their expectations. Or you may wish to take a little more than that. There is no need to be rigid. There may be a number of situations where in your judgment you feel it is preferable to allow social considerations to over-ride the EHSMP. When these situations occur I advise my patients to go ahead, eat and enjoy themselves and also be aware of the degree of pleasure the food is giving them. Generally patients report that while the food thus eaten is quite enjoyable they miss the element of savour and relish that they have become used to when the EHS was present (this is the “cardboard effect”). In this way the exercise can be turned to advantage, because going without savour and relish reinforces the perception of enhanced pleasure that the EHS can provide. In a light sort of way it can be seen as a kind of training exercise.

**Objection:** Nevertheless I still feel your normative theory is paternalistic, prescriptive and limits choice. It assumes that health takes precedence over other values and it values optimisation of pleasure over pleasure per se. **Or:** First they told me not to drink then they told me not to smoke. Now you are telling me I can’t eat whenever I want to!
**Response:** You can eat whenever you want to but you may wish to consider eating in a way that is more enjoyable and more likely to benefit your health. At least you should have the choice. Eating in a non-homeostatic manner is associated with serious health problems and is a major health concern in Western industrialised societies. The theory offers an explanation as to why some people eat in a manner that is non-homeostatic and suggests this is because some people do not gain full satisfaction from eating. All forms of therapy suggest change whether it be taking a drug, undergoing an operation or adopting a life-style change. This theory suggests eating in response to the EHS as a means to enhance eating pleasure and improve health. Is it paternalistic to suggest a way in which people can further enjoy themselves? If so, it must be a benign form of paternalism. Could enhancement of eating pleasure be said to be more paternalistic or prescriptive than other interventions that are recommended in the everyday practice of medicine or dietetics? Is a diet sheet, or an anorexic drug with the enjoinder to “watch your weight” less paternalistic or prescriptive? Which is the more paternalistic or prescriptive for the morbidly obese patient – a mutilating ileojejunal bypass operation, the treatment of choice for these people (Tanyi, Kanyari, Juhasz, & Damjanovich, 2007), or the invitation to find more satisfaction in one’s food?

The author has not encountered the charge of paternalism. The reaction from patients has been the converse. Patients appear to appreciate the chance to take control of their situation without the need to rely on restraint or external props such as pharmaceutical medication.\(^{88}\) The EHSMP therefore appears to be in accord with

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\(^{88}\) Christopher Harshaw describes the same response when depressed persons gain awareness of hunger sensations and differentiate them from other cognitive and emotional experiences (Harshaw C, Personal Communication, 22\(^{nd}\) April 2009).
calls to move in a more patient oriented direction (B. E. Robinson, Gjerdingen, & Houge, 1996) and towards “whole-self” patient self management (Fitzgerald, 1997).

With regard to the question of choice, one can, at any time, simply decide to eat in the absence of the EHS. Faced with a choice between two immediate pleasures, both of equal risk but one of lesser and one of greater magnitude, it seems likely that most people would prefer the greater pleasure, i.e. to optimise pleasure over pleasure per se, however perhaps what was meant by optimising pleasure is that many people might prefer a lesser pleasure in the short term over optimised pleasure in the longer term. Thus one might prefer to eat a piece of plum pudding now rather than wait for the EHS when the pleasure of eating it might be greater.

This is a matter of choice. The theory simply suggests that the enhanced feedback one can get from identifying the EHS is helpful in making eating choices. The element of choice is integral to this theory as it is to Maharishi Ayurveda and the non-diet and intuitive eating programmes. Note the deliberate use of the words you might choose not to eat in the take-home instructions in section 14.1.3. How to eat remains a personal decision, but all choices are easier to make when the full range of relevant data is available.

As to whether health takes precedence over other values, individual health is never an entirely personal matter. If one chooses to compromise one’s health, one inevitably impinges upon others who may have to take responsibility for one’s care or in other ways be affected. The question as to whether individual desires trump the general good has been debated from at least the time of Utilitarians such as Jeremy Bentham
(1748-1832) and John Stuart Mill (1806-1873). Bentham equated pleasure with what is good and held that every person is to pursue his or her own pleasure (B. Russell, 1945). That might imply that one could damage one’s health as one pleases. With respect to the overall good, however, Bentham held that one state of affairs is better than another if it involves the greatest pleasure and the least pain. Those desires and actions are good which promote the general happiness. That might imply that I should stay healthy as my getting sick could bring loss of general happiness, even if I myself am happy to be sick. Individual desires do not always add up to the general good and as Bertrand Russell points out “ethics is necessary because men’s desires conflict” (B. Russell, 1945, p. 779). In medicine, this conflict emerges particularly in areas in which the profession has taken a strong ethical lead for the public good such as in advocating the cessation of smoking (Appel, 2009; Gray, 2004). Some, particularly tobacco companies, argue that, since every person is to pursue his or her own pleasure, smokers have a right to practise their habit without interference. It is arrogant, it is held, for the medical profession to impose its set of values upon others for whom health might be low on their list of priorities. Others, including the profession, wish to limit some people’s pleasure for the sake of the public good, since it is well known that not only is passive smoking dangerous (Jarvie & Malone, 2008), but the cost to the public purse of the complications of smoking is substantial (Rasmussen, Prescott, Sorensen, & Sogaard, 2005). At least one writer (B. Schwartz, 2000) has written upon the “tyranny of freedom” in which he argues that excessive freedom, autonomy and self-determination can be a kind of tyranny, even for the person who is “free” since it can lead to indecision and paralysis. There is a place, Schwartz contends for tradition and traditional authorities such as doctors. It is beyond the scope of this thesis to engage further in this debate, except to point out
that 1) this thesis advocates an intervention that provides interoceptive feedback to individuals to help them in eating related choices and suggests but makes no injunction as to what choice should be made 2) that such feedback offers greater individual eating pleasure without risk of adverse effect, in to contrast dietary restraint interventions, anorexic medication or surgery 3) the pleasure on offer, unlike smoking or driving without a seat-belt does not compromise the public good. Does health triumph over other values? In the case of smoking the medical profession has decided resoundingly that it does. The lifetime medical cost burden of obesity is not insignificant especially over the age of 65 (E. A. Finkelstein et al., 2008; van Baal et al., 2008). This author is however far from advocating coercion to promote any particular style of eating. A recent cover article in the New Zealand Listener in which intuitive eating was featured is evidence of the growing popularity of non-diet “wellness” approaches (Boniface, 2009). The inherently pleasurable nature of the suggested interventions is, in this author’s opinion sufficiently attractive to ensure their adoption and obviate any need for coercion.

**Objection:** Really? But your theory fails to acknowledge that the EHS is uncomfortable for some people. I, for example prefer to avoid such an aversive stimulus and I take care to have something to eat before it ever arrives.

**Response:** While in the consulting room I have frequently heard this objection given as the reason why a patient does not wait to get hungry, it has never been raised after a patient has been given instruction in recognition of the EHS. Those who voice this objection may not have experienced the EHS, perhaps for many years, or even since childhood. They must perforce refer to old memories and associations, which were in
all likelihood experiences of the VEHS. “Hunger at its first rise,” as Bain recognised is not unpleasant for most people and has an anticipatory quality. I have found that when people actually experience the EHS again they do not find it uncomfortable. This is an objection I have found carries less weight in practice than it may appear to have in theory.

**Objection:** Well, if I waited for the EHS, I think that food would taste so delicious I would be tempted to overeat!

**Response:** I suggest you try and see if that is the case, because although there appears to be logic in what you say, it may not be your actual experience. It would be good to eat within 15 minutes or so of the EHS appearing. Once the signal has appeared there is no virtue in prolonging it as it can merge into the VEHS which can indeed promote “overshooting” (hence Ciampolini’s use of the term “initial hunger”). What I have found among my patients is that provided the EHS is not prolonged, the enhanced pleasure of eating feeds back upon desire rather than fuels it.

**Objection:** Is the EHS for everyone? I have always felt very healthy and I never give a thought to my hunger. Maybe some people don’t need to eat in the presence of the EHS.

**Response:** That *may* be correct for you. Maharishi Mahesh Yogi has commented that a fully healthy person can eat when and what he or she likes prepared in any way desired, in whatever quantities desired and under any eating circumstances (Maharishi Mahesh Yogi, 2006). However, he also advised that people of moderate health should
take care over their diet, eat at proper times and only when naturally hungry. Those who are ill are obliged to follow this advice if they do not wish to become even more unwell. It is important here to be aware that Maharishi’s notion of full health is quite different from a Western idea of health (Lovell-Smith, 2002). From the point of view of Maharishi Ayurveda, most Westerners are ill. It is sobering to reflect that according to one anecdotal report, a vaidya (Ayurvedic doctor) representing Maharishi Ayurveda travelling through the United Kingdom in the late 1980s saw some 4,000 people in consultation. Of those, he regarded six as having an efficiently functioning digestive system. So, while the EHSMP might not be strictly necessary for all, in the West it is likely to be beneficial for nearly everyone, and it shows promise in alleviating some illnesses, particularly autoimmune conditions that have been otherwise very difficult to treat. Brillat-Savarin stated that it is a “… privilege of the human species to eat without hunger and to drink without thirst” (Lepkovsky, 1973, p. 281). Lepkovsky suggests this “privilege” may be of doubtful value. I would be cautious about pronouncing a Westerner healthy enough that he or she could eat irrespective of internal eating cues.

**Objection:** Well I don’t think I have ever experienced the EHS. Once I fasted for five days. All I ever felt was weak and a bit light-headed.

**Response:** I have encountered many people who cannot remember ever experiencing the EHS. In a questionnaire study Mattes and Friedman (1993, p. 68) found that 4.8% of subjects reported that they never experience hunger. For most people the EHS appears readily after a missed meal or two. Five days is unusual, but not extraordinary. There are many factors involved. One is probably hereditary. In the
Ayurvedic system, Kapha body types can go for long periods without food and experience very few symptoms. Those with Vata constitutions should be careful about fasting though and in general I do not recommend fasting. In your situation, since you experienced inanition, I would suggest light meals (soups, steamed vegetables or fruit) rather than prolonged fasting.

**Objection:** Is it pathological not to experience the EHS then?

**Response:** In my opinion the EHS is a sign that the digestive apparatus is in good form and ready to undertake its task. While one might get by without the EHS, my clinical impression is that well-being is enhanced and future illness prevented when experiencing it regularly. Existing studies tend to confirm this (Chapter 11) but more studies are needed. Certain digestive stimulants can arouse a sluggish EHS. For example ginger is recommended in Ayurvedic medicine as a digestive stimulant. Ginger is recognised as a digestive aid in Chinese medicine also (Fulder, 1993, p. 20).

**Objection:** Is it only the desire for pleasure that regulates food intake? Or is it that the body understands that it needs to eat, just as it becomes necessary for the body to go to the toilet. If there were no pleasure in eating, would the concept of homeostatic eating dissolve? Maybe consciousness is irrelevant. Maybe it all gets regulated at a preconscious level.

**Response:** The point was touched upon by Grossman (1955) and more latterly by Berridge (1996). Grossman (p. 76) cites the observations of Goltz who found that a dog from which both cerebral hemispheres had been removed regulated its food
intake and maintained normal weight. Grossman also claims that an anencephalic infant shows “essentially normal feeding behaviour.” From this Grossman concludes that intensity of hunger and appetite cannot be “gratuitously assumed” either as determinants or reflections of eating behaviour and that:

…those physiological regulatory processes in which psychic events participate have an underlying “automatic” mechanism on which the mental processes play (p.77).

It is consistent with Type-B materialism to simply assume that such a mechanism exists and at some point interacts with consciousness. Berridge (1966) specifically divides the field of food reward into two questions:

“…leaving consciousness momentarily aside, how can one study fundamental neural processes of reward (in animals), and then later, “how do these fundamental processes relate to consciousness, (which can be studied in humans)?” (p. 2)

On the other hand, as noted in Chapter 1, de Castro and Elmore (1988) found that hunger was not epiphenomenal but has a determining role in food regulation. If the significance of hunger needs to be learned, as Harshaw (2008) argues, then that also supports the notion that, at least in humans, the subjective experience of hunger (and the pleasure that accrues from it) is an important determinant of eating regulation.

Berridge points out that while anencephalics do show basic affective expressions to sweet or bitter tastes implying that the brainstem participates in these reactions, the brain circuits for the full experience of liking are organized hierarchically, and importantly involve limbic structures in the forebrain (Berridge, 2004, p. 200).
seems that certain regulatory mechanism do likely exist at brainstem level which form a kind of substrate upon which higher brain levels operate, the whole being coordinated by the mental phenomena of pleasure and reward. This is not inconsistent with the notion of a homeostatic hierarchy as adopted in this thesis. It should be remembered that under this theory, homeostasis is not an either/or phenomenon. It is not illogical to suppose a continuum of homeostatic eating whose apex stands at the higher levels of cognitive and emotional function.

The degree of homeostatic regulation at the more rudimentary brain levels is likely to be unsuitable though for major environmental challenge. Anencephalic infants do not feed as a normal child and frequently require intragastric feeding. In normally developed adults, it has been argued here, it is because some people eat without pleasure that they become obese, and it may be also that a specific form of adhenonia underlies the anorexic’s disinclination to eat. Whatever the degree to which food regulation occurs “automatically and homeostatically” in humans that degree of automaticity does not seem to be sufficiently powerful to have prevented these two eating disorders from emerging and in the case of obesity, in very high prevalence. So in final answer to the question, the body does probably have some kind of primitive homeostatic intelligence at a pre-conscious level, but the nature of the eating disorders suggests that the absence of pleasure disrupts the full expression of homeostasis severely.

**Objection:** How would you respond if you suggested the EHSMP to a patient and the patient says: “I still enjoy the experience of eating in the absence of the EHS.
Why would you deny me that experience on the presumption that with the EHS my enjoyment of subsequent eating will increase?’

**Response:** In 27 years nobody has said that to me. I do not think it is because they have been too polite. In my experience listening to the body makes intuitive sense to many people. I frequently point out to people that eating is already one of the most enjoyable things we do in life. Why not enjoy it to the maximum? So in response to that patient I would say that this is not to deny the experience you are already enjoying, it is enhance it.

**Objection:** Is that it then? All we have to do to be saved is eat in response to the EHS!

**Response:** In this thesis I have focused on the Ayurvedic injunction to eat when one is hungry because it seemed a simple instruction that yielded, among my patients, fascinating results. These results called out for further investigation. Maharishi Ayurveda is a comprehensive body of health related knowledge and there are many other aspects to diet and eating regulation. In Maharishi Ayurveda eating involves three elements: the eater, the eaten and the relationship between them. These correspond to Rishi, Chandas and Devata, respectively. The EHS is to do with preparedness of the eater. The condition of the eater is a very important part of the trilogy and one that is frequently overlooked in dietetics where almost total emphasis

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89 However the author accepts that politeness or deference to perceived authority could inhibit patients from expressing their feelings on this and related issues such as that of paternalism (above). Patients are usually ill, limited in their choices and motivated to follow their doctor’s advice. It is possible that the compliance with the EHSMP I have found among my patients could owe partly to this. Only future studies can tell how effective the EHSMP will be in a non-general practice setting.
is placed upon the elemental constituents of the food. To make a point I sometimes
tell my patients that the same food could be poison when eaten if not hungry and
nectar if eaten when hungry, or that it is better to eat fish and chips when hungry than
the best health food when not. Of course it is better still to eat a well balanced diet in
accordance with one’s doshic make up, in the presence of hunger. The Devata aspect,
the relationship of the eater to the food should also not be overlooked. This covers
some of the recommendations given in the introduction such as eating in a settled
environment, not watching TV etc. In a thesis the subject of enquiry is necessarily
narrowed and space limitations precluded exploring these points, but this should not
be taken to imply their lesser importance.

**Objection:** Do you need an intact pancreas to experience the EHS?

**Response:** This is a very good question. As mentioned in Chapter 11, none of the
insulin-dependent diabetic patients that I have worked with were experiencing the
EHS on first meeting. However they were all able to identify it after training, which
suggests that an intact pancreas is not necessary for the experience. On the other hand
these patients were all taking exogenous insulin. All patients improved in their
diabetic control when following the EMSMP as indicated by blood glucose and
glycated haemoglobin measurements and were able to lower their insulin dose,
sometimes by up to a third of the original dose, but of course never to zero. So no,
you do not need an intact pancreas to experience the EHS, but you probably need
insulin.\(^90\) It is certain that insulin is necessary for homeostatic eating. The best an

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\(^90\) Grossman and Stein (1948) showed that in vagotomised subjects (stomach isolated from the central
nervous system) the hunger pang was abolished, and could not be stimulated by the injection of insulin
into the blood, but the other symptoms of hunger (called in this thesis inanition) were so elicited. It
insulin dependent diabetic can expect from the EHSMP is avoidance of positive energy balance leading to improved control on a lower insulin dose, with consequently fewer diabetic complications.

In the non-insulin dependent diabetic the pancreas cannot produce sufficient insulin to cope with the demands of the cell mass and itself may be partially damaged by high glucose concentrations. Can it be assumed in this situation that the EHS maps to blood glucose concentrations lower than 4.5mmol/L, the point below which Ciampolini regards eating to be homeostatic? This is really the same question as discussed in section 11.1.4, the relationship between the EHS and blood glucose concentration. On the confirmative side, studies on gastric emptying owing to antral pressure waves, which, when they occur premeal may give rise to the EHS, have shown higher rates of emptying at blood glucose of 4 mmol/L than 8 mmol/L in both normals and diabetics (Schvarcz et al., 1997). The fact that non-insulin dependent diabetic subjects gain better control and lose weight using the EHSMP would suggest that the EHS in these subjects might be associated with an acceptably low blood glucose concentration. On the negative side, however, this could depend upon the degree to which the pancreas is intact. As pointed out in Chapter 11, the relationship between hunger sensations and blood glucose is complex. Ciampolini found elevated blood glucose (above 4.5 mmol/L) in the presence of IH in those who had just eaten sweets or candy. This suggests that in the presence of a compromised pancreas, the EHS could at times be present at dangerously high blood glucose concentrations. However the IH is not the EHS. Only further studies will elucidate these important needs.

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seems certain that an intact neural supply to the stomach is necessary for the EHS and probable that insulin is also a necessary factor.
questions. In the meantime it seems that while diabetics cannot expect to be cured by following the EHSMP, they do benefit in improved glycaemic control.

**Objection:** If I make a mistake and eat in the absence of the EHS, is it the end of the world?

**Response:** Absolutely not! The whole idea is to enjoy eating and feel good about it. In Maharishi Ayurveda, feeling bad or guilty has no place in eating regulation. I would not even think of it as a mistake. It is just a choice you have made. There may be times when you decide for various reasons to eat in the absence of the EHS. If inanition is present, then you should eat something light. Or there could be social reasons why you want to go ahead. A good idea though is to notice how the food tastes on eating that way and how you feel after eating. Do you feel satisfied? Is the desire to eat fully met? You may decide you prefer the savour and relish of eating in the presence of the EHS.

**Objection:** I don’t think you resolved the question of whether the epigastric pang, or EHS, is a result of stomach contractions. What is the final verdict on that?

**Response:** I don’t think there is a final verdict in the sense of consensus, although for this author Grossman and Stein’s findings – that the hunger pang and associated contractions were abolished after isolation of the stomach by vagotomy and sympathectomy is definitive (M. I. Grossman & Stein, 1948). Attention moved away from stomach contractions after the epigastric pang became a “dispensable” element of hunger and no further attempts were made to relate the two. Cannon and
Washburn did not investigate control subjects who were not experiencing the EHS so the possibility that contractions could occur in its absence was not formally investigated. Later investigators have noted that antral pressure waves occur more frequently at blood glucose concentrations of 4mmol/L than at 8mmol/L but in the absence of hunger, but as hunger is not defined, it is difficult to know how to relate these findings to those of Cannon and Washburn (Rayner et al., 2000). As noted in a footnote to section 8.2.2, Carlson observed contractions in the absence of epigastric pangs and decided the rate of contraction was important to the sensation (Carlson, 1993, p. 505). Another possibility is that a kind of “alliesthesia” occurs in which stomach contractions occur frequently but are interpreted (i.e. “felt”) as the EHS only under certain physiologic conditions associated with readiness to eat. Again further studies will be necessary to resolve this long-standing question.

**Objection:** Almost no-one can achieve pure consciousness. The unmet desire for complete fulfillment (and eschewal of diversity) may lead to suffering. You may argue that diversity is ephemeral but we live in the moment (the future is but a life wished for) and in the moment diversity complements stability. Life is a tapestry of said moments.

**Response:** That almost no-one can achieve pure consciousness is an old understanding arising from difficult and unrewarding concentration and contemplation techniques. Using the pleasure-based system of transcending thought (Transcendental Meditation) almost anyone can achieve pure consciousness, sometimes on the first experience of meditation (Alexander et al., 1987, pp. 311-312). The unmet desire for the eschewal of diversity may lead to suffering but that can be
greatly ameliorated by this technique. Diversity “in the moment” certainly complements stability. Life is indeed a tapestry of said moments and pure consciousness is their warp and weft.

**Objection:** Hans-Rudolf Berthoud writes:

…the major components of [the] nonhomeostatic system are cephalic and intestinal feedforward mechanisms, the abundance of food cues in the modern environment, and the easy availability (low physical effort and cost) of palatable, energy-dense foods (snacks) in a socially enhanced environment. Thus, it is not surprising that simply increasing the availability of food can have profound effects on intake and body weight both in rats and humans. When rats were given access to five bottles of 32% sucrose in their home cage, they ingested significantly more calories from sucrose than control rats with only one bottle of sucrose and four bottles of water next to ad libitum chow (Berthoud, 2004a, p. 784).

I can understand why humans go off the rails with so much attractive food around, but why do rats eat more if allowed to? Surely that indicates a basic weakness of design in the physiology of both rodents and humans?

Pleasure is unlikely to be restricted to humans or even primates as studies on affective facial expressions have shown (Berridge, 2004, p. 198). In section 6.1.2 it was argued that the homeostatic hierarchy extends upwards to include cognitive function, purpose and desire. The point is whether we as humans, with our cognitive advantages, can “lift our game” homeostatically speaking to cope with an unprecedented environmental challenge of easily available palatable HE food. This thesis suggests we have access to a whole afferent homeostatic arm that we might not have been
using properly. There is a tendency toward fatalism in the interpretation of animal studies. The fact that rats, living in circumstances they probably find stressful (Balcombe, 2006) should ingest extra sucrose rather as humans might does not need to convince us that therefore we are fatally “design flawed” or that we have no more choice than do rats. The behaviour of rats should not inhibit us from finding ways to enhance our homeostatic competence.

**Objection:** It all seems terribly complicated. If homeostatic eating is so pleasurable, and if the hunger sensation is innate, then surely eating homeostatically should be an easy and simple thing to do?

**Response:** Quite right and it is. It is much easier to train a person in the EHSMP than it has been to write about it. I hope that this tract is of value though in establishing the reasoning behind what is, as you say, a simple intervention.
Chapter 16  Summary and Conclusion

The objective of this thesis was to generate theory to explain why some people eat in a non-homeostatic manner. Part 1 of the thesis laid the foundation for examination of subjective phenomena. Part 2 developed the theory with an enquiry into what it is like to be hungry and continued with an examination of the eating desires. It was suggested that we eat for pleasure, but in the absence of key eating sensations particularly the EHS, eating pleasure is attenuated. When eating pleasure does not reach a certain threshold the desire to eat remains unfulfilled and eating is unregulated. Externally oriented attention and recoding of perceptions may explain non-perception of key eating sensations which may represent a missing afferent arm of homeostatic food intake regulation. The EHS and transcending thought were suggested as two approaches to overcome externally oriented attention and recoding of perception. Two hypotheses emerged with suggestions to test their predictions. In summary:

16.1.1  What was already known

It was known that:

1. The very wide range of illnesses that are diet-related, including the major scourges diabetes and heart disease, could extend to a very broad spectrum of diseases including inflammatory and auto-immune disorders.
2. Obesity has reached alarming levels in Western societies.
4. Homeostatic food regulation is at, or past its limits for some people.
5. Eating is pleasurable.
6. Eating disordered people do not respond properly to internal eating stimuli.
7. People eat for many reasons.

16.1.2 What had been overlooked

It had been forgotten or overlooked that:

1. Underlying assumptions can (and should) be questioned.
2. We benefit from listening to what subjects report about their experiences.
3. Cannon’s “hunger pang” deserved study in its own right.
4. Food tastes wonderful when one is hungry.

16.1.3 What could not be known

Under materialism it could not be considered that:

1. The universe is fundamentally integrated by underlying intelligence.
2. The mind provides a direct route to underlying intelligence.
3. Therefore hunger has meaning.
4. And pleasure has significance
5. Eating regulation could be based upon hunger and pleasure.

16.1.4 What this thesis has added

Hunger and pleasure have been raised for consideration in eating regulation. It has been suggested that:

1. Pleasure is the essence of eating regulation.
2. People eat in a non-homeostatic manner because eating is not pleasurable enough.
3. Eating is not pleasurable enough because key eating sensations have been unrecognised.

4. Even “normal eaters” are confused about eating sensations.

5. This may be because attention has been externally oriented and perceptions recoded.

6. The EHSMP and transcending thought may increase eating pleasure and enhance food intake regulation.

16.1.5 Significance to Public Health

A public health measure should be 1) Effective 2) Cost-effective 3) Safe and 4) Available. What evidence exists supports the effectiveness of the EHSMP and Transcendental Meditation in supporting food regulation. Further studies are needed to confirm this. The interventions are cost-effective since they require no expensive or complicated technology to institute or maintain. Adverse effects have not been demonstrated in either intervention. General Practitioners could be easily trained to help patients identify the EHS. Transcendental Meditation is available through trained teachers in most cities of the world. In addition, the interventions are patient oriented. Should the theory be upheld by further studies, initial evidence suggests its application could be wide preventing illness in “normal” eaters and alleviating some of the most prevalent scourges of industrialised countries.

16.2 Final word

Since much of this work has been inspired by Maharishi Mahesh Yogi’s revival of Vedic knowledge it is appropriate to end this thesis with a quotation from the
Kaushitaki Upanishad illustrating the fundamental necessity for conscious awareness in perception and action:

When consciousness governs speech, through speech one knows all names.

When consciousness governs breath, through breath one knows all smells.

When consciousness governs the eyes, through the eyes one knows all forms.

When consciousness governs the ears, through the ears one knows all sounds.

When consciousness governs the tongue, through the tongue one knows all tastes.

When consciousness governs the hands, through the hands one knows all action.

When consciousness governs the body, through the body one knows pleasure and pain.
When consciousness governs the genitals, 
through the genitals one knows bliss, delight and procreation.

When consciousness governs the feet, 
through the feet one knows all movement.

When consciousness governs the mind, 
through the mind one knows all thoughts.

For truly, without consciousness speech would not reveal any name at all. 
We say, ‘My mind was elsewhere, I did not notice that name.’

For truly, without consciousness breath would not reveal any smell at all. 
We say, ‘My mind was elsewhere, I did not notice that smell.’

For truly, without consciousness the eyes would not reveal any form at all. 
We say, ‘My mind was elsewhere, I did not notice that form.’

For truly, without consciousness the ears would not reveal any sound at all. 
We say, ‘My mind was elsewhere, I did not notice that sound.’
For truly, without consciousness the tongue would not reveal any taste at all.
We say, ‘My mind was elsewhere, I did not notice that taste.’

For truly, without consciousness the hands would not reveal any action at all.
We say, ‘My mind was elsewhere, I did not notice that action.’

For truly, without consciousness the body would not reveal any pleasure or pain.
We say, ‘My mind was elsewhere, I did not notice that pleasure or pain.’

For truly, without consciousness the genitals would not reveal any bliss, delight or pro-creation.
We say, ‘My mind was elsewhere, I did not notice that bliss, delight or procreation.’

For truly, without consciousness the feet would not reveal any movement at all.
We say, ‘My mind was elsewhere, I did not notice that movement.’
For truly, without consciousness the mind would not reveal any thought at all.

We say, ‘My mind was elsewhere, I did not notice that thought.’
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Appendix 1  A summary of the main argument of the thesis
Why do some people eat in a non-homeostatic manner?

Some people do not eat in a homeostatic manner. Obesity and other problems associated with overeating are prevalent.

Principles of Maharishi Ayurveda

Clinical observations in general practice

Eating does not seem very pleasurable for some people.

And they seem to be confused about hunger

Hunger is an internal experience, not given credence by dominant materialistic paradigm

Let’s look at some fundamental assumptions.

Figure 1. The introduction.
Materialism is unable to accommodate “what it is like” to be hungry

So hunger is not emphasised in a materialist based society

Need new paradigm.
Explore mind-body question

To bridge mind-body divide and allow for “what it is like” to be hungry

Maharishi Consciousness-based paradigm (MVS)

Chapter 3

Chapter 4

Chapter 5

Chapter 7

Many people eat in response to stimuli that are not influenced by food intake

This not a regulated system, hence overeating or undereating

How to improve regulation without people feeling deprived?

Restraint does not work

Intuitive eating?

Maybe hunger, satiety and eating desire system not working properly

Mind moves towards greater pleasure

Homeostasis can be expanded to include consciousness and pleasure

Type-a pleasure (excitement) or Type-b pleasure (contentment)

Desire is stimulated by type-a pleasure and fulfilled by type-b pleasure (a regulated system)

e.g. hunger stimulates the desire to eat, contentment after eating eliminates the desire but…

Chapter 6

Chapter 2 Part 1: Background

Universe fundamentally integrated by underlying intelligence

Implies food intake should be regulated. But is it?

Yes, partially, but not completely.

There is no fundamental defect in the homeostatic system, but in a food-rich environment…

Many people eat in response to stimuli that are not influenced by food intake

How to improve regulation without people feeling deprived?

Restraint does not work

Intuitive eating?

Materialism is unable to accommodate “what it is like” to be hungry

So hunger is not emphasised in a materialist based society

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Chapter 6

Chapter 2 Part 1: Background
If so, what went wrong?

Chapter 8

Let’s look at hunger and satiety

Wide agreement that lack of interoceptive awareness relevant to eating disorders

Hunger has been poorly defined, and muddled with eating desire even among “normal eaters”

The EHS is an important overlooked “key sensation” indicates need & readiness

Chapter 9

Let’s look at eating desire

“Food tastes wonderful when you are hungry” (alliesthesia).

Eating pleasure (type a and b) is greatest when eating in response to the EHS

Thus the desire to eat is fulfilled when eating in response to the EHS

So eating is regulated

In the absence of the EHS, the fulfillment threshold is not reached.

Chapter 10

The increased contentment of eating in response to the EHS helps regulates eating.

So why some people eat in a non-homeostatic manner is that eating is not fully satisfying for them.

Outer directed attention in search for type-a pleasure can be seen at basis of cravings, food addictions, and predilection for exciting but unsatisfying food types

Inner directed attention on somatic level allows identification of EHS, on psychic level allows transcending thought

EHS and transcending thought introduce type-b pleasure, help overcome unregulated eating and support homeostasis

Chapter 11

Evidence that EHS supports homeostasis

Inner directed attention allows “seeing what is there”

Overcomes recoding and adverse effects of dominant intellect

Chapter 12

Suggests method to identify EHS

Figure 3. Part 2: The theory
Chapter 13

Awareness of the EHS and pure consciousness should improve food regulation (homeostatic eating)

Hypothesis: That the EHS meal pattern (EHSMP) yields improved measures of homeostatic eating

Hypothesis: That the regular practice of Transcendental Meditation yields improved measures of homeostatic eating

Predictions: 1) Greater eating pleasure 2) Alleviation of illness 3) Regulated tissue energy parameters.

Testing the predictions

Chapter 14

Independent variables – EHSMP, Transcendental Meditation

Proposed empirical Studies

Dependent variables: Eating pleasure, well-being, alleviation of illness.

Chapters 15 & 16

Limitations and objections to the theory

Conclusion

Final summary

Figure 4. Part 3: Implications
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Appendix 3  A Unified Field Chart for Psychology