Preface

Why do humans cooperate and show altruistic behavior? The topic has recently fascinated scholars from varying fields from evolutionary biology and economics to religious studies. In this volume, economists, philosophers and religion scholars analyze the many-fold interconnections between religion and economy from this perspective. The first chapter introduces the various views, questions, and hypotheses related to this theme. These include, first, the idea of humans as rational maximizers of utility, a view by and large contested by those who argue for a "bounded-rationality." In this latter view, human choices and judgments are largely intuitive and not based on a purely rational calculation. Second, several authors have noted the obvious analogy between the concepts of the ‘market’ and ‘God.’ Is there an invisible hand guiding evolution and development? Or, more appropriately, what might be the actual mechanisms in this way metaphorically represented? And, notably, what is it in human cognition that predisposes us to think in such terms? Finally, how has human cooperation actually evolved?

The first contributions are more theoretical in nature. Bulbulia and Schjoedt present a new model for analyzing the evolution of cooperation and the role of religion in that process. The model is based on the ideas of the creation of common knowledge and attempts at predicting the outcomes of one's selfish and cooperative actions in a hostile world. Bulbulia and Schjoedt argue that the classical Prisoner’s Dilemma argument is misguided in that, although deception may seem like the winning strategy, in reality the focal problem is that the outcomes of deception are unknown and people thus must try to somehow predict the outcomes of cooperation versus deception. It is here that religion comes in: it is a means of coordinating common knowledge so that a reliable context for cooperation is created.

How economists actually use modeling and how representatives of the rational choice theory have responded to criticism from the supporters of the idea of bounded rationality is dealt with by Grüne-Yanoff. He argues that, although the idea of bounded rationality has increased social scientists’ sensitivity to the cognitive mechanisms underlying choice, and to systematic behavioral deviations from the standard view, the sig-
Religious Culture and Cooperative Prediction under Risk: Perspectives from Social Neuroscience

JOSEPH BULBULIA AND UFFE SCHJØDETT

1. Religion and Cooperation

1.1 Religion as Policing

The 4th Century B.C.E Greek dramatist Critias explains religion's success from its moral effects:

Some shrewd man fast, a man in judgment wise,
Found for mortals the fear of gods...
So that everything which mortals say is heard
And everything done is visible.
Even if you plan in silence some evil deed
It will not be hidden from the gods: for discernment
Lies in them. (Critias, s.a.)

Critias's ideas are remarkably prescient of contemporary evolutionary treatments, which replace this 'shrewd man' with 'natural selection' (see for example Bering 2006). Yet while Critias's theory explains the benefits of religion, it does not explain religion's evolutionary conservation. If we suppose that religion polices exchange, this policing would appear to create opportunities for the impious to cheat the religiously restrained. Modernizing Critias's theory therefore requires an account for how religious partners reliably recognize each other and interact while avoiding non-cooperative imposters.

1.2 Costly Signalling Theory

Costly signalling explains how religious cooperation is assured. It uses the cost problem (Atran 2002) to explain the cooperative assurance problem. A cost problem arises because the actions that religion inspires appear to harm religious practitioners. Indeed, the costs of piety — blood
rituals, trials by fire, celibacy – seem the sort of practices likely to have been eliminated in nature’s thrifty economy (Irons 2001). Signalling theory explains such apparent waste as cooperation’s efficiency (Sosis 2003; Bulbulia 2004a). Signalling theorists observe that expressions of religious piety are associated with moral commitments and are also hard to fake. This means that pious expressions provide a medium in which partners may express and evaluate genuine moral commitments. Importantly then, costly signalling holds that both the conservation of religion and its apparent irrationality can be accounted for by a single model, one that combines moral policing with virtue signalling.

*Costly signalling: where \( = \) = mutual signals of cooperative intent

(1) \text{partner}^{\text{cost}} = \text{partner}^{\text{cost}}

Because classical signalling theory thus solves the recognition problem with the cost problem, the theory is elegant. Classical signalling theory is also backed by evidence. Indeed a growing number empirical studies reveal that cooperative partners attune to expressions of piety, and that greater productions of religious costs are found as the need for assurance for cooperative interaction action rises (Chen 2007; Soler 2008).

Despite classical signalling theory’s virtues, however, we believe that to understand how religion evolves to support cooperative exchange more explanation is required. Specifically, classical signalling does not explain how individuals are able to predict the future behaviours of unknown partners. The theory does not solve the problem of cooperative recognition in anonymous societies.\(^2\)

### 1.3 The Problem of Anonymous Exchange

Large cooperative societies brings the benefits of specialization, intricate divisions of labor, and the strength of numbers for territorial defense and exploit. However such worlds also increase the scope for anonymous interaction; commitment signalling cannot directly assure anonymous exchange. Among obscure partners, the relevant signals for evaluation are absent. To assure cooperation among anonymous partners, it would therefore seem that something more than sender-receiver signalling is needed.

(2) \text{partner}^{\text{cost}} = \text{partner}^{\text{cost}}

*note: \( = \) cannot obtain for unknown partners: mutual signalling is ruled out for the anonymous.

Costly signalling theorists, then, face two choices respecting large-scale exchange:

1. **to suggest limited cooperative effects:** religious signalling is not relevant to the assurance of anonymous cooperation.
2. **to suggest persistent benefits from evolutionary constraints:** religious signalling supports anonymous cooperation because our evolved minds are adapted to ancestral contexts, and fail to optimise strategic responses in modern worlds.

Against the first option, the data suggest that religious culture does indeed align the cooperative motivations of members in large anonymous groups (Atran et al. 2007).

Against the second option, even if we suppose that many structural features of cognition are adaptations to ancestral worlds, there is much evidence that humans are nevertheless able to revise their responses to novel strategic circumstances. Indeed, the evidence shows that strategic response is especially sensitive to adjustments to local circumstances so subtle that they escape awareness (Norenzayan and Shariff 2008).

Below we explore a third option for signalling theory, which we call *chameleonic signalling*. The option explains how religious practices equip partners to solve a recognition problem for anonymous cohort. Yet to understand this extension of signalling theory, we must first reconsider how defection threatens cooperation in crowds.
2. Cooperation and Confidence

2.1 The Problem of Cheating

Standard evolutionary approaches treat cooperative interaction as threatened by 'a tragedy of the commons'. Cooperation can be decomposed to the investments and labours of individuals. The advantages of cooperation exceed those available to individuals taking on the world alone. Accessing larger benefits is cooperation's evolutionary advantage. For cooperative goods are rarely threatened when defection is rare. For the goods are rarely threatened by a single defection. Temptations to cheat arise, then, because the contribution of any single partner to the goods of civilization are typically nominal. Cheating cooperation enables individuals to access civilization's benefits without the costs of investments and labours. Moreover, defection also pays better when others do not cooperate. For if many others fail to contribute, a lone cooperator will invest and labour at a net deficit. Under conditions where cheating can be anticipated it is prudent to defect.

We agree with those who argue this assessment of cooperation's threat presents a false picture (Skyrms 2004; Ciccheri 2006). Not all defection arises from opportunism. Indeed, perhaps little cooperation is threatened specifically by cheating. By expanding our understanding of cooperation's risks, we will be better able to perceive how religious culture assures large-scale cooperative prediction and response, from the mechanisms of chiromatic signalling.

2.2 The Problem of Anonymous Exchange Is Not Cheating but Sensitivity to Risk

To begin, it is difficult to imagine how cheating could present stable incentives. While cooperation sometimes poses a tragedy of the commons, there is little evidence that cheating offers cooperation's most general or fundamental problem. To assume so requires that cheating allow a reliable benefit. Yet as Calcott observes, cheating requires a stable benefit to take (Caldwell 2008). Why should anyone suppose that cheating will be reliable if the problem of cooperation has not first been solved? Similarly, why should anyone predict this motivation in others to cheat if the problem of cooperation has not been solved?
2.3 Theory of Mind Strongly Facilitates the Representation of Risk by Enabling a Common Knowledge of Uncertainty

Theory of mind (ToM) names the human capacities for attributing mental states—such as beliefs, desires, and intentions—to self and others. We suppose there is no single attributional capacity but rather many, and furthermore that there is individual and cultural variation in the expression of specific aptitudes. Sometime acts of projecting to the thought and desires of others is called 'mentaling' (Frith and Frith 2006). With respect to cooperation, we observe, quite generally, that mentalizing enables partners to represent strategies and preferences—of self and others—prior to decisions about exchange. Notably, many researchers have credited ToM as a key player in the evolution of large hominin society (Dunbar 1998). Though the problem of cooperation threatened by uncertainty (instead of cheating) is not widely studied, it might appear that theory of mind will indeed play a strong supporting role here as well. This is because any partner who possesses the capacity for theory of mind, and is aware that her partners have ToM, may easily generate a representation of the fact that everyone desires cooperation as a top preference. Moreover, such a representation will generalize. Every partner will know that everyone knows this representation of conditional preferences to be common knowledge. Specifically, a mind-sighted agent can know that:

1. I prefer cooperation
2. others prefer cooperation
3. everyone is able to act cooperatively
4. everyone wishes to act cooperatively if others do
5. everyone knows (1-4) to be common knowledge. ToM enables partners to understand the rationality of mutually benefiting exchange. It would seem that the power to represent conditional preferences and strategies as common knowledge will strongly accommodate the evolution of cooperative solutions: "We want to cooperate: let's cooperate."

However, we believe that a closer assessment of the strategic circumstances that ToM reveals a strategic context with substantial new obstacles. These obstacles have trace their roots to the conditional nature of our cooperative preferences. Because preferences to cooperate are conditional on the prediction that cooperation will actually occur, partners equipped with theory of mind must explicitly consider whether others (similarly equipped with ToM) will be sufficiently motivated to exchange. We think about ToM's risk elevation in the following way.

For simplicity, let us imagine that the cooperative of some subpopulation of a larger, anonymous group is sufficient for success, and known to be sufficient by common knowledge (i.e. there are no other risks to success that cooperation of a minimal group 'r' in a larger group R: r⊆R

Let r → denote 'represent.'
Let '(...)' contain the contents of a representation.

We begin by thinking about how cooperative assessment will take place among those lacking ToM capacities. Among mindblind partners, the world is evaluated as it is sensed, or as sensations are remembered. Thus for any mindblind partner:

(3) partner → (world)

We assume that mindblind agents will evolve or learn behaviors based on observable outcomes. Given that significant large-scale cooperation appears to be rare among unrelated organisms, we expect that such learning is difficult.

However it is not clear that ToM gives the decisive advantage. Again, for simplicity, let us imagine that mind-sighted partners judge that if the minimal group 'r' acts for cooperation, a greater benefit will certainly come to members of r. Mind-sighted partners also know that if r does not arise, cooperation will be costly. The mind-sighted represent the

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3 For a discussion of common knowledge see: (Lewis 1969). For a criticism that partners require common knowledge see: (Bimmeke 2008).

4 Later we use → to mean 'sense', without loss of generality, because the representations that ultimately motivate behavior need not be explicit: it is not the representational character of this representation that matters to cooperative solutions, and indeed we suggest that the automation of cooperative affect benefits from the recruitment of non-declarative representations. Cognition is therefore best approached as embodied by which we mean multi-modal, nonlinear, and grounded in situations. From an embodied perspective on cognition, the concepts of 'awareness' is not exhausted by the concepts of 'belief' or 'perception' or 'attention'.
contents of minds (self or others) — beliefs, desires, confidence, expectations, strategies . . . — as strategic factors in the world. Thus, mind-sighted partners encounter an enlarged world, one in which the representation of mental facts as well as of physical facts matters to strategic decision making.

(4) \[ \text{partner}^1 \rightarrow (\text{world + minds}) \]

Of course, not every representation will be relevant to cooperative prediction. (Whether Alice believes that John prefers white to gray, for example, will be irrelevant). Yet, there is one mental fact that will be particularly important to every cooperative partner. Those who think about cooperation carefully will understand that the conditions needed to satisfy cooperative prediction must be strong enough to satisfy the most doubting member of the minimal group (\(i\)) required for cooperative benefits to be generated. We shall call this most doubting member of the minimal cooperative group: \( \text{partner}^0 \). Why is this person’s confidence so important to cooperative prediction?

In the simplified situation we have imagined, it is the decision of this weakest link — \( \text{partner}^0 \) — that will make or break cooperation’s success. Any partner (\( \text{partner}^1 \)) who is able to represent the cooperative confidence of others should therefore not wish to set her confidence higher than that of the weakest link in the minimal group. Thus, in thinking about the strategies of others, any given partner (\( \text{partner}^1 \)) must telescope attention to how the most doubting partner of the minimal group (\( \text{partner}^0 \)) will assess cooperation’s future.

(5) \[ \text{partner}^1 \rightarrow (\text{partner}^0 \rightarrow (\ldots)) \quad i \neq i \]

Indeed, because the weakest link possesses a Theory of Mind, every partner in the minimal cooperative group will require information that will be commonly known to satisfy this weakest link. Where the identity of this weakest link of the minimal group is unknown, partners will be left to their imaginations in evaluating whether the conditions for satisfying this unknown, most doubting partner have been satisfied. At the limit, partners might imagine an incorrigible skeptic to occupy this role.

Will the confidence of all partners who are able to imagine this scenario inevitably decline? While cooperative confidence may actually increase in situations where mentalizing partners imagine their most doubting members will be satisfied, we observe that such confidence is difficult to secure for partners who remain obscure. For anonymous partners must guess at the standards of unknown others, without the ability to verify these guesses. Where the benefit-to-risk ratio warrants cooperating in the face of strong doubts, the inability to dispatch such doubts may not impair cooperative response. However, such indifference to doubt is not available to those who mentalize risky exchange. For example, where risky cooperation has recently failed, where unprecedented and seemingly dangerous cooperative circumstances arise, where the differences between cooperative and non-cooperative benefits are slight, or where evidence is vivid that cooperation is failing, the inability to prevent doubt will support predictions for cooperation’s failure. For cooperation requires a coordinated response. The representation of doubt as common knowledge will undermine cooperation that partners judge to be hazardous.

2.4 Cooperation’s Success Is Possible because Cooperation Does Not Typically Require the Recognition of Partner Virtue

There are numerous means by which cooperation is practically assured among strangers. Indeed, many of these solutions do not have anything to do with religion. For example, David Hume noticed that social partners come to develop cooperative expectations from experience, and from habit:

... experience assures us still more, that the sense of interest has become common to all our fellows, and gives us confidence of the future regularity of their conduct; and it is only on the expectation of this that our moderation and abstinence are founded. In like manner are languages gradually established by human conventions without any promise. In like manner do gold and silver become the common measures of exchange, and are esteemed sufficient payment for what is of a hundred times their value (Hume 1739).

Familiarity combines with common interest to gradually build expectations that mutually benefiting cooperation will indeed occur and per-
sist. Importantly, cooperative prediction that is threatened by uncertainty, rather than by cheating, does not rely on the identification of partner specific virtue. For there is no specific motivation to cheat. The virtuous and vicious alike predictably benefit from living in a cooperative world.

Yet while assurances do build over time, it is precisely their persistence and endurance that requires explanation. We agree with those who notice that our conventions are fragile. For once confidence for our conventions is lost, confidence is difficult to restore. The fragility of trust is well-illustrated by societies in which corruption is rife. Cristina Bicchieri notices that in such societies most people would prefer not to bribe the police and politicians (Bicchieri 2006). Indeed, if all the disadvantaged were to resist at once, corruption would surely end. This fact is common knowledge. Yet it is also common knowledge that no single hero can bring an end to such corruption. In corrupt worlds those who act alone go missing in the night. Reform requires a synchronous resistance of many. The question: ‘Why do the conventions mediating risky exchange not collapse more regularly?’ remains, to our minds, a fundamental, unsolved evolutionary mystery. Given the potential for cooperative decline, the resilience of the prediction that cooperation’s benefits will persist would appear to require specific supporting designs. Indeed, the elaborations of such designs present a more fundamental problem for cooperation than the elimination of cheating. What explains the stable production of this benefit, what Calvocote calls ‘the other cooperation problem’. Mathematical and experimental results agree that cooperative behaviour responds to social and ecological cues. Moreover cooperation’s failure produces evidence for future failure, as current defection presents evidence for future defection (Keizer et al 2008).

In the remainder of this chapter, our purpose will not be to examine the fragility of human conventions (Bicchieri 2006). Rather, we shall consider whether religious culture provides exploitable solutions to the problem of cooperative prediction among strangers. We conjecture that religious cultures evolve to generate cooperative motivations among obscure partners, without doubt. We use this conjecture to explain otherwise puzzling findings in the social neuroscience of religious.

3. Charismatic Culture: Affordance and Alignment

We define ‘charismatic signals’ loosely according to the classic theory of Max Weber who put emphasis on subjects recognising a person or institution as endowed with special powers, and being moved to act in accordance with the sensibility (Weber 1958; see also Taves 2009). For us (as for Weber) charismatic signalling does not exclusively point to information emitted by persons with extraordinary persuasive abilities. Rather, charismatic signalling encompasses objects, institutions, roles, spatial arrays, symbolic productions, ritual theater, ceremonies, musical projection and other factors harboured within shared environments, whose presentations affect both declarative and non-declarative cognition. It is the relationship of these governing factors to embodied cooperative cognition that shall interest us here.

Charismatic signalling hypothesizes that religious cultures strongly enhance confidence by factors that both:

1. afford strong cooperative sensibilities, and
2. synchronise these affordances.

Recall that for cooperation to operate at large social scales, such sensibilities must be recruited and aligned among potentially anonymous partners. Because cooperative assurance does not require that partners receive assurances of each others virtues, the factors that recruit and align these cooperations may work in a relatively widespread and automated fashion, without the need for costly signalling.

(7) partner1 ↔ partner2
(8) partner1 ↔ partner2
(9) partner1 ↔ charismatic signal ↔ partner2
(10) partner1 ↔ charismatic signal ↔ partner2

*where (↔) = reliably sense, and (→) = reliably sense and (⇒) = affect (make confident)

Thus, even where partners are unable to sense each other ((7), (8)), anonymous partners may be motivated to cooperate from the effect on motivation of exogenous factors ((10)). Specifically, where partners are reliably exposed to information that (i) generates and (ii) aligns their cooperative sensibilities, mutually benefitting exchange will be as-
sured. We believe that the problem of risky anonymous cooperation largely amounts to the distribution of factors that promote cooperative sensibilities in a relatively automated fashion, at potentially large social scales (as per (7)) – that is by charismatic signals. Moreover, we suggest that religious cultures harbour some of the oldest and most powerful recipes for charismatic response. Such assurances do not arise from the synchronous orchestration of cooperative actions among partners, at potentially anonymous scales. Such an orchestration relies on a relatively automatic production of confidence among partners, in response to common ecological signals.

3.1 Affording Cooperative Cognition

Having expressed the problem of cooperation as a problem relating to the uncertainty of social prediction, we suggest that the affordance of a benefiting cooperation requires factors that either:
1. promote the expectation of rewarding exchange, and/or
2. distract partners from thinking about risks.

Thus:

(11) charismatic signal /∈ risk
(12) charismatic signal → cooperative motivation

*Where (/∈) means 'does not reliably sense' and (→) means 'reliably sense'

We suggest that religious cultures provide charismatic factors that potentiate confidence by altering the perceived, imagined, remembered, and felt environments that religious persons perceive themselves to inhabit. One might say that religious culture rearranges the mental furniture of those situated in (potentially) anonymous societies, in ways that provoke cooperative sensibilities.

(13) partner¹ ⇔ charismatic signal ⇒ partner³
(14) partner¹, partner³ → (sacred world-minds) = 'embodied states'

3.2 Aligning the Cooperative Affordances of Anonymous Partners

Notice that the generation of cooperative affordances by itself remains insufficient to maintain cooperative benefits over time. For evolutionary processes to conserve charismatic signals, it is not enough that partners feel strong motivations to exchange. If cooperation is to indeed occur, partners must feel sufficient motivations in synchrony.

Because cooperative (trivially) requires coordination cooperative actions, cooperation among distinct individuals (nontrivially) requires an alignment of the cooperative motivations of these individuals. Where partners remain obscure to each other, we must look for factors capable of producing cooperative alignment outside the cognitive and affective states of individuals. The modulators that facilitate social exchange must rather be embedded in external features of the world. To be coincidentally accessible to members of a minimal cooperative group, such signals must be either:

1. **Focally placed**: such that anonymous partners simultaneously observe identical charismatic signals

or

5 Again, we notice that it is the interaction of culture and cognition that leads to cooperative modulation. This requires both genetic and epigenetic contributions. The proximate mechanisms underlying both vectors remain poorly understood. Thus, while evolutionary theory helps to guide the investigation of the proximate engines of success, it can offer no substitution for such investigations.
2. Widely distributed: such that anonymous partners are exposed to charismatic signals, distributed across a cooperative setting, at a rate of exposure sufficient to integrate cooperative actions.

For selection to target and amplify cooperative responses to either locally placed or widely distributed signals, the motivational effects from exposure to such signals must endure sufficiently long (in concert with knowledge about how specifically to act) to integrate cooperative actions among sufficiently many partners to yield cooperative benefits.

4. The Neural Correlates of Charismatic Signals

So far we have argued that an important, and much overlooked threat to cooperation among anonymous partners is uncertainty. Such uncertainty brings risk to cooperative decisions. We have noticed that theory of mind (ToM) enhances the risks of anonymous cooperative interaction, by enabling partners to represent uncertainty as common knowledge. More damaging still, ToM enables partners to consider how the most skeptical among an anonymous cooperative group might respond to the representation of uncertainty, as common knowledge. We have seen that such representations steal optimism from cooperative prediction.

There is, nevertheless, a bright side to cooperative problems threatened by predictive uncertainty. We observed that where partners share a common interest in solving the problem of anonymous recognition, any solution to the problem of cooperative prediction will be highly evolvable. If we assume absolute benefits overwhelm relative benefits (i.e. that a partner cannot benefit by spiting cooperation), then all share an interest in cooperative solutions. Moreover virtue and vice need not be specifically assessed. It is not virtuous to cooperate when there is no benefit from defection. Our analysis also revealed that commonly accessible signals, locally placed or widely distributed, which provoke cooperative motivations reliably, will be strongly conserved for their benefits to cooperative prediction. We called such cooperative triggers ‘charismatic signals’. We suggested that religious culture harbours charismatic signals of exquisite and durable power, and suggested that such benefits form part of the explanation for religion’s astonishing evolutionary conservation. Such functionality explains how Critias’s theory of religious policing can be maintained among anonymous populations.

Yet for our religions to promote cooperative responses at anonymous scales, religious cultures must activate powerful cooperative commitments, in synchrony, among sufficiently many partners to yield cooperative benefits.

It is time now to consider some evidence from the social cognitive neuroscience of religion. These data were not gathered to test the model we have been developing. Rather we use the model to explain lingering anomalies in the data. Thus, charismatic signalling offers an inference to the best explanation—or an abductive explanation—for otherwise puzzling observations (Harman 1965). Much scientific progress occurs from abductive reasoning. There is the part of science where we gather data to test hypotheses, and the part of science where we use hypotheses to explain the data. The following presents an exercise in the latter type of scientific practice.

4.1 Charismatic Authority and Hypnotic Suggestion: Focal Charismatic Affordance

For many religious practices, subjects participate as passive spectators or as recipients of actions performed by religious authorities. The central feature of commitment within such passive practices lies in the subjects’ acceptance of the divine powers of a focal practitioner or authority. Indeed, in many instances, it is the participant’s representation of the powers entangled by priests, shamans, healers and witches that separate effective rituals from meaningless actions.

Though commonplace, the evolutionary dynamics of such assenting remains poorly understood. On the standard model of social exchange, such granting of control to another must remain perplexing, a type of loss that invites exploitation. However, where the problem of exchange is one of synchronous alignment to coordination points, the mystery of this deliberate granting of control to another more easily resolves. For we have seen that the problem of securing cooperation is better accommodated by factors that express and coordinate confidence among members of a distributed group. Thus, where entrainment coordinates affective states in the right way, a trusting of focal authority can form a stable evolutionary target. We believe that considering charismatic authority from the vantage point of social exchange reveals functionality in

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6 Though see Henrich 2009; Johnston and Fowler 2009.
those practices/responses defined by the subjective granting of control over to a charismatic authority. Consider the case.

Recent data suggest that charismatic signals operate on the same cognitive mechanisms used to induce hypnotic responses and placebo effects in patients. In hypnotic practices, the perceived authority of the practitioner strongly predicts facilitation of patient responses. Such findings point to a specific cognitive processing that renders subjects more susceptible to a psycho-physical governance mediated by confidence in focal authorities. Indeed, findings in the hypnotic literature reveal that cognitive inhibition of executive function is a central component to this generation of this effect (Schjoedt et al. 2010). Using functional magnetic resonance imaging (fMRI), Schjoedt et al. (2010) investigated how assumptions about the healing powers of praying speakers changed the evoked BOLD response in secular and Christian participants who received prayers of healing. The researchers found that Christians down-regulated their social cognitive and executive networks when they believed they were listening to speakers known to have healing powers. Indeed, those who down-regulated social-cognitive and executive networks most strongly were subsequently found to express the most positive experience of the healer. Interestingly, none of these effects were observed in the secular group when they listened to the same healer. This absence of an observed down-regulation suggests that secular participants did not experience charismatic governance. These findings suggest that the observed response to charismatic authority is therefore linked to how subjects frame the social relationship to focal authorities. Moreover such framing, combined with exposure, subsequently produces predictable attitudes. These effects correspond to findings in hypnosis research demonstrating that hypnotic susceptibility is associated with frontal inhibition (Jamieson and Sheehan 2004; Gruezleri 2006; Oskley et al. 2007; Raz et al. 2007) and that instructions received during hypnotically induced inhibition influence how subjects subsequently perceive and relate to stimuli (MacLeod and Sheehan 2003). Given the results of these hypnosis studies, it would appear that secular listeners do not respond by inhibiting the relevant networks because they do not manage to believe in the powers of the healer.

Schjoedt et al.’s (2010) study provides early evidence that charismatic factors promote strong affective alignment to focal authorities from (at least) two related mechanisms: 1) from the strong modulation of trust and acceptance to central authorities; 2) from an intriguing interplay of declarative and non-declarative representations — explicit belief and the inhibition of explicit awareness. From the vantage point of charismatic signalling, this puzzling interaction exhibits impressive functionality. For coupling the states of a potentially large (and anonymous) audience to a central figure enables strong affective alignment, without scale constraints: precisely what cooperation in nameless, faceless society requires. Charismatic influence appears to function at the neuronal level through a subtle orchestration of social cognitive response, involving the recruitment and modulation of both reflective and embodied networks in the brain. It is this interplay that results in an increase in subjective susceptibility to messages and attitudes among committed followers. Finally, the study helps to clarify charismatic signalling, by revealing a potential channel of reinforcement feeding back from experiential outcomes in response to charismatic influence to beliefs consistent with the maintenance of traditional perspectives. Thus, the data reveal how charismatic experience may lead to greater confidence in religious authority, thus supporting the propagation the charismatic traditions in which such authority is maintained.

4.2 Distributed Charismatic Affordance from Personal and Repetitive Prayer

There is, of course, much more to religion than the trusting of charismatic authorities. Perhaps the most fascinating and salient feature of our religions is the experience many have of divinities. We next focus to the social neuroscience of private prayer. In thinking about the relationship of prayer to cooperative prediction, two facts stand out. Prayer plays a central role in religious traditions with diffuse networks of exchange. However, while ostentatious prayer may help to facilitate exchange by costly signalling (see: Irons 2003) much prayer appears to be performed in private. Among anonymous cohort it is difficult to understand how such costly private prayer could be conserved (though for a costly signalling explanation for private prayer, see: Sosis 2003). However if prayer is a practice whose benefits arise to suppress risk-sensitivity, and to generate confidence, then private prayer, when common, may be strongly conserved as a charismatic trigger point for social mobilization. Findings from recent social neuroscience reveal that prayer generates the types of representations that may lead to the expression of confident feeling and reward expectations. Because the data suggest that such representations will be common among those that frequently
prayer, it would appear that prayer may align cooperative behaviours among potentially anonymous cohort. These data thus shed light on three puzzling observations:

1. religious cultures potentiate strong affective responses, even in anonymous populations.
2. religious cultures remain strongly conserved over historical timescales.
3. religious psychology remains strongly conserved over evolutionary timescales.

In a recent study investigating the neural basis of private prayer, Schjoedt et al. (2009) found that social cognitive regions were strongly active in highly religious Christian participants while they engaged in personal prayer, with weaker effects among those who prayed less frequently (Schjoedt et al. 2009). These data suggest that Christians who pray frequently represent God as a real person who responds to communication with reciprocity. While personal prayer typically occurs in private, and thus does not afford cooperative signalling – nevertheless, cortical activations observed in this study are strongly consistent with the functions of a system designed to support cooperative response among potentially anonymous partners. Consider how the experience of Divinity may support cooperative motivation among relative strangers who synchronise their expectations and responses through experiences of Divinity.

First, Schjoedt et. al.'s (2009) studies reveal that personal prayer provides the prayerful with a remarkable experience of God's personal involvement. Thus, prayer does not merely produce abstract expectations (in a manner that might be discounted: 'if you do your homework, one day you will be rich ...') personal prayer provides an immediate and moving experience of God's personal reality, and interest. Some evolutionary researchers suggest that religion relies on a 'belief in belief' (Dennett 2006). Others doubt any religious belief whatsoever (e.g. Palmer and Steadman 2004). Schjoedt et. al.'s (2009) findings demonstrate something more than belief, namely the generation of evidence from encounter. When such experience of a personal God is paired with cooperative norms, and made widely available to partners, prayer will both anchor and orchestrate cooperative responses, even for partners who remain anonymous.

Second, reward expectations from interaction with divinities need not be given as purely instrumental goods — payments or punishments, say, in the afterlife. Rather, those who pray receive motivation to follow God's ways directly from an empathetic sharing of God's desires and expectations, from responses to God's suffering, or from intrinsic desires to please a God who is experienced as personally significant. Thus, an embodied relationship to Divinity allows for emotional recruitment, motor responses, affective mirroring, modifications to sensation, and other multi-modal representations, to express and orchestrate normative motivations, with fascinating complexity. While much remains to be discovered about the social/affective effects of prayer, preliminary evidence for the expression among those who pray of theories of God's mind (ToGM) exhibits an impressive tool for the synchronous expression of solidarity.

Third, personal prayer offers a means for meeting life's inevitable challenges. These are the recurring problems of illnesses, loss, suffering, and insecurity about the future. Given that resolution of such concerns often remains outside the scope of individual control, worry cannot be remedied from individual responses. However, by locating the control of future events in the actions of an all-loving, all-powerful Deity (or with the help of less perfect spirits), new possibilities for security and comfort become available to those who discover committed gods in prayer. Specifically, reductions to anxiety may enhance cooperative performance, given that too much anxiety destroys performance. Moreover, the future really is brighter for cooperative groups. Praying groups who use their religion to access cooperative goods find evidence to support religious experience, which in turn ratifies cooperative confidence. Moreover when cooperation fails, the perspective of eternity enables partners to discount losses, thus retain a confidence not available to those who adopt purely natural evaluative frames.

Fourth, by allocating theory of mind processing to God's mind, inferences about the risks of other partner's minds become less available. For God is believed to ultimately determine whether partners cooperate. Here we find the suppression of risk judgments from practices that locate confidence in a strategic landscape whose supernatural furni-
nature finds no seat for cooperative risk-aversion. Partners distracted by God’s mind, are less easily distracted by doubts about each other’s doubts.

Further evidence for the manufacture of cooperative confidence comes from a study on formulaic prayer which observed strong activations from repetitive prayer in the striatal reward system (Schjoedt et al. 2008). (Repetitive prayer differs from personal prayer because it involves the repetition of standard phrases). This finding is interesting, in the first instance, because reward processing in the dorsal striatum has been demonstrated to depend on trust in social exchange studies.8 Thus greater trusting in God and his sanctioned practices may correspond to the observed involvement of reward processing. It is noteworthy, moreover, that the generation of implicit reward signals occurs in somewhat automated fashion among those who pray regularly. From an evolutionary stance, the conservation of reward representations in response to such ostensibly non-utilitarian behaviour remains mysterious. For while reward circuits can be co-opted by novel agents (drugs, unhealthy foods, marketing) the long-enduring survival of religious practices hints at potential benefits. Yet the automation of reward—factors in the design specifications of an intervention designed to robustly support the alignment of confidence among potentially unknown partners. Here again, Schjoedt et al.’s (2008) study reveals the expression of charismatic affordances through yet another intricate orchestration of declarative and embodied rates. Focusing specifically on the activation of embodied representations—here motor habits, automated speech, and (outside the scanner) body postures—charismatic signalling enables researchers to examine how these activations possess strong social utilities. While it remains to be seen whether other religious practices suppress anxiety and express the expectation for reward, these preliminary studies reveal how personal and repetitive prayer may contribute to produce confidence, even among strangers.

8 For example, King-Casas et al. (2005) have demonstrated that learning to trust partners in economic exchange games is predicted and mirrored by activation of this structure.

5. Conclusion

Charismatic signalling extends costly signalling theories of religion by explaining how religious culture equips partners for anonymous exchange in situations where signals of virtue cannot be assured. We observed that where the problem of cooperation comes from an uncertainty over cooperation’s benefit, rather than from a certainty for defection’s benefit, cooperation fails not from defection but from uncertainty and risk. We found that theory of mind (ToM) has the potential to strongly impair cooperative prediction. For in thinking about the likelihood that others will adopt cooperative strategies, partners require information that will satisfy the most skeptical among them. Such a requirement would appear to render cooperation especially fragile.

It is well known that selection does not always optimize, and for this reason, many have preferred by-product explanations for religious culture and cognition. If the persistence of costly religion can be explained without attributing design, such an by-product explanation may appear preferable for their apparent simplicity. Yet while the endurance of certain facets of specific religions may be partially explained as a by-product, and while our religions do bring harms, we do not share enthusiasm for by-product perspectives when explaining long enduring trends. For religion has experienced a conservatism that is unrivaled. Here we have considered how the problem of cooperative prediction under uncertainty is managed by charismatic signals. We noticed that where information can be elaborated to reliably express and align strong cooperative sensibilities among potentially anonymous others, such information will be targeted by cultural and perhaps natural selection.

Charismatic signalling explains how our religious facilitate cooperative confidence and trust for anonymous populations. They do so through factors that suppress sensitivity to risk, and that evoked heightened states of confidence, in synchrony. In reviewing recent work in the social neuroscience of religion from the stance of charismatic signalling we resolved anomalies presented in these data.

Specifically, the data show that charismatic authority relies on a sub-declaration in both declarative and non-declarative representations, that is, from the modulation of embodied cognition. Surprisingly, it seems this orchestration relies on an executive inhibition of error monitoring in response to charismatic authority. We noticed that while the effects of this interaction appear to rely on initial confidence, charismat-
ic interaction also produces experiences consistent with the initial confidence—a track record which supports further success downstream. More fundamental, we noticed that because such confidence is shared, charismatic authority enables a coupling of the internal states of potentially anonymous and large audiences to the signals produced by focal figures. This coupling of many-to-one enables a powerful alignment in the thoughts, moods, and motivations of those who fall under charisma’s spell. While such large-scale hypnotic effects appear to invite opportunism (occasionally realized, no doubt) we suggested that the conservation of hypnotic effects arises from the benefits of large-scale cooperative interactions whose motivations hypnotic cultures support.

In our review of the neuroscience of personal prayer, we found that different patterns of explicit and implicit are activated in the neuronal populations that support prayerful cognition. However we noticed that activations, though substantially different to interactive prayer, nevertheless revealed a similar capacity for alignment of the thoughts and expectations of widely distributed partners. In personal prayer we found a strong recruitment of the social cognitive network, pointing to experiences of God as a real person, whose benefits can be expected. Prayer appears to elaborate ToM in a manner that belies extraordinary functionality, both by reducing anxiety and by increasing the expectation of future rewards in social exchange.

In considering the data on repetitive prayer, we noticed how an automated activation of a reward signal was observed among those who pray regularly. Charismatic signalling observes specific benefits from automation in the production of this signal. Such automation in the potentiation of reward expectation displaces the suppression of risk from declarative awareness while expressing strong emotion. Such displacement grounds the expectation of reward in feelings, which cannot be readily doubted, explicitly. Charismatic signalling predicts the generation of such benefits through embodied states. Presently, however, we do not know how far these effects generalise to other religious practices. It is worth closing with a remark about variation, and its relationship to evolutionary theory. We have seen that even within a relatively homogenous religious community, the scope for variation in religious cognition from distinct practices is rather large. Thus, we might expect that as cognitive scientists explore religious practices among distinct and heterogeneous religious populations, further variation will likely be disclosed. Yet our discussion already illustrates how evolutionary theory is able to help researchers to find such adaptive functionalty amid strong variation in cognitive effects, by focussing attention to how various practices occupy our bodies and minds with tasks that deliver strikingly similar social-cognitive benefits. Do the strong conservation of these effects tell a functional story? More studies are needed before researchers can be certain. Specifically needed are studies that show direct evidence of cooperative outcomes from charismatic interventions.9

While charismatic signalling focuses attention to cooperative benefits, it must be remembered that there may be non-cooperative benefits arising from cooperative practices too, such as the benefits to individuals of increased health or the benefits of retaining time-tested wisdom. We must therefore allow the prospect that non-cooperative benefits play a role in the impressive durability of our ancient religions. Indeed, such benefits are not incommensurable with the advantages religion brings to social exchange. Though the proximate effects of religion can be costly, or inert, we do not share enthusiasm for the hypothesis that religion has been conserved accidentally. For it has occupied central stage in the Hominin lifestyle for too long, we think, for the accident hypothesis to be probable.

We have motivated an approach to our sacred traditions as impressive technologies for human flourishing. Cognitive and evolutionary science is only beginning to understand how these long-enduring technologies work. Many discoveries lie ahead.

References


9 For a review of recent studies suggesting such effects see Bulbulia (2009).