



<http://researchspace.auckland.ac.nz>

ResearchSpace@Auckland

Copyright Statement

The digital copy of this thesis is protected by the Copyright Act 1994 (New Zealand).

This thesis may be consulted by you, provided you comply with the provisions of the Act and the following conditions of use:

- Any use you make of these documents or images must be for research or private study purposes only, and you may not make them available to any other person.
- Authors control the copyright of their thesis. You will recognise the author's right to be identified as the author of this thesis, and due acknowledgement will be made to the author where appropriate.
- You will obtain the author's permission before publishing any material from their thesis.

To request permissions please use the Feedback form on our webpage.

<http://researchspace.auckland.ac.nz/feedback>

General copyright and disclaimer

In addition to the above conditions, authors give their consent for the digital copy of their work to be used subject to the conditions specified on the Library Thesis Consent Form.

STUDIES ON THE PROJECTIONS OF THE SUPERIOR CEREBELLAR PEDUNCLE
AND THE RUBROTHALAMIC AND NIGROTHALAMIC PROJECTIONS IN THE RAT,
AND THEIR RELEVANCE TO THE HOMOLOGIES OF THE ANTERIOR PARTS OF
THE VENTRAL NUCLEUS OF THE THALAMUS IN THE MAMMALIAN BRAIN.

BY

R. L. M. FAULL

BEING A THESIS SUBMITTED IN FULFILMENT OF
THE REQUIREMENTS FOR THE DEGREE OF DOCTOR
OF PHILOSOPHY IN THE UNIVERSITY OF AUCKLAND

AUGUST, 1975

I agree to this thesis being consulted and/or photocopied for the purpose
of research or private study provided that due acknowledgment is made where
appropriate and that my permission is obtained before any material is
published.

Signed.....*R. L. M. Faull*.....

Date.....*10 Sept 1984*.....

TABLE OF CONTENTS

LIST OF PLATES	(IV)
LIST OF FIGURES	(V)
ABBREVIATIONS	(VII)
INTRODUCTION	1
REVIEW OF THE LITERATURE	3
SECTION I PROJECTIONS OF THE SUPERIOR CEREBELLAR PEDUNCLE	3
The Contralateral Ascending Pathway	8
The Contralateral Descending Pathway	19
The Ipsilateral Descending Pathway	25
SECTION II RUBROTHALAMIC PROJECTIONS	29
SECTION III NIGROTHALAMIC PROJECTIONS	35
MATERIAL AND METHODS	40
THE PLACEMENT OF PRECISE LESIONS	40
SECTIONING AND STAINING	47
INTERPRETATION	53
PRESENTATION OF RESULTS	56

RESULTS	58
SECTION I PROJECTIONS OF THE SUPERIOR CEREBELLAR PEDUNCLE	58
GROUP A: LESIONS NOT INVOLVING THE SUPERIOR CEREBELLAR PEDUNCLE	59
GROUP B: COMPLETE LESIONS OF THE SUPERIOR CEREBELLAR PEDUNCLE	61
The Contralateral Ascending Pathway	65
The Contralateral Descending Pathway	78
The Ipsilateral Descending Pathway	85
GROUP C: PARTIAL LESIONS OF THE SUPERIOR CEREBELLAR PEDUNCLE	86
SECTION II RUBROTHALAMIC PROJECTIONS	89
GROUP D: LESION CAUDAL TO RED NUCLEUS	91
GROUP E: RUBRAL LESIONS	93
SECTION III NIGROTHALAMIC PROJECTIONS	98
GROUP F: LESIONS IN PARS RETICULARIS	98
GROUP G: LESIONS IN PARS COMPACTA	102

DISCUSSION		106
SECTION I	PROJECTIONS OF THE SUPERIOR CEREBELLAR PEDUNCLE	110
	FINDINGS DUE TO THE INVOLVEMENT OF TISSUES OTHER THAN THE SUPERIOR CEREBELLAR PEDUNCLE	111
	FINDINGS DUE TO THE INVOLVEMENT OF THE SUPERIOR CEREBELLAR PEDUNCLE	113
	The Ipsilateral Descending Pathway	114
	The Contralateral Descending Pathway	117
	The Contralateral Ascending Pathway	126
SECTION II	RUBROTHALAMIC PROJECTIONS	139
SECTION III	NIGROTHALAMIC PROJECTIONS	142
SECTION IV	HOMOLOGIES OF THE ANTERIOR PARTS OF THE VENTRAL NUCLEUS OF THE THALAMUS	147
CONCLUSIONS		151
ABSTRACT		154
ACKNOWLEDGEMENTS		156
LITERATURE CITED		157

LIST OF PLATES

FRONTISPIECE	"Details of the bifurcation of the superior cerebellar peduncle". After Ramon y Cajal (1903).	
		following page
Plate 1	General view of the stereotaxic instrument in use.	40
Plate 2	The calibrated brass block positioned in the head-holder of the stereotaxic instrument.	44
Plate 3	The perfusion apparatus in use.	47
Plate 4	General view of the motorised sliding-block microtome.	48
Plate 5	The lesion in experiment SP10.	62
Plate 6	Axonal degeneration in the red nucleus, ventro-medial nucleus and ventro-lateral complex in experiment SP10.	67
Plate 7	Axonal degeneration in the nucleus reticularis tegmenti pontis and inferior olive in experiment SP10 and in the pontine nuclei in experiment SP6.	79
Plate 8	Axonal degeneration in the nucleus reticularis parvocellularis at the level of the motor nucleus of the trigeminal nerve in experiment SP10.	85
Plate 9	The lesions in experiment CR12.	94
Plate 10	Degeneration in experiments SP46 and CR8.	95
Plate 11	The lesion in experiment SN73 and the axonal degeneration in the ventro-medial nucleus of the thalamus.	99

LIST OF FIGURES

	following page
Figure 1	Electrode approaches: (a) to S.C.P.; (b) to red nucleus; (c) to substantia nigra. 42
Figure 2	Schema showing plane of sections and levels of illustrations. 57
Figure 3	Lesion in experiment SP19. 59
Figure 4	Lesion in experiment SP8. 61
Figure 5	Lesion in experiment SP10. 62
Figure 6	Degeneration in experiment SP10 at levels 14 and 17. 64
Figure 7	Degeneration in experiment SP10 at level 13. 65
Figure 8	Degeneration in experiment SP6, sectioned horizontally through the ventral parts of the midbrain tegmentum and of the thalamus. 66
Figure 9	Degeneration in experiment SP10 at level 12. 67
Figure 10	Degeneration in experiment SP10 at level 11. 68
Figure 11	Degeneration in experiment SP10 at level 9. 69
Figure 12	Degeneration in experiment SP10 at level 7. 70
Figure 13	Terminal degeneration in the left principal oculomotor nucleus in experiment SP7, sectioned sagittally. 70
Figure 14	The ventral nucleus of the rat thalamus. 72
Figure 15	Degeneration in experiment SP6, sectioned horizontally. 73
Figure 16	Degeneration in the left thalamus in experiment SP7, sectioned sagittally. 73
Figure 17	Degeneration in experiment SP10 at level 6. 75
Figure 18	Degeneration in experiment SP10 at level 5. 75
Figure 19	Degeneration in experiment SP10 at level 4. 75
Figure 20	Degeneration in experiment SP10 at level 3. 75
Figure 21	Degeneration in experiment SP10 at level 2. 75
Figure 22	Degeneration in experiment SP10 at level 1. 75
Figure 23	Degeneration in experiment SP10 at level 15. 78
Figure 24	Degeneration in experiment SP10 at level 17. 79
Figure 25	Terminal degeneration in the nuclei pontis and in the nucleus reticularis tegmenti pontis in experiment SP10, sectioned coronally. 79

Figure 26	Terminal degeneration in the nuclei pontis and in the nucleus reticularis tegmenti pontis on the left side in experiment SP7, sectioned sagittally.	79
Figure 27	Terminal degeneration in the nuclei pontis and in the nucleus reticularis tegmenti pontis in experiment SP6, sectioned horizontally.	79
Figure 28	Degeneration in experiment SP10 at level 19.	82
Figure 29	Degeneration in experiment SP10 at level 22.	83
Figure 30	Degeneration in experiment SP10 at level 26.	84
Figure 31	Degeneration in the left inferior olivary nuclear complex in experiment SP6, sectioned horizontally.	84
Figure 32	Lesion in experiment SP44.	89
Figure 33	Lesions in experiment CR5.	91
Figure 34	Lesions in experiment CR12.	94
Figure 35	Degeneration in experiment CR12 at level 7.	96
Figure 36	Degeneration in experiment CR12 at level 6.	96
Figure 37	Degeneration in experiment CR12 at level 5.	96
Figure 38	Degeneration in experiment CR12 at level 4.	96
Figure 39	Degeneration in experiment CR12 at level 3.	96
Figure 40	Degeneration in experiment CR12 at level 2.	96
Figure 41	Degeneration in experiment CR12 at level 1.	96
Figure 42	Lesion in experiment SN73.	99
Figure 43	Degenerating fibres coursing through the midbrain to terminate in the thalamus in experiment SN70, sectioned sagittally.	100
Figure 44	Degeneration in experiment SN73 at level 6.	101
Figure 45	Degeneration in experiment SN73 at level 5.	101
Figure 46	Degeneration in experiment SN73 at level 4.	101
Figure 47	Degeneration in experiment SN73 at level 3.	101
Figure 48	Degeneration in experiment SN73 at level 2.	101
Figure 49	Degeneration in experiment SN73 at level 1.	101

ABBREVIATIONS

Ab	Nucleus ambiguus
A.C.	Anterior commissure
Ad	Anterodorsal nucleus
Am	Anteromedial nucleus
Av	Anteroventral nucleus
C.C.	Crus cerebri
Ce	Central medial nucleus
Cl	Central lateral nucleus
C.T.	Trapezoid body
Ct	Nucleus of the trapezoid body
Cv	Ventral cochlear nucleus
D	Nucleus of Darkschewitsch
Ep	Entopeduncular nucleus
Ew	Nucleus of Edinger-Westphal
F	Fornix
F.L.	Fasciculus longitudinalis
F.R.	Fasciculus retroflexus
F.T.	Fibrae pontis transversae
G.	Genu of the facial nerve
Hb	Habenular nuclei
I	Interstitial nucleus of Cajal
IC	Inferior colliculus
I.C.	Internal capsule
I.C.P.	Inferior cerebellar peduncle
Ip	Interpeduncular nucleus
Lc	Locus coeruleus
Ld	Laterodorsal nucleus
Lgd	Dorsal lateral geniculate nucleus
Lgv	Ventral lateral geniculate nucleus
Lp	Lateroposterior complex
M.C.P.	Middle cerebellar peduncle
Md	Nucleus medialis dorsalis
Mg	Medial geniculate nucleus

M.L.	Medial lemniscus
M.L.F.	Medial longitudinal fasciculus
M.T.T.	Mammillothalamic tract
Mv	Medioventral nucleus
Od	Dorsal accessory nucleus of the inferior olive
Oi	Inferior olivary nuclear complex
Om	Medial accessory nucleus of the inferior olive
Op	Principal nucleus of the inferior olive
Os	Superior olivary nucleus
P	Pontine nuclei
Pa	Paratenial nucleus
Pbl	Lateral parabrachial nucleus
Pbm	Medial parabrachial nucleus
Pc	Paracentral nucleus
Pcm	Nucleus of the posterior commissure
Pf	Parafascicular nucleus
Pi	Nuclei pontis, pars intermedius
Pl	Nuclei pontis, pars lateralis
Pm	Nuclei pontis, pars medialis
Po	Posterior nuclear group of the thalamus
P.T.	Pyramidal tract
Pt	Anterior pretectal nucleus
Pv	Periventricular nuclei
R	Reticular nucleus of the thalamus
Rf	Reticular formation of the midbrain
Rgc	Nucleus reticularis gigantocellularis
Rh	Rhomboid nucleus
Rm	Red nucleus, magnocellular division
Rmc	Magnocellular nuclei of the reticular formation
Rn	Red nucleus
Rp	Red nucleus, parvocellular division
Rpa	Nucleus reticularis parvocellularis
Rpc	Nucleus reticularis pontis caudalis
Rpo	Nucleus reticularis pontis oralis
Rtp	Nucleus reticularis tegmenti pontis

S.C.P.	Superior cerebellar peduncle
Sgm	Stratum griseum mediale colliculi superioris
Sgp	Stratum griseum profundum colliculi superioris
Sgs	Stratum griseum superficiale colliculi superioris
S.M.	Stria medullaris
Sm	Submedial nucleus
Sn	Substantia nigra
Snc	Substantia nigra, pars compacta
Snr	Substantia nigra, pars reticularis
St	Subthalamic nucleus
Vb	Ventro-basal complex
Vl	Ventro-lateral complex
Vm	Ventro-medial nucleus
Vt	Ventral tegmental nucleus
Zi	Zona incerta
III	Principal oculomotor nucleus
IV	Trochlear nucleus
Vm	Motor nucleus of the trigeminal nerve
Vmes	Mesencephalic nucleus of the trigeminal nerve
Vs	Principal sensory nucleus of the trigeminal nerve
Vsp	Nucleus of the spinal tract of the trigeminal nerve