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Systematic analysis of the connectional neuroanatomy of the non-human primate cerebellum

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Thesis

SYSTEMATIC ANALYSIS OF THE CONNECTIONAL NEUROANATOMY OF THE NON-HUMAN PRIMATE CEREBELLUM

by

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DEDICATION

I would like to dedicate this work to my parents and my grandparents. Thank you for always supporting me and believing in me more than I believe in myself – you guys are my world and I hope to continue making you proud.

ACKNOWLEDGMENTS

Dad, this one’s for you! Thank you for being my best friend in the whole world and pushing me to be the best version of myself every day. You are the reason I made it this far and I hope to continue to make you proud.

Amma, I can’t believe 23 years ago you were getting your master's degree in a new country while pregnant with me. Now it’s my turn! You are the epitome of the woman I aspire to be, and I hope to be as hardworking, kind, and driven as you are. You inspire me every day – so thankful to not only have such an amazing woman as my role model but also as my mother. Love you lots.

To my wonderful grandparents, thank you for your constant encouragement, love, and support. You guys are my biggest supporters, and you make me want to strive to reach the stars – love you all so dearly.

Special thank you to my mentor, Dr. Rushmore, and our entire lab. Thanks to you all, I grew so much as a researcher, and it would not have been possible without the constant encouragement and support from each and every one of you. Our lab memories will forever be cherished.

SYSTEMATIC ANALYSIS OF THE CONNECTIONAL NEUROANATOMY OF THE NON-HUMAN PRIMATE CEREBELLUM

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ABSTRACT

The cerebellum is a complex brain structure highly connected to the spinal cord, brainstem and forebrain that plays a major role in the motor coordination of the body. While multiple studies elaborate on the function of the cerebellum, very little direct knowledge is known about the structural neuroanatomical connectivity of the human cerebellum. The majority of structural connectivity data about the cerebellum comes from studies in experimental animal models, which are then used to infer connections in the human brain. These studies involve the injection of tracers into specific brain regions. After a time interval for the tracer to be transported, the brain is cut and histologically prepared to demonstrate the presence and location of labeled neurons, axons and/or terminals. In this way, the connectivity of the injected area can be directly delimited. The macaque monkey is the experimental animal model most similar to the human and is the dominant model in which such connectivity studies are used to provide information about connections in the human brain. However, most of the connectivity studies performed in the monkey are performed in the forebrain. As a result, it is unclear which animal model has been used to detail cerebellar connectional diagrams that is to inform studies in the human cerebellum. In this project, we will address this question through a systematic examination of the connectional neuroanatomy of the macaque cerebellum. All scientific manuscripts using neuroanatomical tract-tracing techniques that delineate projections to or from the

cerebellum in the macaque monkey will be collected and evaluated. We will then use data mining techniques to create a comprehensive database and connectivity matrix of the monkey cerebellum to better inform on the validity of diffusion MRI-based tractography connections in the human brain.

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LIST OF ABBREVIATIONS

AIN .... Anterior Interposed Nucleus

AIP .... Anterior Interposed Nucleus

Am. .... Ambiguus Nucleus

CCN .... Contralateral Cuneate Nucleus

Cl .... Central Lateral Nucleus

CM .... Centre Median Nucleus

CN .... Cuneate Nucleus

Cn.Md .... Nucleus Centrum Medianum

CtB .... Cholera Toxin Subunit B

DAO .... Dorsal Accessory Nucleus

DE .... Dentate Nucleus

DA .... Dextran-Amines

DMCC .... Dorsal Medial Cell Column

DN .... Dentate Nucleus

DP .... Dorsal Paraflocculus

DPN .... Dorsal Paramedian Nucleus

DPRN .... Dorsal Pontine Reticular Nucleus

EC .... External Cuneate Nucleus

FL .... Flocculus

FN .... Fastigial Nucleus

GM .... Medial Geniculate Nucleus

H-7 Area... Hemispheric Lobule VII

HRP .... Horseradish Perioxidase

IO .... Inferior Olive

IVN .... Inferior Vestibular Nucleus

LC .... Locus Coerulus

LD .... Lateral Dorsal Nucleus

LP... Lateral Posterior Nucleus

LPT .... Lateral Pontine Tegmentum

LRN... Lateral Reticular Nucleus

LVN .... Lateral Vestibular Nucleus

MAO .... Medial Accessory Nucleus

Mc .... Magnocesullar Medial Geniculate Nucleus

MD .... Mediodorsal Nucleus

MVN .... Medial Vestibular Nucleus

NIA .... Anterior Interposed Nucleus

NIP .... Posterior Interposed Nucleus

NPP .... Nucleus Prepositus Hyperglossi

NRG .... Nucleus Reticularis Gigantocellularis

NRTP .... Nucleus Reticularis Tegmenti Pontis

NS .... Solitary Nucleus

PAG... Periaqueductal Grey

PD .... Periaqueductal Grey

PF .... Parafasicular Nucleus

PHA-L .... Phaseolus vulgaris-leucoagglutinin

PHN .... Nucleus Prepositus Hyperglossi

PI .... Pulvinar

PIN .... Posterior Interposed Nucleus

PIP .... Posterior Interposed Nucleus

PMPN .... Paramedian Pontine Nucleus

PN .... Pontine Nucleus

PO .... Pontine Nucleus

PPRF .... Paramedian Pontine Reticular Formation

PPRN .... Paramedian Pontine Reticular Nucleus

PQ .... Periaqeuductal Grey

PRN .... Pontine Reticular Nucleus

PuLo .... Anterior Pulvinar Nucleus

RB .... Rabies

RTN .... Reticulotegmental Nucleus

Ru .... Red Nucleus

SG .... Suprageniculate Nucleus

SGS .... Suprageniculate Nucleus

SM .... Stria Medullaris

SVN .... Superior Vestibular Nucleus

THI .... Habenulointerpeduncular Tract

VesD ....Descending Vestibular Nucleus

VesM... Basal Ventromedial Nucleus

VLc .... Ventral Lateral Nucleus, caudal

VLo ....Ventral Lateral Nucleus, pars postrema

VLpV ....Ventral Psterior Thalamic Nucleus

VPI ....Ventral Posterior Nucleus, inferior divsion

VPL ....Ventral Lateral Posterolateral Nucleus

VPLc ....Ventral Posterolateral Nucleus, caudal

VPLo..Ventral Posterior Nucleus, oral

VPLs .... Ventral Lateral Nucleus, Pars Postrema

VPM... Ventral Posteromedial Nucleus

Vsp .... Spinal Vestibular Nucleus

VST ....Vestibulospinal Tract

WGA ....Wheat Germ Agglutin

Zi ....Zona Incerta

INTRODUCTION:

The cerebellum is a subdivision of the brain located above the brainstem and below the occipital and temporal lobes. It is characterized by its bilateral hemispheres, and it attaches to the brainstem via the superior, middle, and inferior peduncles.[1] The main function of the cerebellum is to contribute to vestibular processing by promoting motor coordination. Via joint coordination between the cerebral cortex and the basal ganglia, the cerebellum can regulate and plan movements to ensure smooth motor coordination.[1,2] Recent literature has also shown evidence that the cerebellum contributes to cognitive processing. Various neuropsychological studies have explored the effect of damage to certain cerebellar regions (such as the Crus I and Crus II) and how that plays a role on cognition and language.[3] While there have been multiple ongoing studies that help assess the role of the cerebellum, there is still very little information regarding the zonal organization and the cerebellar projections in non-human primates.[1]

Anatomy

The cerebellum consists of a gray matter cortex and an underlying white matter, in which deep cerebellar nuclei are located. The cerebellar cortex contains two hemispheres which are joined on the midline by the vermis. The vermis is the region at the midline of the cerebellum that divides the cerebral hemispheres and can further be divided into two parts, the superior and inferior vermis.[3] A portion of the vermis lies within the three cerebellar lobules, the anterior, flocculonodular, and posterior.[3,4] These three lobes are further divided into ten divisions known as lobules which are labeled numerically from I –

X. Each lobule is separated by a fissure that is oriented in the medio-lateral dimension. The primary fissure is a V-shaped fissure that separates the anterior and posterior lobe and the posterolateral fissure (PLF) separates the flocculonodular and posterior lobe.[4,5,6] The anterior lobe is designated as lobule I - V, the flocculonodular lobe is X, and the posterior lobe ranges from VI - IX.[5,6,7]

Histologically, the cerebellar cortex is made up of three layers, the superficial molecular layer, the deep granular cell layer, and the intervening Purkinje cell layer.[8] The main processing units of the cerebellar cortex include Purkinje cells, climbing fibers, and mossy fibers.[8, 9] Information regarding cerebellar input is limited, however, mossy fibers and climbing fibers are thought to be the primary inputs of the cerebellar cortex.[8] The synaptic inputs of mossy fibers and climbing fibers ultimately – contribute to the nodulation of the cerebellar output neuron.[9,10] Purkinje cells are the only output neuron of the cerebellar cortex. They are identified histologically via their large size and flat, branched appearance in the Purkinje cell layer. Purkinje cells also play a role in cerebellar motor coordination through the integration of inputs from parallel fibers and climbing fibers.[8,9,10] Through the integration of this input, movements can be corrected by Purkinje cells while they are in progress and then carried to the motor cortex via the deep cerebellar nuclei.[9] Climbing fibers originate from the contralateral inferior olive and form synapses with a single Purkinje cell.[9,10] The integration of sensorimotor information from climbing fibers is one in which a single climbing fiber produces a strong synaptic input for a Purkinje cell.[8] Mossy fibers on the other hand originate from areas that project to the cerebellar cortex such as the brainstem nuclei and spinal cord, they terminate in the granular cell layer.[11] The axons of the granule cells ascend through the Purkinje cell layer and into the molecular layer where they give rise to parallel fibers and synapse with Purkinje cell dendrites.[7]

Parallel fibers and mossy fibers play an integral role in processing information needed for cerebellar input.[10,11] It is important to note that a single parallel fiber can innervate multiple Purkinje cells.[7,8] Mossy fibers, as mentioned above, terminate in the granular cell layer, and send sensorimotor information, via parallel fibers, to the Purkinje cells. After the input information is received from the parallel fibers to the Purkinje cells via synapse of the dendrites, this information is received by the cerebellum which allows for coordination of motor movements.[8]

Deep Cerebellar Nuclei

The deep cerebellar nuclei (DCN) serve as the main output structures of the cerebellum and are enclosed by a layer of thin tissue comprising of neurons and glial cells that encompasses the cerebellar cortex.[12] The four deep cerebellar nuclei on each side: are as follows: fastigial (FN), emboliform (PIN), globose (AIN), and dentate (DN).[12,13] These nuclei are receive inhibitory GABAergic signals from the Purkinje cells of the cerebellar cortex.[13,14] The nuclei also receive excitatory glutaminergic signals from the mossy fibers carrying information from the spinal cord and other regions of the brain and the climbing fibers carrying information from the inferior olive.[8] The fibers from the cerebellar cortex for the dentate, emboliform, and globose nuclei leave the cerebellum through the superior cerebellar peduncle and the fibers from the fastigial nucleus leave via the juxtarestiform body which is a part of the inferior cerebellar peduncle (ICP).[14] The cerebellar peduncles are symmetric white matter tracts that are located ventrally and laterally beneath the deep cerebellar nuclei. They help connect the cerebellar cortex to the brainstem.[15,16]

The fastigial nucleus (FN) is located in the medial aspect of the DCN and it receives input from the vermis portion of the cerebellar cortex. Its main function is to regulate eye movements, gait, head orientation, and stance.[17] The interposed nuclei (IN) are located laterally to the fastigial nucleus and is composed of the emboliform nucleus and the globose nuclei, which are also referred to as the posterior and anterior interposed nuclei, respectively.[16,18] Interposed nuclei have a diverse range of roles with the main role of the interposed nuclei is to receive input from cerebellar afferent signals that carry sensory and motor feedback regulating different reflexes such as blinking or stretching.[19] Several studies have also found evidence that the interposed nuclei play a role in reflexive circuits that are seen throughout all mammals and have a role in gait stimulation.[15,20]

The dentate nucleus (DN) is the largest of the cerebellar nuclei and it is lateral to the interposed nuclei. It is the most lateral of the deep cerebellar nuclei and adjacent to the cerebellar vermis and the fourth ventricle. It helps regulate voluntary movement, sensory functions, and cognitive functions.[20, 21] The DN receives input from cerebellar afferents (specifically those in the middle cerebellar peduncle) that carry information from the pontine nuclei. The principal projections of the DN are to the contralateral thalamus and the contralateral red nucleus.[21] The information received from these afferents are used to facilitate motor planning and coordination, specifically in refining motor commands to generate coordinated muscle movements. While the DCN play a role in regulating the outputs of the cerebellum and in oculomotor control, there is very little data known regarding its organization and connectivity with other cerebellar regions.[22,23] While many studies are using MRI mapping and/or tractography to map out cerebellar anatomy, it is large and complex to cover especially since there is little known about the anatomical nature of the DCN and their physiological processes.[20]

Cerebellar Peduncles

The peduncles are separated into three: the superior, middle, and inferior which are alternatively known as the brachium conjunctivum, brachium pontis and the restiform body respectively.[24] Through these three peduncles, the cerebellum is connected to various structures of the brain with the superior peduncle connecting to the midbrain, the middle peduncle connecting to the bridge of Varolius, and the inferior peduncle connecting to the medulla oblongata.[16, 26] The bridge of Varolius is another name for the pons which is a structure located in between the midbrain and the medulla oblongata.[27] The pons has a variety of functions including controlling respiratory functions, regulating sleep, and relaying sensorimotor information between various parts of the brain.[28]

These cerebellar peduncles also comprise the afferent and efferent pathways of the cerebellum. The fibers that travel through the superior cerebellar peduncle are efferent pathways from the deep cerebellar nuclei. These pathways project to neurons of the red nucleus and thalamus.[14,24] The middle cerebellar peduncle is an afferent pathway from the pontine nuclei. The inferior cerebellar peduncle has both cerebellar afferent and efferent pathways. The cerebellar afferent pathways are from the spinal cord, brainstem reticular formation, and the vestibular nuclei whereas the efferent cerebellar pathways in the inferior cerebellar peduncle projects to the reticular formation and the vestibular nuclei.[14]

Divisions of the Cerebellum

The cerebellum is further divided into 3 functional zones: the vestibulocerebellum, cerebrocerebellar, and the spinocerebellum.[29,30] The vestibulocerebellum is composed of the flocculonodular lobe (which contains the flocculus and nodulus) and receives input via the midbrain, vestibular nuclei, and the visual cortex. It is primarily known for facilitating ocular movements (specifically the vestibulo-ocular reflex) and conveying balance information to the rest of the body.[30,31] The spinocerebellum is composed of the vermis and paravermis. It obtains input from the spinocerebellar tracts and propagates this information to the rest of the body to stabilize muscle movements. The cerebrocerebellar includes both cerebellar hemispheres and helps to coordinate timing of motor movements, vestibular coordination, and planning of motor movements. It receives input primarily from the cerebral cortical areas. Together these functional zones help coordinate motor coordination, vestibular balance, and cognitive pathways.[29]

Organization of Cerebellar Projections

The afferent and efferent projections of the cerebellum are highly organized and follow two general principles. The first is that the cerebellum largely receives sensory information from the ipsilateral (same side) of sensory space. For example, the left cerebellum receives input from somatosensory receptors from muscles located on the left side of the body. This contrasts with the cerebral cortex, which generally receives sensory signals from the contralateral (opposite side) of sensory space. Thus, the cerebellum from one side must communicate with the cerebral cortex on the other side, and anatomical connections between the two regions organized accordingly. The second organizing principle is that the cerebellum compares motor commands produced by the cerebral cortex or subcortical nuclei with the sensory information about the ongoing movement, thus producing an error signal between what is commanded and what occurs. This error signal is then relayed from the cerebellum back to the motor command centers to adjust the motor command to be more accurate in light of ongoing events.

Interpreted in these ways, the inputs to and outputs from the cerebellum can be conceived of as forming discrete loops, and these loops are frequently organized in terms of the lobes as delineated above. It should be noted that the loops overlap, and the most canonical loops are the vestibulocerebellar loop, the cerebrocerebellar loop, and the spinocerebellar loop. The vestibulocerebellar loop is a loop that receives input from the vestibular organs and relays it to the fastigial nuclei to the motor vestibular output region.[29, 31]Its sensory input is obtained from the vestibular nucleus and it carries output to the vestibular output nuclei. This loop helps integrate sensory information to facilitate eye movements, maintain the vestibulocular reflex, and maintain vestibular coordination. The cerebrocerebellar has a primary role in using sensory and cognitive information processed by the cerebral cortex to guide fine movement execution and coordination, fine tuning of motor movements, and cognitive processes.[32,33] This is carried out through a multisynaptic loop. This loop begins in the cerebral cortical areas involved in processing sensory, motor, and cognitive signals. These signals are relayed to the cerebellum via the pons. The cerebellum processes and integrates his information before relaying it back to the cerebral cortex via the deep cerebellar nuclei and then the thalamus.[33] The spinocerebellar loop is composed of the connections between the vermis and paravermis with the spinal cord via the spinocerebellar tracts.[29,34] These loops provide proprioceptive input to the cerebellar cortex. From here, these signals progress to the emboliform and globose nuclei before leaving the cerebellum in one of two pathways: path number one is via the red nucleus and projects to the spinal cord via the rubrospinal tract to control voluntary muscles; path number two is via the thalamus to motor cortex, which then controls voluntary muscles via the corticospinal tract and peripheral motor nerves.[34] The red nucleus and motor cortex also projects to the inferior olivary nucleus and then back to cerebellum as a nested loop.[35]

Neuronal Tracers

To better understand neuroanatomical projections in the brain , researchers began using retrograde and anterograde tracers. These tracers are substances that are injected into circumscribed brain areas and taken up into neurons. These tracers then are transported in the neuron, either from the cell to the axon terminal or from the axon terminal back to the cell body.[36] Two main types of tracers are used which are transported in specific directions: retrograde and anterograde tracers. Retrograde tracers are taken up at terminals and transported to the cell body whereas anterograde tracers are taken up by the cell body and transported towards the axonal processes.[36,37] After transport, the presence of tracers are visualized using histological techniques.

Several known retrograde tracers are horseradish peroxidase (HRP), Fast Blue, Diamidino Yellow, True Blue, and Cholera Toxin B (CtB).[36] HRP is one of the most commonly used tracers as it allows for neurons to be analyzed via the cell body and has efficient uptake in conjunction with wheat germ agglutin (WGA).[36,] WGA provides a more thorough labeling of the neuron and can transport neurons in anterograde and retrograde directions. Fluorescent retrograde tracers such as fast blue, diamidino yellow, and true blue are inorganic and are generally used for identification of motor or sensory neurons.[36] CtB can be used alone or in conjunction with HRP in order to increase the labeling of neurons via cell bodies and can increase the number of neurons labeled via retrograde tracing.[36]

One type of anterograde tracer that is very commonly used are the radiolabeled amino acids, tritiated proline, and leucine, which helps detect axon terminals and processes in the neurons of interest.[36] Another type of commonly used anterograde tracer is known as *Phaseolus vulgaris*-leucoagglutinin, PHA-L, which binds to carbohydrates and allows for the detection of axon terminals and is detected by immunohistochemistry.[36,37] Additionally, dextran-amines (DAs) are also commonly used anterograde tracers which use immunolabeling to spread across the injection site.[38]

Histological Analysis of Neuronal Tract Tracing

After researchers determine the location of the injection site and the portion of the macaque brain they want to analyze, that specific region of the brain is histologically stained and analyzed to determine the axons or cells labeled. There are a variety of neuronal tracers that are utilized in connectivity studies to label how different structures of the brain connect via axon terminal or cell labeling.

Autoradiography allows one to visualize the radioactive materials of the tritiated amino acids which can lead to the detection of the desired neuronal structure the tracer was aimed to identify. PHA-L, which is comprised of amino acids, is an example of an anterograde tracer in which autoradiography can be used to determine the radioactivity of axon terminals.[39] As mentioned previously, fluorescent tracers can be utilized to identify different types of neurons while also labeling cells via the presence of tracers.[37,39,40] In order to identify the different types of neurons that are labeled by fluorescent labeling, as various retrograde tracers like CtB are conjugated with a fluorescent dye and injected into a desired region, the neurons in the desired region uptake the tracer. As the tracer is transported via retrograde transport, the labeling of cell bodies neurons that project to the injected area occur. The different types of neurons that can be identified by fluorescent tracers are sensory and motor neurons, interneurons, projection neurons, etc.[39,40]

Neurotropic viruses such as CtB or rabies (RB) can also be utilized to identify retrograde or anterograde labeling of neuronal structures.[40] The use of neurotrophic viruses is thought to be advantageous because they allow for the proliferation without a decrease in the intensity of a signal and spread across synaptic connections unlike traditional neuronal tracers such as WGA, PHAL, TAA, etc.[40]

The Scientific Premise of this Study

The detailed connectivity of the human brain has yet to be elucidated because the currently available techniques do not capture the intricate details of neuronal connections. To account for the intricacies of the connectivity of different structures throughout the brain, experimental studies in the monkey are utilized as a proxy to further understand connections in the human brain. Specifically, tracer studies in non-human primates are used to infer the connectivity of the brain in humans due to the anatomical similarities between the non-human primate and humans. These tracer studies have been done for the cerebral cortex however, due to a lack of knowledge on the connectivity of the monkey brain, there has been more of a recent emphasis on researching the unknown connections. While multiple cerebral cortex studies have been done in non-human primates and collated, the connectivity of the macaque cerebellum has not yet been collated. There also has been no systematic evaluation of contralateral and ipsilateral cerebellar connectional patterns to create a monkey database. The goals of this systematic review of literature are to evaluate cerebellar connections that are known in the macaque, evaluate what connections have not been studied in the macaque using tracer, collate and synthesize tracing data from the macaque, and generate a connection matrix that includes contralateral and ipsilateral connections of the macaque cerebellum. This aggregation of data will allow for a means by which connectivity in the human, using dMRI can be assessed and evaluated.

METHODS:

Search Procedures & Identification of Articles.

Primary research studies were identified with Google Scholar and PubMed using the keywords *cerebellar connectivity AND macaques,* and *non-human primate AND cerebellar neuronal tracing studies*. Studies were also drawn from reference lists of papers identified above.

For the literature to be included in the systematic review of literature, studies had to meet the following inclusion criteria:

a. Studies had to utilize a sample of non-human primate subjects. The sample was not restricted to the sex, species, or number of subjects included in the study. Multiple species such as Macaca fascicularis, Rhesus Monkeys, Macaca fuscata, Macaca Mulatta, Macaca nemestrina, and Macaca Mulatta were included in the study. The sample was not restricted to sex or number of the subjects included in the study.
b. Studies had to include the use of neuronal tracers to determine the connectivity of neuronal structures. The type of neuronal tracer was not restricted.
c. The authors specified that one of the goals of the study was to determine the structural connectivity of neuronal structures in the cerebellum to other parts of the cerebellum or the thalamus via the use of neuronal tracers.

The search procedure yielded forty-eight articles. Out of these articles, twenty-one articles that pertained to deep cerebellar nuclear projections were utilized in the final data compilation. The remaining twenty-seven papers were excluded if they contained information pertaining to projections to regions other than the deep cerebellar structures, not tracer studies, or were not experimental studies. The cerebellar regions that were used as inclusion criteria included the four deep cerebellar nuclei (fastigial nucleus, emboliform nucleus/posterior interposed nucleus, dentate nucleus, globose/anterior interposed nucleus) and the cerebellar cortical lobules. If a paper had an injection of tract tracer in these regions, or a documented projection targeted these areas, they were included in the database. Of the total twenty-seven papers excluded, five papers were excluded due to the species not being comparable with other studies or the study not being a neuroanatomical tract tracing experiment. The remaining twenty-two papers were excluded due to their injection or projection sites not having a delineated projection to the sites above.

Table 1: Overall Number of Studies Prior to Inclusion and Exclusion Criteria

Author:	Journal:	Year:	Species:
Amino	Neuroscience Letters	2001	Macaca fuscata
Asunama	Brain Research Reviews	1983	Macaca fascicularis
Asunama	Brain Research Reviews	1983	Macaca fascicularis, Macaca mulatta
Batton	Journal of Clinical Neurology	1977	Macaca mulatta
Brodal	Journal of Comparative Neurology	1981	Macaca mulatta
Carleton	Brain Research	1983	10 cats and 1 Saimiri nucleus
Chan Palay	Book	1977	Macaca mulatta
Evrard	Journal of Comparative Neurology	2008	Macaca fascicularis
Fries	Visual Neuroscience	1990	Macaca fasiscularis, Macaca nemestrina, Macaca mulatta

Author:	Journal:	Year:	Species:
Glickstein	Journal of Comparative Neurology	1994	Macaca fascicularis, Macaca nemestrina
Gonzalo-Ruiz	Journal of Comparative Neurology	1998	Macaca mulatta
Hartmann-von Monakow	Schweizer Archiv Fur Neurologie, Neurochirurgie Und Psychiatrie	1981	Macaca fascicularis
Illinsky & Kultas - Illinsky	Journal of Comparative Neurology	1987	Macaca mulatta
Jaarsma	Journal of Comparative Neurology	2018	C57BL/6 Mice, BALB/c mice, GlyT2GFP transgenic mice, Rabbit, Ferret, Macaque species not specified
Kalil	Journal of Comparative Neurology	1979	Macaca mulatta
Kalil	Journal of Comparative Neurology	1981	Macaca mulatta
Kievit and Kuypers	Brain Research	1972	Macaca mulatta
Kitazawa	Neuroscience Letters	2009	Macaca fascicularis, Macaca mulatta
Kralj-Hans	Experimental Brain Research	2007	Macaca fascicularis
Kyuhou	Neuroscience Letters	1997	Macaca fuscata
Langer	Journal of Comparative Neurology	1985	Macaca mulatta
Mason	Journal of Comparative Neurology	2000	Macaca mulatta
May	Journal of Comparative Neurology	1990	Macaca mulatta, Macaca fascicularis
May	Journal of Comparative Neurology	1992	Macaca mulatta, Macaca fascicularis
Matute	Experimental Brain Research	1987	Macaca fascicularis
Mehler and Nauta	Congina Neurologica	1974	n/a
Middleton Strick	International Review of Neurobiology	1997	n/a
Morecraft	Frontiers NA	2019	Macaca mulatta
Nagao	Neuroscience Reserves	1997	Macaca fuscata

Author:	**Journal:**	**Year:**	**Species:**
Noda	Journal of Comparative Neurology	1990	Macaca nemestrina
Percherson	Journal für Hirnforschung	1996	Macaca mulatta, Macaca fascicularis
Prevosto	Cerebral Cortex	2010	Macaca fascicularis, Macaca mulatta
Ralston DD	Journal of Comparative Neurology	1994	Macaca fascicularis
Sakai	Molecular Brain Research	1996	Japanese White Rabbits
Schmahmann	Ann Neurol	2004	Macaca mulatta
Schmahmann	Neuroscience Letters	1995	Macaca mulatta
Schnyder	Brain Research	1985	Macaca mulatta
Stanton	Journal of Comparative Neurology	1980	Macaca mulatta
Strick 1976a	Journal of Neurophysiology	1976	Macaca mulatta
Thach and Jones	Experimental Brain Research	1979	Macaca fascicularis
Thielert	Journal of Comparative Neurology	1993	Macaca mulatta
Vassbo	Journal of Comparative Neurology	1999	Macaca fascicularis
Voogd	Archives Italiennes de Biologie	1991	Macaca nemestrina and Macaca fascicularis
Wisendanger & Wisendanger	Experimental Brain Research	1985	Macaca fascicularis
Xiong et. al	Neuroscience Letters	2002	Macaca fascicularis
Xiong et. al	Neuroscience Letters	2010	Macaca fascicularis
Yamada	Journal of Comparative Neurology	1987	Macaca nemestrina

Table 2: Studies that Met the Inclusion Criteria

Author:	Journal:	Year:	Species:
Amino	Neuroscience Letters	2001	Macaca fuscata
Asunama	Brain Research Reviews	1983	Macaca fascicularis
Asunama	Brain Research Reviews	1983	Macaca fascicularis, Macaca mulatta
Batton	Journal of Clinical Neurology	1977	Macaca mulatta
Chan Palay	N/a	1977	Macaca mulatta
Evrard	Journal of Comparative Neurology	2008	Macaca fascicularis
Glickstein	Journal of Comparative Neurology	1994	Macaca fascicularis, Macaca nemestrina
Kalil	Journal of Comparative Neurology	1979	Macaca mulatta
Kalil	Journal of Comparative Neurology	1981	Macaca mulatta
Langer	Journal of Comparative Neurology	1985	Macaca mulatta
May	Journal of Comparative Neurology	1990	Macaca mulatta, Macaca fascicularis
May	Journal of Comparative Neurology	1992	Macaca mulatta, Macaca fascicularis
Matute	Experimental Brain Research	1987	Macaca fascicularis
Nagao	Neuroscience Reserves	1997	Macaca fuscata
Noda	Journal of Comparative Neurology	1990	Macaca nemestrina

Author:	Journal:	Year:	Species:
Thach and Jones	Experimental Brain Research	1979	Macaca fascicularis
Voogd	Archives Italiennes de Biologie	1991	Macaca nemestrina and Macaca fascicularis
Xiong et. al	Neuroscience Letters	2002	Macaca fascicularis
Xiong et. al	Neuroscience Letters	2010	Macaca fascicularis
Yamada	Journal of Comparative Neurology	1987	Macaca nemestrina

Table 3: Studies that Did Not Meet the Inclusion Criteria

Author:	Journal:	Year:	Species:	Reason for Exclusion:
Brodal	Journal of Comparative Neurology	1981	Macaca mulatta	Cortical Zones
Carleton	Brain Research	1983	10 cats and 1 Saimiri sciureus	Samiri scirueus is not comparable with other macaques in this systematic review of literature
Fries	Visual Neuroscience	1990	Macaca fasiscualris, Macaca	Cortex

Author:	Journal:	Year:	Species:	Reason for Exclusion:
			nemestrina, Macaca mulatta	
Gonzalo-Ruiz	Journal of Comparative Neuroscience	1988	Macaca mulatta	Thalamic projections
Hartmann-von Monakow	Schweizer Archiv Fur Neurologie, Neurochirurgie Und Psychiatrie	1981	Macaca fascicularis	Motor Cortex
Illinsky & Kultas - Illinsky	Journal of Comparative Neurology	1987	Macaca mulatta	Thalamic projections
Jaarsma	Journal of Comparative Neuroscience	2018	C57BL/6 Mice, BALB/c mice, GlyT2GFP transgenic mice, Rabbit, Ferret, Macacque [RR6] Monkey from other studies	CHAT Immunohistochemistry Staining
Kievit and Kuypers	Brain Research	1972	Macaca mulatta	Thalamic projections
Kitazawa	Neuro Letters	2009	Macaca fascicularis, Macaca mulatta	Motor Cortex
Kralj-Hans	Experimental Brain Research	2007	Macaca fascicularis	Cortex
Kyuhou	Neuroscience Letters	1997	Macaca fuscata	Cortex
Mason	Journal of Comparative Neuroscience	2000	Macaca Mulatta	Thalamus
Mehler and Nauta	Congina Neurologica	1974	n/a	Not a tracer study
Middleton Strick	International Review of Neurobiology	1997	n/a	Not a tracer study
Morecraft	Frontiers NA	2019	Macaca mulatta	Motor cortex

Author:	Journal:	Year:	Species:	Reason for Exclusion:
Percheron	Journal für Hirnforschung	1977	Macaca mulatta, Macaca fascicularis	Thalamus
Prevosto	Cerebral Cortex	2010	Macaca fascicularis, Macaca mulatta	Cortex
Ralston DD	Journal of Comparative Neurology	1994	Macaca fascicularis	Corticorubral projections
Sakai	Molecular Brain Research	1996	Japanese White Rabbits	Not a macacque study
Schmahmann	Ann Neurol	2004	Macaca mulatta	Cortical- Pontine Projections
Schmahmann	Neuroscience Letters	1995	Macaca mulatta	Cortical- Pontine Projections
Schnyder	Brain Research	1985	Macaca mulatta	Motor cortex
Stanton	The Journal of Comparative Neurology	1980	Macaca mulatta	Degeneration Study
Strick 1976a	Journal of Neurophysiology	1976	Macaca mulatta	Thalamus
Thielert	Journal of Comparative Neuroscience	1993	Macaca mulatta	Cortex
Vassbo	Journal of Comparative Neuroscience	1999	Macaca fascicularis	Motor Cortex
Wisendanger & Wisendanger	Experimental Brain Research	1985	Macaca fascicularis	Thalamus

Organization of Studies

After the manuscripts were collected, a spreadsheet titled “Connectivity Matrix Papers” was created to analyze different parameters detailed in each manuscript. The spreadsheet was divided into 3 major categories: Authors, Subjects, and Tracers.

The Authors section listed the title of the article, the journal it was published in, and the year of publication. The Subjects section indicated the species of the sample, the number of subjects as well as their age and sex. Finally, in the Tracers section the following information was collated for each study: the number of tracers, the type of tracers (anterograde, retrograde, both, transsynaptic), the injection site(s), the number of injections per site, the volume of each injection, and the concentration of the tracers. The initial extraction of this information helped determine how many retrograde versus how many anterograde studies were present in the database and allowed for a comparison of the various studies that were included in the study. After establishment of this initial database, a second database was created to document the injection sites, the termination loci if an anterograde tracer was used and/ or the origin loci if retrograde tracers were used.

Organization of Studies by Cerebellar Pathways

After the studies were organized according to author, journal, tracer type, injection site, and projection site, a delineation based on cerebellar pathways was carried out. Through systematic analysis of the literature in the study and the incorporation of data from the primary data spreadsheet, a new data table as seen in Table 3, with the author, year, tracer type, injection sites, and projection sites were established in order to examine the different cerebellar pathways discussed in each paper. Through the establishment of this data table, studies were further assessed to determine if they should be incorporated in the final matrix as a means of where their injection sites projected to.

Table 4: Organization of Studies according to Cerebellar Pathways

Author:	Year:	Tracer(s) Type:	Injection Site (s):	Pathway (s):
Amino	2001	Anterograde - WGA-HRP	Lateral and Interposed Cerebellar Nuclei	Cerebellar Cortico-deep cerebellar nuclear
Asunama	1983	Anterograde - TAA	Interposed Nucleus Dorsal Column Nuclei Deep Cerebellar Nuclei	Cerebellar Cortico-deep cerebellar nuclear
Asunama	1983	Anterograde - TAA	Interposed Nucleus, Deep Cerebellar Nuclei	Cerebellar Cortico-deep cerebellar nuclear
Batton	1977	Anterograde - TAA	Fastigial Nucleus	Cerebellar Cortico-deep cerebellar nuclear
Chan Palay	1977	Retrograde - HRP Anterograde - S - methionine	Deep Cerebellar Nuclei & Lobule IVa Deep Cerebellar Nucli	Cerebellar Cortico-deep cerebellar nuclear
Evrard	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	Contralateral VlPv Ipsilateral VlPv	Deep-cerebellar nuclear -thalamus
Glickstein	1994	Retrograde, WGA-HRP	DL Pontine Nuclei Dorsal Paraflocculus Petrosal Lobule Lobule X/Vermis Paramedian Lobule	Cortico-pontine Cerebellar Cortico-deep cerebellar nuclear

Author:	Year:	Tracer(s) Type:	Injection Site (s):	Pathway (s):
			Ventral Paraflocculus	
Kalil	1979	Anterograde - TAA	Dentate Nucleus, Interpositus Nucleus Fastigial Nucleus	Cerebellar Cortico-deep cerebellar nuclear
Kalil	1981	Anterograde - TAA (proline)	Dentate Nucleus Fastigial Nucleus Interpositus Nuclei Dorsal Column Nuclei Cuneate Nucleus	Cerebellar Cortico-deep cerebellar nuclear Brainstem-deep cerebellar nuclei
Langer	1985	Anterograde - HRP	Rostral Half of Flocculus Caudal Flocculus	Cortico-nuclear
May	1990	HRP-anterograde HRP-retrograde	Superior Colliculus Fastigial Nucleus	Cerebellar Cortico-deep cerebellar nuclear
May	1992	Retrograde WGA-HRP	Fastigial Nucleus Posterior Interposed Nucleus	Cerebellar Cortico-deep cerebellar nuclear
Matute	1987	Retrograde	Cerebellar Cortex, Crus I, Crus II	Cortico-nuclear
Nagao	1994	WGA-HRP, Anterograde, bilateral	Cerebellar Cortex Floculus or Ventral Paraflocculus	Cerebellar Cortico-deep cerebellar nuclear
Noda	1990	Retrograde & Anterograde (WGA-HRP)	Fastigial Nucleus Cerebellar Cortex-Vermis VIII	Cerebellar Cortico-deep cerebellar nuclear Brainstem-deep cerebellar nuclei

Author:	Year:	Tracer(s) Type:	Injection Site (s):	Pathway (s):
Thach and Jones	1979	Anterograde - TAA (proline and leucine)	Dentate Nucleus	Cerebellar Cortico-deep cerebellar nuclear Brainstem-deep cerebellar nuclei
Voogd	1991	Retrograde - WGA-HRP	Deiter's Nucleus Vestibular Nuclei	Vestibulocerebellar
Xiong and Nagao	2010	Retrograde - CTB	Crura I, Crura I Pontine Nuclei	Brainstem-deep cerebellar nuclei Corticopontine
Xiong	2002	Retrograde - CTB & BD, Retrograde - CTB, Retrograde - FB, Retrograde - FB & CTB	LP Anterior and Posterior Crus I, Crus II, H-7 DP	Brainstem-deep cerebellar nuclei
Yamada	1987	Retrograde and anterograde (WGA-HRP/HRP)	Cerebellar Cortex - Lobule VII	Cerebellar Cortico-deep cerebellar nuclear

Excel CocoBellum Database Compilation

After a spreadsheet that delineated the different parameters analyzed in the literature reviewed was established, another spreadsheet tiled "CocoBellum Database" was generated to present the outcomes of the reviewed studies in more detail. This spreadsheet served as the primary database to give information about the types of tracers used, injection sites, projection sites, and strength of the projections that were found after analyzing each of the articles in the organizational database. There were 10 categories in this primary database: Author, Journal, Year, Tracer Type, Cases, Directionality, Injection Sites, Projections, and Projection strength.

In the authors, journal, and year sections, the author of the article, journal it was published in, and the year of publication were listed. In the tracer type section, the type of tracer, (e.g., retrograde, anterograde, or both) were noted. For the papers in the organizational database, each studied a specific number of cases where a certain animal, given an identification number or name, was injected with a tracer. In some studies, there were several animals examined whereas other studies were limited to just a few animals or focused solely on a single animal. In the "cases" section of the primary database spreadsheet, the names/identification numbers of the different subjects that were studied were put in. To account for all the cases and their associated injection or projection sites in a study, the cases were separated so each injection site and projection site could be assessed (especially if one case had more than one injection site or one injection site that corresponded to multiple different projections).

In the directionality section, each case was assigned a directionality that consisted of contralateral or ipsilateral. If a case mentioned that the tracer projected to both ipsilateral and contralateral regions, it was labeled as "bilateral." If a case projected to only the ipsilateral region, then it was delineated as "IL" and if a case projected to the contralateral region, it was delineated as "CL."

For the injection and projection sites sections, each study had a set of different injection sites that projected to or received projections from different regions. The injection sites were identified by which region of the brain the tracer was being injected into. The projection sites were identified by which area of the brain the tracer revealed labels to be in post-injection. In instances where there were multiple of the same injection sites or projection sites in one study or pertaining to one case in the study, the sites were separated one by one (like the cases) to account for all the regions being studied. There were a few studies that incorporated injection sites that projected to sites of interests as delineated by the inclusion criteria. However, after further analysis, a few papers extracted from the data base search showed that while the injection sites projected to sites of interest corresponding to the cerebellum, they were primarily thalamic or cortical injections. These papers were excluded in the overall connectivity matrix; however, their injection and projection sites were still initially assessed to examine if they can be used as a reference point.

The projection strength section was divided according to tracer type. For anterograde tracers, the projection strength corresponded to the magnitude of projections seen in terminal sites, and each terminal site was assigned a number as a projection strength. Strength was evaluated based on one or more of the following. 1) textual descriptions, 2) figures, 3) tables. For retrograde studies, the strength was determined based on the number of cells that accumulated tracer following injection in a distal site. Here, as with the anterograde studies, estimates were derived from one or more of the following: textual descriptions, figures, and tables. For retrograde studies, however, labeled cell numbers were often cited in the paper, and in these cases projection strength was then mapped according to the relative proportion of cell label per brain region. Projection strength was also divided into two further sections: staining and corresponding numerical values according to the stains. For each projection, categories of label intensity ranging from dark, medium, light, or sparse to each projection site. These labels were given semiquantitative scores for dark (4), medium (3), light (2) or sparse (1). A zero score indicated the absence of a projection in the study. For retrograde studies for which quantitative data were available, the relative percentage of labeled neurons was used to calculate strength such that 4 corresponded to > 70% of total number, 3 corresponded to between 70 and 50%, 2 was between 30-50%, 1 was 30% and lower.

After each projection strength was assigned, the quantitative labels ranging from 1 – 4 with one being minimal projections and 4 being the strongest projections, an Excel algorithm was assigned to binarize the labels. This algorithm helped provide the percentage of labeled neurons as described above. If a paper did not provide figures of corresponding projection labels, then autonomic numerical values were assigned based on the relative strengths of the projections described in the papers. The numerical number 0 was not used to define any projection unless there was specifically not a connection from the injection site to the corresponding projection site as described in the paper. This was also done to prevent miscalculation of the overall matrix as a value of 0 would not yield appropriate data regarding the connectivity across different cerebellar regions.

Connectivity Matrix

i. Organization of the matrices

A directed connectional matrix was constructed by collating all data from the spreadsheets described above. The purpose of the matrix was to collage the connections of the cerebellar regions without regard to sidedness (i.e. ipsilateral, contralateral). The matrix was divided into two sections: Origin ("soma location" – columns) and Termination ("axon terminal" – rows). Anterograde and retrograde data were used to populate the cells. If the tracer used was retrograde, the injection site corresponded to the Termination ("going to") row and each associated projection was listed in the corresponding Origin ("coming from") column. The number representing the strength was entered in the intersected cell. If the tracer used was anterograde, the strength estimate was inserted in the intersection between the injection region (Origin column) and the projection site (Termination column).

The matrix thus comprised all retrograde and anterograde connections. Importantly, this matrix was not symmetrical since the connections were not assumed to be reciprocal and of equal strength. A second binarized matrix was constructed by setting non-zero weights to 1. Several assumptions were made in the construction these matrices, as has been previously described.

1) All connections that were not specified were set as 0. Thus, the matrix is unable to tell whether a projection was not investigated vs whether a projection was investigated and found to not be present.
2) If connections were identified by several different investigators, papers were reviewed together to determine the most accurate estimate of the projection

strength. This assessment was derived from a pattern of projection and reproducibility of the pattern of projections. The same is true for instances where a projection was noted in one paper, but not in another.

3) In some instances, projections were included in the database, but not in the matrix. This was performed if the projection was unclear from the paper and not reproduced in other papers.
4) Injections that spread into multiple regions were not included in the matrix.

Contralateral/Ipsilateral Matrix

The initial directed connectivity matrix was then separated according to whether connections were with contralateral or ipsilateral sites. The determination of whether the connections were identified as contralateral or ipsilateral were based on the literature that was reviewed. If a connection originated from the ipsilateral region and terminated in the ipsilateral section, it was recorded in that section of the matrix and vice versa for contralateral projections. If a projection originated from the ipsilateral region and terminated in the contralateral section, it was recorded appropriately in terms of where it was coming from and going based on its tracer in the appropriate sections of the matrix (and vice versa) for the contralateral projections.

RESULTS:

Overview Studies Included in the Matrices

A total of twenty-one studies were incorporated into the matrices. The details regarding specific injection sites and projection areas organized per paper are further provided in the Appendix. The matrices shown below encompass the connectivity between regions analyzed in these twenty-one studies and they are organized by tracer type and directionality.

Subject Characteristics

In the twenty-one studies incorporated in this systematic review of literature, a variety of non-human primates were used. The five species studied were Macaca fuscata, Macaca fascicularis, Macaca nemestrina ,and Macaca mulatta (Table 5). The percentage of Macaca fuscata studied was 11.1%, the percentage of Macaca nemestrina studied was 14.8%, the percentage of Macaca fascicularis studied was 40.7%, and the percentage of Macaca mulatta studied was 29.6%. Additionally, the number of subjects included in each study varied per study and is further delineated in Table 5.

Table 5: Breakdown by Species in the Included Studies

Species:	%:
Macaca fuscata	11.1%
Macaca nemestrina	14.8%
Macaca mulatta	29.6%
Macaca fascicularis	40.7%

Table 6: Breakdown by Number of Subjects in the Included Studies

Author:	Journal:	Year:	Species:	Subjects:
Amino	Neuroscience Letters	2001	Macaca fuscata	4

Author:	Journal:	Year:	Species:	Subjects:
Asunama	Brain Research Reviews	1983	Macaca fascicularis	21
Asunama	Brain Research Reviews	1983	Macaca fascicularis, Macaca mulatta	29
Batton	Journal of Clinical Neurology	1977	Macaca mulatta	not reported
Chan Palay	N/A	1977	Macaca mulatta	12
Evrard	Journal of Comparative Neurology	2008	Macaca fascicularis	21
Glickstein	Journal of Comparative Neurology	1994	Macac Macaca fascicularis, Macaca nemestrina	11
Kalil	Journal of Comparative Neurology	1979	Macaca mulatta	14
Kalil	Journal of Comparative Neurology	1981	Macaca mulatta	19
Kyuhou	Neuroscience Letters	1997	Macaca fuscata	8
Langer	Journal of Comparative Neurology	1985	Macaca mulatta	6
May	Journal of Comparative Neurology	1990	Macaca mulatta, Macaca fascicularis	7
May	Journal of Comparative Neurology	1992	Macaca mulatta, Macaca fascicularis	9
Matute	Experimental Brain Research	1987	Macaca fascicularis	1

Author:	Journal:	Year:	Species:	Subjects:
Nagao	Neuroscience Reserves	1997	Macaca fuscata	8
Noda	Journal of Comparative Neurology	1990	Macaca nemestrina	8
Thach and Jones	Experimental Brain Research	1979	Macaca fascicularis	3
Voogd	Archives Italiennes de Biologie	1991	Macaca nemestrina and Macaca fascicularis	2
Xiong et. al	Neuroscience Letters	2002	Macaca fascicularis	4
Xiong et. al	Neuroscience Letters	2010	Macaca fascicularis	4
Yamada	Journal of Comparative Neurology	1987	Macaca nemestrina	3

In terms of the reporting according to the sex of the subjects, very few studies provided this information. Out of the twenty-one studies, only two studies provided the sex of the animal, and the remaining nineteen studies did not provide further information regarding sex of the macaques used.

Table 7: Breakdown by Sex in the Included Studies

Author:	Journal:	Year:	Species:	Sex:
Amino	Neuroscience Letters	2001	Macaca fuscata	Not provided
Asunama	Brain Research Reviews	1983	Mucaca fascicularis	Not provided
Asunama	Brain Research Reviews	1983	Macaca fascicularis, Macaca mulatta	Not provided
Batton	Journal of Clinical Neurology	1977	Macaca mulatta	Not provided
Chan Palay	N/A	1977	Macaca mulatta	Not provided
Evrard	Journal of Comparative Neurology	2008	Macaca fascicularis	Both male and female
Glickstein	Journal of Comparative Neurology	1994	Macaca fascicularis Macaca nemestrina	Not provided
Kalil	Journal of Comparative Neurology	1979	Macaca mulatta	Not provided
Kalil	Journal of Comparative Neurology	1981	Macaca mulatta	Not provided
Kyuhou	Neuroscience Letters	1997	Macaca fuscata	Not provided
Langer	Journal of Comparative Neurology	1985	Macaca mulatta	Not provided
May	Journal of Comparative Neurology	1990	Macaca mulatta, Macaca fascicularis	Not provided
May	Journal of Comparative Neurology	1992	Macaca mulatta, Macaca fascicularis	Not provided

Author:	Journal:	Year:	Species:	Sex:
Matute	Experimental Brain Research	1987	Macaca fascicularis	Female
Nagao	Neuroscience Reserves	1997	Macaca fuscata	Not provided
Noda	Journal of Comparative Neurology	1990	Macaca nemestrina	Not provided
Thach and Jones	Experimental Brain Research	1979	Macaca fascicularis	Not provided
Voogd	Archives Italiennes de Biologie	1991	Macaca nemestrina and Macaca fascicularis	Not provided
Xiong et. al	Neuroscience Letters	2002	Macaca fascicularis	Not provided
Xiong et. al	Neuroscience Letters	2010	Macaca fascicularis	Not provided
Yamada	Journal of Comparative Neurology	1987	Macaca nemestrina	Not provided

Age, like the sex of the animals was also not provided in most of the studies that were included in this systematic review. Of the included studies, only the Kalil, Yamada, Voogd, and Matute studies provided an approximate age group for the macaques used in their studies. The approximate age groups of the animals in these studies were adolescent monkeys, young adult monkeys, and adult monkeys. In total, five studies out of the total twenty-one studies reported age groups while the remaining sixteen studies did not report age. There were no specific age ranges in any of the papers.

Table 8: Demographic Breakdown by Age of Animals in the Studies Included in the Matrix

Author:	Journal:	Year:	Species:	Age:
Amino	Neuroscience Letters	2001	Macaca fuscata	Not provided
Asunama	Brain Research Reviews	1983	Mucaca fascicularis,	Not provided
Asunama	Brain Research Reviews	1983	Macaca fascicularis, Macaca mulatta	Not provided
Batton	Journal of Clinical Neurology	1977	Macaca mulatta	Not provided
Chan Palay	N/A	1977	Macaca mulatta	Not provided
Evrard	Journal of Comparative Neurology	2008	Macaca fascicularis	Not provided
Glickstein	Journal of Comparative Neurology	1994	Macaca fascicularis, Macaca nemestrina	Not provided
Kalil	Journal of Comparative Neurology	1979	Macaca mulatta	Young adult
Kalil	Journal of Comparative Neurology	1981	Macaca mulatta	Young adult and Adult
Kyuhou	Neuroscience Letters	1997	Macaca fuscata	Not provided
Langer	Journal of Comparative Neurology	1985	Macaca mulatta	Not provided
May	Journal of Comparative Neurology	1990	Macaca mulatta, Macaca fascicularis	Not provided
May	Journal of Comparative Neurology	1992	Macaca mulatta, Macaca fascicularis	Not provided

Author:	Journal:	Year:	Species:	Age:
Matute	Experimental Brain Research	1987	Macaca fascicularis,	Adult
Nagao	Neuroscience Reserves	1997	Macaca fuscata	Not provided
Noda	Journal of Comparative Neurology	1990	Macaca nemestrina	Adolescent
Thach and Jones	Experimental Brain Research	1979	Macaca fascicularis	Not provided
Voogd	Archives Italiennes de Biologie	1991	Macaca nemestrina and Macaca fascicularis	Adult
Xiong and Nagao	Neuroscience Letters	2002	Macaca fascicularis	Not provided
Xiong	Neuroscience Letters	2010	Macaca fascicularis	Not provided
Yamada	Journal of Comparative Neurology	1987	Macaca nemestrina	Adolescent

Combined Matrix

The combined matrix represents the connectional data which was derived from the CoCoBellum database. The color-coding scheme elucidated by Figure 1 represents each of the twenty-one studies incorporated into the matrix and the light blue coloring represents the overlap of connectional data across studies in the matrix. The data is divided by tracer type as indicated by the “Origin” and “Termination” sections. The connectional strength was assessed on a scale from 1 – 4 with 1 being the minimal strength and 4 being the maximal strength. A strength of 0 indicated no connections to the specific region listed. A more in-depth analysis of connectional data provided by the CocCoBellum database is given in the Appendix.

Color Coded Matrix Key:	
	NODA, 1990, RETROGRADE
	NODA, 1990, ANTEROGRADE
	MAY 1990, ANTEROGRADE
	MAY, 1990, RETROGRADE
	BATTON, 1977, ANTEROGRADE
	AMINO, 2001, ANTEROGRADE
	EVRARD, 2008, RETROGRADE
	MAY 1992, ANTEROGRADE
	MAY, 1992 RETROGRADE
	GLICKSTEIN, 1994, RETROGRADE
	KALIL,1981, ANTEROGRADE
	ASUNAMA, 1983, ANTEROGRADE
	YAMADA, 1987, RETROGRADE
	VOOGD, 1991, RETROGRADE
	MATUTE, 1987, RETROGRADE
	LANGER, 1985, RETROGRADE
	KALIL, 1979, ANTEROGRADE
	THACH AND JONES, 1979, ANTEROGRADE
	XIONG, 2010, RETROGRADE
	NAGAO,1977, ANTEROGRADE
	XIONG and NAGAO, 2002, RETROGRADE
	ASUNAMA et. Al, 1983, ANTEROGRADE
	CHAN-PALAY, 1977, RETROGRADE
	OVERLAP, Between Studies

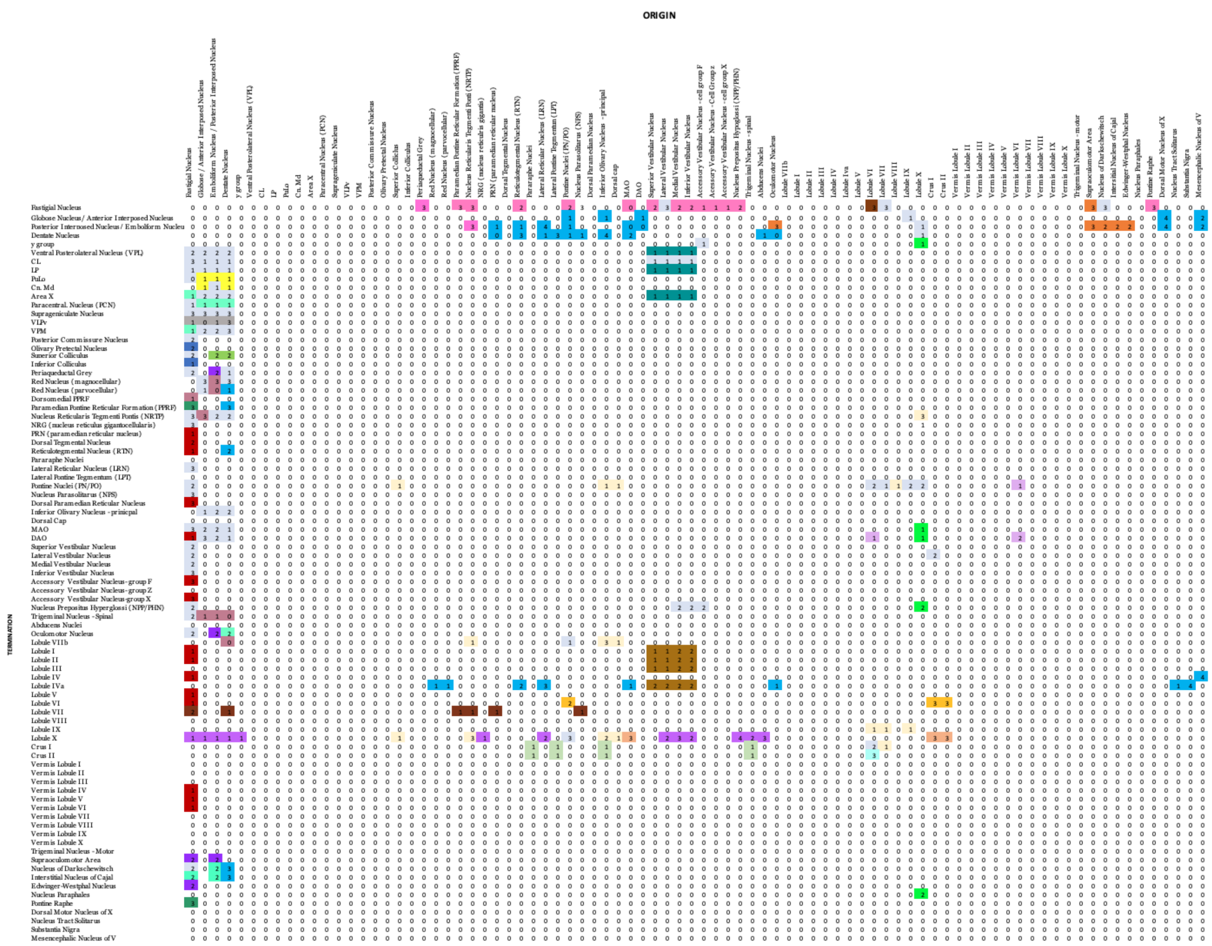

Figure 1: Combined Matrix. Key for Figure 1 is listed above. Each color represents one of the twenty-one studies incorporated. A light blue connection represents an overlap of connections between studies. Connections weighted 4 are strong, heavy connections; connections weighted 3 are medium connections weighing 2 are light; connections weighing 1 are weak and sparse; and connections weighing 0 are defined as having no projections to the area at all as indicated by the literature. The connections which are listed horizontally represent retrograde tracing studies and those that are listed vertical represent anterograde tracing studies

Overall Observations of Projections

In the present study, 1070 total connections were tabulated from twenty-one studies. There was a total of ten anterograde and eleven retrograde studies included with each study containing at least two or more connections to other regions of the cerebellum. When comparing the regions where the connections were deemed to be the heaviest as seen in Figure 1, the deep cerebellar nuclei, the vestibular nuclei, and specific cerebellar lobules had the most connections overall. Anterograde studies specifically had the most connections to the deep cerebellar nuclei, vestibular nuclei, Lobule VI, and Lobule X. Retrograde studies had the most connections to the deep cerebellar nuclei, pontine nuclei, Lobule Via, and Lobule X. The anterograde studies provided a larger number of connections to the deep cerebellar nuclei and vestibular nuclei whereas the retrograde studies produced more connections to the cerebellar lobules. A breakdown of the most prevalent connections by tracer type is provided below in table 10.

Table 9: Most Common Connections by Tracer Type

Anterograde	# of Connections	Retrograde	# of Connections
Fastigial Nucleus	94	Fastigial Nucleus	42
Globose/Anterior Interposed Nucleus	29	Globose/Anterior Interposed Nucleus	10
Emboliform/Posterior Interposed Nucleus	40	Emboliform/Posterior Interposed Nucleus	29
Dentate Nucleus	46	Dentate Nucleus	17
Vestibular Nuclei	66	Pontine Nuclei	11
Lobule VI	12	Lobule IVa	14
Lobule X	15	Lobule X	37

There were also many regions of overlap when comparing the projection sites in the combined matrix. The overlap which is delineated in light blue in Figure 1 shows that at least seven of the studies out of the twenty-one studies incorporated studied the similar pathways and the data across all the similar replicated studies was consistent throughout. The most common regions of overlap included thalamic regions such as the VPL, CL, LP, PuLo, Area X, VPM, and the PE. In ongoing neuroanatomical tract tracing studies, these regions are some of the most commonly investigated in order to assess their relationship to the motor cortex. The data obtained in the matrix also helps establish the notion that thalamic connections also have a role in the cerebellum. Additional common regions of overlap included connections to and from the olivary complex, vestibular nuclei, suprageniculate nucleus, red nucleus, PHN, oculomotor nucleus, and a few of the cerebellar lobules. There were a few other regions of overlap but through the analysis of the most common regions of overlap, the replication of strengths across multiple studies was consistent. Many studies had projections coming to or coming from the common regions above and when analyzed in the CoCoBellum spreadsheet, their strengths were all relatively similar. Hence, the data in the matrix is reflective of the strengths of the regions of overlap being similar across different studies.

One limitation regarding the data in Figure 1 can be seen by the lack of projections to or from the cerebellar cortex. Out of the studies included, barely any indicated projections to or from the cerebral cortex area which indicates that these connectivity in these regions may still be relatively unknown.

Since one of the main goals of the study was to gain a better understanding regarding how the structures of the cerebellum especially those with deep cerebellar nuclear connections played a role in overall connectivity, this data allowed us to collate what is known about the connectivity of the cerebellar structures across various studies.

All connections were tabulated in the database, for clarity of the matrix, but only studies that were consistently identified as connecting to the cerebellum was included. Inconsistently labeled structures across studies, or unclear regions were not included. Structures were not included if they were too broad and insufficiently defined (e.g., Inferior Olivary Complex). Finally, regions whose injections obscured clear delineation of projections to ipsilateral and contralateral sites (e.g., paravermal cerebellar cortex).

Specifically, connections from the following studies were taken out of the matrix: Noda, Yamada, Glickstein, Matute, Kalil, Langer, Thach and Jones, Carleton, Asunama, Chan Palay, and Xiong. Examples of specific structures from the studies listed that were excluded are further delineated in the table below.

Table 10: Structures that Were Excluded by the Matrix Organized by Study

Study:	Year:	Structure(s):
Noda	1990	Interfascicular Nucleus, Rostral Interstitial nucleus of the MLF, Medial portion of Field of Forel H, Central Midbrain Reticular Formation, Medullary Reticular Formation
Yamada	1987	Paravermal Zone, Cuneate Nucleus
Glickstein	1994	Dorsal Leaf of Principal Olive, Ventral Leave of Principal Olive, Dorsomedial Cell Column, Beta cap, Ventral Cap
Matute	1987	Inferior Olivary Complex, Dorsal Lamella, Ventral Lamella, Olivary Neuropil
Kalil	1979	Cuneate Nucleus
Langer	1985	Inferior Nuclei, Rostral Medulla, Lateral Cuneate Nucleus, Nucleus Intertrigeminalis, Basal Interstitial Nucleus of the Cerebellum, Nucleus Reticularis Paramedian
Kalil	1981	Mediodorsal Nucleus, Centre Median Nucleus
Thach and Jones	1979	Ventral Posterior Nucleus (inferior division), Inferior Olivary Nucleus
Carleton	1983	CCN, dorsomedial Reticular Formation, AN, VI nucleus, nucleus B, DMCC, DC of the Principal Olive, TN, Dorsal Somatic cell Column of the OMC, Vermal cortex of the nodulus, Vestibulospinal Tract, Lamina VIII, Lamina VII

Study:	Year:	Structure(s):
Asunama	1983	Lateral Dorsal Nucleus , Centre Median Nucleus, Ventral Posterior Nucleus Inferior Division, VMb, Pulvinar, Zona Incerta, Magnocellular Medial Geniculate Nucleus, Medial Geniculate Nucleus, Solitary Nucleus, Cell Group G, External Cuneate Nucleus, Spinal Vestibular Nucleus , Ambiguus Nucleus, XII, Stria Medullaris , Habenulointerpeduncular Tract, Basal Ventromedial Nucleus
Chan Palay	1977	Locus Ceruleus, Nucleus Medialis Annuli Aqeuductus, Raphe dorsalis, Pontine Reticular Nucleus (caudalis), Parvocellular reticular nucleus
Xiong	2010	Ventral Leaf of the Principal Olivary Nucleus, Dorsal Cap of Medial Accessory Nucleus

Combined Matrix with weighting

As seen above, the primary combined matrix seen in Figure 1 represents the total 1070 connections that were assessed via systematic review. Figure 2 represents an additional matrix made to visualize the magnitude of labeling in the included studies. The scale of magnitude ranges from 1-4 with 1 being the lightest labeling/weakest projection strength to 4 being the darkest/strongest projection strength. Through the grey-scale analysis of this matrix, it can be inferred that most of the connections from the deep cerebellar nuclei, vestibular nuclei, and lobules are darker in color indicating a larger magnitude. Most of the connections coming from or to the deep cerebellar nuclei, vestibular nuclei, and lobules have a strength of 2 and above whereas most other connections have a minimal magnitude ranging from 1-2. This reflects the analysis made regarding Figure 1, as the most prevalent connections in the matrix are to and from these regions. Many additional structures do not have reported magnitudes at all indicating that there is a lack of connections to these areas or previous literature has not explored these connections yet.

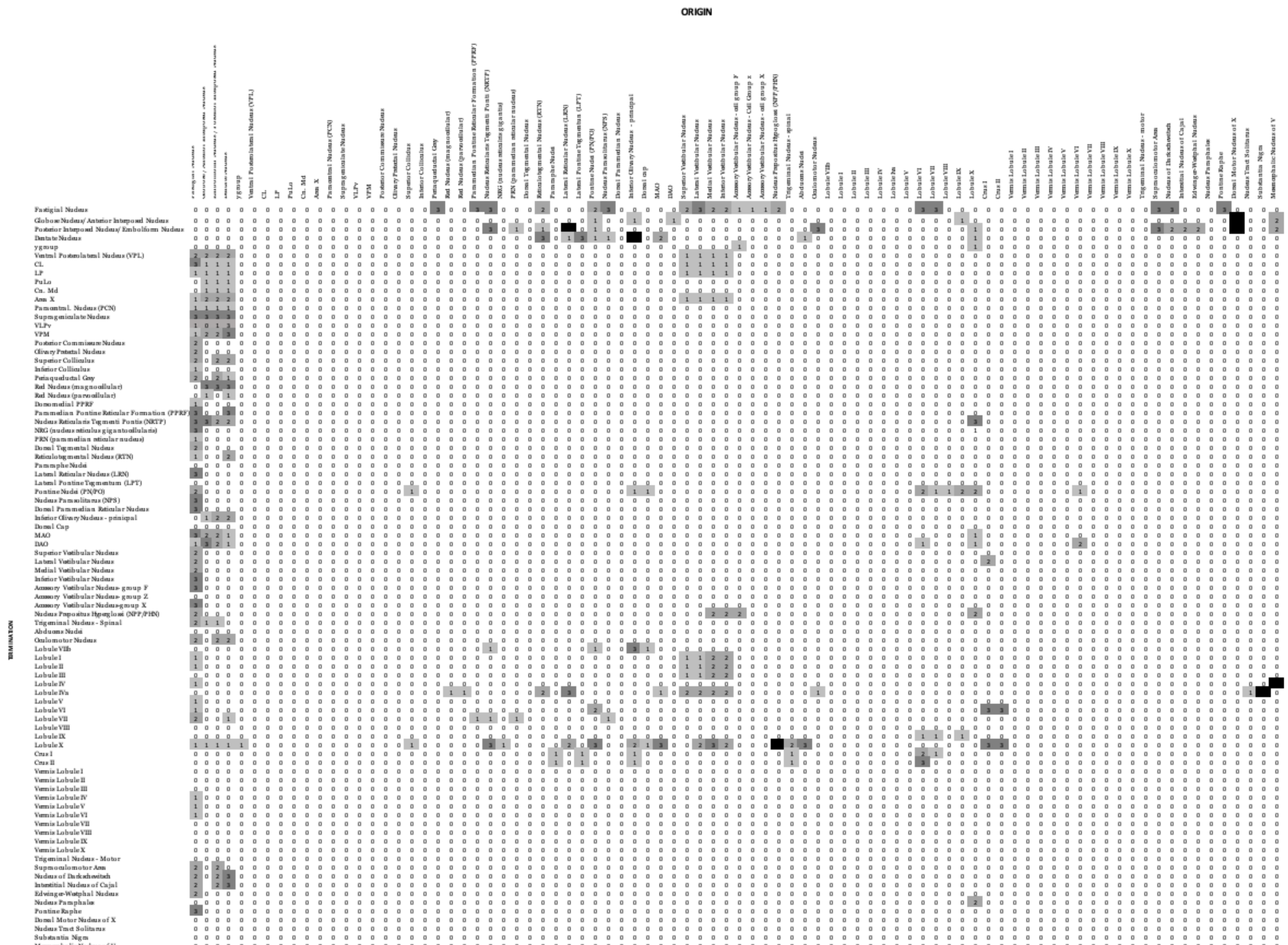

Figure 2: Combined Grey-Scale Matrix. Connections weighted 1 are weak/very lightly labeled; connections weighted 2 are slightly weak/more labeled than 1; connections weighted 3 are intermediate and more darkly labeled; and connections weighted 4 are very strong and have the darkest labeling.

Comparison of Ipsilateral versus Contralateral Matrices

Figures 3 – 7 show the matrices for the ipsilateral and contralateral projections. In Figures 3 and 4, a summary of the contralateral and ipsilateral projections is made respectively based on magnitude in order to assess the strength of projections for each connection listed. These connections follow a similar pattern as seen in Figure 2 where the connections to the deep cerebellar nuclei, vestibular nuclei, and specific cerebellar lobules are relatively dark ranging from strengths 2 and greater whereas most of the other regions are in the 1-2 range. Specifically, in the magnitude matrix in Figure 4, the contralateral projections to the deep cerebellar nuclei, medullary reticular formations, and Lobule Iva are very strong. In the ipsilateral magnitude matrix seen in Figures 5, the projections to the vestibular nuclei and lobules I - V are darker than their contralateral counterparts. The ipsilateral matrix also shows slightly dark connections to the deep cerebellar nuclei but not as strong as its contralateral matrix.

In the weighted and binarized matrix in Figures 5 and 6, the analysis from Figures 3 and 4 is further corroborated by the number of contralateral projections being greater than those in the ipsilateral matrices. The binarized matrices utilize an algorithm which represent projection values on a scale from 1 – 4 based on the original strength they were assigned. The purpose of this matrix was to simplify the projection strengths into a system that delineates strengths into specific numerical categories. Figure 6 on the other hand, compares the contralateral and ipsilateral matrices on a weighted scale indicating that this is a summary of strengths to and from each region. Both Figures 5 and 6 indicate that the deep cerebellar nuclei, vestibular nuclei, and cerebellar lobules have the highest number of connections. However, the contralateral connections to the deep cerebellar nuclei are larger than their ipsilateral counterparts and the ipsilateral connections to the vestibular and cerebellar lobules are larger than their contralateral counterparts.

Figure 7 represents the tabulated summary of the contralateral and ipsilateral connections presented in the original matrix. The green boxes represent a higher magnitude of contralateral connections, and the red boxes represent a higher magnitude of ipsilateral connections. This figure shows that the ipsilateral matrix has a slightly stronger connections to the lobules and vestibular nuclei compared to the contralateral matrix. The contralateral connections on the other hand have a stronger connection to the deep cerebellar nuclei and medullary regions compared to the ipsilateral matrix. They also have less connections to the lobules compared to the ipsilateral matrix as seen by the lack of green boxes in those regions. A breakdown of the most common projections to the difference matrix in the cerebellar regions separated by tracer type is provided below in Table 11.

Table 11: Most Common Connections by Tracer Type in the Difference Matrix

Anterograde:	# of Connections:	CC/IPSI:	Retrograde:	# of Connections:	CC/IPSI:
Fastigial Nucleus	20	CC	NRTP	11	CC
Globose/Anterior Interposed Nucleus	16	CC	Lobule X	21	IPSI
Emboliform/Posterior Interposed Nucleus	20	CC	Vestibular Nuclei	26	IPSI
Dentate Nucleus	19	CC			
Vestibular Nuclei	17	CC			

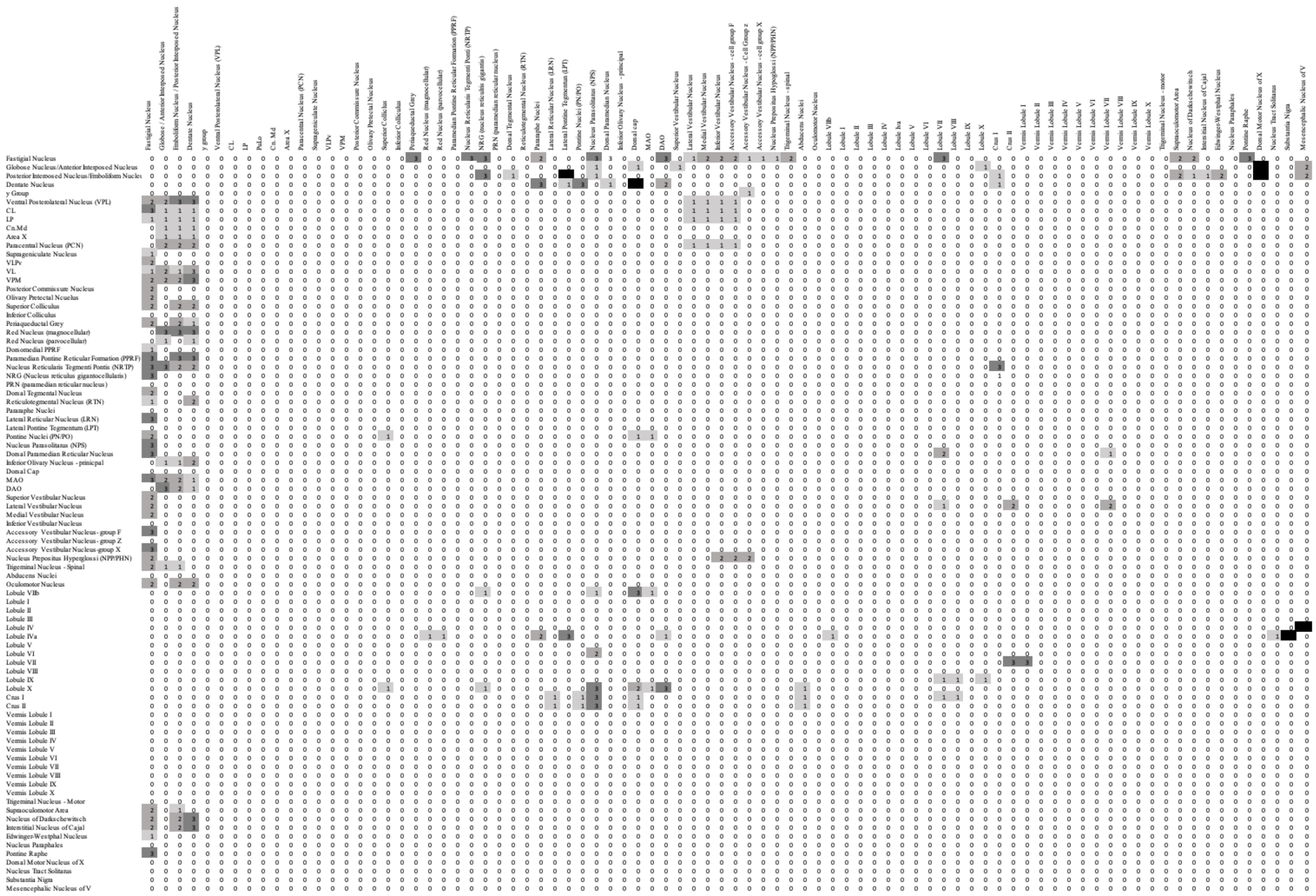

Figure 3: Grey-Scale Contralateral Matrix. The summary of contralateral projections assessed on a magnitude scale similar to the one seen in Figure 2. Connections weighted 1 are weak/very lightly labeled; connections weighted 2 are slightly weak/more labeled than 1; connections weighted 3 are intermediate and more darkly labeled; and connections weighted 4 are very strong and have the darkest labeling.

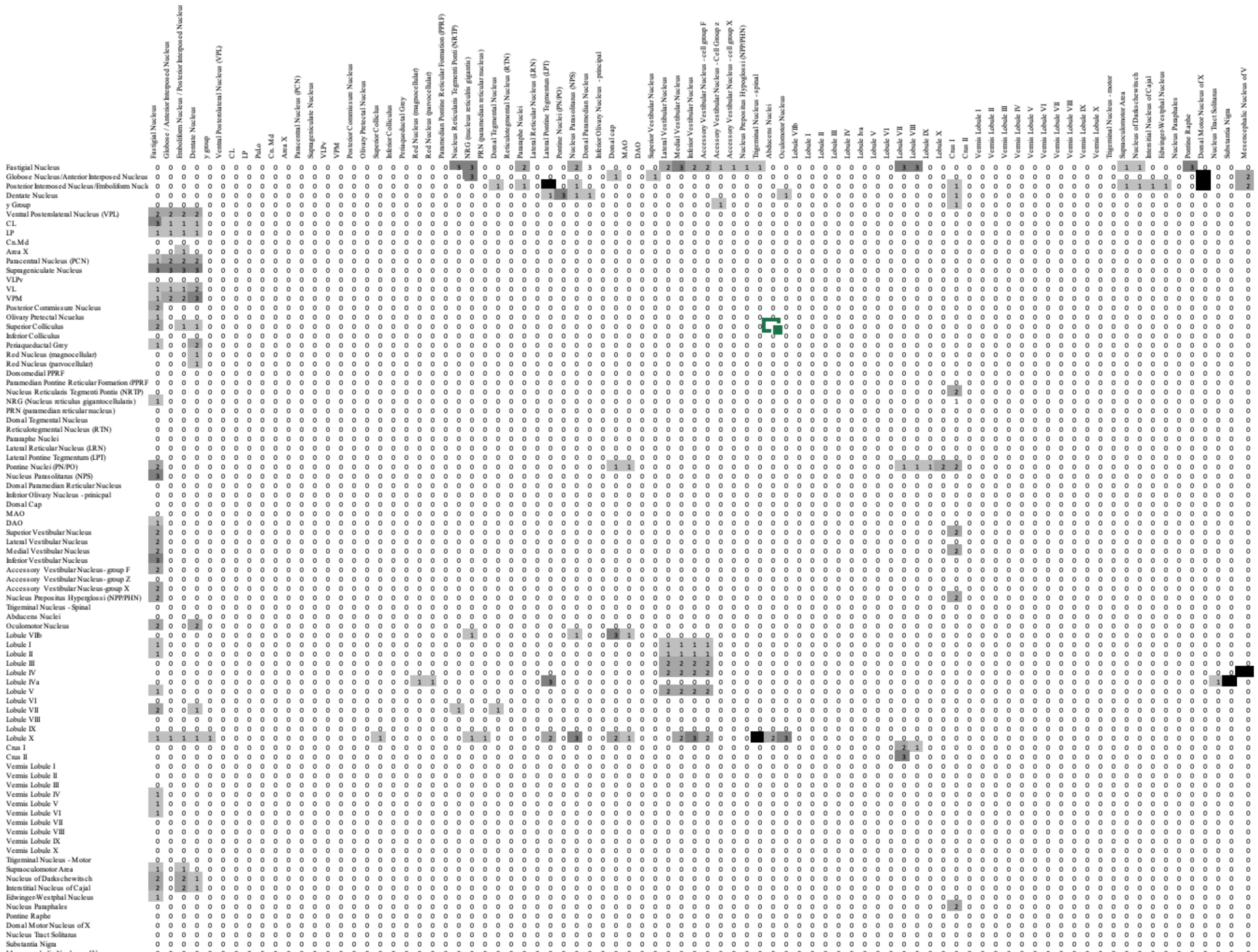

Figure 4: Grey-Scale Ipsilateral Matrix. The summary of ipsilateral projections assessed on a magnitude scale similar to the one seen in Figure 2. Connections weighted 1 are weak/very lightly labeled; connections weighted 2 are slightly weak/more labeled than 1; connections weighted 3 are intermediate and more darkly labeled; and connections weighted 4 are very strong and have the darkest labeling.

Combined Matrix Visualization

A combined matrix for the contralateral and ipsilateral regions was generated to compare the directionality of the origin and termination sites for each connection provided in Figure 1. In Figure 5A, which showcases the contralateral connections, most of these connections stem from the deep cerebellar nuclei, vestibular nuclei, Lobule IV, and Lobule X. In Figure 5B, which displays the ipsilateral connections, the deep cerebellar nuclei, the vestibular nuclei, Lobule VI, Lobule VII, and Lobule X. When comparing both the contralateral and ipsilateral there is a larger representation of connections for the contralateral direction as compared to the ipsilateral direction. This reflects the primary data as seen in the CoCoBellum database as most of the connections were crossed and terminated contralaterally compared to ipsilaterally.

5A) Contralateral Matrix **5B) Ipsilateral Matrix**

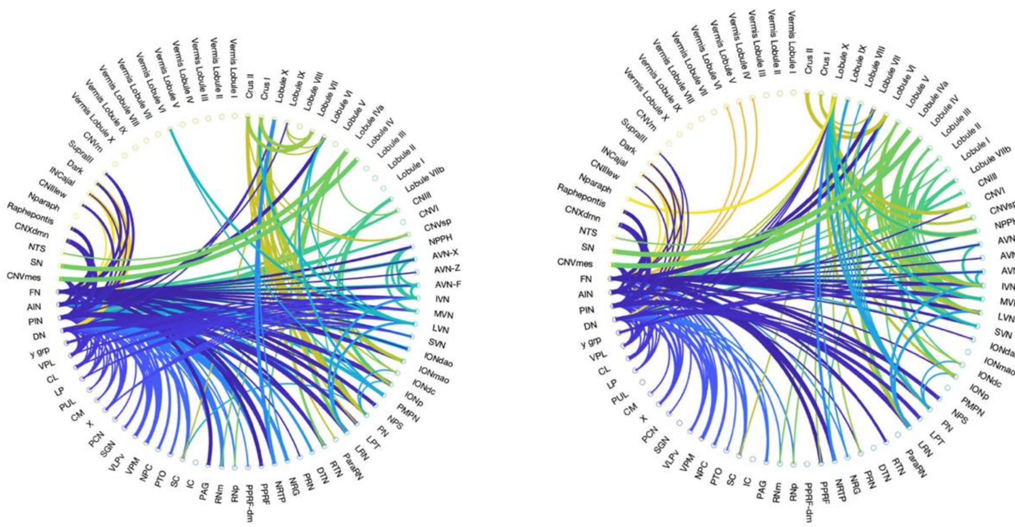

Figure 5: Contralateral and Ipsilateral Weighted Matrices. The summary of cerebellar projections that arose from the ipsilateral and contralateral regions of the cerebellum. The initial connections were integrated from the primary CoCoBellum database based on their origin and termination sites. The weighted connections or sum of total projections were tabulated for each direction to for a comparison. Figure 3A, represents the contralateral projections from the matrix while Figure 3B, represents the ipsilateral connections from the matrix.

Contralateral and Ipsilateral Binary Matrices:

Figure 6A) Contralateral

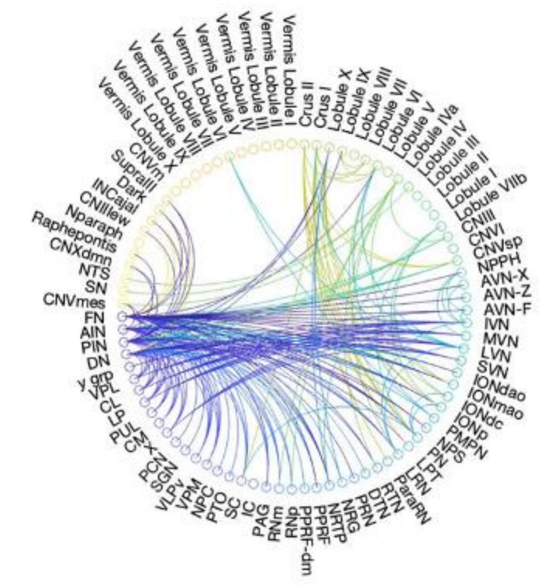

Figure 6B) Ipsilateral

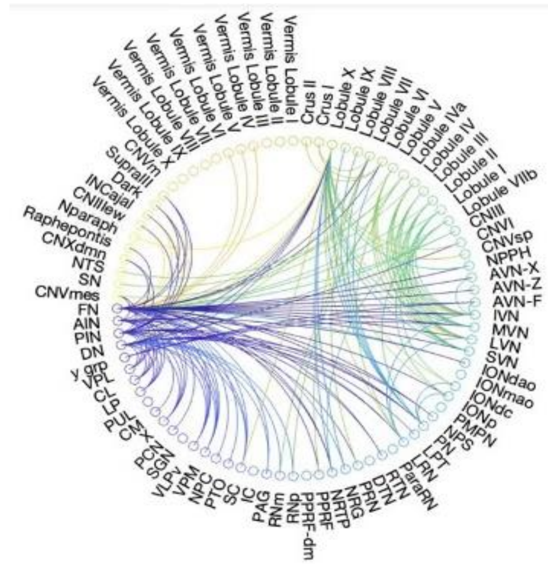

Figure 6: Contralateral and Ipsilateral Binary Matrices. The summary of binary cerebellar projections that arose from the contralateral and ipsilateral cerebellum. These graphs were generated from the weighted matrix, but adjusted such that the presence of a connection rather than the weighted magnitude was noted as a connection. Figure 6A represents the contralateral binarized projections while 6B represents the ipsilateral binarized projection.

Figure 7: Difference Matrix between Contralateral and Ipsilateral Connectional Strength. Representation of the connections when contralateral connectional strengths were subtracted from ipsilateral connectional strengths on a per region basis. The green boxes represent

the connection strength when contralateral projections were stronger whereas the red boxes represent the strength when the ipsilateral projections were stronger.

DISCUSSION:

The cerebellar connectivity of the non-human primate model has been evaluated by tracer studies in the past as means to evaluate the relationship between cerebellar structures in the brain. Very few studies have directly assessed the connectivity of the non-human primate cerebellum and how this connectivity can be applied to the human brain model. There has also not been analysis of contralateral and ipsilateral connections and how they play a role in the overall structural connectivity of the macaque brain. This systematic review of literature was conducted to determine neuroanatomical relationships between different cerebellar structures in the non-human primate in hopes to apply that knowledge to human models.

The results of this study showed that there are a limited number of studies that comprise the connectional neuroanatomical underlying cerebellar circuits in the macaque monkey, the reporting of subject characteristic such as sex and age is incomplete or missing, and the collation of studies show that the cerebellum is incompletely studied in some cases (e.g., the cerebellar cortical regions, leaving a substantial gap in knowledge. In addition, of the existing studies, most focus on connections from the deep cerebellar nuclei, vestibular nuclei, Lobule VI, and Lobule X of which the anatomical relationships to other areas of the cerebellum are relatively well known and have been explored in ongoing studies. Whereas this data provides corroboration to data in pre-existing studies, there is still a large unknown gap regarding connections to other cerebellar areas as the literature on these regions is very limited.

Literature Analysis

In this systematic review, the neuroanatomical data on macaque cerebellar connectivity has been analyzed through visual representation as a connectivity matrix. The results show while there is some literature available, there is still a large knowledge gap that needs to be addressed regarding cerebellar connectivity in non-human primate models. Of the total forty-seven articles yielded results, only twenty-one articles were incorporated indicating a that a very small sample was used to make predictions about overall cerebellar connectivity. This makes it more difficult to translate these results into human cerebellar models of the brain. Another important aspect to note is that of the studies utilized, each study had a variable number of subjects that were incorporated. Some studies had little as one subject whereas other studies had at least twenty animals or more. This may be a limitation due to the small sample size utilized in overall smaller sample of literature that is being used to make a deduction about the overall connectivity in the cerebellum of a non-human primate brain.

Matrix Representation and Assessment of Projection Strength

This connectivity matrix was developed to analyze the connections from non-human primate tracer papers and put them in a structural database which has never been done before. It is important to acknowledge that this model is bound to change, and it has a very limited number of studies due to the lack of literature on this specific topic. With that, there were still general patterns that helped support pre-existing knowledge about cerebellar connections.

The deep cerebellar nuclei, vestibular nuclei, and lobule connections were generally quantified as strong as they ranged from strengths 2 and up whereas most other connections yielded strengths of 1 and 2. For contralateral projections, the deep cerebellar nuclei, medullary regions, and Lobule Iva were some of the most common projections whereas vestibular nuclei and Lobules I – V were some of the most common projections for ipsilateral projections. Lobule X had a similar number of connections in both ipsilateral and contralateral projections. While the directionality data is integral in assessing the complexity of cerebellar neuronal connections, it also important to acknowledge that this directionality can be used to assess whether the patterns of directionality of the cerebellum in the non-human primate reflect that of the human brain since it has never been mapped out before. The directionality data gathered thus far is promising as it does reflect pre-existing studies done regarding cerebellar studies in the macaques. For example, the connection data from the vestibular nuclei shows a greater magnitude on the ipsilateral side of the matrix which shows support for evidence in pre-existing literature as the main termination sites of vestibular nuclei being primarily ipsilateral.[42] Additionally, the DCN having bilateral connections to the contralateral and ipsilateral sides seen in the matrix is also representative of their ability to regulate coordinated movement.[43]

When tabulating the connections to structures that were replicated across multiple studies, it was found that most if not of all these projection sites had similar values for strength and directionality. This allows for the assumption that in the studies in which regions of overlap were studied, the projection sites have similar connectivity patterns which allows for a more solidified understanding of the connectivity of the macaque cerebellum.

Limitations of the Current Study

<u>*Demographics*</u>

While the quantification of connection magnitude yielded consistent results in comparison with previous literature, one of the major limitations of this study was the lack of demographic information that was available. With the rise of recent studies focusing on the sex differences regarding the structural connectivity of the human brain, it is important to apply these potential differences to non-human primates since there is increasing evidence that there may be lobule specific differences between sexes in the cerebellum.[43] Most of the studies that were incorporated into the connectivity matrix did not provide information about the age or sex of the animal which makes it hard to account for any sex-differences that the animals may have when assessing cerebellar projections. This lack of information on age and sex also makes it difficult to cross compare the data across animals of different ages and sexes and it yields yet another unknown question of whether age and sex are two variables that influence the structural connectivity of the non-human primate brain.

<u>*Comparativity of Different Studies & Species*</u>

After conducting the initial search to determine which articles should be utilized in the connectional database, it was found that only twenty-one articles fit the inclusion criteria. This was under the assumption that they all investigated deep cerebellar nuclear projections via tracer studies. However, this the cross-comparison of these twenty-one studies operated under the assumption that they were all comparable to one another even if they used different species, tracer methods, and explored different connections. This is important to note since a study such as this one has never been done before and there is no way of determining whether the comparison of connections across species and studies is the most effective way of determining the connectivity of the non-human primate brain. Additionally, through the analysis of each study, it was seen that the termination sites were very similar but they all different names. For example, the periaqueductal grey could be referred to as "PD" in one study and "PE" in the other study. This difference in structural delineation may contribute to result variation as each study had their own glossary of termination sites that varied in naming. Due to the limited amount of literature available on the connectivity of the non-human primate brain, this systematic review is the first step in assessing the relationship of connectivity between cerebellar structures however, it may be bound to change as more subsequent studies are done.

Differences in Tracer Studies

Every study in the connectional matrix utilized either a retrograde or anterograde tracer to analyze the projections to and from the designated cerebellar regions of study. While multiple tracer studies have been utilized to identify labels to different areas of the brain, the incorporation of tracer studies in the matrix all had different injection sites and quantities of tracer utilized. The cross comparison of all these studies were under the assumption that regardless of the difference in injection sites and quantities of tracers used, the labeling of projection sites would be comparable across multiple studies. The difference of injection sites and tracer substances may produce differences in results that we may not be aware of. This is integral to note as a limitation because as mentioned previously, due to a lack of studies regarding connectional relationships in the non-human primate cerebellum, this is a major assumption and may be bound to change if future studies show that studies with different tracer and injection sites cannot be compared.

Quantification of Projection Strength

Projection strength was determined on a scale of 1 – 4 based on the magnitude of labeling observed across each of the twenty-one studies. In each specific study, each investigator had their own ways of evaluating labeling strength and it differed for each study. For some studies, there was a quantitative analysis of projection strength whereas for some other studies, there was a qualitative assessment of strength ranging from light, medium, dark. There were some difficulties in interpreting different strengths across each study. To adapt to the differences of labeling across each study, a semi-quantitative scale of 1 – 4 was developed in this study to be applicable for a comparison across all studies. However, this scale is completely objective, and it may not account for all the differences in labeling across all studies.

Future Research

In this study, while the connectivity strengths were assessed meticulously through analysis of multiple tracer studies, there were still a very small number of overall studies included and a limited number of demographic variables that were incorporated. If a future study was to be conducted, it would be useful to examine if there is more literature of tracing studies that correspond to deep cerebellar nuclear projections or make a cross reference comparison regarding these demographic variables and in other studies that focus on other projections throughout the brain such as corticothalamic or olivocerebellar. Additionally, it may also be helpful to investigate connections outside the deep cerebellar nuclear projections which were the primary focus of this present study. The inclusion of other connections may help yield more papers, overall matrix data, and provides a chance for a cross-comparison of different connections throughout the cerebellum.

CONCLUSION:

Since human connectivity of the brain cannot be directly studied, non-human primates are used as a model as a means of comparatively. Experimental studies such as tracer studies are used to identify the labeling of certain neuronal regions.

In this systematic review of literature, the structural connectivity of cerebellar structures in non-human primates was assessed utilizing data from past tracing experiments. After a series of studies were analyzed, a series of connectivity matrices were built from the primary CoCoBellum spreadsheet, which contained detailed information regarding the injection site/projection site of each animal studied. This information was then translated into a combined matrix where retrograde and anterograde studies were inputted in tandem to visually interpret the connections coming to and going from each cerebellar structure. Additional matrices were composed to assess the directionality of these cerebellar connections as no evaluation of contralateral versus ipsilateral projections has been utilized to create a connectional database. It was determined that the contralateral connections were more heavily present than those ipsilaterally. While there was valuable information extracted regarding the connections from each cerebellar structure, there was very limited information on the age and sex of the animals incorporated into the study and projections to the cerebellar cortical regions. The next step will be to analyze more projections outside of the deep cerebellar nuclear projections incorporated in this study in hopes to gain more demographical information while also including a larger total number of studies in the connectivity matrix.

APPENDIX

This appendix describes the information derived from the analyses of the different articles incorporated into the study and is titled ‘CocoBellum’. There are ten categories on this spreadsheet divided as follows: author, journal, date, tracer type, case, injection site, projection site, strength, and an additional notes section. The purpose of this spreadsheet was to organize the data in a streamlined manner while also providing more information on how values in the matrix were delineated and how each study was defined in terms of tracer type, injection sites, projection sites, and strength.

Noda	Journal of Comparative Neurology	1990	Retrograde	Variable	Fastigial Nucleus	IL	Lobule VI	3	
Noda	Journal of Comparative Neurology	1990	Retrograde	Variable	Fastigial Nucleus	IL	Lobule VII	3	
Noda	Journal of Comparative Neurology	1990	Retrograde	Variable	Fastigial Nucleus	CL	MAOb	3	
Noda	Journal of Comparative Neurology	1990	Retrograde	Variable	Fastigial Nucleus	IL	Superior Vestibular Nucleus	1	
Noda	Journal of Comparative Neurology	1990	Retrograde	Variable	Fastigial Nucleus	IL	Medial Vestibular Nucleus	2	
Noda	Journal of Comparative Neurology	1990	Retrograde	Variable	Fastigial Nucleus	IL	Inferior Vestibular Nucleus	2	
Noda	Journal of Comparative Neurology	1990	Retrograde	Variable	Fastigial Nucleus	IL	Accessory Vestibular Nuclues - group f	1	

Noda	Journal of Comparative Neurology	1990	Retrograde	Variable	Fastigial Nucleus	IL	Accessory Vestibular Nucleus - group x	1	
Noda	Journal of Comparative Neurology	1990	Retrograde	Variable	Fastigial Nucleus	IL	Accessory Vestibular Nucleus - group z	1	
Noda	Journal of Comparative Neurology	1990	Retrograde	Variable	Fastigial Nucleus	IL	Nucleus prepositius hypoglossi	1	
Noda	Journal of Comparative Neurology	1990	Retrograde	Variable	Fastigial Nucleus	CL	Superior Vestibular Nucleus	1	
Noda	Journal of Comparative Neurology	1990	Retrograde	Variable	Fastigial Nucleus	CL	Medial Vestibular Nucleus	2	
Noda	Journal of Comparative Neurology	1990	Retrograde	Variable	Fastigial Nucleus	CL	Inferior Vestibular Nucleus	2	
Noda	Journal of Comparative Neurology	1990	Retrograde	Variable	Fastigial Nucleus	CL	Accessory Vestibular Nuclues - group f	1	
Noda	Journal of Comparative Neurology	1990	Retrograde	Variable	Fastigial Nucleus	CL	Accessory Vestibular Nucleus - group x	1	
Noda	Journal of Comparative Neurology	1990	Retrograde	Variable	Fastigial Nucleus	CL	Accessory Vestibular Nucleus - group z	1	
Noda	Journal of Comparative Neurology	1990	Retrograde	Variable	Fastigial Nucleus	CL	Nucleus prepositius hypoglossi	1	
Noda	Journal of Comparative Neurology	1990	Anterograde	Variable	Fastigial Nucleus	IL	Lateral Vestibular Nucleus	3	
Noda	Journal of Comparative Neurology	1990	Anterograde	Variable	Fastigial Nucleus	IL	Inferior Vestibular Nucleus	3	
Noda	Journal of Comparative Neurology	1990	Anterograde	Variable	Fastigial Nucleus	CL	Lateral Vestibular Nucleus	2	

Noda	Journal of Comparative Neurology	1990	Anterograde	Variable	Fastigial Nucleus	CL	Inferior Vestibular Nucleus	2	
Noda	Journal of Comparative Neurology	1990	Anterograde	Variable	Fastigial Nucleus	IL	Superior Vestibular Nucleeus	2	
Noda	Journal of Comparative Neurology	1990	Anterograde	Variable	Fastigial Nucleus	IL	Medial Vestibular Nuclei	2	
Noda	Journal of Comparative Neurology	1990	Anterograde	Variable	Fastigial Nucleus	CL	Superior Vestibular Nucleeus	2	
Noda	Journal of Comparative Neurology	1990	Anterograde	Variable	Fastigial Nucleus	CL	Medial Vestibular Nuclei	2	
Noda	Journal of Comparative Neurology	1990	Anterograde	Variable	Fastigial Nucleus	IL	Prepositus Hypoglossi	2	
Noda	Journal of Comparative Neurology	1990	Anterograde	Variable	Fastigial Nucleus	CL	Prepositus Hypoglossi	2	
Noda	Journal of Comparative Neurology	1990	Retrograde	Variable	Fastigial Nucleus	IL	NRTP	3	
Noda	Journal of Comparative Neurology	1990	Retrograde	Variable	Fastigial Nucleus	CL	NRTP	3	
Noda	Journal of Comparative Neurology	1990	Retrograde	Variable	PIN	IL	NRTP	3	
Noda	Journal of Comparative Neurology	1990	Retrograde	Variable	PIN	CL	NRTP	3	
Noda	Journal of Comparative Neurology	1990	Retrograde	Variable	Fastigial Nucleus	IL	PN	2	
Noda	Journal of Comparative Neurology	1990	Retrograde	Variable	Fastigial Nucleus	CL	PN	3	

Noda	Journal of Comparative Neurology	1990	Retrograde	Variable	Fastigial Nucleus	IL	Pontine Raphe	3	
Noda	Journal of Comparative Neurology	1990	Retrograde	Variable	Fastigial Nucleus	CL	Pontine Raphe	3	
Noda	Journal of Comparative Neurology	1990	Retrograde	Variable	Fastigial Nucleus	IL	PPRF	3	
Noda	Journal of Comparative Neurology	1990	Retrograde	Variable	Fastigial Nucleus	CL	PPRF	3	
Noda	Journal of Comparative Neurology	1990	Retrograde	Variable	Fastigial Nucleus	CL	PAG	3	
Noda	Journal of Comparative Neurology	1990	Anterograde	Variable	Fastigial Nucleus	CL	PAG	2	
Noda	Journal of Comparative Neurology	1990	Anterograde	Variable	Fastigial Nucleus	CL	dorsal tegmental nucleus	2	
Noda	Journal of Comparative Neurology	1990	Anterograde	Variable	Fastigial Nucleus	CL	medial portion of Field of Forel H	2	
Noda	Journal of Comparative Neurology	1990	Anterograde	Variable	Fastigial Nucleus	CL	Nucleus of Darkschewitsch	2	
Noda	Journal of Comparative Neurology	1990	Anterograde	Variable	Fastigial Nucleus	CL	nucleus of the posterior commissure	3	
Noda	Journal of Comparative Neurology	1990	Anterograde	Variable	Fastigial Nucleus	CL	central midbrain reticular formation	2	
Noda	Journal of Comparative Neurology	1990	Anterograde	Variable	Fastigial Nucleus	CL	PPRF	3	
Noda	Journal of Comparative Neurology	1990	Anterograde	Variable	Fastigial Nucleus	CL	Pontine Raphe	3	

Noda	Journal of Comparative Neurology	1990	Anterograde	Variable	Fastigial Nucleus	IL	medullary reticular formation	3	
Noda	Journal of Comparative Neurology	1990	Anterograde	Variable	Fastigial Nucleus	CL	medullary reticular formation	2	
Noda	Journal of Comparative Neurology	1990	Anterograde	Variable	Fastigial Nucleus	CL	NRTP	3	
Noda	Journal of Comparative Neurology	1990	Anterograde	Variable	PIN	CL	NRTP	3	
Noda	Journal of Comparative Neurology	1990	Anterograde	Variable	Fastigial Nucleus	CL	PN	3	
Noda	Journal of Comparative Neurology	1990	Anterograde	Variable	Fastigial Nucleus	CL	nucleus parasolitarius	3	
Noda	Journal of Comparative Neurology	1990	Anterograde	Variable	Fastigial Nucleus	CL	VPL	2	
Noda	Journal of Comparative Neurology	1990	Anterograde	Variable	PIN	CL	VPL	2	
Noda	Journal of Comparative Neurology	1990	Anterograde	Variable	PIN	CL	VPM	2	
Noda	Journal of Comparative Neurology	1990	Anterograde	Variable	PIN	CL	VL	2	
Noda	Journal of Comparative Neurology	1990	Anterograde	Variable	Fastigial Nucleus	CL	Superior Colliculus	2	
Noda	Journal of Comparative Neurology	1990	Anterograde	Variable	Fastigial Nucleus	CL	MAO	3	
Noda	Journal of Comparative Neurology	1990	Anterograde	Variable	PIN	CL	MAO	3	

Noda	Journal of Comparative Neurology	1990	Anterograde	Variable	PIN	CL	DAO	3	
Yamada	JCN	1987	Retrograde - WGA-HRP	Monkey Jo	Lobule VII	IL	Fastigial Nucleus	1.00	
Yamada	JCN	1987	Retrograde - WGA-HRP	Monkey Jo	Lobule VII	IL	Paravermal Zone	1.00	
Yamada	JCN	1987	Retrograde - WGA-HRP	Monkey Jo	Lobule VII	IL	Dentate Nucleus	1.00	
Yamada	JCN	1987	Retrograde - WGA-HRP	Monkey Jo	Lobule VII	IL	NRTP	1.00	
Yamada	JCN	1987	Retrograde - WGA-HRP	Monkey Jo	Lobule VII	IL	PMPN	1.00	
Yamada	JCN	1987	Retrograde - WGA-HRP	Monkey Jo	Lobule VII	IL	PPRF	1.00	
Yamada	JCN	1987	Retrograde - WGA-HRP	Monkey Rh	Lobule VII	IL	Fastigial Nucleus	1.00	
Yamada	JCN	1987	Retrograde - WGA-HRP	Monkey Rh	Lobule VII	IL	Paravermal Zone	2.00	
Yamada	JCN	1987	Retrograde - WGA-HRP	Monkey Rh	Lobule VII	IL	Dentate Nucleus	1.00	
Yamada	JCN	1987	Retrograde - WGA-HRP	Monkey Rh	Lobule VII	IL	NRTP	1.00	
Yamada	JCN	1987	Retrograde - WGA-HRP	Monkey Rh	Lobule VII	IL	PMPN	1.00	
Yamada	JCN	1987	Retrograde - WGA-HRP	Monkey Rh	Lobule VII	IL	PPRF	1.00	
Yamada	JCN	1987	Retrograde - WGA-HRP	Monkey An	Lobule VII	IL	Fastigial Nucleus	1.00	
Yamada	JCN	1987	Retrograde - WGA-HRP	Monkey An	Lobule VII	IL	Paravermal Zone	1.00	
Yamada	JCN	1987	Retrograde - WGA-HRP	Monkey An	Lobule VII	IL	Dentate Nucleus	1.00	
Yamada	JCN	1987	Retrograde - WGA-HRP	Monkey An	Lobule VII	IL	NRTP	1.00	
Yamada	JCN	1987	Retrograde - WGA-HRP	Monkey An	Lobule VII	IL	PMPN	1.00	
Yamada	JCN	1987	Retrograde - WGA-	Monkey An	Lobule VII	IL	PPRF	1.00	

[redacted]									
			HRP						
Yamada	JCN	1987	Anterograde - HRP	Monkey Jo	Lobule VII	IL	FN	3.00	
Kalil	JCN	1979	TAA - Anterograde	MCB6	Dentate Nucleus	CL	DAO	1.00	
Kalil	JCN	1979	TAA - Anterograde	MCB6	Dentate Nucleus	CL	MAO	1.00	
Kalil	JCN	1979	TAA - Anterograde	MCB6	Dentate Nucleus	CL	PO	1.00	
Kalil	JCN	1979	TAA - Anterograde	MCB6	Interpositus Nucleus	CL	DAO	1.00	
Kalil	JCN	1979	TAA - Anterograde	MCB6	Interpositus Nucleus	CL	MAO	1.00	
Kalil	JCN	1979	TAA - Anterograde	MCB6	Interpositus Nucleus	CL	PO	1.00	
Kalil	JCN	1979	TAA - Anterograde	MCB5	Dentate Nucleus	CL	DAO	0.00	
Kalil	JCN	1979	TAA - Anterograde	MCB5	Dentate Nucleus	CL	MAO	2.00	
Kalil	JCN	1979	TAA - Anterograde	MCB5	Dentate Nucleus	CL	PO	1.00	
Kalil	JCN	1979	TAA - Anterograde	MCB5	Interpositus Nucleus	CL	DAO	0.00	
Kalil	JCN	1979	TAA - Anterograde	MCB5	Interpositus Nucleus	CL	MAO	2.00	
Kalil	JCN	1979	TAA - Anterograde	MCB5	Interpositus Nucleus	CL	PO	1.00	
Kalil	JCN	1979	TAA - Anterograde	MVL 21	Cerebellar Nuclei	CL	DAO	3.00	
Kalil	JCN	1979	TAA - Anterograde	MVL 21	Cerebellar Nuclei	CL	MAO	0.00	
Kalil	JCN	1979	TAA - Anterograde	MVL 21	Cerebellar Nuclei	CL	PO	2.00	
Kalil	JCN	1979	TAA - Anterograde	MCB4	Cerebellar Nuclei	CL	DAO	1.00	
Kalil	JCN	1979	TAA - Anterograde	MCB4	Cerebellar Nuclei	CL	MAO	0.50	
Kalil	JCN	1979	TAA - Anterograde	MCB4	Cerebellar Nuclei	CL	PO	1.00	
Kalil	JCN	1979	TAA - Anterograde	MCB2	Cerebellar Nuclei	CL	DAO	1.00	
Kalil	JCN	1979	TAA - Anterograde	MCB2	Cerebellar Nuclei	CL	MAO	2.00	
Kalil	JCN	1979	TAA - Anterograde	MCB2	Cerebellar Nuclei	CL	PO	1.00	
Kalil	JCN	1979	TAA - Anterograde	MCB1	Cuneate Nucleus	CL	Dentate Nucleus	1.00	
Kalil	JCN	1979	TAA - Anterograde	MCB1	Cuneate Nucleus	CL	Interpositus Nucleus	1.00	
Kalil	JCN	1979	TAA - Anterograde	MCB1	Cuneate Nucleus	CL	DAO	1.00	
Kalil	JCN	1979	TAA - Anterograde	MCB1	Cuneate Nucleus	CL	MAO	1.00	
Kalil	JCN	1979	TAA - Anterograde	MCB1	Cuneate Nucleus	CL	PO	1.00	
Kalil	JCN	1979	TAA - Anterograde	MCB1	Cuneate Nucleus	CL	DCN	1.00	
Kalil	JCN	1979	TAA - Anterograde	MCB8	Fastigial Nucleus	CL	DAO	1.00	
Kalil	JCN	1979	TAA - Anterograde	MCB8	Fastigial Nucleus	CL	MAO	1.00	
Kalil	JCN	1979	TAA - Anterograde	MCB8	Fastigial Nucleus	CL	PO	1.00	
Kalil	JCN	1979	TAA - Anterograde	MVL24	Fastigial Nucleus	CL	DAO	1.00	
Kalil	JCN	1979	TAA - Anterograde	MVL24	Fastigial Nucleus	CL	MAO	1.00	
Kalil	JCN	1979	TAA - Anterograde	MVL24	Fastigial Nucleus	CL	PO	1.00	
Xiong and Nagao	Neuro Letters	2002	Retrograde - CTB	Monkey IW	Lobule VII	CL	Crura I	3.00	*mf = motor facial area of

									cerebral cortex
Xiong and Nagao	Neuro Letters	2002	Retrograde - CTB	Monkey IW	Lobule VII	CL	Crura II	3.00	*mf = motor facial area of cerebral cortex
Xiong and Nagao	Neuro Letters	2002	Anterograde - BD	Monkey IW	Lobule VII	CL	PN	2.00	
Xiong and Nagao	Neuro Letters	2002	Retrograde - CTB	Monkey Ja	Lobule X	CL	PN	2.00	
Amino	Neuro Letters	2001	Anterograde - WGA-HRP	I,II,III	Lateral and Interposed Cerebellar Nuclei	CL	VLo	1.00	*not separated case by case
Amino	Neuro Letters	2001	Anterograde - WGA-HRP	I,II,III	Lateral and Interposed Cerebellar Nuclei	CL	CL	1.00	
Amino	Neuro Letters	2001	Anterograde- WGA-HRP	I,II,III	Lateral and Interposed Cerebellar Nuclei	CL	LP	1.00	
Amino	Neuro Letters	2001	Anterograde0 WGA-HRP	I,II,III	Lateral and Interposed Cerebellar Nuclei	CL	PuLo	1.00	
Amino	Neuro Letters	2001	Anterograde- WGA-HRP	I,II,III	Lateral and Interposed Cerebellar Nuclei	CL	VPLc	2.00	
Amino	Neuro Letters	2001	Anterograde - WGA-HRP	I,II,III	Lateral and Interposed Cerebellar Nuclei	CL	Cn.Md	1.00	
Amino	Neuro Letters	2001	Anterograde - WGA-HRP	I,II,III	Lateral and Interposed Cerebellar Nuclei	CL	VLc	3.00	
Amino	Neuro Letters	2001	Anterograde - WGA-HRP	I,II,III	Lateral and Interposed Cerebellar Nuclei	CL	VLps	1.00	
Amino	Neuro Letters	2001	Anterograde - WGA-HRP	I,II,III	Lateral and Interposed Cerebellar Nuclei	CL	Area X	2.00	
Amino	Neuro Letters	2001	Anterograde - WGA-HRP	I,II,III	Lateral and Interposed Cerebellar Nuclei	CL	VPLo	3.00	
May	Neuroscience	1990	WGA-HRP- retrograde	Retrograde Case 1: Macaca Fascicularis	Superior Colliculus	Bilateral	Posterior Fastigial Nucleus	2.00	
May	Neuroscience	1990	WGA-HRP- retrograde	Retrograde Case 1: Macaca Fascicularis	Superior Colliculus	Bilateral	Posterior Interposed Nucleus	3.00	
May	Neuroscience	1990	WGA-HRP- retrograde	Retrograde Case 1:	Superior Colliculus	Bilateral	Dentate Nucleus	3.00	

				Macaca Fascicularis					
May	Neuroscience	1990	WGA-HRP- retrograde	Retrograde: Case 2: Macaca Fascicularis 2	Superior Colliculus	Bilateral	Posterior Fastigial Nucleus	3.00	
May	Neuroscience	1990	WGA-HRP- retrograde	Retrograde: Case 2: Macaca Fascicularis 3	Superior Colliculus	Bilateral	Posterior Interposed Nucleus	2.00	
May	Neuroscience	1990	WGA-HRP- retrograde	Retrograde: Case 2: Macaca Fascicularis 4	Superior Colliculus	Bilateral	Dentate Nucleus	2.00	
May	Neuroscience	1990	WGA-HRP-retrograde	Retrograde: Case 3: Macaca Mulatta	Superior Colliculus	Bilateral	Posterior Fastigial Nucleus	1.00	
May	Neuroscience	1990	WGA-HRP-retrograde	Retrograde: Case 3: Macaca Mulatta	Superior Colliculus	Bilateral	Posterior Interposed Nucleus	1.00	
May	Neuroscience	1990	WGA-HRP-retrograde	Retrograde: Case 3: Macaca Mulatta	Superior Colliculus	Bilateral	Dentate Nucleus	2.00	
May	Neuroscience	1990	HRP-anterograde	Anterograde: Cases 4&5 Macaques	Right Fastigial Nucleus	Bilateral	Posterior Interposed Nucleus	1.00	
May	Neuroscience	1990	HRP-anterograde	Anterograde: Cases 4&5 Macaques	Right Fastigial Nucleus	Bilateral	Dentate Nucleus	1.00	
May	Neuroscience	1990	HRP-anterograde	Anterograde: Cases 4&5 Macaques	Right Fastigial Nucleus	Bilateral	Superior Colliculus	1.00	

May	Neuroscience	1990	HRP-anterograde	Anterograde: Cases 4&5 Macaques	Right Fastigial Nucleus	Bilateral	Supraoculamotor Area	2.00	
May	Neuroscience	1990	HRP-anterograde	Anterograde: Cases 4&5 Macaques	Right Fastigial Nucleus	Bilateral	Periaqueeductal Grey	2.00	
May	Neuroscience	1990	HRP-anterograde	Anterograde: Cases 4&5 Macaques	Right Fastigial Nucleus	Bilateral	Posterior Commissure Nucleus	2.00	
May	Neuroscience	1990	HRP-anterograde	Anterograde: Cases 4&5 Macaques	Right Fastigial Nucleus	Bilateral	Olivary Pretectal Nucleus	2.00	
Nagao	JCN	1997	WGA-HRP, Anterograde, bilateral	KA	Floculus or Ventral Parafloculus	IL	PN	2.00	
Nagao	JCN	1997	WGA-HRP, Anterograde, bilateral	KA	Floculus or Ventral Parafloculus	IL	Raphe Nuclei	2.00	
Nagao	JCN	1997	WGA-HRP, Anterograde, bilateral	KA	Floculus or Ventral Parafloculus	IL	NPP	2.00	
Nagao	JCN	1997	WGA-HRP, Anterograde, bilateral	KA	Floculus or Ventral Parafloculus	IL	NRTP	2.00	
Nagao	JCN	1997	WGA-HRP, Anterograde, bilateral	KA	Floculus or Ventral Parafloculus	IL	Medial Vestibular Nucleus (MV)	1.00	
Nagao	JCN	1997	WGA-HRP, Anterograde, bilateral	KA	Floculus or Ventral Parafloculus	IL	Superior Vestibular Nucleus (SV)	1.00	
Nagao	JCN	1997	WGA-HRP, Anterograde, bilateral	KA	Floculus or Ventral Parafloculus	IL	VLV	1.00	
Nagao	JCN	1997	WGA-HRP, Anterograde,	KA	Floculus or Ventral Parafloculus	IL	DE	1.00	

			bilateral						
Nagao	JCN	1997	WGA-HRP, Anterograde, bilateral	KI	Floculus or Ventral Parafloculus	IL	PN	2.00	
Nagao	JCN	1997	WGA-HRP, Anterograde, bilateral	KI	Floculus or Ventral Parafloculus	IL	Raphe Nuclei	2.00	
Nagao	JCN	1997	WGA-HRP, Anterograde, bilateral	KI	Floculus or Ventral Parafloculus	IL	NPP	2.00	
Nagao	JCN	1997	WGA-HRP, Anterograde, bilateral	KI	Floculus or Ventral Parafloculus	IL	Medial Vestibular Nucleus (MMV)	1.00	
Nagao	JCN	1997	WGA-HRP, Anterograde, bilateral	KI	Floculus or Ventral Parafloculus	IL	Superior Vestibular Nucleus (SV)	1.00	
Nagao	JCN	1997	WGA-HRP, Anterograde, bilateral	KI	Floculus or Ventral Parafloculus	IL	y group	1.00	
Nagao	JCN	1997	WGA-HRP, Anterograde, bilateral	KI	Floculus or Ventral Parafloculus	IL	PIP	1.00	
Nagao	JCN	1997	WGA-HRP, Anterograde	KI	Floculus or Ventral Parafloculus	IL	DE	1.00	
Nagao	JCN	1997	WGA-HRP, Anterograde, bilateral	KU	Floculus or Ventral Parafloculus	IL	PN	2.00	
Nagao	JCN	1997	WGA-HRP, Anterograde, bilateral	KU	Floculus or Ventral Parafloculus	IL	Raphe Nuclei	2.00	
Nagao	JCN	1997	WGA-HRP, Anterograde, bilateral	KU	Floculus or Ventral Parafloculus	IL	NPP	2.00	
Nagao	JCN	1997	WGA-HRP, Anterograde	KU	Floculus or Ventral Parafloculus	IL	Medial Vestibular Nucleus (MMV)	2.00	
Nagao	JCN	1997	WGA-HRP, Anterograde	KU	Floculus or Ventral Parafloculus	IL	Superior Vestibular Nucleus (SV)	1.00	
Nagao	JCN	1997	WGA-HRP,	KU	Floculus or Ventral	IL	y group	1.00	

			Anterograde		Parafloculus				
Nagao	JCN	1997	WGA-HRP, Anterograde	KU	Floculus or Ventral Parafloculus	IL	PIP	1.00	
Nagao	JCN	1997	WGA-HRP, Anterograde	KU	Floculus or Ventral Parafloculus	IL	DE	1.00	
Nagao	JCN	1997	WGA-HRP, Anterograde, bilateral	KE	Floculus or Ventral Parafloculus	IL	PN	2.00	
Nagao	JCN	1997	WGA-HRP, Anterograde, bilateral	KE	Floculus or Ventral Parafloculus	IL	Raphe Nuclei	2.00	
Nagao	JCN	1997	WGA-HRP, Anterograde, bilateral	KE	Floculus or Ventral Parafloculus	IL	NPP	2.00	
Nagao	JCN	1997	WGA-HRP, Anterograde, unilateral	KE	Floculus or Ventral Parafloculus	IL	Medial Vestibular Nucleus (MMV)	2.00	
Nagao	JCN	1997	WGA-HRP, Anterograde, unilateral	KE	Floculus or Ventral Parafloculus	IL	Superior Vestibular Nucleus (SV)	2.00	
Nagao	JCN	1997	WGA-HRP, Anterograde,unilateral	KE	Floculus or Ventral Parafloculus	IL	y group	0.00	
Nagao	JCN	1997	WGA-HRP, Anterograde, unilateral	KE	Floculus or Ventral Parafloculus	IL	PIP	1.00	
Nagao	JCN	1997	WGA-HRP, Anterograde, unilateral	KE	Floculus or Ventral Parafloculus	IL	DE	1.00	
Nagao	JCN	1997	WGA-HRP, Anterograde, bilateral	KO	Floculus or Ventral Parafloculus	IL	PN	2.00	
Nagao	JCN	1997	WGA-HRP, Anterograde, bilateral	KO	Floculus or Ventral Parafloculus	IL	Raphe Nuclei	2.00	
Nagao	JCN	1997	WGA-HRP, Anterograde, bilateral	KO	Floculus or Ventral Parafloculus	IL	NPP	2.00	
Nagao	JCN	1997	WGA-HRP,	KO	Floculus or Ventral	IL	Medial Vestibular	1.00	

			Anterograde, unilateral		Parafloculus		Nucleus (MMV)		
Nagao	JCN	1997	WGA-HRP, Anterograde, unilateral	KO	Floculus or Ventral Parafloculus	IL	Superior Vestibular Nucleus (SV)	2.00	
Nagao	JCN	1997	WGA-HRP, Anterograde	KO	Floculus or Ventral Parafloculus	IL	FL	0.00	
Nagao	JCN	1997	WGA-HRP, Anterograde, unilateral	KO	Floculus or Ventral Parafloculus	IL	y group	0.00	
Nagao	JCN	1997	WGA-HRP, Anterograde, unilateral	KO	Floculus or Ventral Parafloculus	IL	PIP	1.00	
Nagao	JCN	1997	WGA-HRP, Anterograde, unilateral	KO	Floculus or Ventral Parafloculus	IL	DE	1.00	
Nagao	JCN	1997	WGA-HRP, Anterograde, bilateral	SE	Floculus or Ventral Parafloculus	IL	PN	2.00	
Nagao	JCN	1997	WGA-HRP, Anterograde, bilateral	SE	Floculus or Ventral Parafloculus	IL	Raphe Nuclei	2.00	
Nagao	JCN	1997	WGA-HRP, Anterograde, bilateral	SE	Floculus or Ventral Parafloculus	IL	NPP	2.00	
Nagao	JCN	1997	anterograde, PHA-L, unilateral	SE	Floculus or Ventral Parafloculus	IL	Medial Vestibular Nucleus (MMV)	2.00	
Nagao	JCN	1997	anterograde, PHA-L, unilateral	SE	Floculus or Ventral Parafloculus	IL	Superior Vestibular Nucleus (SV)	1.00	
Nagao	JCN	1997	anterograde, PHA-L, unilateral	SE	Floculus or Ventral Parafloculus	IL	y group	1.00	
Nagao	JCN	1997	anterograde, PHA-L, unilateral	SE	Floculus or Ventral Parafloculus	IL	PIP	1.00	
Nagao	JCN	1997	anterograde, PHA-L, unilateral	SE	Floculus or Ventral Parafloculus	IL	DE	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	P10 & P6	DL Pontine Nuclei	CL	Inferior Olive	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	P10 & P6	DL Pontine Nuclei	CL	Dorsal Leaf of Prinicple Olive	1.00	

Glickstein	JCN	1994	WGA-HRP Retrograde	P10 & P6	DL Pontine Nuclei	CL	Ventral Leaf of Prinicple Olive	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	P10 & P6	DL Pontine Nuclei	CL	Medial Accessory Nucleus	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	P10 & P6	DL Pontine Nuclei	CL	Dorsal Accessory	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	P10 & P6	DL Pontine Nuclei	CL	DM Cell Column	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	P10 & P6	DL Pontine Nuclei	CL	Beta	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	P10 & P6	DL Pontine Nuclei	CL	Dorsal Cap	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	P10 & P6	DL Pontine Nuclei	CL	Ventral Cap	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	P10 & P6	DL Pontine Nuclei	CL	Superior Colliculus	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	P10 & P6	DL Pontine Nuclei	CL	Petrosal Lobule	3.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	P10 & P6	DL Pontine Nuclei	IL	Lobule VI	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	P10 & P6	DL Pontine Nuclei	IL	Lobule VII	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	P10 & P6	DL Pontine Nuclei	IL	Lobule VIII	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	P10 & P6	DL Pontine Nuclei	IL	Lobule IX	2.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	P10 & P6	DL Pontine Nuclei	IL	NRTP	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	P10 & P6	DL Pontine Nuclei	IL	Lobule VIH	0.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	P10 & P6	DL Pontine Nuclei	IL	Lobule VIIH	2.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	P10 & P6	DL Pontine Nuclei	IL	Lobule VIIIH	2.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	P10 & P6	DL Pontine Nuclei	IL	Lobule IXH	2.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	P8	Dorsal Paraflocculus	CL	Pontine Nuclei	3.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	P8	Dorsal Paraflocculus	CL	Inferior Olive	0.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	P8	Dorsal Paraflocculus	CL	Dorsal Leaf of Prinicple Olive	3.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	P8	Dorsal Paraflocculus	CL	Ventral Leaf of Prinicple Olive	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	P8	Dorsal Paraflocculus	CL	Medial Accessory Nucleus	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	P8	Dorsal Paraflocculus	CL	Dorsal Accessory	3.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	P8	Dorsal Paraflocculus	CL	DM Cell Column	0.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	P8	Dorsal Paraflocculus	CL	Beta	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	P8	Dorsal Paraflocculus	CL	Dorsal Cap	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	P8	Dorsal Paraflocculus	CL	Ventral Cap	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	P8	Dorsal Paraflocculus	CL	Superior Colliculus	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	P8	Dorsal Paraflocculus	IL	Petrosal Lobule	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	P8	Dorsal Paraflocculus	IL	Lobule VI	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	P8	Dorsal Paraflocculus	IL	Lobule VII	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	P8	Dorsal Paraflocculus	IL	Lobule VIII	1.00	

Glickstein	JCN	1994	WGA-HRP Retrograde	P8	Dorsal Paraflocculus	IL	Lobule IX	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	P8	Dorsal Paraflocculus	CL	NRTP	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	P8	Dorsal Paraflocculus	IL	Lobule VIH	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	P8	Dorsal Paraflocculus	IL	Lobule VIIH	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	P8	Dorsal Paraflocculus	IL	Lobule VIIIH	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	P8	Dorsal Paraflocculus	IL	Lobule IXH	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	P9	Petrosal Lobule	CL	Pontine Nuclei	3.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	P9	Petrosal Lobule	CL	Inferior Olive	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	P9	Petrosal Lobule	CL	Dorsal Leaf of Prinicple Olive	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	P9	Petrosal Lobule	CL	Ventral Leaf of Prinicple Olive	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	P9	Petrosal Lobule	CL	Medial Accessory Nucleus	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	P9	Petrosal Lobule	CL	Dorsal Accessory	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	P9	Petrosal Lobule	CL	DM Cell Column	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	P9	Petrosal Lobule	CL	Beta	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	P9	Petrosal Lobule	CL	Dorsal Cap	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	P9	Petrosal Lobule	CL	Ventral Cap	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	P9	Petrosal Lobule	CL	Superior Colliculus	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	P9	Petrosal Lobule	IL	Petrosal Lobule	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	P9	Petrosal Lobule	IL	Lobule VI	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	P9	Petrosal Lobule	IL	Lobule VII	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	P9	Petrosal Lobule	IL	Lobule VIII	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	P9	Petrosal Lobule	IL	Lobule IX	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	P9	Petrosal Lobule	IL	NRTP	2.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	P9	Petrosal Lobule	IL	Lobule VIH	2.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	P9	Petrosal Lobule	IL	Lobule VIIH	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	P9	Petrosal Lobule	IL	Lobule VIIIH	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	P9	Petrosal Lobule	IL	Lobule IXH	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	UV1/UV2	Lobule X/Vermis	CL	Pontine Nuclei	2.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	UV1/UV2	Lobule X/Vermis	CL	Inferior Olive	2.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	UV1/UV2	Lobule X/Vermis	CL	Dorsal Leaf of Prinicple Olive	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	UV1/UV2	Lobule X/Vermis	CL	Ventral Leaf of Prinicple Olive	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	UV1/UV2	Lobule X/Vermis	CL	Medial Accessory Nucleus	1.00	

Glickstein	JCN	1994	WGA-HRP Retrograde	UV1/UV2	Lobule X/Vermis	CL	Dorsal Accessory	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	UV1/UV2	Lobule X/Vermis	CL	DM Cell Column	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	UV1/UV2	Lobule X/Vermis	CL	Beta	2.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	UV1/UV2	Lobule X/Vermis	CL	Dorsal Cap	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	UV1/UV2	Lobule X/Vermis	CL	Ventral Cap	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	UV1/UV2	Lobule X/Vermis	CL	Superior Colliculus	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	UV1/UV2	Lobule X/Vermis	IL	Petrosal Lobule	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	UV1/UV2	Lobule X/Vermis	IL	Lobule VI	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	UV1/UV2	Lobule X/Vermis	IL	Lobule VII	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	UV1/UV2	Lobule X/Vermis	IL	Lobule VIII	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	UV1/UV2	Lobule X/Vermis	IL	Lobule IX	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	UV1/UV2	Lobule X/Vermis	CL	NRTP	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	UV1/UV2	Lobule X/Vermis	IL	Lobule VIH	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	UV1/UV2	Lobule X/Vermis	IL	Lobule VIIH	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	UV1/UV2	Lobule X/Vermis	IL	Lobule VIIIH	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	UV1/UV2	Lobule X/Vermis	IL	Lobule IXH	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	PMD1	Paramedian Lobule	CL	Pontine Nuclei	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	PMD1	Paramedian Lobule	CL	Inferior Olive	3.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	PMD1	Paramedian Lobule	CL	Dorsal Leaf of Prinicple Olive	2.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	PMD1	Paramedian Lobule	CL	Ventral Leaf of Prinicple Olive	2.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	PMD1	Paramedian Lobule	CL	Medial Accessory Nucleus	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	PMD1	Paramedian Lobule	CL	Dorsal Accessory	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	PMD1	Paramedian Lobule	CL	DM Cell Column	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	PMD1	Paramedian Lobule	CL	Beta	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	PMD1	Paramedian Lobule	CL	Dorsal Cap	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	PMD1	Paramedian Lobule	CL	Ventral Cap	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	PMD1	Paramedian Lobule	CL	Superior Colliculus	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	PMD1	Paramedian Lobule	IL	Petrosal Lobule	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	PMD1	Paramedian Lobule	CL	Lobule VI	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	PMD1	Paramedian Lobule	CL	Lobule VII	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	PMD1	Paramedian Lobule	CL	Lobule VIII	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	PMD1	Paramedian Lobule	CL	Lobule IX	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	PMD1	Paramedian Lobule	CL	NRTP	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	PMD1	Paramedian Lobule	IL	Lobule VIH	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	PMD1	Paramedian Lobule	IL	Lobule VIIH	1.00	

Glickstein	JCN	1994	WGA-HRP Retrograde	PMD1	Paramedian Lobule	IL	Lobule VIIIH	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	PMD1	Paramedian Lobule	IL	Lobule IXH	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	PMD2	Ventral Parafloculus	CL	Pontine Nuclei	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	PMD2	Ventral Parafloculus	CL	Inferior Olive	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	PMD2	Ventral Parafloculus	CL	Dorsal Leaf of Prinicple Olive	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	PMD2	Ventral Parafloculus	CL	Ventral Leaf of Prinicple Olive	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	PMD2	Ventral Parafloculus	CL	Medial Accessory Nucleus	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	PMD2	Ventral Parafloculus	CL	Dorsal Accessory	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	PMD2	Ventral Parafloculus	CL	DM Cell Column	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	PMD2	Ventral Parafloculus	CL	Beta	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	PMD2	Ventral Parafloculus	CL	Dorsal Cap	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	PMD2	Ventral Parafloculus	CL	Ventral Cap	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	PMD2	Ventral Parafloculus	CL	Superior Colliculus	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	PMD2	Ventral Parafloculus	IL	Petrosal Lobule	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	PMD2	Ventral Parafloculus	IL	Lobule VI	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	PMD2	Ventral Parafloculus	IL	Lobule VII	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	PMD2	Ventral Parafloculus	IL	Lobule VIII	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	PMD2	Ventral Parafloculus	IL	Lobule IX	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	PMD2	Ventral Parafloculus	CL	NRTP	3.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	PMD2	Ventral Parafloculus	IL	Lobule VIH	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	PMD2	Ventral Parafloculus	IL	Lobule VIIH	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	PMD2	Ventral Parafloculus	IL	Lobule VIIIH	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	PMD2	Ventral Parafloculus	CL	Lobule IXH	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	VPF2	Ventral Parafloculus	CL	Pontine Nuclei	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	VPF2	Ventral Parafloculus	CL	Inferior Olive	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	VPF2	Ventral Parafloculus	CL	Dorsal Leaf of Prinicple Olive	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	VPF2	Ventral Parafloculus	CL	Ventral Leaf of Prinicple Olive	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	VPF2	Ventral Parafloculus	CL	Medial Accessory Nucleus	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	VPF2	Ventral Parafloculus	CL	Dorsal Accessory	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	VPF2	Ventral Parafloculus	CL	DM Cell Column	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	VPF2	Ventral Parafloculus	CL	Beta	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	VPF2	Ventral Parafloculus	CL	Dorsal Cap	1.00	

Glickstein	JCN	1994	WGA-HRP Retrograde	VPF2	Ventral Paraflocculus	CL	Ventral Cap	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	VPF2	Ventral Paraflocculus	CL	Superior Colliculus	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	VPF2	Ventral Paraflocculus	IL	Petrosal Lobule	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	VPF2	Ventral Paraflocculus	IL	Lobule VI	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	VPF2	Ventral Paraflocculus	IL	Lobule VII	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	VPF2	Ventral Paraflocculus	IL	Lobule VIII	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	VPF2	Ventral Paraflocculus	IL	Lobule IX	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	VPF2	Ventral Paraflocculus	IL	NRTP	2.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	VPF2	Ventral Paraflocculus	IL	Lobule VIH	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	VPF2	Ventral Paraflocculus	IL	Lobule VIIH	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	VPF2	Ventral Paraflocculus	IL	Lobule VIIIH	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	VPF2	Ventral Paraflocculus	IL	Lobule IXH	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	FL1	Dorsal Paraflocculus	CL	Pontine Nuclei	2.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	FL1	Dorsal Paraflocculus	CL	Inferior Olive	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	FL1	Dorsal Paraflocculus	CL	Dorsal Leaf of Prinicple Olive	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	FL1	Dorsal Paraflocculus	CL	Ventral Leaf of Prinicple Olive	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	FL1	Dorsal Paraflocculus	CL	Medial Accessory Nucleus	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	FL1	Dorsal Paraflocculus	CL	Dorsal Accessory	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	FL1	Dorsal Paraflocculus	CL	DM Cell Column	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	FL1	Dorsal Paraflocculus	CL	Beta	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	FL1	Dorsal Paraflocculus	CL	Dorsal Cap	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	FL1	Dorsal Paraflocculus	CL	Ventral Cap	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	FL1	Dorsal Paraflocculus	CL	Superior Colliculus	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	FL1	Dorsal Paraflocculus	IL	Petrosal Lobule	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	FL1	Dorsal Paraflocculus	IL	Lobule VI	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	FL1	Dorsal Paraflocculus	IL	Lobule VII	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	FL1	Dorsal Paraflocculus	IL	Lobule VIII	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	FL1	Dorsal Paraflocculus	IL	Lobule IX	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	FL1	Dorsal Paraflocculus	IL	NRTP	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	FL1	Dorsal Paraflocculus	IL	Lobule VIH	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	FL1	Dorsal Paraflocculus	IL	Lobule VIIH	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	FL1	Dorsal Paraflocculus	IL	Lobule VIIIH	1.00	
Glickstein	JCN	1994	WGA-HRP Retrograde	FL1	Dorsal Paraflocculus	IL	Lobule IXH	1.00	
Evrard	JCN	2008	Retrograde - Cholera Toxin	M142	VlPv (contralateral)	CL	Dentate Nucleus	3.00	

			B/fluroescent Dextrans						
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M142	VlPv (contralateral)	CL	NIA	1.00	
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M142	VlPv (contralateral)	CL	NIP	1.00	
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M142	VlPv (contralateral)	CL	Fastigial Nucleus	1.00	
Evrard	JCN	2008	Cholera Toxin B/fluroescent Dextrans	M142	VlPv (ipsilateral)	CL	Dentate Nucleus	2.00	
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M142	VlPv (ipsilateral)	IL	NIA	1.00	
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M142	VlPv (ipsilateral)	IL	NIP	1.00	
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M142	VlPv (ipsilateral)	IL	Fastigial Nucleus	2.00	
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M178	VlPv (contralateral)	CL	Dentate Nucleus	3.00	
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M178	VlPv (contralateral)	CL	NIA	2.00	
Evrard	JCN	2008	Retrograde - Cholera Toxin	M178	VlPv (contralateral)	CL	NIP	1.00	

			B/fluroescent Dextrans						
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M178	VlPv (contralateral)	CL	Fastigial Nucleus	1.00	
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M178	VlPv (ipsilateral)	IL	Dentate Nucleus	2.00	
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M178	VlPv (ipsilateral)	IL	NIA	1.00	
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M178	VlPv (ipsilateral)	IL	NIP	1.00	
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M178	VlPv (ipsilateral)	IL	Fastigial Nucleus	1.00	
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M171	VlPv (contralateral)	CL	Dentate Nucleus	4.00	
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M171	VlPv (contralateral)	CL	NIA	1.00	
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M171	VlPv (contralateral)	CL	NIP	1.00	
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M171	VlPv (contralateral)	CL	Fastigial Nucleus	1.00	

Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M171	VlPv (ipsilateral)	IL	Dentate Nucleus	2.00	
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M171	VlPv (ipsilateral)	IL	NIA	1.00	
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M171	VlPv (ipsilateral)	IL	NIP	1.00	
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M171	VlPv (ipsilateral)	IL	Fastigial Nucleus	1.00	
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M208	VlPv (contralateral)	CL	Dentate Nucleus	4.00	
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M208	VlPv (contralateral)	CL	NIA	1.00	
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M208	VlPv (contralateral)	CL	NIP	0.00	
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M208	VlPv (contralateral)	CL	Fastigial Nucleus	1.00	
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M208	VlPv (ipsilateral)	IL	Dentate Nucleus	1.00	
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent	M208	VlPv (ipsilateral)	IL	NIA	1.00	

			Dextrans						
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M208	VlPv (ipsilateral)	IL	NIP	1.00	
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M208	VlPv (ipsilateral)	IL	Fastigial Nucleus	1.00	
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M187	VlPv (contralateral)	CL	Dentate Nucleus	3.00	
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M187	VlPv (contralateral)	CL	NIA	1.00	
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M187	VlPv (contralateral)	CL	NIP	1.00	
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M187	VlPv (contralateral)	CL	Fastigial Nucleus	1.00	
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M187	VlPv (ipsilateral)	IL	Dentate Nucleus	4.00	
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M187	VlPv (ipsilateral)	IL	NIA	1.00	
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M187	VlPv (ipsilateral)	IL	NIP	1.00	
Evrard	JCN	2008	Retrograde - Cholera	M187	VlPv (ipsilateral)	IL	Fastigial Nucleus	1.00	

			Toxin B/fluroescent Dextrans						
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M188	VlPv (contralateral)	CL	Dentate Nucleus	2.00	
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M188	VlPv (contralateral)	CL	NIA	1.00	
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M188	VlPv (contralateral)	CL	NIP	1.00	
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M188	VlPv (contralateral)	CL	Fastigial Nucleus	1.00	
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M188	VlPv (ipsilateral)	IL	Dentate Nucleus	1.00	
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M188	VlPv (ipsilateral)	IL	NIA	1.00	
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M188	VlPv (ipsilateral)	IL	NIP	1.00	
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M188	VlPv (ipsilateral)	IL	Fastigial Nucleus	1.00	
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M190	VlPv (contralateral)	CL	Dentate Nucleus	2.00	

Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M190	VlPv (contralateral)	CL	NIA	1.00	
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M190	VlPv (contralateral)	CL	NIP	1.00	
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M190	VlPv (contralateral)	CL	Fastigial Nucleus	1.00	
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M190	VlPv (ipsilateral)	IL	Dentate Nucleus	1.00	
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M190	VlPv (ipsilateral)	IL	NIA	1.00	
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M190	VlPv (ipsilateral)	IL	NIP	1.00	
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M190	VlPv (ipsilateral)	IL	Fastigial Nucleus	1.00	
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M200	VlPv (contralateral)	CL	Dentate Nucleus	3.00	
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M200	VlPv (contralateral)	CL	NIA	1.00	
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent	M200	VlPv (contralateral)	CL	NIP	1.00	

			Dextrans						
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M200	VlPv (contralateral)	CL	Fastigial Nucleus	1.00	
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M200	VlPv (ipsilateral)	IL	Dentate Nucleus	3.00	
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M200	VlPv (ipsilateral)	IL	NIA	1.00	
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M200	VlPv (ipsilateral)	IL	NIP	1.00	
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M200	VlPv (ipsilateral)	IL	Fastigial Nucleus	1.00	
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M179	VlPv (contralateral)	CL	Dentate Nucleus	3.00	
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M179	VlPv (contralateral)	CL	NIA	1.00	
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M179	VlPv (contralateral)	CL	NIP	1.00	
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M179	VlPv (contralateral)	CL	Fastigial Nucleus	1.00	
Evrard	JCN	2008	Retrograde - Cholera	M179	VlPv (ipsilateral)	IL	Dentate Nucleus	4.00	

			Toxin B/fluroescent Dextrans						
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M179	VlPv (ipsilateral)	IL	NIA	1.00	
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M179	VlPv (ipsilateral)	IL	NIP	1.00	
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M179	VlPv (ipsilateral)	IL	Fastigial Nucleus	1.00	
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M194	VlPv (contralateral)	CL	Dentate Nucleus	3.00	
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M194	VlPv (contralateral)	CL	NIA	1.00	
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M194	VlPv (contralateral)	CL	NIP	1.00	
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M194	VlPv (contralateral)	CL	Fastigial Nucleus	1.00	
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M194	VlPv (ipsilateral)	IL	Dentate Nucleus	2.00	
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M194	VlPv (ipsilateral)	IL	NIA	1.00	

Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M194	VlPv (ipsilateral)	IL	NIP	1.00	
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M194	VlPv (ipsilateral)	IL	Fastigial Nucleus	2.00	
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M206	VlPv (contralateral)	CL	Dentate Nucleus	4.00	
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M206	VlPv (contralateral)	CL	NIA	1.00	
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M206	VlPv (contralateral)	CL	NIP	1.00	
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M206	VlPv (contralateral)	CL	Fastigial Nucleus	1.00	
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M206	VlPv (ipsilateral)	IL	Dentate Nucleus	1.00	
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M206	VlPv (ipsilateral)	IL	NIA	1.00	
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent Dextrans	M206	VlPv (ipsilateral)	IL	NIP	1.00	
Evrard	JCN	2008	Retrograde - Cholera Toxin B/fluroescent	M206	VlPv (ipsilateral)	IL	Fastigial Nucleus	1.00	

			Dextrans						
Voogd	Arch Ital Biol	1991	Retrograde - WGA-HRP	Monkey MR8	Deiter's Nucleus & Vestibular Nuclei	IL	Lobule I	1.00	
Voogd	Arch Ital Biol	1991	Retrograde - WGA-HRP	Monkey MR9	Deiter's Nucleus & Vestibular Nuclei	IL	Lobule II	1.00	
Voogd	Arch Ital Biol	1991	Retrograde - WGA-HRP	Monkey MR10	Deiter's Nucleus & Vestibular Nuclei	IL	Lobule III	1.00	
Voogd	Arch Ital Biol	1991	Retrograde - WGA-HRP	Monkey MR11	Deiter's Nucleus & Vestibular Nuclei	IL	Lobule IV	1.00	
Voogd	Arch Ital Biol	1991	Retrograde - WGA-HRP	Monkey MR12	Deiter's Nucleus & Vestibular Nuclei	IL	Lobule V	1.00	
Voogd	Arch Ital Biol	1991	Retrograde - WGA-HRP	Monkey MR7	Deiter's Nucleus & Vestibular Nuclei	IL	Lobule I	1.00	
Voogd	Arch Ital Biol	1991	Retrograde - WGA-HRP	Monkey MR8	Deiter's Nucleus & Vestibular Nuclei	IL	Lobule II	1.00	
Voogd	Arch Ital Biol	1991	Retrograde - WGA-HRP	Monkey MR9	Deiter's Nucleus & Vestibular Nuclei	IL	Lobule III	2.00	
Voogd	Arch Ital Biol	1991	Retrograde - WGA-HRP	Monkey MR10	Deiter's Nucleus & Vestibular Nuclei	IL	Lobule IV	2.00	
Voogd	Arch Ital Biol	1991	Retrograde - WGA-HRP	Monkey MR11	Deiter's Nucleus & Vestibular Nuclei	IL	Lobule V	2.00	
Matute	EBR	1987	Anterograde	Monkey I	Cerebellar Cortex, Crus I, Crus II	CL	Inferior Olivary Complex	2.00	
Matute	EBR	1987	Anterograde	Monkey I	Cerebellar Cortex, Crus I, Crus II	CL	Dorsal Lamella	2.00	
Matute	EBR	1987	Anterograde	Monkey I	Cerebellar Cortex, Crus I, Crus II	CL	Ventral Lamella of (Prinicpal Olivary Nucleus)	2.00	
Matute	EBR	1987	Anterograde	Monkey I	Cerebellar Cortex, Crus I, Crus II	CL	Olivary Neuropil	1.00	
Matute	EBR	1987	Anterograde	Monkey I	Cerebellar Cortex, Crus I, Crus II	CL	Pontine Nuclei	1.00	
Matute	EBR	1987	Anterograde	Monkey I	Cerebellar Cortex, Crus I, Crus II	CL	Raphe Nuclei	1.00	
Matute	EBR	1987	Anterograde	Monkey I	Cerebellar Cortex, Crus I, Crus II	CL	Tegmentum	1.00	
Matute	EBR	1987	Anterograde	Monkey I	Cerebellar Cortex, Crus I, Crus II	CL	Trigeminal Nuclei	1.00	

Langer	JCN	1985	Retrograde	Barney	Rostral Half of Flocculus	IL	Vestibular Complex	4.00	
Langer	JCN	1985	Retrograde	Barney	Rostral Half of Flocculus	IL	Nucleus Prepositus Hypoglossi	4.00	
Langer	JCN	1985	Retrograde	Barney	Rostral Half of Flocculus	IL	Medial Vestibular Nuclei	3.00	
Langer	JCN	1985	Retrograde	Barney	Rostral Half of Flocculus	IL	Superior Vestibular Nuclei	2.00	
Langer	JCN	1985	Retrograde	Barney	Rostral Half of Flocculus	IL	Inferior Nuclei	2.00	
Langer	JCN	1985	Retrograde	Barney	Rostral Half of Flocculus	IL	Rostral Medulla	4.00	
Langer	JCN	1985	Retrograde	Barney	Rostral Half of Flocculus	IL	Abducens Nuclei	3.00	
Langer	JCN	1985	Retrograde	Barney	Rostral Half of Flocculus	IL	Nucleus Reticularis Tegmenti Pontis	3.00	
Langer	JCN	1985	Retrograde	Barney	Rostral Half of Flocculus	IL	Dorsal Cap of Koy	3.00	
Langer	JCN	1985	Retrograde	Barney	Rostral Half of Flocculus	IL	PN	1.00	
Langer	JCN	1985	Retrograde	Barney	Rostral Half of Flocculus	IL	Fastigial Nucleus	1.00	
Langer	JCN	1985	Retrograde	Barney	Rostral Half of Flocculus	IL	Emboliform Nuceli	1.00	
Langer	JCN	1985	Retrograde	Barney	Rostral Half of Flocculus	IL	Dentate Nucleus	1.00	
Langer	JCN	1985	Retrograde	Barney	Rostral Half of Flocculus	IL	Globose Nuclei	1.00	
Langer	JCN	1985	Retrograde	Barney	Rostral Half of Flocculus	IL	Lateral Cuneate Nucleus	3.00	
Langer	JCN	1985	Retrograde	Barney	Rostral Half of Flocculus	IL	Lateral Reticular Nucleus	2.00	
Langer	JCN	1985	Retrograde	Barney	Rostral Half of Flocculus	IL	Trigeminal Spinal Nucleus	2.00	
Langer	JCN	1985	Retrograde	Barney	Rostral Half of Flocculus	IL	Nucleus Intertrigeminalis	2.00	
Langer	JCN	1985	Retrograde	Barney	Rostral Half of Flocculus	IL	Y group	1.00	

Langer	JCN	1985	Retrograde	Barney	Rostral Half of Flocculus	IL	NRTP	3.00	
Langer	JCN	1985	Retrograde	Kaiser	Caudal Flocculus	IL	Flocculus	sparse	
Langer	JCN	1985	Retrograde	Kaiser	Caudal Flocculus	IL	Superior Olive	sparse	
Langer	JCN	1985	Retrograde	Kaiser	Caudal Flocculus	IL	Motor Nucleus of the Trigeminal Nerve	sparse	
Langer	JCN	1985	Retrograde	Kaiser	Caudal Flocculus	IL	Basal Interstitial Nucleus of Cerebellum	sparse	
Langer	JCN	1985	Retrograde	Kaiser	Caudal Flocculus	IL	Superior Vestibular Nuclei	sparse	
Langer	JCN	1985	Retrograde	Kaiser	Caudal Flocculus	IL	Lateral Vestibular Nucleus	sparse	
Langer	JCN	1985	Retrograde	Kaiser	Caudal Flocculus	IL	Medial Vestibular Nuclei	sparse	
Langer	JCN	1985	Retrograde	Kaiser	Caudal Flocculus	IL	Nucleus Prepositus Hypoglossi	dark	
Langer	JCN	1985	Retrograde	Kaiser	Caudal Flocculus	IL	Nucleus Reticularis gigantocellularis	sparse	
Langer	JCN	1985	Retrograde	Kaiser	Caudal Flocculus	IL	Nucleus paraphales	dark	
Langer	JCN	1985	Retrograde	Kaiser	Caudal Flocculus	IL	Spinal tract of trigeminal nerve	medium	
Langer	JCN	1985	Retrograde	Kaiser	Caudal Flocculus	IL	Nucleus reticularis Paramedian	medium	
Langer	JCN	1985	Retrograde	Kaiser	Caudal Flocculus	IL	Lateral Reticular Nucleus	medium	
Langer	JCN	1985	Retrograde	Kaiser	Caudal Flocculus	IL	NRTP	medium	
Langer	JCN	1985	Retrograde	Kaiser	Caudal Flocculus	IL	PN	medium	
May	JCN	1992	Retrograde -WGA-HRP	Case 1	Fastigial Nucleus	Bilateral	Supraoculomotor Area	3.00	
May	JCN	1992	Retrograde -WGA-HRP	Case 1	Fastigial Nucleus	Bilateral	Oculomotor nucleus	3.00	
May	JCN	1992	Retrograde -WGA-HRP	Case 2	Posterior Interposed Nucleus	Bilateral	Oculomotor nucleus	3.00	
May	JCN	1992	Retrograde -WGA-HRP	Case 2	Posterior Interposed Nucleus	Bilateral	Periaqueductal Grey (PG)	2.00	
May	JCN	1992	Retrograde -WGA-HRP	Case 2	Posterior Interposed Nucleus	Bilateral	Nucleus of Darkschewitsch	2.00	
May	JCN	1992	Retrograde -WGA-HRP	Case 2	Posterior Interposed Nucleus	Bilateral	Intersititial Nucleus of Cajal	2.00	
May	JCN	1992	Retrograde -WGA-HRP	Case 2	Posterior Interposed	Bilateral	Edinger-Westphal	2.00	

					Nucleus		Nucleus		
May	JCN	1992	Anterograde	Case 1	FN	Bilateral	Supraoculomotor Area	2.00	
May	JCN	1992	Anterograde	Case 1	FN	Bilateral	Oculomotor nucleus	2.00	
May	JCN	1992	Anterograde	Case 1	FN	Bilateral	Edinger-Westphal Nucleus	2.00	
May	JCN	1992	Anterograde	Case 1	Posterior Interposed Nucleus	Bilateral	Oculomotor nucleus	2.00	
May	JCN	1992	Anterograde	Case 2	Posterior Interposed Nucleus	Bilateral	Periaqueductal Grey (PG)	2.00	
May	JCN	1992	Anterograde	Case 2	Posterior Interposed Nucleus	Bilateral	Supraoculomotor Area	2.00	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB6L	DN/Fastigial	IL	VPLo	medium	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB6L	DN/Fastigial	IL	X	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB6L	DN/Fastigial	IL	Vlo	medium	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB6L	DN/Fastigial	IL	VLc	light	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB6L	DN/Fastigial	IL	PCn	light	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB6L	DN/Fastigial	IL	MD	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB6L	DN/Fastigial	IL	CM	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB6L	DN/Fastigial	Bilateral	Oculomotor nucleus	dark	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB6L	DN/Fastigial	CL	Ru	dark	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB6L	DN/Fastigial	IL	VPLs	medium	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB6L	DN/Fastigial	IL	PF	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB6L	DN/Fastigial	IL	Cl	dark	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB6L	DN/Fastigial	IL	LP	light	
Kalil	JCN	1982	Anterograde - TAA	MCB6L	DN/Fastigial	Bilateral	Nucleus of	2.00	

			(proline)				Darkschewitsch		
Kalil	JCN	1983	Anterograde - TAA (proline)	MCB6L	DN/Fastigial	Bilateral	Intersititial Nucleus of Cajal	2.00	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB6L	DN/Fastigial	IL	VPM	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB5	DN/Interpositus Nuclei	IL	VPLo	dark	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB5	DN/Interpositus Nuclei	IL	X	medium	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB5	DN/Interpositus Nuclei	IL	Vlo	medium	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB5	DN/Interpositus Nuclei	IL	VLc	sparse	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB5	DN/Interpositus Nuclei	IL	PCn	light	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB5	DN/Interpositus Nuclei	IL	MD	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB5	DN/Interpositus Nuclei	IL	CM	light	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB5	DN/Interpositus Nuclei	Bilateral	Oculomotor nucleus	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB5	DN/Interpositus Nuclei	CL	Ru	medium	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB5	DN/Interpositus Nuclei	IL	VPLc	sparse	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB5	DN/Interpositus Nuclei	IL	PF	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB5	DN/Interpositus Nuclei	IL	Cl	light	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB5	DN/Interpositus Nuclei	IL	LP	medium	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB6	DN/Interpositus Nuclei	Bilateral	Nucleus of Darkschewitsch	2.00	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB7	DN/Interpositus Nuclei	Bilateral	Intersititial Nucleus of Cajal	2.00	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB5	DN/Interpositus Nuclei	IL	VPM	none	
Kalil	JCN	1981	Anterograde - TAA	MVL21	DN/Interpositus	IL	VPLo	dark	

			(proline)		Nuclei				
Kalil	JCN	1981	Anterograde - TAA (proline)	MVL21	DN/Interpositus Nuclei	IL	X	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MVL21	DN/Interpositus Nuclei	IL	Vlo	dark	
Kalil	JCN	1981	Anterograde - TAA (proline)	MVL21	DN/Interpositus Nuclei	IL	VLc	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MVL21	DN/Interpositus Nuclei	IL	PCn	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MVL21	DN/Interpositus Nuclei	IL	MD	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MVL21	DN/Interpositus Nuclei	IL	CM	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MVL21	DN/Interpositus Nuclei	Bilateral	Oculomotor nucleus	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MVL21	DN/Interpositus Nuclei	CL	Ru	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MVL21	DN/Interpositus Nuclei	IL	VPLc	sparse	
Kalil	JCN	1981	Anterograde - TAA (proline)	MVL21	DN/Interpositus Nuclei	IL	PF	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MVL21	DN/Interpositus Nuclei	IL	Cl	light	
Kalil	JCN	1981	Anterograde - TAA (proline)	MVL21	DN/Interpositus Nuclei	IL	LP	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MVL22	DN/Interpositus Nuclei	Bilateral	Nucleus of Darkschewitsch	2.00	
Kalil	JCN	1981	Anterograde - TAA (proline)	MVL23	DN/Interpositus Nuclei	Bilateral	Intersitital Nucleus of Cajal	2.00	
Kalil	JCN	1981	Anterograde - TAA (proline)	MVL21	DN/Interpositus Nuclei	IL	VPM	light	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB4	DN	IL	VPLo	medium	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB4	DN	IL	X	medium	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB4	DN	IL	Vlo	sparse	
Kalil	JCN	1981	Anterograde - TAA	MCB4	DN	IL	VLc	light	

			(proline)						
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB4	DN	IL	PCn	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB4	DN	IL	MD	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB4	DN	IL	CM	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB4	DN	IL	Oculomotor nucleus		
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB4	DN	CL	Ru	dark	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB4	DN	IL	VPLc	light	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB4	DN	IL	PF	light	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB4	DN	IL	Cl	dark	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB4	DN	IL	LP	light	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB4	DN	IL	VPM	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB4	DN	IL	VLPs	dark	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB5	DN	Bilateral	Nucleus of Darkschewitsch	2.00	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB6	DN	Bilateral	Intersititial Nucleus of Cajal	2.00	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB4	DN	IL	VLm	medium	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB8	Fastigial Nucleus, Interpositus Nucleus	IL	VPLo	light	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB8	Fastigial Nucleus, Interpositus Nucleus	IL	X	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB8	Fastigial Nucleus, Interpositus Nucleus	IL	Vlo	medium	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB8	Fastigial Nucleus, Interpositus Nucleus	IL	VLc	none	
Kalil	JCN	1981	Anterograde - TAA	MCB8	Fastigial Nucleus,	IL	PCn	none	

			(proline)		Interpositus Nucleus				
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB8	Fastigial Nucleus, Interpositus Nucleus	IL	MD	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB8	Fastigial Nucleus, Interpositus Nucleus	IL	CM	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB8	Fastigial Nucleus, Interpositus Nucleus	Bilateral	Oculomotor nucleus	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB8	Fastigial Nucleus, Interpositus Nucleus	CL	Ru	medium	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB8	Fastigial Nucleus, Interpositus Nucleus	IL	VPLc	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB8	Fastigial Nucleus, Interpositus Nucleus	IL	PF	medium	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB8	Fastigial Nucleus, Interpositus Nucleus	IL	Cl	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB8	Fastigial Nucleus, Interpositus Nucleus	IL	LP	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB8	Fastigial Nucleus, Interpositus Nucleus	IL	VPM	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB8	Fastigial Nucleus, Interpositus Nucleus	IL	VLPs	medium	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB8	Fastigial Nucleus, Interpositus Nucleus	IL	VLm	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB8	Fastigial Nucleus, Interpositus Nucleus	Bilateral	Nucleus of Darkschewitsch	2.00	
Kalil	JCN	181	Anterograde - TAA (proline)	MCB10	Fastigial Nucleus, Interpositus Nucleus	Bilateral	Intersitital Nucleus of Cajal	2.00	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB8	Fastigial Nucleus, Interpositus Nucleus	IL	VPLo	medium	
Kalil	JCN	1981	Anterograde - TAA (proline)	MVL24	Fastigial Nucleus	IL	VPLo	medium	
Kalil	JCN	1981	Anterograde - TAA (proline)	MVL24	Fastigial Nucleus	IL	X	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MVL24	Fastigial Nucleus	IL	Vlo	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MVL24	Fastigial Nucleus	IL	VLc	none	
Kalil	JCN	1981	Anterograde - TAA	MVL24	Fastigial Nucleus	IL	PCn	none	

			(proline)						
Kalil	JCN	1981	Anterograde - TAA (proline)	MVL24	Fastigial Nucleus	IL	MD	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MVL24	Fastigial Nucleus	IL	CM	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MVL24	Fastigial Nucleus	Bilateral	Oculomotor nucleus	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MVL24	Fastigial Nucleus	CL	Ru	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MVL24	Fastigial Nucleus	IL	VPLc	light	
Kalil	JCN	1981	Anterograde - TAA (proline)	MVL24	Fastigial Nucleus	IL	PF	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MVL24	Fastigial Nucleus	IL	Cl	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MVL24	Fastigial Nucleus	IL	LP	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MVL24	Fastigial Nucleus	IL	VPM	light	
Kalil	JCN	1981	Anterograde - TAA (proline)	MVL24	Fastigial Nucleus	IL	VLPs	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MVL24	Fastigial Nucleus	IL	VLm	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MVL24	Fastigial Nucleus	IL	VPLo	medium	
Kalil	JCN	1981	Anterograde - TAA (proline)	MVL12	DCN	IL	VPLo	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MVL12	DCN	IL	X	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MVL12	DCN	IL	Vlo	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MVL12	DCN	IL	VLc	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MVL12	DCN	IL	PCn	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MVL12	DCN	IL	MD	none	
Kalil	JCN	1981	Anterograde - TAA	MVL12	DCN	IL	CM	none	

			(proline)						
Kalil	JCN	1981	Anterograde - TAA (proline)	MVL12	DCN	Bilateral	Oculomotor nucleus	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MVL12	DCN	CL	Ru	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MVL12	DCN	IL	VPLc	medium	
Kalil	JCN	1981	Anterograde - TAA (proline)	MVL12	DCN	IL	PF	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MVL12	DCN	IL	Cl	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MVL12	DCN	IL	LP	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MVL12	DCN	IL	VPM	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MVL12	DCN	IL	VLPs	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MVL12	DCN	IL	VLm	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MVL12	DCN	Bilateral	Nucleus of Darkschewitsch	2.00	
Kalil	JCN	1981	Anterograde - TAA (proline)	MVL12	DCN	Bilateral	Intersitital Nucleus of Cajal	2.00	
Kalil	JCN	1981	Anterograde - TAA (proline)	MVL12	DCN	IL	VPLc	dark	
Kalil	JCN	1981	Anterograde - TAA (proline)	MVL13	Cuneate Nucleus	IL	VPLo	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MVL13	Cuneate Nucleus	IL	X	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MVL13	Cuneate Nucleus	IL	Vlo	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MVL13	Cuneate Nucleus	IL	VLc	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MVL13	Cuneate Nucleus	IL	PCn	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MVL13	Cuneate Nucleus	IL	MD	none	
Kalil	JCN	1981	Anterograde - TAA	MVL13	Cuneate Nucleus	IL	CM	none	

			(proline)						
Kalil	JCN	1981	Anterograde - TAA (proline)	MVL13	Cuneate Nucleus	Bilateral	Oculomotor nucleus	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MVL13	Cuneate Nucleus	CL	Ru	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MVL13	Cuneate Nucleus	IL	VPLc	dark	
Kalil	JCN	1981	Anterograde - TAA (proline)	MVL13	Cuneate Nucleus	IL	PF	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MVL13	Cuneate Nucleus	IL	Cl	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MVL13	Cuneate Nucleus	IL	LP	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MVL13	Cuneate Nucleus	IL	VPM	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MVL13	Cuneate Nucleus	IL	VLPs	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MVL13	Cuneate Nucleus	IL	VLm	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MVL13	Cuneate Nucleus	IL	VPLc	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MVL13	Cuneate Nucleus	IL	VPI	dark	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB6R	DCN	IL	VPLo	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB6R	DCN	IL	X	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB6R	DCN	IL	Vlo	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB6R	DCN	IL	VLc	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB6R	DCN	IL	PCn	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB6R	DCN	IL	MD	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB6R	DCN	IL	CM	none	
Kalil	JCN	1981	Anterograde - TAA	MCB6R	DCN	Bilateral	Oculomotor nucleus	none	

			(proline)						
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB6R	DCN	CL	Ru	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB6R	DCN	IL	VPLc	dark	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB6R	DCN	IL	PF	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB6R	DCN	IL	Cl	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB6R	DCN	IL	LP	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB6R	DCN	IL	VPM	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB6R	DCN	IL	VLPs	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB6R	DCN	IL	VLm	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB6R	DCN	IL	VPLc	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB6R	DCN	Bilateral	Nucleus of Darkschewitsch	2.00	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB6R	DCN	Bilateral	Intersitital Nucleus of Cajal	2.00	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB6R	DCN	IL	VPI	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB1	DCN	IL	VPLo	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB1	DCN	IL	X	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB1	DCN	IL	Vlo	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB1	DCN	IL	VLc	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB1	DCN	IL	PCn	none	
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB1	DCN	IL	MD	none	
Kalil	JCN	1981	Anterograde - TAA	MCB1	DCN	IL	CM	none	

			(proline)							
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB1	DCN	Bilateral	Oculomotor nucleus	none		
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB1	DCN	CL	Ru	none		
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB1	DCN	IL	VPLc	medium		
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB1	DCN	IL	PF	none		
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB1	DCN	IL	Cl	none		
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB1	DCN	IL	LP	none		
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB1	DCN	IL	VPM	none		
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB1	DCN	IL	VLPs	none		
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB1	DCN	IL	VLm	none		
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB1	DCN	IL	VPLc	none		
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB2	DCN	Bilateral	Nucleus of Darkschewitsch	medium		
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB3	DCN	Bilateral	Intersititial Nucleus of Cajal	medium		
Kalil	JCN	1981	Anterograde - TAA (proline)	MCB1	DCN	IL	VPI	none		
Thach and Jones	Brain Research	1979	Anterograde - TAAA (proline and leucine)	CM56RL	DN	CL	Inferior Olivary Nucleus	1.00		
Thach and Jones	Brain Research	1979	Anterograde - TAAA (proline and leucine)	CM56RL	DN	CL	Nuclei reitcularis tegmenti pontis	1.00		
Thach and Jones	Brain Research	1979	Anterograde - TAAA (proline and leucine)	CM56RL	DN	CL	red nucleus	1.00		
Thach and Jones	Brain Research	1979	Anterograde - TAAA (proline	CM56RL	DN	CL	CL	1.00		

			and leucine)						
Thach and Jones	Brain Research	1979	Anterograde - TAAA (proline and leucine)	CM56RL	DN	CL	VPLo	3.00	
Thach and Jones	Brain Research	1979	Anterograde - TAAA (proline and leucine)	CM56RL	DN	CL	VLc	1.00	
Thach and Jones	Brain Research	1979	Anterograde - TAAA (proline and leucine)	CM56RL	DN	CL	VLo	3.00	
Thach and Jones	Brain Research	1979	Anterograde - TAAA (proline and leucine)	60R	DN	CL	VPLo	2.00	
Thach and Jones	Brain Research	1979	Anterograde - TAAA (proline and leucine)	60R	DN	CL	VLc	2.00	
Thach and Jones	Brain Research	1979	Anterograde - TAAA (proline and leucine)	57R	DN	CL	VPLO	2.00	
Carleton	Brain Res	1983	HRP (anterograde) & TAA (anterograde)	U133	LVN (center)	Bilateral	contralateral CCN	light	
Carleton	Brain Res	1983	HRP (anterograde) & TAA (anterograde)	U133	LVN (center)	Bilateral	LVN	none	
Carleton	Brain Res	1983	HRP (anterograde) & TAA (anterograde)	U133	LVN (center)	Bilateral	y	1.00	
Carleton	Brain Res	1983	HRP (anterograde) & TAA (anterograde)	U133	LVN (center)	Bilateral	dorsomedial RF	light	
Carleton	Brain Res	1983	HRP (anterograde) & TAA (anterograde)	U133	LVN (center)	Bilateral	MVN	light	
Carleton	Brain Res	1983	HRP (anterograde) & TAA (anterograde)	U133	LVN (center)	Bilateral	SVN	light	
Carleton	Brain Res	1983	HRP (anterograde) &	U133	LVN (center)	Bilateral	anterior lobe vermis	medium	

			TAA (anterograde)						
Carleton	Brain Res	1983	HRP (anterograde) & TAA (anterograde)	U133	LVN (center)	Bilateral	AN	medium	
Carleton	Brain Res	1983	HRP (anterograde) & TAA (anterograde)	U126	MVN	Bilateral	CCN	medium	
Carleton	Brain Res	1983	HRP (anterograde) & TAA (anterograde)	U126	MVN	Bilateral	NPP	medium	
Carleton	Brain Res	1983	HRP (anterograde) & TAA (anterograde)	U126	MVN	Bilateral	y	medium	
Carleton	Brain Res	1983	HRP (anterograde) & TAA (anterograde)	U126	MVN	Bilateral	SVN	medium	
Carleton	Brain Res	1983	HRP (anterograde) & TAA (anterograde)	U126	MVN	Bilateral	IVN	none	
Carleton	Brain Res	1983	HRP (anterograde) & TAA (anterograde)	U126	MVN	Bilateral	LVN	light	
Carleton	Brain Res	1983	HRP (anterograde) & TAA (anterograde)	U126	MVN	Bilateral	VI nucleus	medium	
Carleton	Brain Res	1983	HRP (anterograde) & TAA (anterograde)	U112	caudal IVN	Bilateral	f group	medium	
Carleton	Brain Res	1983	HRP (anterograde) & TAA (anterograde)	U112	caudal IVN	Bilateral	x group	medium	
Carleton	Brain Res	1983	HRP (anterograde) & TAA (anterograde)	U112	caudal IVN	Bilateral	nucleus B	medium	
Carleton	Brain Res	1983	HRP (anterograde) & TAA (anterograde)	U112	caudal IVN	Bilateral	dmcc	medium	

Carleton	Brain Res	1983	HRP (anterograde) & TAA (anterograde)	U112	caudal IVN	Bilateral	dc of the principle olive	medium	
Carleton	Brain Res	1983	HRP (anterograde) & TAA (anterograde)	U112	caudal IVN	Bilateral	TN	medium	
Carleton	Brain Res	1983	HRP (anterograde) & TAA (anterograde)	U112	caudal IVN	Bilateral	dorsal somatic cell column of the OMC	medium	
Carleton	Brain Res	1983	HRP (anterograde) & TAA (anterograde)	U112	caudal IVN	Bilateral	ipsilateral vermal cortex of the nodulus, uvula, anterior lobe	medium	
Carleton	Brain Res	1983	HRP (anterograde) & TAA (anterograde)	U116	LVN/parts of IVN	Bilateral	DCN	none	
Carleton	Brain Res	1983	HRP (anterograde) & TAA (anterograde)	U116	LVN/parts of IVN	Bilateral	VST (ipsilateral)	medium	
Carleton	Brain Res	1983	HRP (anterograde) & TAA (anterograde)	U116	LVN/parts of IVN	Bilateral	LRN	medium	
Carleton	Brain Res	1983	HRP (anterograde) & TAA (anterograde)	U116	LVN/parts of IVN	Bilateral	DPRN	0.00	
Carleton	Brain Res	1983	HRP (anterograde) & TAA (anterograde)	U116	LVN/parts of IVN	Bilateral	VPRN	0.00	
Carleton	Brain Res	1983	HRP (anterograde) & TAA (anterograde)	U116	LVN/parts of IVN	Bilateral	Lamina VIII	medium	
Carleton	Brain Res	1983	HRP (anterograde) & TAA (anterograde)	U116	LVN/parts of IVN	Bilateral	Lamina VII	medium	
Carleton	Brain Res	1983	HRP (anterograde) & TAA (anterograde)	U116	LVN/parts of IVN	Bilateral	NPP	medium	
Carleton	Brain Res	1983	HRP (anterograde) & TAA (anterograde)	U116	LVN/parts of IVN	Bilateral	nucleus B	light	

Carleton	Brain Res	1983	HRP (anterograde) & TAA (anterograde)	U116	LVN/parts of IVN	Bilateral	y group	none	
Carleton	Brain Res	1983	HRP (anterograde) & TAA (anterograde)	U116	LVN/parts of IVN	Bilateral	ispsilateral AN	light	
Carleton	Brain Res	1983	HRP (anterograde) & TAA (anterograde)	U176/U177	LVN	Bilateral	all vestibular nuclei	medium	
Carleton	Brain Res	1983	HRP (anterograde) & TAA (anterograde)	U176/U177	LVN	Bilateral	VST	medium	
Carleton	Brain Res	1983	HRP (anterograde) & TAA (anterograde)	U176/U177	LVN	Bilateral	LRN	medium	
Carleton	Brain Res	1983	HRP (anterograde) & TAA (anterograde)	U176/U177	LVN	Bilateral	laminae VIII	medium	
Carleton	Brain Res	1983	HRP (anterograde) & TAA (anterograde)	U176/U177	LVN	Bilateral	lamina VII	medium	
Carleton	Brain Res	1983	HRP (anterograde) & TAA (anterograde)	U176/U177	LVN	Bilateral	a motor neurons	none	
Asunama	Brain Research	1983	Anterograde - TAAA	CM100RT	Interposed Nucleus	CL	LD	none	
Asunama	Brain Research	1983	Anterograde - TAAA	CM100RT	Interposed Nucleus	CL	Vlo	none	
Asunama	Brain Research	1983	Anterograde - TAAA	CM100RT	Interposed Nucleus	CL	CM	none	
Asunama	Brain Research	1983	Anterograde - TAAA	CM100RT	Interposed Nucleus	CL	VPM	none	
Asunama	Brain Research	1983	Anterograde - TAAA	CM100RT	Interposed Nucleus	CL	VPI	light	
Asunama	Brain Research	1983	Anterograde - TAAA	CM100RT	Interposed Nucleus	CL	VMb	none	
Asunama	Brain Research	1983	Anterograde - TAAA	CM100RT	Interposed Nucleus	IL	SG	none	
Asunama	Brain Research	1983	Anterograde - TAAA	CM100RT	Interposed Nucleus	CL	PI	none	
Asunama	Brain Research	1983	Anterograde - TAAA	CM100RT	Interposed Nucleus	CL	LP	none	
Asunama	Brain Research	1983	Anterograde - TAAA	CM100RT	Interposed Nucleus	CL	LD	none	
Asunama	Brain Research	1983	Anterograde - TAAA	CM100RT	Interposed Nucleus	CL	VLc	light - sparse	
Asunama	Brain Research	1983	Anterograde - TAAA	CM100RT	Interposed Nucleus	CL	VPLo	light - sparse	
Asunama	Brain Research	1983	Anterograde - TAAA	CM100RT	Interposed Nucleus	CL	X	none	
Asunama	Brain Research	1983	Anterograde - TAAA	CM100RT	Interposed Nucleus	CL	CL	light	

Asunama	Brain Research	1983	Anterograde - TAAA	CM122	Dorsal Column Nuclei	CL	VLc	dark	
Asunama	Brain Research	1983	Anterograde - TAAA	CM122	Dorsal Column Nuclei	IL	VPLo	dark	
Asunama	Brain Research	1983	Anterograde - TAAA	CM122	Dorsal Column Nuclei	CL	Vlo	none	
Asunama	Brain Research	1983	Anterograde - TAAA	CM122	Dorsal Column Nuclei	CL	Lp	none	
Asunama	Brain Research	1983	Anterograde - TAAA	CM122	Dorsal Column Nuclei	CL	PI	none	
Asunama	Brain Research	1983	Anterograde - TAAA	CM122	Dorsal Column Nuclei	CL	VPLC	dark	
Asunama	Brain Research	1983	Anterograde - TAAA	CM122	Dorsal Column Nuclei	CL	VPM	none	
Asunama	Brain Research	1983	Anterograde - TAAA	CM122	Dorsal Column Nuclei	CL	VPI	light	
Asunama	Brain Research	1983	Anterograde - TAAA	CM122	Dorsal Column Nuclei	CL	ZI	light - sparse	
Asunama	Brain Research	1983	Anterograde - TAAA	CM122	Dorsal Column Nuclei	CL	Po	none	
Asunama	Brain Research	1983	Anterograde - TAAA	CM122	Dorsal Column Nuclei	IL	SG/Li	none	
Asunama	Brain Research	1983	Anterograde - TAAA	CM122	Dorsal Column Nuclei	CL	CM	none	
Asunama	Brain Research	1983	Anterograde - TAAA	CM 111	Deep Cerebellar Nuclei	CL	VLC	medium	
Asunama	Brain Research	1983	Anterograde - TAAA	CM111	Deep Cerebellar Nuclei	CL	VLo	none	
Asunama	Brain Research	1983	Anterograde - TAAA	CM111	Deep Cerebellar Nuclei	CL	VPLo	medium	
Asunama	Brain Research	1983	Anterograde - TAAA	CM111	Deep Cerebellar Nuclei	CL	CL	light	
Asunama	Brain Research	1983	Anterograde - TAAA	CM111	Deep Cerebellar Nuclei	CL	LP	none	
Asunama	Brain Research	1983	Anterograde - TAAA	CM111	Deep Cerebellar Nuclei	CL	VPM	none	
Asunama	Brain Research	1983	Anterograde - TAAA	CM111	Deep Cerebellar Nuclei	CL	VPI	light - sparse	

Asunama	Brain Research	1983	Anterograde - TAAA	CM111	Deep Cerebellar Nuclei	IL	Sg	medium	
Asunama	Brain Research	1983	Anterograde - TAAA	CM111	Deep Cerebellar Nuclei	CL	Mc	none	
Asunama	Brain Research	1983	Anterograde - TAAA	CM111	Deep Cerebellar Nuclei	CL	GM	none	
Asunama	Brain Research	1983	Anterograde - TAAA	CM111	Deep Cerebellar Nuclei	CL	PI	none	
Asunama	Brain Research	1983	Anterograde - TAAA	CM98	Vestibular Nuclei	CL	NS	none	
Asunama	Brain Research	1983	Anterograde - TAAA	CM98	Vestibular Nuclei	CL	g	none	
Asunama	Brain Research	1983	Anterograde - TAAA	CM98	Vestibular Nuclei	CL	EC	none	
Asunama	Brain Research	1983	Anterograde - TAAA	CM98	Vestibular Nuclei	CL	Vsp	light - sparse	
Asunama	Brain Research	1983	Anterograde - TAAA	CM98	Vestibular Nuclei	CL	Am	none	
Asunama	Brain Research	1983	Anterograde - TAAA	CM98	Vestibular Nuclei	CL	IO	light	
Asunama	Brain Research	1983	Anterograde - TAAA	CM98	Vestibular Nuclei	CL	XII	none	
Asunama	Brain Research	1983	Anterograde - TAAA	CM98	Vestibular Nuclei	CL	X	none	
Asunama	Brain Research	1983	Anterograde - TAAA	CM98	Vestibular Nuclei	CL	PPH	none	
Asunama	Brain Research	1983	Anterograde - TAAA	CM98	Vestibular Nuclei	CL	MLF	none	
Asunama	Brain Research	1983	Anterograde - TAAA	CM98	Vestibular Nuclei	CL	Vsp	none	
Asunama	Brain Research	1983	Anterograde - TAAA	CM98	Vestibular Nuclei	CL	Am	none	
Asunama	Brain Research	1983	Anterograde - TAAA	CM98	Vestibular Nuclei	CL	ICP	none	
Asunama	Brain Research	1983	Anterograde - TAAA	CM98	Vestibular Nuclei	CL	VesD	light	
Asunama	Brain Research	1983	Anterograde - TAAA	CM98	Vestibular Nuclei	CL	VesM	none	
Asunama	Brain Research	1983	Anterograde - TAAA	CM98	Vestibular Nuclei	CL	LD	none	
Asunama	Brain Research	1983	Anterograde - TAAA	CM98	Vestibular Nuclei	CL	SM	none	
Asunama	Brain Research	1983	Anterograde - TAAA	CM98	Vestibular Nuclei	CL	CL	light	
Asunama	Brain Research	1983	Anterograde - TAAA	CM98	Vestibular Nuclei	CL	PC	none	
Asunama	Brain Research	1983	Anterograde - TAAA	CM98	Vestibular Nuclei	CL	Re	none	
Asunama	Brain Research	1983	Anterograde - TAAA	CM98	Vestibular Nuclei	CL	VPO	none	
Asunama	Brain Research	1983	Anterograde - TAAA	CM98	Vestibular Nuclei	CL	VPLO	light -sparse	
Asunama	Brain Research	1983	Anterograde - TAAA	CM98	Vestibular Nuclei	CL	Vlo	none	
Asunama	Brain Research	1983	Anterograde - TAAA	CM98	Vestibular Nuclei	CL	VLc	none	
Asunama	Brain Research	1983	Anterograde - TAAA	CM98	Vestibular Nuclei	CL	VMb	none	
Asunama	Brain Research	1983	Anterograde - TAAA	CM98	Vestibular Nuclei	CL	SM	none	
Asunama	Brain Research	1983	Anterograde - TAAA	CM98	Vestibular Nuclei	CL	CL	light	
Asunama	Brain Research	1983	Anterograde - TAAA	CM98	Vestibular Nuclei	CL	THI	none	
Kitazawa	Neuro Letters	2009	Retrograde - CTB	IW	Lobule VII	CL	MAO Cell Group a	0.00	
Kitazawa	Neuro Letters	2009	Retrograde - CTB	IW	Lobule VII	CL	MAO Cell Group B	0.00	

Kitazawa	Neuro Letters	2009	Retrograde - CTB	IW	Lobule VII	CL	MAO Cell Group C	0.00	
Kitazawa	Neuro Letters	2009	Retrograde - CTB	IW	Lobule VII	CL	MAO Cell Group D and E	1.00	
Kitazawa	Neuro Letters	2009	Retrograde - CTB	IW	Lobule VII	CL	MAO Cell Group F	0.00	
Kitazawa	Neuro Letters	2009	Retrograde - CTB	IW	Lobule VII	CL	DAO	0.00	
Kitazawa	Neuro Letters	2009	Retrograde - CTB	IW	Lobule VII	CL	PO	1.00	
Kitazawa	Neuro Letters	2009	Retrograde - FB	LE	Vermal Lobule VII	CL	MAO Cell Group a	1.00	
Kitazawa	Neuro Letters	2009	Retrograde - FB	LE	Vermal Lobule VII	CL	MAO Cell Group B	2.00	
Kitazawa	Neuro Letters	2009	Retrograde - FB	LE	Vermal Lobule VII	CL	MAO Cell Group C	2.00	
Kitazawa	Neuro Letters	2009	Retrograde - FB	LE	Vermal Lobule VII	CL	MAO Cell Group D and E	0.00	
Kitazawa	Neuro Letters	2009	Retrograde - FB	LE	Vermal Lobule VII	CL	MAO Cell Group F	2.00	
Kitazawa	Neuro Letters	2009	Retrograde - FB	LE	Vermal Lobule VII	CL	DAO	1.00	
Kitazawa	Neuro Letters	2009	Retrograde - FB	LE	Vermal Lobule VII	CL	PO	0.00	
Kitazawa	Neuro Letters	2009	Retrograde - FB	JA	Vermal Lobule VII	CL	MAO Cell Group a	1.00	
Kitazawa	Neuro Letters	2009	Retrograde - FB	JA	Vermal Lobule VII	CL	MAO Cell Group B	1.00	
Kitazawa	Neuro Letters	2009	Retrograde - FB	JA	Vermal Lobule VII	CL	MAO Cell Group C	1.00	
Kitazawa	Neuro Letters	2009	Retrograde - FB	JA	Vermal Lobule VII	CL	MAO Cell Group D and E	0.00	
Kitazawa	Neuro Letters	2009	Retrograde - FB	JA	Vermal Lobule VII	CL	MAO Cell Group F	1.00	
Kitazawa	Neuro Letters	2009	Retrograde - FB	JA	Vermal Lobule VII	CL	DAO	0.00	
Kitazawa	Neuro Letters	2009	Retrograde - FB	JA	Vermal Lobule VII	CL	PO	0.00	
Kitazawa	Neuro Letters	2009	Retrograde - FB	YU	Vermal Lobule VII	CL	MAO Cell Group a	1.00	
Kitazawa	Neuro Letters	2009	Retrograde - FB	YU	Vermal Lobule VII	CL	MAO Cell Group B	1.00	
Kitazawa	Neuro Letters	2009	Retrograde - FB	YU	Vermal Lobule VII	CL	MAO Cell Group C	1.00	
Kitazawa	Neuro Letters	2009	Retrograde - FB	YU	Vermal Lobule VII	CL	MAO Cell Group D and E	0.00	
Kitazawa	Neuro Letters	2009	Retrograde - FB	YU	Vermal Lobule VII	CL	MAO Cell Group F	0.00	
Kitazawa	Neuro Letters	2009	Retrograde - FB	YU	Vermal Lobule VII	CL	DAO	1.00	
Kitazawa	Neuro Letters	2009	Retrograde - FB	YU	Vermal Lobule VII	CL	PO	0.00	
Chan-Palay	N/A	1977	Retrograde - HRP	JH 7540	Dentate Nucleus	Bilateral	Pontine Nuclei	3.00	
Chan-Palay	N/A	1977	Retrograde - HRP	JH 7540	Dentate Nucleus	CL	Inferior Olivary Nucleus	4.00	
Chan-Palay	N/A	1977	Retrograde - HRP	JH 7540	Dentate Nucleus	Bilateral	Paramedian Reticular Nucleus	0.00	
Chan-Palay	N/A	1977	Retrograde - HRP	JH 7540	Dentate Nucleus	Bilateral	Gracile Nucleus	0.00	
Chan-Palay	N/A	1977	Retrograde - HRP	JH 7540	Dentate Nucleus	Bilateral	Cuneate Nucleus	0.00	
Chan-Palay	N/A	1977	Retrograde - HRP	JH 7540	Dentate Nucleus	Bilateral	Oculomotor nucleus	0.00	
Chan-Palay	N/A	1977	Retrograde - HRP	JH 7540	Dentate Nucleus	Bilateral	MAO	2.00	

Chan-Palay	N/A	1977	Retrograde - HRP	JH 7540	Dentate Nucleus	Bilateral	RTN	3.00	
Chan-Palay	N/A	1977	Retrograde - HRP	JH 7540	Dentate Nucleus	Bilateral	LRN	1.00	
Chan-Palay	N/A	1977	Retrograde - HRP	JH 7540	Dentate Nucleus	IL	NPS	1.00	
Chan-Palay	N/A	1977	Retrograde - HRP	JH 7540	Dentate Nucleus	IL	Abducens Nuclei	1.00	
Chan-Palay	N/A	1977	Retrograde - HRP	JH 7540	Dentate Nucleus	Bilateral	Principal sensory N. V.	2.00	
Chan-Palay	N/A	1977	Retrograde - HRP	JH 7540	Dentate Nucleus	Bilateral	N. spinal tract V	2.00	
Chan-Palay	N/A	1977	Retrograde - HRP	JH 7540	Dentate Nucleus	Bilateral	Locus Ceruleus	2.00	
Chan-Palay	N/A	1977	Retrograde - HRP	JH 7540	Dentate Nucleus	CL	Nucleus Medialis anuuli aqueductus	1.00	
Chan-Palay	N/A	1977	Retrograde - HRP	JH 7540	Dentate Nucleus	CL	Motor N. V.	2.00	
Chan-Palay	N/A	1977	Retrograde - HRP	JH 7540	Dentate Nucleus	Bilateral	Raphe Nuclei	1.00	
Chan-Palay	N/A	1977	Retrograde - HRP	JH 7539	Dentate Nucleus	IL	Pontine Nuclei	1.00	
Chan-Palay	N/A	1977	Retrograde - HRP	JH 7539	Dentate Nucleus	CL	MAO	1.00	
Chan-Palay	N/A	1977	Retrograde - HRP	JH 7539	Dentate Nucleus	Bilateral	Locus Ceruleus	3.00	
Chan-Palay	N/A	1977	Retrograde - HRP	JH 7539	Dentate Nucleus	IL	Raphe dorsalis	1.00	
Chan-Palay	N/A	1977	Retrograde - HRP	JH 7539	Dentate Nucleus	Bilateral	Dorsal Motor Nucleus of X	3.00	
Chan-Palay	N/A	1977	Retrograde - HRP	JH 7534	AIN	CL	Pontine Nuclei	1.00	
Chan-Palay	N/A	1977	Retrograde - HRP	JH 7534	AIN	CL	Principal Olivary Nucleus	1.00	
Chan-Palay	N/A	1977	Retrograde - HRP	JH 7534	AIN	IL	DAO	1.00	
Chan-Palay	N/A	1977	Retrograde - HRP	JH 7534	AIN	Bilateral	Mesencephalic nucleus of V	2.00	
Chan-Palay	N/A	1977	Retrograde - HRP	JH 7534	AIN	Bilateral	Locus Ceruleus	6+	
Chan-Palay	N/A	1977	Retrograde - HRP	JH 7534	AIN	Bilateral	Raphe dorsalis	2.00	
Chan-Palay	N/A	1977	Retrograde - HRP	JH 7534	AIN	Bilateral	Dorsal Motor Nucleus of X	4+	
Chan-Palay	N/A	1977	Retrograde - HRP	JH 7541	PIN	Bilateral	Pontine Nuclei	1.00	
Chan-Palay	N/A	1977	Retrograde - HRP	JH 7541	PIN	Bilateral	Mesencephalic nucleus of V	2.00	
Chan-Palay	N/A	1977	Retrograde - HRP	JH 7541	PIN	Bilateral	Locus Ceruleus	6+	
Chan-Palay	N/A	1977	Retrograde - HRP	JH 7541	PIN	Bilateral	Raphe dorsalis	1.00	
Chan-Palay	N/A	1977	Retrograde - HRP	JH 7541	PIN	Bilateral	Dorsal Motor Nucleus of X	6+	
Chan-Palay	N/A	1977	Retrograde - HRP	JH 7541	PIN	Bilateral	Nucleus Medialis anuuli aqueductus	1.00	
Chan-Palay	N/A	1977	Retrograde - HRP	JH 7541	PIN	CL	RTN	1.00	

Chan-Palay	N/A	1977	Retrograde - HRP	JH 7541	PIN	CL	Pontine Reticular nucleus, caudalis	1.00	
Chan-Palay	N/A	1977	Retrograde - HRP	JH 7541	PIN	CL	Paramedian Reticular Nucleus	1.00	
Chan-Palay	N/A	1977	Retrograde - HRP	JH 7541	PIN	Bilateral	Lateral Reticular Nulceus	4+	
Chan-Palay	N/A	1977	Retrograde - HRP	JH 7541	PIN	Bilateral	Ventral Reticular Nucleus	2.00	
Chan-Palay	N/A	1977	Retrograde - HRP	JH 7541	PIN	Bilateral	Parvocellular reticular nuclus	2.00	
Chan-Palay	N/A	1977	Retrograde - HRP	JH 7541	PIN	Bilateral	Mao	0.00	
Chan-Palay	N/A	1977	Retrograde - HRP	JH 7541	PIN	Bilateral	Dao	0.00	
Chan-Palay	N/A	1977	Retrograde - HRP	JH 7533	Lobule Iva	Bilateral	Pontine Nuclei	1.00	
Chan-Palay	N/A	1977	Retrograde - HRP	JH 7533	Lobule Iva	Bilateral	Principal Olivary Nucleus	0.00	
Chan-Palay	N/A	1977	Retrograde - HRP	JH 7533	Lobule Iva	CL	MAO	1.00	
Chan-Palay	N/A	1977	Retrograde - HRP	JH 7533	Lobule Iva	Bilateral	Mesencephalic nucleus of V	2.00	
Chan-Palay	N/A	1977	Retrograde - HRP	JH 7533	Lobule Iva	Bilateral	Locus Ceruleus	4.00	
Chan-Palay	N/A	1977	Retrograde - HRP	JH 7533	Lobule Iva	Bilateral	Dorsal Motor Nucleus of X	3.00	
Chan-Palay	N/A	1977	Retrograde - HRP	JH 7533	Lobule Iva	Bilateral	Substantia Nigra	5+	
Chan-Palay	N/A	1977	Retrograde - HRP	JH 7533	Lobule Iva	Bilateral	Median Eminescence	0.00	
Chan-Palay	N/A	1977	Retrograde - HRP	JH 7533	Lobule Iva	CL	Oculomotor nucleus	1.00	
Chan-Palay	N/A	1977	Retrograde - HRP	JH 7533	Lobule Iva	Bilateral	Red Nucleus	1.00	
Chan-Palay	N/A	1977	Retrograde - HRP	JH 7533	Lobule Iva	Bilateral	Nucleus aqueductus annuli	2.00	
Chan-Palay	N/A	1977	Retrograde - HRP	JH 7533	Lobule Iva	Bilateral	RTN	2.00	
Chan-Palay	N/A	1977	Retrograde - HRP	JH 7533	Lobule Iva	Bilateral	Parvocellular reticular nuceus	2.00	
Chan-Palay	N/A	1977	Retrograde - HRP	JH 7533	Lobule Iva	Bilateral	Magnocellular reticular nuecleus	1.00	
Chan-Palay	N/A	1977	Retrograde - HRP	JH 7533	Lobule Iva	Bilateral	Mesenephalic reticular nucleus	2.00	
Chan-Palay	N/A	1977	Retrograde - HRP	JH 7533	Lobule Iva	Bilateral	Pontine Reticular nucleus, oralis	2.00	
Chan-Palay	N/A	1977	Retrograde - HRP	JH 7533	Lobule Iva	Bilateral	Pontine Reticular nucleus, caudalis	1.00	

Chan-Palay	N/A	1977	Retrograde - HRP	JH 7533	Lobule Iva	Bilateral	Ventral Reticular Nucleus	1.00	
Chan-Palay	N/A	1977	Retrograde - HRP	JH 7533	Lobule Iva	Bilateral	Lateral Reticular Nulceus	3.00	
Chan-Palay	N/A	1977	Retrograde - HRP	JH 7533	Lobule Iva	Bilateral	Nucleus Tractus Solitarius	1.00	
Chan-Palay	N/A	1977	Anterograde - S-Methionine	JH 7548	Dentate Nucleus	CL	PPRF	3.00	
Chan-Palay	N/A	1977	Anterograde - S-Methionine	JH 7548	Dentate Nucleus	CL	RTN	2.00	
Chan-Palay	N/A	1977	Anterograde - S-Methionine	JH 7548	Dentate Nucleus	CL	Red Nucleus	3.00	
Chan-Palay	N/A	1977	Anterograde - S-Methionine	JH 7548	Dentate Nucleus	CL	Periaqueductal Grey (PG)	3.00	
Chan-Palay	N/A	1977	Anterograde - S-Methionine	JH 7548	Dentate Nucleus	CL	Interstitial Nucleus of Cajal	3.00	
Chan-Palay	N/A	1977	Anterograde - S-Methionine	JH 7548	Dentate Nucleus	CL	Nucleus of Darkschewitsch	3.00	
Chan-Palay	N/A	1977	Anterograde - S-Methionine	JH 7548	Dentate Nucleus	IL	Red Nucleus	1.00	
Chan-Palay	N/A	1977	Anterograde - S-Methionine	JH 7548	Dentate Nucleus	IL	Interstitial Nucleus of Cajal	1.00	
Chan-Palay	N/A	1977	Anterograde - S-Methionine	JH 7548	Dentate Nucleus	IL	Nucleus of Darkschewitsch	1.00	
Chan-Palay	N/A	1977	Anterograde - S-Methionine	JH 7548	Dentate Nucleus	CL	Area X	2.00	
Chan-Palay	N/A	1977	Anterograde - S-Methionine	JH 7548	Dentate Nucleus	CL	CL	3.00	
Chan-Palay	N/A	1977	Anterograde - S-Methionine	JH 7548	Dentate Nucleus	CL	VLc	2.00	
Chan-Palay	N/A	1977	Anterograde - S-Methionine	JH 7545	Dentate Nucleus	CL	Red Nucleus - parvocellular	3.00	
Chan-Palay	N/A	1977	Anterograde - S-Methionine	JH 7545	Dentate Nucleus	Bilateral	Periaqueductal Grey (PG)	2.00	
Chan-Palay	N/A	1977	Anterograde - S-Methionine	JH 7545	Dentate Nucleus	CL	Interstitial Nucleus of Cajal	2.00	
Chan-Palay	N/A	1977	Anterograde - S-Methionine	JH 7545	Dentate Nucleus	CL	VLPs	2.00	

Chan-Palay	N/A	1977	Anterograde - S-Methionine	JH 7545	Dentate Nucleus	Bilateral	CL	2.00	
Chan-Palay	N/A	1977	Anterograde - S-Methionine	JH 7545	Dentate Nucleus	CL	LP	2.00	
Chan-Palay	N/A	1977	Anterograde - S-Methionine	JH 7545	Dentate Nucleus	CL	VPM	2.00	
Chan-Palay	N/A	1977	Anterograde - S-Methionine	JH 7649	Dentate Nucleus	CL	Red Nucleus - magno	3.00	
Chan-Palay	N/A	1977	Anterograde - S-Methionine	JH 7652	Dentate Nucleus	CL	Red Nucleus - parvo	2.00	
Chan-Palay	N/A	1977	Anterograde - S-Methionine	JH 7652	Dentate Nucleus	CL	CL	3.00	
Chan-Palay	N/A	1977	Anterograde - S-Methionine	JH 7652	Dentate Nucleus	IL	VPLs	1.00	
Chan-Palay	N/A	1977	Anterograde - S-Methionine	JH 7652	Dentate Nucleus	IL	VLc	1.00	
Chan-Palay	N/A	1977	Anterograde - S-Methionine	JH 7652	Dentate Nucleus	IL	CL	1.00	
Chan-Palay	N/A	1977	Anterograde - S-Methionine	JH 7652	Dentate Nucleus	IL	VPM	3.00	
Chan-Palay	N/A	1977	Anterograde - S-Methionine	JH 7652	Dentate Nucleus	CL	VPLs	2.00	
Chan-Palay	N/A	1977	Anterograde - S-Methionine	JH 7652	Dentate Nucleus	CL	VLc	2.00	
Chan-Palay	N/A	1977	Anterograde - S-Methionine	JH 7652	Dentate Nucleus	CL	VPLs	3.00	
Chan-Palay	N/A	1977	Anterograde - S-Methionine	JH 7652	Dentate Nucleus	CL	VLc	2.00	
Chan-Palay	N/A	1977	Anterograde - S-Methionine	JH 7652	Dentate Nucleus	CL	CL	2.00	
Chan-Palay	N/A	1977	Anterograde - S-Methionine	JH 7652	Dentate Nucleus	CL	VPM	2.00	
Chan-Palay	N/A	1977	Anterograde - S-Methionine	JH 7652	Dentate Nucleus	CL	VPLs	2.00	
Chan-Palay	N/A	1977	Anterograde - S-Methionine	JH 7652	Dentate Nucleus	CL	VLc	2.00	
Chan-Palay	N/A	1977	Anterograde - S-Methionine	JH 7652	Dentate Nucleus	CL	Red Nucleus	3.00	

Batton	JCN	1977	TAA - Anterograde	not specified	FN	CL	LVN	3	
Batton	JCN	1977	TAA - Anterograde	not specified	FN	CL	IVN	3	
Batton	JCN	1977	TAA - Anterograde	not specified	FN	CL	MVN	1	
Batton	JCN	1977	TAA - Anterograde	not specified	FN	CL	SWN	0	
Batton	JCN	1977	TAA - Anterograde	not specified	FN	CL	NRG	3	
Batton	JCN	1977	TAA - Anterograde	not specified	FN	CL	Group F	3	
Batton	JCN	1977	TAA - Anterograde	not specified	FN	CL	Group X	3	
Batton	JCN	1977	TAA - Anterograde	not specified	FN	CL	Dorsal Paramedian Reticular	3	
Batton	JCN	1977	TAA - Anterograde	not specified	FN	CL	Lateral Reticular Nucleus	3	
Batton	JCN	1977	TAA - Anterograde	not specified	FN	CL	N Parasolitarious	3	
Batton	JCN	1977	TAA - Anterograde	not specified	FN	CL	RTN	1	
Batton	JCN	1977	TAA - Anterograde	not specified	FN	CL	PN	2	
Batton	JCN	1977	TAA - Anterograde	not specified	FN	CL	Spinal V	2	
Batton	JCN	1977	TAA - Anterograde	not specified	FN	IL	LVN	3	
Batton	JCN	1977	TAA - Anterograde	not specified	FN	IL	MVN	1	
Batton	JCN	1977	TAA - Anterograde	not specified	FN	IL	SVN	0	
Batton	JCN	1977	TAA - Anterograde	not specified	FN	IL	IVN	2	
Batton	JCN	1977	TAA - Anterograde	not specified	FN	IL	Group F	2	
Batton	JCN	1977	TAA - Anterograde	not specified	FN	IL	Group X	2	
Batton	JCN	1977	TAA - Anterograde	not specified	FN	IL	N Parasolitarious	1	
Batton	JCN	1977	TAA - Anterograde	not specified	FN	IL	NRG	1	
Batton	JCN	1977	TAA - Anterograde	not specified	FN	IL	Lateral Reticular Nucleus	0	
Batton	JCN	1977	TAA - Anterograde	not specified	FN	IL	Dorsal Paramedian Reticular	0	
Batton	JCN	1977	TAA - Anterograde	not specified	FN	CL	Suprageniculas	2	
Batton	JCN	1977	TAA - Anterograde	not specified	FN	IL	SC	2	
Batton	JCN	1977	TAA - Anterograde	not specified	FN	CL	SC	2	
Batton	JCN	1977	TAA - Anterograde	not specified	FN	IL	NPC	2	
Batton	JCN	1977	TAA - Anterograde	not specified	FN	CL	NPC	2	
Batton	JCN	1977	TAA - Anterograde	not specified	FN	CL	dorsal tegmental nucleus	2	
Batton	JCN	1977	TAA - Anterograde	not specified	FN	CL	VPL	3	
Batton	JCN	1977	TAA - Anterograde	not specified	FN	CL	VL	2	
Batton	JCN	1977	TAA - Anterograde	not specified	FN	CL	Vlo	2	
Batton	JCN	1977	TAA - Anterograde	not specified	FN	CL	Paracental	1	
Batton	JCN	1977	TAA - Anterograde	not specified	AIN	CL	RN	2	

Batton	JCN	1977	TAA - Anterograde	not specified	FN	IL	Lobule I	1	
Batton	JCN	1977	TAA - Anterograde	not specified	FN	IL	Lobule II	1	
Batton	JCN	1978	TAA - Anterograde	not specified	FN	IL	Lobule IV	1	
Batton	JCN	1979	TAA - Anterograde	not specified	FN	IL	Lobule V	1	
Batton	JCN	1980	TAA - Anterograde	not specified	FN	IL	Vermis Lobule IV	1	
Batton	JCN	1981	TAA - Anterograde	not specified	FN	IL	Vermis Lobule V	1	
Batton	JCN	1982	TAA - Anterograde	not specified	FN	IL	Vermis Lobule VI	1	
Batton	JCN	1983	TAA - Anterograde	not specified	AIN	CL	Red Nucleus	2	
Batton	JCN	1977	TAA - Anterograde	not specified	FN	IL	Lobule VI	1	
Batton	JCN	1977	TAA - Anterograde	not specified	AIN	CL	VLo	2	
Asuname et. Al	Brain Research	1983	TAA-Anterograde	var	DN	CL	NRTP	3	
Asuname et. Al	Brain Research	1983	TAA-Anterograde	var	DN	CL	IO principal	3	
Asuname et. Al	Brain Research	1983	TAA-Anterograde	var	DN	CL	dAO	0	
Asuname et. Al	Brain Research	1983	TAA-Anterograde	var	DN	CL	MAO	0	
Asuname et. Al	Brain Research	1983	TAA-Anterograde	var	DN	CL	oculomotor complex	0	
Asuname et. Al	Brain Research	1983	TAA-Anterograde	var	DN	CL	Spinal Cord	0	
Asuname et. Al	Brain Research	1983	TAA-Anterograde	var	NIA	CL	NRTP	3	
Asuname et. Al	Brain Research	1983	TAA-Anterograde	var	NIA	CL	IO princiipal	0	
Asuname et. Al	Brain Research	1983	TAA-Anterograde	var	NIA	CL	MAO	0	
Asuname et. Al	Brain Research	1983	TAA-Anterograde	var	NIA	CL	dAO	3	
Asuname et. Al	Brain Research	1983	TAA-Anterograde	var	NIP	CL	NRTP	3	
Asuname et. Al	Brain Research	1983	TAA-Anterograde	var	NIP	CL	IO princiipal	0	

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