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We dedicate this book to Kosta Theodore Paxinos and Anwen Angharad Williams.
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Preface

In the first four editions of this atlas, we relied on a coronal section set that had some significant limitations; the section frequency proved over time to be too wide, sections did not always appear at regular intervals, and a few damaged sections had been replaced with sections from another brain. The fifth edition is based on a new coronal set which includes 161 sections from a single brain at regular 120µm intervals. This edition of the atlas is not simply an incremental improvement on the previous edition, but a completely new and far more comprehensive map of the rat brain.

Although the fifth edition features a different coronal section set, readers can be assured that the stereotaxic coordinates in the new atlas match those in previous editions. We have increased the scope of the atlas by incorporating new anatomical concepts where appropriate, and have once again delineated and named some areas not previously recognised.

Over the past decade our efforts at mapping the brain have been greatly enhanced by the availability of sections stained with a wide range of different chemical markers. A further contribution to the accuracy of our maps has been the knowledge we have gained from comparative neuroanatomical studies. One of us (GP) has published atlases of the human (Paxinos and Huang, 1995; Mai et al. 2004), monkey (Paxinos et al. 2000), and mouse brain (Paxinos and Franklin, 2004), and both of us are part of a team that is in the final stages of preparing an atlas of the chicken brain (Puelles et al. in press). Each of these atlas projects has provided us with new insights that have enhanced our ability to interpret the anatomy of the rat brain.

Acknowledgements

We thank Hongqin Wang for outstanding technical assistance from the inception to the completion of the project. We are indebted to Lewis Tsalis for speed, accuracy and brilliance in construction of diagrams and designing this book; to Paul Halasz for his imagination in construction of the CD-ROM; to Julia Tsalis for accurate labelling of diagrams; to Hongmei Liu for technical assistance, and to Yvette Paxinos for the cover design.

We acknowledge with gratitude the intellectual contribution to delineations made by Yuri Koutcherov (hypothalamus), Konrad Talbot (hippocampus), Nicola Palomero-Gallagher and Karl Zilles (cortex), Brent Vogt (cingulate cortex), Jan Vogt (cerebellum, precerebellar nuclei and vestibular nuclei), George Alheid (basal forbrain), Pascal Carrive (periaqueductal gray and hypothalamus), Glenda Halliday (substantia nigra and VTA), Ellen Covey and Manolo Malmierca (auditory system), Joel Elmqvist (hypothalamus), Ann Goodchild and David Hopkins (rostroventral and caudoventral lateral medulla), Jose DeOlmos (amygdala), Henk Groenewegen (thalamus), Joseph Travers (orofacial motor nuclei), John Mitrofanis (zona incerta), Pierre-Yves Risold (septum), Miklos Palkovits (paralemniscal nuclei), Harvey Karten (pretectal area), Chip Gerfen (basal ganglia), Terry Furlong (hypothalamus), Jean Buettner-Ennever (oculomotor nuclei), Marina Bentivoglio (parafascicular nucleus).

George Paxinos acknowledges the support he has received from the Australian National Health and Medical Research Council (he holds an NHMRC Principal Research Fellowship), as well as assistance from the Clive and Vera Ramaciotti Foundation, the Rebecca Cooper Foundation, and the Brennan Foundation.

We have appreciated the intelligent and enthusiastic support from our Elsevier editor Johannes Menzel. His patience and consideration have made a real difference to the successful completion of this project. We also thank Maureen Twag and other Elsevier staff for their willingness to help in solving production problems.
Features of the Fifth Edition

- 161 coronal diagrams based on a single brain
- Diagrams spaced at constant 120 µm intervals giving scientists the most comprehensive and convenient atlas of the rat brain
- The most accurate stereotaxic reference system available
- Outlines of figures and brain structures in blue, but labels and leader lines in black for increased clarity of delineations
- All delineations re-examined in the light of recent findings
- Delineations of brain structures have been made with reference to sections stained for Nissl substance, AChE, parvalbumin, calbindin, calretinin, SMI-32, tyrosine hydroxylase, and NADPH diaphorase (Paxinos et al. 1999a,b)
- Extensive use was made of reference works, including the third edition of *The Rat Nervous System* (Paxinos, 2004) and other recent neuroanatomical literature
- Spinal cord drawings from the atlas of Molander and Grant (1995)
- Diagrams available on CD-ROM for printing.

Introduction

There are many reasons why the rat is the most commonly selected subject for research in mammalian neuroscience. First, rats are the right size: neither too small for accurate stereotaxic localization of discrete brain areas, nor too large for cost-effective laboratory management. Second, rats are generally hardy animals and are resistant to infections. Third, a number of inbred strains are available commercially, so that animals of consistent size can be used for stereotaxic procedures.

When the first edition of *The Rat Brain in Stereotaxic Coordinates* was published in 1982, it was the first atlas to be based on the flat skull position. It offered a choice of bregma, lambda, or the midpoint of the interaural line as the reference point. Although the coordinates were developed from study of adult male Wistar rats with weights ranging from 270 to 310 g, the atlas can be successfully used with male or female rats, with weights ranging from 250 to 350 g (Paxinos et al., 1985).

With each new edition of the atlas, we have attempted to improve the accuracy of our delineations and have incorporated new findings on brain anatomy. However, our work has been hampered by the fact that our original series of coronal sections suffered from a number of limitations. First of all, our primary sections series showed sections at 0.5 mm intervals, which is insufficient to adequately represent all major structures in the brain for modern research purposes. Although we later attempted to better illustrate some areas by using some intervening sections, we could never fully compensate for the wide section interval in the primary series. In addition, we lost some sections in some areas of the brain and were forced to interpolate sections from another brain to compensate for the missing sections.

We were aware that the only real solution to these problems was to replace the coronal section series with a new section set based on shorter intervals and with all sections taken from the one brain. The new coronal section series is
presented in the present (fifth) edition of the atlas. It shows diagrams of sections taken at regular intervals of 0.12 mm. Having constant intervals between the sections shown in the atlas diagrams eliminates one of the annoying features of many brain atlases – the fact that when the reader turns a page they do not know how far they have advanced along the prime axis. All sections are from the one brain.

The sections in our new coronal series were stained with cresyl violet or with methods to demonstrate AChE or NADPH diaphorase because we found that these three methods were compatible with using fresh (unfixed) tissue, a requirement for deriving an accurate stereotaxic grid. However, we consistently used other markers to confirm our delineations (Paxinos et al., 1999a, Paxinos et al., 1999b).

We have once again been greatly assisted by the suggestions of many colleagues in the delineation of structures. We welcome further advice that might improve the accuracy of our diagrams in the future. Please email us on g.paxinos@unsw.edu.au or c.watson@curtin.edu.au.

The present book will be followed by a comprehensive publication, which will include accompanying photographs and revised diagrams of sagittal and horizontal sections.

Methods

A fresh brain from a male 290 g Wistar rat was frozen, and coronal sections were cut at 40 mm thickness. The sections were cut at right angles to the horizontal plane joining bregma and lambda.

Stereotaxic surgery

We placed an anesthetized rat in a Kopf small-animal stereotaxic instrument, and the incisor bar was adjusted until the heights of lambda and bregma were equal. This flat-skull position was achieved when the incisor bar was lowered 3.3 ± 0.4 mm below horizontal zero (Table 1). Because the point of intersection of the lambdoid and sagittal sutures is variable, we have chosen to define lambda as the midpoint of the curve of best fit along the lambdoid suture (see skull diagram). This redefined reference point is considerably more reliable than the true lambda (the point of intersection of the sagittal and lambdoid sutures), and it is located 0.3 ± 0.3 mm anterior to the interaural line. We defined bregma as the point of intersection of the sagittal suture with the curve of best fit along the coronal suture. When the two sides of the coronal suture meet the sagittal suture at different points, bregma usually falls midway between the two junctions. The anteroposterior position of bregma was 9.1 ± 0.3 mm anterior to the coronal plane passing through the interaural line, but for the brain represented in this atlas bregma is deemed to lie at 9.0 mm. The top of the skull at bregma and lambda was 10.0 ± 0.2 mm dorsal to the interaural zero plane. To confirm the stereotaxic orientation of sections in the brain used for this atlas, reference needle tracks were made perpendicular to the horizontal and coronal planes. One horizontal needle insertions perpendicular to the coronal plane were made from the posterior of the brain at 4.0 mm above the interaural line and was 2.0 mm lateral to the midline. The reference track from the horizontal needle appears as a small hole in coronal sections.

Following surgery, the rat was decapitated and the whole head frozen on dry ice. The frozen skull was then prised off the frozen brain, and the brain was carefully mounted on the stage of microtome so that the sections would be cut in the coronal stereotaxic plane.

Every third section was used for preparation of the atlas diagrams, so that the interval between atlas diagrams is 0.12 mm. Exceptions to this rule are found in the region rostral to the rostrum of the corpus colossum (Interaural AP 11.28) and in the region of the medulla caudal to the inferior olive (Interaural AP -5.76 mm). In these two regions, sections were selected for presentation in the atlas at 0.24 mm intervals. Finally, the olfactory bulb is depicted at only three representative levels.
Histological methods

The ‘atlas’ sections were stained with either cresyl violet or the demonstration of AChE on an alternate basis, so that cresyl violet sections are 0.24 mm apart and AChE sections are also 0.24 mm apart. The two sections that intervene between each ‘atlas’ section were stained with cresyl violet or for the presence of AChE or NADPH diaphorase, according to the following sequence:

1. Cresyl violet ‘atlas’ section
2. AChE intervening section
3. NADPH intervening section
4. AChE ‘atlas’ section
5. Cresyl violet intervening section
6. NADPH diaphorase intervening sections

This sequence was repeated throughout the series of coronal section. This arrangement ensures that every ‘atlas’ section is accompanied by two adjacent sections, each of a different stain. For example, the ‘atlas’ AChE section described as number four above is preceded by an NADPH diaphorase section and followed by a cresyl violet section. This arrangement gave us maximum information for each ‘atlas’ section from the three stains. Staining was carried out on the same day as section cutting.

All sections, whether ‘atlas’ or intervening, were photographed on 4"x5" black and white negatives and printed on 36"x24" photographic paper. Each ‘atlas’ section was then covered with a sheet of ‘Mylar’ tracing film and outlines of structures were drawn in pencil. The final pencil drawings were scanned and then digitized using Adobe Illustrator.

Quality of Sections

In some cases, the sections were slightly stretched or compressed in the process of cutting and mounting on slides. We have compensated for this by constructing diagrams which represent, as best we can judge from the study of adjacent sections, the original shape of the brain section. In the worst cases, the ‘atlas’ section was so badly damaged that we have taken our drawing from an adjacent section.

Cresyl Violet Staining

Slides were immersed for 5 min in each of the following: xylene, xylene, 100% alcohol, 100% alcohol, 95% alcohol, and 70% alcohol. They were dipped in distilled water and stained in 0.5% cresyl violet for 15-30 min. They were differentiated in water for 3-5 min and then dehydrated through 70% alcohol, 95% alcohol, 100% alcohol, and 100% alcohol. They were then put in xylene and coverslipped.

To make 500 mL of 0.5% cresyl violet of about pH 3.9, mix 2.5 g of cresylecht violet (Chroma Gesellschaft, Postfach 11 10, D-73257, Kongen, Germany, Fax number: 49-7024-82660), 300 mL of water, 30 mL of 1.0 M sodium acetate (13.6 g of granular sodium acetate in 92 mL of water), and 170 mL of 1.0 M acetic acid (29 mL of glacial acetic acid added to 471 mL of water). Mix this solution for at least 7 days on a magnetic stirrer, then filter.

AChE Histochemistry

The method for the demonstration of AChE followed the procedures of Koelle and Friedenwald (1949) and Lewis (1961). Slides were incubated for 15 h in 100 mL of stock solution (see below) to which had been added 116 mg of S-acetylthiocholine iodide and 3.0 mg ethopropazine (May & Baker). The slides were rinsed with tap water and developed for 10 min in 1% sodium sulphide (1.0 g in 100 mL of water) at pH 7.5. They were then rinsed with water and immersed in 4% paraformaldehyde in phosphate buffer for 8 h, and then allowed to dry. Subsequently, they were dehydrated for 5 min in 100% alcohol, then immersed in xylene and coverslipped with Permount. The stock solution was a 50 mM sodium acetate buffer at pH 5.0 which was made 4.0 mM with respect to copper sulphate and 16 mM with respect to glycine. This was done by adding 6.8 g of sodium acetate, 1.0 g of
copper sulphate crystals, and 1.2 g of glycine to 1.0 L of water and lowering the pH to 5.0 with HCl. We found that fresh, unfixed tissue from the frozen brains showed a substantially stronger reaction for both stains than tissue fixed with formalin, paraformaldehyde, glutaraldehyde, or alcohol.

**NADPH diaphorase**

The sections were washed in phosphate buffer for 10 minutes and incubated in 10 ml of a phosphate buffer solution containing 0.0125% nitroblue tetrazolium, 0.05% NADPH, 0.5% Triton X-100, and 1 mM magnesium chloride. The pH of the solution was adjusted to 7.6. The sections were incubated at 4°C for 48 hours. The incubation was stopped with a wash in phosphate buffer.

**Photography and drawings**

**Photography**

The photographs of stained brain sections were taken with a Nikon Multiplot macrophotographic apparatus using 4"x5" Kodak Plus X film. High contrast paper was used to print the photographs of Nissl sections, whereas lower contrast paper was used to print the photographs of AChE and NADPH sections.

**Drawings**

Drawings, which later formed the basis of the figures, were made by tracing the photographs of sections. We drew only the right side of each section and derived the outline of structures on the left side by mirror image construction using Adobe Illustrator.

Fiber tracts in the drawings are outlined by solid lines, and nuclei and cell groups are outlined by broken lines. In general, each abbreviation is placed in the center of the structure to which it relates; where this is not possible, the abbreviation is placed alongside the structure and a leader line is used. The abbreviations for fiber tracts and fissures are almost always positioned on the left side of the figure, and the abbreviations for nuclei and other cell groups are generally positioned on the right side. The outlines of the ventricles and aqueduct are filled in with solid color.

**Stereotaxic Reference System**

The stereotaxic reference system is based on the flat skull position, in which bregma and lambda lie in the same coronal plane. Two coronal and two horizontal zero-reference planes are referred to in these drawings. One reference coronal plane cuts through bregma and the other cuts through the interaural line. Similarly, one horizontal plane is at the level of bregma on the top of the skull and the other is at the level of the interaural line. Lambda is usually located 0.3 mm anterior to the interaural line, and it can be used as an alternative reference point in conjunction with the dorsoventral coordinate of bregma. The position of the stereotaxic reference points and planes are indicated on the skull diagram. The stereotaxic reference grid shows 0.2 mm intervals.

**Drawings of coronal brain sections**

In each of the coronal drawings, the large number at the bottom left shows the anteroposterior distance of the section from the vertical coronal plane passing through the interaural line. The large number at bottom right shows the anteroposterior distance of the plate from a vertical coronal plane passing through bregma. Note that these two coronal planes are 10 mm apart, so the two numbers on any one plate add up to 10 mm. The small numbers on the left margin show the dorsoventral distance from the horizontal plane passing through the interaural line. The numbers on the right margin show the dorsoventral distance from the horizontal plane passing through bregma and lambda on the surface of the skull. The numbers on the top and bottom margins show the distance of structures from the midline sagittal plane.
Skull Diagram  Dorsal and lateral views of the skull of a 290 g Wistar rat. The positions of bregma, lambda and the plane of the interaural line are shown above the lateral view. The distance between the horizontal plane passing through the interaural line is shown on the right of the lateral view. The distance between the incisor bar and the horizontal plane passing through the interaural line is shown on the left of the lateral view. Lambda (midpoint of the curve of best fit along the lambdoid suture) is 0.3 mm anterior to the coronal plane passing through the interaural line.
Accuracy of the stereotaxic coordinates

In almost all cases, the potential error in defining the position of any point in the brain is less than 0.5 mm. Although we used medium-sized (average 290 g) male Wistar rats in the construction of this atlas, we recognize that researchers often use animals of different sex, strain, and weight. Because of this, we have estimated the error that may occur if this atlas is used with female Wistar rats, male hooded (Long Evans) rats, male Sprague Dawley rats of 300-g weight, juvenile (180 g) Wistar rats, and mature (436 g) Wistar rats. The results of these estimations are shown in Table 1 (reproduced from Paxinos et al., 1985).

Table 1  Craniometric and stereotaxic data (means + S.D.) for rats of different sex, strain and weight

<table>
<thead>
<tr>
<th>Subject</th>
<th>Mean weight (g)*</th>
<th>Mean AP I – B (mm)</th>
<th>Mean AP I – L (mm)</th>
<th>Mean DV I – B (mm)</th>
<th>Mean AP I – Acb (mm)**</th>
<th>Mean AP B – ac (mm)**</th>
<th>Mean AP I – 7n (mm)**</th>
<th>Mean AP I – incisor bar (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>'Atlas' Wistar</td>
<td>290</td>
<td>9.1 ± 0.3</td>
<td>0.3 ± 0.3</td>
<td>10.0 ± 0.2</td>
<td>11.7</td>
<td>0.0</td>
<td>-1.3</td>
<td>-3.3 ± 0.4</td>
</tr>
<tr>
<td>Coronal plates</td>
<td>300</td>
<td>9.2</td>
<td>0.2</td>
<td>10.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sagittal plates</td>
<td>270</td>
<td>8.9</td>
<td>0.0</td>
<td>10.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Horizontal plates</td>
<td>290</td>
<td>9.1</td>
<td>0.2</td>
<td>10.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female Wistar</td>
<td>282</td>
<td>9.3 ± 0.2</td>
<td>0.5 ± 0.3</td>
<td>10.0 ± 0.1</td>
<td>11.6</td>
<td>0.1</td>
<td>-1.2</td>
<td>-3.2 ± 0.5</td>
</tr>
<tr>
<td>Hooded</td>
<td>290</td>
<td>9.4 ± 0.4</td>
<td>0.3 ± 0.6</td>
<td>9.8 ± 0.2</td>
<td>11.9</td>
<td>0.0</td>
<td>-1.2</td>
<td>-3.9 ± 0.6</td>
</tr>
<tr>
<td>Sprague</td>
<td>299</td>
<td>9.0 ± 0.2</td>
<td>0.7 ± 0.2</td>
<td>10.1 ± 0.1</td>
<td>11.7</td>
<td>0.1</td>
<td>-1.2</td>
<td>-3.9 ± 0.5</td>
</tr>
<tr>
<td>Juvenile Wistar</td>
<td>180</td>
<td>7.7 ± 0.4</td>
<td>-0.4 ± 0.3</td>
<td>9.9 ± 0.2</td>
<td>10.2</td>
<td>-0.1</td>
<td>-1.6</td>
<td>-2.0 ± 0.4</td>
</tr>
<tr>
<td>Mature Wistar</td>
<td>436</td>
<td>9.7 ± 0.3</td>
<td>0.6 ± 0.3</td>
<td>10.7 ± 0.4</td>
<td>12.4</td>
<td>0.1</td>
<td>-0.8</td>
<td>-2.7 ± 0.3</td>
</tr>
</tbody>
</table>

* S.D.s ≤ 20g.
** S.D.s ≤ 0.4 mm.
ac, anterior commissure; Acb, accumbens nucleus; AP, anterior-posterior; B, bregma; DV, dorsal-ventral; 7n, facial nerve; I, interaural line; L, lambda.
Reprinted with permission from J. Neuroscience Methods. 13 (1985) 139-143.
and 9.7 mm in the mature rats (9.0 mm in 290-g male rats). Lambda is 0.4 mm posterior to the interaural line in the juvenile rats and 0.6 mm anterior to this line in the mature rats (0.3 mm anterior in 290-g rats). Unexpectedly, the dorsoventral distance between the interaural line and bregma for juvenile rats (9.9 mm) was almost the same as that of 290-g rats (10.0 mm). In the mature rats, the interaural line to bregma vertical distance was 10.7 mm. In female rats, as well as in hooded, juvenile (180 g), mature (436 g) and 290-g Wistar rats, bregma was found to be above the most forward crossing fibers of the anterior commissure. This is the point at which the posterior limbs of the anterior commissure appear. These data confirm the observation of Whishaw et al. (1977) that bregma is more stable than the interaural line for positioning of electrodes in brain structures close to, or anterior to, bregma. However, data from insertion of needles aimed at the level where the facial nerve leaves the facial genu show that the interaural reference point is more stable than bregma for localization of such posterior structures. Therefore, if juvenile or mature rats are used, greater accuracy can be achieved if bregma is used as the reference point for work with rostral structures and the interaural line for work with caudal structures.

A further improvement in accuracy can be obtained by taking into account the actual location of the accumbens nucleus and the genu of the facial nerve. In agreement with Slotnick and Brown (1980), we noticed that coordinates of structures were closer to target if the coordinates given by the interaural and bregma reference systems were averaged.

No atlas or stereotaxic instrument will compensate for using bregma and lambdoid points inappropriately. These reference skull marks for bregma is the midpoint of the curve of best fit along the coronal suture, and the reference skull mark for lambda is the midpoint of the curve of best fit along the lambdoid suture. These two reference marks are not necessarily the points of intersection of these sutures with the midline suture.

Nomenclature and the construction of abbreviations

The need for a stable neuroanatomical nomenclature to accurately and efficiently convey information between neuroscientists is obvious. However, many terms or abbreviations are still used to describe a single structure, and, in some cases, the same term or abbreviation is used for completely different structures. We urge all researchers to consider the merits of our system of nomenclature because it is systematic and derived after extensive consultations with neuroanatomy experts.

In considering the merit of a particular name over synonyms, we have chosen terms that have been ratified by modern usage, particularly usage by experts in that field. We have used anglicized versions of terms rather than older latinized versions wherever possible, and we have in all but a handful of cases avoided the use of eponyms.

Neuroscience communities concerned with different systems have developed identical abbreviations for completely different structures; for example SO may stand for both supraoptic nucleus and superior olive, SC for suprachiasmatic nucleus and superior colliculus, and IC for inferior colliculus and internal capsule. In dealing with the entire nervous system (as increasingly more researchers do) these parochial abbreviation schemes are serious obstacles to communication of data. An additional complication arises when homologous structures are nonetheless named or abbreviated differently in different species. We have made an effort to establish homologies and are using the same abbreviations for homologous structures in atlases of the rat (Paxinos and Watson, 1986), mouse (Franklin and Paxinos, 1996), monkey (Paxinos et al., 2000), human (Paxinos et al., 1990; Mai et al., 2004), and chicken (Puelles et al., in press).

The importance of following a logical system of abbreviations is shown by the fact that a term such as the accumbens nucleus can be (and probably has
been) abbreviated about 20 different ways. We used the abbreviation Acb in this as well as all our other atlases. We have adopted the same rule for other all other structures, and so we have maintained the same abbreviation across mammalian and avian species, homologies permitting.

Our abbreviations have been constructed on the basis of the following principles:

1. The abbreviations represent the order of words as spoken in English (e.g., DLG = dorsal lateral geniculate nucleus) rather than the order in which they appear in older latinised terms.

2. The general principle used in the abbreviations of the names of elements in the periodic table was followed: the capital letter representing the first letter of a word in a nucleus is followed by a lower case letter most characteristic of that word (not necessarily the second letter; e.g., Mg = magnesium; Rt = reticular thalamic nucleus).

3. All nuclei and other cell groupings (such as cortical areas) begin with a capital letter, except some cranial nerve nuclei which begin with a number followed by capital N (for ‘nucleus’). All fibre bundles begin with lower case letters except some cranial nerves which begin with a number followed by lower case n (for ‘nerve’). Thus, there is no necessity in for the letter “N” to been used to point out that a structure is a nucleus, except in the case of some cranial nerves. Similarly, there is no need for the letter “t” to be used to denote a fiber tracts.

4. Compound names of nuclei have a capital letter for each part (e.g., LPGi = lateral paragigantocellular nucleus).

5. If a word occurs in the names of a number of structures, it is almost always given the same abbreviation (e.g., Rt = reticular thalamic nucleus; RtTg = reticulotegmental nucleus of the pons). Exceptions to this rule are made for well-established abbreviations such as VTA.

6. Abbreviations of brain regions are omitted where the identity of the region in question is clear from its position (CMn = centromedian thalamic nucleus; not CMnTh).

7. Arabic numerals are used instead of Roman numerals in identifying cranial nerves and nuclei (as in the Berman, 1968, atlas), layers of the cortex, and layers of the spinal cord. While the spoken meaning is the same, the detection threshold is lower, ambiguity is reduced, and they are easier to position in small spaces available on diagrams.

To assist in the recognition of brain structures, the labels for cell groups are placed on the right hand side of the diagram, and the labels for fibre bundles and nerves are placed on the left hand side of the diagram. However, where structures are crowded, we have placed some cell group labels on the left hand side for reasons of clarity.

The basis of delineation of structures

For the fifth edition, we completely reviewed our delineations of all areas of the brain. Our primary guide was an extensive collection of histochemically stained sections (monoclonal antibodies and enzyme-based stains - Paxinos et al., 1999a,b). We have also made extensive use of other publications from our laboratory (Paxinos, 1995; Paxinos and Huang, 1995; Paxinos et al., 1994), the atlas prepared by Swanson (2004), as well as many authoritative studies published in major journals such as the Journal of Comparative Neurology.

We present below a brief account of the basis of delineation of structures. We have not repeated here the rationale for the delineation of structures presented in the second edition (Paxinos and Watson, 1996). Readers will be better able to judge the suitability of our delineations when our photographs are published as part of the comprehensive (three cardinal planes) edition of this atlas in 2005.
Olfactory System

Refer to Shipley et al. (2004) and de Olmos et al. (1978) for a general description of the olfactory system.

Intermediate endopiriform nucleus (IEn)

We have given this name to an area ventral to the dorsal endopiriform nucleus (DEn). Both DEn and IEn are deep to the piriform cortex. We previously included this area in DEn (RBSC4); Swanson sometimes calls it DEn and sometimes includes it in the deep layer of the piriform cortex. The cells in this area are relatively sparse and smaller than those in DEn. Both DEn and IEn are NADPH positive (Fig 88 Paxinos et al., 1999a), but IEn has parvalbumin positive elements (Fig 89 Paxinos et al., 1999a).

Basal Ganglia and Basal Forebrain

Refer to Heimer et al. (1995) and Gerfen (2004) for a general description of the basal ganglia and to de Olmos et al. (2004) for a discussion of the substantia innominata and extended amygdala. Immunoreactivity for parvalbumin and the neurofilament protein SMI-32 identifies the ventral pallidum (Paxinos et al., 1999a). We retained the term substantia innominata and identified dorsal, ventral (as in Grove, 1988), and basal components with the assistance of George Alheid. The basal component is marked by some positivity in tyrosine hydroxylase but is negative for SMI-32 (although surrounding areas are positive).

The concept of ventral pallidum, first proposed by Heimer and his associates, has been the guiding principle for structure/function relations of the basal forebrain (Barragan and Ferreyra-Moyano, 1995; Heimer et al., 1997).

The researchers at the University of Virginia and Universidad Nacional de Cordoba have carved out of the substantia innominata another big territory, the sublenticular extended amygdala (Alheid et al., 1995). Paxinos and Franklin (2001) have used the new scheme for their mouse brain atlas. We retained the name substantia innominata (for the part remaining after the territory of the ventral pallidum has been defined) in keeping with earlier editions of this atlas. The dorsal substantia innominata roughly corresponds to the sublenticular extended amygdala, central part, while the ventral substantia innominata corresponds to the sublenticular extended amygdala, medial part. The area previously called fundus striati resembles the striatum proper in some respects and the accumbens shell in others. Given that the use of the term fundus striati creates problems with primate homologues, we followed the advice of George Alheid and called it the lateral accumbens shell. The remaining accumbens is delineated in accordance with Zaborszky et al. (1985) and Heimer et al. (1991). We followed de Olmos et al. (1995) in the identification of the interstitial nucleus of the posterior limb of the anterior commissure (IPAC).

Substantia nigra

We used the primate terminology for the dorsal and ventral tiers of the substantia nigra and also for the part of the VTA which is called the parabrachial pigmented nucleus. The names of the primate SN subdivisions were developed earlier than those subsequently used in rodent studies, and the identified primate subdivisions are consistent with the degeneration patterns seen in Parkinson’s disease (Glenda Halliday, personal communication, 2004). The reticular part of the substantia nigra can be divided into a ventrolateral and a dorsomedial component on the basis of parvalbumin and calbindin distribution (Paxinos et al., 1999b). The remainder of the substantia nigra and the ventral tegmental area were delineated according to the work of McRitchie et al. (1996).

Navicular nucleus (Nv)

We have renamed the area in the basal forebrain which we previously called the semilunar nucleus. The reason is that the name semilunar nucleus has priority in the avian literature and it refers to a completely different structure in birds. The existence of the semilunar nucleus was established on the basis of NADPH-diaphorase histochemistry (Paxinos et al., 1999a). We acknowledge assistance of R. Harlan and P-Y. Wang in the identification of this structure (Ahima and Harlan, 1990; Wang and Zhang, 1995).
Globus pallidus external and internal parts (GPE, GPI)
We have used the terms internal and external instead of medial and lateral in relation to the parts of globus pallidus to be consistent with the primate literature.

Lateral stripe of the striatum (LSS)
LSS is a dense band of cells in Nissl stained sections. The area is negative in calbindin sections and lighter stained than the LAcbSh and striatum in TH (the distinction is very clear in Fig. 87 of Paxinos et al., 1999a).

Dorsal and ventral parts of the claustrum (DCl and VCl)
We have identified distinct dorsal and ventral parts of the claustrum in AChE stained sections. The dorsal part is positive for AChE and the ventral part is negative.

Ventral Tegmental Area
We have identified the rat homologue of the human parapeduncular nucleus (Paxinos & Huang, 1995) but have named it the parainterfascicular nucleus. We suggest that the new term be also used for the human given its more descriptive nature. With the identification of the parainterfascicular in the rat, the entire VTA (in most levels) is represented by specifically name component parts. This avoids the problem of previous editions of this atlas where the label VTA was placed only on what we now call parainterfascicular nucleus, giving the impression that it alone was the VTA. The VTA in our view consists of the paranigral, the parainterfascicular, the parabrachial pigmented nuclei and the VTAR.

Septum, Hypothalamus, and Neurosecretory Nuclei
Refer to Simerly (2004), Armstrong (2004), Risold (2004), and Oldfield and McKinley (2004) for a general description of these structures. Jutting ventrolaterally from the anterodorsal preoptic nucleus is a strip which is negative for parvalbumin which we have called the alar nucleus. The alar nucleus displays substance P positive cell bodies but little reactivity in its neuropil (Larsen, 1992). In the preoptic area we followed Simerly (2004) and Simerly et al. (1984) except for the identification of the ventromedial and ventrolateral preoptic nuclei, for which we followed Elmquist et al. (1996) and Sherin et al. (1996). The compact part of the medial preoptic nucleus is negative for substance P (Harding et al., 2004).

In the lateral hypothalamus we identified a ventrolateral hypothalamic nucleus on the basis of NADPH-diaphorase reactivity (Paxinos et al., 1999a). This nucleus is caudal to the ventrolateral preoptic nucleus and dorsal to the supraoptic nucleus. The ventral part of dorsomedial nucleus is marked by densely stained cell bodies and terminals in NADPH-diaphorase preparations (Paxinos et al., 1999a). The gemini nucleus is a conspicuous nest of a NADPH-diaphorase cell bodies (Paxinos et al., 1999a). The parasubthalamic nucleus is present in the rat (Wang and Zhang, 1995), but it is not as impressive as the homologous structure seen in the mouse brain (Paxinos and Franklin, 2001). The arcuate nucleus was delineated according to the work of Magoul et al. (1994). See Paxinos and Watson (1986) for the identification of the striohypothalamic, magnocellular lateral hypothalamic, terete, and subincertal nuclei.

Lateral hypothalamus (PLH, TuLH, PeFLH, JPLH)
We have given names to different regions that are now recognized as comprising the lateral hypothalamus. The features characteristic of lateral hypothalamus (particularly the population of large cells) are not limited to the area lateral to the fornix. The orexin and hypocretin containing cells are not confined to the classically defined LH area, but are also found medial to the fornix. Swanson (2004) correctly extended the lateral hypothalamus medial to the fornix, but still identified the fornix as another boundary from where various areas emanate. The region both medial and lateral to the fornix when stimulated electrically induces attack by a cat on a rat (Paxinos, Bandler and Flynn, unpublished observations), indicating that the PeFLH behaves in a unitary fashion as it concerns this behavior. The components of the lateral hypothalamus in our scheme are as follows.
PLH – ‘peduncular part of the lateral hypothalamus’
TuLH – ‘tuberal part of the lateral hypothalamus’
PeFLH – perifornical part of the lateral hypothalamus’
JPLH – justaparaventricular part of the lateral hypothalamus’

Posterior hypothalamus, dorsal area (PHD)
This is an area previously identified as PHA in our atlas.

Arcuate nucleus (ArcMP)
ArcMP is ACHE positive and this distinguishes it from DM

Episupraoptic nucleus (ESO)
We named this nucleus on the basis of its location. Its rostral pole begins at the caudal pole of the ventrolateral preoptic nucleus; ESO can be found in Figs 39-45.

Paraterate nucleus (PTc)
This nucleus is located within the ventrolateral hypothalamic tract (Swanson, 2004) and rostral, dorsal and lateral to the terate hypothalamic nucleus.

Amygdala and Bed Nucleus of Stria Terminalis
Refer to de Olmos et al. (2004) for a general description of the amygdala and the bed nucleus of the stria terminalis. The anterodorsal part of the medial nucleus of the amygdala and the basomedial nucleus are defined by the presence of intense NADPH-diaphorase reactivity (Paxinos et al., 1999a). The lateral part of the central nucleus of the amygdala is marked by the presence of tyrosine hydroxylase fibers and AChE negativity (Paxinos et al., 1999a).

Reticulostrial nucleus (RtSt)
We have named this nucleus for its position between the stria terminalis and the reticular nucleus. In calretinin stained sections it has a densely positive neuropil whereas the reticular nucleus has a pale neuropil. In parvalbumin sections, RtSt is positive in neuropil while the reticular nucleus is positive for cells and neuropil (streaky and spotty). RtSt is largest at anterior pole of the thalamus. In calbindin sections, the stria terminalis is positive whereas the RtSt is negative (Fig 160, Paxinos et al., 1999a). Its medial part is negative and lateral is positive in parvalbumin (Fig 166, Paxinos et al., 1999a).

Rostral amygdalopiriform area (RAPir)
The rostral amygdalopiriform area is a distinct region between PLCo and Pir has a dense layer 2 in lateral two thirds but much less dense in medial third.

Thalamus
Refer to Groenewegen and Witter (2004) for a general description of thalamic nuclei. See Paxinos and Watson (1986) for the identification of the ethmoid, retroethmoid, subgeniculate, and precommissural nuclei. We have reverted to the use of the term ventral posterior nucleus, parvicellular part (Paxinos and Watson, 1982) for the nucleus that we previously named the gustatory nucleus of the thalamus (Paxinos and Watson, 1986). We made this change on the advice of Clifford Saper that gustatory input is more medial in this nucleus, and autonomic-related inputs can be found at more lateral parts of this structure (Yasui et al., 1989).

Retroreuniens area (RRe)
We gave the name RRe to a region dorsal to the PH, ventral to CM, and medial to VPPC and SPF. Caudally, RRe merges with the periventricular gray matter.

Paraxiphoid (PaXi)
The paraxiphoid nucleus (PaXi) lies between the xiphoid nucleus (Xi) of the thalamus medially and the zona incerta laterally. It appears to be part of a belt separating hypothalamus from thalamus. In Fig 264 of Paxinos et al., 1999a, an NADPH positive belt can be seen to extend from the reticular nucleus to zona incerta and paraxiphoid.
Ventral limitans thalamic nucleus (Vli)
This nucleus is a thin sheet between subparafascicular, parvicellular part and the medial lemniscus. We so named it to complement the posterior limitans thalamic nucleus. Palkovits has observed CGRP positivity in this nucleus (personal communications, 2004).

Hippocampal Region
Refer to Witter and Amaral (2004) for a general description of the hippocampal region.

We now distinguish a dorsal and a ventral subiculum. We have labeled the transition area of dorsal and ventral subiculum as STri. We have drawn the borders of the presubiculum and parasubiculum so as to reach the white matter as explained in Haug (1976) and Mulders et al. (1997).

The entorhinal parcellation scheme of Insausti et al. (1997) is appealing because each of the cytoarchitecturally distinct divisions has a different pattern of connections as they detail in their paper. The parcellation recognizes that the medial and lateral sectors of the entorhinal area are separated by two intermediate sectors obvious in our Nissl preparations. Insausti et al. specifically identify six entorhinal fields: (1) an amygdalopiriform cortex which they termed amygdalo-entorhinal transition field; (2) a medial entorhinal field (MEnt) equivalent to the ventromedial entorhinal area of Krettek and Price (1977); (3) a caudomedial entorhinal field (CEnt), which is the classic medial entorhinal area; (4) a ventral intermediate entorhinal field (VIEnt) equivalent to the caudal ventrolateral entorhinal field of Krettek and Price (1977); (5) a dorsal intermediate entorhinal field (DIEnt); and (6) a dorsolateral entorhinal field (DLEnt). The last two fields together are equivalent to the dorsolateral entorhinal field of Krettek and Price (1977).

The postsubicular area was identified on the basis of the work of Van Groen et al. (1992).

Cerebral cortex
There have been two comprehensive cortical parcellation schemes in recent decades. The first notable one was presented by Zilles (1985) and was constructed on the original stained sections of the earlier editions of our atlas. In the second edition of our atlas we used the cortical parcellations of Zilles (1985). The second comprehensive cortical delineation scheme was presented by Swanson (1992). The Zilles (1985) delineations differ significantly from the Swanson (1992, 2004) scheme. The atlas of chemical markers (Paxinos et al., 1999a, b) enabled us to make a decision on the strengths of the two schemes. On this basis we have retained many of the features of the sensory, motor, and insular areas proposed by Zilles (1985). However, we have curtailed the rostral spread of Zilles’s occipital areas and delineated the sensory representation of the trunk region and temporal association area in line with Swanson (1992, 2004).

We have retained the perirhinal cortex at caudal levels (along with Zilles, 1985) because there is a characteristic NADPH-diaphorase reactivity associated with this area. Palomero-Gallagher and Zilles (2004) have recently completed a substantial revision of the Zilles and Wree (1995) plan especially in the non-sensory parietal regions and we have followed their lead. Strong parvalbumin immunoreactivity is present in layer 4 of the primary somatosensory cortex. SMI-32 immunoreactivity formed distinctive patches in layer 4 of the barrel field and forelimb and hindlimb region.

The primary auditory area was identified on the basis of reduced calbindin immunoreactivity in the deep layers. All the auditory areas were marked by the presence of SMI-32 positive cells in the superficial layers (Paxinos et al., 1999a, b).

AChE marked the location of the prelimbic and agranular insular cortices. NADPH-diaphorase assisted in defining the agranular insular, perirhinal, and retrosplenial granular cortices. Additionally, NADPH-diaphorase immunoreactivity indicated the ventral part of the medial entorhinal cortex.
Calretinin immunoreactivity assisted in delineation of the lateral entorhinal cortex where the outer part of layer one is densely stained.

The dorsolateral orbital cortex was delineated in accordance with the work of Ray and Price (1992). We use the term frontal association cortex for the frontal cortex that others allocated to the secondary motor cortex (Swanson, 1992, 2004; Zilles, 1985). This designation is in agreement with microstimulation data (Neafsey et al., 1986).

Retrospenial cortex (RSD and RSG)
The retrospenial dysgranular cortex (RSD) was previously named by us the retrospenial agranular cortex, but we have changed it on the advice of Brent Vogt. The retrospenial granular cortex (RSG) is divided into three areas a, b, and c. Some authors refer to the RSG as area 24, according to the original scheme of Brodmann.

Reticular Formation
Refer to Jones (1995) for a general description of the reticular formation. The intermediate reticular zone was first identified in the rat (Paxinos and Watson, 1986), but is seen to advantage in the human brain (Paxinos and Huang, 1995). The intermediate reticular zone at levels of the caudal pole of the facial nerve nucleus is marked by NADPH-diaphorase positive cells. The lateral paragigantocellular nucleus is conspicuous in NADPH-diaphorase preparations (Paxinos et al., 1999b). We have identified the parapyramidal nucleus as the cell group dorsolateral to the pyramidal tract, which is outlined but not named in the second edition of this atlas (Paxinos and Watson, 1986). The identification of the epifascicular nucleus is based on the description of this nucleus in the human brain (Paxinos and Huang, 1995).

Conterminal nucleus (Ct)
We have identified the conterminal nucleus in the medulla close to the inferior olive. This group was originally identified by Olzewski and Baxter (1954) and is clearly shown in the human brain stem atlas (Paxinos and Huang, 1995). The nucleus is seen as two separate AChE positive cell groups, one lateral to the inferior olive (caudal pole of IOA) and a second group medial to the IOA.

Periaqueductal and Periventricular Gray
Refer to Keay and Bandler (2004) for a general description of the periaqueductal gray. The boundaries of periaqueductal gray cell columns were drawn according to Carrive (1993), Carrive and Paxinos (1994), and Paxinos and Huang (1995). We identify the rodent homologue of the human pleogial periaqueductal gray in Figs 77-80. Two nuclei lateral to the central gray pars alpha were identified on the basis of SMI-32 immunoreactivity – central gray pars beta and central gray pars gamma (Paxinos et al., 1999b).

Lithoid nucleus (Li)
We have named this nucleus for the Greek word for a stone. This word was particularly applied to an elongated stone used in the ancient Olympics. Li is a prominent group of large cells in the dorsal part of the rostral PVG. While generally ovoid in cross section, the medial and lateral sides are in Figures 71-73 parallel to each other. Li lies medial to MCPC caudally, and medial to RPF rostrally. It is ventral to the PrC and dorsal to the fasciculus retroflexus. More caudally, it is dorsal to Dk. It can be readily identified in a horizontal section (Fig 105, Paxinos and Watson, 1998).

Tegmental Nuclei
For the identification of the anterior tegmental, microcellular tegmental, subpeduncular tegmental, rabdoid, and epiduralspinal nuclei, see Paxinos and Watson (1986).

Epipeduncular nucleus (EpP)
A small but distinctive group of large cells below the peripeduncular nucleus and above the cerebral peduncle (Fig 78-80) has no home in the surrounding nuclei. We have named this group the epipeduncular nucleus.
Reticular tegmental nucleus, L part (RtTgL)
In Figs 112-114 the rat homologue of the subnucleus L of the LtRt nucleus Olzewsiki and Baxter (1954) can been identified (see also Paxinos and Huang, 1995).

Raphe Nuclei
We identified the raphe nuclei on the basis of 5-hydroxytryptamine sections prepared by G. Halliday and I. Tork (see also Harding et al., 2004). We identified the raphe interpositus nucleus on the basis of the work of Buettner-Ennever et al. (1988).

Locus Coeruleus and Brainstem Catecholamine Cell Groups
Refer to Aston-Jones (2004) for the delineation of the locus coeruleus. We delineated the catecholamine cell groups by following Hökfelt et al. (1984) with assistance from our own tyrosine hydroxylase preparations (Paxinos et al., 1999b).

Brainstem Nuclei Associated with Taste, Respiratory, Cardiovascular and Other Autonomic Functions
Refer to Saper (1995) and Norgren (1995) for a general description of these nuclei.

Nucleus of the solitary tract
The posterior part of the nucleus of the solitary tract was delineated in accordance with the work of Whitehead (1990), Herbert et al. (1990), McRitchie (1992), and Altschuler et al. (1989). The rostral part of the nucleus of the solitary tract was difficult to delineate, but we recognize a rostrolateral subnucleus on the basis of NADPH-diaphorase positivity.

Medullary respiratory groups and the Botzinger complex
These areas were delineated in accordance with Ellenberger et al. (1990), Kanjhan et al. (1995), and Cox and Halliday (1993).

Parabrachial nucleus
The parabrachial nucleus is delineated in accordance with Fulwiler and Saper (1984), Herbert et al. (1990), Whitehead (1990), and Herbert and Saper (1990). The external part of the lateral parabrachial nucleus and medial parabrachial nucleus are marked by NADPH-diaphorase positive cells and fibers (Paxinos et al., 1999b).

Oromotor Nuclei
Refer to Travers (2004) for a description of the oromotor nuclei.

Precerebellar Nuclei and Red Nucleus
Refer to Ruigrok (2004) for a general description of these structures. Within what has been previously called the pararubral area there is a circumscribed cell group which we called the pararubral nucleus. We have named the large cells above the lateral lemniscus the epileminiscal nucleus (Paxinos et al., 1999b).

Cerebellum
The identification of lobules, fissures, and deep cerebellar nuclei is based on the work of Voogd (2004) and Swanson (2004).

Somatosensory System
Refer to Tracey (2004b) for a general description of the somatosensory system. The general basis of delineation of these structures is described in Paxinos and Watson (1996). However, we followed Marfurt and Rajchert (1991) for the borders of the spinal trigeminal nucleus.

Trigeminal transition zone (5Tr)
We identify the NADPH-diaphorase positive area medial to the principal sensory trigeminal nucleus as the 5Tr given it juxtaposition between the trigeminal and the parabrachial nuclei.
The trigeminosolitary zone (5Sol)
The trigeminosolitary zone commences caudal to the trigeminal transition zone, and extends as far caudal as the level of the area postrema. The rostral part of this zone was previously identified by Paxinos and Huang (1995) in the human and named the subsolitary nucleus. We note that in the medulla, much like in the thalamus (VPM, VPPC – Lundy and Norgren, 2004), there is a progression of functional areas from the trigeminal concerned with somatosensory function to the solitary concerned with gustatory function from receptors of the same peripheral structures.

Matrix (Mx)
Paxinos and Huang (1995) identified in the human the pericuneate and peritrigeminal matrix. We observed a similar structure in the rat and identified it as the residual region after the solitary, trigeminosolitary, cuneate and parvicellular reticular nuclei are accounted for.

Cuneate nucleus, rotund part (CuR)
We note that as in primates, the rat has a rotund part in the cuneate nucleus which almost certainly represents the forepaw area.

Visual System
Refer to Sefton et al. (2004) for a general description of the visual system. The ventral tectal visual relay zone was identified on the basis of the work of Giolli et al. (1985). The intergeniculate leaf was delineated on the basis of the work of Morin and Blanchard (1995).

Auditory System
Refer to Malmierca and Merchán (2004) for a general description of the auditory system. We used Faye-Lund and Osen (1985) as well as Malmierca and Merchán (2004) for the identification of areas of the inferior colliculus. The medial geniculate was delineated according to the work of LeDoux et al. (1985). The nucleus of the central acoustic tract has been identified in the cat, and Ellen Covey has delineated this structure in our atlas. For additional details on the basis of delineation of the components of the auditory system refer to Paxinos and Watson (1986).

Nucleus of the commissure of the inferior colliculus (Com)
The commissure of the inferior colliculus is populated by many cells. On the advice of Ellen Covey we have named this the nucleus of the commissure of the inferior colliculus.

Dorsal cochlear nucleus
We have adopted new abbreviations for the layers of the dorsal cochlear nucleus: DCDp is the dorsal cochlear deep core; DCFu is the dorsal cochlear fusiform layer; DCMo is the dorsal cochlear molecular layer.

Periolivary horn (POH)
The periolivary region has a dorsolateral protrusion positive in parvalbumin (Paxinos et al., 1999b), which we termed the periolivary horn (POH).
References


List of Structures

Names of the structures are listed in alphabetical order. Each name is followed by abbreviation of the structure.

1st cerebellar lobule (lingula) 1Cb
2b cerebellar lobule 2Cb
2nd and 3rd cerebellar lobules 2/3Cb
2nd cerebellar lobule 2Cb
3rd and 4th cerebellar lobules 3/4Cb
3rd ventricle 3V
4th and 5th cerebellar lobules 4/5Cb
4th cerebellar lobule 4Cb
5th cerebellar lobule 5Cb
6a cerebellar lobule 6aCb
6b cerebellar lobule 6bCb
6c cerebellar lobule 6cCb
6b cerebellar lobule 6bCb
6a cerebellar lobule 6aCb
7th cerebellar lobule 7Cb
8th cerebellar lobule 8Cb
9th cerebellar lobule, a 9aCb
9th cerebellar lobule, b 9bCb
9th cerebellar lobule, c 9cCb
10th cerebellar lobule (module) 10Cb

accessory optic tract aopt
acumbens nucleus Acc
acumbens nucleus, core Aac
acumbens nucleus, rostral pole AcrP
acumbens nucleus, shell AcsSh
acoustic radiation ar
acoustic stria as
agranular insular cortex AI
agranular insular cortex, dorsal part AID
alar nucleus AI
alveus of the hippocampus alv
ambiguus nucleus Amb
ambiguus nucleus, compact part Ambc
ambiguus nucleus, loose part AmbL
amygdalohippocampal area AH
amygdalohippocampal area, posteromedial part AHPM
amygdalolateral nucleus af
amygdalostriatal transition area IMG
amygdalostriatal transition area, nucleus ASt
anterior amygdaloid area, ventral part AA V
anterior amygdaloid area, dorsal part AAD
anterior amygdaloid area, ventral part AAV
anterior cerebral artery ac
anterior commissural nucleus AC
anterior commissural nucleus, anterior part ac
anterior commissural nucleus, intrabulbar part aci
anterior commissural nucleus, posterior part acp
anterior hypothalamic area AH
anterior hypothalamic area, central part AHC
anterior olfactory nucleus, dorsal part AOD
anterior olfactory nucleus, external part AOE
anterior olfactory nucleus, ventroposterior part AOVp
anteroventral thalamic nucleus, dorsomedial part AVDM
anteroventral thalamic nucleus, ventromedial part AVVM
aqueduct Aq
arcuate nucleus, dorsal part ArcD
arcuate nucleus, lateral part ArcL
arcuate hypothalamic nucleus, lateral part ArcL
arcuate hypothalamic nucleus, lateroposterior part ArcLP
area postrema AP
ascending fibers of the facial nerve asc7
basal nucleus Barrington's nucleus Bar
basal ganglia nuclei BBL
basolateral amygdaloid nucleus BL
basolateral amygdaloid nucleus, anterior part BLA
basolateral amygdaloid nucleus, posterior part BLB
basolateral amygdaloid nucleus, ventral part BLV
basomedial amygdaloid nucleus BM
basomedial amygdaloid nucleus, posterior part BMP
bed nucleus of the stria terminalis, basomedial division BST
bed nucleus of the stria terminalis, basolateral division BSL
bed nucleus of the stria terminalis, dorsomedial division DST
bed nucleus of the stria terminalis, lateral division SDL
bed nucleus of the stria terminalis, medial division STM
blood vessels bv
brachium of the inferior colliculus bic
brachium of the superior colliculus bsc
brachium pontis (stem of middle cerebellar peduncle) bp
caudal interstitial nucleus of the medial longitudinal fasciculus CI
caudal linear nucleus of the raphe CLI
caudal periventricular nucleus CPV
caudomedial entothelial cortex CEnt
caudoventral respiratory group CVRG
caudoventrolateral reticular nucleus CVL
cell bridges of the ventral striatum CB
central amygdaloid nucleus, medial division, anteroventral part CeMAV
central amygdaloid nucleus Ce
central amygdaloid nucleus, capsular part CeC
central amygdaloid nucleus, lateral division Cel
central amygdaloid nucleus, medial division Cem
central amygdaloid nucleus, medial posteriorventral part CmPV
central canal CC
central cervical nucleus of the spinal cord CcCr
central gray CG
central gray of the pons CGPn

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supramammillary nucleus SuM
supramammillary nucleus, lateral part SuML
supramammillary nucleus, medial part SuMM
suprasylvian motor cap Su3C
suprasylvian motor periaqueductal gray Su3
supraoptic decussation sod
supraoptic nucleus SO
supraoptic nucleus, retrochiasmatic part SOR
supratrigeminal nucleus Su5

T
tectospinal tract ts
temporal association cortex TeA
terete hypothalamic nucleus Te
traverse fibers of the pons Tfp
trapezoid body Tr
triangular nucleus Tr
triangular septal nucleus TS
trigeminal ganglion 5Gn
trigeminal nucleus 5N
trigeminal nucleus, capsular part 5NCap
trigeminal nucleus, granule cell layer 5CGr
trigeminal nucleus, posterior part 5P
trigeminal nucleus, posterior part, octopus cell area 5PO

V
vagus nerve 10n
vascular organ of the lamina terminalis VOLT
ventral anterior thalamic nucleus VA
ventral cochlear nucleus, anterior part VCA
ventral cochlear nucleus, capsular part VOCap
ventral cochlear nucleus, granule cell layer VCAgr
ventral cochlear nucleus, posterior part VCP
ventral cochlear nucleus, posterior part, octopus cell area VCPo
ventral endopiriform nucleus VE
ventral hippocampal commissure vhc
ventral intermediate-entorhinal cortex VIEnt
ventral lateral geniculate nucleus VLG
ventral lateral geniculate nucleus, layer 1 VLG1
ventral linear nucleus of the thalamus VLI
ventral nucleus of the lateral geniculate VLL
ventral orbital cortex VO
ventral pallidum VP
ventral part of claustrum VCI
ventral posterior nucleus of the thalamus, parvocellular part VPPC
ventral posterolateral thalamic nucleus VPL
ventral posteromedial thalamic nucleus VPM
ventral reuniens thalamic nucleus VRe
ventral spinocerebellar tract vsc
ventral spinocerebellar tract decussation vsd
ventral subiculum VS
ventral tegmental area VTA
ventral tegmental area, rostral part VTAR
ventral tegmental decussation vgd
ventral tegmental nucleus VTg
ventral tenia tecta VTT
ventral tenia tecta, layer 1 VTT1
ventral tuberomammillary nucleus VTM
ventrolateral preoptic nucleus VLPO
ventrolateral thalamic nucleus VL
ventromedial hypothalamic nucleus VMH
ventromedial hypothalamic nucleus, anterior part VMHA
ventromedial hypothalamic nucleus, central part VMHC
ventromedial hypothalamic nucleus, dorsomedial part VMHDM
ventromedial hypothalamic nucleus, ventrolateral part VMHVL
ventromedial nucleus of the hypothalamus shell VMHSh
Index of Abbreviations

The abbreviations are listed in alphabetical order. Each abbreviation is followed by the structure name and the number of the figures on which the abbreviations appear.

1 layer 1 of cortex  9-21, 30-34, 52, 54-55, 59-75, 94, 99-109
1b layer 1b of cortex  8
1Ch 1st cerebellar lobule (lingula) 112-128
2 layer 2 of cortex  7-75, 94, 99-109
2/Cb 2nd and 3rd cerebellar lobules 106-109
2Cb 2b cerebellar lobule 110
2Ch 2nd cerebellar lobule 103-120
3 layer 3 of cortex  8-75, 99-109
3/4 layers 3 and 4 of cortex  94
3Cb 3rd cerebellar lobule 106-120, 122, 124-126, 134
3N oculomotor nucleus  85-91
3n oculomotor nerve  79-82
3PC oculomotor nucleus, parvicellular part  84-91
3V 3rd ventricle  29-73
4 layer 4 of cortex  8-10, 30-35, 52
4/Cb 4th and 5th cerebellar lobules 106-109
4Cb 4th cerebellar lobule 108-126
4N trochlear nucleus  92-95
4n trochlear nerve  94-112
4Sh trochlear nucleus shell region  92-95
4V 4th ventricle  104-146
s layer 5 of cortex  52, 94
5 layer 5 of cortex  52, 94
5a layer 5a of cortex  52, 94
5Ac motor trigeminal nucleus, accessory subnucleus  113-116
5b layer 5b of cortex  52, 94
5Ch 5th cerebellar lobule 109-120, 122-131
5Ma motor trigeminal nucleus, mesaterior part  109-113
5MbMy motor trigeminal nucleus, mylohyoid part  109-110
5N motor trigeminal nucleus  108
5SSd trigeminal-solitary transition zone  122-148
5Te motor trigeminal nucleus, temporalis part  109-115
5Tr trigeminal transition zone  113-117
5VM motor trigeminal nucleus, ventromedial part  111-113
6 layer 6 of cortex  94
6a layer 6a of cortex  52
6aCb 6a cerebellar lobule 121-127, 129-133
6Ac accessory abducens nucleus  117-120
6b layer 6b of cortex  52
6bCb 6b cerebellar lobule 134-138
6Cb 6th cerebellar lobule 128, 133
6Cb 6c cerebellar lobule 134-137, 139-143
6N abducens nucleus  117-119
6n root of abducens nerve  115-116
7Ac facial motor nucleus, accessory part  120-125, 128-132
7Cb 7th cerebellar lobule 137-150
7DM facial nucleus, dorsal intermediate subnucleus  123-131
7DL facial nucleus, dorsolateral subnucleus  122-132
7DM facial nucleus, dorsomedial subnucleus  121-131
7L facial nucleus, lateral subnucleus  122-134
7m facial nerve  111-119
7m intermedio superioris of the facial nerve  121-123
7V1 facial nucleus, ventral intermediate subnucleus  121-132
7VM facial nucleus, ventromedial subnucleus  121-130
8Cb 8th cerebellar lobule 135-155
8Ci cochlear root of the vestibulocochlear nerve  112-117, 123-126, 127-132
8Vn vestibular root of the vestibulocochlear nerve  115-125
9a,3Cb 9th cerebellar lobule, a and b 140-159
9Cb 9th cerebellar lobule 131-133, 135-139
9cb 9th cerebellar lobule, c  140-150
9G oligostrionmal nerve  130-132
10Cb 10th cerebellar lobule (nodule) 129-149
10N dorsal motor nucleus of vagus  136-156
10n vagus nerve  132-133, 135-137, 139, 141-143, 147, 149-150
11N accessory nerve nucleus  157-161
12Cgh hypoglossal nucleus, geniohyoid part  147-156
12N hypoglossal nucleus  138-157
12n root of hypoglossal nerve  137, 141-144, 149-155

A

A1 A1 noradrenaline cells  152-161
A1/C1 A1 noradrenaline cells/C1 adrenaline cells  151
A11 A11 dopamine cells  59-70
A13 A13 dopamine cells  50-57
A2 A2 noradrenaline cells  155-161
A5 A5 noradrenaline cells  108-113, 115-125, 127
A7 A7 noradrenaline cells  102-108
AA anterior amygdaloid area  35-48
aca anterior commissure  34-37
aca anterior commissure, anterior part  8-33
AcbC accumens nucleus, core  11-29
AcbR accumens nucleus, rostral pole  10
AdSh accumens nucleus, shell  11-29
ac anterior cerebral artery  13-20, 29-30, 35-37
aci anterior commissure, intralubar part  2-7
ACo anterior cortical amygdaloid nucleus  37-55
acp anterior commissure, posterior part  34-43
AD anterodorsal thalamic nucleus  43-52
af amygdaloisular fissure  46-47, 50, 54, 68-80
AHA anterior hypothalamic area, anterior part  41-45
AHb anterior hypothalamic area, central part  46-50
AHEAL amygdalahepaticompanic area, anterolateral part  59-66
AHEBP amygdalahepaticompanic area, posterolateral  67-70
AHPMy amygdalahepaticompanic area, postomedial  67-71
AHP anterior hypothalamic area, posterior part  47-52
AJD agranular insular cortex, dorsal part  8-32
AIF agranular insular cortex, posterior part  33-57
AIV agranular insular cortex, ventral part  8-32
Al alae nuclei  33-34
alv areae of the hippocampus  47-96
AM anteromedial thalamic nucleus  42-53
AmbAmb ambiguus nucleus, compact part  133-140
AmbL ambiguous nucleus, loose part  146-151
AmbMc ambiguous nucleus, subcompact part  141-145
AMV anteromedial thalamic nucleus, ventral part  45-49
AngT angular thalamic nucleus  53-55
ANS accessory neurosecretory nuclei  43-50
AOE anterior olfactory nucleus, dorsal part  4-7
AOE anterior olfactory nucleus, external part  3-5
AOl anterior olfactory nucleus, lateral part  3-8
AOM anterior olfactory nucleus, medial part  4-7
AOP anterior olfactory nucleus, posterior part  9-11
aot accessory olfactory tract  46
AOV anterior olfactory nucleus, ventral part  4-5
AOVP anterior olfactory nucleus, ventroposterior part  6-9
AP area postrema  147-152
APF anterior perirhinal cortex  39-41
APir amygdaloirexiform transition area  64-88
apmf anisoperamidialis fissure  139-148, 150
AFT anterior pretectal nucleus  80-82
APTD anterior pretectal nucleus, dorsal part  69-79
APTV anterior pretectal nucleus, ventral part  70-79
Aq aqueduct  74-103
Arc arcuate hypothalamic nucleus  47-48
ArcD arcuate hypothalamic nucleus, dorsal part  49-61
Arcl arcuate hypothalamic nucleus, lateral part  49-61
ArcLP arcuate hypothalamic nucleus, lateroposterior part  62-68
Arch arcuate hypothalamic nucleus, medial part  49-61
ArcMP arcuate hypothalamic nucleus, medial posterior part  62-69
asc7 ascending fibers of the facial nerve  122-126
asp anterior spinal artery  137, 139-142, 144-145
AS anterior stipital transition area  46-50, 54-61
ATg anterior tegmental nucleus  96-100
AuD secondary auditory cortex, dorsal part  58-90
AuV secondary auditory cortex, ventral area  60-90
AV anteroventral thalamic nucleus  42
AVDM anteroventral thalamic nucleus, dorsomedial part  43-53
AVPr anteroventral periventricular nucleus  32-34
AVVL anteroventral thalamic nucleus, ventralposterior  43-51
azac amygdaloid afferent nucleus  10-12
azp amygdaloid pericallosal artery  10-18
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<td>TS triangular septal nucleus</td>
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<tr>
<td>th trigeminotinal tract</td>
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<td>Tu olfactory tubercle</td>
<td>10-35</td>
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<td>TuLH tuber region of lateral hypothalamus</td>
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<td>Tz nucleus of the trapezoid body</td>
<td>107-120</td>
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<td>tz trapezoid body</td>
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<td>tzd decussation of the trapezoid body</td>
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<td>un uncinate fasciculus of the cerebellum</td>
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<td>und uncinate fasciculus decussation</td>
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<td>V1B primary visual cortex, binocular area</td>
<td>82-111</td>
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<td>V1M primary visual cortex, monocular area</td>
<td>82-112</td>
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<td>V2L secondary visual cortex, lateral area</td>
<td>79-111</td>
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<td>V2ML secondary visual cortex, mediolateral area</td>
<td>68-98</td>
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<tr>
<td>V2MM secondary visual cortex, mediaimodal area</td>
<td>68-107</td>
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<td>VA ventral anterior thalamic nucleus</td>
<td>46, 48-52</td>
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<td>VA/ VL region where VA and VL overlap</td>
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<td>CVA ventral cochlear nucleus, anterior part</td>
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<td>CVAgr ventral cochlear nucleus, granule cell layer</td>
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<td>VCaC ventral cochlear nucleus, capsular part</td>
<td>122-125</td>
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<td>VCI ventral part of cauclusa</td>
<td>15-49</td>
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<tr>
<td>VCP ventral cochlear nucleus, posterior part</td>
<td>120-122, 125-127</td>
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<td>VCPO ventral cochlear nucleus, posterior, octopus cell area</td>
<td>123-125</td>
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<td>VDB nucleus of the vertical limb of the diagonal band</td>
<td>18-29</td>
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<td>VChC vestibulocerebellar nucleus</td>
<td>122-126</td>
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<td>Vems vestibulomesencephalic tract</td>
<td>116-122</td>
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<td>Ven ventral endopiriform nucleus</td>
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<td>Vesp vestibulospinal tract</td>
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<td>Vhc ventral hippocampal commissure</td>
<td>38-48</td>
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<td>VEnt ventral intermediate entorhinal cortex</td>
<td>85-100</td>
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<td>V1L ventrolateral thalamic nucleus</td>
<td>48-59</td>
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<td>VLG ventral lateral geniculate nucleus</td>
<td>60-63, 65-71, 73-77</td>
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<td>VLGI ventral lateral geniculate nucleus, layer 1</td>
<td>64-72</td>
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<td>VLH ventrolateral hypothalamic nucleus</td>
<td>39-46</td>
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<td>Vlh ventrolateral hypothalamic tract</td>
<td>47-56</td>
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<td>VLI ventral linear nucleus of the thalamus</td>
<td>69-74</td>
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<td>VLL ventral nucleus of the lat lemniscus</td>
<td>97-108</td>
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<td>VLPAG ventrolateral periaqueductal gray</td>
<td>88-106</td>
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<td>VLPQ ventrolateral preoptic nucleus</td>
<td>35-38</td>
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<tr>
<td>VM ventromedial thalamic nucleus</td>
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<tr>
<td>VMH ventromedial hypothalamic nucleus</td>
<td>48-49, 60-64</td>
</tr>
<tr>
<td>VMHA ventromedial hypothalamic nucleus, anterior part</td>
<td>47</td>
</tr>
<tr>
<td>VMHC ventromedial hypothalamic nucleus, central part</td>
<td>50-59</td>
</tr>
<tr>
<td>VMHDM ventromedial hypothalamic nucleus, dorso medial part</td>
<td>50-59</td>
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<tr>
<td>VMFSh ventromedial nucleus of the hypothalamus shell</td>
<td>47-61</td>
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<tr>
<td>VMHVL ventromedial hypothalamic nucleus, ventrolateral part</td>
<td>50-59</td>
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<tr>
<td>VMPO ventromedial preoptic nucleus</td>
<td>31, 36, 107-109</td>
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<td>VO ventral orbital cortex</td>
<td>5-11</td>
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<td>VOLT vascular organ of the lamina terminalis</td>
<td>28-33</td>
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<td>VP ventral pallidum</td>
<td>11-42</td>
</tr>
<tr>
<td>VPL ventral posterolateral thalamic nucleus</td>
<td>51-70</td>
</tr>
<tr>
<td>VPM ventral posteromedial thalamic nucleus</td>
<td>64-75</td>
</tr>
<tr>
<td>VPPO ventral posterior nucleus of the thalamic, parvicellular part</td>
<td>62-69</td>
</tr>
<tr>
<td>VR ventral reuniens thalamic nucleus</td>
<td>43-61</td>
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<tr>
<td>VS ventral subiculum</td>
<td>71-90</td>
</tr>
<tr>
<td>Vc v ventral spinocerebellar tract</td>
<td>105-161</td>
</tr>
<tr>
<td>vsd ventral spinocerebellar tract decussation</td>
<td>123</td>
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<tr>
<td>VTA ventral tegmental area</td>
<td>89-90</td>
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<td>VTAR ventral tegmental area, rostral part</td>
<td>72-75</td>
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<tr>
<td>VTg ventral tegmental nucleus</td>
<td>100-105</td>
</tr>
<tr>
<td>Vtg ventral tegmental decussation</td>
<td>78-86</td>
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<td>VTM ventral tuberomammillary nucleus</td>
<td>64-74</td>
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<td>VTT ventral tenia tecta</td>
<td>7, 10</td>
</tr>
<tr>
<td>VTT1 ventral tenia tecta, layer 1</td>
<td>8-9</td>
</tr>
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<td>X X nucleus X</td>
<td>125-139</td>
</tr>
<tr>
<td>Xi xiphoid thalamic nucleus</td>
<td>45-48, 51-53</td>
</tr>
<tr>
<td>Y Y nucleus Y</td>
<td>124-127</td>
</tr>
<tr>
<td>Z Z nucleus Z</td>
<td>140-142</td>
</tr>
<tr>
<td>ZI zona incerta</td>
<td>54-55</td>
</tr>
<tr>
<td>ZIC zona incerta, caudal part</td>
<td>70-76</td>
</tr>
<tr>
<td>ZID zona incerta, dorsal part</td>
<td>56-69</td>
</tr>
<tr>
<td>ZIR zona incerta, rostral part</td>
<td>49-53</td>
</tr>
<tr>
<td>ZIV zona incerta, ventral part</td>
<td>56-69</td>
</tr>
<tr>
<td>ZL zona limitans</td>
<td>30-32</td>
</tr>
<tr>
<td>Zo zona layer of the superior colliculus</td>
<td>77-99</td>
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Figures

Coronal sections of the brain  Figures 1-161

Transverse sections of the spinal cord  Figures 162a, b, c, d, e
Figure 1

Interaural 16.56 mm  Bregma 7.56 mm

E  ependyma/subepend
EPI  ext plex olf bulb
GI  glomerular olf b
GrO  granular olf bulb
IPI  int plexi olf bulb
Mi  mitral olf bulb
OV  olfact ventricle
Figure 2

Interaural 16.08 mm  Bregma 7.08 mm

aci ac intrabulbar
E ependyma/subepen
EPl ext plex olf bulf
Gl glomerular olf b
GrA gran acc olf bulb
GrO granular olf bulb
IPI int plexi olf bulb
Mi mitral olf bulb
OV olfact ventricle
Interaural 15.60 mm

Bregma 6.60 mm

Figure 3

aci ac intrabulbar
AOE ant olfact ext
AOL ant olfact lat
dlo dorso lat olf tr
E epipendyma/subepend
epl ext plex olf buli
EPlA ext plex acc olf bul
Gl glomerular olf bul
GrA gran acc olf bul
GrO granular olf bul
IPl int plexi olf buli
Io lat olfactory tr
Mi mitral olf bul
MiA mitral acc olf bul
OV olfact ventricle
<table>
<thead>
<tr>
<th>aci</th>
<th>ac intrabulbar</th>
</tr>
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<tbody>
<tr>
<td>AOL</td>
<td>ant olfact lat</td>
</tr>
<tr>
<td>AOM</td>
<td>ant olfact medial</td>
</tr>
<tr>
<td>AOD</td>
<td>ant olfact dorsal</td>
</tr>
<tr>
<td>AOE</td>
<td>ant olfact ext</td>
</tr>
<tr>
<td>AOL</td>
<td>ant olfact lat</td>
</tr>
<tr>
<td>AOM</td>
<td>ant olfact medial</td>
</tr>
<tr>
<td>AOV</td>
<td>ant olfact vent</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>dlo</th>
<th>dorsal lat olf tr</th>
</tr>
</thead>
<tbody>
<tr>
<td>EPI</td>
<td>ext plex olf bulb</td>
</tr>
<tr>
<td>EPIA</td>
<td>ext plex acc olf b</td>
</tr>
<tr>
<td>FrA</td>
<td>frontal assoc cx</td>
</tr>
<tr>
<td>Gl</td>
<td>glomerular olf b</td>
</tr>
</tbody>
</table>

| GLA | glom acc olf bulb |
| GlA | glom acc olf bulb |
| GrO | granular olf bulb |
| GrA | gran acc olf bulb |
| IPl | int plex olf bulb |
| IPI | int plex olf bulb |
| Io | lat olfactory tr |
| Lo | lat olfactory tr |
| Ml | mitral olf bulb |
| Mi | mitral olf bulb |

| MIA | mitral acc olf bulb |
| MIA | mitral acc olf bulb |
| OPl | olf ventricle |
| OPP | olf ventricle |
| rf | rhinal fissure |
| ri | rhinal incisure |

Figure 4

Interaural 15.12 mm  Bregma 6.12 mm
Figure 5

Interaural 14.64 mm  Bregma 5.64 mm

aci ac intrabulbar
AOD ant olf dorsal
AOE ant olfact ext
AOL ant olfact lat
AOM ant olfact medial
AOV ant olfact vent
E ependyma/subepen
EPL ext plex olf bulf
FrA frontal assoc cx
GI glomerular olf b
GIA glom acc olf bulb
Gra gran acc olf bulb
GrO granular olf bulb
IPi ant plex olf bulb
LO lat orbital cx
Lo lat olfactory tr
Mt mitral olf bulb
MO medial orbital cx
OV olfact ventricle
rf rhinal fissure
ri rhinal incisure
VO ventral orbital cx
Figure 7

Interaural 13.68 mm  Bregma 4.68 mm

2 layer 2 cortex  
acl ac intrabulbar  
AOD ant olf dorsal  
AOL ant olf lat  
AOM ant olf medial  
AOVP ant olf ventropost  
DLO dorsolat orbital cx  
E/OV epend/olf ventr  
Fr3 frontal area 3  
LO lat orbital cx  
M1 primary motor cx  
M2 2ary motor cx  
MO medial orbital cx  
Prl piriform layer 1  
Prl prelincic cx  
rfl rhinal fissure  
ri rhinal incisur  
VO ventral orbital cx  
VTT ventral tenia tecta
Figure 8

Interaural 13.20 mm

Bregma 4.20 mm

1b layer 1b cortex
2 layer 2 cortex
3 layer 3 cortex
4 layer 4 cortex
a artery
aca ant comm, ant
AID ant insular dorsal
AIV ant insular ventral

AOL ant olfact lat
AOVP ant olf ventropost
Cg1 cingulate area 1
Cl claustrum
DEn dorsal endopirif
DTr dorsal trans zone
DTT1 dors TT layer 1
EOV epend/olf ventr

fmi forceps minor
Fr3 frontal area 3
IEn intermed endopir
lo lat olfactory tr
M1 primary motor cx
M2 2ary motor cx
MO medial orbital cx

Pir1 piriform layer 1
Prl prelimbic cx
ri rhinal incisure
VO ventral orbital cx
VTT1 vent TT layer 1

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Figure 11

The Rat Brain in Stereotaxic Coordinates 5th Edition Paxinos & Watson

2 layer 2 cortex 3 layer 3 cortex aca ant comm, ant AcbC accumbens core AcbSh accumbens shell AID ant insular dorsal AIV ant insular ventral AOP ant olfact post azac azyg ant cer art aarp azyg perical art cg cingulum Cl claustrum DEn dorsal endopirif DI dysgran insular DP dorsal pedunc cx DTT dorsal tenia tecta EOV epend/olf ventr fmi forceps minor Fr3 frontal area 3 IEn intermed endopirif IL infralimbic cx LO lat orbital cx lo lat olfactory tr M1 primary motor cx M2 2ary motor cx Ne navicular nu Pir1 piriform layer 1 PrL prelimbic cx rf rhinal fissure S1J S1 cx, jaw region Tal olf tub layer 1 VO ventral orbital cx VP ventral pallidum
Interaural 11.76 mm

Bregma 2.76 mm

The diagram shows the rat brain in stereotaxic coordinates with various anatomical structures labeled. The coordinates are given as Interaural 11.76 mm and Bregma 2.76 mm.
Interaural 11.52 mm

Bregma 2.52 mm

Figure 13
Figure 17

Interaural 10.92 mm  Bregma 1.92 mm
Figure 18

Interaural 10.80 mm  
Bregma 1.80 mm
Figure 19

Interaural 10.68 mm

Bregma 1.68 mm

The Rat Brain in Stereotaxic Coordinates  5th Edition  Paxinos & Watson

2 layer 2 cortex
3 layer 3 cortex
aca ant comm, ant
AcbC accumbens core
AcbSh accumbens shell
AID ant insular dorsal
AVD ant insular ventral
cg cingulum
Cg1 cingulate area 1
Cg2 cingulate area 2
CPu caudate putamen
DCI dorsal claustrum
dEn dorsal endopir
Di dysgran insular
E ependyma/subepend
ec external capsule
gcc genu of corp call
GI granular insular
IGI islands of Calleja
IGM major is Calleja
IEn intermed endopir
IG indusium griseum
LAcbSh lat accumb shell
lo lat olfactory tr
LSD lat septal dors
LSI lat septal intermediate
LSV lat septal vent
LV lat ventricle
M1 primary motor cx
M2 2ary motor cx
mhb med foreb bundle
Pir piriform cx
rf rhinal fissure
SHDZ S1 dysgranular zn
SIDVZ S1 oral dysgran zn
SII S1 forelimb region
SIIJ S1 cx, jaw region
S1ULp S1 upper lip region
SHi septohipp nu
TuT olf tub layer 1
VCI ventral claustrum
VDB nu vent limb diag b
VP ventral pallidum
Figure 21

Interaural 10.44 mm

Bregma 1.44 mm
Interaural 10.32 mm

Bregma 1.32 mm

The Rat Brain in Stereotaxic Coordinates 5th Edition Paxinos & Watson

2 layer 2 cortex
3 layer 3 cortex
aca ant comm, ant
AcbC accumbens core
AcbSh accumbens shell
AID ant insular dorsal
AV ant insular ventral
c c corpus callosum
cg cingulum
Cg1 cingulate area 1
Cg2 cingulate area 2
CPu caudate putamen
DCI dorsal claustrum
DEn dorsal endopirif
dI dysgran insular
E ependyma/subepen
lO lat olfactory tr
LSD lat septal dors
LSI lat septal intermed
LSS lat stripe of str
LSV lat septal vent
LVL lateral ventricle
M1 primary motor cx
M2 2ary motor cx
mfb med forebr bundle
MS medial septal nu
Prv1 pariform layer 1
PLd paralambo sept
RF rhinal fissure
ShDZ S1 dysgranular zn
ShDZO S1 oral dysgran zn
S1FL S1 forelimb region
S1ULp S1 upper lip region
Shi septohipp nu
Tu1 olf tub layer 1
VC2 ventral claustrum
VDB nu vert limb diag b
VP ventral pallidum

Figure 22
Figure 23

Interaural 10.20 mm

Bregma 1.20 mm

2 layer 2 cortex
3 layer 3 cortex
aca ant comm, ant
AcbC accumbens core
AcbSh accumbens shell
AID ant insular dorsal
AVF ant insular ventral
cc corpus callosum
cg cingulum
cg1 cingulate area 1
cg2 cingulate area 2
CPu caudate putamen
DC3 dorsal claustrum
dEn dorsal endopir
DI dysgran insular
E ependyma/subepen
ec external capsule
gl granular insular
IG islands of Calleja
IGM major is Calleja
mcer mid cerebral art
mfb med forebr bundle
MS medial septal nu
MSH septohipp nu

Ld lambda septal zn
LO lat olfactory tr
LSL lat septal dors
LSV lat septal vent
LV lat ventricle
LSS lat stripe of str
M1 primary motor cx
M2 2ary motor cx
MD midd cerebral art
mfb med forebr bundle
MS medial septal nu
Pir1 piriform layer 1
PLd paralambdoid sept
rf rhinal fissure
S1D Z1 oral dysgran zn
S1DZ2 S1 orbital dysgran zn
S1FL S1 forslimb region
S1S S1 cx, jaw region
S1ULp S1 upper lip region
S2 2ary somatosens
SHi septohipp nu

rb scis qxp 16/9/04 16:36
Interaural 9.84 mm

Bregma 0.84 mm

2 layer 2 cortex
3 layer 3 cortex
aca ant comm, ant
AcbC accumbens core
AcbSh accumbens shell
AID ant insular dorsal
AIV ant insular ventral
CB cell bridges
cg cingulum
cg1 cingulate area 1
cg2 cingulate area 2
CPu caudate putamen
DC1 dorsal claustrum
DEn dorsal endopir
DI dysgran insular
e ependyma/subepen
ec external capsule
gI granular insular
HDB nu horiz limb DB
ICJ islands of Calleja
IEEn intermed endopir
IG inluesium griseum
LAcbSh lat accumb shell
LD lambdoid septal zn
lo lat olfactory tr
LSD lat septal dext
LS1 lat septal intermed
LS5 lat stripe of stri
LSV lat septal vent
LV lat ventricle
M1 primary motor cx
M2 2ary motor cx
mcer mid cerebral art
mfb med forebr bundle
MB medial septal nu
Pl1 piriform layer 1
Pl2 paralambdoid sept
rf rhinal fissure
SHDZ S1 dysgranular zn
SIFL S1 forecamb region
SULp S1 upper lip region
S2 2ary somatosens
SHi septohipp nu
SIB subst innom basal
STMA ST med div, ant
Tex3 olf tub layer 1
VCI ventral claustrum
VP ventral pallidum
Figure 27

Interaural 9.72 mm

Bregma 0.72 mm

2 layer 2 cortex
3 layer 3 cortex
aca ant comm, ant
AcbC accumbens core
AcbSh accumbens shell
AID ant insular dorsal
AVT ant insular ventral
CB cell bridges
cc corpus callosum
cg cingulum
Cg1 cingulate area 1
Cg2 cingulate area 2
CPu caudate putamen
DCI dorsal claustrum
DEn dorsal endopirif
DI dysgran insular
eca ependyma/subepen
ecp external capsule
gI granular insular
HDB nu horiz limb DB
IG1 islands of Calleja
IG1 intermed endopir
IG indusium griseum
Ld lambdoid septal zn
LdL lat septal dors
LSD lat septal intermed
LSF lat septal vent
LSV lat ventricle
LxM primary motor cx
LxF 2ary motor cx
mc e mid cerebral art
mfb med forebr bundle
MS medial septal nu
PiR1 piriform layer 1
PLd paralambdoid sept
rf rhinal fissure
SHDZ St diysgranular zn
S2FL St forelimb region
SULp S1 upper lip region
S2 2ary somatosens
SHI septolapp mu
SIB subst innom basal
STMA ST med div, ant
T12 of tub layer 1
VCI ventral claustrum
VDB nu vert limb diag b
VP ventral pallidum
Figure 28

Interaural 9.60 mm  Bregma 0.60 mm
**Figure 30**

The Rat Brain in Stereotaxic Coordinates 5th Edition

- **2** layer 2 cortex
- **3** layer 3 cortex
- **3V** 3rd ventricle
- **4** layer 4 cortex
- **aca** ant comm, ant
d- **AID** ant insular dorsal
- **AV** ant insular ventral
- **cc** corpus callosum
c- **Cg1** cingulate area 1
c- **Cg2** cingulate area 2
c- **CPu** caudate putamen
c- **DCI** dorsal claustrum
d- **DEn** dorsal endopir
c- **DG** dentate gyrus
- **DLE** diencephalon
- **DSO** dorsal somatosensory
- **E** ependyma/subepen
- **EC** external capsule
- **EC** external capsule
- **EC** external capsule
- **F** fornix
- **G** granular
- **G** granular
- **H** hippocampus
- **ICj** islands of Calleja
- **InEn** intermed endopir
- **IPAC** interstitial nu acp
- **LD** lateral diencephalon
- **Ld** lambdoid septum
- **LGD** lateral geniculate
d- **LH** lateral hypothalamus
- **LH** lateral hypothalamus
- **LPO** lat preoptic area
- **LS** lateral septum
d- **LSD** lat septal dors
d- **LSV** lat septal vent
- **LSS** lat stripe of str
- **M** medulla oblongata
- **M1** primary motor cx
- **M2** secondary motor cx
- **MnPO** median preoptic nu
- **MPA** med preoptic area
- **MS** medial septal nu
- **och** optic chiasm
- **Pir1** piriform layer 1
- **r** rhinal fissure
d- **S1DZ** S1 dysgranular zn
d- **S1FL** S1 forelimb region
d- **S1HL** S1 hindlimb region
d- **S1ULp** S1 upper lip region
d- **S1Upl** S1 upper lip region
- **S2** secondary somatosensory
d- **SHI** septohipp nu
- **SHy** septohypothal nu
- **SIB** subst innom basal
- **STLP** ST lat div, post
- **STMA** ST med div, ant
- **STMV** ST med div, vent
- **Tu1** olf tub layer 1
- **VCl** ventral claustrum
- **VOLT** vasc org lam term
- **VP** ventral pallidum
- **ZL** zona limitans
Interaural 9.12 mm  
Bregma 0.12 mm
Interaural 8.88 mm  
Bregma -0.12 mm
Figure 35

Interaural 8.76 mm

Bregma -0.24 mm

The Rat Brain in Stereotaxic Coordinates, 5th Edition, Paxinos & Watson

Layer 2 cortex
Layer 3 cortex
3V 3rd ventricle
AA ant amygdal area
ac ant commissure
acer ant cerebral art
acp ant comm post
AIP agran insular post
B basal nu
cc corpus callosum
cg cingulum
Cg1 cingulate area 1
Cg2 cingulate area 2
chp choroid plexus
CST nu comm at term
CxA1 cx-amyg trans 1
DCl dorsal claustrum
Diff dorsal endopir
DI dygian insular
E ependyma/subepen
cc external capsule
EGP est globus pallidus
f fornix
fi fimbria of hipp
Fu ST fusiform part
G1 granular insular
HDB nu horiz limb DB
ic internal capsule
Hea intermed endopir
IG indusium griseum
IPAC IPAC, lateral
IPACM IPAC, medial
lo lat olfactory tr
LPO lat preoptic area
LSD lat septal dors
LSI lat septal intermed
LSS lat stripe of str
LSV lat septal vent
LTr flexura terminalis
LV lat ventricle
The Rat Brain in Stereotaxic Coordinates 5th Edition  Paxinos & Watson

Interaural 8.64 mm  Bregma -0.36 mm
Figure 37

Interaural 8.52 mm

Bregma -0.48 mm

2 layer 2 cortex
3 layer 3 cortex
3V 3rd ventricle
a artery
AA ant amygd area
ac ant commissure
accr ant cerebral art
ACa ant cortical amyg
acp ant comm post
AIP agran insular post
B basal nu
BAC bed nu ant comm
cc corpus callosum
cg. cingulum
Cg1 cingulate area 1
Cg2 cingulate area 2
chp choroid plexus
Cpu caudate putamen
CxA1 cc-amyg trans 1
cx. thalamus
DC3 dorsal caudatum
DEn dorsal endopir
DI dysgran insular
dygran insular
de ependyma/subepen
demonstration
ed external capsule
ef extern. globus pallidus
ig f fornix
fi fimbria of hipp
GI granular insular
HDB nu horiz limb DB
HDDB nu horiz limb DB
HDB nu horiz limb DB
HDB nu horiz limb DB
HDB nu horiz limb DB
ic internal capsule
IEn intermed endopir
ig indusium griseum
IPAC IPAC, lateral
IPACM IPAC, medial
IPACL IPAC, lateral
lateral
IEn intermed endopir
LOT nu of lat olt tr
LOTI LOT layer I
LOTTLOT layer L
lpo lateral preoptic
LS2 Late septal dors
LSI lat septal interned
LSS lat stripe of stri
ter lemma terminals
LV lat ventricle
Interaural 8.40 mm  
Bregma -0.60 mm
Figure 42

The Rat Brain in Stereotaxic Coordinates 5th Edition Paxinos & Watson

M1 primary motor cx
M2 2ary motor cx
mch med cort hypoth
MCPO magnocellular preopt
MeAd med anterodorsal
mfb med forebrain bundle
MDA med preoptic area
MPOM medial preopt med
opt optic tract
PaAP Pa ant parvicell
Pe periventric hy nu
Pa1 periform layer 1
Pt parietal th nu
PVA paraventric th ant
rCh retrosplenial area
Re recess th nu
rf rhinal fissure
Rt reticular th nu
RcTe reticuothal nu
S1BF S1 cx, barrel field
S1DZ S1 dysgranular zn
S1FL S1 forelimb region
S1HL S1 hindlimb region
S1ULp S1 upper lip region
S2 2ary somatosens
SFO septofimbrial nu
SM nu stria medull
sm stria medullaris
SO supraoptic nu
sod supraoptic decuss
SPO subparaventric zn
st stria terminalis
StHy striohypothal nu
STMP ST med div, post
STMP1 STM posteromed
STMP2 STM posterolat
TS triangular septal
VCh ventral caudatum
VEn ventral endopir
vhc ventral hip comm
VlH ventrolat hy nu
VP ventral pallidum

Interaural 7.92 mm
Bregma -1.08 mm
Interaural 7.80 mm
Bregma -1.20 mm

Figure 43

The Rat Brain in Stereotaxic Coordinates  5th Edition  Paxinos & Watson

2 layer 2 cortex
3 layer 3 cortex
3V 3rd ventricle
a artery
AA ant amygd area
ACo ant cortical amygd
acp ant comm post
AD anterodors th nu
AHA ant hypothal ant
AIP agran insular post
AM anteromed th nu
ANS acc neurosecret
AVDM AV th dorsomed
AVVL AV th ventrolat
B basal nu
BMA basomed amygd ant
c cc corpus callosum
cg cingulum
Cg1 cingulate area 1
Cg2 cingulate area 2
chp choroid plexus
CM centrol med th nu
CPu caudate putamen
cst commiss st term
CxA1 cx-amygd trans 1
dDV dorsal 3rd vent
dGV dorsal 3rd vent
dEs dorsal endopirif
df dorsal fornix
di diayram insular
dI dysgran insular
dM dorsal endopirif
dOIC calcarine
dEAM sublimet EA cent
dEAM sublimet EA
f fimbria of hipp
fi fimbria of hippoc
GI granular insular
HDB nu horiz limb DB
i intercalated nu
IAAD interanterodors nu
ic internal capsule
IG indusium griseum
IPAC interstitial nu acp
IPACL IPAC, lateral
IPAGM IPAC, medial
LA latroant hy nu
lo lat olfactory tr
LOTI LOT layer 1
LV lat ventricle

2 layer 2 cortex
3 layer 3 cortex
3V 3rd ventricle
a artery
AA ant amygd area
ACo ant cortical amygd
acp ant comm post
AD anterodors th nu
AHA ant hypothal ant
AIP agran insular post
AM anteromed th nu
ANS acc neurosecret
AVDM AV th dorsomed
AVVL AV th ventrolat
B basal nu
BMA basomed amygd ant
c cc corpus callosum
cg cingulum
Cg1 cingulate area 1
Cg2 cingulate area 2
chp choroid plexus
CM centrol med th nu
CPu caudate putamen
cst commiss st term
CxA1 cx-amygd trans 1
dDV dorsal 3rd vent
dGV dorsal 3rd vent
dEs dorsal endopirif
df dorsal fornix
di diayram insular
dI dysgran insular
dM dorsal endopirif
dOIC calcarine
dEAM sublimet EA cent
dEAM sublimet EA
f fimbria of hipp
fi fimbria of hippoc
GI granular insular
HDB nu horiz limb DB
i intercalated nu
IAAD interanterodors nu
ic internal capsule
IG indusium griseum
IPAC interstitial nu acp
IPACL IPAC, lateral
IPAGM IPAC, medial
LA latroant hy nu
lo lat olfactory tr
LOTI LOT layer 1
LV lat ventricle
**Figure 44**

Interaural 7.68 mm

Bregma -1.32 mm
Figure 45

Interaural 7.56 mm

Bregma -1.44 mm
The Rat Brain in Stereotaxic Coordinates  5th Edition  Paxinos & Watson

Interaural 7.44 mm  Bregma -1.56 mm

Figure 46

- M1 primary motor cx
- M2 2ary motor cx
- MCPO magnocell preopt
- MeAD med anterodorsal
- mfb med forebe bundle
- MoDG molecular dent gy
- opt optic tract
- PaMM Pa-med magn
- PaMP Pa-med parvicell
- PaV Pa ventral part
- PaXi paraxiphoid nu
- PC paracentral th nu
- Pe periventric hy nu
- Pn1 perf layer 1
- PLH peduncular lat hy
- PT paratenual th nu
- PV paraventric th nu
- PVA paraventric th ant
- RCh retrochiasm area
- RChL retrochiasm lat
- Re reuniens th nu
- Rf rhinal fissure
- Rt reticular th nu
- Rtx reticulostrual nu
- SIBF S1 cx, barrel field
- S1DL S1 dysgranular zn
- S1FL S1 forelimb region
- S1HL S1 hindlimb region
- S1L1P S1 upper lip region
- S2 2ary somatosens
- SFO subfoveal organ
- SM stria medull
t
- Smed stria medullaris
- SO supraoptic nu
- sod supraoptic decuss
- Spa subparaventric zn
- STHM st stria terminals
- STMPM STM posteromed
- S2 ST supracaps lat
- STSM ST supracaps med
- TS triangular septal
- TuLH tuberal lat hy
- VA ventral ant th nu
- VCI ventral clausrum
- VEn ventral endopir
- vhc ventral hippoc
- VLH ventrolat hy nu
- VRe vent reuniens nu
- Xi xiphoid th nu
Figure 47

Interaural 7.28 mm

Bregma -1.72 mm
Figure 48

Interaural 7.20 mm  Bregma -1.80 mm

The Rat Brain in Stereotaxic Coordinates  5th Edition  Paxinos & Watson

M1  primary motor cx  M2 2ary motor cx  MD  medio dorsol th nu  ME  median eminence  MeAD  med anterodorsal  MeAV  med anterovent  mfb  med foreb bundle  MfHb  med habenular nu  MoDG  molecular dent gy  mt  mammillothal tr  ns  nigrostriat bundle  opt  optic tract  Or  oriens layer hippoc  PaDC  Pa, dorsal cap  PaLM  Pa lat magnocell  PaMP  Pa med parvicell  PaV  Pa, ventral part  PaXi  parasidial nu  Pc  paracentral th nu  Pe  periventric th nu  Pf  periforn layer 1  PnL peduncular lat hy  Pt  paratemporal th nu  Rf  rhinal fissu  Rh  rhomboid thal nu  RSD  retrosplen dysgran  RSGc  RSG, c region  Py  pyramidal cells  RCh  retrochiasm area  RChL  retrochiasm lat  Re  reuniens th nu  Rf  rhinal fissu  Rh  rhomboid thal nu  RSD  retrosplen dysgran  RSGc  RSG, c region  Rt  reticular th nu  Rst  reticularostial nu  S1BF  S1 cx, barrel field  S1DZ  S1 dysgranul zn  S1HL  S1 hindlimb region  S1Sh  S1 shoulder region  S1ULp  S1 upper lip region  S2 2ary somatosens  SFO  subfornical organ  sm  stria medullaris  SO  supraoptic nu  sop  supraoptic decuss  SpA  subparaventric zn  st  stria terminalis  TuLH  tuberal lat hy  VA  ventral ant th nu  VA/ VL  VA and VL  VA/VL  VA and VL  VCL  ventral caudal th  VEm  ventral endopir  Vh  ventral hpp comm  Vl  ventrolat th nu  vlv  ventral hy tr  VM  ventromed th nu  VMH  ventromed hy nu  VMH A  VMH, anterior  VMHSh  VMH shell  Vr  vent reuniens nu  Xi  xiphoid th nu  M1 primary motor cx  M2 2ary motor cx  MD  medio dorsol th nu  ME  median eminence  MeAD  med anterodorsal  MeAV  med anterovent  mfb  med foreb bundle  MfHb  med habenular nu  MoDG  molecular dent gy  mt  mammillothal tr  ns  nigrostriat bundle  opt  optic tract  Or  oriens layer hippoc  PaDC  Pa, dorsal cap  PaLM  Pa lat magnocell  PaMP  Pa med parvicell  PaV  Pa, ventral part  PaXi  parasidial nu  Pc  paracentral th nu  Pe  periventric th nu  Pf  periforn layer 1  PnL peduncular lat hy  Pt  paratemporal th nu  Rf  rhinal fissu  Rh  rhomboid thal nu  RSD  retrosplen dysgran  RSGc  RSG, c region  Py  pyramidal cells  RCh  retrochiasm area  RChL  retrochiasm lat  Re  reuniens th nu  Rf  rhinal fissu  Rh  rhomboid thal nu  RSD  retrosplen dysgran  RSGc  RSG, c region  Rt  reticular th nu  Rst  reticularostial nu  S1BF  S1 cx, barrel field  S1DZ  S1 dysgranul zn  S1HL  S1 hindlimb region  S1Sh  S1 shoulder region  S1ULp  S1 upper lip region  S2 2ary somatosens  SFO  subfornical organ  sm  stria medullaris  SO  supraoptic nu  sop  supraoptic decuss  SpA  subparaventric zn  st  stria terminalis  TuLH  tuberal lat hy  VA  ventral ant th nu  VA/ VL  VA and VL  VA/VL  VA and VL  VCL  ventral caudal th  VEm  ventral endopir  Vh  ventral hpp comm  Vl  ventrolat th nu  vlv  ventral hy tr  VM  ventromed th nu  VMH  ventromed hy nu  VMH A  VMH, anterior  VMHSh  VMH shell  Vr  vent reuniens nu  Xi  xiphoid th nu
Interaural 6.72 mm

Bregma -2.28 mm
Figure 53

Interaural 6.60 mm Bregma -2.40 mm

1 layer cortex
2 layer 2 cortex
3 layer 3 cortex
3V 3rd ventricle
a artery
A13 A13 dopamine
ACo ant cortical amyg
af amygdal fissure
AIP agran insular post
AM anteromed th nu
AngT angular th nu
ArcD arcuate by dors
ArcL arcuate by lat
ArcM arcuate by med
AST amygdalostr trans
AVDM AV th dorsomed
B basal nu
BLA basolat amyg ant
BLF basolat amyg post
BLV basolat amyg vent
BMAM basomed amyg ant
BMP basomed am post
CA1 field CA1 hipp
CA2 field CA2 hipp
CA3 field CA3 hipp
CC corpus callosum
CM centr med th nu
CPu caudate putamen
CSTI commiss st term
DA dorsal 3rd vent
dE dorsal endopirif
df dorsal fornix
dhc dorsal hipp comm
dI dorsomedial dors
dygran insular
dM external capsule
eGP ext globus pallidus
f fornix
fi fimbria of hipp
GL granular insular
GrDG granular dent gy
hf hippoc fissue
I intercalated nu
ic internal capsule
IG II globus pallidus
IGP int globus pallidus
IMD intermediodors nu
IMG intramedull gray
LaDL lat amyg dorsolat
LMol lacunosum mole
LV lat ventricle

1 layer 1 cortex
2 layer 2 cortex
3 layer 3 cortex
3V 3rd ventricle
a artery
A13 A13 dopamine
ACo ant cortical amyg
af amygdal fissure
Interaural 6.48 mm
Bregma -2.52 mm
Figure 58

Interaural 6.00 mm  Bregma -3.00 mm
<table>
<thead>
<tr>
<th>Anatomical Region</th>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>M1 primary motor cortex</td>
<td>M1</td>
<td>primary motor cortex</td>
</tr>
<tr>
<td>M2 secondary motor cortex</td>
<td>M2</td>
<td>secondary motor cortex</td>
</tr>
<tr>
<td>MCLH magnocellular lateral hypothalamic nucleus</td>
<td>MCLH</td>
<td>magnocellular lateral hypothalamic nucleus</td>
</tr>
<tr>
<td>MDC mediodorsal centrum</td>
<td>MDC</td>
<td>mediodorsal centrum</td>
</tr>
<tr>
<td>MDM mediodorsal lateral</td>
<td>MDM</td>
<td>mediodorsal lateral</td>
</tr>
<tr>
<td>MEE med eminence externa</td>
<td>MEE</td>
<td>med eminence externa</td>
</tr>
<tr>
<td>MEI med eminence interna</td>
<td>MEI</td>
<td>med eminence interna</td>
</tr>
<tr>
<td>MoPD med posterodorsal</td>
<td>MoPD</td>
<td>med posterodorsal</td>
</tr>
<tr>
<td>MoPV med posteroverentral</td>
<td>MoPV</td>
<td>med posteroverentral</td>
</tr>
<tr>
<td>mfb med forebrain bundle</td>
<td>mfb</td>
<td>med forebrain bundle</td>
</tr>
<tr>
<td>mHB med habenular nucleus</td>
<td>mHB</td>
<td>med habenular nucleus</td>
</tr>
<tr>
<td>ml medialis lemniscus</td>
<td>ml</td>
<td>medialis lemniscus</td>
</tr>
<tr>
<td>MoDG molecular layer of the dentate gyrus</td>
<td>MoDG</td>
<td>molecular layer of the dentate gyrus</td>
</tr>
<tr>
<td>MPA med parietal area</td>
<td>MPA</td>
<td>med parietal area</td>
</tr>
<tr>
<td>mt mammillothalamic tract</td>
<td>mt</td>
<td>mammillothalamic tract</td>
</tr>
<tr>
<td>MTu medial tuberal nucleus</td>
<td>MTu</td>
<td>medial tuberal nucleus</td>
</tr>
<tr>
<td>mns nigrostriatal bundle</td>
<td>mns</td>
<td>nigrostriatal bundle</td>
</tr>
<tr>
<td>OPC oval paracentral nucleus</td>
<td>OPC</td>
<td>oval paracentral nucleus</td>
</tr>
<tr>
<td>opt optic tract</td>
<td>opt</td>
<td>optic tract</td>
</tr>
<tr>
<td>Or orbiens layer of the hippocampus</td>
<td>Or</td>
<td>orbiens layer of the hippocampus</td>
</tr>
<tr>
<td>PC paracentral thalamus</td>
<td>PC</td>
<td>paracentral thalamus</td>
</tr>
<tr>
<td>Pe periventricular thalamus</td>
<td>Pe</td>
<td>periventricular thalamus</td>
</tr>
<tr>
<td>Pp parietal pole</td>
<td>Pp</td>
<td>parietal pole</td>
</tr>
<tr>
<td>PpF perifornical nucleus</td>
<td>PpF</td>
<td>perifornical nucleus</td>
</tr>
<tr>
<td>PpFLH perifornical lateral hypothalamus</td>
<td>PpFLH</td>
<td>perifornical lateral hypothalamus</td>
</tr>
<tr>
<td>PPD paraventricular thalamus</td>
<td>PPD</td>
<td>paraventricular thalamus</td>
</tr>
<tr>
<td>Py pyramidal cells</td>
<td>Py</td>
<td>pyramidal cells</td>
</tr>
<tr>
<td>Rad radiatum layer</td>
<td>Rad</td>
<td>radiatum layer</td>
</tr>
<tr>
<td>RAP Pir rostral amygdalopiriform nucleus</td>
<td>RAP Pir</td>
<td>rostral amygdalopiriform nucleus</td>
</tr>
<tr>
<td>Re reuniens thalamus</td>
<td>Re</td>
<td>reuniens thalamus</td>
</tr>
<tr>
<td>rF rhinal fissure</td>
<td>rF</td>
<td>rhinal fissure</td>
</tr>
<tr>
<td>RH rhomboid thalamic nucleus</td>
<td>RH</td>
<td>rhomboid thalamic nucleus</td>
</tr>
<tr>
<td>RSD retrosplenial dysgranular cell layer</td>
<td>RSD</td>
<td>retrosplenial dysgranular cell layer</td>
</tr>
<tr>
<td>RSGC RSG, c region</td>
<td>RSGC</td>
<td>RSG, c region</td>
</tr>
<tr>
<td>RF reticular nucleus</td>
<td>RF</td>
<td>reticular nucleus</td>
</tr>
<tr>
<td>S1BF S1 cortex, barrel field</td>
<td>S1BF</td>
<td>S1 cortex, barrel field</td>
</tr>
<tr>
<td>S1DZ S1 dysgranular zone</td>
<td>S1DZ</td>
<td>S1 dysgranular zone</td>
</tr>
<tr>
<td>S1Tr S1 trunk region</td>
<td>S1Tr</td>
<td>S1 trunk region</td>
</tr>
<tr>
<td>S2 secondary somatosensory cortex</td>
<td>S2</td>
<td>secondary somatosensory cortex</td>
</tr>
<tr>
<td>SLM stratum lacunosum moleculare</td>
<td>SLM</td>
<td>stratum lacunosum moleculare</td>
</tr>
<tr>
<td>sm stria medullaris</td>
<td>sm</td>
<td>stria medullaris</td>
</tr>
<tr>
<td>sod supraoptic decussation</td>
<td>sod</td>
<td>supraoptic decussation</td>
</tr>
<tr>
<td>st stria terminalis</td>
<td>st</td>
<td>stria terminalis</td>
</tr>
<tr>
<td>STh subthalamic nucleus</td>
<td>STh</td>
<td>subthalamic nucleus</td>
</tr>
<tr>
<td>STL subthalamic nucleus</td>
<td>STL</td>
<td>subthalamic nucleus</td>
</tr>
<tr>
<td>STIA STG intraamygdaloid nucleus</td>
<td>STIA</td>
<td>STG intraamygdaloid nucleus</td>
</tr>
<tr>
<td>Sub submedius thalamic nucleus</td>
<td>Sub</td>
<td>submedius thalamic nucleus</td>
</tr>
<tr>
<td>SubI subincertal thalamic nucleus</td>
<td>SubI</td>
<td>subincertal thalamic nucleus</td>
</tr>
<tr>
<td>Te terete thalamic nucleus</td>
<td>Te</td>
<td>terete thalamic nucleus</td>
</tr>
<tr>
<td>TuLH tuberal lateral hypothalamus</td>
<td>TuLH</td>
<td>tuberal lateral hypothalamus</td>
</tr>
<tr>
<td>VL ventrolateral thalamus</td>
<td>VL</td>
<td>ventrolateral thalamus</td>
</tr>
<tr>
<td>VM ventromedial thalamus</td>
<td>VM</td>
<td>ventromedial thalamus</td>
</tr>
<tr>
<td>VMH ventromedial hypothalamus</td>
<td>VMH</td>
<td>ventromedial hypothalamus</td>
</tr>
<tr>
<td>VMHC VMH, central complex</td>
<td>VMHC</td>
<td>VMH, central complex</td>
</tr>
<tr>
<td>VMHDM VMH, dorsomedial nucleus</td>
<td>VMHDM</td>
<td>VMH, dorsomedial nucleus</td>
</tr>
<tr>
<td>VMHSH VMH, shell</td>
<td>VMHSH</td>
<td>VMH, shell</td>
</tr>
<tr>
<td>VMHVL VMH, ventrolateral nucleus</td>
<td>VMHVL</td>
<td>VMH, ventrolateral nucleus</td>
</tr>
<tr>
<td>VPL ventral posterolateral thalamus</td>
<td>VPL</td>
<td>ventral posterolateral thalamus</td>
</tr>
<tr>
<td>VPM ventral posteromedial thalamus</td>
<td>VPM</td>
<td>ventral posteromedial thalamus</td>
</tr>
<tr>
<td>VRe vent reuniens thalamic nucleus</td>
<td>VRe</td>
<td>vent reuniens thalamic nucleus</td>
</tr>
<tr>
<td>VTr ventroreuniens thalamic nucleus</td>
<td>VTr</td>
<td>ventroreuniens thalamic nucleus</td>
</tr>
<tr>
<td>ZID zona incerta dorsalis</td>
<td>ZID</td>
<td>zona incerta dorsalis</td>
</tr>
<tr>
<td>ZIV zona incerta ventralis</td>
<td>ZIV</td>
<td>zona incerta ventralis</td>
</tr>
</tbody>
</table>
Interaural 5.52 mm

Bregma -3.48 mm
Figure 64

Interaural 5.28 mm

Bregma -3.72 mm
Figure 65

Interaural 5.16 mm

Bregma -3.84 mm
Figure 68

Interaural 4.80 mm
Bregma -4.20 mm
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Figure 69

1 layer 1 cortex
2 layer 2 cortex
3 layer 3 cortex
3V 3rd ventricle
a artery
A11 A11 dopamine
af amygdal fissure
AHiAL AHi anterolat
AHiPL AHi posterolat
AHiPM AHi posteromed
alv alveus of hpp
APr amygdalopir trans
APTV ant pretectal dors
ArcMP arcuate med post
A11 primary and cx
AuD 2ary aud cx, dors
AuV 2ary aud cx, vent
BLP basolat amyg post
bsc brachium sup coll
CA1 field CA1 hipp
CA2 field CA2 hipp
CA3 field CA3 hipp
corpus callosum
cp choroid plexus
cp cerebral peduncle
dc deep cerebr white
dorR dorsal endopirif
dorR dors lat geniculate
D2L dors lat geniculate
dorsal 3rd vent
Ect ectorhinal cx
Eth ethmoid cx
EhM ethmoid th nu
f fields of Forel
f fornix
FC fasciola cinereum
Fr fasc retroflexus
Gem gemini by nu
GrDG granular dent gr
hbc habenular comm
hif hippocampus
ic internal capsule
icG indusium griseum
IGI intergenic leaf
IMA intramodal th area
LEnt lat entorhinal cx
LHi lat habenular comm
LM lat mammillary nu
LMol lacunosum mole
LPMC LP mediocaudal
LPMR LP mediorostral
LV lat ventricle
Figure 71
Figure 72

Interaural 4.32 mm
Bregma -4.68 mm
Figure 75

Interaural 3.96 mm

Bregma -5.04 mm
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- artery
- af amygdal fissure
- AHiPM AHi posteromed
- alv alveus of hipp
- APir amygdalopir trans
- APTD ant pretectal dors
- APTV ant pretectal vent
- Aqu aqueduct
- a artery
- AfD 2ary aud cx, dors
- AHiV 2ary aud cx, vent
- Bsc beutchum sup coll
- CA1 field CA1 hipp
- CA2 field CA2 hipp
- CA3 field CA3 hipp
- cg cingulum
- cp cerebral peduncle
- csc comm of sup coll
- Dc deep cerebr white
- Dch dorsal hipp comm
- Dk nu Darkschewitsch
- Dlg dors lat geniculate
- DMPAG dorsomedial PAG
- DpG deep gray SC
- Ds dorsal subiculum
- Ec etorhinial cx
- Ep epipeduncular nu
- Ew Edinger-Westphal
- FC fasciola cinereum
- Fmj forceps major
- Fr fasc retroflexus
- GrDG granular dent gy
- Hf hippoc fores
- If interfascicular nu
- IMa intramedul th area
- IntC interstiti nu Cajal
- IntSh interstiti nu shell
- InWh intermed white SC
- Ipf interpedunc fossa
- LEnt lat entorhinal cx
- Lmg lam ovum mole
- LPAG lat periaqu gray
- LPmc LP laterocaudal
- Lpmc LP mediocaudal
- LT lat terminal nu
- LV lat ventricle

Interaural 3.72 mm

Bregma -5.28 mm

Figure 77
Figure 88
Figure 89

Interaural 2.28 mm

Bregma -6.72 mm
Interaural 1.92 mm
Bregma -7.08 mm

Figure 92

m5  motor root 5n
mcp  mid cerebellar ped
Me5  mesenceph 5 nu
ma5  mesenceph 5 tr
MeEnt  medial entorhinal
MiTg  microcell teg nu
ml  medial lemniscus
mllf  med long fasc
MoS  molec layer subic
Op  optic n layer SC
PaS  parabasal nucleus
PrSa  parabasal nucleus
Pn  pineal stalk
PMr  paramedian raphe
Pn  pontine nuclei
Post  postsubiculum
PPTg  pedunculopont teg
PcCaF  precuneiform area
PrNh  perihinal cx
Prl  preorbital cx
Rbd  rhaboid nu
Rs  rhinal fissure
Rf  reticular field
Rs  rubrospinal tract
RSp  retrosplenial area
St  sensory root of 5n
Stp  scp descend limb
Stu  subthalamus
Sub  subthalamus
SubB  subbrachial nu
SuG  superficial gray SC
TeA  temporal assoc
TPl  trans fibers pons
Ts  tectospinal tract
Tth  trigeminothal tr
U  vein
V1B  V1, binocular
V1M  V1, monocular
V2L  V2, lateral
V2ML  V2 cx, mediolat
V2MM  V2 cx, mediomed
V1Ent  vent int entorh
VLPAG  ventrolat PAG
Za  zonal layer SC
Figure 94

Interaural 1.68 mm  Bregma -7.32 mm

m5  motor root 5n
mcp  mid cerebellar ped
Me5  mesenceph 5 nu
me5  mesenceph 5 tr
MEnt  medial entorhinal
MfTg  microcell teg nu
ml  medial lemniscus
mlf  med long fasc
MnR  median raphe nu
Op  optic n layer SC
Pa4  paratrochlear nu
Pax  paraventricular nu
PBG  parabigeminal nu
PDR  posterodorsal raphe
Pt  pineal gland
Pst  pineal stalk
PMrk  paramedian raphe
Pn  pontine nuclei
PnO  pontine retic oral
Post  postsubiculum
PPTg  pedunculopont teg
PrCnF  precuneiform area
Prh  perihinal cx
Prs  presubiculum
Rbd  rhomboid nu
Rf  rhinal fissure
RR  retrorubral nu
scp  spongy matrix
scp  scp descend limb
STr  subiculum trans
SnG  superfic gray SC
TeA  temporal assocn
ts  trans fibers pons
V1  V1, binocular
V1M  V1, monocular
V2L  V2, lateral
V2ML  V2 cx, mediolat
V2MM  V2 cx, mediomed
VlEnt  vent int entorh
VLPAG  ventrolat PAG
Zn  zonal layer SC
Interaural 1.44 mm

Bregma -7.56 mm

Figure 96

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Figure 100

Interaural 0.96 mm  Bregma -8.04 mm
Figure 101

The Rat Brain in Stereotaxic Coordinates 5th Edition

Interaural 0.84 mm

Bregma -8.16 mm
Figure 103

The Rat Brain in Stereotaxic Coordinates 5th Edition Paxinos & Watson

Interaural 0.60 mm
Bregma -8.40 mm
The Rat Brain in Stereotaxic Coordinates 5th Edition  Paxinos & Watson

Interaural 0.48 mm  Bregma -8.52 mm

Figure 104
Interaural 0.24 mm

Bregma -8.76 mm

Figure 106
Figure 109

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Interaural -0.12 mm

Bregma -9.12 mm
Figure 111

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Interaural -0.36 mm

Bregma -9.36 mm
Interaural -0.60 mm

Bregma -9.60 mm

Figure 113

1Cb 1st Cb lobule
2Cb 2nd Cb lobule
3Cb 3rd Cb lobule
4Cb 4th Cb lobule
4V 4th ventricle
5Acs mo 5 accessory
5Cs 5th Cb lobule
5Ma mo 5 masseter
5Te mo 5 temporalis
5Tr trigem trans zone
5VM mo 5 ventromed
7n facial nerve
8cn cochlear root 8n
a artery
A5 A5 noradr cells
bax basilar artery
cbw cereb white mat
cbg central gray beta
CGA central gray alpha
CGB central gray betas
CGO central gray pons
Cxs cerebral cortex
DMtg dorsomed teg area
DPO dorsal periolivary
FL flocculus
GrC granule cochlear
LC locus coeruleus
LPB lat parabrach
LPBI lat parabrach int
LPBV lat parabrach vent
LR4V lat recess 4V
LSO lat superior olive
LVPO laterovent period
PCG5 central gray nu O
PSVDv central gray nu O
SubCV subcommissural ventricle
VCA central gray nu O
PnV central gray nu O
RIP central gray nu O
RMP central gray nu O
SubCD central gray nu O
Su5 central gray nu O
Sz5 central gray nu O
Vca central gray nu O
Figure 114

Interaural -0.72 mm

Bregma -9.72 mm
The Rat Brain in Stereotaxic Coordinates 5th Edition  Paxinos & Watson

1Cb 1st Ch lobule
2Cb 2nd Ch lobule
3Cb 3rd Ch lobule
4Cb 4th Ch lobule
4V 4th ventricle
5Acs sn 5 accessory
5Qs 5 th Qs lobule
5Ma mo 5 masseter
5Te mo 5 temporalis

1Ch 1st Ch lobule
2Ch 2nd Ch lobule
3Ch 3rd Ch lobule
4Ch 4th Ch lobule

Interaural -0.84 mm
Bregma -9.84 mm
Interaural -1.08 mm
Bregma -10.08 mm

Figure 117

1Cb 1st Cb lobule
2Cb 2nd Cb lobule
3Cb 3rd Cb lobule
4Cb 4th Cb lobule
4V 4th ventricle
5Cb 5th Cb lobule
5Tr trigem trans zone
6Acs access abducens
6N abducens nu
7n facial nerve
8cn cochlear root 8 n
8vn vestib root 8 n
a artery
A5 A5 noradr cells
bas basilar artery
cbw cereb white mat
CGA central gray alpha
CGG cent gray gamma
chp choroid plexus
Cn a1 crus 1 ansiform
DPO dorsal periolivary
EVE nu efferents 8vn
FL flocculus
g7 genu of 7 n
GrC grande cochlear
I8 interstitial nu 8n
icp inf cerebellar ped
IRt intermed ret nu
LC locus coeruleus
LR4V lat recess 4V
LSO lat superior olive
MVPO laterovent periol
Figure 121

Interaural - 1.56 mm

Bregma 10.56 mm

1Cb 1st Cb lobule
3Cb 3rd Cb lobule
4Cb 4th Cb lobule
4V 4th ventricle
5Cb 5th Cb lobule
5Sol trig sol trans zn
6aCb 6a Cb lobule
7Acs mo 7 accessory
7DL 7 nu dorsolat
7DM 7 nu dorsomedial
7L 7 nu lateral
7VI 7 nu vent intermed
7VM 7 nu ventromedial
8cn cochlear root 8 n
8en vestib root 8 n
a artery
A5 A5 noradr cells
asc7 asc fibers of 7 n
bas basilar artery
cbc cerebellar comm
cbw cerebellar white mat
Cl caud interstit mlf
cPO caudal perilv nu
cr41 crus 1 ansiform
dc1dp dors coch dp core
dc1fu dors coch fusiform
dc1gr dors coch granular
dcm5 dors coch mole
dms5 dorsomed sp 5 nu
dpgi dors paragigantoc
EVe nu efferents 8vn
fl flocculus
g7 genu of 7 n
gi gigantocell ret nu
GiA gigantocell alpha
GnC granule cochlear
GrCb granule layer
i8 interstitial nu 8n
scp inf cerebellar ped
icpd icp decussation
intA interposed ant
irA intermed rt alpha
lat lat cerebellar nu
lpgA lat paragig alph
lpgai lat paragigel est
lr4V lat recess 4V
LSO lat superior olive
lvE lat vestibular nu
Interaural -1.68 mm

Bregma 10.68 mm
Interaural -1.92 mm

Bregma 10.92 mm
Interaural -2.16 mm  
Bregma 11.16 mm
Figure 127

Interaural -2.28 mm

Bregma 11.28 mm
Figure 130

Interaural -2.64 mm

Bregma 11.64 mm
Figure 132
Figure 134

Interaural -3.12 mm

Bregma -12.12 mm
Figure 135

Interaural -3.24 mm  Bregma -12.24 mm
Interaural -3.84 mm
Bregma -12.84 mm
Figure 141

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4V 4th ventricle
5Sol trig sol trans zn
6Cb 6th Cb lobule
7Cb 7th Cb lobule
8Cb 8th Cb lobule
9a,bCb 9th Cb lobule, a&b
9cCb 9th Cb lobule, c
10Cb 10th Cb lobule
10N dorsal mo nu 10
10n vagus n
12N hypoglossal nu
12n root of 12n
AmbSC anaparamed fiss
asp ant spinal artery
C1 C1 adren cells
C2 C2 adren cells
cbw cereb white mat
chp choroid plexus
Cop copula of pyramis
Crus1 crus 1 ansiform
Crus2 crus 2 ansiform
Cu cuneate nu
CVL caudoventrolat rt
dsc/oc dors sp cer/ol cer
ECu ext cuneate nu
Gi gigantocell ret nu
GiV gigantocell vent
icp inf cerebellar ped
In intercalated nu
IOD 10 dorsal nu
IOM 10 medial nu
IOPr 10 principal nu
IRt intermed ret nu
JxO juxtaolivary nu
Li linear nu
LPGi lat paragig cell
ml mediallemniscus
mff med long fasc
MVe med vestibular nu
Mx matrix region
PaS paratrigrigeminal nu
PCRt parvicell ret nu
ph posterolat fissure
PM paramedian lobule
PMn paramedian sulcus
pms paramedian sulcus
pms paraxial fiss
py pyramidal tract
ro ro of Roller
RPa raphe pallidus nu
RVRG rostral ventral rsp
sol solitary tract
SolD Sol dorsolateral
SolI Sol interstitial
SolIM Sol intermediate
SolL Sol lateral
SolM Sol medial
SolV Sol ventral
SoVL Sol ventrolateral
Sp5 sp trigeminal tr
SpSt spinal 5 interparasymp
SpVe spinal vestib nu
tes tectospinal tract
vert vertebral artery
vsc vent spinocer tr
Z nu Z
Figure 143

Interaural -4.20 mm

Bregma -13.20 mm
Interaural -4.44 mm

Bregma -13.44 mm
Figure 152

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*8Ch, 8th Ch lobule*
*9a,bCh, 9th Ch lobule, a,b*
*10N, dorsal mo nu 10*
*12GH, 12 geniohyoid*
*12N, hypoglossal nu*
*12n, root of 12n*
*A1, A1 noradr cells*
*AP, amy postrema*

*cbw, cereb white mat*
*CC, central canal*
*Ccr, central cervic nu*
*Cop, copula of pyramis*
*Ct, conterminal nu*
*Cfa, cuneate nu*
*Cuf, cuneate fasciculus*
*dsc, doral sp cereb tr*
*Gr, gracile nu*
*Dai, int arcuate fibers*
*Ioa, IO med sub nu A*
*Iob, IO med sub nu B*
*IobE, IO beta sub nu*
*Ioc, IO med sub nu C*
*Irt, intermed ret nu*
*LRt, lat reticular nu*
*LRPC, lat retic parvicell*
*MdD, medullary ret dors*
*MdV, medull ret vent*
*Mld, med lem decuss*
*Mx, matrix region*
*Pm, paramedian lobule*
*Py, pyramidal tract*
*Ramb, retroambiguus nu*
*Rob, raphe obscurus nu*
*Rpa, raphe pallidus nu*
*Rs, rubrospinal tract*
*Sf, 2ary fissure*
*Sol, solitary tract*
*SoC, Sol commissural*
*SoDl, Sol doralat*
*SoEm, Sol medial*
*Soiv, Sol ventral*

*CeCv, central cervic nu*
*Cop, copula of pyramis*
*Ct, conterminal nu*
*Cu, cuneate nu*
*CuR, cun rotundus*
*Cu, cuneate fasciculus*
*dsc, doral sp cereb tr*
*Gr, gracile nu*
*Dai, int arcuate fibers*
*Ioa, IO med sub nu A*
*Iob, IO med sub nu B*
*IobE, IO beta sub nu*
*Ioc, IO med sub nu C*
*Irt, intermed ret nu*
*LRt, lat reticular nu*
*LRPC, lat retic parvicell*
*MdD, medullary ret dors*
*MdV, medull ret vent*
*Mld, med lem decuss*
*Mx, matrix region*
*Pm, paramedian lobule*
*Py, pyramidal tract*
*Ramb, retroambiguus nu*
*Rob, raphe obscurus nu*
*Rpa, raphe pallidus nu*
*Rs, rubrospinal tract*
*Sf, 2ary fissure*
*Sol, solitary tract*
*SoC, Sol commissural*
*SoDl, Sol doralat*
*SoEm, Sol medial*
*Soiv, Sol ventral*

*Sp5C, spinal 5 caudal*
*SubP, subpostrema area*
*Ts, tectospinal tract*
*Vert, vertebral artery*
*Vsc, vent spinocer tr*
The Rat Brain in Stereotaxic Coordinates 5th Edition Paxinos & Watson

Interaural -6.00 mm Bregma -15.00 mm

Figure 157

9a,bCb 9th Ch lobule, a&b
9cCb 9th Ch lobule, c
11N access nerve nu
12N hypoglossal nu
A1 A1 norad cells
A2 A2 norad cells
CC central canal
CeCv central cervic nu
Cu cuneate nu
cu cuneate fasciculus
dcc dorsal sp cereb tr
Gr gracile nu
gr gracile fasciculus
IB internal basal nu
IBR intermed ret nu
LRT lat reticular nu
LRPC lat retic parvicell
MdD medullary ret dors
MdIV medull ret vent
mlf med long fasc
MnA median acc nu
Mx matrix region
py pyramidal tract
pyd pyramidal decussn
RAmb retroambiguus nu
rs rubrospinal tract
sol solitary tract
SoC Sol commissural
SoM Sol medial
SoV Sol ventral
SoVL Sol ventrolat
sp5 sp trigeminal tr
Sp5C spinal 5 caudal
ts tectospinal tract
vert vertebral artery
vsc vent spinocer tr
Figure 159
Figure 162a*
1-10 spinal cord layers
C6C central cervical nucleus
cu cuneate fasciculus
dl dorsolateral fasciculus
gr gracile fasciculus
IML intermediolateral cell column
IMM intermediomedial cell column
LatC lateral cervical nucleus
LSp lateral spinal nucleus
dcs dorsal corticospinal tract

*Fig 162a, 162b, 162c, 162d, 162e are reproduced from Molander and Grant (1995) with permission of the authors. Users of these figures should cite Molander, C., and Grant, G., 1995, Spinal cord cytoarchitecture.

1-10 spinal cord layers
CeCv central cervical nucleus
cu cuneate fasciculus
D dorsal nucleus (Clarke)
dl dorsolateral fasciculus
gr gracile fasciculus
IML intermediolateral cell column
IMM intermediomedial cell column
LatC lateral cervical nucleus
LSp lateral spinal nucleus
dcs dorsal corticospinal tract

Fig 162a, 162b, 162c, 162d, 162e are reproduced from Molander and Grant (1995) with permission of the authors. Users of these figures should cite Molander, C. and Grant, G., 1995, Spinal cord cytoarchitecture.


Figure 162c*
1-10 spinal cord layers
CeCv central cervical nucleus
D dorsal nucleus (Clarke)
dl dorsolateral fasciculus
gr gracile fasciculus
IML intermediolateral cell column
IMM interomedial cell column
LatC lateral cervical nucleus
LSp lateral spinal nucleus
dcs dorsal corticospinal tract

*Fig 162a, 162b, 162c, 162d, 162e are reproduced from Molander and Grant (1995) with permission of the authors. Users of these figures should cite Molander, C. and Grant, G., 1995, Spinal cord cytoarchitecture.

1-10 spinal cord layers
CeCv central cervical nucleus
dl dorsolateral fasciculus
gr gracile fasciculus
IML intermediolateral cell column
IMM intermediomedial cell column
LatC lateral cervical nucleus
LSp lateral spinal nucleus
dcs dorsal corticospinal tract

*Fig 162a, 162b, 162c, 162d, 162e are reproduced from Molander and Grant (1995) with permission of the authors. Users of these figures should cite Molander, C. and Grant, G., 1995, Spinal cord cytoarchitecture.