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Toward a Common Terminology for the Gyri and Sulci of the Human Cerebral Cortex

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The gyri and sulci of the human brain were defined by pioneers such as Louis-Pierre Gratiolet and Alexander Ecker, and extensified by, among others, Dejerine (1895) and von Economo and Koskinas (1925). Extensive discussions of the cerebral sulci and their variations were presented by Ono et al. (1990), Duvernoy (1992), Tamraz and Comair (2000), and Rhoton (2007). An anatomical parcellation of the spatially normalized single high resolution T1 volume provided by the Montreal Neurological Institute (MNI; Collins, 1994; Collins et al., 1998) was used for the macroscopical labeling of functional studies (Tzourio-Mazoyer et al., 2002; Rolls et al., 2015). In the standard atlas of the human brain by Mai et al. (2016), the terminology from Mai and Paxinos (2012) is used. It contains an extensively analyzed individual brain hemisphere in the MNI-space. A recent revision of the terminology on the central nervous system in the Terminologia Anatomica (TA, 1998) was made by the Working Group Neuroanatomy of the Federative International Programme for Anatomical Terminology (FIPAT) of the International Federation of Associations of Anatomists (IFAA), and posted online as the Terminologia Neuroanatomica (TNA, 2017: http://FIPAT.library.dal.ca) as the official FIPAT terminology. This review deals with the various terminologies for the cerebral gyri and sulci, aiming for a common terminology.

Keywords: terminology, gyri, sulci, cerebral cortex, human brain

INTRODUCTION

Although the gyri and sulci of the human brain were already beautifully illustrated by Vicq d’Azyr (1786) and von Soemmerring (1791), they were named and defined by Gratiolet (1854), Huschke (1854), Ecker (1869), Pansch (1868, 1879), Jensen (1871), Wernicke (1876), Eberstaller (1884, 1890), and Brissaud (1893), and extensified by, among others, Dejerine (1895), Retzius (1896), von Economo and Koskinas (1925), and Rose (1935). More recently, extensive discussions of the cerebral sulci and their variations were presented by Ono et al. (1990), Duvernoy (1992), Tamraz and Comair (2000), and Rhoton (2007). An anatomical parcellation of the spatially normalized single high resolution T1 volume provided by the Montreal Neurological Institute (MNI) was used for the macroscopic labeling of functional studies (Tzourio-Mazoyer et al., 2002; Rolls et al., 2015), using largely the Dejerine terminology. The previously much used Talairach atlas (Talairach and Tournoux, 1988) proved to be rather inaccurate for the cytoarchitectonic allocation of functional activations (Tzourio-Mazoyer et al., 2002; Eickhoff et al., 2005). In the standard atlas of the human
brain by Mai et al. (2016), the terminology from Mai and Paxinos (2012) is used. It contains an individual brain hemisphere in the MNI-space. In a recent pocket atlas (Mai and Majtanik, 2017), a probabilistic neuroanatomy of 152 individuals was presented to which the main atlas is registered. Mai and colleagues used the Brodmann (1909) and von Economo and Koskinas (1925) subdivisions of the cerebral cortex. A comprehensive cellular-resolution atlas of the adult human brain (Ding et al., 2016) presents the first digital human brain atlas across a complete adult female brain. The terminology used largely follows Brodmann terminology.

Recently, a revision of the terminology on the central nervous system in the Terminologia Anatomica (TA, 1998) was made by the Working Group Neuroanatomy of the Federative International Programme for Anatomical Terminology (FIPAT) of the International Federation of Associations of Anatomists (IFAA), and posted online as the Terminologia Neuroanatomica (TNA, 2017; http://FIPAT.library.dal.ca; for an introductory paper, see ten Donkelaar et al., 2017) as the official FIPAT terminology. This review deals with the various terminologies for the cerebral gyri and sulci on the superolateral, inferomedial, and basal surfaces of the cerebrum, aiming for a common terminology. It combines the data from the TNA (2017), an illustrated version (ten Donkelaar et al., 2018) and additional terms found in preparing this review.

**BRIEF REVIEW OF THE LITERATURE**

In Figure 1, the wealth of gyri and sulci of the human cerebral cortex as distinguished by von Economo and Koskinas (1925) is shown. The gyri of the cerebral lobes are indicated by the classical numbering such as F1-F3, T1-T4, and the sulci without capitals (f1, f2, etc). Clearly visible are the first and second intermediate parietal sulci of Jensen and Eberstaller (s.imdI and s.imdII, respectively) as well as the frontomarginal sulcus of Wernicke with various components. Many of the smaller or infrequent sulci were forgotten, several of which were reintroduced in the recent human brain mapping era and in the TNA. The Supplementary Table 1 contains a list of synonyms and eponyms for the cerebral gyri and the Supplementary Table 2 of the main sulci.

Terminological differences used in Tzourio-Mazoyer’s approach (Tzourio-Mazoyer et al., 2002; Rolls et al., 2015; Figure 2) vs. the Terminologia Anatomica (TA, 1998) concern the use of eponyms such as Rolandoic operculum, Sylvian fissure and Heschl’s gyrus, and the use of gyrus instead of lobule for the superior and inferior parietal lobules.

In the atlas of Mai et al. (2016) and the recent pocket atlas by Mai and Majtanik (2017), the use of the term fissure is advocated for the lateral, parietooccipital and hippocampal sulci. In the BNA (1895), the terms fissurae cerebri lateralis, collateralis, parietooccipitalis, calcarea, and hippocampi were used. In the JNA (1936), only the lateral, Sylvian fissure remained as fissure. This was corrected in the PNA (1955) and later editions, and for the cerebrum, the term fissure is in use only for the interhemispheric fissure. Therefore, the term fissure should not have been advocated anymore.

Minor differences in Mai et al. (2016) are the use of the terms central operculum for the subcentral gyrus, anterior intermediate parietal sulcus for the first intermediate parietal sulcus of Jensen (see also Zlatkina and Petrides, 2014), medial occipitotemporal gyrus as a common term for the lingual gyrus and the parahippocampal gyrus, perinsular sulcus for the circular sulcus of the insula, and a rather extensive terminology for the opercula, including frontal, frontoparietal, and temporal opercula (Figure 3). Their frontoparietal operculum includes the anterior central (precentral) operculum, the subcentral gyrus, the posterior central (postcentral) operculum, and the parietal operculum. The first three collectively may belong to the subcentral gyrus.

In their atlas of the human brain in MNI space, Mai et al. (2016) presented photographs of cell-stained sections of the right hemisphere of a 24-year-old male from the Vogt-collection in Düsseldorf (Vogt and Vogt, 1919). Schematic drawings show delineations of the cortex, which are based on the original maps of Brodmann (1909). The surface-based maps by Van Essen (2005); Van Essen et al. (2012) were modified by manually estimating areal boundaries on the atlas drawing and transforming them on the surface of the 3D reconstruction. Nieuwenhuys et al. (2015) adapted the standard brain, generated from the colin27 brain (http://www.bic.mni.mcgill.ca/ServicesAtlases/Colin27). In Figures 4, 5, gyri and sulci are shown for the lateral and medial aspects, respectively. The colin27 image is the result of averaging 27 linearly registered high-resolution T1-weighted scans of the same individual (Collins, 1994; Collins et al., 1998; Holmes et al., 1998), matched to the MNI305-space (Mazziotta et al., 2001). Several neuroimaging software systems adopted the colin27 template as the standard reference. Nieuwenhuys et al. (2015) noted a few peculiarities of the colin27 template brain: (1) the Broca area of the inferior frontal gyrus is very large, but the middle frontal gyrus is relatively narrow; (2) the superior temporal sulcus is not continuous with the groove marking the cortex of the angular gyrus; (3) both the collateral and cingulate sulci are interrupted, and the posterior part of the cingulate sulcus shows an unusual zigzag course; and (4) the upper surface of the splenium of the corpus callosum has a remarkable bump. It may be added that no attempt was made to subdivide the lateral aspect of the occipital lobe, and that the fairly constant frontomarginal sulcus is absent.

In this review, the terminology of the recent TNA (2017) is presented along with short descriptions and currently used synonyms, and summarized in Tables 1–3. Both English and Latin official terms from the TNA are used. The sulci of the cerebral cortex can be divided into interlobar sulci, separating the cerebral lobes, and lobar sulci present in a lobe.

**SUPEROLATERAL SURFACE OF THE CEREBRAL HEMISPHERE**

The lateral aspect of the cerebral (Figure 6; and Table 1) shows two interlobar sulci: the lateral and central sulci. The lateral sulcus (sulcus lateralis of Sylvius), known for a long time as the Sylvian fissure, between the frontal and temporal lobes, has three branches: the anterior (ramus anterior) or horizontal...
FIGURE 1 | Sulcal pattern in the human cerebral cortex: (A) Lateral aspect; (B) medial aspect (after von Economo and Koskinas, 1925). AB, area parolfactoria of Broca; Ang, angular lobule; AR, gyri of Andreas Retzius; BB, band of Broca; BG, bandelette of Giacomini; B.olf, olfactory bulb; C, calcarine fissure; Ca, Cn, anterior and posterior central gyri; Ca, corpus callosum; Coa, anterior commissure; Cm, cuneus; cmg, callosomarginal sulcus; d, diagonal sulcus of Eberstaller; E, descending occipital gyrus of Ecker; F1, F2, F3, first, second and third frontal gyri; F3o, F3op, F3pt, orbital, opercular, pretriangular, and triangular parts of F3; H1, H2, superior and inferior frontal sulci; f.olf, fascia dentata; f.m, middle frontal sulcus; fo, fornix; f.p., paracentral fossa; fs.c, fasciola cinerea; f.sy, Sylvian fissure; Fus (T4), fusiform gyrus; g. ant. a., g. ant. d., g. ant. prc, antical, antidiagonal and antiprecentral gyrus of operculum; Gsm, supramarginal lobule; g.a.a., g.a.m., g.a.p., arcuate gyrus of anterior, middle and posterior parietal lobule; g.amb, amygdala; g. br. a., g. br. i., il, iii, g.br.imd, accessory short, first, second and third short and intermediate short gyrus of insula; g. cl. p., posterior cuneolinguo commissural gyrus; g. dt, dentate gyrus; g.d.u., digital gyrus of unica; g. fil. a., g. fil. p., anterior and posterior frontolimbic gyr; g. fs, fasciolar gyrus; g. g, geniculate gyrus; g. i, intralimbic gyrus; g. l, lateral and medial olfactorial gyrus; g. pip, posterior inferior parietal gyrus; g. p. a., g. p. p., anterior and posterior parietolimbic gyrus; g. po. i, g. po. s., inferior and superior parieto-occipital gyrus; g. po. is. i., g. po. is. ii, first and second postcentral gyrus of insula; g. po. is. iy, precentral gyrus of isthmus; g. r, retrolimbic gyrus; g. sc, subcallosal gyrus; g. sg. i., g. sg. m, g. sg. s., inferior, middle, and superior supragramaticus of cuneus; g. sml, semilunar gyrus; g. str, subtriangular gyrus of operculum; g. tr. a., g. tr. p., anterior and posterior temporolimbic gyrus; g. tr. s., anterior transverse temporal gyrus of Schwalbe; g. tr. is, transverse gyrus of insula; g. tr. op. i., g. tr. op. ii., first and second transverse gyrus of parietal operculum; H.I, H.II, first and second gyrus of Heschl; Hi, hippocampal gyrus; h, horizontal branch of Sylvian fissure; hi, hippocampal fissure; io, isthmus; ic, incisura capitis; ig, indusium griseum; ip, interparietal sulcus; ipo, preoccipital incisure; it, temporal incisure; L. g, lingula; L. s. a., L. s. p., anterior and posterior part of superior lingual gyrus; Lr, retrosplenial part of limbic gyrus; l, intralimbic gyrus; la, lamina affixa; i.g, lingual sulcus; ii, lamina terminalis; mg. a., mg. p., anterior and posterior border of circular sulcus of insula; O1, O2, O3, first, second and third occipital gyrus; Op. R, operculum of Rolando; Op. R, frontal operculum of Rolando; Opt, optic nerve; ot, occipitotemporal (collateral) fissure; Pa, paracentral lobule; Pb, basolateral region; Pr, inferior parietal lobule; Pr, precuneus; Ps, superior parietal lobule; Pr, temporopolar gyrus; p. f, falloform incisure; po, parieto-occipital fissure; p. sy, posterior branch of Sylvian fissure; R, sulcus of Rolando; (Continued).
The upper arch borders a “knob,” von Economo and Horn, 1930; Geschwind and distinguished two. Recent mapping approaches. These transverse gyri contain the primary superior and F3, separated by together the of Eberstaller). The orbital part is continuous with the central sulcus usually does not reach the lateral sulcus, and is (sulcus frontomarginalis). The ascending (ramus ascendens) or vertical ramus and the posterior ramus (ramus posterior), separating the parietal and temporal lobes. The central sulcus (sulcus centrales of Rolando) separates the frontal and parietal lobes. It is not a straight line but forms two arches from the superior margin of the hemisphere downwards to the lateral sulcus, the genu superior and the genu inferior (Broca, 1878a). The upper arch borders a “knob,” which protrudes posteriorly, and contains the hand area of the somatosensory cortex (Testut and Latarjet, 1948; Bludau et al., 2014) distinguished two cytoarchitectonically and functionally distinct areas: the lateral frontopolar area 1 (Fp1) and the medial frontopolar area 2 (Fp2).

The temporal lobe (lobus temporalis) is formed by the superior, middle and inferior temporal gyri (gyrus temporalis superior, -medius, and -inferior), classically numbered T1, T2, and T3, separated by the superior and inferior temporal sulci (sulcus temporalis superior and -inferior, classically numbered t1 and t2). The temporopolar cortex (cortex temporopolaris) at the temporal pole (polus temporalis) is a heterogenous region, situated between isocortex laterally, praeisocortex in caudorostral continuation and paleocortex caudodorsally (Ding et al., 2009; Blaizot et al., 2010).

On the upper surface of the superior temporal gyrus (Figure 7), forming the temporal operculum, the planum polare, the anterior and posterior transverse gyri (gyrus temporalis transversus anterior and - posterior of Heschl) and the planum temporale can be distinguished, separated by sulci. The anterior transverse temporal sulcus (sulcus temporalis transversus anterior) separates the planum polare from the transverse temporal gyri of Heschl, the two transverse temporal gyri are subdivided by the intermediate transverse temporal sulcus (sulcus temporalis transversus intermedius), and the posterior transverse temporal sulcus (sulcus temporalis transversus posterior) separates the posterior transverse temporal gyri from the planum temporale. There is usually one transverse gyrus of Heschl on the left and two on the right (Heschl, 1878; Marie et al., 2015; Tzourio-Mazoyer and Mazoyer, 2017). These transverse gyri contain the primary auditory cortex. The planum temporale is on the left usually larger than on the right (von Economo and Horn, 1930; Geschwind and Levitsky, 1968; Galaburda et al., 1978; Ide et al., 1999; Tzourio-Mazoyer and Mazoyer, 2017). The posterior part of the superior temporal gyrus forms the sensory or receptive language area of Wernicke (1874).

The temporal lobe is the location of strong asymmetries of its surface with a strong leftward asymmetry of the planum temporale (von Economo and Horn, 1930; Geschwind and

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**Figure 1 |** Post, rostrum of corpus callosum; rc, retrocalcarine fissure; rh, rhinal fissure; ri, rs, inferior and superior rostral sulcus; rl, retrolingual sulcus; Spl, splenium of corpus callosum; s.a, acoustic sulcus; s.B, sulcus of Brissaud; s.Bcl, s.Bcl II, first and second short sulcus of insula; s.c.c, sulcus of corpus callosum; s.c.ia, central sulcus of insula; s.td, fimbriodentate sulcus; s.fmg.ml, s.fmg.md, s.fmg.it, medial, middle, and lateral frontomarginal sulcus; s.g.F1, sulcus of first frontal gyrus; s.imdI, s.imdII, first (of Jensen) and second (of Eberstaller) intermediate sulcus; s.l, lunate sulcus; so.f, so.2, first and second occipital sulcus; s.ol, oolfactory sulcus; s.or.imdI, s.or.imdII, intermediate, lateral, medial, and transverse orbital sulcus; s.pa, paracentral sulcus; s.po.i, s.p.o.s, inferior and posterior postcentral sulcus; s.po.is postcentral sulcus of isthmus; spola, s.pol.m, s.pol.p, s.pol.ps, anterior, middle, posterior, and postremal parafalky sulcus; s.pr.c, precuneate sulcus; s.pr.d, prediagonal sulcus; s.pr.i, s.p.s, inferior and superior precentral sulcus; s.pr.is, precentral sulcus of insula; s.p.s, s.p.tr, superior and transverse parietal sulcus; s.r.h.i, internal rhinal sulcus; s-san, semianular sulcus; s.sca, s.s.c.p, anterior and posterior subcentral sulcus; s.sgi, s.g.s, inferior and superior sagittal sulcus of cuneus; s.so, suboccipital sulcus; s.so.r, supraorbital sulcus; s.spl, splenial sulcus; s.st, s.t.p, first and second deep temporal sulcus; s.tca.5, anterior transverse temporal sulci of Schwalbe; s.tr.cpi, s.tr.cpi II, first and second transverse sulcus of parietal operculum; t1, t2, t3, first, second and third temporal sulcus; Th, thalamus; Tr, trunk of the parieto-occipital and calcarine fissures; Tr.o, olfactory trigonum; Tu.o, olfactory tubercle; U1, U2, U3, first, second and third temporal sulci; U, uncus; v, ventral branch of the Sylvian fissure; uc.mg, vertical branch of callosomarginal sulcus.
FIGURE 2 | Sulci definition on the 3-D renderings of the T1 MNI single subject brain: (A) Lateral view; left hemisphere on the left. From the frontal pole to the occipital pole, the following sulci are indicated: the superior frontal sulcus (dark green), the inferior frontal sulcus (red), the anterior, horizontal ramus of the lateral, Sylvian sulcus (cyan), the diagonal sulcus (yellow), the precentral sulcus (purple), the central, Rolandic sulcus (red), the postcentral sulcus (cyan), the intraparietal and intraoccipital sulci (purple), the anterior limit of the occipital lobe, corresponding in its inferior part to the anterior occipital sulcus (light green), the transverse occipital sulcus (yellow), and the inferior occipital sulcus (pink). (B) medial view; from the frontal to the occipital pole: the paracingulate sulcus (red), the cingulate sulcus (orange), the anterior rostral sulcus (purple), the paracentral sulcus (light green), the central, Rolandic sulcus (red), the marginal ramus (orange), the subparietal sulcus (yellow), the parieto-occipital sulcus (blue), and the calcarine sulcus (cyan). (C) At the left, superior view: the superior frontal sulcus (dark green) runs in the same direction and is symmetric in an horizontal plane with the intraoccipital sulcus (purple); the central, Rolandic sulcus (red), the marginal ramus (orange), the subparietal sulcus (yellow), the parieto-occipital sulcus (blue), and the calcarine sulcus (cyan). At the right, basal view: in the frontal lobe the orbital (white) and olfactory (red) sulci are depicted, and in the temporal lobe, the rhinal sulcus (light green), the inferior temporal sulcus (dark blue), the occipitotemporal sulcus (yellow) and the collateral sulcus (red). Adapted from Tzourio-Mazoyer et al. (2002).

Levitsky, 1968; Galaburda et al., 1978; Ide et al., 1999; Toga and Thompson, 2003; Tzourio-Mazoyer and Mazoyer, 2017), the Heschl gyrus and of its sulci depth. A leftward asymmetry of the lateral sulcus is already present at birth (Hill et al., 2010).

The triangular insula of Reil lies in the depths of the lateral sulcus and is covered by the frontal, frontoparietal, parietal, and temporal opercula (Türk et al., 1999; Naidich et al., 2004; Morel
et al., 2013; Figure 8). The limen insulae, the insular threshold or frontotemporal junction, forms the transition from the anterior perforated substance to the basal aspect of the frontal lobe to the insula. The insula is surrounded by the circular sulcus of the insula (sulcus circularis insulae of Reil) or perinsular sulcus, and contains several vertically directed gyri, usually three short gyri (gyri breves insulae), anterior, middle and posterior, and one or two long gyri (gyri longi insulae), anterior and posterior, separated by the central sulcus of the insula (sulcus centralis insulae) or transverse insular sulcus of Eberstaller. The three short gyri converge to the apex of the insula, and are joined to the orbital part of the inferior frontal gyrus by a short annectant gyrus, the transverse insular gyrus ( gyrus transversus insulae of Eberstaller).

The lateral aspect of the parietal lobe ( lobus parietalis) shows the postcentral gyrus ( gyrus postcentralis), the postcentral sulcus (sulcus postcentralis), and the superior and inferior parietal lobules ( lobulus parietalis superior and - inferior), numbered P1 and P2, respectively, and separated by the intraparietal sulcus ( sulcus intraparietalis). Dorsally, the parietal lobe is connected with the occipital lobe by the parietooccipital arc ( arcus parietooccipitalis) of Gratiolet. Another "pli de passage" connects the posterior part of the angular gyrus with the superior occipital gyrus. In monkeys, the intraparietal sulcus contains numerous intraparietal areas ( AIP, LIP, MIP, PIP, and VIP; Rizzolatti et al., 1998; ten Donkelaar, 2011; Zilles and Amunts, 2012). In an fMRI study, Seitz and Binkofski (2003) identified AIP and VIP in the human brain. Two cytoarchitectonic areas were identified and termed hIP ( human Intraparietal) 1 and hIP2 in the anterior part of the intraparietal sulcus (Choi et al., 2006), which may be the anatomical correlates of VIP and AIP, respectively (see also Zlatkina and Petrides, 2014). A third intraparietal area, hIP3, was delineated in the anterior medial wall of the intraparietal sulcus, directly across hIP1 and hIP2 ( Scheperjans et al., 2008a,b).

The inferior parietal lobule (IPL) consists of the supramarginal and angular gyri ( gyrus supramarginalis and - angularis), both of which can be further subdivided ( see Caspers et al., 2012). The supramarginal gyrus surrounds the posterior ascending ramus of the lateral sulcus and can be subdivided into five areas. The angular gyrus lies around the caudal end of the superior temporal gyrus and is composed of two areas. The first intermediate sulcus ( sulcus intermedius primus of Jensen) may subdivide the inferior parietal lobule into the supramarginal and angular gyri, and the second intermediate sulcus ( sulcus intermedius secundus of Eberstaller) may be found posterior to the Jensen sulcus, dividing the angular gyrus into anterior and posterior parts.

The transverse parietal sulcus ( sulcus parietalis transversus of Brissaud) may subdivide the superior parietal lobule (SPL) into anterior and posterior portions, when it extends on the superolateral aspect of the cerebrum. The SPL includes the preparietal area, the superior parietal area, each with subdivisions ( see Scheperjans et al., 2008a,b). The parietal operculum ( operculum parietale) contains four cytoarchitectonic areas ( OP1-OP4), corresponding to the secondary somatosensory cortex ( Eickhoff et al., 2006a,b).

Most of the occipital lobe ( lobus occipitalis) is found on the medial aspect of the cerebrum. An imaginary line between the parietooccipital sulcus superiorly and the preoccipital notch inferiorly indicates the border between the occipital lobe and the parietal and temporal lobes. On the superolateral aspect, the following occipital gyri and sulci can be found: the superior occipital gyrus ( O1 or gyrus occipitalis superior), the middle occipital gyrus ( O2 or gyrus occipitalis medius), the upper and lower parts of which are separated by the lunar sulcus ( sulcus lunatus), the inferior occipital gyrus ( O3 or gyrus occipitalis inferior) and the descending occipital gyrus ( gyrus occipitalis descendens of Ecker). An inferior occipital sulcus ( sulcus occipitalis inferior) may divide the lower part of O2 from O3. For variations of the gyri and sulci on the occipital lobe convexity, see Ono et al. (1990), Alves et al. (2012) and Malikovic et al. (2012).

**INFEROMEDIAL SURFACE OF THE CEREBRAL HEMISPHERE**

On the inferomedial surface of the cerebral hemisphere, interlobar sulci include the continuation of the central sulcus, the cingulate sulcus, the sulcus of the corpus callosum, the parietooccipital sulcus, the subparietal sulcus and the collateral sulcus (Figure 9; and Table 2). The cingulate sulcus ( sulcus cinguli or "scissure limbique" of Broca, 1878b) runs parallel to the corpus callosum and ascends above the posterior part (the splenium) of the corpus callosum toward the superior...
| English official terms and synonyms | Latin official terms and synonyms | Abbreviations and acronyms | Eponyms |
|-----------------------------------|----------------------------------|---------------------------|---------|
| **Superolateral interlobar sulci** | *Sulci interlobares superolaterales* | ces | sulcus of Rolando |
| central sulcus                     | sulcus centrales                  |                           |         |
| lateral sulcus                     | sulcus laterales                  | ls                        | sulcus of Sylvius |
| posterior ramus                    | ramus posterior                   | lsp                       |         |
| ascending ramus                    | ramus ascendens                  | lsas                      |         |
| anterior ramus                     | ramus anterior                    | lsan                      |         |
| parietooccipital sulcus           | sulcus parietooccipitales         | pos                       | sulcus of Gratiolet |
| preoccipital notch                 | incisura preoccipitales          | pn                        | incisure of Meynert |
| **Frontal lobe**                  | *Lobus frontalis*                |                           |         |
| frontomarginal sulcus             | sulcus frontomarginalis           | fmg                       | sulcus of Wernicke |
| frontal pole                      | polus frontalis                  | FP                        |         |
| frontopolar area                  | area frontopolaris               | FPA                       |         |
| superior frontopolar gyrus        | gyrus frontopolaris superior     | SFPG                      | area of Gratiolet |
| middle frontopolar gyrus          | gyrus frontopolaris medius       | MFPG                      | area of Broca |
| inferior frontopolar gyrus        | gyrus frontopolaris inferior     | IFPG                      | area of Broca |
| frontomarginal gyrus              | gyrus frontomarginalis           | FMG                       | sulcus of Eberstaller |
| frontal operculum                 | operculum frontale               | FOp                       |         |
| inferior frontal gyrus            | gyrus frontalis inferior         | IFG; F3                   |         |
| orbital part                      | pars orbitalis                   | IFGOr                     |         |
| triangular part                   | pars triangularis                | IFGTr                     |         |
| radiate sulcus                    | sulcus radiatus                  | ras                       | sulcus of Eberstaller |
| opercular part                    | pars opercularis                 | IFGOp                     | area of Broca |
| diagonal sulcus                   | sulcus diagonalis                | dis                       | sulcus of Eberstaller |
| inferior frontal sulcus           | sulcus frontalis inferior        | ifs; f2                   |         |
| middle frontal gyrus              | gyrus frontalis medius           | MFG; F2                   |         |
| precentral gyrus                  | gyrus precentralis               | PRG                       |         |
| precentral sulcus                 | sulcus precentralis              | prs                       |         |
| anterior subcentral sulcus        | sulcus subcentralis anterior     | ascis                     |         |
| subcentral gyrus                  | gyrus subcentralis               | SCeG                      | central or Rolandic operculum |
| posterior subcentral sulcus       | sulcus subcentralis posterior    | pscs                      |         |
| superolateral superior frontal gyrus | gyrus frontalis superior superolateralis | SFGL; F1 |         |
| superior frontal sulcus           | sulcus frontalis superior        | sfs; f1                   |         |
| **Parietal lobe**                 | *Lobus parietalis*               |                           |         |
| postcentral gyrus                 | gyrus postcentralis              | POG                       |         |
| postcentral sulcus                | sulcus postcentralis             | pcs                       |         |
| superior parietal lobule          | lobulus parietalis superior      | SPL; P1                   | first parietooccipital passage of Gratiolet |
| parietooccipital arc              | arcus parietooccipitales         | POCA                      |         |
| intraparietal sulcus              | sulcus intraparietales           | ips                       |         |
| first intermediate sulcus; anterior| sulcus intermedius primus; sulcus| fis                       | sulcus of Jensen |
| intermediate sulcus               | intermedius anterior             |                           |         |
| second intermediate sulcus; posterior| sulcus intermedius secundus; sulcus| sis                       | sulcus of Eberstaller |
| intermediate sulcus               | intermedius posterior            |                           |         |
| transverse parietal sulcus        | sulcus parietalis transversus    | tps                       | sulcus of Brissaud |
| inferior parietal lobule          | lobulus parietalis inferior      | IPL; P2                   |         |
| angular gyrus                     | gyrus angularis                  | AG                        |         |
| parietal operculum                | operculum parietale              | POP                       |         |
| supramarginal gyrus               | gyrus supramarginalis            | SMG                       |         |
### TABLE 1 | Continued

| English official terms and synonyms                          | Latin official terms and synonyms           | Abbreviations and acronyms | Eponyms                  |
|--------------------------------------------------------------|---------------------------------------------|----------------------------|--------------------------|
| **Occipital lobe**                                            | **Lobus occipitalis**                       |                            |                          |
| occipital pole                                               | polus occipitalis                          | OP                         |                         |
| lunate sulcus                                                | sulcus lunatus                             | lus                        |                         |
| transverse occipital sulcus                                  | sulcus occipitalis transversus             | tos                        |                         |
| superior occipital gyrus                                     | gyrus occipitalis superior                  | SOG; O1                    |                         |
| middle occipital gyrus                                       | gyrus occipitalis medius                   | MOG; O2                    |                         |
| inferior occipital gyrus                                     | gyrus occipitalis inferior                 | IOG; O3                    |                         |
| descending occipital gyrus                                   | gyrus occipitalis descendens               | DOG                        | gyrus of Ecker           |
| **Temporal lobe**                                            | **Lobus temporalis**                       |                            |                          |
| temporal pole                                                | polus temporalis                           | TP                         |                         |
| temporopolar cortex                                          | cortex temporalis                          | TPC                        |                         |
| superior temporal gyrus                                      | gyrus temporalis superior                  | STG; T1                    |                         |
| anterior part                                                | pars anterior                             | STGa                       | area of Wernicke         |
| posterior part                                               | pars posterior                             | STGp                       |                         |
| temporal operculum                                           | operculum temporale                        | TOp                        |                         |
| polar plane                                                  | planum polare                              | PPO                        |                         |
| transverse temporal gyri                                     | gyri temporales transversi                 |                            | gyri of Heschl           |
| anterior transverse temporal gyrus                           | gyrus temporalis transversus anterior       | TTGa                       |                         |
| posterior transverse temporal gyrus                          | gyrus temporalis transversus posterior      | TTGp                       |                         |
| temporal plane                                               | planum temporale                           | PTE                        |                         |
| transverse temporal sulci                                    | sulci temporales transversi                |                            |                         |
| anterior transverse temporal sulcus                          | sulcus temporalis transversus anterior      |                           |                         |
| intermediate transverse temporal sulcus                       | sulcus temporalis transversus              | itts                       |                         |
|                                                               |                                            |                            |                         |
| superior transverse temporal sulcus                          | sulcus temporalis transversus posterior     | ptt                        |                         |
| middle temporal gyrus                                        | gyrus temporalis medius                    | MTG; T2                    |                         |
| inferior temporal sulcus                                      | gyrus temporalis inferior                  | Its; t2                    |                         |
| superolateral inferior temporal gyrus                        | gyrus temporalis inferior superolateralis  | ITGL; T3                  |                         |
| **Insula; insular lobe**                                     | **Insula; lobus insularis**                | Ins                        |                         |
| insular gyri                                                 | gyri insulae                               |                            |                         |
| long gyrus of insula                                         | gyrus longus insulae                       | LGI                        |                         |
| short gyri of insula                                         | gyri breves insulae                        | SGI                        |                         |
| transverse insular gyrus                                     | gyrus transversus insulae                  | TIG                        |                         |
| central sulcus of insula                                     | sulcus centralis insulae                   | CSI                        |                         |
| circular sulcus of insula; perinsular sulcus                 | sulcus circularis insulae                  | cas                        | sulcus of Rell           |
| limen insulae; insular threshold; frontotemporal junction    | limen insulae; junctio frontotemporalis    | LI                         |                         |

For a summarizing figure, see Figure 6.
The cingulate gyrus is identified two new areas, FG3 and FG4, medial and lateral in the midfusiform gyrus, respectively, separated by the sulcus fusiformis medius (also known as the lateral occipitotemporal gyrus). Areas of the fusiform gyrus within the inferotemporal cortex are part of the ventral visual stream area (see Rosenke et al., 2018), and they process higher-order visual information associated with faces, limbs, words, and places. Caspers et al. (2013) identified two areas, FG1 and FG2, medial and lateral in the posterior part of the fusiform gyrus, respectively. Lorenz et al. (2017) identified two new areas, FG3 and FG4, medial and lateral in the mid fusiform gyrus, respectively, separated by the sulcus fusiformis medius (also known as the lateral occipitotemporal gyrus). The occipitotemporal sulcus (sulcus occipitotemporalis inferior) from T4. Various classifications for the temporal sulci and gyri have been published (Ono et al., 1990; Duvernoy, 1992; Hanke, 1997; ten Donkelaar et al., 2018).

(1999) found a single sulcus more frequently on the right (69%) than on the left (31%) hemispheres, whereas the double pattern was more frequent on the left (68%) than right (32%) hemispheres.

Caudal to the paracentral lobule lies the large precuneus (P1), bordered by the marginal branch of the cingulate gyrus (ramus marginalis sulci cinguli) rostrally, the parietooccipital sulcus (sulcus parietooccipitalis of Gratiolet) caudally, and the subparietal sulcus (sulcus subparietalis) ventrally.

The inner zone, separated from the corpus callosum by the sulcus of the corpus callosum (sulcus corporis callosi), and earlier known as the fornicate gyrus (gyrus fornicatus of Meynert), is formed by the cingulate gyrus (gyrus cinguli). The cingulate gyrus can be divided into four parts: an anterior part, a midcingulate cortex, a posterior part and a retrosplenial part (Vogt and Palomero-Gallagher, 2012). The cingulate gyrus is continuous through a narrowing (isthmus gyri cinguli) with the parahippocampal gyrus (gyrus parahippocampalis or T5) in the temporal lobe. The collateral sulcus (sulcus collateralis, also known as the medial occipitotemporal sulcus) separates T5 from T4, the temporal part of the fusiform gyrus (gyrus fusiformis, also known as the lateral occipitotemporal gyrus). Areas of the fusiform gyrus within the inferotemporal cortex are part of the ventral visual stream area (see Rosenke et al., 2018), and they process higher-order visual information associated with faces, limbs, words, and places. Caspers et al. (2013) identified two areas, FG1 and FG2, medial and lateral in the posterior part of the fusiform gyrus, respectively. Lorenz et al. (2017) identified two new areas, FG3 and FG4, medial and lateral in the mid fusiform gyrus, respectively, separated by the sulcus fusiformis medius (also known as the lateral occipitotemporal gyrus). The occipitotemporal sulcus (sulcus occipitotemporalis inferior) from T4. Various classifications for the temporal sulci and gyri have been published (Ono et al., 1990; Duvernoy, 1992; Hanke, 1997; ten Donkelaar et al., 2018).
| English official terms and synonyms | Latin official terms and synonyms | Abbreviations and acronyms | Eponyms |
|-----------------------------------|---------------------------------|---------------------------|---------|
| **Inferomedial interlobar sulci** | **Sulci Interlobares inferomediales** | **scc** | **sulcus of Gratiolet** |
| sulcus of corpus callosum         | sulcus corporis callosi         |                           |         |
| cingulate sulcus                  | sulcus cinguli                  | cgs                       |         |
| marginal branch; marginal sulcus  | ramus marginalis; sulcus marginalis | cgsmb                     |         |
| parietooccipital sulcus           | sulcus parietooccipitalis       | pos                       |         |
| subparietal sulcus                | sulcus subparietalis           | sps                       |         |
| collateral sulcus                 | sulcus collateralis            | cos                       |         |
| central sulcus                    | sulcus centralis               | ces                       |         |
| **Frontal lobe**                  | **Lobus frontalis**            |                           |         |
| inferomedial superior frontal gyrus | gyrus frontalis superior inferomedialis | **SFGM; F1** |         |
| paracingulate sulcus              | sulcus paracinguli             | pCG                       |         |
| paracingulate gyrus               | gyrus paracinguli              | PGC                       |         |
| paracentral sulcus                | sulcus paracentralis           | pacs                      |         |
| paracentral lobule                | lobulus paracentralis          | PCL                       |         |
| anterior paracentral gyrus        | gyrus paracentralis anterior   | APaG                      |         |
| subcallosal area; subcallosal gyrus | area subcallosa; gyrus subcallosus | SCA                      |         |
| paraterminal gyrus                | gyrus paraterminalis           | PTG                       |         |
| parolfactory area                 | area parolfactoria             | PaOA                      |         |
| parolfactory gyrus                | gyrus parolfactorius           | PsOG                      |         |
| parolfactory sulci                | suci parolfactori              |                         |         |
| anterior parolfactory sulcus      | sulcus parolfactorius anterior | apaos                     |         |
| posterior parolfactory sulcus     | sulcus parolfactorius posterior| ppaos                     |         |
| orbital gyri                      | gyri orbitales                 |                           |         |
| medial orbital gyrus              | gyrus orbitalis medialis       | MORG                      |         |
| anterior orbital gyrus            | gyrus orbitalis anterior       | AOrG                      |         |
| posterior orbital gyrus           | gyrus orbitalis posterior      | POrg                      |         |
| lateral orbital gyrus             | gyrus orbitalis lateralis      | LOrG                      |         |
| posteromedial orbital lobule      | lobulus orbitalis posteromedialis | PMOL                    |         |
| Posterior lateral orbital region  | regio orbitalis posterolateralis | PLCR                    |         |
| orbital sulci                     | suci orbitales                 |                           |         |
| lateral orbital sulcus            | sulcus orbitalis lateralis     | lors                      |         |
| transverse orbital sulcus         | sulcus orbitalis transversus   | tors                      |         |
| medial orbital sulcus             | sulcus orbitalis medialis      | mors                      |         |
| superior rostral sulcus           | sulcus rostralis superior      | srs                       |         |
| inferior rostral sulcus           | sulcus rostralis inferior      | irs                       |         |
| straight gyrus                    | gyrus rectus                   | SG                        |         |
| olfactory sulcus                  | sulcus olfactorius             | ols                       |         |
| anterior perforated substance; rostral perforated substance | substantia perforata anterior; substantia perforata rostralis | APS |         |
| **Olfactory structures**          | **Structurae olfactoriae**     |                           |         |
| olfactory bulb                    | bulbus olfactorius             | OB                        |         |
| olfactory peduncle                | pedunculus olfactorius         | op                        |         |
| olfactory tract                   | tractus olfactorius            | ot                        |         |
| olfactory trigone                 | trigonum olfactorium           | OT                        |         |
| olfactory tubercle                | tuberculum olfactorium         | Tu                        |         |
| olfactory stria                   | striae olfactoriae             |                           |         |
| medial olfactory stria            | stria olfactoria medialis      | mos                       |         |
| lateral olfactory stria           | stria olfactoria lateralis     | los                       |         |
| retrobulbar region                | region retrobulbaris           | RBR                       |         |
| piriform cortex                   | cortex piriformis; cortex olfactorius primarius | Pr |         |
TABLE 2 | Continued

| English official terms and synonyms | Latin official terms and synonyms | Abbreviations and acronyms | Eponyms |
|---|---|---|---|
| frontal part | pars frontalis | PrF | |
| temporal part | pars temporalis | PrT | |
| Parietal lobe | Lobus parietalis | | |
| paracentral lobule | lobulus paracentralis | PCL | |
| posterior paracentral gyrus | gyrus paracentralis posterior | PPaG | |
| transverse parietal sulcus | sulcus parietalis transversus | tps | sulcus of Brissaud |
| precuneus | precuneus | PCun; P1 | |
| subparietal sulcus | sulcus subparietalis | sps | |
| Occipital lobe | Lobus occipitalis | | |
| cuneus | cuneus | Cun; O6 | |
| calcarine sulcus | sulcus calcarinus | cas | |
| lingual gyrus; medial occipitotemporal gyrus | gyrus lingualis; gyrus occipitotemporalis medialis | LG; O5 | |
| fusiform gyrus; lateral occipitotemporal gyrus | gyrus fusiformis; gyrus occipitotemporalis lateralis | FG; O4 | |
| occipitotemporal sulcus; lateral occipitotemporal sulcus | sulcus occipitotemporalis; sulcus occipitotemporalis lateralis | ots | |
| Temporal lobe | Lobus temporalis | | |
| inferomedial inferior temporal gyrus | gyrus temporalis inferior inferomedialis | ITGM; T3 | |
| occipitotemporal sulcus; lateral occipitotemporal sulcus | sulcus occipitotemporalis; sulcus occipitotemporalis lateralis | ots | |
| fusiform gyrus; lateral occipitotemporal gyrus | gyrus fusiformis; gyrus occipitotemporalis lateralis | FG; T4 | |
| medial part | pars medialis | FGM | |
| lateral part | pars lateralis | FGL | |
| ectorhinal cortex | cortex ectorhinalis | EcC | |
| mid fusiform sulcus | sulcus fusiformis medius | mfs | |
| collateral sulcus; medial occipitotemporal sulcus | sulcus collateralis; sulcus occipitotemporalis medialis | cos | |
| parahippocampal gyrus | gyrus parahippocampalis | PHG; T5 | |

For summarizing figures, see Figures 9, 10.

Huntgeburth and Petrides, 2012; Chau et al., 2014; Cikla et al., 2016) with different relations between the collateral and rhinal sulci and patterns of the various sulci.

The posterior part of the medial cerebral cortex has two deep sulci, which converge toward the splenium. The interlobar parietooccipital sulcus (sulcus parietooccipitalis of Gratiolet) separates the parietal and occipital lobes, and the lobar calcarine sulcus (sulcus calcarinus) divides the occipital lobe into a dorsal part, the cuneus (O6) and a ventral part, the lingual or medial occipitotemporal gyrus (O5; gyrus lingualis or gyrus occipitotemporalis medialis). The lingual gyrus may be divided into two parts by the lingual sulcus (sulcus lingualis). The primary visual cortex is mainly found on both sides of the calcarine sulcus. Below the lingual gyrus, separated by the occipitotemporal sulcus (sulcus occipitotemporalis), lies the occipital part of the fusiform or lateral occipitotemporal gyrus (O4; gyrus fusiformis or gyrus occipitotemporalis lateralis). The visual areas outside the striate area (area striata) are grouped together as the extrastriate areas (areae extrastriatae; for current views and further discussion, see Wang et al., 2015).

BASAL SURFACE OF THE CEREBRAL HEMISPHERE

On the bas al surface of the cerebral hemisphere, the occipital lobes are largely covered by the cerebellum, so only the frontal and temporal lobes are visible (Figure 10; and Table 2). On the orbital surface of the frontal lobe, the olfactory sulcus (sulcus olfactorius) with the olfactory bulb and tract separates the straight gyrus (gyrus rectus) from the orbital gyri. The olfactory tract divides into the medial and lateral olfactory striae, of which only the lateral olfactory tract contains secondary olfactory fibers. Between these striae lies the anterior perforated substance of Vicq d’Azyr, a region studded with small openings through which the anteromedial central arteries and the recurrent artery of Heubner from the anterior cerebral artery and the lenticulostriate arteries from the middle cerebral artery pass to the basal ganglia and the internal capsule. The medial part of the temporal lobe is formed by the parahippocampal gyrus (T5; gyrus parahippocampalis or medial occipitotemporal gyrus), the continuation of the cingulate gyrus. The most rostral part of the
parahippocampal gyrus protrudes medially as the uncus. Below the uncus lies the amygdala. Lateral to the parahippocampal gyrus, the following structures can successively be observed: the collateral sulcus (sulcus collateralis), the fusiform gyrus (T4; gyrus fusiformis) or lateral occipitotemporal gyrus, the occipitotemporal sulcus (sulcus occipitotemporalis), and the inferior temporal gyrus (T3; gyrus temporalis inferior).

The naming of two "olfactory gyri" in the TA (1998) suggested that there were clearly identifiable gyral structures; this is not true. These terms persisted from the old description of the "rhinencephalon" (see Gastaut and Lammers, 1961; Stephan, 1975) and have been deleted in the TNA (2017). The real olfactory cortex is the piriform or primary olfactory cortex (corpus piriformis or cortex olfactorius primarius), which can be divided into frontal and temporal parts (Allison, 1954; Heimer et al., 1977, 1999; Zilles, 2004; Zilles and Amunts, 2012; ten Donkelaar et al., 2018).

In the TNA (2017), the TA names for the sulci and gyri in the orbitofrontal cortex have been corrected. Lateral to the olfactory sulcus, there are two longitudinally directed sulci, the medial orbital sulcus (sulcus orbitalis medialis) and the lateral orbital sulcus (sulcus orbitalis lateralis), which are joined by the transverse orbital sulcus (sulcus orbitalis transversus) to form an H or a K pattern (Duvernoy, 1992; Chiavaras and Petrides, 2000; Öngur et al., 2003; Petrides and Pandya, 2012; Rolls et al., 2015; ten Donkelaar et al., 2018). The following orbital gyri can be found: the medial orbital gyrus (gyrus orbitalis medialis) between the olfactory sulcus and the medial orbital sulcus, the anterior orbital gyrus (gyrus orbitalis anterior), the cortex rostral to the transverse orbital sulcus, the posterior orbital gyrus (gyrus orbitalis posterior), the cortex caudal to the transverse orbital sulcus, and the lateral orbital gyrus (gyrus orbitalis lateralis) lateral to the lateral orbital sulcus. The caudal parts of the medial and posterior orbital gyri merge to form the posteromedial orbital lobule (lobulus orbitalis posteromedialis) as described by Türe et al. (1999) and Naidich et al. (2004). The posteromedial orbital lobule gives rise to the transverse insular gyrus (gyrus transversus insulae). Mai and Majtanik (2017) also distinguished a posterolateral orbital region (regio orbitalis posterolateralis) between the posterior orbital gyrus and the orbital part of the inferior frontal gyrus.

**THE LIMBIC LOBE**

The cingulate gyrus and the parahippocampal gyrus form a border (limbus) around the corpus callosum and the brain stem (Broca, 1878b). Broca subdivided his grand lobe limbique into inner (the hippocampal formation) and outer (the cingulate and parahippocampal) rings for which now the general descriptive term limbic lobe is used (Heimer et al., 2008; Nieuwenhuys et al., 2008). The "scissure limbique" separates the limbic lobe from the rest of the cerebral cortex and can be seen as an interlobar sulcus (Duvernoy, 1992; ten Donkelaar et al., 2018). It consists of (Figure 11; and Table 3): the anterior paraolfactory sulcus (sulcus paraolfactorius anterior) in the subcallosal area, the cingulate sulcus (sulcus cinguli), part of the subparietal sulcus, the rostral part of the parietooccipital sulcus, the collateral sulcus (sulcus collateralis), and the rhinal sulcus (sulcus rhinalis).

The limbic lobe consists of an inner ring (known as the intralimbic gyrus in the French literature; Testut and Latarjet,
### TABLE 3 | Structures of the limbic lobe (based on TNA, 2017; ten Donkelaar et al., 2018).

| English official terms and synonyms                                      | Latin official terms and synonyms                                      | Abbreviations and acronyms | Eponyms                       |
|--------------------------------------------------------------------------|------------------------------------------------------------------------|----------------------------|-------------------------------|
| **Limbic gyrus; outer ring of limbic lobe**                              | Gyrus limbicus                                                        | SCA                        |                               |
| subcallosal area; subcallosal gyrus                                      | area subcallosa; gyrus subcallosus                                     |                            |                               |
| cingulate gyrus                                                          | gyrus cinguli                                                         | CG                         |                               |
| anterior cingulate cortex                                                | gyrus cinguli, pars anterior                                          | ACC                        |                               |
| midcingulate cortex                                                      | gyrus cinguli, pars media                                             | MCC                        |                               |
| posterior cingulate cortex                                               | gyrus cinguli, pars posterior                                         | PCC                        |                               |
| retrosplenial cortex                                                     | cortex retrosplenialis                                                | RSC                        |                               |
| isthmus of cingulate gyrus                                               | isthmus gyri cinguli                                                 | ICG                        |                               |
| parahippocampal gyrus                                                    | gyrus parahippocampalis                                               | PHG; TS                    |                               |
| entorhinal cortex                                                        | cortex entorhinalis                                                   | EC                         | substance of Arnold           |
| white reticular substance                                                | substantia reticularis alba                                            |                            |                               |
| hippocampal warts                                                       | verrucae hippocampi                                                   |                            |                               |
| perirhinal cortex                                                        | cortex perirhinalis                                                   | PRC                        |                               |
| uncus                                                                    | uncus                                                                  | Un                         |                               |
| ambient gyrus                                                            | gyrus ambiens                                                         | AmG                        |                               |
| semianular sulcus                                                        | sulcus semianularis                                                   | sas                        |                               |
| semilunar gyrus                                                          | gyrus semilunaris                                                     | SLG                        |                               |
| uncinate gyrus                                                           | gyrus uncinatus                                                       | UG                         |                               |
| band of dentate gyrus                                                    | limbus fasciae dentatae                                               | BDG                        | band of Giacomini             |
| intralimbic gyrus; uncal apex                                            | gyrus intralimbicus                                                   | ILG                        |                               |
| collateral sulcus                                                        | sulcus collateralis                                                   | cos                        |                               |
| rhinal sulcus                                                            | sulcus rhinalis                                                       | rhs                        |                               |
| intrarhinal sulcus                                                       | sulcus intrarhinalis                                                  | irhs                       |                               |
| **Hippocampal formation; inner ring of limbic lobe**                     | **Formatio hippocampi**                                               |                            |                               |
| precommissural part of hippocampus                                       | pars precommissurals hippocampi                                       | HiP                        | taenia tecta; stria of Lancisi|
| supracommissural part of hippocampus                                     | pars supracommissurals hippocampi                                     | HIS                        | taenia libera; stria of Lancisi|
| lateral longitudinal stria                                               | stria longitudinalis lateralis                                       | lls                        |                               |
| indusium griseum                                                        | indusium griseum                                                     | IGr                        |                               |
| medial longitudinal stria                                               | stria longitudinalis medialis                                        | mls                        |                               |
| retrocommissural part of hippocampus; hippocampus proper                 | pars retrocommissurals hippocampi; hippocampus proper                  | HIR                        |                               |
| pes hippocampi; pes of hippocampus                                       | pes hippocampi                                                        | PHip                       |                               |
| head; anterior segment                                                   | caput; pars anterior                                                  | HtH                        |                               |
| body; middle sement                                                      | corpus; pars media                                                    | HtB                        |                               |
| tail; posterior segment                                                  | cauda; pars posterior                                                 | HtT                        |                               |
| hippocampal sulcus                                                       | sulcus hippocampalis                                                  | his                        |                               |
| dentate gyrus                                                            | gyrus dentatus                                                        | DG                         |                               |
| fimbriodentate sulcus                                                    | sulcus fimbriodentatus                                                | fds                        |                               |
| fimbria of hippocampus                                                   | fimbria hippocampi                                                    | FHI                        |                               |
| gyri of andreas retzius; subsplenial gyri                               | dentes subcili; gyri subspleniales                                   | GAR; SG                    |                               |
| fasciolar gyrus                                                          | gyrus fasciolaris                                                     | FG                         |                               |
| fasciola cinerea                                                         | fasciola cinerea                                                      | FC                         |                               |
| subiculum                                                                | subiculum                                                             | S                          |                               |
| presubiculum                                                             | presubiculum                                                          | PrS                        |                               |
| parasubiculum                                                            | parasubiculum                                                         | PsS                        |                               |

For summarizing figures, see [Figures 9, 11].
the hippocampal formation (see below), and an outer ring, the limbic gyrus. The **limbic gyrus** (** gyrus limbicus**) includes: (1) the **subcallosal area** (**area subcallosa** or ** gyrus subcallosus**), which includes the **parahippocampal gyrus** (** gyrus parahippocampalis**) between the anterior and posterior parahippocampal sulci, and the **paraterminal gyrus** (** gyrus paraterminalis**) just rostral to the lamina terminalis; (2) the **cingulate gyrus** (** gyrus cinguli**); (3) the **isthmus of the cingulate gyrus** (** isthmus gyri cinguli**); (4) the **parahippocampal gyrus** (** gyrus parahippocampalis**); (5) the **entorhinal cortex** (** cortex entorhinalis**); and (6) the **uncus**. In the TNA (2017), the uncus is treated as a structure separate from the parahippocampal gyrus, following Insauti and Amaral (2012). The **entorhinal cortex** (** cortex entorhinalis**; Braak and Braak, 1992; Insauti et al., 1995, 2017) is located at the rostral part of the parahippocampal gyrus, which includes the **uncus** and small gyri called the the **uncinate gyrus** (** gyrus uncinatus**), the **ambient gyrus** (** gyrus ambiens**) and the **semilunar gyrus** (** gyrus semilunaris**). The entorhinal cortex corresponds to BA28 and has been subdivided into eight different subfields (Insauti et al., 1995). Adjacent is the **perirhinal** (Anglo-Saxon terminology) or **transentorhinal** (German terminology) cortex. The entorhinal cortex can be defined macroscopically by the **white reticular matter** (** substantia reticularis alba** of Arnold) and the **hippocampal warts** (** verrucae hippocampi**) described by Retzius (1896) and Klinger (1948). The entorhinal cortex is characterized by a dissecting layer (** lamina dissecans**), separating the external and internal layers, for which Rose (1926) introduced the term schizocortex.

The **uncus** (** uncus**) includes a number of bulges: (1) the **uncinate gyrus** (** gyrus uncinatus**), its most rostral part, corresponding to the **amygdalohippocampal transition area** (** area transitionis amygdalohippocampalis**); (2) the **band of the dentate gyrus** (** limbus fasciae dentatae** of Giacomini); the middle part, corresponding to the dentate gyrus; and (3) the **intralimbic gyrus** or ** uncal apex** (** gyrus intralimbicus**), the most caudal part of the uncal bulge and corresponding to the CA3 field. The dorsal limit of the uncus is rather inconspicuous, but its ventral limit is marked by the **hippocampal sulcus** (** sulcus hippocampalis**). The hippocampal sulcus continues rostralwards as the **intrahippocampal sulcus** (** sulcus intrahippocampalis**), forming the ventral limit of the ambient gyrus (** gyrus ambiens**). The **semilunar sulcus** (** sulcus semilunaris**) separates the ambient gyrus from the **semilunar gyrus** (** gyrus semilunaris**), which forms the periamygdaloid cortex.

The **perirhinal cortex** (** cortex perirhinalis**) is a periarchicortical structure (Suzuki and Amaral, 1994; Augustinack et al., 2013) around the **hippocampal sulcus** (** sulcus perirhinalis**) and corresponds to the **transentorhinal region** (** regio transentorhinalis**) of Braak and Braak (1992). Its laminar structure is comparable to that of the entorhinal cortex. Adjacent to the perirhinal cortex is the **ectorial cortex** (** cortex ectorhinalis**), an isocortical part of the inferior temporal surface, but sometimes included in the perirhinal cortex (Ding and Van Hoesen, 2010). Classically, the **hippocampal formation** (** formatio hippocampi**) is divided into three, originally adjacent, allocortical areas (Stephan, 1975; Duveryn, 1998; ten Donkelaar, 2011): (1) the **dentate gyrus** (** gyrus dentatus**); (2) the **hippocampus proper or Ammon’s horn** (** hippocampus proprius or cornu ammonis**); and (3) the **subiculum** (** subiculum**). These three structures are known as the **archicortex**. A small indentation between the fimbria and the molecular layer of the dentate gyrus has been termed the **fimbriodentate sulcus** (** sulcus fimbriodentatus**) by Gastaut and Lammers (1961). Several periallocortical structures, including the entorhinal cortex, the presubiculum and the parasubiculum, all parts of the parahippocampal gyrus, have also been included within the term “hippocampal formation,” since they are closely related and share a common pattern of projections (Insauti and Amaral, 2012). The TNA (2017), however, follows the classic view.

The hippocampal formation develops from the medial pallium, and during the outgrowth of the cerebral hemispheres, first caudalwards and subsequently ventralwards and rostralwards, the **retrocommissural part** of the hippocampus (** pars retrocommissuralis hippocampi**) becomes situated in the temporal lobe (see ten Donkelaar et al., 2014). Rudiments of the **supracommissural part** of the hippocampus (** pars supracommissuralis hippocampi**) can be found above the corpus callosum as the **indusium griseum** (** indusium griseum**), a thin cell layer, flanked by the **lateral longitudinal stria** of Lancisi (** stria longitudinalis lateralis**), also known as the taenia tecti, and the **medial longitudinal stria** of Lancisi (** stria longitudinalis medialis**), also known as the taenia libera. The **precommissural part** of the hippocampus (** pars precommissuralis hippocampi**) disappears.

Macroscopically, the following parts of the hippocampus can be distinguished (Duveryn, 1998; Insauti and Amaral, 2012; ten Donkelaar et al., 2018): (1) the **pes hippocampi** or ** pes of the hippocampus** (** pes hippocampi**); showing the hippocampal...
CONCLUSIONS

In this review, an attempt for a common terminology for the cerebral gyri and sulci is presented, largely following the recently published Terminologia Neuroanatomica (TNA, 2017). The differences found in the modern literature mainly concern:

1. The use of the term fissure for certain deep sulci; here, it is advocated to restrict the term fissure to the interhemispheric fissure, and to use the term sulcus for all other grooves;

2. The use of the topographical terms lateral and medial occipitotemporal gyri for the fusiform gyrus and the lingual gyrus, respectively.

3. These terms and some other frequently used terms are placed as synonyms, both in English and Latin in the TNA, and are summarized in Tables 1 – 3.

4. We suggest a simple system of abbreviations with capitals for gyri and small letters for sulci.

5. In the near future, several new subdivisions will have to be included. The TNA database at the FIPAT websites (www.unifr.ch/fipa; http://FIPAT.library.dal.ca) will be regularly updated.

AUTHOR CONTRIBUTIONS

All authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fnana.2018.00093/full#supplementary-material
