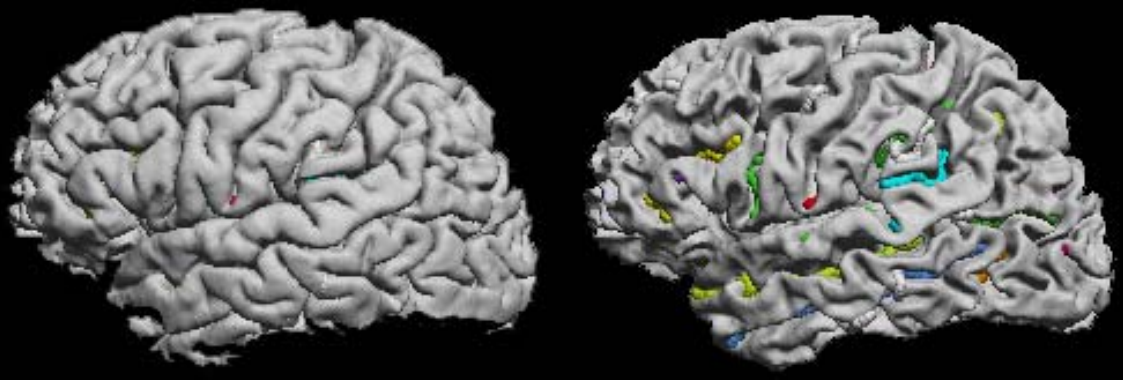
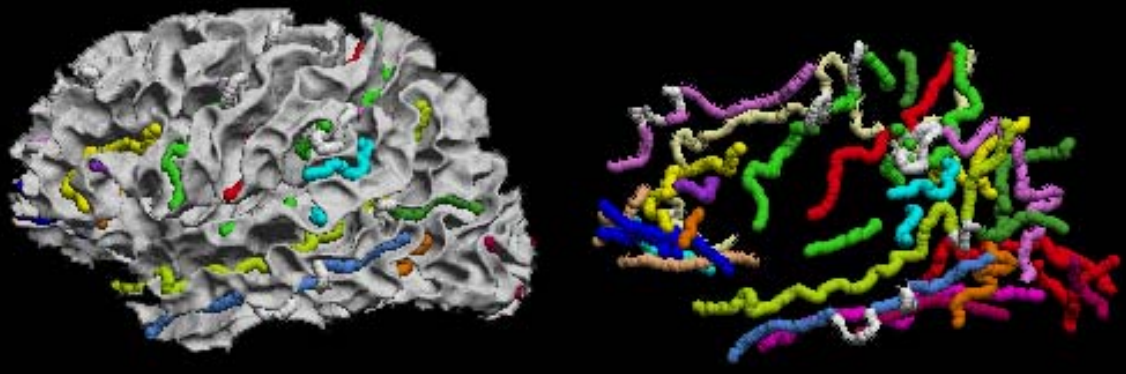
Hanna Damasio
Dana Dornsife Professor of Neuroscience



PROTOCOL FOR THE TRACING OF SULCI IN BRAINSUITE



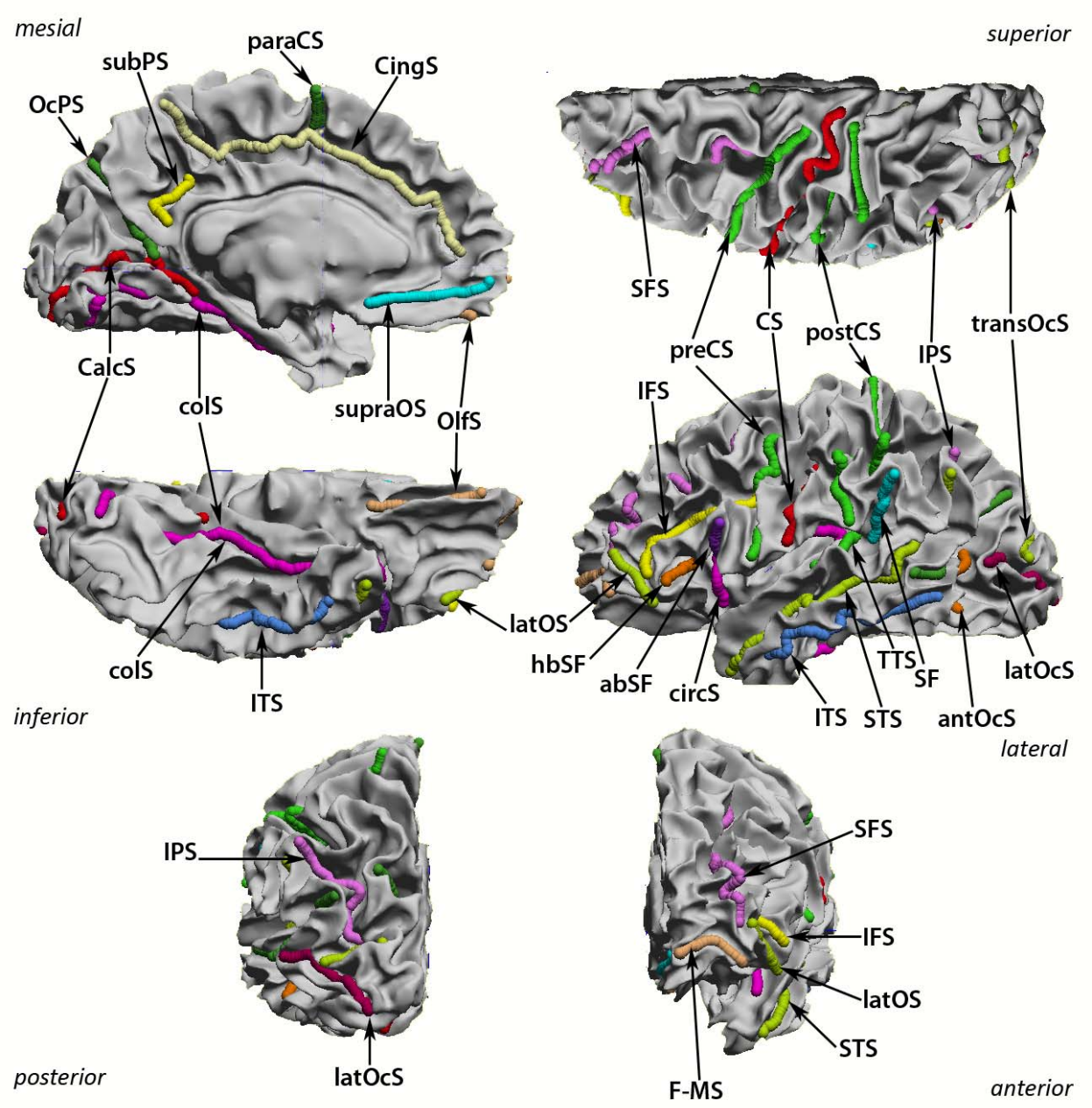
Dornsife Cognitive Neuroscience Imaging Center
and Brain and Creativity Institute
University of Southern California

For this protocol of BrainSuite all sulci are traced on the brain's midcortical surface. On occasion, when sulci are very deep, they may be shown on a gray/white junction surface (but the curves will have been traced on the midcortical surface). All sulci are traced at a 0.5 of "stickiness". When jumping over gyri which interrupt the course of a sulcus it is best to remove the "stickiness' because it facilitates the placement of the curve. It is also advisable to turn the surface view in such a way that the dropping of a point is done perpendicular to the deep surface where the point is meant to be dropped. The different sulci curves cannot touch one another, there has to be a gap between them. This is important to keep in mind when, on occasion, some sulci actually cross other sulci. For alignment purposes they have to be kept separate.

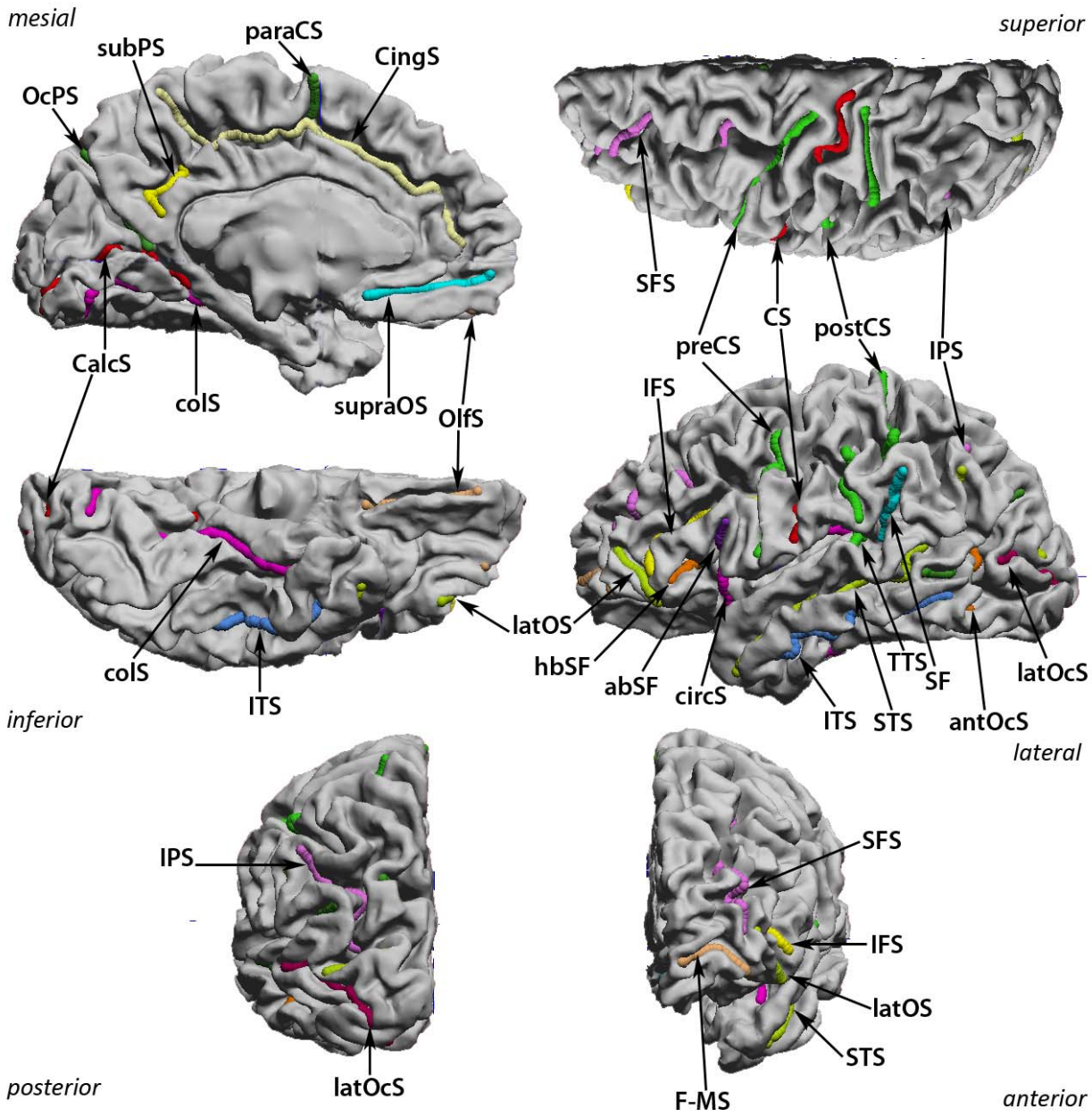
The sequence in which the sulci are traced is arbitrary. Here, and in the actual protocol in BrainSuite, the sulci are ordered by lobes, starting with the Frontal, continuing with the Temporal, the Parietal and finally the Occipital. In the Frontal and Parietal lobes I start with the dorsolateral views, move to the mesial views, and to the inferior view (in the frontal lobe). The Temporal lobe starts on the dorsolateral view and gradually proceeds to the mesial view. The occipital lobe starts with the mesial view because this is the view where its major sulci are seen, and finishes with the dorsolateral view.

For a general overview, the first images show the brain in straight lateral, mesial and inferior views, with all sulci traced and identified with the abbreviations of the sulci names (all introduced in the text for the individual sulci). The image using the pial surface also has the major gyri labeled.

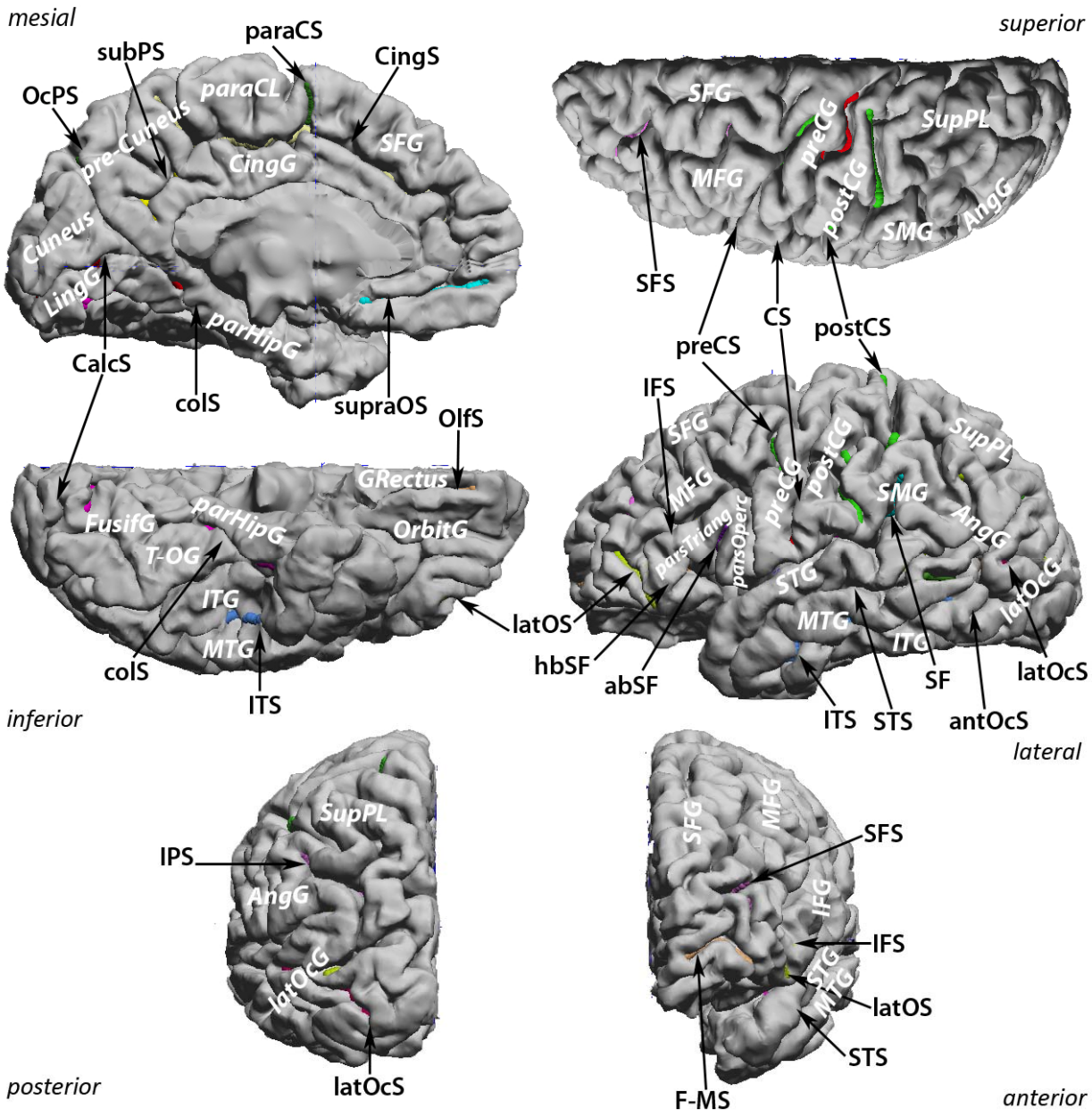
Recommended sources of further information for sulci (and gyri) identification: H.Damasio, *Human Brain Anatomy in Computerized Images*, 2nd Edition, Oxford University Press, 2004; H.M.Duvernoy, *The Human Brain: Surface,Blood-Supply, and Three-Dimensional Section Anatomy*, 2nd Edition, Springer Verlag, 1999; M.Ono et al., *Atlas of the Cerebral Sulci*, Thieme Verlag, 1989.



Gray/White junction surface



Midcortex surface, the surface on which curves were generated.



Pial surface in which the curves are not seen but sulci and gyri can be identified

In the **frontal lobe**: SFG=superior frontal gyrus; MFG=middle frontal gyrus; IFG=inferior frontal gyrus with its subdivisions of the parsTriang=pars triangularis, and parsOperc=pars opercularis; preCG=precentral gyrus; paraCL=paracentral lobule; GRectus=gyrus rectus; OrbitG=orbital gyri of which there are four (medial, lateral, anterior and posterior); CingG=cinguate gyrus. In the **parietal lobe**: postCG=postcentral gyrus; SMG=supra marginal gyrus; AngG=angular gyrus (the combination of the two forms the inferior parietal lobule); SupPL=superior parietal lobule; pre-Cuneus or mesial prietal lobe. In the **temporal lobe**: STG=suprior temporal gyrus; MTG=middle temporal gyrus; ITG=inferior temporal gyrus; T-OG=temporo-occipital gyrus;

paraHipg=parahipocampal gyrus. In the **occipital lobe**: latOcG=lateral occipital gyri; Cuneus or supracalcarine region; LingG=lingual gyrus; FusifG=fusiform gyrus (the lingual and fusiform gyri form the infracalcarine region).

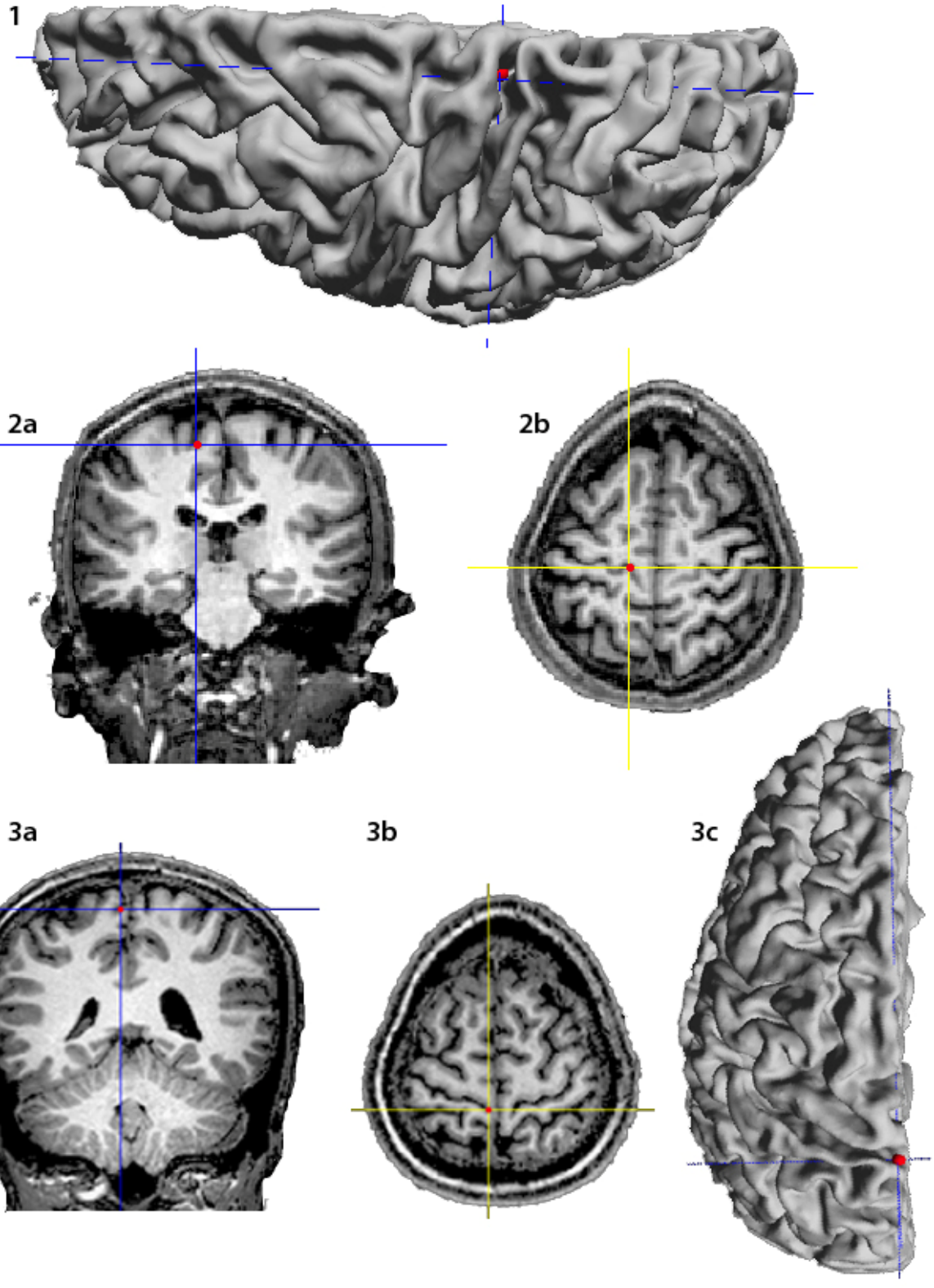
CENTRAL SULCUS

The Central Sulcus (CS) separates the frontal lobe from the parietal, and constitutes the posterior limit of the precentral gyrus. It can be found on the lateral surface of the hemisphere, where there are 3 parallel sulci running superior to inferior. The CS is the middle one. It is most often a continuous sulcus that starts at the interhemispheric fissure and runs inferiorly and anteriorly towards the Sylvian Fissure. It may or may not reach it. The superior end may actually be on the mesial surface of the hemisphere. For the purpose of alignment of different brains using the sulci as constraints, the superior starting point should be considered on the dorsolateral surface, close to the midline interhemispheric fissure.

Begin by aligning the hemisphere perpendicular to the screen, looking at the edge of the interhemispheric fissure (1), and drop the first point close to the midline. Check in the coronal and the horizontal slices that the point is in fact on the dorsolateral surface (2a - b). In 3a-c are the images that show an initial point dropped on the mesial surface of the hemisphere. This is correct anatomically. However, because of the reasons given above to align different brains to each other using the sulci as constraints, it is preferable to restrict the sulcus to the dorsolateral surface. Move the hemisphere so as to see the full dorsolateral surface, and drop the endpoint of the CS (4).

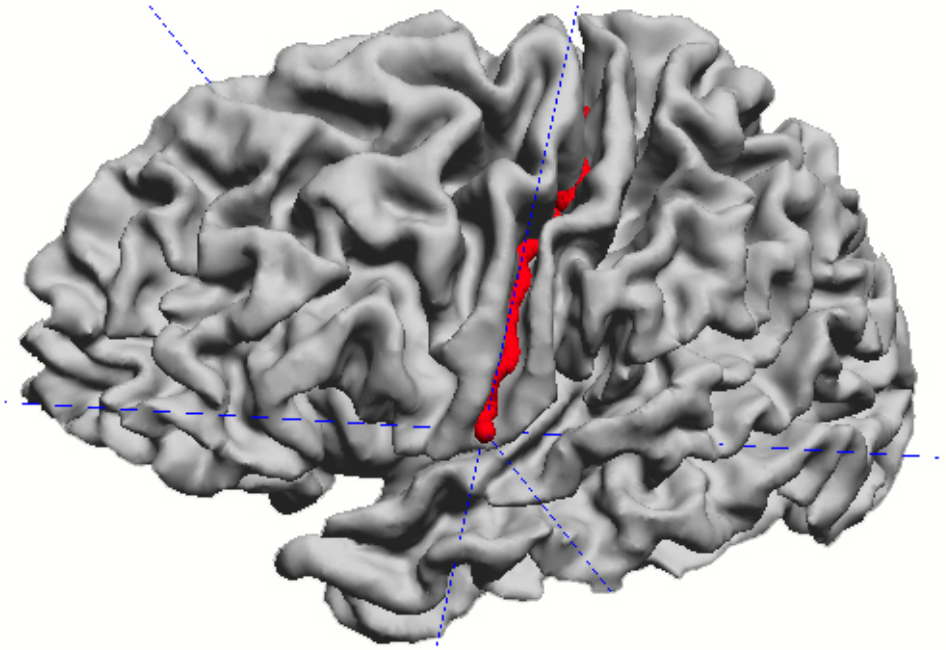
The mesial view of the hemisphere can help in the identification of the CS. Once the Cingulate Sulcus is identified together with its superior and posterior end (the ascending ramus of the Cingulate Sulcus), the CS is the small sulcus anterior to it with an antero-posterior direction (5).

CENTRAL SULCUS



CENTRAL SULCUS

4



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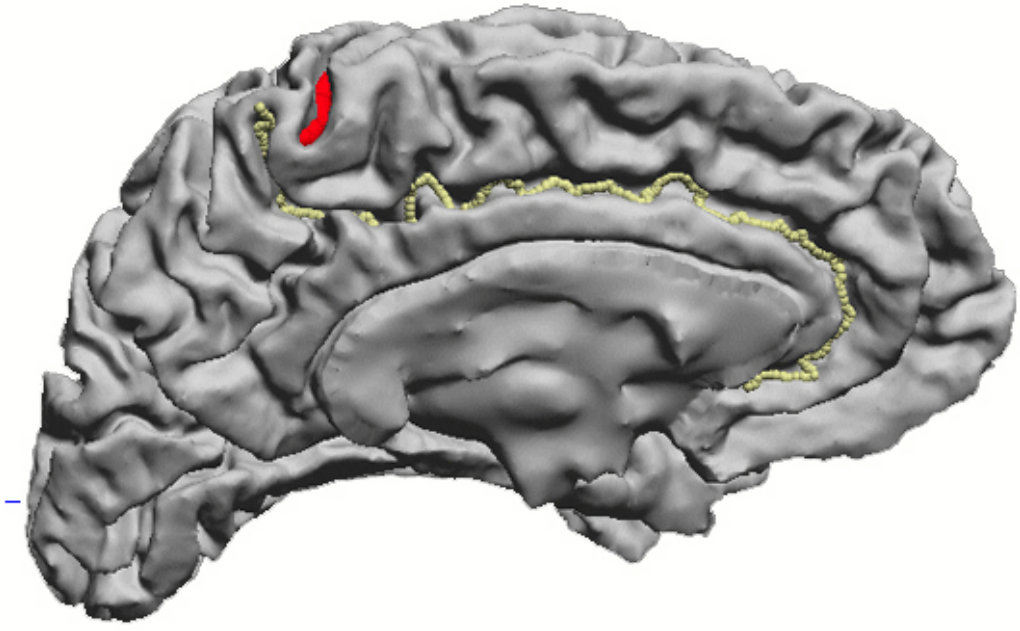
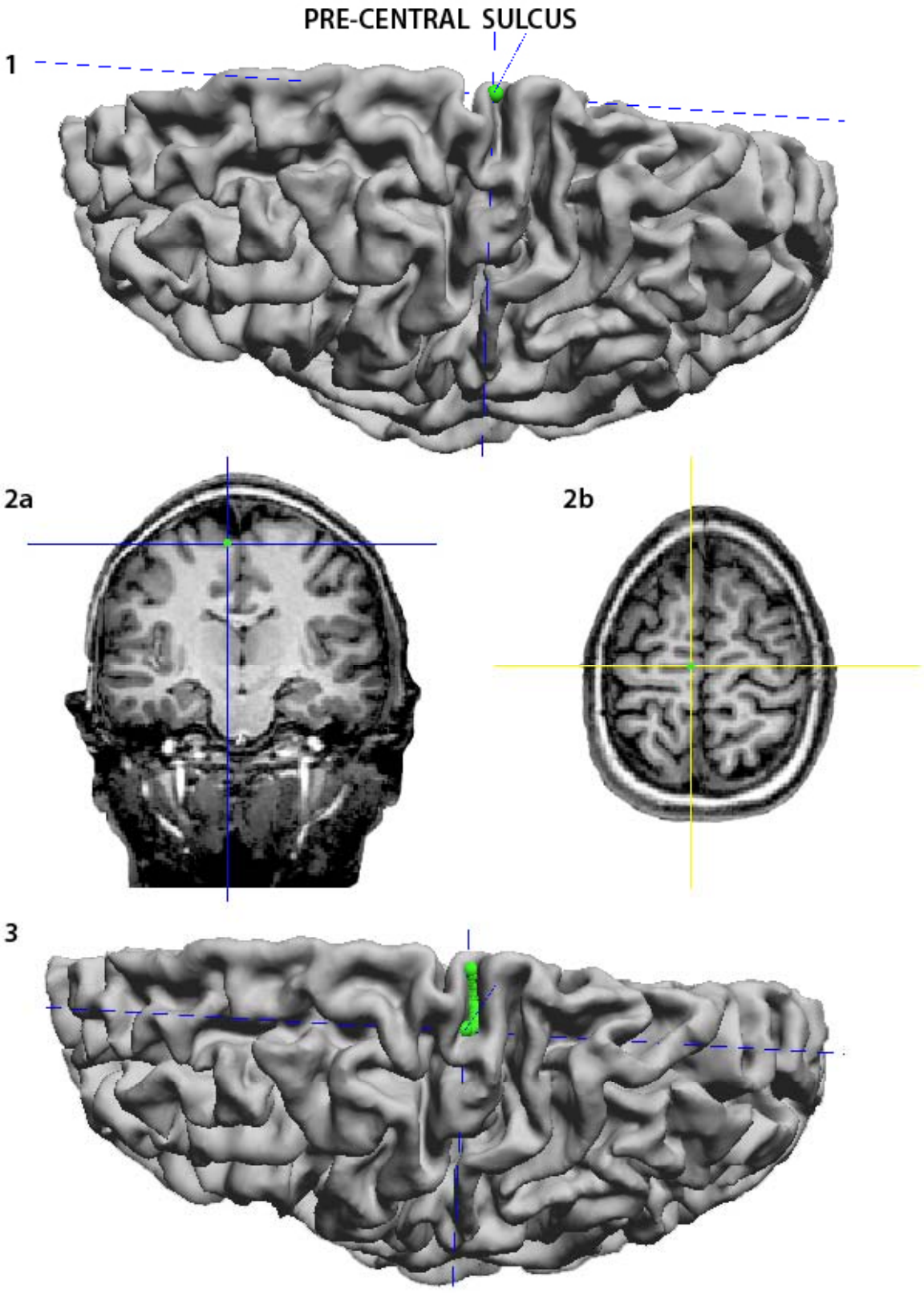


PRE-CENTRAL SULCUS

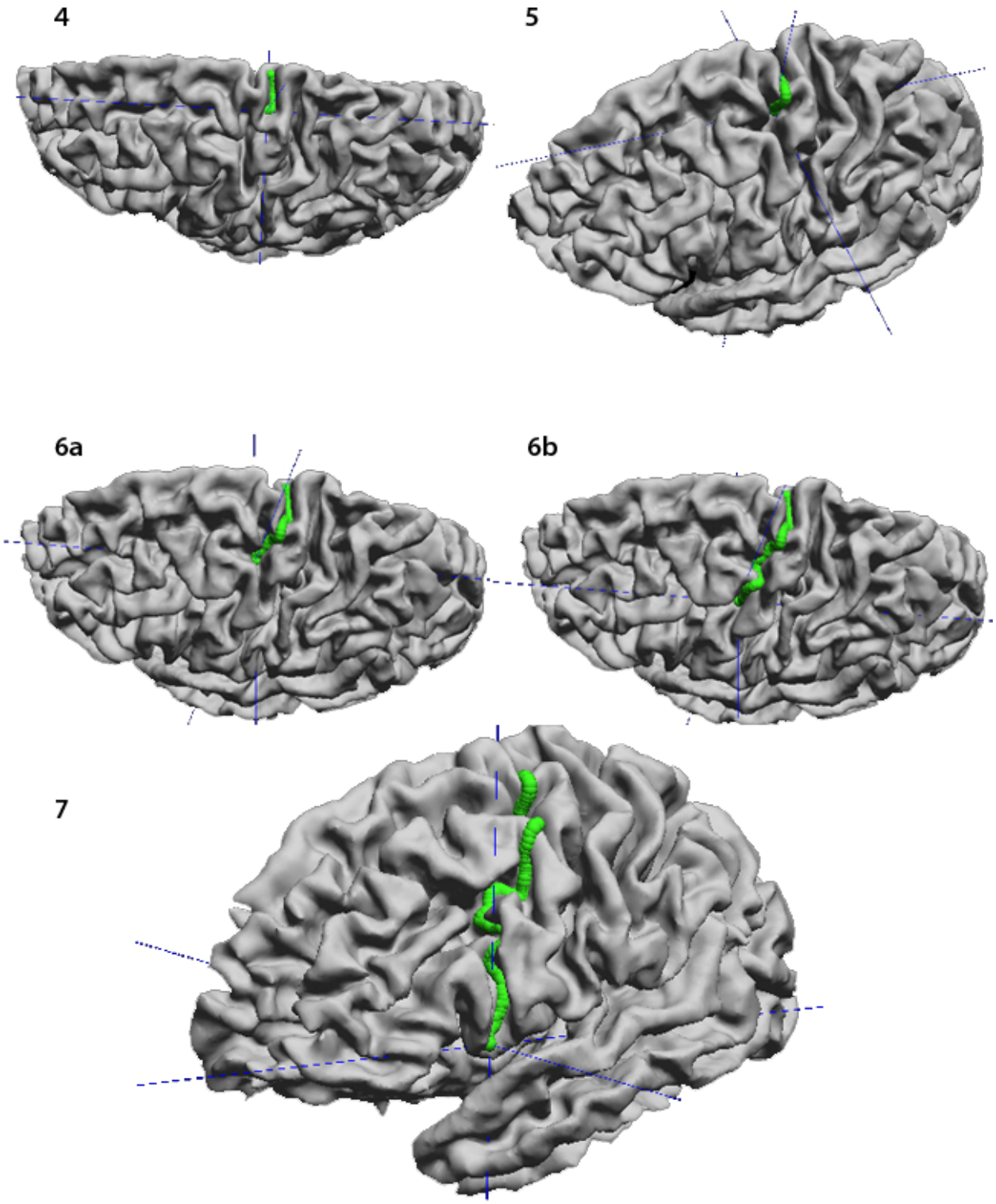
The pre-Central Sulcus (preCS) forms the anterior limit of the precentral gyrus. It is parallel to the CS and is immediately rostral to it. It also starts at the interhemispheric fissure and runs inferiorly and anteriorly towards the Sylvian Fissure. It is very often subdivided into two or more segments.

Drop the first point of the curve high in the drsolateral surface of the hemisphere, close to the interhemispheric fissure (1), and check the position in the coronal and horizontal slices (2a-b), as was done for the CS. Then proceed to the end of that segment (3). To jump over the gyrus interrupting the sulcus select *no stickiness* which helps direct the trace exactly where it should go (5). Do the same to the next interruption (6a-b), and continue to the end of the sulcus (7). The surface image has to be rotated from drop to drop so as to maintain a view that is essentially perpendicular to the place where the next point is dropped.

The beginning of the preCS can have two small branches in the form of a **V**. Either can be chosen, but it is important to maintain consistency across subjects. I chose the posterior sulcal extent (8), because it seems to be the more consistent course for this sulcus.


PRE-CENTRAL SULCUS
1
2a
2b
3

PRE-CENTRAL SULCUS



SUPERIOR FRONTAL SULCUS

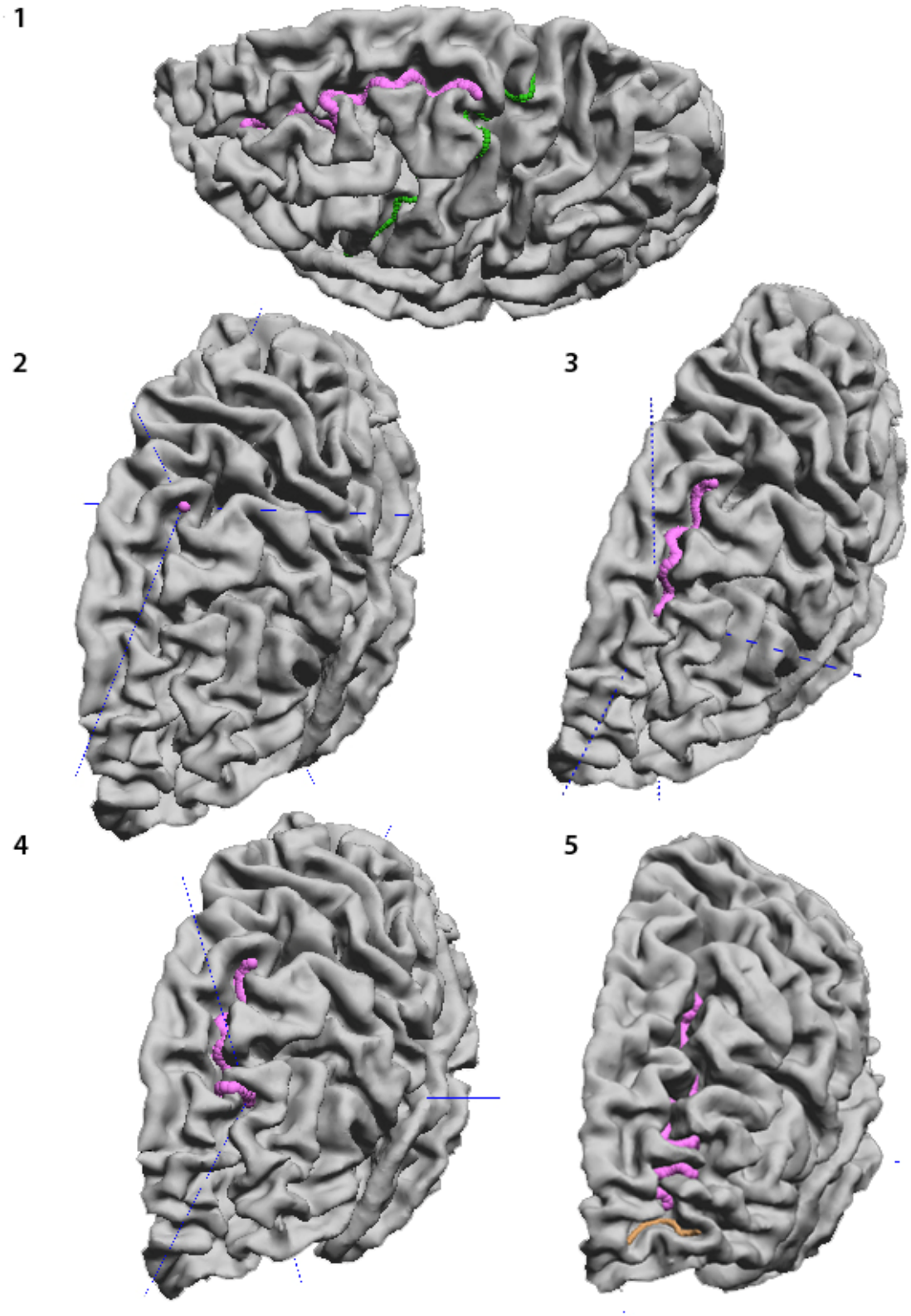
The Superior frontal Sulcus (SFS) separates the superior frontal from the middle frontal gyrus. It is seen best when looking at the dorsolateral surface of the hemisphere from above. It has a postero-anterior course parallel to the interhemispheric fissure (1). It starts at the preCS (1), with which it can merge or even cross, and it ends at the Fronto-Marginal Sulcus (see below) close to the frontal pole (5). It is very often interrupted and has very deep and sometimes long side branches.

Drop the first point of the curve at the posterior end, immediately in front of the preCS (2), even if the SFS reaches the preCS or crosses it (see 6-11). Then proceed to the end of that segment (3). To jump over the gyrus interrupting the sulcus select *no stickiness* which helps direct the trace exactly where it should go (4), and go to the anterior end of the curve (5).

When the SFS merges with the preCS as shown in 6, the curve cannot start at the exact point where the two sulci join. The curve on 6 (detail in 7) is wrong. Start the curve immediately above the preCS (8, detail in 9). Then proceed in the usual way. The final correct curve will be as in 10 (detail in 11).

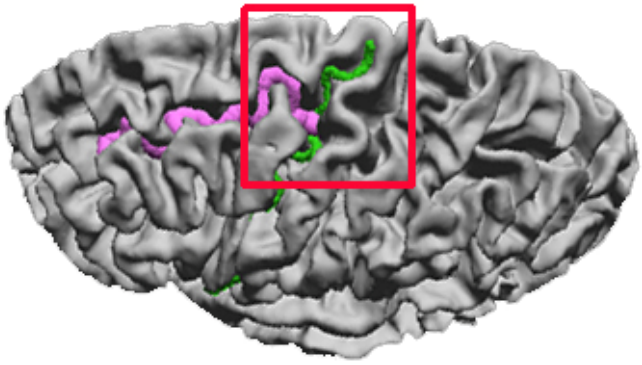
[The **Fronto-Marginal Sulcus** (F-MS) is a short sulcus best seen when looking at the hemisphere from its polar view. It runs horizontally from the interhemispheric fissure (1) to the lateral surface of the hemisphere, to end closely to the anterior end of the Lateral Orbital Sulcus (2). It sits at the anterior end of the SFS.]

SUPERIOR FRONTAL SULCUS



SUPERIOR FRONTAL SULCUS

6



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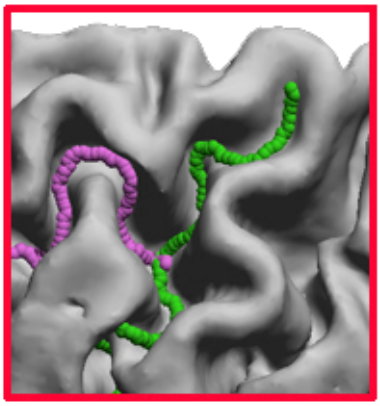

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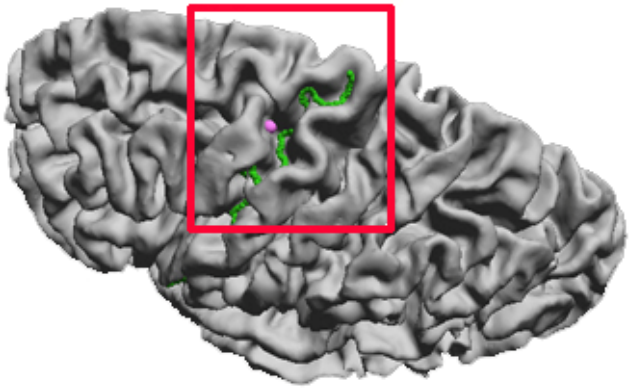
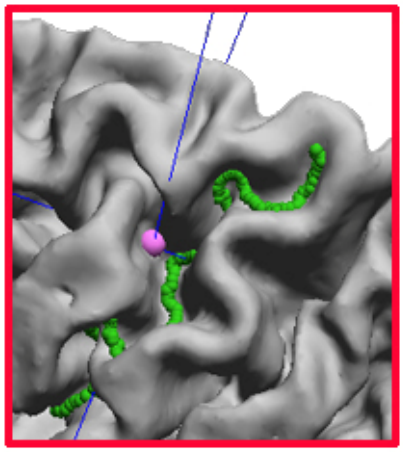
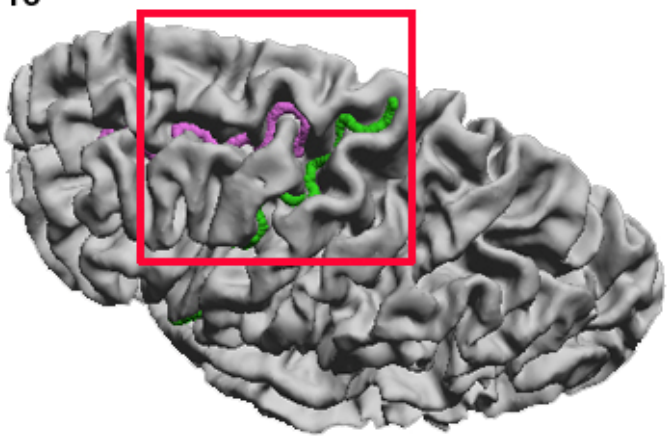


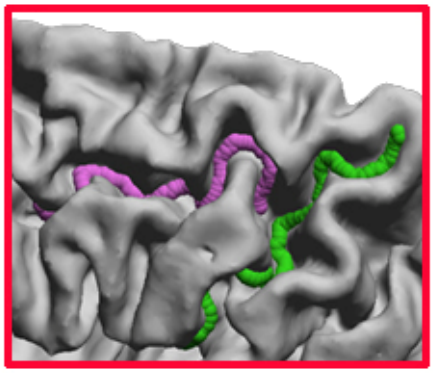
9



10

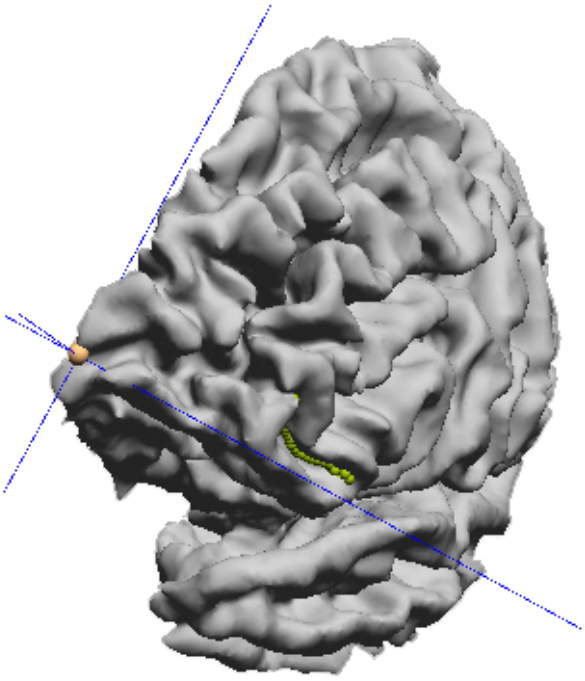


11

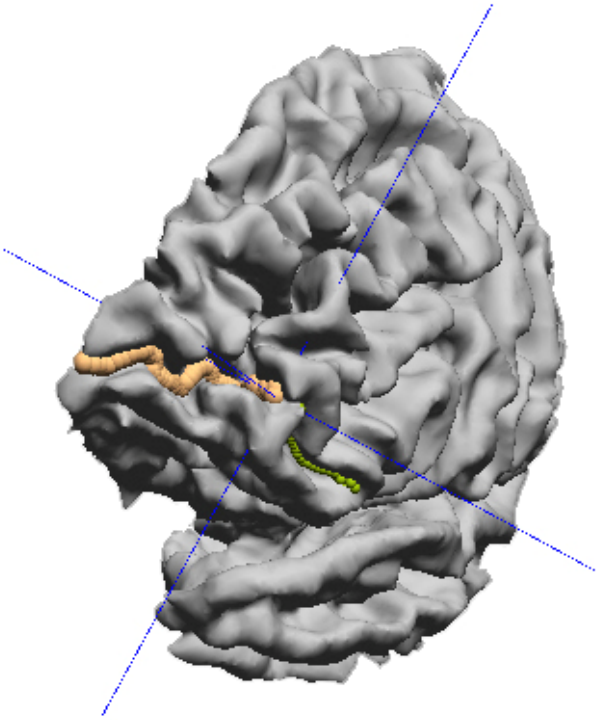


FRONTO-MARGINAL SULCUS

1



2



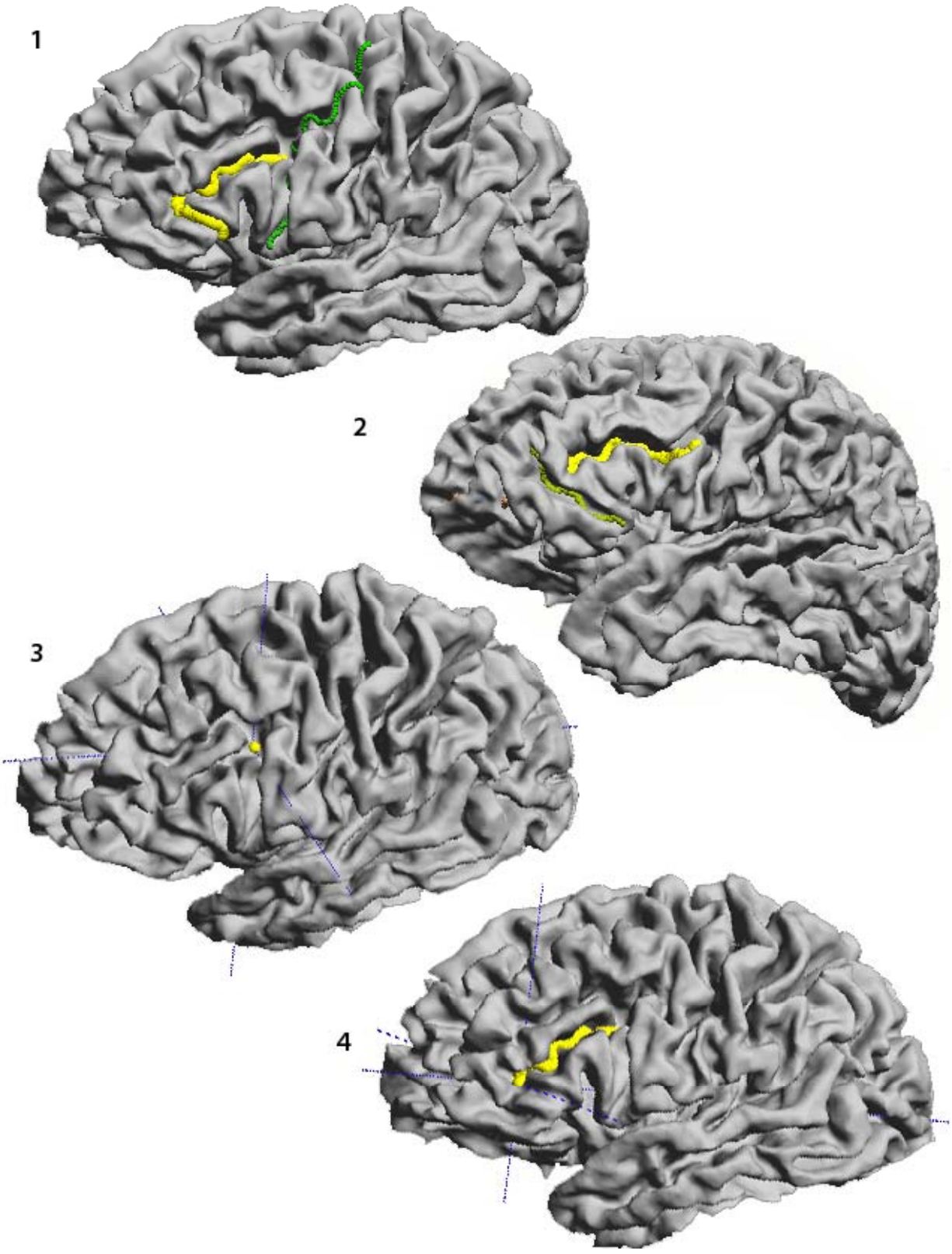
INFERIOR FRONTAL SULCUS

The Inferior Frontal Sulcus (IFS) separates the middle frontal from the inferior frontal gyrus. It is also a sulcus running posterior to anterior, in the lower dorsolateral sector of the hemisphere. It also starts at the preCS with which it can merge. It ends anteriorly, most often with a downturn towards the orbital surface of the frontal lobe (1). This downturn, however, is very variable and on occasion, the IFS does not have an anterior downturn and ends as a straight line in the continuation of the main sector (2). It actually terminates in the direction of the Lateral Orbital Sulcus (see below).

Drop the first point of the curve at the posterior end, immediately in front of the preCS, even if the IFS reaches the preCS or crosses it (3). Then proceed to the end of the straight segment (4) and end the tracing there even if the sulcus curves down. We do this for consistency in alignment.

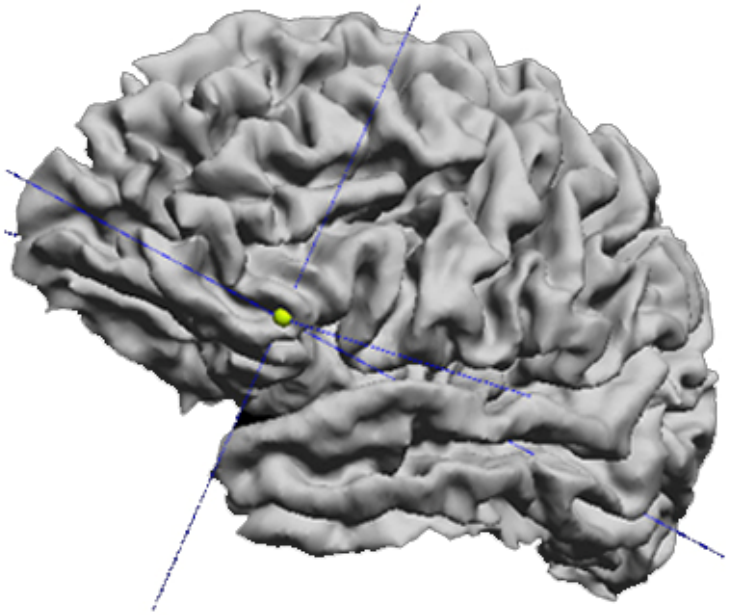
[The **LATERAL ORBITAL SULCUS** (latOS) is a relatively short sulcus on the infero-anterior lateral surface of the hemisphere. It sits immediately above the edge of the orbital surface of the hemisphere, and below the posteriorly curved segment of the IFS. It starts posteriorly (1) and has an anterior and slightly superior course, ending close to the fronto-polar region (2). Start the tracing at the inferior end and move up.]

INFERIOR FRONTAL SULCUS



LATERAL ORBITAL SULCUS

1



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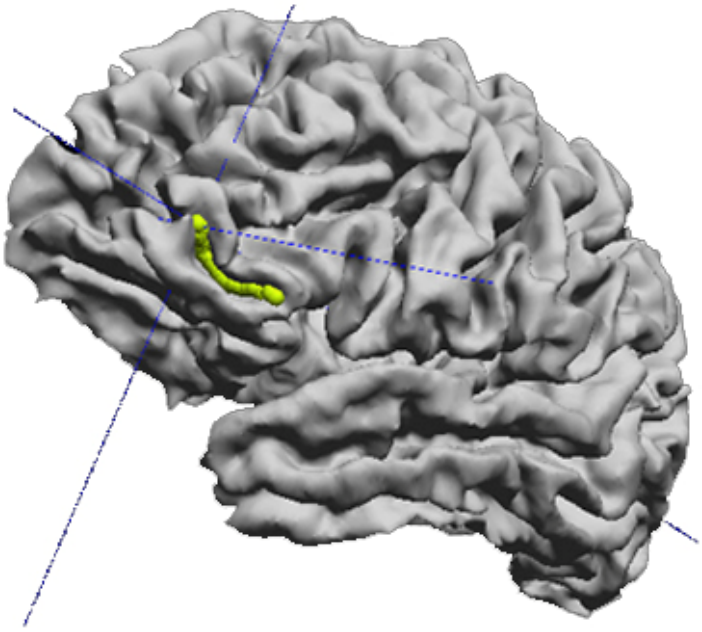


ANTERIOR TERMINAL BRANCHES of the SYLVIAN FISSURE

(a) ASCENDING BRANCH of the SYLVIAN FISSURE

The Ascending Branch of the Sylvian Fissure (abSF) separates the pars opercularis from the pars triangularis, both sectors of the inferior frontal gyrus. It starts, as the name suggests, at the anterior end of the SF. It runs superiorly, parallel to the lower segment of the preCS, towards the IFS which it rarely reaches.

The first point of the curve should be dropped inferiorly (1) followed by the terminal, superior point (2).

(b) HORIZONTAL BRANCH of the SYLVIAN FISSURE

The Horizontal Branch of the Sylvian Fissure (hbSF) separates the pars triangularis from the pars orbitalis, both sectors of the inferior frontal gyrus. It starts together with the abSF with which it may be linked. It runs posterior to anterior towards the descending segment of the IFS or the Lateral Orbital Sulcus which it rarely reaches.

The first point of the curve should be dropped posteriorly (3) followed by the anterior terminal point (4).

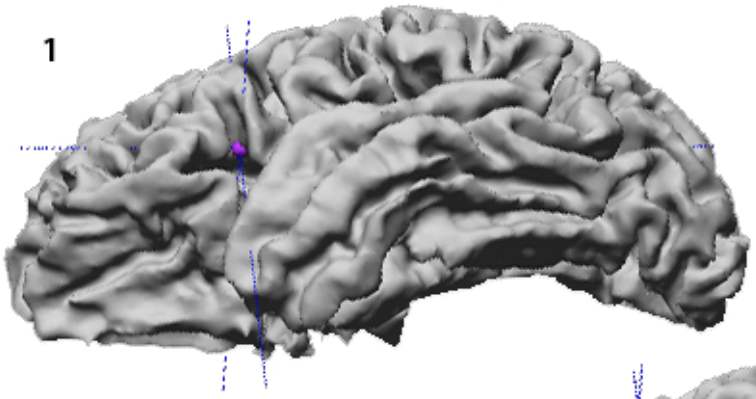
Parasagital slices can be of help to identify these two sulci (5). The two terminal branches form a **V** or **Y**, easily seen on parasagital slices as shown.

The combination of the pars opercularis and triangularis is usually called, in the left hemisphere, Broca's Area.

ANTERIOR TERMINAL BRANCHES of the SYLVIAN FISSURE

(a) ASCENDING BRANCH of the SYLVIAN FISSURE

1



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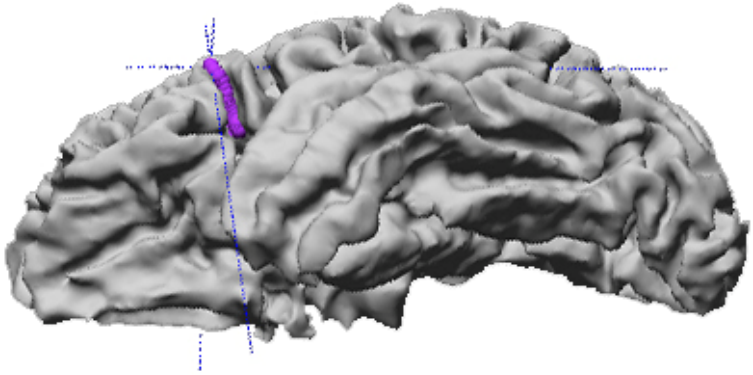
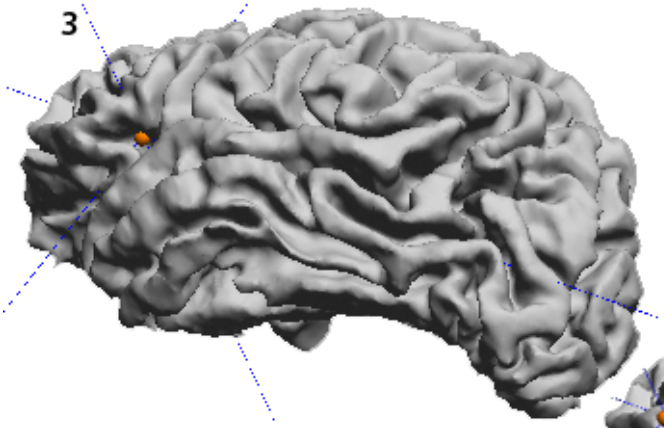


(b) HORIZONTAL BRANCH of the SYLVIAN FISSURE

3



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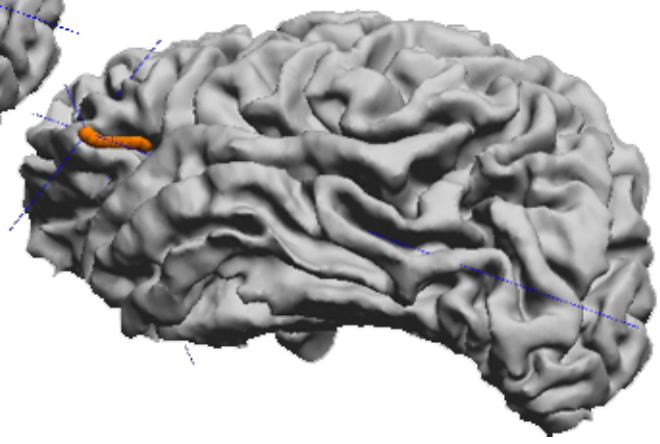
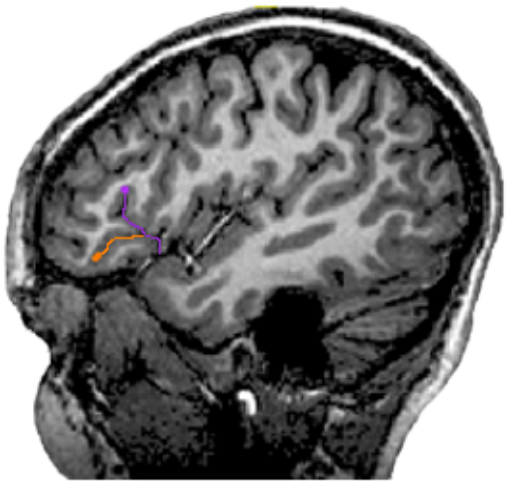
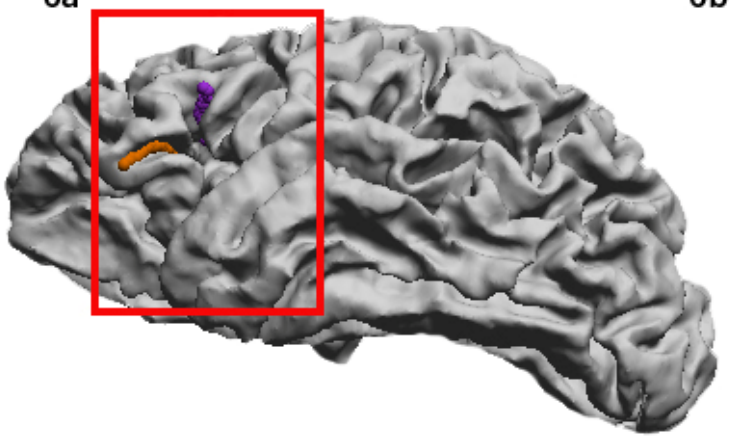


ANTERIOR TERMINAL BRANCHES of the SYLVIAN FISSURE

5



6a



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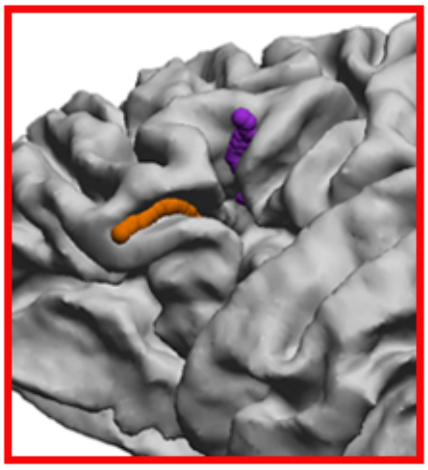

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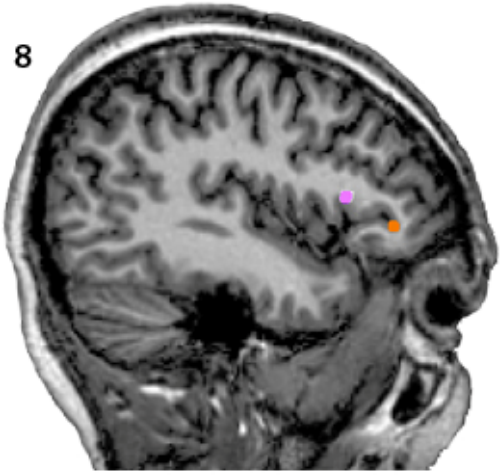
8



CINGULATE SULCUS

The Cingulate Sulcus (CingS) separates the cingulate gyrus from rhe rest of the frontal lobe. It is seen on the mesial surface of the hemisphere, and is parallel to the anterior three quarters of the Corpus Callosum (CC). It has an anterior to posterior course starting just below the CC (1).

Because the point of origin can vary, particularly in relation to the Supra-Orbital Sulcus (see below) with which it may or not merge (2, 3), the original point should be marked, for consistency, just in front of the genu of the CC (4). From there it courses anteriorly, superiorly, and posteriorly (5). Before reaching the end it turns upward and reaches the top of the mesial surface (6). This posterior sector is known as the Ascending Branch of the Cingulate Sulcus (ascCingS), and constitutes a good landmark for the identification of the mesial segment of the CS. (See Central Sulcus.)

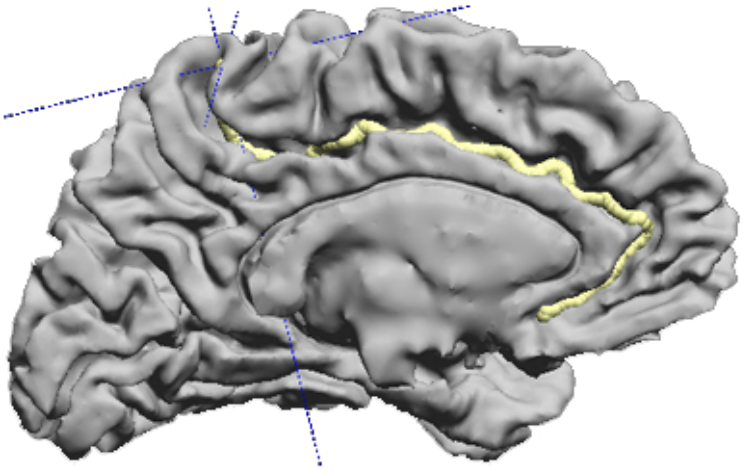
The CingS has, most often, a single, uninterrupted course, but it can also have real interruptions (8, curve traced in 9), or it can be doubled in the anterior sector (10) , or more posteriorly (12). In the two latter cases, for consistency reasons, it is convenient to trace the most anterior located sulcus and join the posteriorly set segment when the anterior segment ends (11, 13).

The **SUPRA-ORBITAL SULCUS** (supraOS) is seen in the mesial surface of the hemisphere immediately below the inferior sector of the CingS. It runs parallel to it from posterior (1, dot of origin) to anterior (2).

Often there are two supraOS , a superior and a inferior supraOS (image 13 of the cingulated shows clearly the presence of 2 supraOS under the inferior segment of the CingS. For consistency, the superior should be traced.

CINGULATE SULCUS

1



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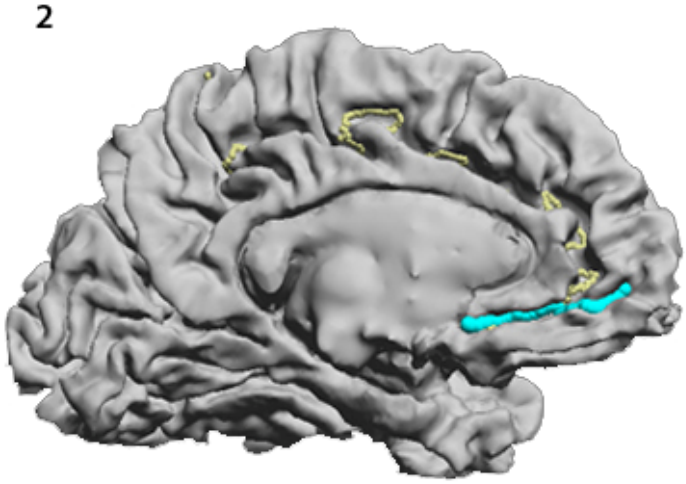

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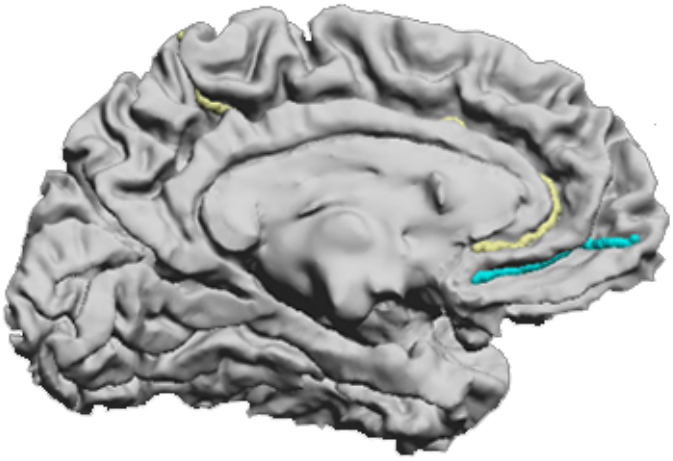
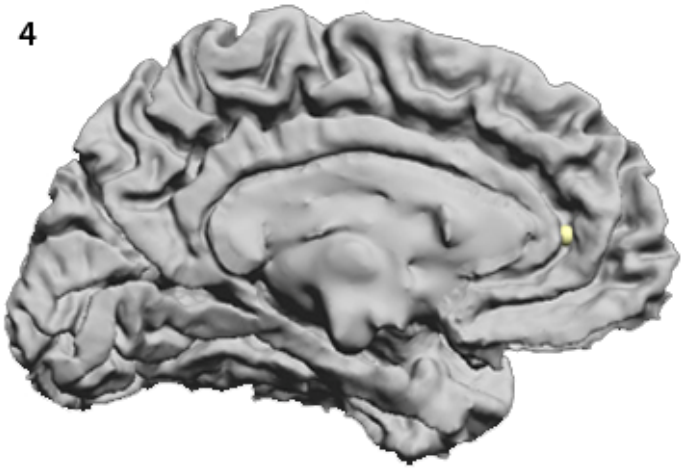


CINGULATE SULCUS

4



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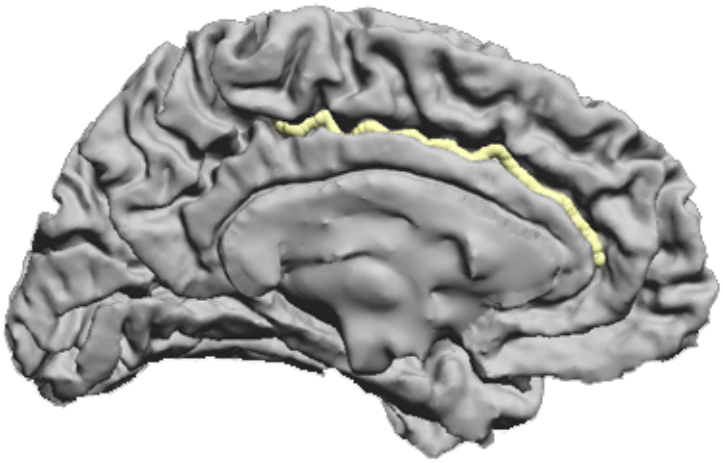
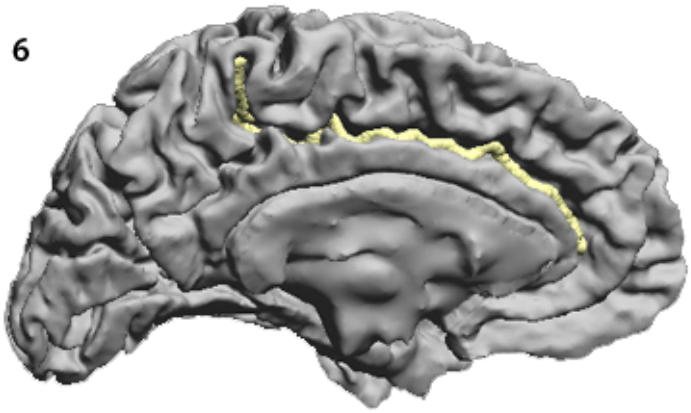
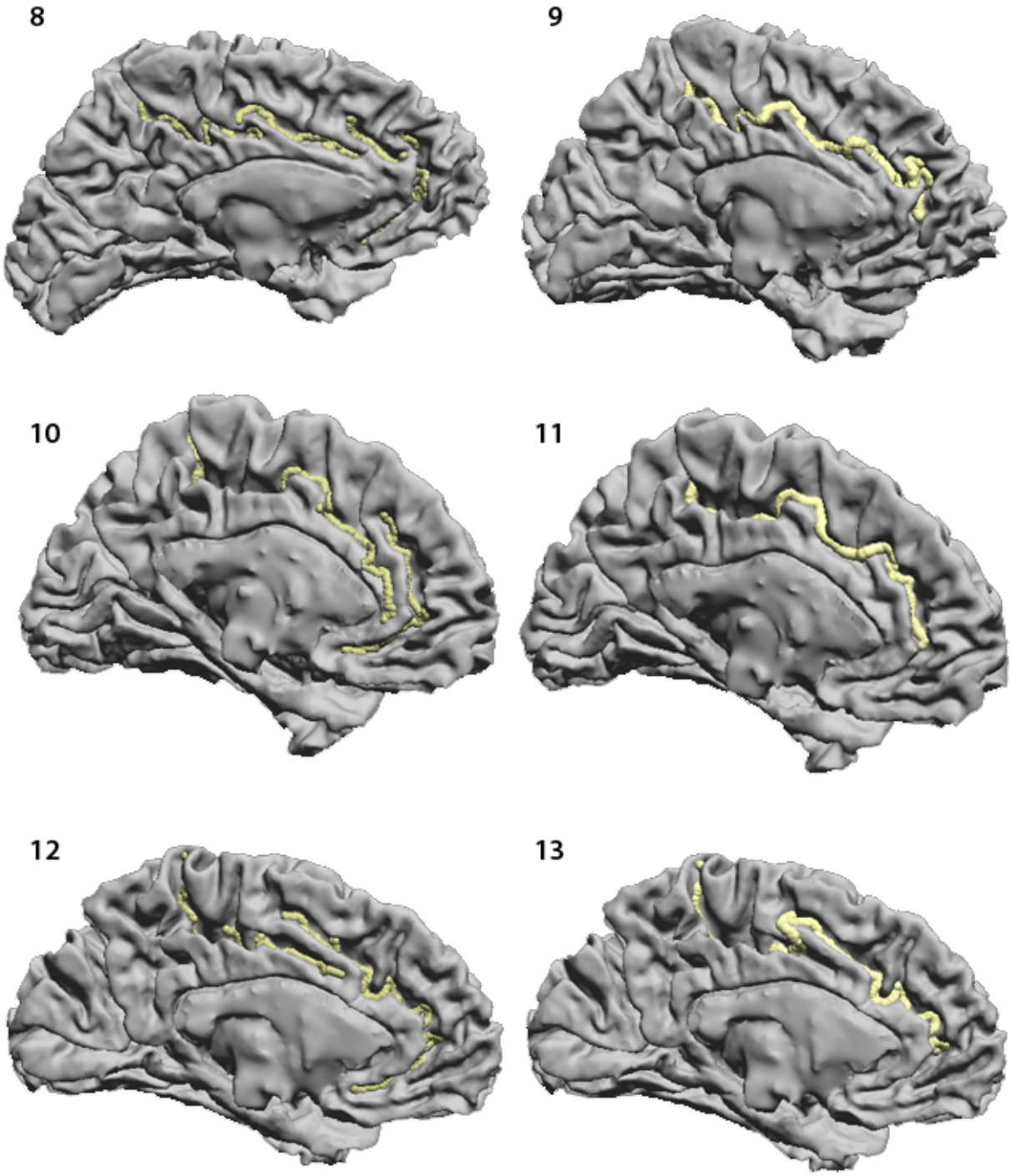


6

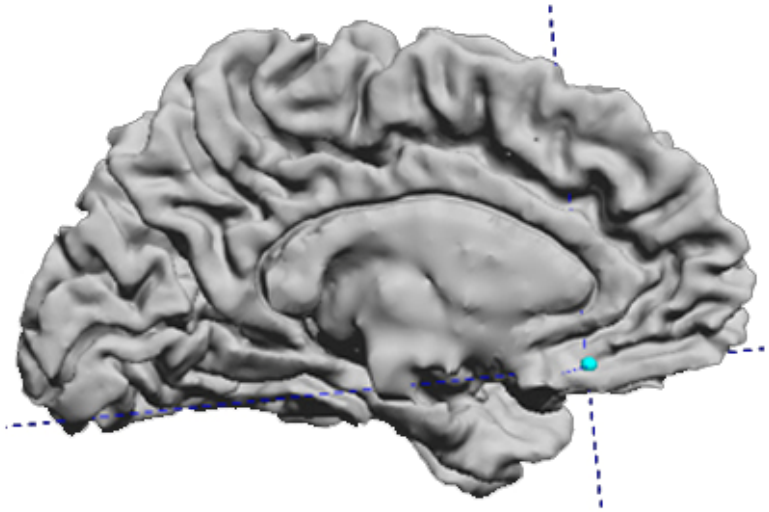


CINGULATE SULCUS



SUPRA-ORBITAL SULCUS

1



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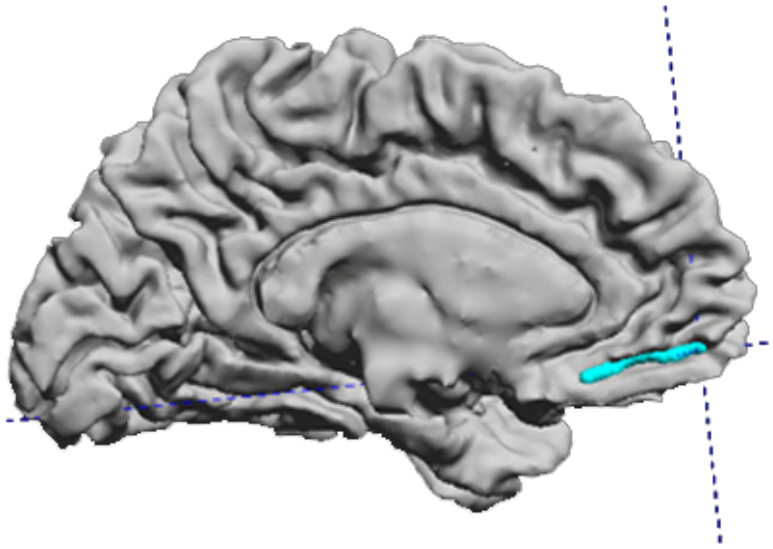
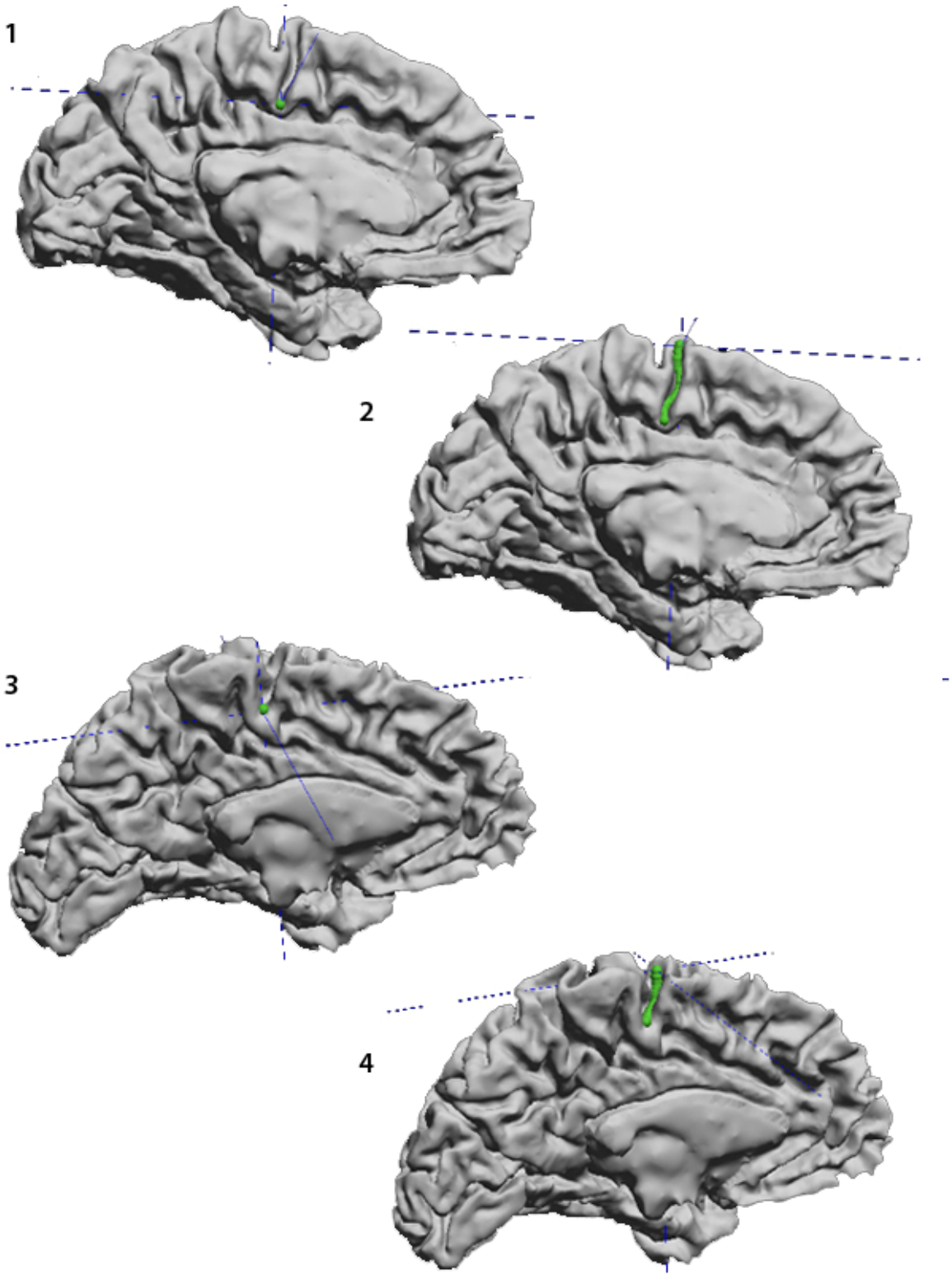


PARA-CENTRAL SULCUS

The Para-Central Sulcus (paraCS) forms the anterior limit of the paracentral lobule. It is a small vertical sulcus on the medial surface of the hemisphere. It runs from the posterior sector of the CingS (1), straight up to the edge of the mesial surface of the hemisphere (2). It can also come in the opposite direction, from the edge of the mesial surface down towards the CingS (3,4). The superior end is at the level of, or just anterior to, the superior end of the precentral sulcus. Regardless of considering it running infero-superiorly or supero-inferiorly it should always be traced starting at the lower end and moving superiorly.

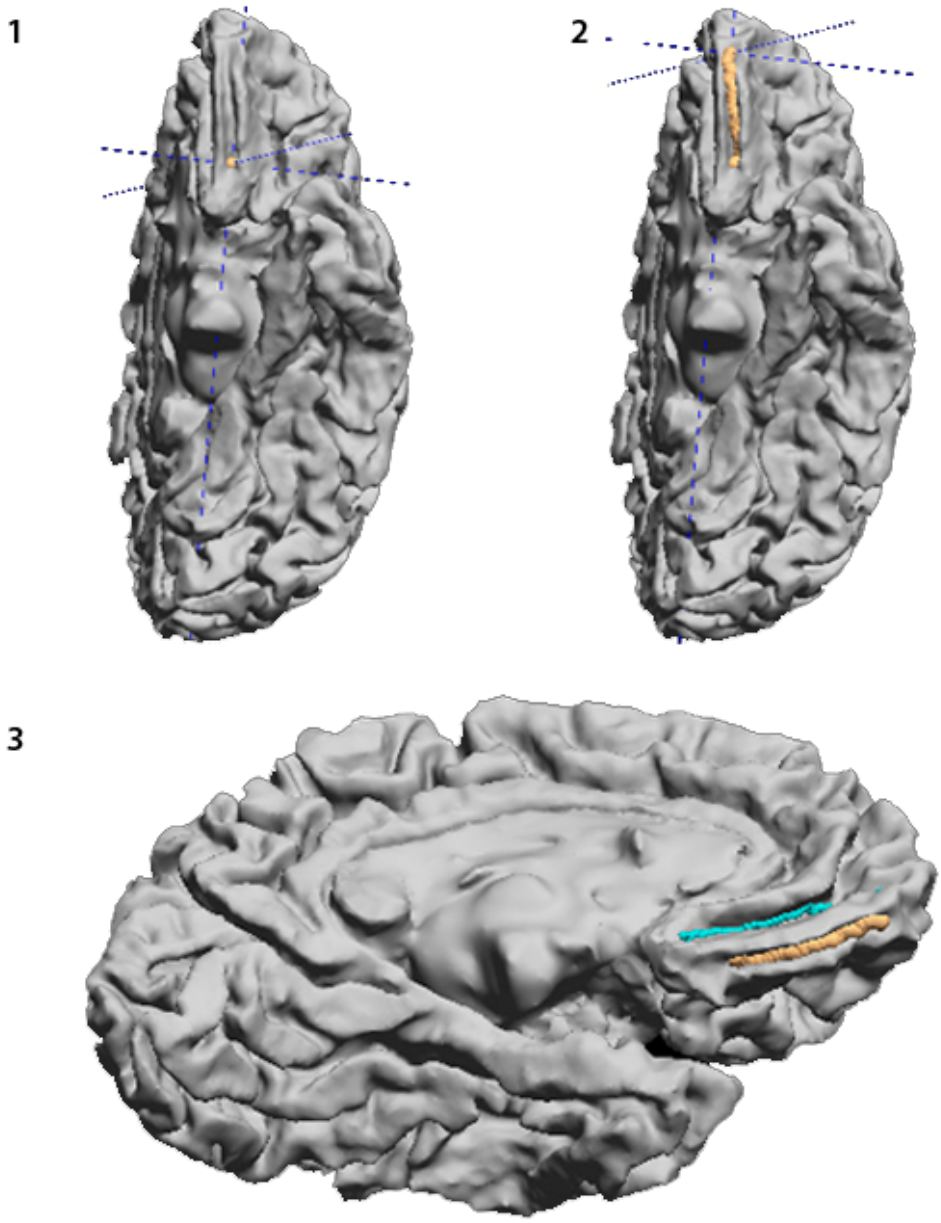
PARA-CENTRAL SULCUS



MIDDLE ORBITAL or OLFACTORY SULCUS

The Olfactory Sulcus (OlfS) is the most mesial sulcus seen on the orbital surface of the hemisphere. The OlfS separates the gyrus rectus from the medial orbital gyrus. It is parallel to the interhemispheric fissure and has a straight postero-anterior course. It ends close to the pole but does not reach it completely (1,2). This sulcus is best seen when looking straight at the inferior surface of the hemisphere, but it can also be seen when looking at a tilted view, showing at the same time inferior and mesial surfaces of the hemisphere (3). In such a view its relation to the supraOS can be appreciated.

OLFACTORY SULCUS



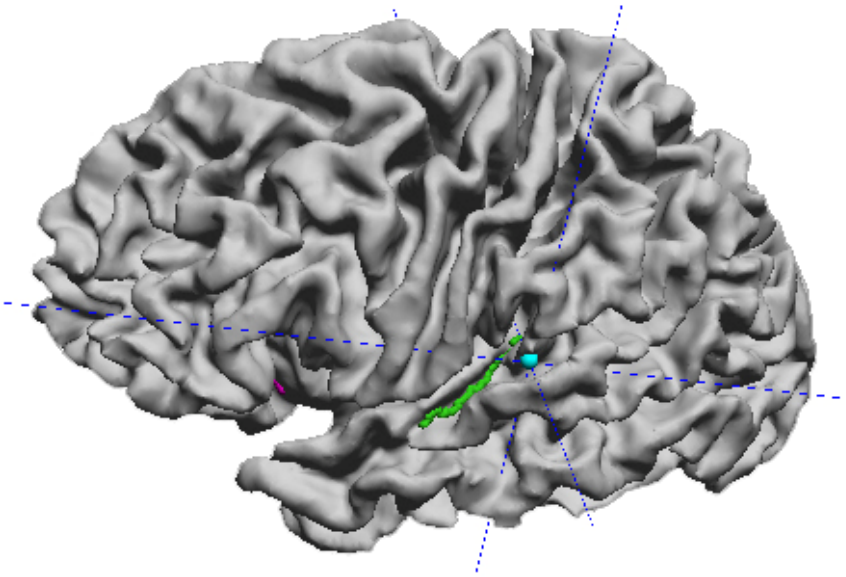
SYLVIAN FISSURE

The Sylvian Fissure (SF) separates the temporal lobe from the frontal and parietal lobes above. The SF can be traced on the surface of the brain but, because it is a real fissure and not a sulcus, it has no deep boundary; in depth it merges with the circular sulcus. Therefore, it should not be part of the curves discussed here. However, its terminal branches can be viewed as independent sulci and should be traced. The terminal segment of the SF starts in the depth of space formed by the temporal and parietal opercula. From there it courses posteriorly and laterally to reach the lateral surface of the hemisphere. It terminates as a single horizontal sulcus or as a single ascending sulcus. Traditionally the left hemisphere SF is considered to have a more or less horizontal course and the right hemisphere a more ascending course. The SF may also split into two terminal branches, one ascending and one descending. For the purpose of consistency for brain alignment it may be best to trace the ascending branch whenever there is more than one to choose from.

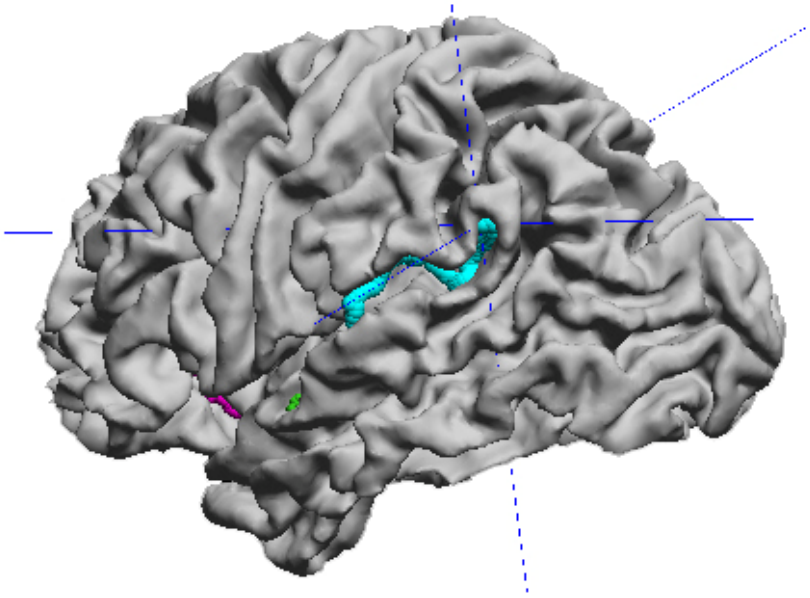
It is best to trace the SF after tracing the Transverse Temporal Sulcus (TTS) and the Circular Sulcus (CircS). The SF starts immediately behind the most mesial and posterior point of the TTS (green) as seen in (1). It then courses posteriorly to end naturally on the surface of the hemisphere (2).

SYLVIAN FISSURE, terminal branch

1



2



The transverse temporal sulcus is also traced (in green)

SUPERIOR TEMPORAL SULCUS

(a) main portion

The Superior Temporal Sulcus (STS) separates the superior temporal gyrus from the middle temporal gyrus. It is, after the SF, the most visible sulcus on the lateral surface of the temporal lobe. It is a long sulcus that starts close, or at, the temporal pole. It has a horizontal antero-posterior course, more or less parallel to the SF. Close to the end of the SF it usually splits into two rami, one ascending the other either descending (or horizontal). The level of the split is variable among subjects. For the purpose of brain alignment we will consider the superior split as the continuation of the STS.

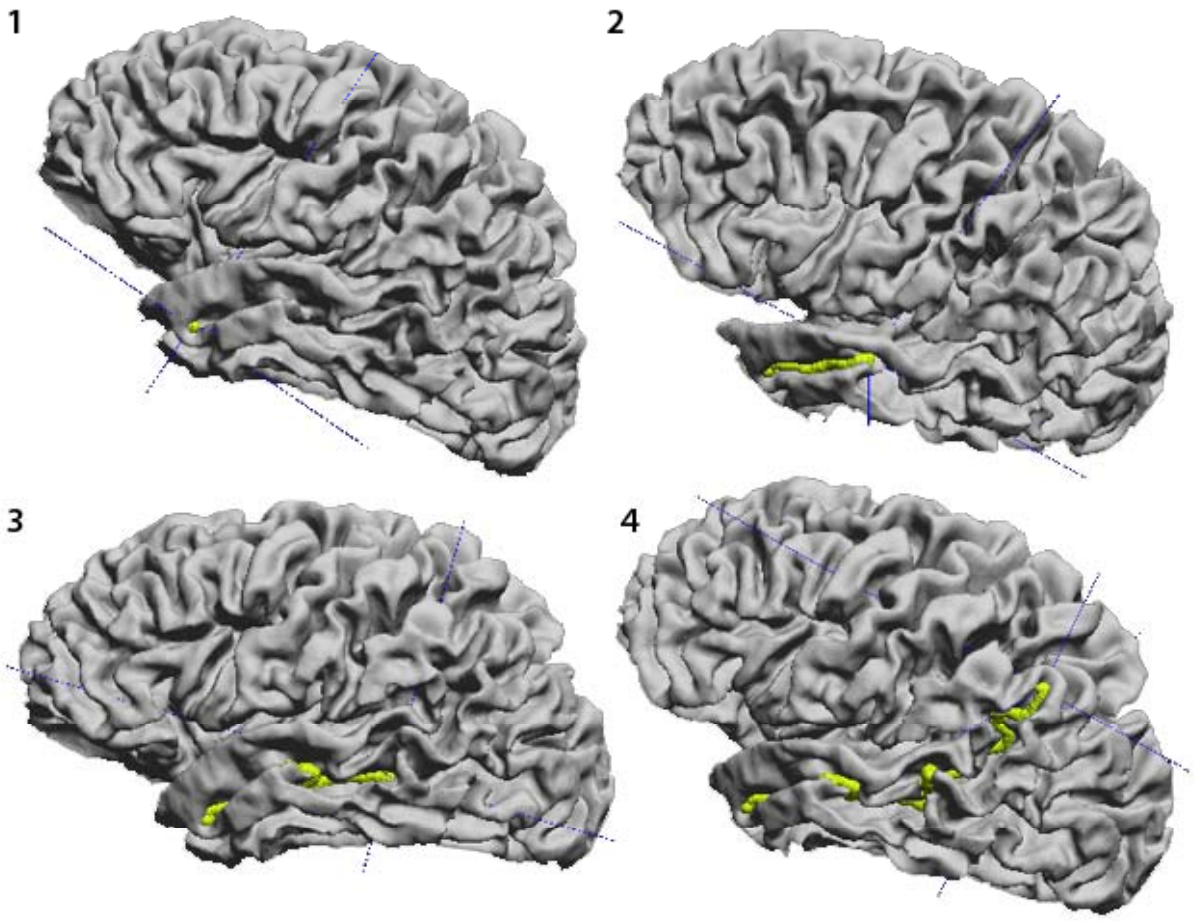
The first point is dropped at the anterior end (1) and from there the curve continues posteriorly (2, 3), and into the parietal lobe until the posterior end of the superior ramus (4).

The STS can be a continuous sulcus or have multiple partial interruptions. It can also be interrupted in its course by actual gyri. This happens often at the level of the split (3, 4).

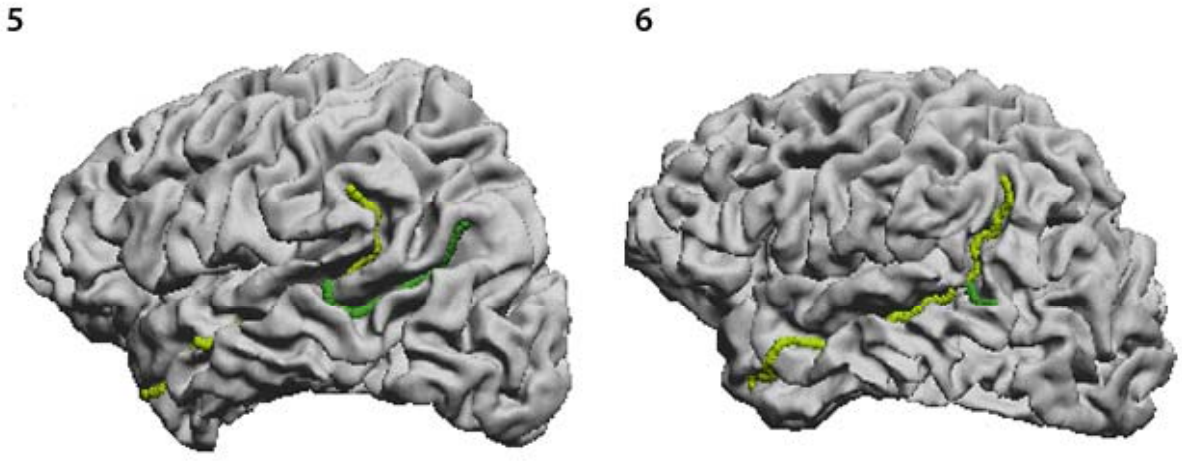
(c) inferior ramus

The inferior ramus can join the main portion or be seprated by a small gyrus. It is extremely variable in position length and even direction, an example is provided below (5, 6). Because it is so variable it is best left out for alignment purposes.

SUPERIOR TEMPORAL SULCUS



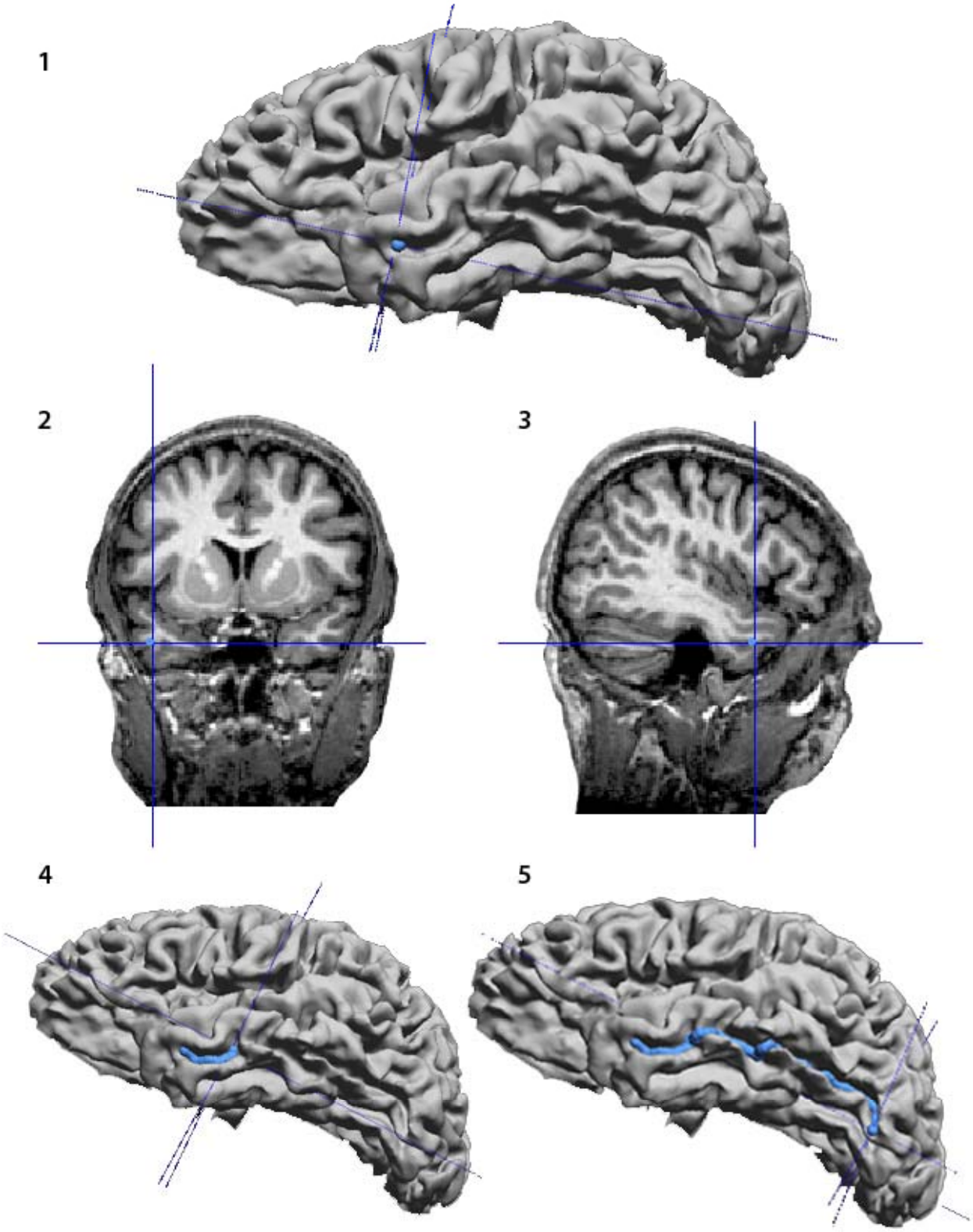
inferior ramus of Superior Temporal Sulcus



INFERIOR TEMPORAL SULCUS

The Inferior Temporal Sulcus (ITS) forms the inferior border of the middle temporal gyrus, separating it from the inferior temporal gyrus. It may be difficult to identify because it is often formed by several independent sulcal segments. It is parallel to the STS and also starts anteriorly at the level of the temporal pole (1) and courses posteriorly. The origin can easily be identified on anterior coronal (2) or parasagital (3) slices. Image 4 shows several segments forming this sulcus. The sulcus extends into the occipital lobe where it ends (5).

INFERIOR TEMPORAL SULCUS



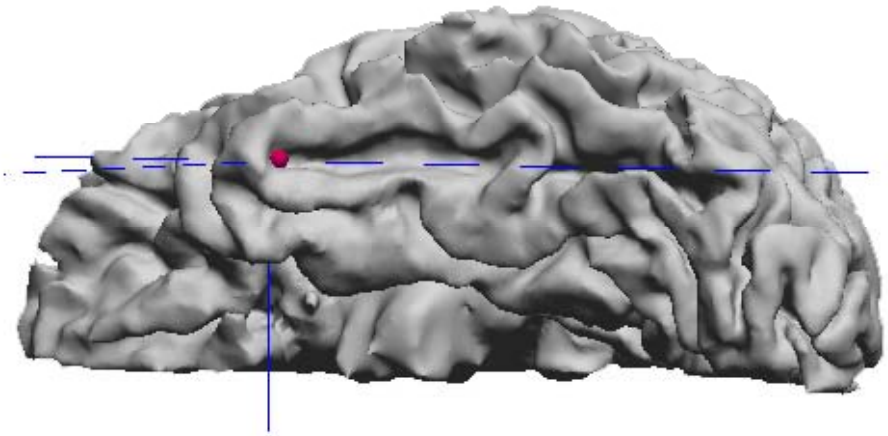
OCCIPITO TEMPORAL SULCUS

The Occipito Temporal Sulcus is the 4th temporal sulcus running antero posteriorly. It is best seen when looking at the inferior aspet of the temporal lobe, and it separates the inferior temporal gyrus, laterally, from the occipito-temporal gyrus, mesially. It often is discontinuous.

Drop the first point at the anterior end (1). Images 2 and 3 show the position of this point in a coronal and parasagital view respectively. Continue posteriorly to the point of interruption (4), change to no stickiness and jump over the gyrus (5 and 6), and continue to the end of the sulcus at the beginning of the occipital lobe (7).

OCCIPITO TEMPORAL SULCUS

1



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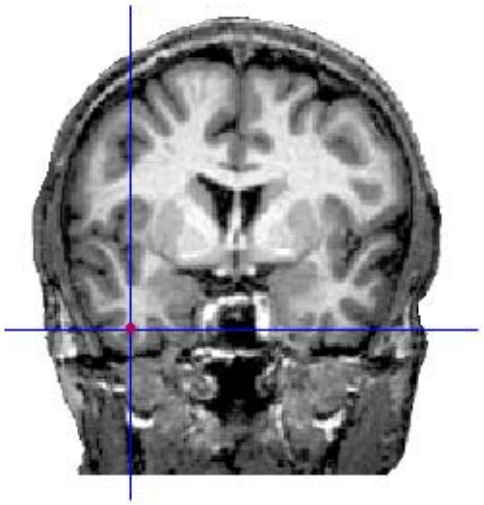
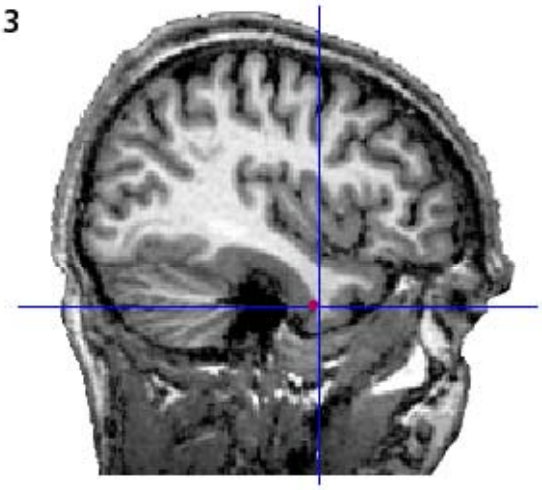
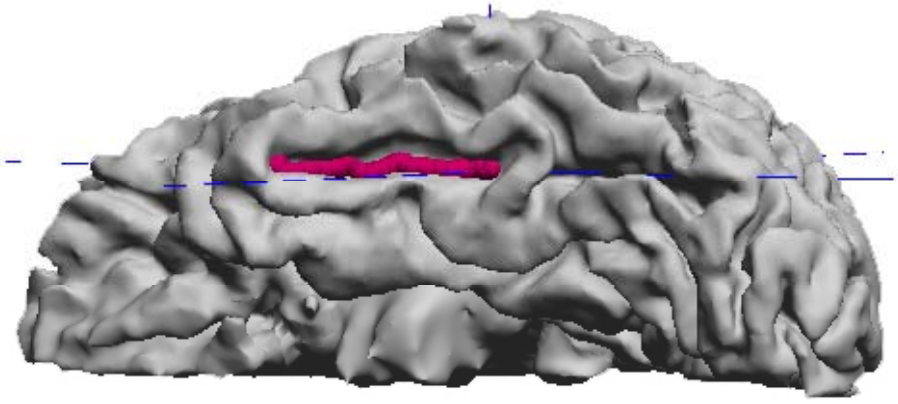


3

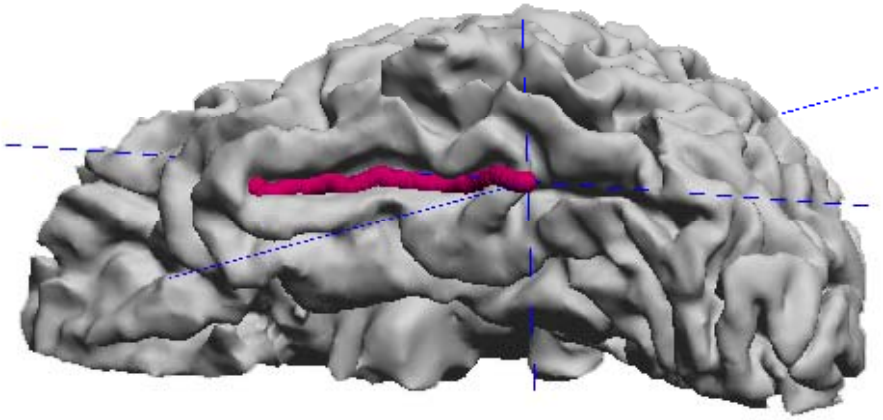


4

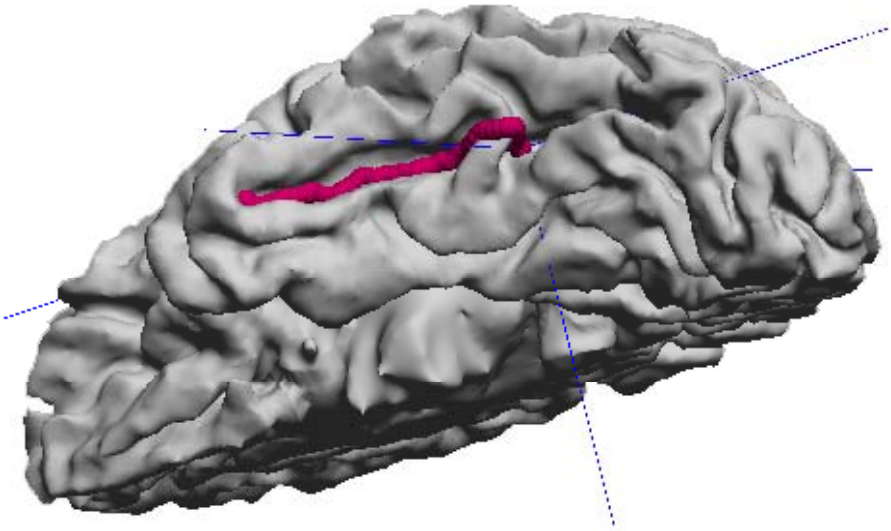


OCCIPITO TEMPORAL SULCUS

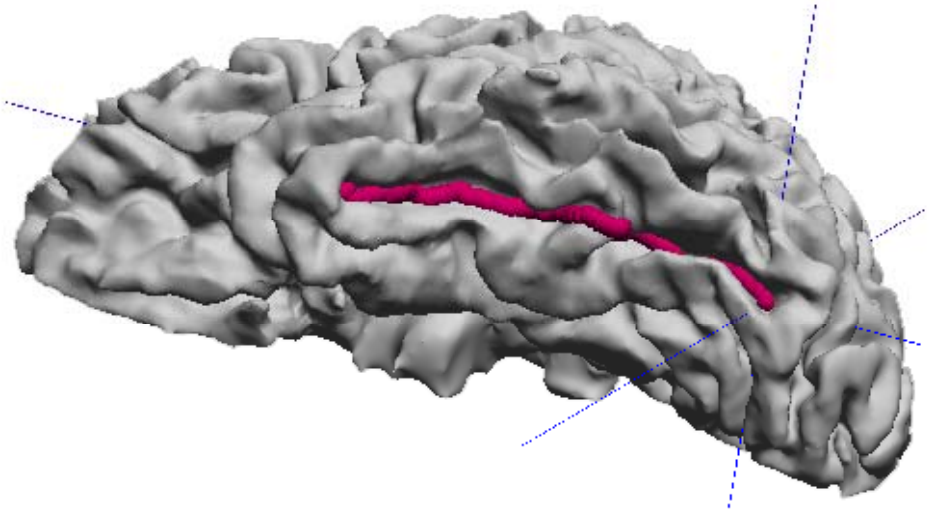
5



6



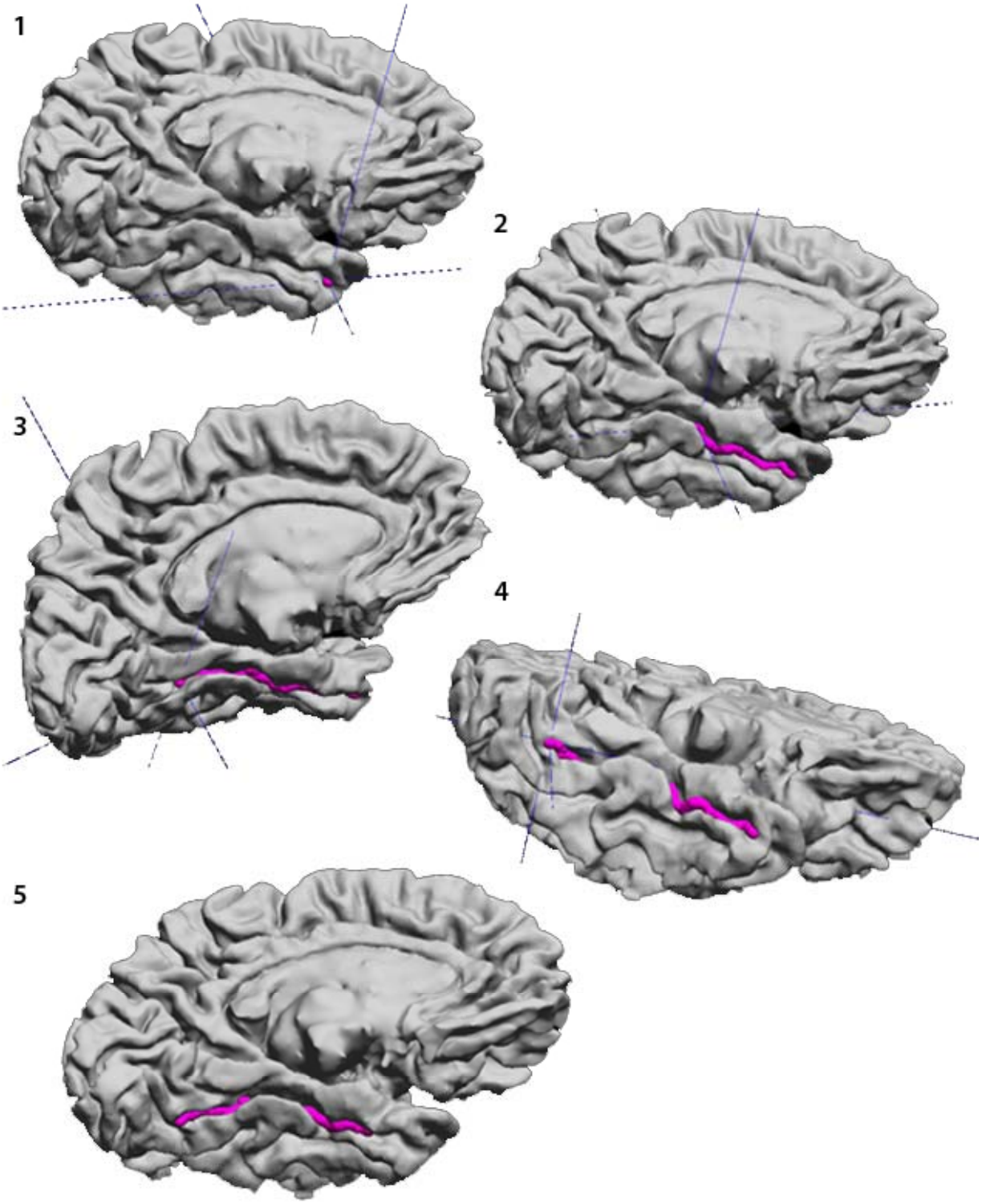
7



COLLATERAL SULCUS

The Collateral Sulcus (ColS) is yet another anteroposteriorly running temporal sulcus. It is the most mesial temporal sulcus and provides the lateral limit of the parahippocampal gyrus. The ColS is best seen with the surface rendering tilted halfway between a mesial and an inferior position (1). The anterior end often merges with the rhinal sulcus to form the antero-medial border of the uncus. Here, to facilitate the marking of the curve, we include the rhinal sulcus a the most anterior segment of the collateral sulcus. Drop the starting point here (1). The ColS runs posteriorly paralll to the hippocampal fissure (3). It often splits into two rami which continue into the occipital lobe. The lower, or more lateral ramus (5) will separate the lingual and fusiform gyri in the mesial occipital lobe. The sulcus should be terminated at the posterior end of the temporal lobe, or continued into the occipital lobe chosing the lateral terminal branch. Once again, the importance is to be consistent across subjects.

COLLATERAL SULCUS



TRANSVERSE TEMPORAL SULCUS

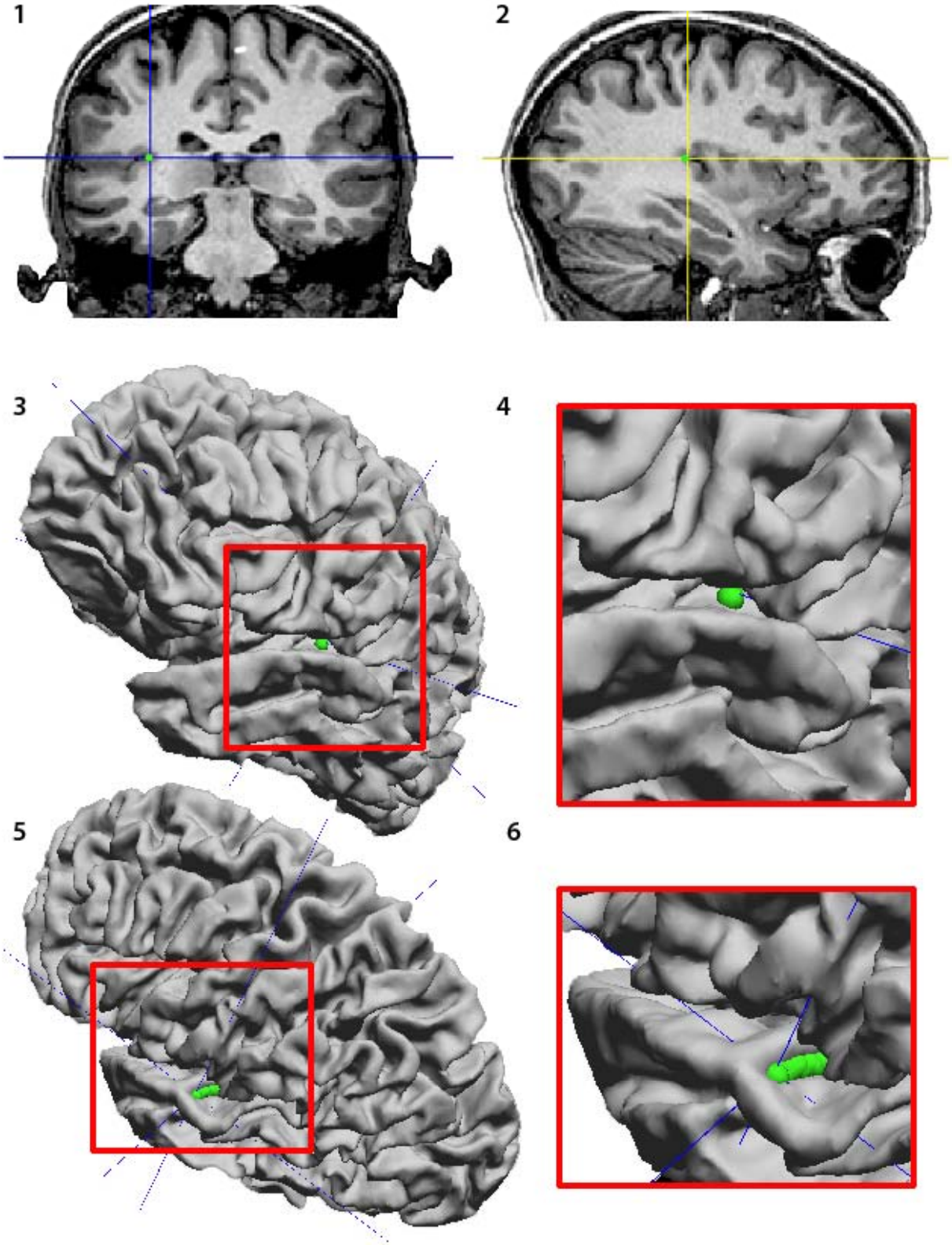
The Transverse Temporal Sulcus (TTS) is the posterior limit of the transverse gyrus of Heschel. It is hidden on the superior surface of the superior temporal gyrus covered by the fronto-parietal operculum. It cannot be seen unless the frontal and parietal lobes are removed to expose the superior surface of the temporal lobe. Even when stripping the hemispheric surface to the midcortical level, or even to the gray/white junction, it is difficult to see this region clearly. However, it is an important sulcus given that it constitutes the boundary of the primary auditory cortex. It has a course from postero-mesial to antero-lateral.

The best approach to tracing the TTS is to start with a coronal slice, at the level of poterior thalamus and identify, in the temporal lobe, a mesial hump (1), which is also clearly seen in a parasagital slice (2). Drop here the beginning of the curve and see where it falls in the surface view (3, detail in 4). Move laterally and drop the terminal point (5, detail in 6). The sulcus ends most of the time on the superior surface of the temporal lobe, but, occasionally it may reach the lateral surface (7 and 8). Once again, because of consistency among curves for the purpose of alignment, it should always be ended at the edge of the superior surface (9 and 10).

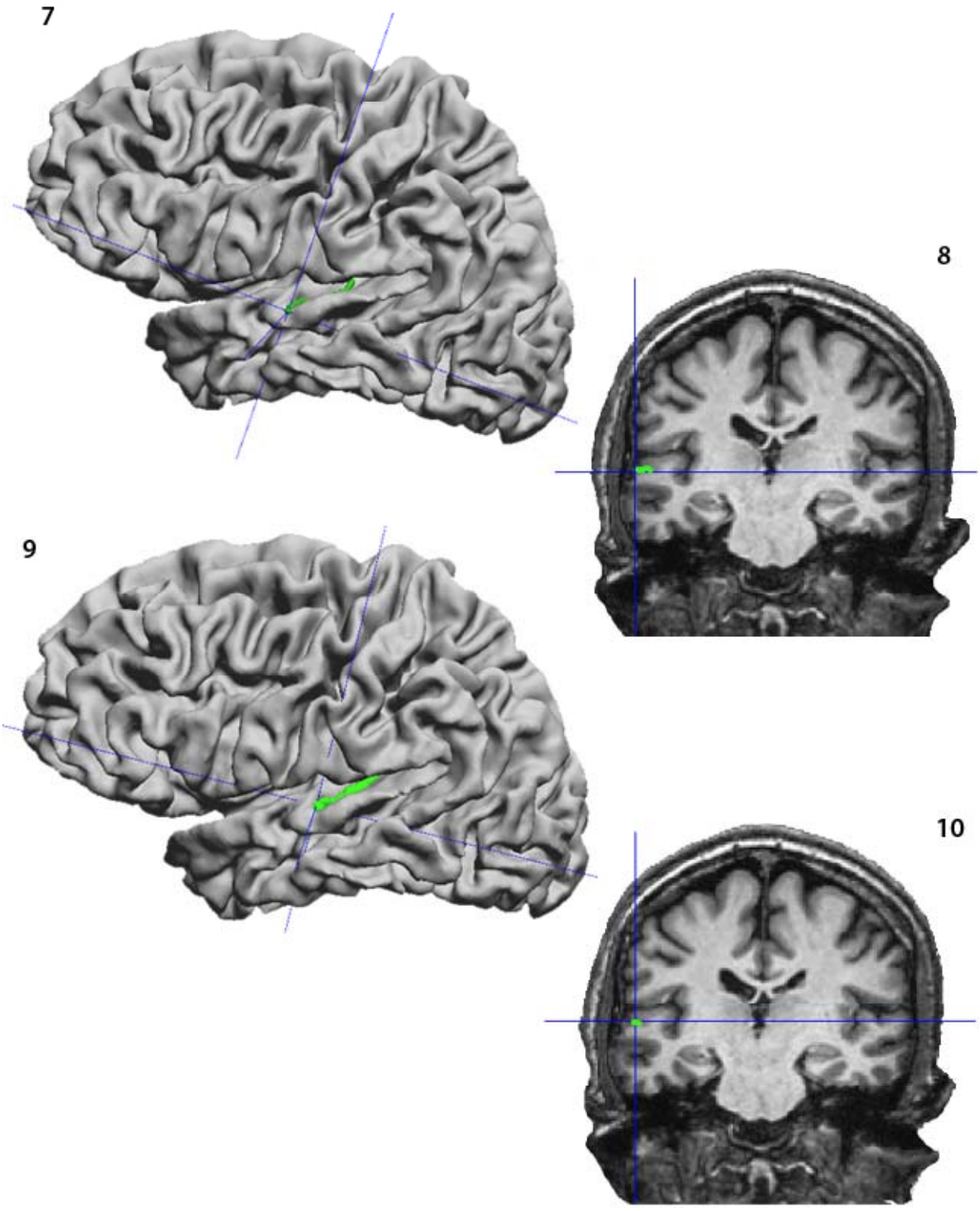
Looking at the marked sulcus on the gray/white junction surface (11) permits a better overall view. The coronal (12), parasagital (13), and axial (14) slices continue to show the sulcus very clearly.

The TTS can be a double sulcus. In that case trace the most anterior sulcus.

TRANSVERSE TEMPORAL SULCUS

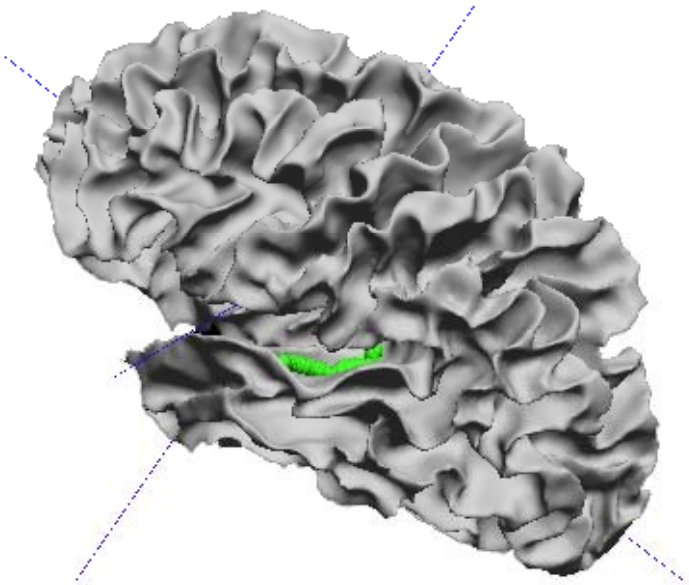


TRANSVERSE TEMPORAL SULCUS

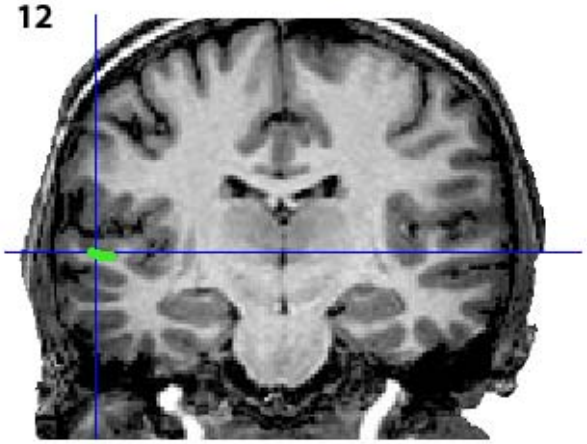


TRANSVERSE TEMPORAL SULCUS

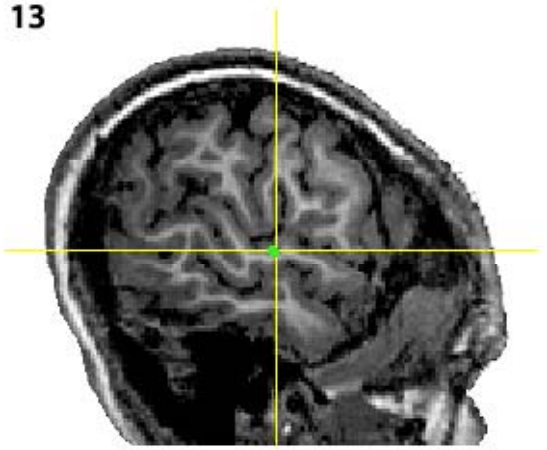
11



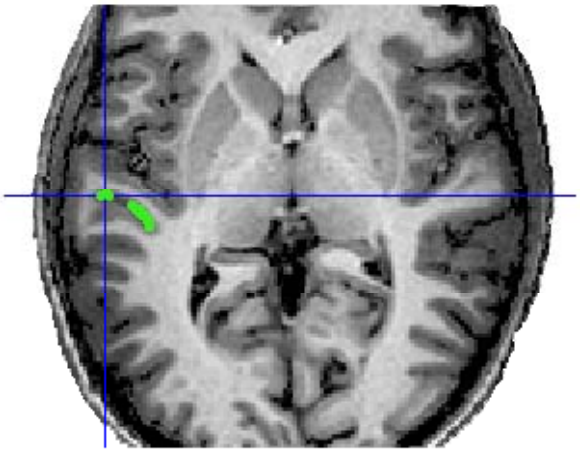
12



13



14



CIRCULAR SULCUS

The Circular Sulcus (circS) is the sulcus that runs all around the insula, separating it from the temporal, frontal and parietal lobes. This sulcus cannot be easily followed on the surface rendering because it is always partially covered. To trace it, it is best to use a combination of axial and coronal slices. The first two images show the circular sulcus appearing anteriorly under the frontal operculum (1), and in its entirety in a semitransparent brain (2).

Point #1, inferior-anterior: Start with the most anterior and inferior point. This point can be found in axial slices. Go down until the insula and the frontal lobe loose their continuity. Then slowly come up and drop the point at the level at which the insula is first clearly demarcated from the frontal lobe. Drop the anterior starting of the curve (3). In (4) there is the image of this dot on a coronal slice. It can also be seen in the surface rendering. In (5) on the midcortical surface, the one used for the tracing, and in (6) on a gray/white juncture rendering.

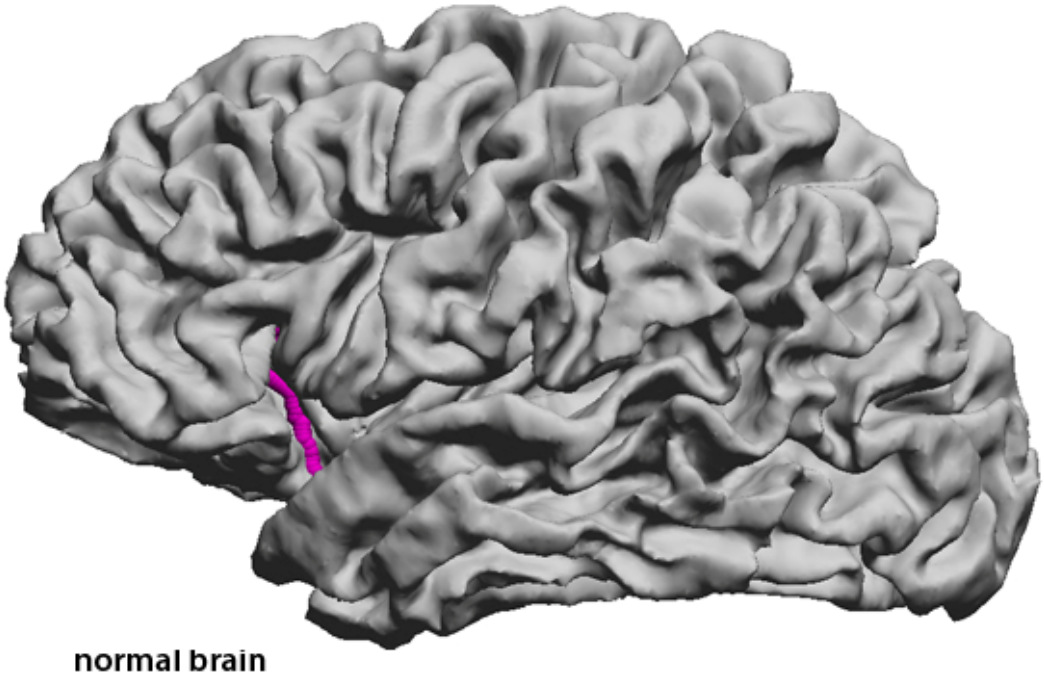
Point #2, superior-anterior: Next move the axial slices up until the insula and the sulcus are not clearly seen any more. Drop down to the highest slice where they can be seen and drop the 2nd point (7). In (8) the second point is seen in a coronal slice, and in (9) and (10) on the two surface renderings.

Point #3, superior-posterior: Use now the coronal slices and move back to the posterior end of the insula. At the point where the transverse temporal gyrus seems to continue into the overlying parietal lobe (TTS in green on the coronal slice) drop the posterior point (11). The axial slice is in (12) but this slice does not provide good reference for the posterior and superior point in the curve. In (13) and (14) are the two surface renderings showing the curve so far drawn.

Point #4, end point: In the coronal slices move anteriorly to a few cuts behind the image where the first point appears in coronal slices, so as to clearly see the lowest sector of the insula as it connects to the temporal lobe. This will happen at the beginning of the temporal stem (15). This will be the end point of the circular sulcus. In (16) is the point in the axial slice, and in (17) on the gray/white juncture surface rendering. In (17) the anterior and posterior segments can be seen, in (18) the superior and middle segment is visible.

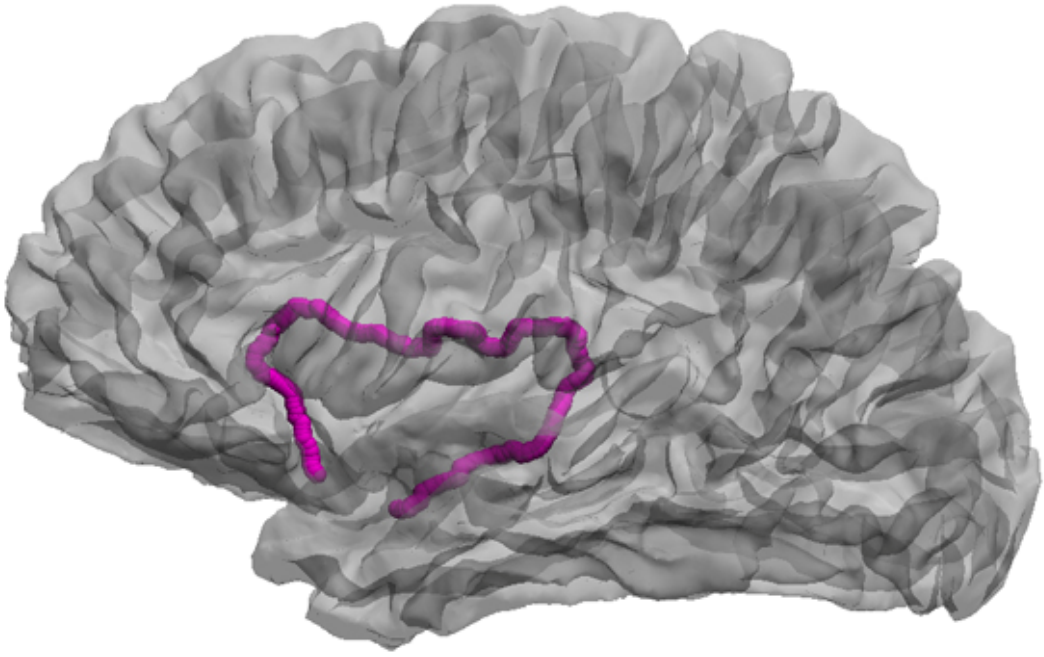
CIRCULAR SULCUS

1



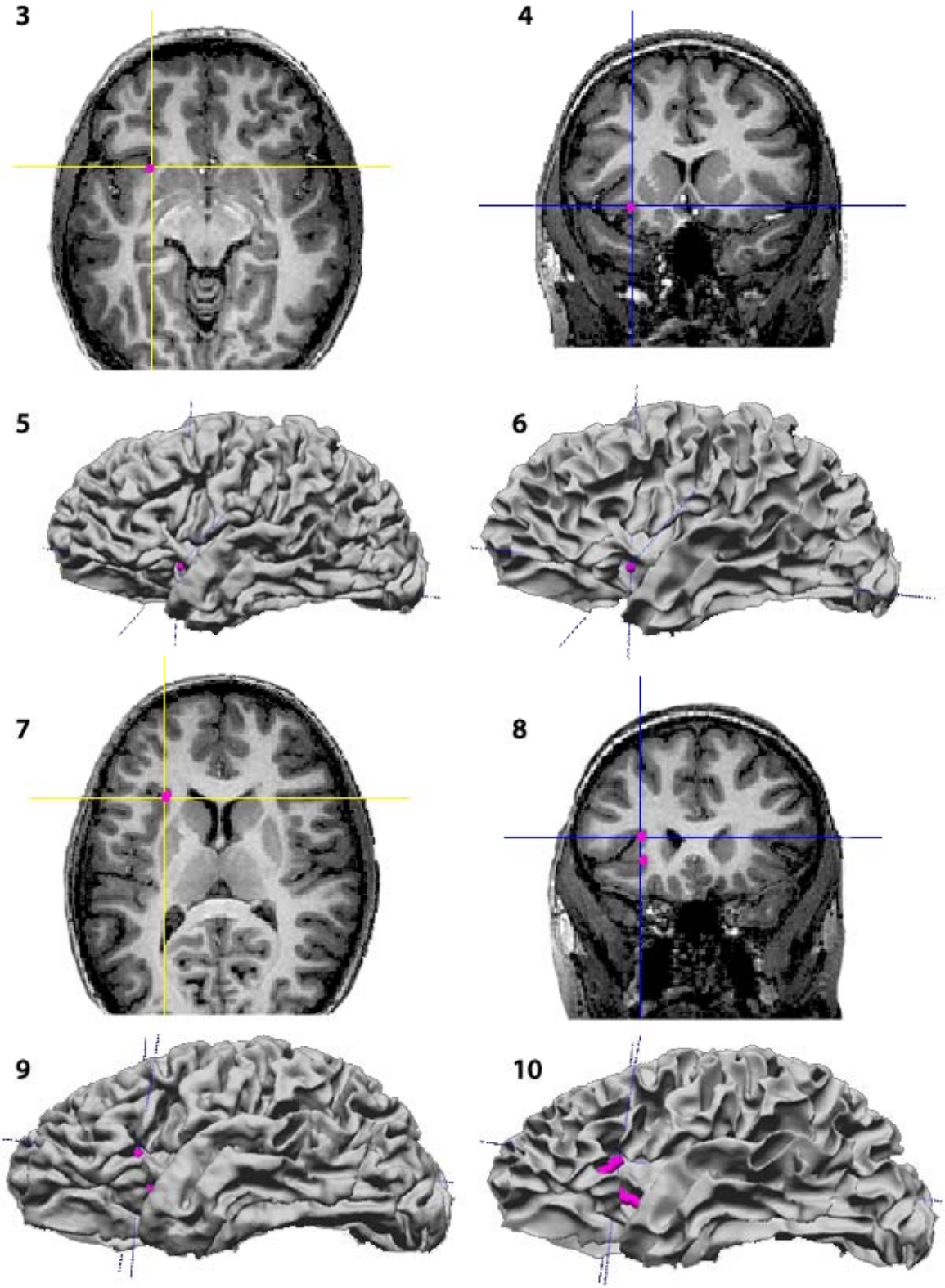
normal brain

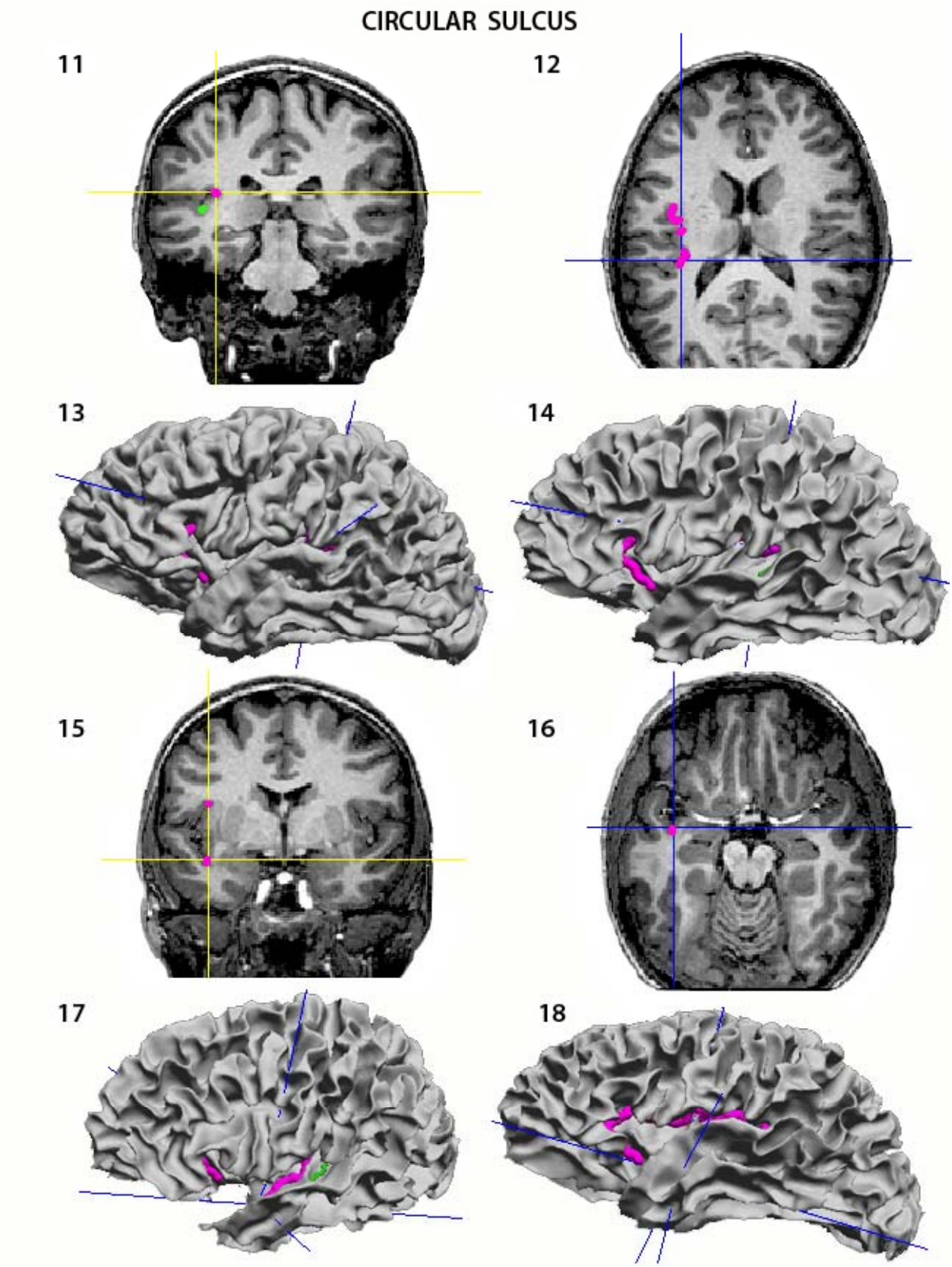
2



semi-tranparent brain

CIRCULAR SULCUS




CIRCULAR SULCUS
11
12
13
14
15
16
17
18

POST-CENTRAL SULCUS

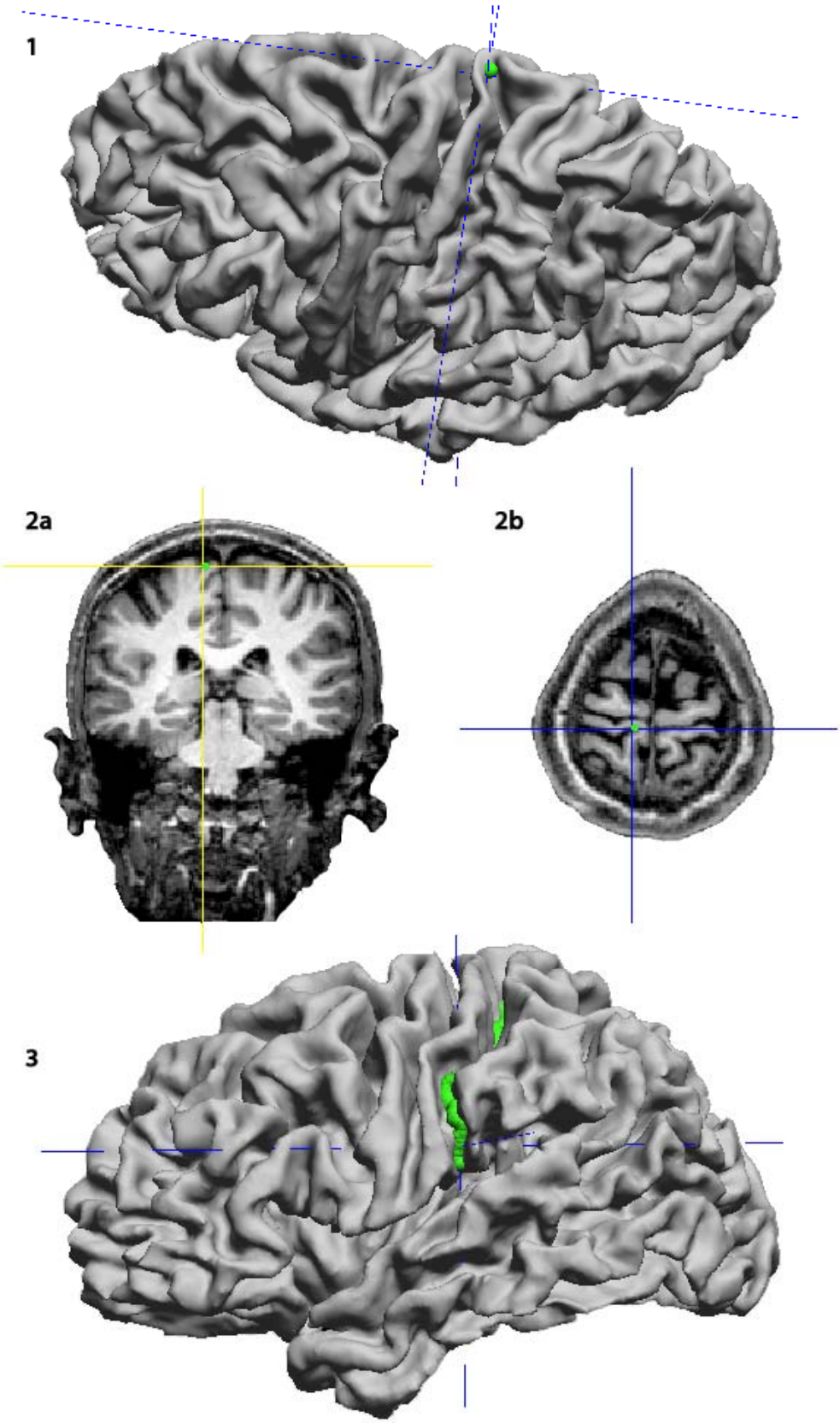
The post-Central Sulcus (postCS) forms the posterior limit of the post central gyrus. It is parallel to the CS and is immediately caudal to the CS. It also starts at the interhemipheric fissure and runs inferiorly and anteriorly towards the Sylvian Fissure. It can be a continuous sulcus, or show true interruptions.

When continuous, drop the first point of the curve high in the dorsolateral surface of the hemisphere, close to the interhemispheric fissure (1), and check in coronal and axial slices (2a-b) as was done for the CS and the preCS; then drop the inferior end close to the Sylvian fissure (3).

The postCS often starts in the form of a **V**. For the purpose of brain alignment it may be best to choose the anterior branch as the superior end of the sulcus (4) since it seems to be the more consistent course for this sulcus.

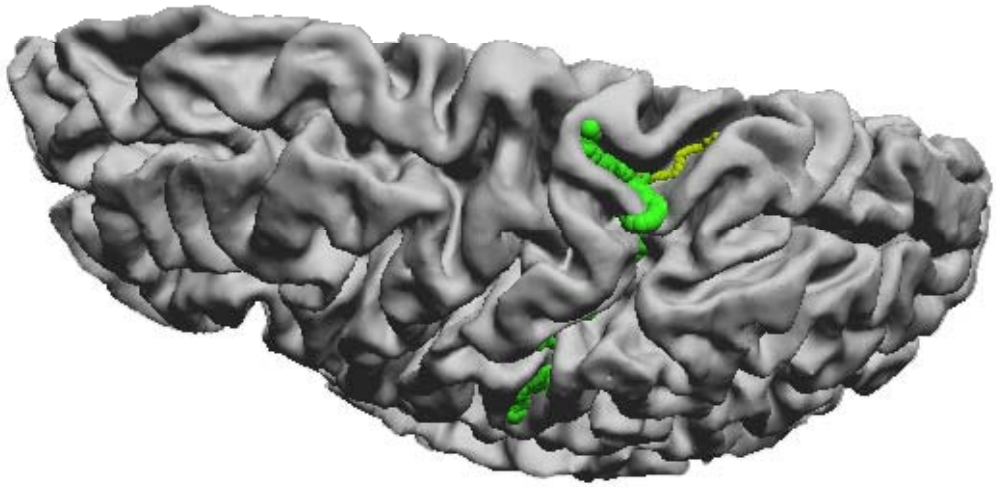
On occasion, the postCS can be doubled. For consistency, the posterior sulcus should be selected as the curve to trace (5).

POST-CENTRAL SULCUS

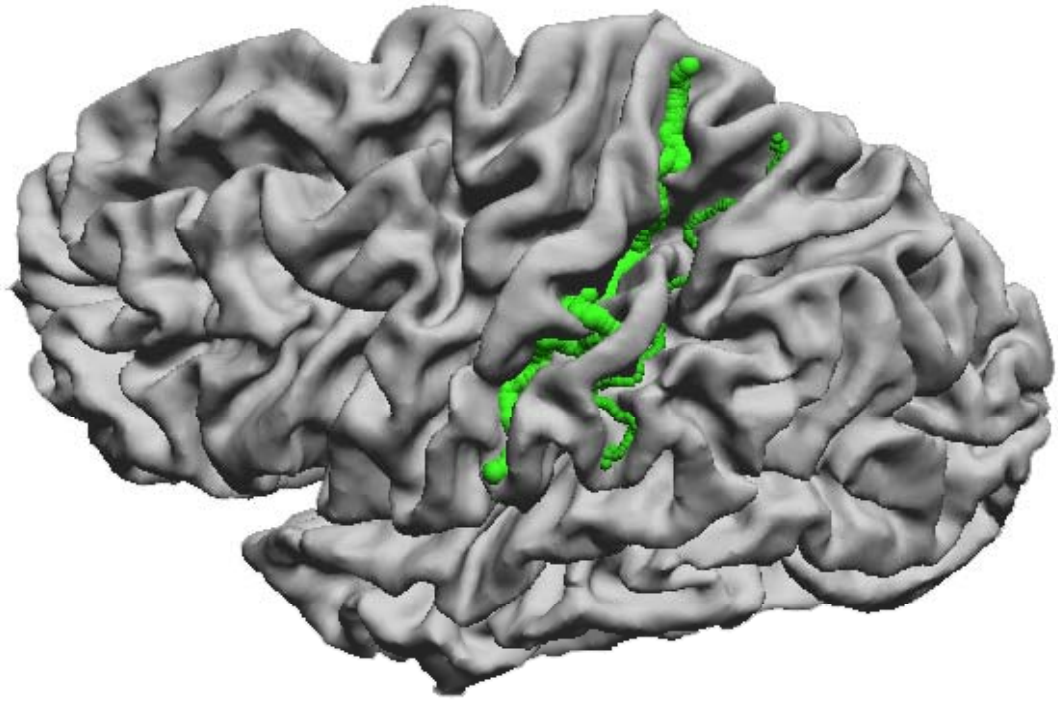


POST-CENTRAL SULCUS

4



5



Select the posterior, thinner line, as the curve to trace in (5)

INTRAPARIETAL SULCUS

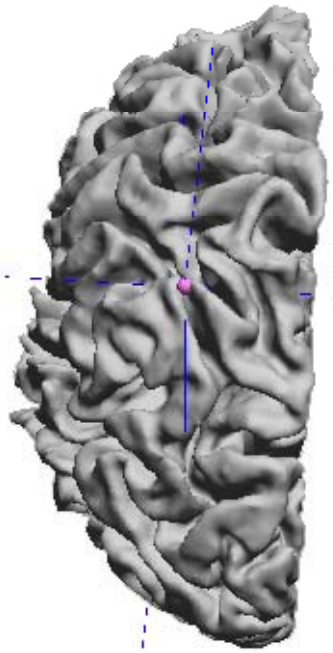
The Intraparietal Sulcus (IPS) separates the superior parietal lobule from the inferior parietal lobule. It is best seen when looking at the dorsolateral surface of the hemisphere from above. The IPS is a long and deep antero-posterior sulcus, parallel to the intrahemispheric fissure. It starts at the postCS, either merging with it or not. Sometimes it can actually cross the postCS. It can also have an initial ascending course parallel to the postCS.

The first point of the curve should always be dropped behind the postCS (1), even when the IPS merges with the postCS. The ITS may or may not have real interruptions. The terminal point is posterior (2) at the level of the Transverse Occipital Sulcus (3).

The **Transverse Occipital Sulcus** (transOcS) is a horizontal sulcus in the most anterior and superior sector of the surface of the occipital lobe. It can be considered to mark the antero-superior limit of the occipital lobe. It runs from the interhemispheric fissure (1) towards the lateral aspect of the hemisphere (2). It is seen at the posterior end of the IPS (3 shows these two sulci on the gray/white surface).

INTRAPARIETAL SULCUS

1



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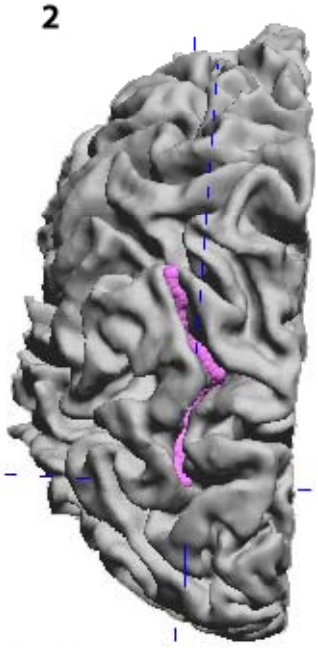

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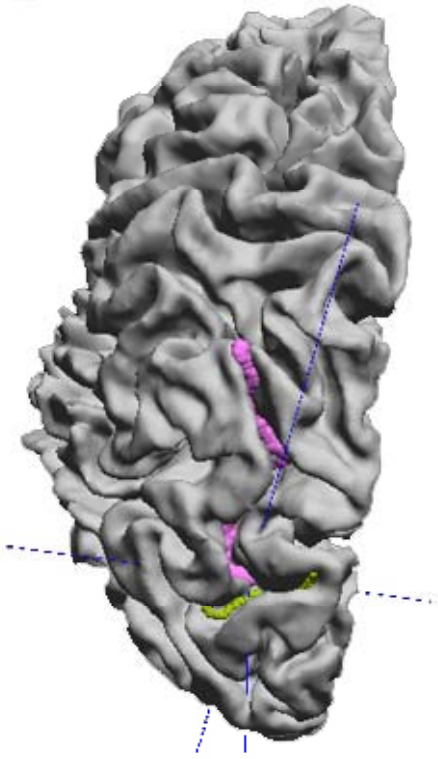
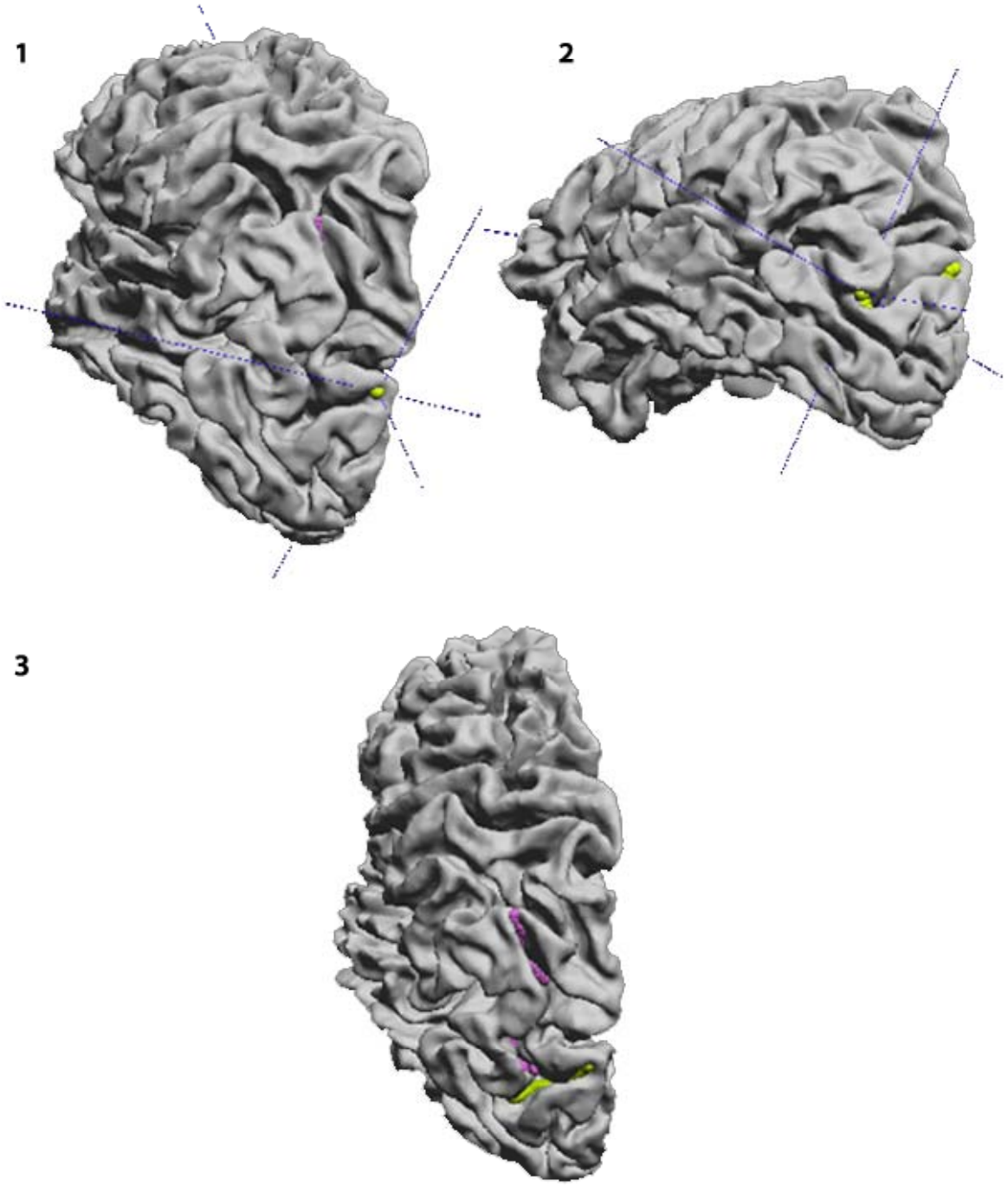


TRANSVERSE OCCIPITAL SULCUS

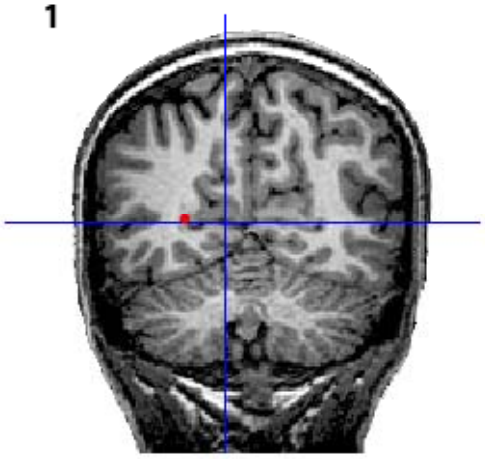


OCCIPITO-PARIETAL SULCUS

The Occipito Parietral Sulcus (OcPS) separates the mesial parietal lobe (precuneus) from the mesial occipital lobe (cuneus). It starts at the Calcarine Sulcus and its origine is best found in coronal (1) and parasagital (2) slices (at the crossing of the orthogonal axes). [The calcarine sulcus has been traced in all images as a reference and is shown in red.] If the first point of the curve is dropped at this level, it will overlap with the calcarine sulcus (3, detail in 4). It needs to be dropped slightly higher (5, detail in 6). The sulcus moves superiorly to the superior edge of the mesial surface of the hemisphere, where the end should be marked (7), it can however continue onto the dorsolateral surface of the hemisphere. At the superior end it can apparently split into two terminal branches; however, most often the split is in reality a deep and long side branche that needs to be recognized as such and not be followed. The OcPS is usually a continuous and deep sulcus. Because it is so deep, the whole course is best seen in a surface image of the gray-white junction (8).

OCCIPITO-PARIETAL SULCUS

1



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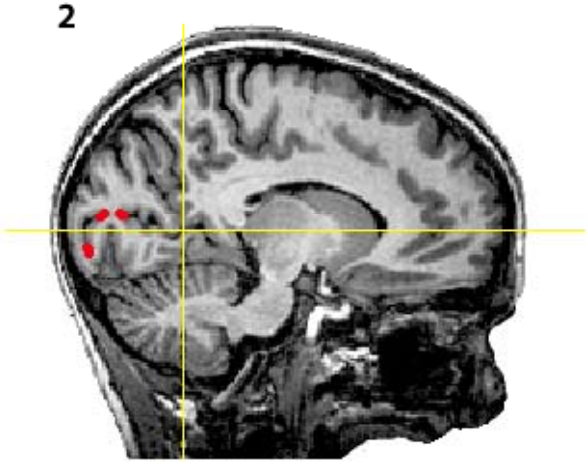

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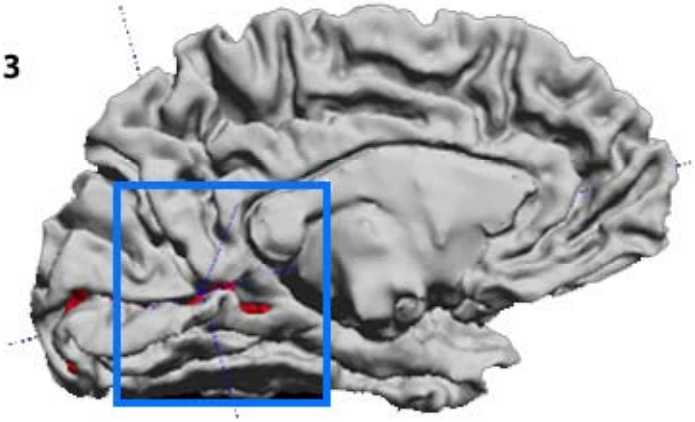

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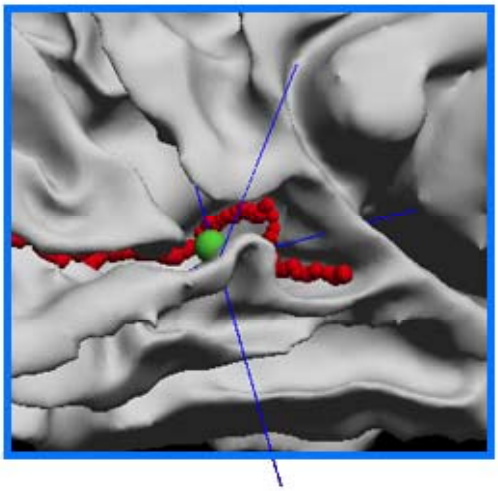
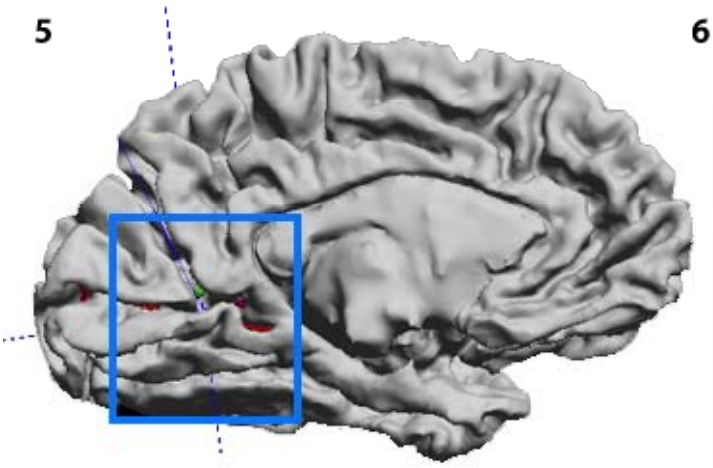


OCCIPITO-PARIETAL SULCUS

5



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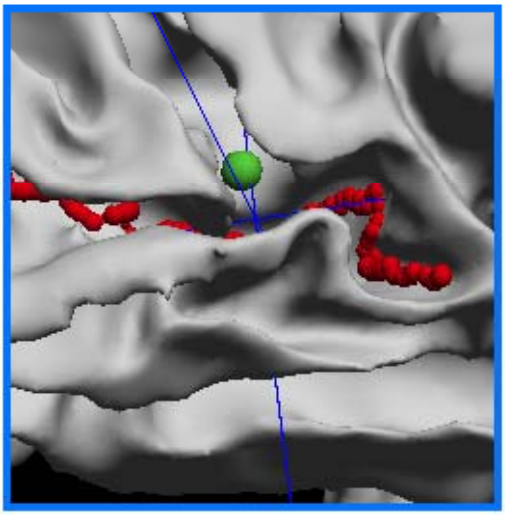

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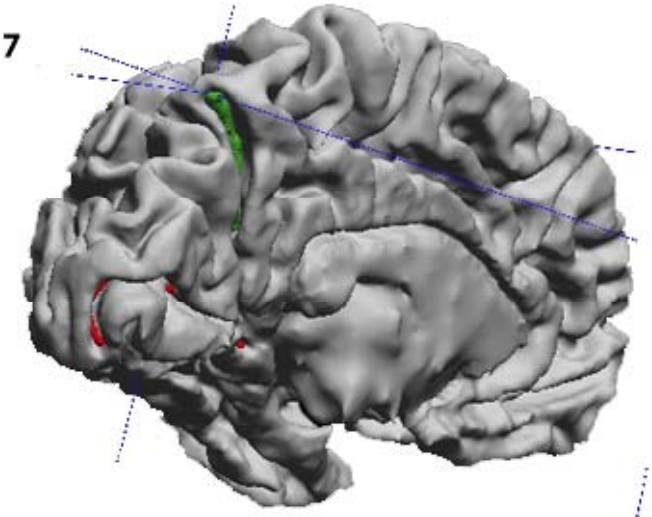
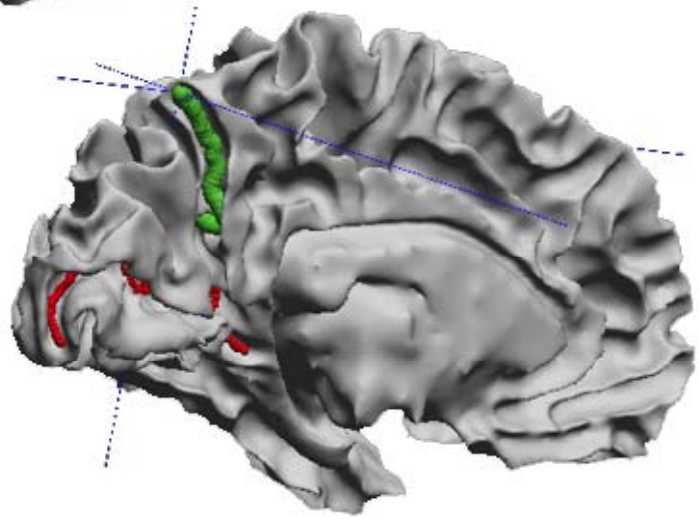


8

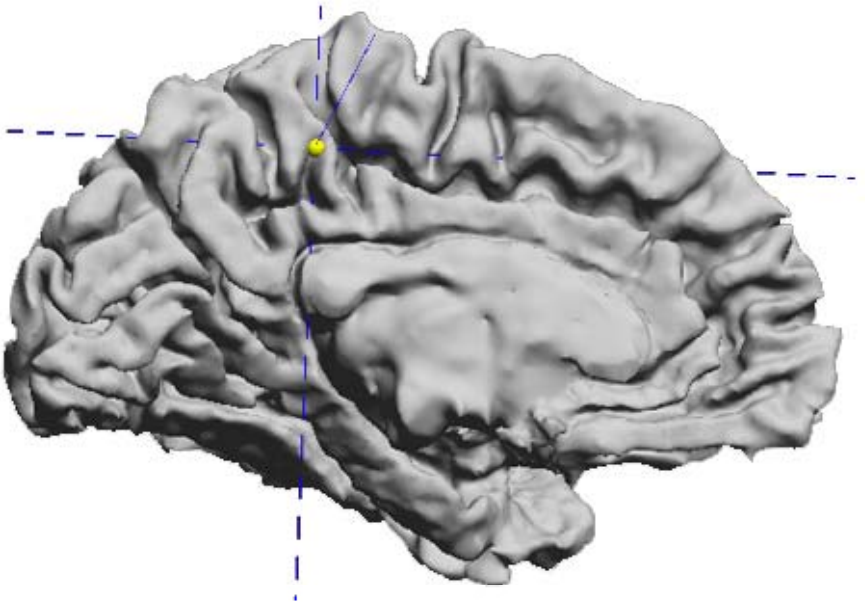


SUB-PARIETAL SULCUS

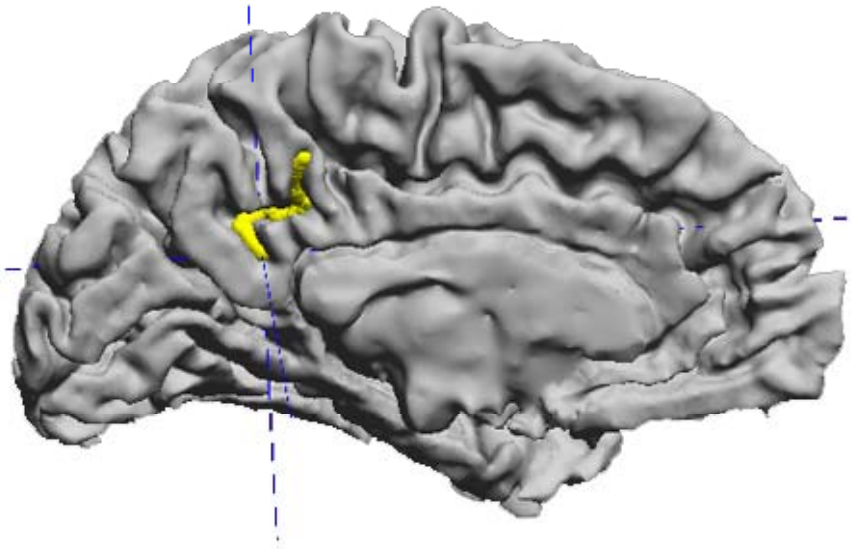
The Sub-Parietal Sulcus (subPS) can be considered the parietal continuation of the CingS and separates the mesial parietal lobe (precuneus) from the posterior sector of cingulate gyrus. It has an anterior-posterior course starting immediately behind the beginning of the ascCinS (1), and continues posteriorly and inferiorly hugging the splenium of the corpus callosum (2). It has side branches that, most often, give the overall impression of an **H**; it can also be constituted by several independent segments. Because of the variability of presentation it is important to devise a consistent approach to the tracing.

SUB-PARIETAL SULCUS

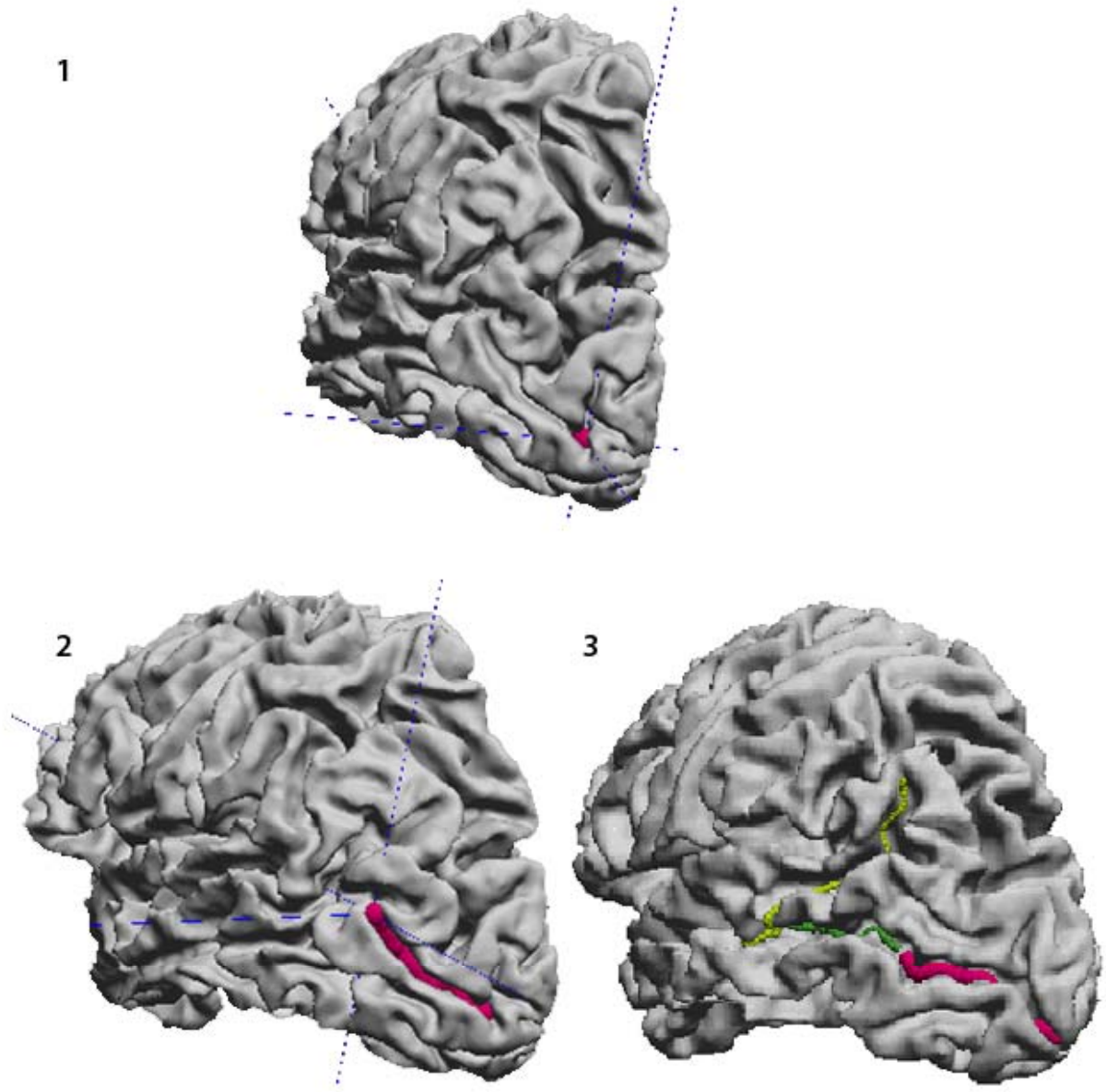
1



2



LATERAL OCCIPITAL SULCUS



The Lateral Occipital Sulcus (latOcS) is found on the dorsolateral surface of the occipital lobe. It divides the lateral occipital surface in two sectors, one superior, and one inferior. It starts close to the occipital pole (1). The starting point is best seen when looking from behind. Then it courses anteriorly, stopping close to the inferior branch of the STS (2). On occasion it can actually continue, uninterrupted, into this branch as in (3) where the STS and its inferior branch are marked.

CALCARINE SULCUS

The Calcarine Sulcus (CalcS) is a deep antero-posterior sulcus which starts in the temporal lobe, under the splenium of the corpus callosum, and continues in the direction of the occipital pole. The CalcS splits the mesial occipital lobe into two sectors, the superior or cuneus, and the inferior or infra-calcarine sector, a combination of lingual and fusiform gyri. The banks of the CalcS contain the primary visual cortex.

The CalcS should be traced from anterior (1) to posterior (2). The course is quite variable from subject to subject, but the main direction is always the same. It may end at the pole, on the mesial surface of the hemisphere, or even course to the lateral surface of the hemisphere, in a straight line, or curve downward (3), or split into a **T** (4). For the purpose of aligning brains, the lower split should be chosen (5).

Both these types of termination can take place on the dorsal surface instead of the mesial. At the posterior end there may be a real interruption of the CalcS. The CalcS should always be traced to very end, even when that end happens more dorsally.

CALCARINE SULCUS