

22. "Über die Beziehung des Strickkörpers zum Hinterstrang und Hinterstrangkern, nebst Bemerkungen über zwei Felder der Oblongata" (On the Relationship of the Restiform Body to the Posterior Column Nucleus with Observations on Two Fields of the Oblongata), *Neurologisches Zentralblatt*. Band 5 (1886). The New York Academy of Medicine.

Fig. 1. Schema of the restiform body at the lower levels of the auditory nerve.

1. Head of the primary restiform body.
2. Tail of the primary restiform body.
3. Poorly myelinated fringe (secondary restiform body).

Fig. 2. Transverse section at the upper levels of Deiters's nucleus (Series II).

1. Head of the primary restiform body in which small particles of grey substance appear (drawn as visualized in deeper planes).
2. Its tail.
3. Secondary restiform body (olivary system) beginning to separate.

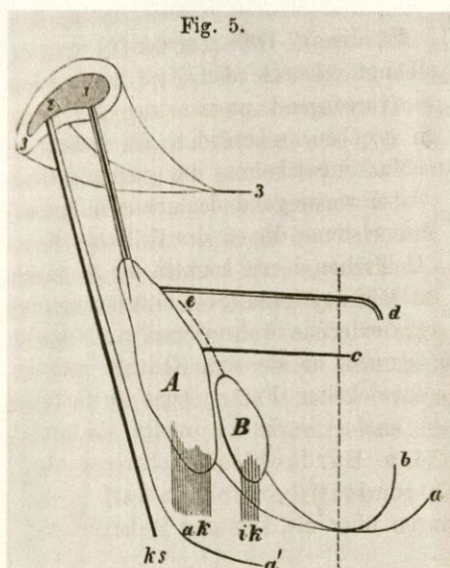
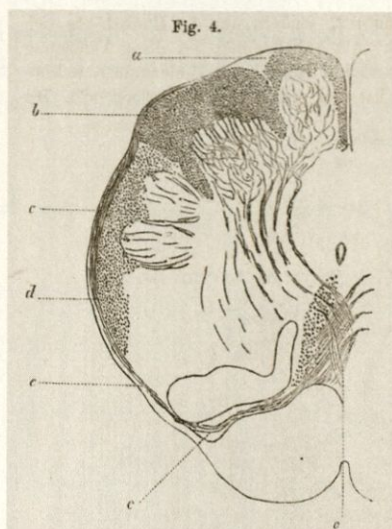
V. Ascending trigeminal root.

VIII. Deiters's nucleus with the ascending auditory root (Roller).

IX. Ascending root of the vagal system.

Fig. 3. Transverse section at the upper level of Deiters's nucleus (Series II). The numbering is the same as in Fig. 2. The place of the head has been occupied by nucleus 1.





23. "Über die Beziehung des Strickkörpers zum Hinterstrang und Hinterstrangkern, nebst Bemerkungen über zwei Felder der Oblongata" (On the Relationship of the Restiform Body to the Posterior Column Nucleus with Observations on Two Fields of the Oblongata), *Neurologisches Zentralblatt*. Band 5 (1886). The New York Academy of Medicine.

Fig. 4. Transverse section through the "superior pyramidal decussation" (Series II):

- a* = Residue of Goll's column.
- b* = Residue of Burdach's column.
- c, c, c* = Fibres leading from the superior pyramidal decussation to the restiform body.
- d* = Lateral cerebellar tract.
- e* = Superior pyramidal (lemniscal decussation).

Fig. 5. Schematic representation of the posterior column nucleus and its connexions.

- A* = Burdach's nucleus.
- B* = Goll's nucleus.
- 1* = Head of the primary restiform body.
- 2* = Tail of the above.
- 3* = Secondary restiform body (olivary system)
- a* = Fibre leading from the inferior arcuate fibre system to the contralateral restiform body.
- b* = Inferior arcuate fibre system (superior pyramidal decussation) leading to inter-olivary layer.
- c* = Middle arcuate fibre system.
- d* = Superior arcuate fibre system.
- e* = Fibres from Goll's tract (fibrae arcuatae externae).
- Ks* = Lateral cerebellar tract.
- aK* = External cuneiform tract (fibres from the arm).
- iK* = Internal cuneiform tract (fibres from the leg).

*Comment:*

In this and the next study, Freud progressed from the spinal cord upwards to the *brain* itself, and also from the individual nerve



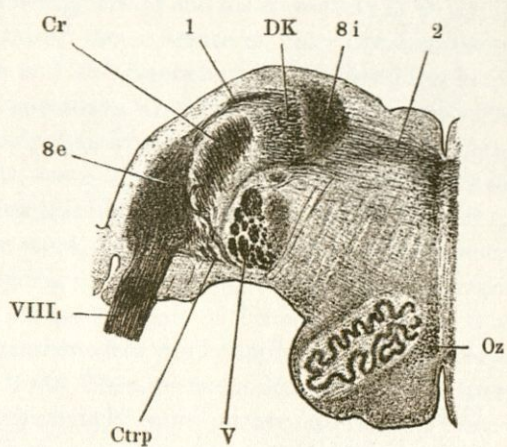
cell to cell *groups* (and the pathways that link them). He simultaneously shifted from the animal to the *human* nervous system. In these drawings Freud and his co-author, L. O. von Darkschewitsch, demonstrated the existence of links between the posterior spinal columns and the cerebellum in the restiform body. It is hard to imagine nowadays, when medical students simply learn the anatomy of the brainstem from textbooks, that barely 100 years ago pioneers like Freud were laboriously identifying structures and connections in this tiny but highly complex part of the nervous system.

In this work, Freud's methodology was again interesting. Instead of attempting to directly map the masses of fiber-paths within this densely compacted part of the adult brain, he studied the much simpler patterns that can be more easily visualized in the fetal and infantile brain. Then, he methodically traced the later developments across increasingly more mature specimens. Once more, Freud's commitment to evolutionary and *developmental* ways of thinking is apparent.

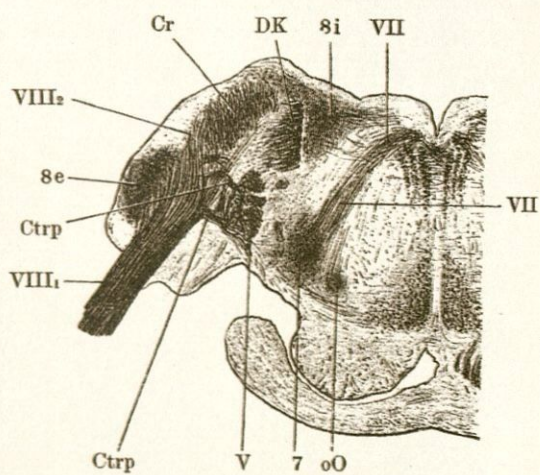




Figur I.



Figur II.



24. "Über den Ursprung des Nervus acusticus" (On the Origin of the Nervus Acusticus), *Monatsschrift für Ohrenheilkunde sowie für Kehlkopf-, Nasen-, Rachen-Krankheiten. (Neue Folge)* vol. XX, no. 8 (1886), Figs. 1-2. Collection of Bruce Sklarew, MD, Chevy Chase, Maryland.

Fig. I. Section through the most inferior level of the origin of the acusticus from a human foetus of 6 months. treated with Weigert's haematoxyline:

*VIII* = The first portion of the auditory nerve.

*8e, 8i* = External and internal nucleus of the acusticus.

*DK* = Deiters's nucleus.

*V* = Cross-section through [nervus] quintus.

*Cr* = Corpus restiforme.

*Oz* = Inter-olivary layer.

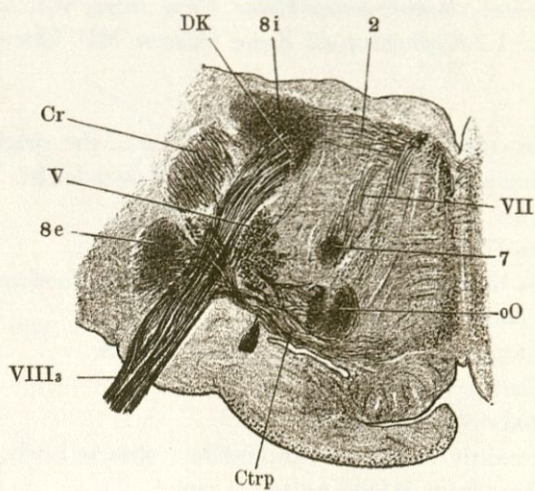
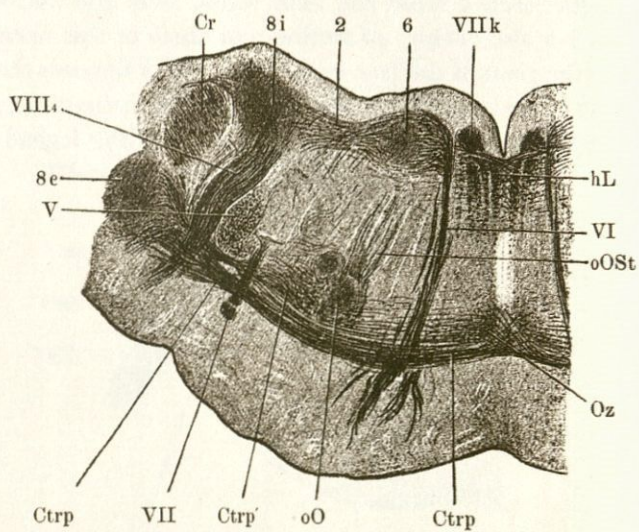
*1* = Acusticus fibres surrounding the restiform body.

*2* = Fibres from *8i* leading to the raphe.

*Ctrp* = Corpus trapezoides.

Fig. II. Higher section from the same series. Here the nucleus of the facialis 7 is also visible, as are the root fibres of this nerve VII running to the genu of the [nervus] facialis. *VIII2* denotes the second portion of the acusticus, running around and through the restiform body; *O* is the upper olive. The remainder of the legend as in Fig. I.



**Figur III****Figur IV.**

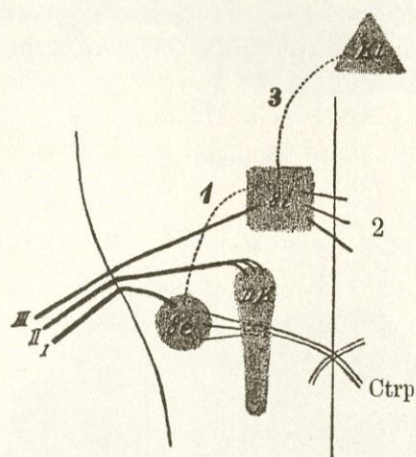
25. "Über den Ursprung des Nervus acusticus" (On the Origin of the Nervus Acusticus), *Monatsschrift für Ohrenheilkunde sowie für Kehlkopf-, Nasen-, Rachen-Krankheiten. (Neue Folge)* vol. XX, no. 8 (1886), Figs. 3-4. Collection of Bruce Sklarew, MD, Chevy Chase, Maryland.

Fig. III illustrates the transition of the third portion of the acusticus *VIII B* into the fibres of Deiters's nucleus [DK]. All markings as before.

Fig. IV. Section through the level of the fourth portion of the acusticus and of the nucleus of the n[ervus] abducens (6). *VI* is the n[ervus] abducens, *hL* the posterior longitudinal tracts, *VIII k* the genu of the facialis, *Ctrp* the part of the corpus trapezoides which proceeds to the ipsilateral upper olive, *OST* stem of the upper olive. Other markings as before.



Figur V.



26. "Über den Ursprung des Nervus acusticus" (On the Origin of the Nervus Acusticus), *Monatsschrift für Ohrenheilkunde sowie für Kehlkopf-, Nasen-, Rachen-Krankheiten. (Neue Folge)* vol. XX, no. 9 (1886), Fig. 5. Collection of Bruce Sklarew, MD, Chevy Chase, Maryland.

Fig. V. Schematic diagram of the origin of the acusticus:

- I* = The first portion, which terminates in the acusticus ganglion *8e*.
- II* = The third portion, which proceed into the fibres of Deiters's nucleus.
- III* = The second and fourth portions of the nerve, which terminate in the interior acusticus field (*8i*). Central projections:
  - Ctrp* = Corpus trapezoides.
  - 1* = Fibres which connect the exterior with the interior nucleus.
  - 2* = Fibres from *8i* to the raphe.
  - 3* = Arcuate fibres from *8i* to the contralateral roof nucleus of the cerebellum.

*Comment:*

In these drawings, Freud traced the origin and connections of the auditory nerve in the human medulla oblongata. Again, he studied fetal specimens (see legend to Fig. I). On the basis of his findings, Freud formulated the theory that the sensory cranial nerve nuclei are homologous with the posterior nerve roots of the cord. He thus brought simple order to a once-chaotic and opaque region of the brain. This was Freud's last *primary* anatomical research paper. From this point onward, his anatomical writings become increasingly abstract and *theoretical*.

Many years later, in *New Introductory Lectures on Psychoanalysis* (1933), looking back on this period of his work through the lens of psychoanalysis, Freud wrote:

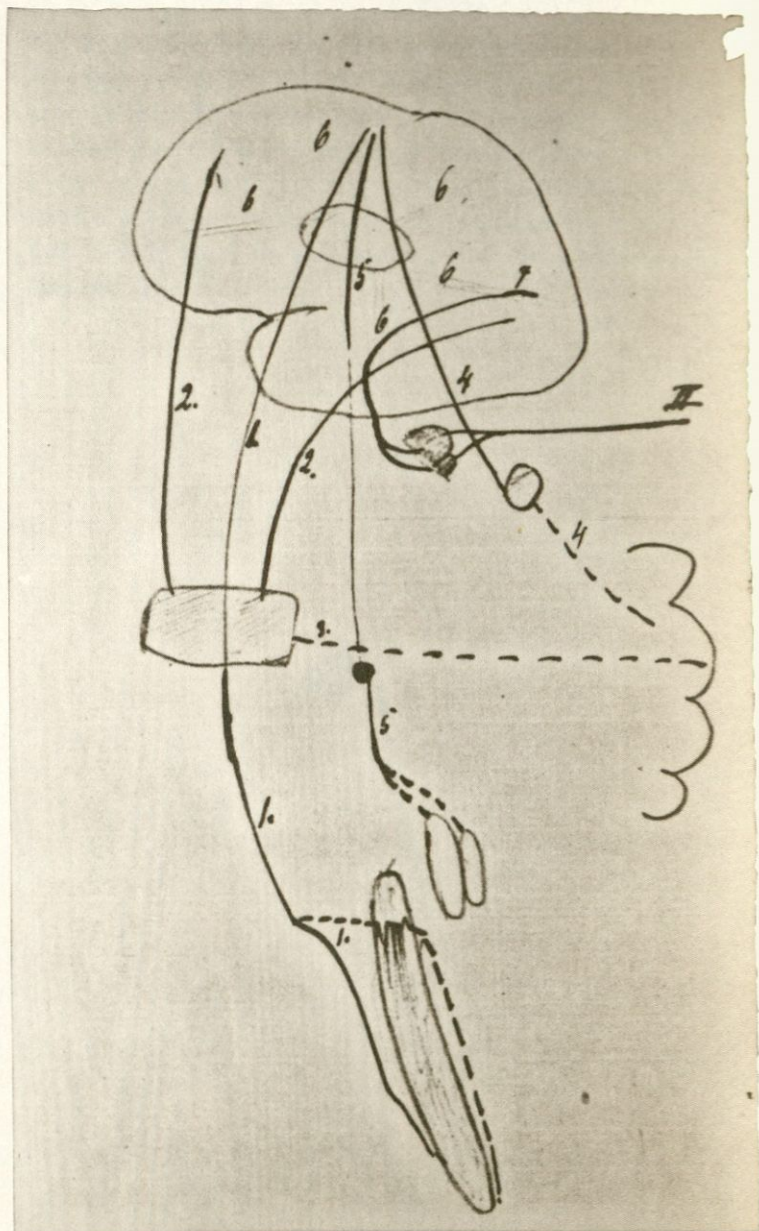
"You will certainly expect psychoanalysis to approach [the subject of anxiety] in quite a different way from academic medicine. Interest there seems mainly to be centered on the anatomical paths along which the state of anxiety is brought



about. We are told that the medulla oblongata is stimulated, and the patient learns that he is suffering from a neurosis of the vagus nerve. The medulla oblongata is a very serious and lovely object. I remember quite clearly how much time and trouble I devoted to its study many years ago. Today, however, I must remark that I know of nothing that could be of less interest to me for the psychological understanding of anxiety than knowledge of the path of the nerves along which its excitations pass."

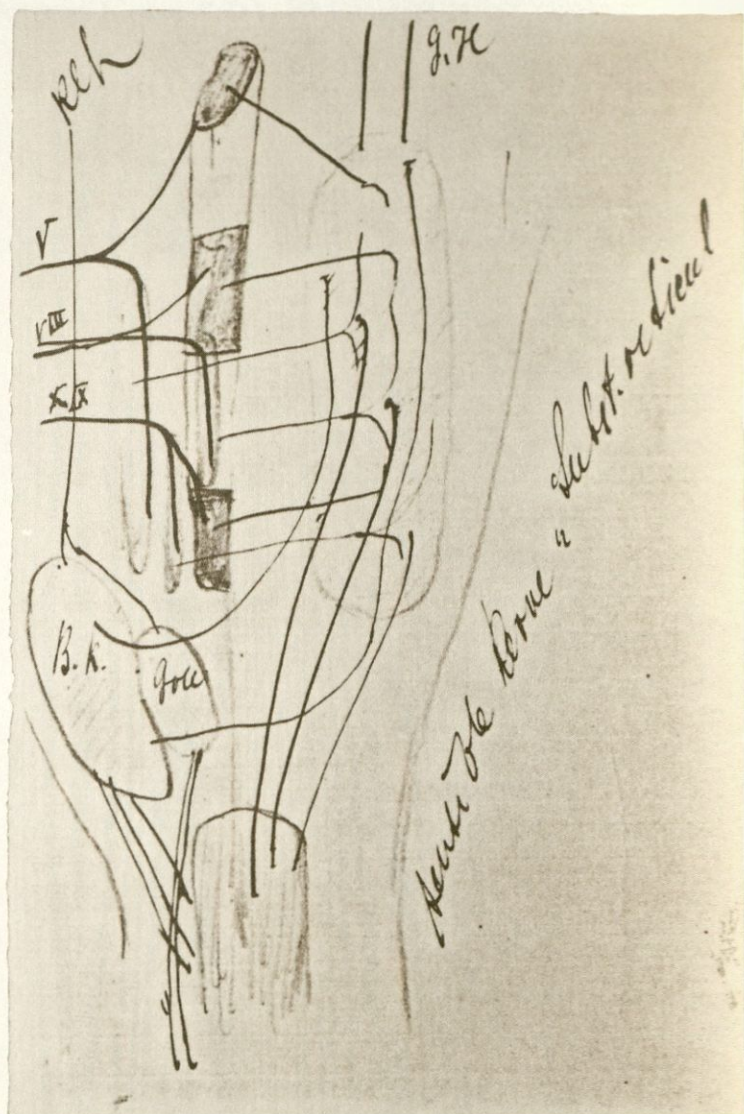






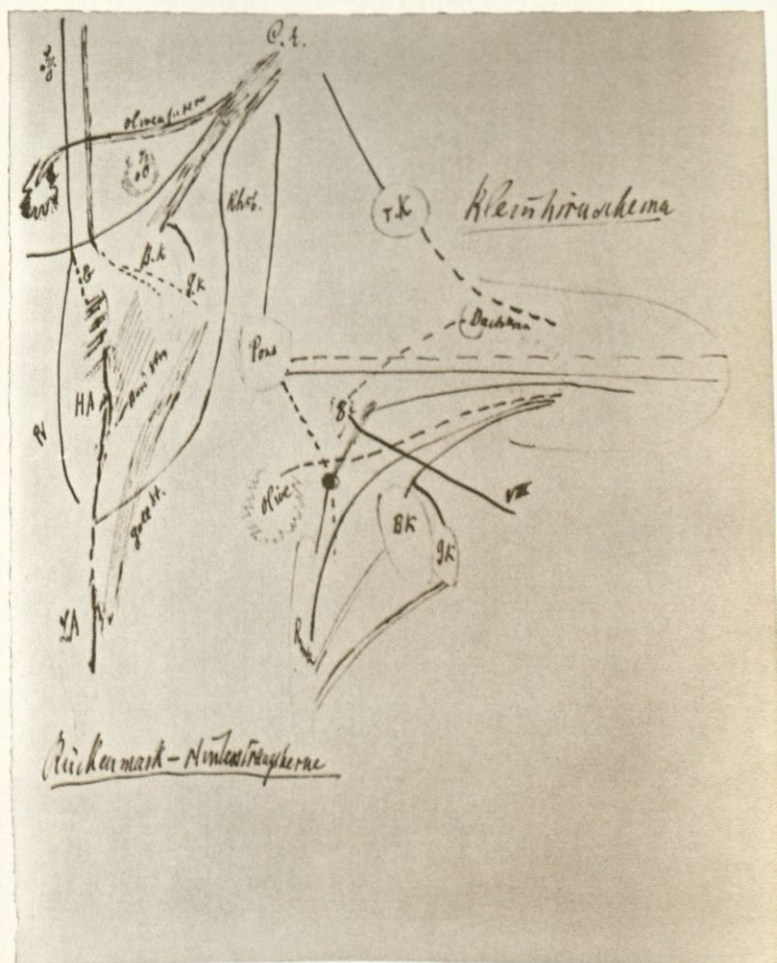
27. *Einleitung in die Nervenpathologie* (Introduction to Neuropathology) (c. 1886), Fig. 1. Sigmund Freud Collection, Library of Congress.





28. *Einleitung in die Nervenpathologie* (Introduction to Neuropathology) (c. 1886), Fig. 2. Sigmund Freud Collection, Library of Congress.





29. *Einleitung in die Nervenpathologie* (Introduction to Neuropathology) (c. 1886), Fig. 3. Sigmund Freud Collection, Library of Congress.

*Comment:*

These rough drawings in the unpublished manuscript *Einleitung in die Nervenpathologie* (Introduction to Neuropathology, circa 1886) represent the culmination of Freud's theoretical contributions to neuroanatomy. They were sketched for an unpublished manuscript that he wrote shortly after his period of study in Paris with Jean-Martin Charcot. In this manuscript, Freud provided a succinct overview of the general structure of the human nervous system. The overview included novel concepts which laid the foundations for his later work. The most important novelty was the idea that *the body periphery is not projected onto the cortex in a simple and direct fashion*, as Freud's teacher Theodor Meynert had supposed it was, but rather it is *represented* there. In other words, the relationship between body and cortex is not topological but *functional*. This important concept was restated in Freud's 1891 aphasia monograph as follows:

"The fibres that reach the cerebral cortex after their progression through [spinal and subcortical nuclei] still maintain some relationship with the periphery of the body, but they can no longer deliver an image that resembles it topologically. They contain the body periphery in the same way as a poem contains the alphabet, in a complete rearrangement, serving different purposes, with manifold links between the individual elements, whereby some of them may be rendered several times, others not at all.... Topographic relations are only maintained in so far as they fit in with the claims of function."

It is no exaggeration to say that this insight is the precise point at which the *mind* – that aspect of the organism which represents the body not concretely but rather *functionally, abstractly and symbolically* – entered Freud's scientific work. The concept is explicitly repeated in Freud's 1893 study on "Organic and hysterical paralysis," where he famously stated that hysterical paralysees do not represent the body in a topologically correct fashion; rather, they are "lesions of ideas" (i.e., of functional representations). The same concept was



repeated explicitly again in a letter to Fliess dated December 6, 1896 (see Plate 39) and as we shall see, it then became the basis of Freud's first truly psychoanalytic model of the mind (Plate 40).





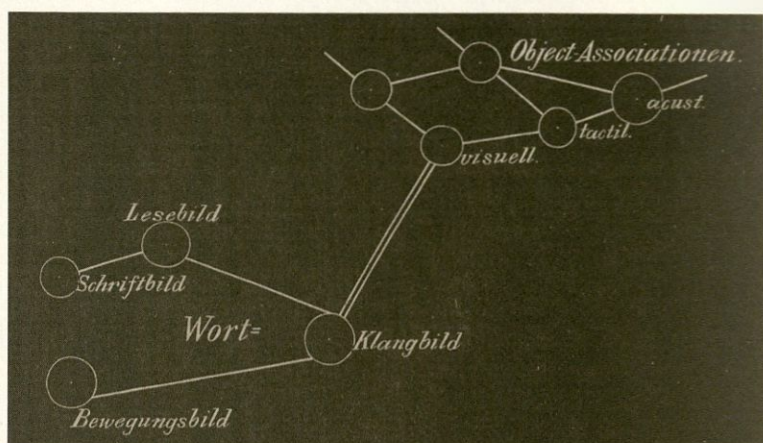


Fig. 8

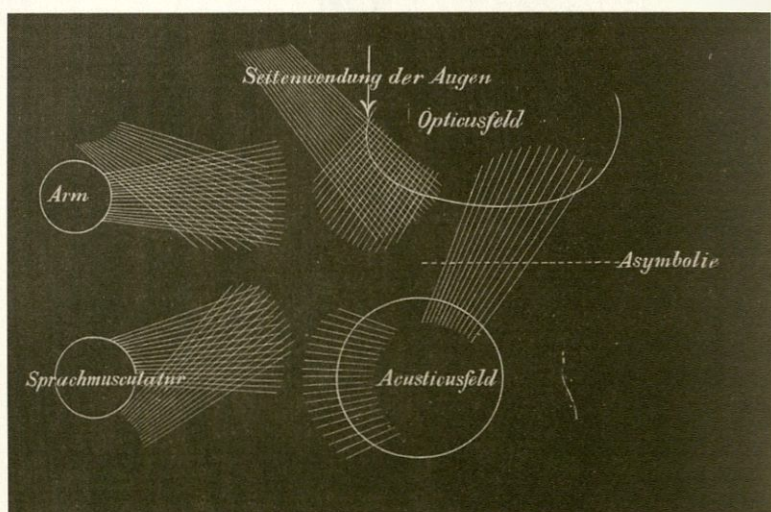


Fig. 9

30. *Zur Auffassung der Aphasien* (On Aphasia) (Leipzig, Wien: Franz Deuticke, 1891). Figs. 8 and 9. Collection of Bruce Sklarew, MD, Chevy Chase, Maryland.

Fig. 8. Psychological diagram of the word presentation.

The word presentation is shown as a closed complex of presentations, whereas the object presentation is shown as an open one. The word presentation is not linked to the object presentation by all its constituent elements, but only by its sound image. Among the object associations, it is the visual ones which stand for the object, in the same way as the sound image stands for the word. The connections linking the word sound image with object associations other than the visual ones are not indicated.

Fig. 9. Anatomical diagram of the language association field

Explaining the appearance of language centers. The cortical fields of the acusticus, opticus, arm and articulatory musculature are depicted diagrammatically by circles; the association pathways reaching from there into the interior of the language field are represented by radiating clusters. The points at which the latter are crossed by clusters which have been disconnected from their [contralateral] regions of origin become "centers" for the associative elements in question. The bilateral connections of the acusticus field have not been indicated, partly to prevent the figure becoming confusing and partly due to the uncertainty that surrounds precisely this relationship between the auditory field and the auditory language center. The spatial division of the connections with the opticus field into two bundles also allows for the consideration that eye movements are enlisted in a special way in reading associations.

*Comment:*

Having detached himself from a concretely anatomical way of thinking by entering the realm of functional representations, Freud turned his attention to the field of *neuropsychology*. He started with the problem of how language is organized in the brain. Fig. 8 is Freud's first drawing of a purely psychological entity: the "word presentation" (contrasted with "object presentations"). Students of



psychoanalysis will recognize these theoretical entities, which continued to play an important role in Freud's later conceptualizations of the mind and its workings.

The special role assigned to the "sound image" in this drawing also persisted in Freud's later writings. Consider the following passage from *The Ego and the Id* (1923):

"Verbal residues are derived primarily from auditory perceptions, so that the system *Pcs.* has, as it were, a special sensory source. The visual components of word-presentations . . . may to begin with be left on one side; so may the motor images of words. . . . In essence a word is after all the mnemonic residue of a word that has been heard."

Freud believed that the auditory origin of language gave it the concrete, perceptual quality that was necessary for associations to become *conscious*. It could be said, therefore, that this drawing introduced the fundamental conceptual basis of the "talking cure," namely the mechanism by which unconscious processes may be rendered conscious.

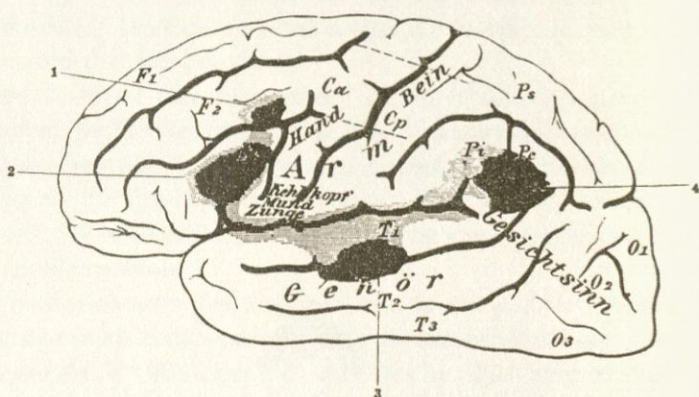
Freud also accorded a special role to the auditory element of language in his conceptualization of the genesis of the *superego* (*The Ego and the Id*, 1923), and the processes by which internal superego activities become conscious thoughts or hallucinations.

Fig. 9 purports to be an anatomical diagram, to complement the psychological schema depicted in Fig. 8; but comparing it with Freud's earlier anatomical drawings, it is apparent that it really is a functional diagram. Freud would never again concern himself with the concrete structure of the brain. Henceforth his approach was always *functional* and *dynamic*. Consider the following passage from *The Interpretation of Dreams* in the light of this drawing:

"Ideas, thoughts and psychical structures in general must never be regarded as localized *in* organic elements of the nervous system but rather, as one might say, *between* them, where resistances and facilitations provide the corresponding correlates. Everything that can be an object of our internal perception is *virtual*, like the image produced in a telescope by the passage of light-rays."







31.

31. Diagram of areas in which damage produces major languages disorders, in *Diagnostisches Lexikon für praktische Ärzte*. Band 1. Berlin, Wien, Urban and Schwarzenberg (1893).

The hatched areas correspond to the language field, and the darkened portion to the so-called language centers:

1. the region in which lesions evoke agraphia (border zone adjacent to the center for the hand);
2. Broca's area, where lesions cause motor a[phasia] (alongside the centers for the vocal and laryngeal musculature);
3. Wernicke's area, where lesions produce word-deafness (alongside the terminal field of the acusticus or at least a part thereof);
4. the region where lesions cause alexia (immediately alongside the cortical center for vision).

A large part of the *central language field* lies in the depths of the Sylvian fissure.

#### Comment:

This is Freud's only *clinical* neurological (or *neuropathological*) drawing. It identifies the four areas of the brain in which damage produces major language disorders. These anatomical areas can be mapped onto the functional zones and elements that Freud had identified in Figs. 8 and 9 (Plate 30). The distinction between those (functional) images and this (anatomical) one coincides with an important theoretical distinction that Freud drew in his neuropsychological studies from this period: lesions can be *localized* anatomically but functions cannot. This was the fundamental premise upon which he eventually shifted from clinical neurological to purely psychological ground. Psychical locality is a functional locality (see Plate 38). Moreover, the functional localities associated with *neurotic* disorders, unlike neurocognitive ones, cannot be mapped onto anatomical areas on the basis of lesion studies. It is definitional of neuroses that they are not caused by structural brain lesions. Neuroses are functional disorders of the nervous system. But they exist, and they are disorders of the *nervous* system nonetheless. Therefore Freud had to grapple with them, like it or not.







32. *Entwurf einer Psychologie* (Project for a Scientific Psychology), manuscript of 1895. Sigmund Freud Collection, Library of Congress.

Extract from Freud's text:

"Quantity in phi is expressed by *complexity* in psi."

*Comment:*

The "Project" and the Fliess correspondence contained Freud's final attempts to conceptualize the functions of the mind in neurological terms. The neurological mechanisms which he inferred from his clinical studies of neurotic patients were, however, almost entirely conjectural. This is because the complex mental processes involved could not be mapped onto neuroanatomy (due to the absence of lesions) and physiology (due to lack of appropriate methods). The consequent need to theorize on the basis of "imaginings, transpositions and guesses" (*Project for a Scientific Psychology*, 1895) played a pivotal role in Freud's subsequent abandonment of *neuro*-psychological images in favor of *metapsychological* ones – that is, purely functional ones (Plates 40-46).

This schematic drawing below, from the text at left, is divided vertically into two sections: the left half, which contains the cell body of a neuron, is part of the phi (perceptual) system of the brain; and the right half, which contains the terminal branches of its axon, is part of the psi (memory) system. The drawing depicts Freud's inference that phi energies are widely distributed in the psi system, thereby protecting it from excessive stimuli. This precursor of his well-known psychological theory to the effect that internal mental

processes require a *protective shield against external stimuli* has interesting parallels with his earlier anatomical theory to the effect that representational processes arise out of the indirect nature of the relationship between peripheral and central elements in the nervous system (see Plate 27).



32. Detail.



[illegible]

Wenn als im Herbst, nach 20 Jhr. Primärbefruchtung

[illegible]

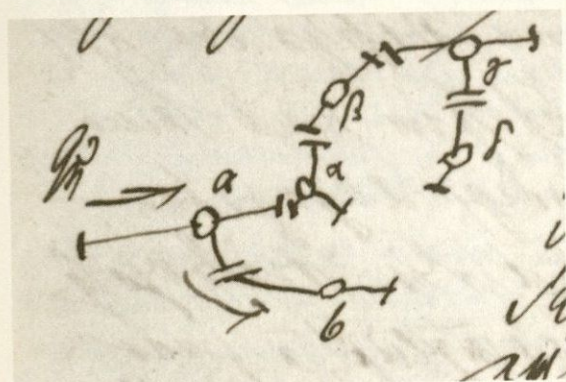
33. *Entwurf einer Psychologie* (Project for a Scientific Psychology), manuscript of 1895. Sigmund Freud Collection, Library of Congress.

Extract from Freud's text.

"A 'lateral' cathexis thus acts as *an inhibition on the passage of quantity*."

*Comment:*

This famous drawing (left and below) depicts another way in which Freud envisaged psi neurons dealing with the threat of excessive stimulation, namely through inhibition. By a mechanism called "side cathexis," Freud imagined that energy could be inhibited by being diverted away from psi (mnemonic) neurons which would, if activated, generate feelings of unpleasure (due to their associative connections).



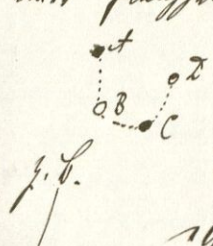
33. Detail.



# des Lössbänkefeldes.

(62)

des Banquet der Lössbänkefeldes ist vor allem ein Bräutchen.  
 Kistchen, so ist nach der genau Spezifikation gemacht worden,  
 sondern nur einzelnes Kistchen, das nach der Höhe und Breite  
 mitgeliefert, welches man mit Kistchen in der Höhe aufhängt.  
 so ist man nach der Größe der Kistchen Kistchen zu  
 nicht bei folgenden: so ist es ein Kistchen, das man  
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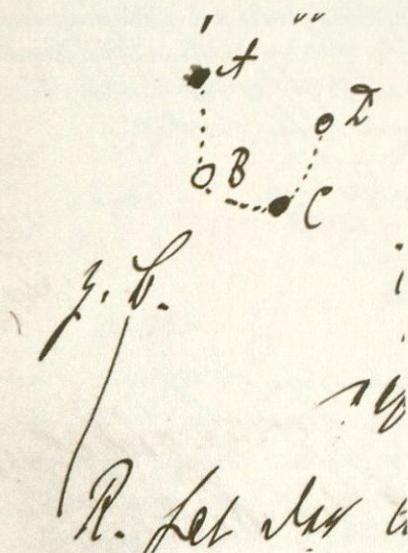
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34. *Entwurf einer Psychologie* (Project for a Scientific Psychology), manuscript of 1895. Sigmund Freud Collection, Library of Congress.

Extract from Freud's text:

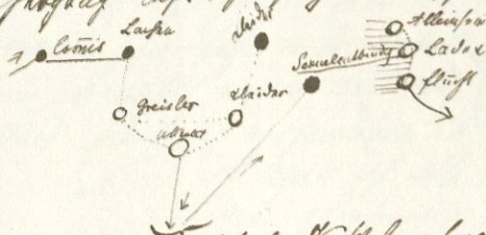
"Unconscious intermediate links."



34. Detail.



(75)  
 Sprünge raucht, das sie demselben nicht bewußt, eine  
 sexuelle Verbindung, die sich in Luft auflöst. Mit dieser Luft  
 fliehet sie, die Louis könnte das Atmen nicht  
 sehen & laßt davon.  
 Es ist ganz physiologisch, daß sie 2 Arten von Wärmegraden  
 und einerseits, daß sie fortwährend an Louis & (sprachlos)  
 in einem anderen Zustand sich befindet, der  
 Sprünge Luft ist, folgendes was sie hat.

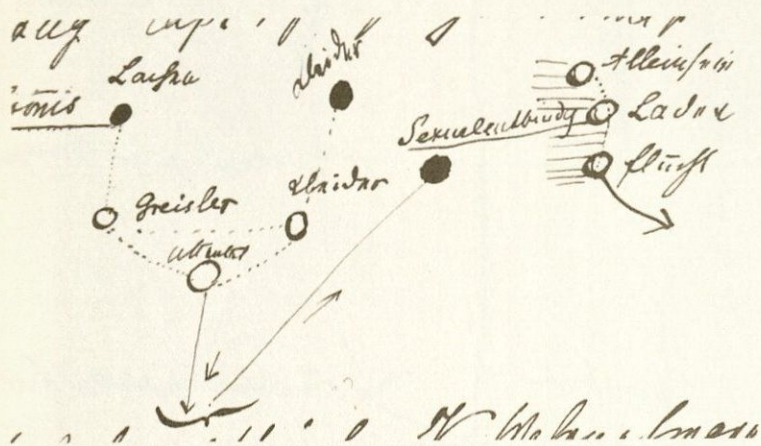


Man sieht die physiologische & mechanische, die auf einem neuen  
 das die sexuelle Verbindung auf zum Schmelzen, den Kopf der  
 Kopf mechanische, die, die das Louis sich selbst.  
 Das ist, mit einem in der in einem neuen, Alkalien-  
 steht ist, ganz korrekt, die mit dem Kopf auf alle  
 nicht die Affektionsorgane. Altem von dem (mit der Kopf) Alkalien  
 Morgang ist nicht zum Haupt, sondern es das nicht Alkalien  
 und das mit dem, welches Alkalien ist das dem  
 nach dem Material: (Louis, Luise, Alte, Schwangerschaft)  
 ganz selbst, mechanische, die sie in einem  
 ist Alkalien, welches Kopf und das die eine  
 Louis ist, welches sich selbst, was ist.  
 Das neue Alkalien (ist selbst) ist im dem, welches Kopf  
 die eine, die selbst Alkalien, welches die Kopf.

35. *Entwurf einer Psychologie* (Project for a Scientific Psychology), manuscript of 1895. Sigmund Freud Collection, Library of Congress.

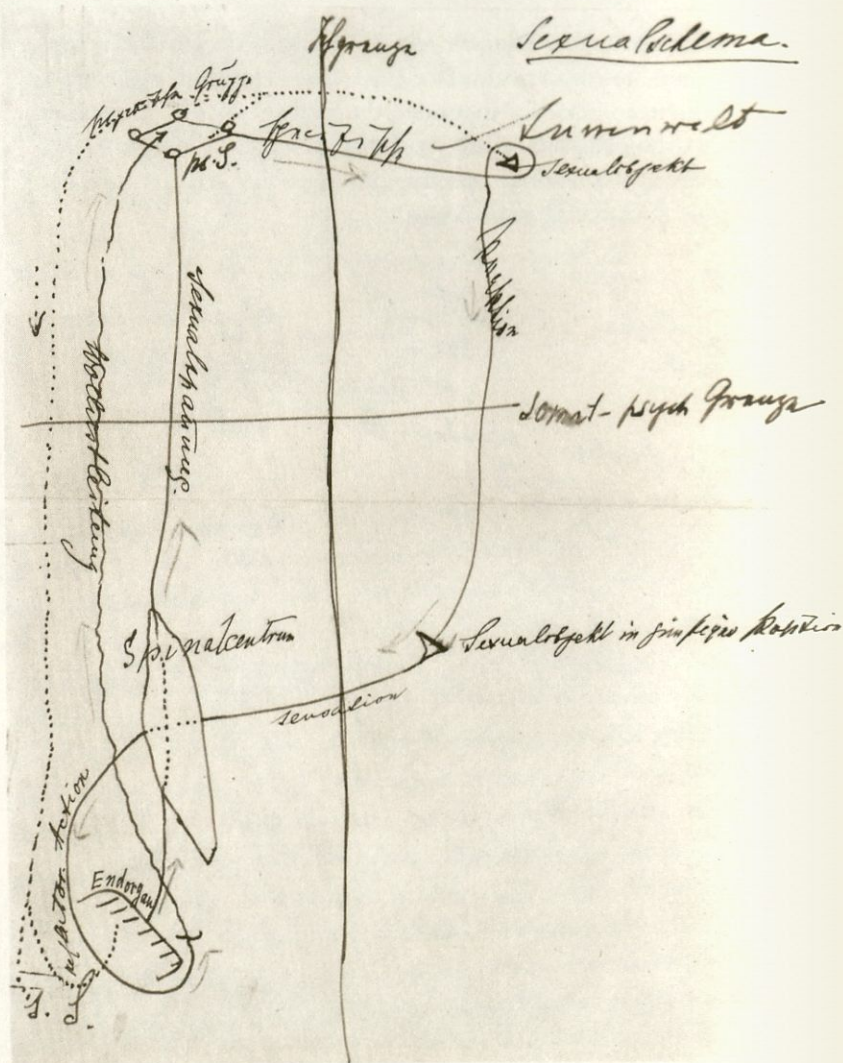
*Comment:*

These drawings (Plates 34 and 35) depict a dream and a traumatic memory respectively. The black dots represent associations that generate *conscious* awareness; the white ones are *unconscious* intermediate links. It is noteworthy that anatomical detail is no longer necessary for Freud to portray the functional mechanisms that underpin such complex processes.



35. Detail.





36. Letter to Wilhelm Fleiss, December 17, 1894. Sigmund Freud Collection, Library of Congress.

*Comment:*

The drawing at left and those on the following pages (Plates 37-39) are schematic diagrams of the relationship between various normal and pathological mood states and sexual physiology. These drawings are Freud's penultimate attempts to picture the neurological mechanisms underlying mental processes. The drawings depict theoretical relations he had inferred between sexuality and various mood states.



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 ansetzt. Diese haben nur keine typische Form.  
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 spring zum vollständigen Kriechen, freier. Die sind von 10.9 ab  
 haben ab.

Bei niedrigen Grad von Spannung in E. sind die Eigenschaften  
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37. Letter to Wilhelm Fleiss, December 17, 1894. Sigmund Freud Collection, Library of Congress.





38. Letter to Wilhelm Fleiss, December 17, 1894. Sigmund Freud Collection, Library of Congress.





39. Letter to Wilhelm Fleiss, December 6, 1896. Sigmund Freud Collection, Library of Congress.

*W* = Perception.

*Wz* (I) = Indications of perception.

*Ub* (II) = Unconscious.

*Vb* (III) = Preconscious.

*Bew* = Conscious.

*Comment:*

The drawing at the top of Plate 39 (a highly schematic depiction of the functional relations between systems of neurons) is Freud's last *neuropsychological* drawing. The diagram directly anticipates the *metapsychological* picture of the same functional relations that he set out four years later in the *Interpretation of Dreams* (1900). The continuity between this diagram and his subsequent metapsychological one (Plate 40) is clearly evident. Its origin in his last theoretical anatomical writings of circa 1886 (Plates 27-29) is also apparent in his letter to Fliess which accompanied the drawing:

"What is essentially new in my theory is the thesis that memory is present not once but several times over, that it is registered in various species of 'signs'. (I postulated a similar kind of rearrangement some time ago, in my study of aphasia, for the paths leading from the periphery.) I cannot say how many of these registrations there may be: at least three and probably more. I have illustrated this in the following schematic picture, which assumes that the different transcriptions are also separated (though not necessarily in topography) in respect to the neurons which are their vehicles. This assumption may not be an essential one, but it is the simplest and is provisionally admissible."

The "not necessarily topographical" separation between the different systems of neurons that Freud refers to is a *temporal* (rather than spatial) one. The drawing therefore depicts a succession of functional connections rather than an anatomical stratification. In the accompanying text, Freud states that *repression* consists in a failure of re-transcription between the Unconscious and the Preconscious-Conscious systems. After this drawing, Freud abandoned all speculation about the physiological substrata of such complex mental processes.



Fig. 1.

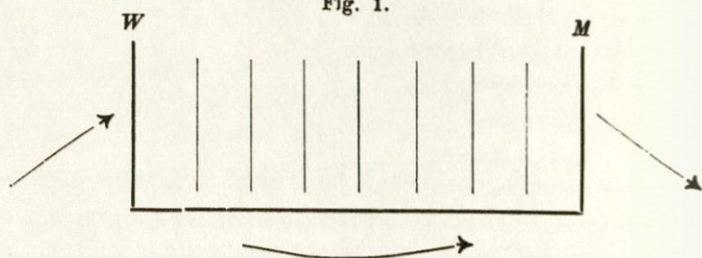


Fig 2.

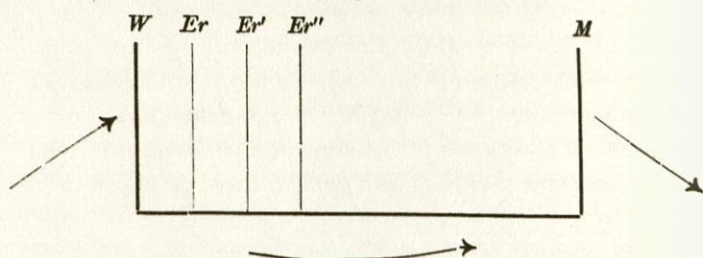
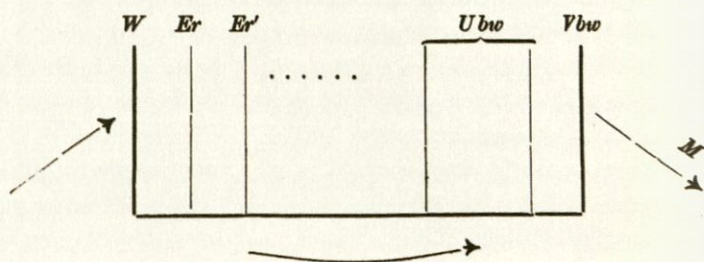


Fig. 3.



40. *Die Traumdeutung* (The Interpretation of Dreams), (Leipzig und Wien: Franz Deuticke, 1900). Figs. 1-3. Collection of Bruce Sklarew, MD, Chevy Chase, Maryland.

*W* = Perceptual system.

*Er, Er', Er''* = Memory systems.

*Ubw* = Unconscious system.

*Vbw* = Preconscious system.

*M* = Motor system.

Extract from Freud's text:

"What is presented to us [here] is the idea of *psychical locality*. I shall entirely disregard the fact that the mental apparatus with which we are here concerned is also known to us in the form of an anatomical preparation, and I shall carefully avoid the temptation to determine psychical locality in any anatomical fashion. I shall remain upon psychological ground, and I propose simply to follow the suggestion that we should picture the instrument which carries out our mental functions as resembling a compound microscope or a photographic apparatus, or something of the kind. On that basis, psychical locality will correspond to a point inside the apparatus at which one of the preliminary stages of an image comes into being. In the microscope and telescope, as we know, these occur in part at ideal points, regions in which no tangible component of the apparatus is situated. I see no necessity to apologize for the imperfections of this or of any similar imagery. Analogies of this kind are only intended to assist us in our attempt to make the complications of mental functioning intelligible by dissecting the function and assigning its different constituents to different component parts of the apparatus. So far as I know, the experiment has not hitherto been made of using this method of dissection in order to investigate the way in which the mental instrument is put together, and I can see no harm in it. We are justified, in my view, in giving free reign to our speculations so long as we retain the coolness of our judgment and do not mistake the scaffolding for the building. And since at our first approach to something unknown all that we need is



the assistance of provisional ideas I shall give preference in the first instance to hypotheses of the crudest and most concrete description.

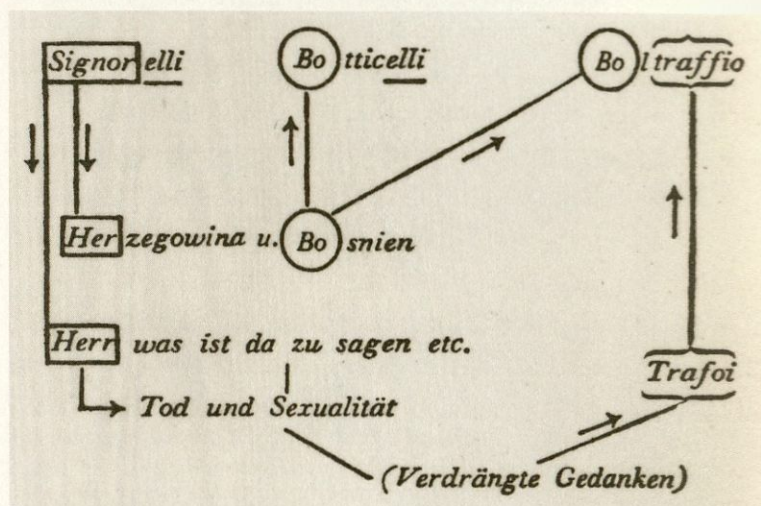
Accordingly, we will picture the mental apparatus as a compound instrument, to the components of which we will give the name of 'agencies,' or (for the sake of greater clarity) 'systems'. It is to be anticipated, in the next place, that these systems may perhaps stand in a regular spatial relation to one another, in the same kind of way in which the various systems of lenses in a telescope are arranged behind one another. Strictly speaking, there is no need for the hypothesis that the psychical systems are actually arranged in a *spatial* order. It would be sufficient if a fixed order were established by the fact that in a given psychic process the excitation passes through the systems in a particular *temporal* sequence."

*Comment:*

The difference between the drawing in Plate 39 and Fig. 3 in Plate 40 is minimal; yet the drawing in Plate 40 is famous for being Freud's first diagrammatic representation of the mental apparatus as a *purely psychological* entity. Seen in context with the earlier drawings, it is apparent that the decisive shift in Freud's thinking had actually occurred much earlier, when he moved from describing neurological *structures* to describing neurological *functions*. This applies particularly to higher cortical functions, which Freud saw as involving increasingly *abstracted representations* of more basic bodily processes.





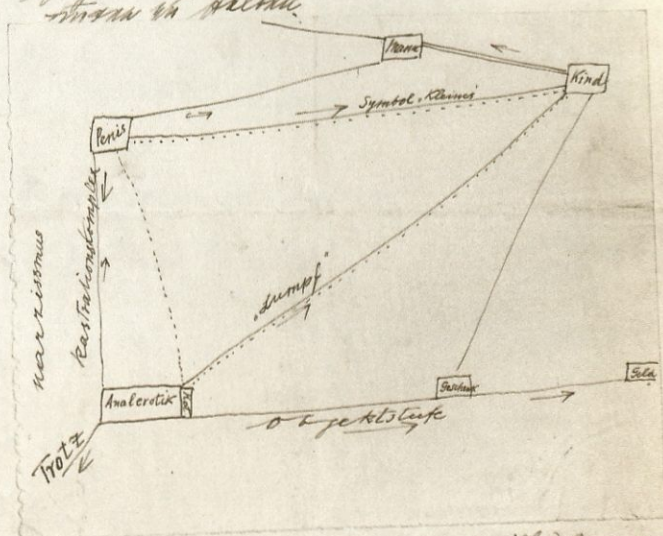


41. *Zum psychischen Mechanismus der Vergesslichkeit* (The Psychical Mechanism of Forgetfulness), *Monatschrift für Psychiatrie und Neurologie*, Bd.4, Nr.6 (Dec. 1898), Fig. 1.

*Comment:*

This drawing, which depicts associative links between various conscious, preconscious and unconscious word presentations, is conceptually identical with Freud's earlier depictions of neuropsychological processes in dreaming and traumatic amnesia (Plates 34-35).



[illegible]

Auch der Quatzenick geht in vorzüglichster Reinheit  
 aus der Erde hervor als ein Gefäß aus Gold.  
 Denn der in dieser Erde wachsende Quatzenick  
 ist dem Gold sehr ähnlich und sehr  
 in der Erde mit dem Gold zusammen.  
 Das Gold ist dem Quatzenick sehr  
 ähnlich in der Erde und sehr  
 dem Gold sehr ähnlich.

42. *Über Triebumsetzung, insbesondere der Analerotik* (On Transformations of Instinct as Exemplified in Anal Erotism), 1917, Fig. 2. Sigmund Freud Collection, Library of Congress.

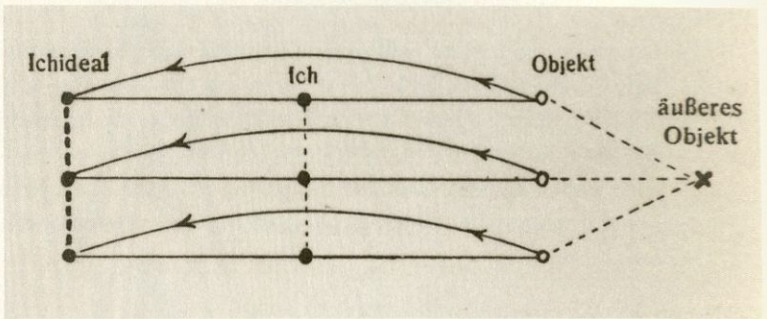
Extract from Freud's text:

"Unfortunately this technical device [diagrammatic representation of manifold mental relations in the case of 'Little Hans'], is not sufficiently pliable for our purpose, or possibly we have not yet learned to use it with effect. In any case I hope the reader will not expect too much from it."

*Comment:*

The "technical device" to which Freud refers here is *diagrammatic representation* itself. It is clear from this statement why drawings became increasingly rare in Freud's writings as he made the transition from neuroanatomy to psychoanalysis; the processes he was concerned with became progressively more complex, dynamic and abstract, and therefore less amenable to visual modes of representation.





43.

43. *Massenpsychologie und Ich-Analyse* (Group Psychology and the Analysis of the Ego), 1921. Sigmund Freud Collection, Library of Congress.

Extract from Freud's text:

*"A primary group ... is a number of individuals who have put one and the same object in the place of their ego ideal and have consequently identified themselves with one another in their ego. This condition admits of graphic representation."*

*Comment:*

This diagram is unique among Freud's drawings in so far as it attempts to represent relations between the major mental systems (or agencies) in a group of human minds.







44. *Das Ich und das Es*. (The Ego and the Id) (Leipzig, Vienna, Zürich: Internationaler Psychoanalytischer Verlag, 1923). The New York Academy of Medicine.

Extract from Freud's text:

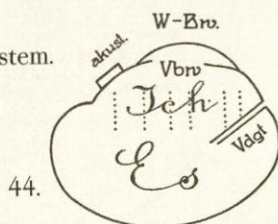
"If we make an effort to represent this pictorially, we may add that the ego does not completely envelop the id, but only does so to the extent that the system *Pept.* forms its surface, more or less as the germinal disc rests upon the ovum. The ego [Ich] is not sharply separated from the id [Es]; its lower portion merges into it. But the repressed merges into the id as well, and is merely a part of it ... The state of things which we have been describing can be represented diagrammatically; though it must be remarked that the form chosen has no pretensions to any special applicability, but is merely intended to serve for purposes of exposition."

*W-Bw* = Perception-Consciousness system.

*Vbw* = Preconscious system.

*Vdgt* = the Repressed.

*Akust.* = nervus acusticus.

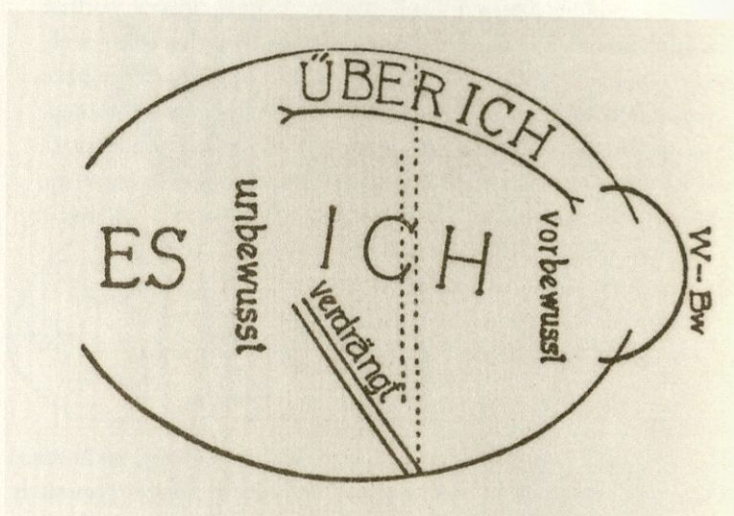


*Comment:*

The distance Freud had traveled from his earliest anatomical drawings, the whole purpose of which was to picture as accurately as possibly the true physical features of structures laboriously visualized under a microscope, is vividly conveyed by the closing sentence of the extract above. Here, Freud insists that the form chosen is entirely arbitrary, wholly in the service of a verbal description of functional relations between the systems or agencies of the mind.

On the other hand, the long shadow of Freud's neuroscientific training is still evident in the following sentence, which immediately follows the passage quoted above: "We might add, perhaps, that the ego wears a 'cap of hearing' — on the one side only, as we learn from cerebral anatomy." Compare the comment on Plate 30, concerning the special functional role Freud always assigned to language. We should not forget the fact that it was Freud himself who traced the anatomical origin of the nervus acusticus depicted here (Plates 24-26).





45.

45. The psychical apparatus, *Neue Folge der Vorlesungen zur Einführung in die Psychoanalyse*. (New Introductory Lectures on Psychoanalysis) (Leipzig, Wien, Zürich: Internationaler Psychoanalytischer Verlag G.M.B.H., 1933).

Extract from Freud's text:

"I should like to portray the structural relations of the mental personality, as I have described it to you, in the unassuming sketch which I now present you with: [Plate 45]. As you see here, the superego merges into the id; indeed as heir to the Oedipus complex it has intimate relations with the id; it is more remote than the ego from the perceptual system. The id has intercourse with the external world only through the ego – at least, according to the diagram. It is certainly hard to say today how far the drawing is correct. In one respect it is undoubtedly not. The space occupied by the unconscious id ought to have been incomparably greater than that of the ego or the preconscious. I must ask you to correct this in your thoughts."

*Comment:*

If this diagram is compared with the very similar one in *The Ego and the Id* (Plate 44) it will be seen that the earlier diagram differs from the present one principally in the fact that the *superego* is not indicated in it. Its absence is justified in the following passage from the earlier work: "It would be vain to attempt to localize the ego ideal, even in the sense in which we have localized the ego, or to work it into any of the analogies with the help of which we have tried to picture the relation between the ego and the id." The "sense in which we have localized the ego" to which Freud refers here probably refers to the following passage in the earlier work:

"The ego is first and foremost a bodily ego; it is not merely a surface entity, but is itself the projection of a surface. If we wish to find an anatomical analogy for it we may best identify it with the 'cortical homunculus' of the anatomists, which stands on its head in the cortex, sticks up its heels, faces backwards and, as we know, has its speech area on the left-hand side."



Once again, therefore, the shadow of Freud's neuroscientific training is evident, notwithstanding all his disclaimers. In fact, the implications of the fact that the ego derives from "a mental projection of the surface of the body" cannot be overestimated; for this is merely a restatement in different words of the fundamental insight Freud had first reached in his *Introduction to Neuropathology* (Plates 26-28) to the effect that higher cortical networks transform information derived from the body periphery until it is so altered that it can no longer be reasonably described in anatomical terms. *This transformation is the origin of the mind.* The ego, too, therefore, could ultimately be said to "contain the body periphery in the same way as a poem contains the alphabet, in a complete rearrangement, serving different purposes" (*On Aphasia*, 1891). It is for this reason that the mature ego cannot be "localized" any more than the superego can – and this is also the ultimate reason why Freud had to abandon anatomical drawing for his later "unassuming sketches" of the complexities of the mind.







46. Manuscript for *Neue Folge der Vorlesungen zur Einführung in die Psychoanalyse*. (New Introductory Lectures on Psychoanalysis), 1933. Sigmund Freud Collection, Library of Congress.

*Comment:*

These remarkable sketches, discovered among Freud's papers in the Library of Congress by Ilse Grubrich-Simitis, show five variants of the diagram that appeared in his "Dissection of the Psychical Personality" in the *New Introductory Lectures* (Plate 43). The variants differ primarily with respect to the relation between the ego and the *Pcs.* on the one hand, and the repressed on the other. Interestingly, the dotted lines descending from the system *Cs.-Pcpt.* into the ego do not appear in the published version. Also, it is evident that the printed drawing has been rotated through 90 degrees. It is unclear whether this change was made by Freud or the publisher.



## Contributors

Lynn Gamwell is a historian of art and science and director of the Binghamton University Art Museum of the State University of New York. Her publications include *Sigmund Freud and Art: His Personal Collection of Antiquities* (1989), *Madness in America: Cultural and Medical Perceptions of Mental Illness before 1914* (1994), *Dreams 1900-2000: Science, Art, and the Unconscious Mind* (2000) and *Exploring the Invisible: Art, Science, and the Spiritual* (2002).

Mark Solms is a psychoanalyst and a lecturer in neurosurgery at the St. Bartholomew's and Royal London School of Medicine; chair of neuropsychology, University of Cape Town, South Africa and director of the Arnold Pfeffer Center for Neuro-Psychoanalysis at the New York Psychoanalytic Institute. His publications include *A Moment of Transition: Two Neuroscientific Articles by Sigmund Freud* (1990), *The Neuropsychology of Dreams: A Clinico-Anatomical Study* (1997), *Clinical Studies of Neuropsychology: An Introduction to Depth Neuropsychology* (2000) and *The Brain and the Inner World: An Introduction to the Neuroscience of Subjective Experience* (2002).

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The New York Academy of Medicine.

Plates #: 22, 23.

Chris Focht.

Plates #: 3, 14, 20, 21, 24, 25, 26, 30, 31, 40, 41, 45.

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I reserve for last the expression of my profoundest gratitude to the psychoanalyst who has taught me most about the workings of the mind, Peter A. Gelker, MD, PhD.

*Lynn Gamwell, Curator of the Exhibition*



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