Das Modul Kognitive Neuropsychologie

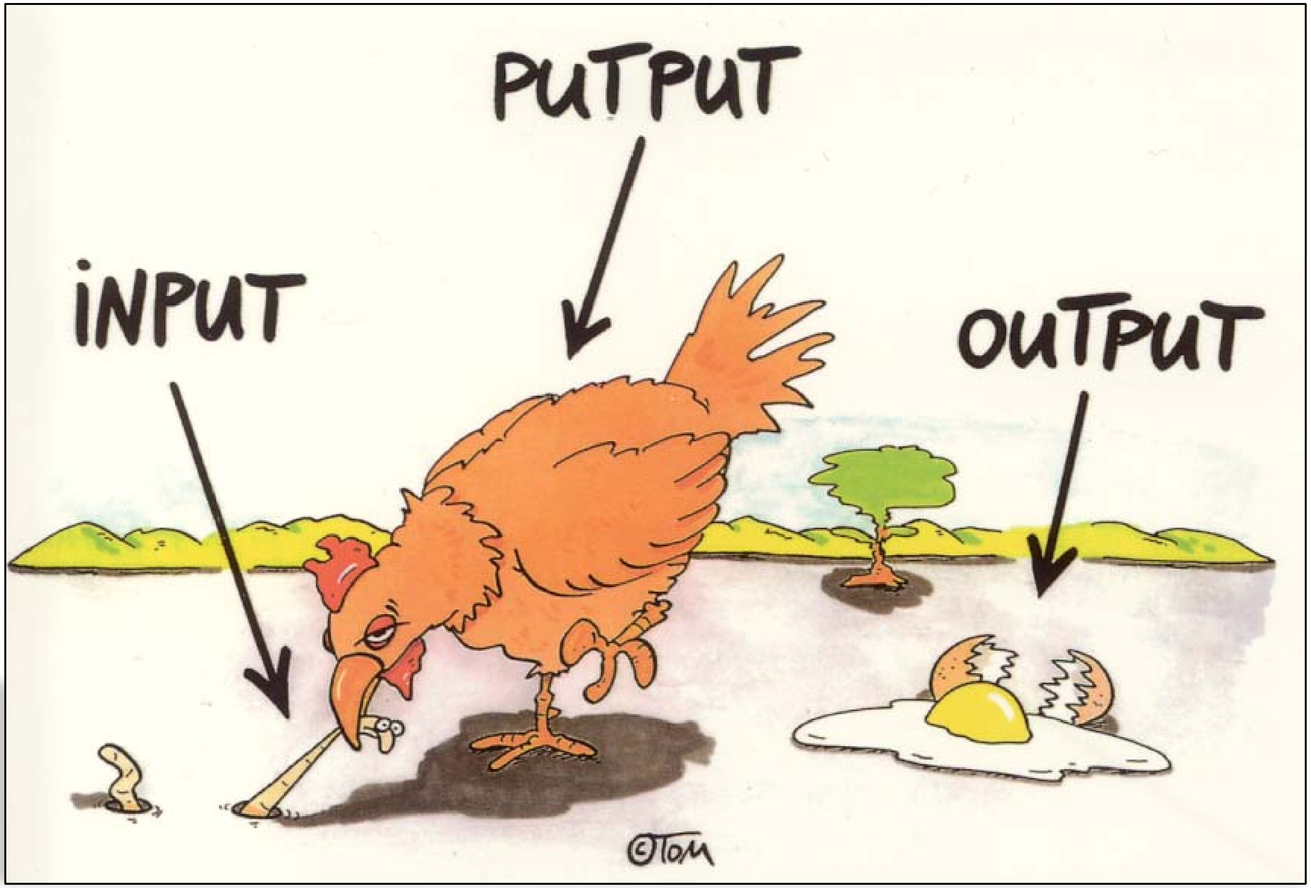
WiSe: VL: Kognitive Neuropsychologie

S: Kognitive Psychophysiologie

SoSe: S: Ausgewählte Themen der KNP

Wahlpflichtfach: Mündliche Modulabschlußprüfung (12 CP)

Wahlfach: Zwei Veranstaltungen (frei kombinierbar; VL mit schriftl. Ausarbeitung) (8 CP)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Kognitive Neuropsychologie

03.11. Geschichte der kognitiven Neurowissenschaft

10.11. Funktionelle Neuroanatomie

17.11. Methoden der kognitiven Neuropsychologie I

24.11. Methoden der kognitiven Neuropsychologie II

01.12. Visuelle Wahrnehmung

08.12. Objekterkennung

15.12. Auditive Wahrnehmung

05.01. Sprache

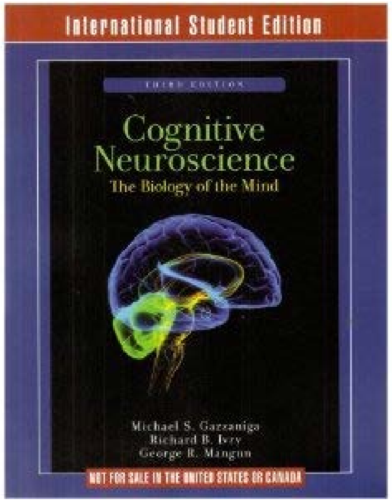
12.01. Aufmerksamkeit und Selektion

19.01. Kognitive Kontrolle

26.01. Gedächtnis & Lernen

02.02. Kognitives Altern

Literatur



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- Karnath, H.O., & Thier, P (2012). Kognitive Neurowissenschaften 3. Auflage). Springer: NewYork
- www: Brain Tutor (BrainVoyager home page)
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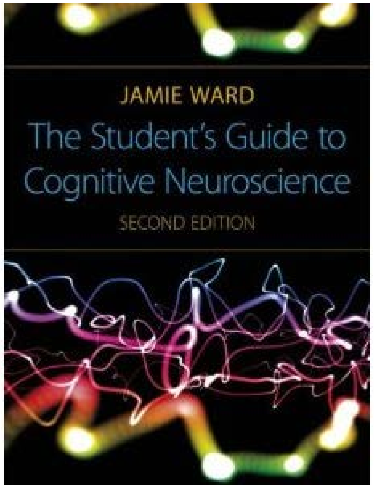
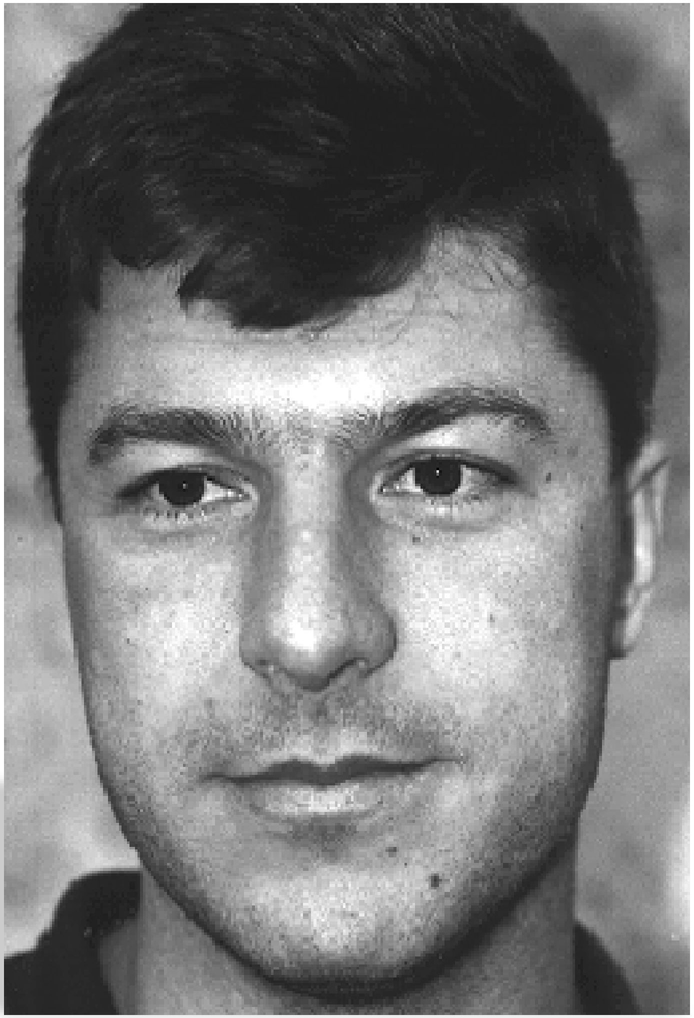
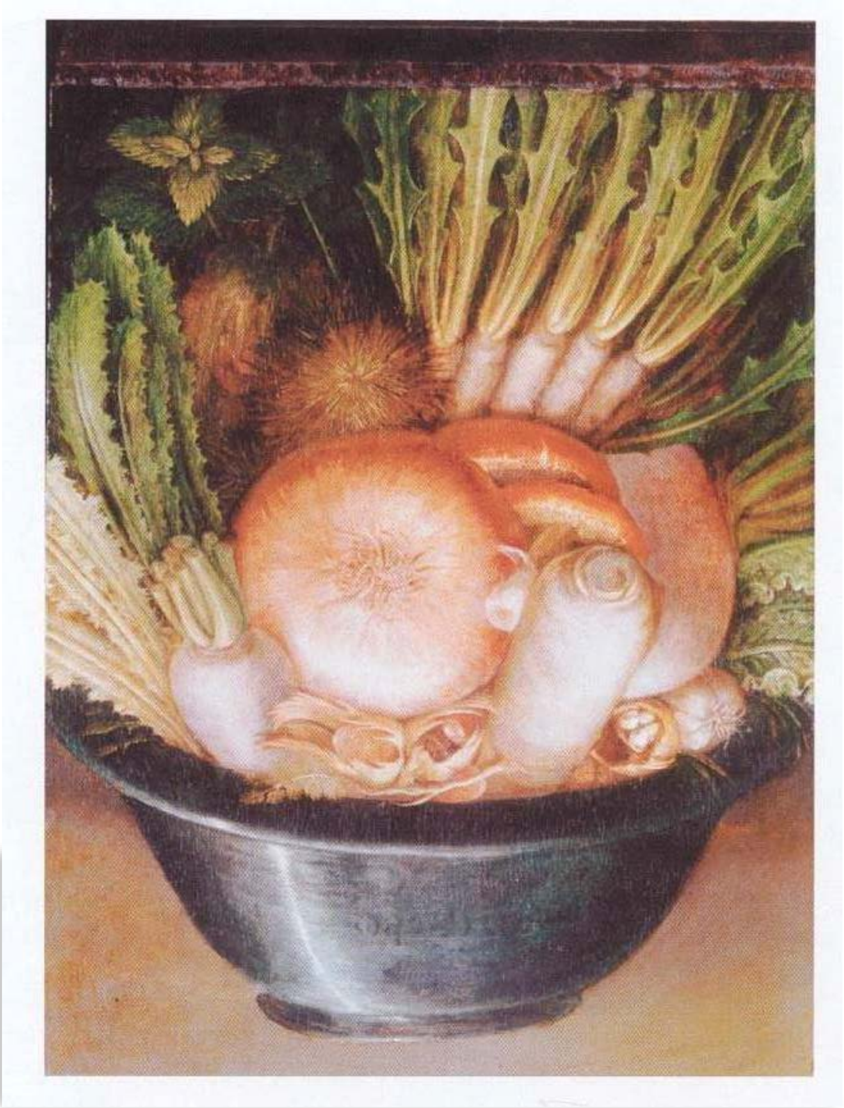
- Kolb, B. & Whishaw, I.Q. (1996). Neuropsychologie (2. Auflage) Spektrum: Heidelberg.
- **Ward, J. (2010). The student's guide to cognitive neuroscience. (2nd Edition) Psychology Press. New York.**



- www.dasGehirn.info

Vorlesungsskripte in Moodle (jeweils Di ab 14.00)





Ein biologisches Gewebe kann ...

denken

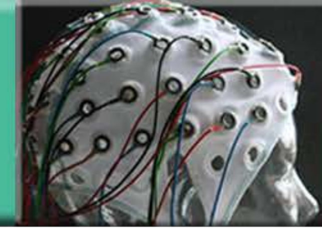
erinnern

sprechen

aufmerksam sein

Gedichte schreiben....

Wie ist es beschaffen?



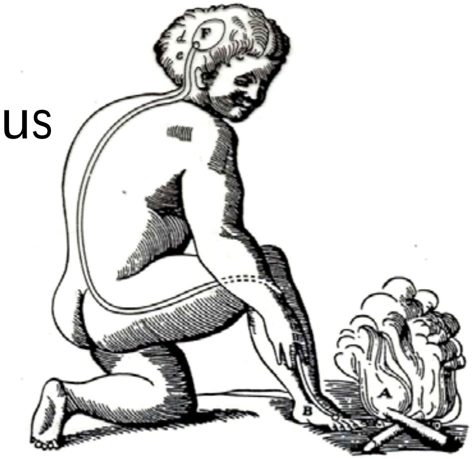
Die Geschichte der kognitiven Neurowissenschaften

- Cartesischer Dualismus
- Phrenologie (Gall / Spurzheim)
- Theorie der Aggregatfelder (Flourens)
- Topographische Organisation des Großhirns (Hughlings Jackson)

Der cartesische Dualismus

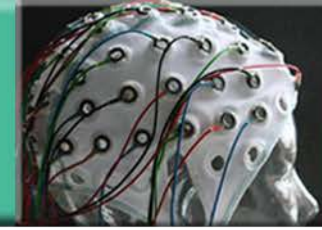
R. Descartes (1596-1650) / cartesischer Dualismus

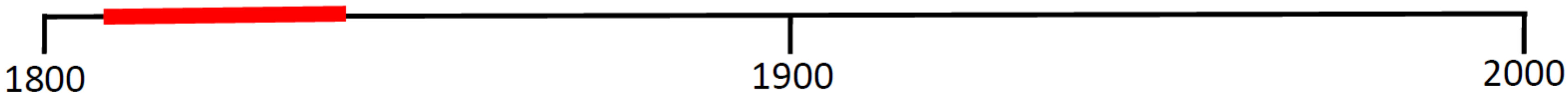
Monistische und Dualistische Positionen



1.1 Der Begriff des Reflexes stammt von Descartes. In diesem Beispiel führt die Flammenhitze dazu, daß ein im Nerv befindlicher Faden gezogen wird und Ventrikelflüssigkeit durch eine geöffnete Pore ausströmt. Sie fließt durch den Nerv und verursacht nicht nur ein Zurückziehen des Fußes, sondern auch, daß Augen und Kopf sich auf den Reiz richten, die Hand gestreckt wird und der ganze Körper sich biegt, um sich zu schützen. Das Konzept war durch Automaten, so wie sie in jenen Tagen in Frankreich bei Springbrunnen Mode waren, inspiriert worden. Ein Besucher französischer Gärten konnte zum Beispiel auf eine Platte treten, die durch eine raffinierte Mechanik bewirkte, daß Statuen sich verbargen, plötzlich erschienen oder Wasser spien. Descartes' Verwendung des Reflexbegriffs bezog sich allerdings auf relativ komplexes Verhalten, das man heute nicht als reflektorisch bezeichnen würde; Verhalten, das man heute als reflektorisch bezeichnet, wurde von Descartes nicht berücksichtigt. (Aus Descartes 1664.)

Phrenologie (Gall / Spurzheim) 1810-1840





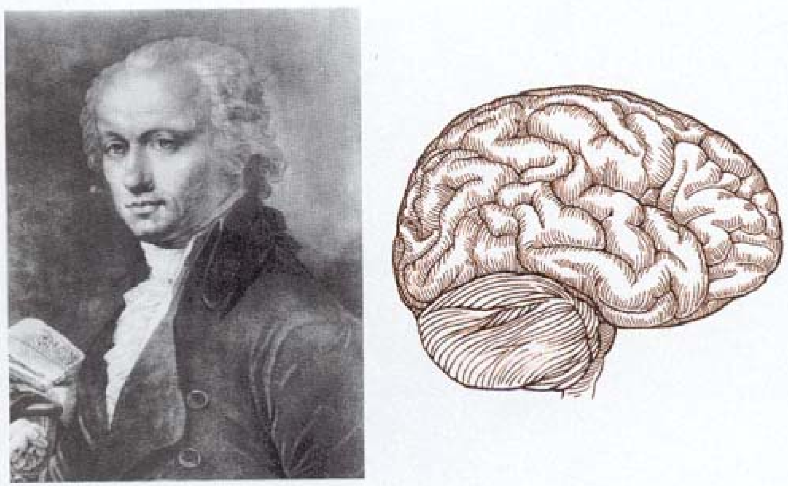
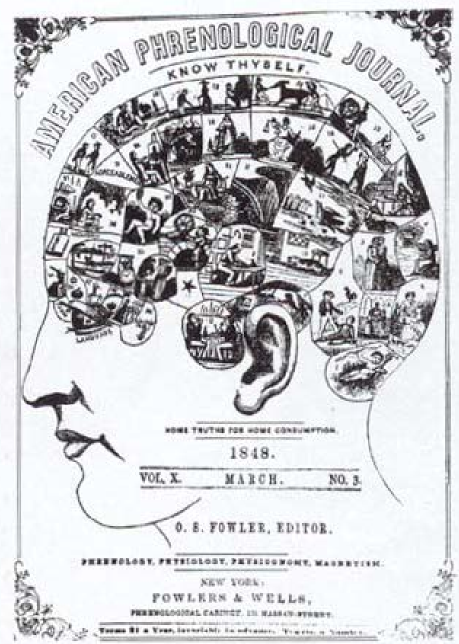
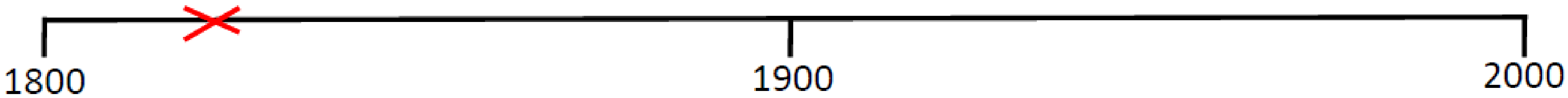


Figure 1.1 **Left:** Franz Joseph Gall. One of the founders of phrenology in the early nineteenth century. **Right:** The right hemisphere of the brain, from Gall and Spurzheim in 1810.



Theorie der Aggregatfelder (Pierre Flourens)



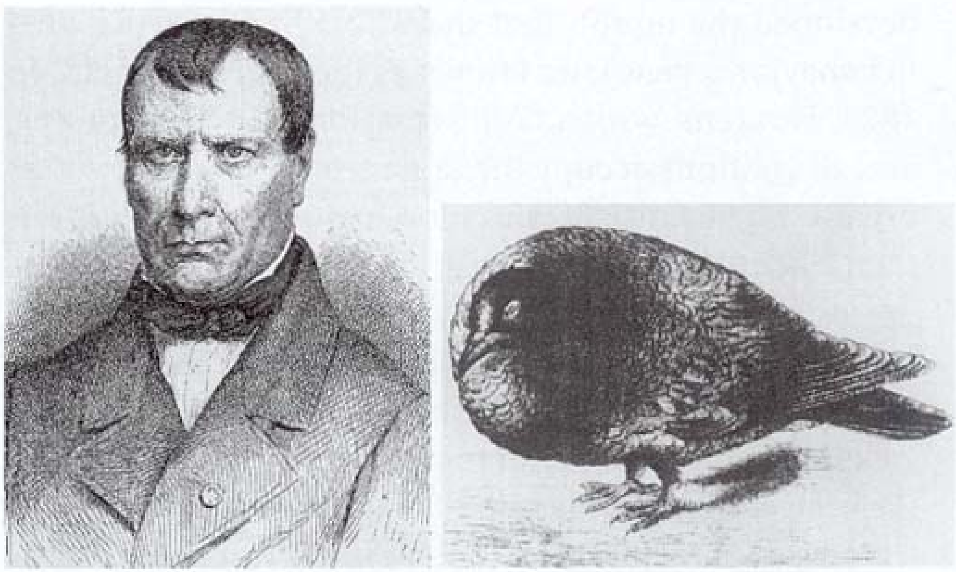


Figure 1.3 **Left:** Pierre Jean Marie Flourens (1794–1867), who supported the idea later termed the *aggregate field*. **Right:** The position of a pigeon deprived of its cerebral hemispheres described by Flourens.

„All sensations, all perceptions and all volitions occupy the same seat in these (cerebral) organs. The faculty of sensation, percept and volition is then essentially one faculty“

Topographische Organisation des Großhirns (John Hughlings Jackson)

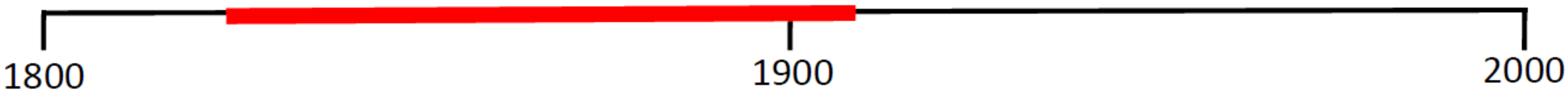


Figure 1.4 John Hughlings Jackson, an English neurologist who was one of the first to recognize the localizationist view.

Broca's Area: Pierre Paul Broca

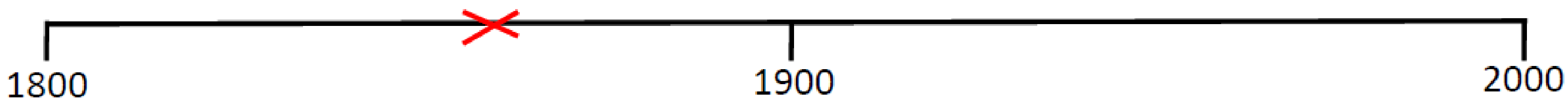
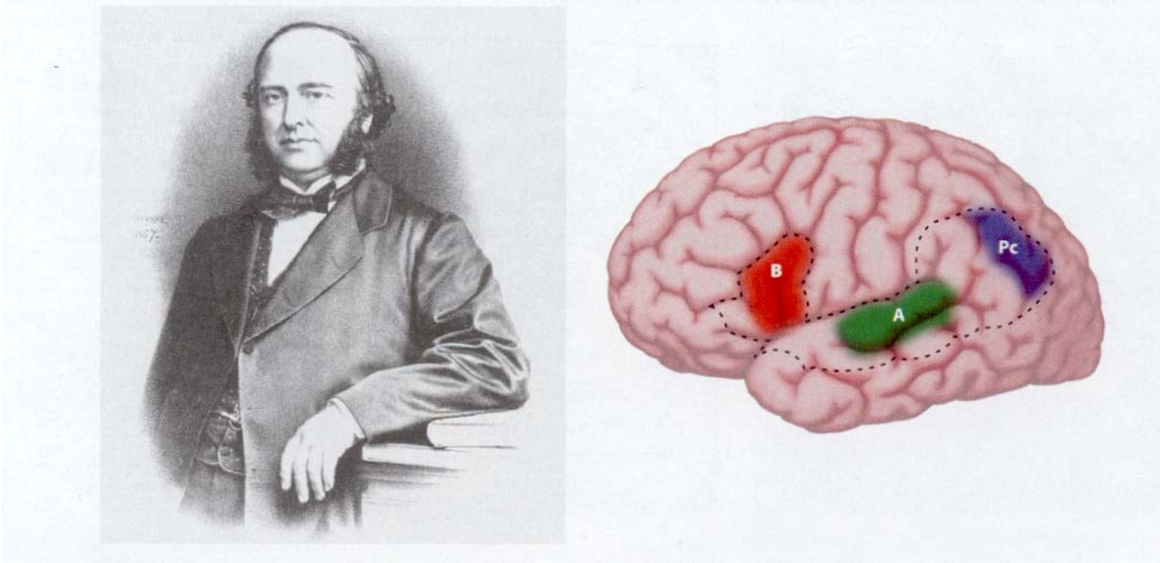


Figure 1.5 **Left:** Pierre Paul Broca. **Right:** The connections between the speech centers, from Wernicke's article on aphasia. B = Broca's area of motor speech; A = the sensory speech center of Wernicke; Pc = area concerned with language.



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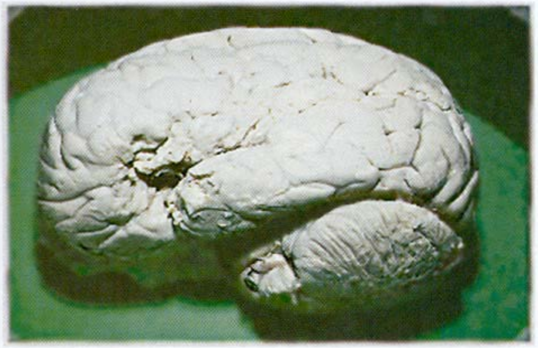
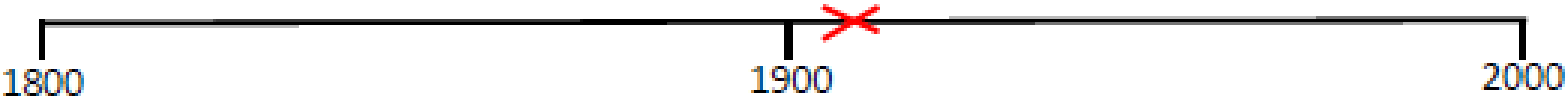
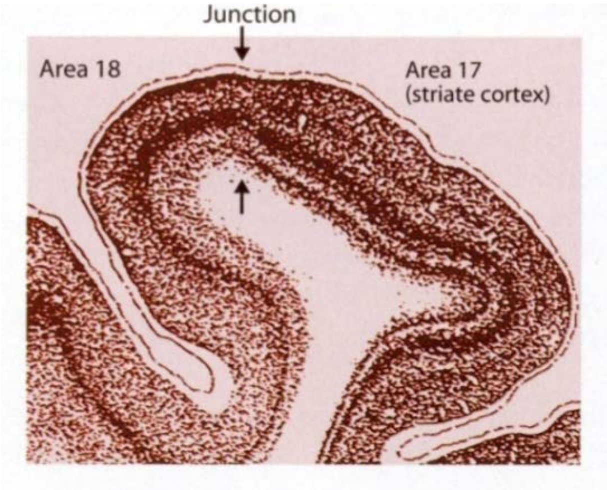
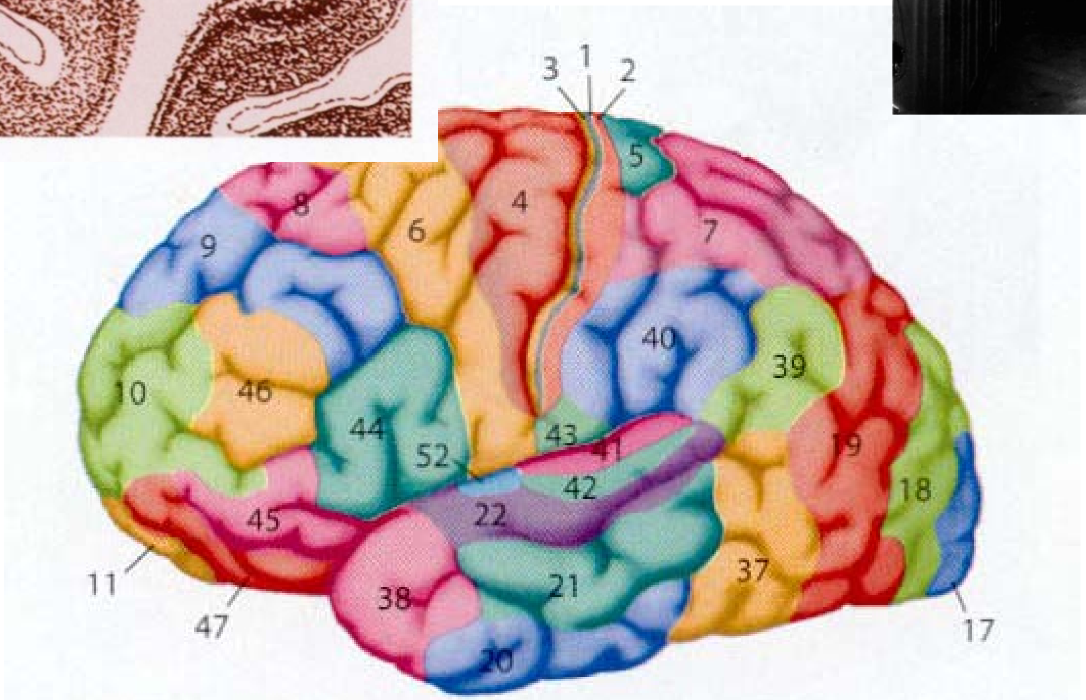
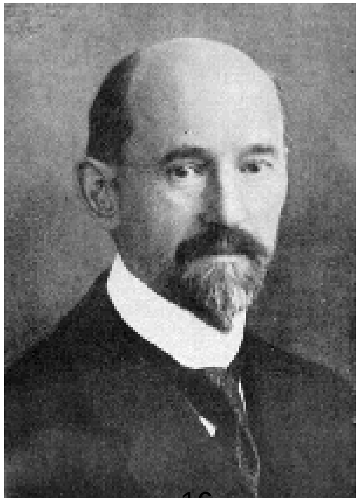


Analyse der zellulären Struktur des Großhirns: Cytoarchitektur: Korbinian Brodmann



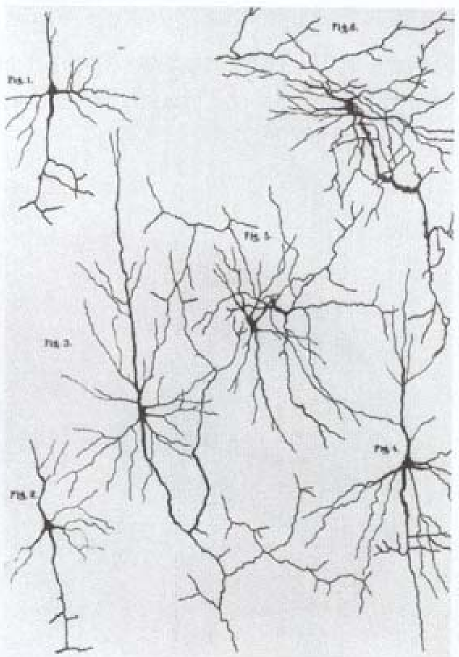






Visualisierung neuronaler Strukturen:
Golgi / Cajal
Nobelpreis 1906: Arbeiten zu den Feinstrukturen des NS

Figure 1.8 **Left:** Camillo Golgi (1843–1926), co-winner of the Nobel Prize in 1906. **Right:** Golgi's drawings of different types of ganglion cells in dog and cat.



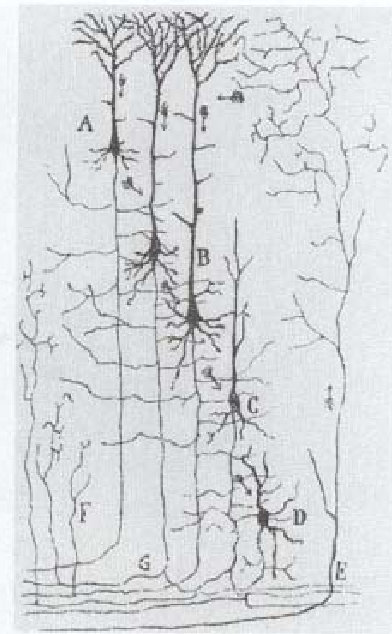
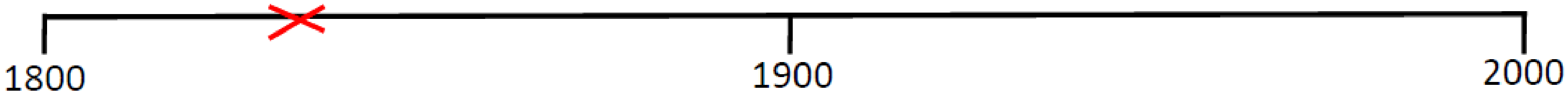


Figure 1.9 **Left:** Santiago Ramón y Cajal (1852–1934), co-winner of the Nobel Prize in 1906. **Right:** Cajal's drawing of the afferent inflow to the mammalian cortex.

Die Neuronen Doktrin: Purkinje, Freud



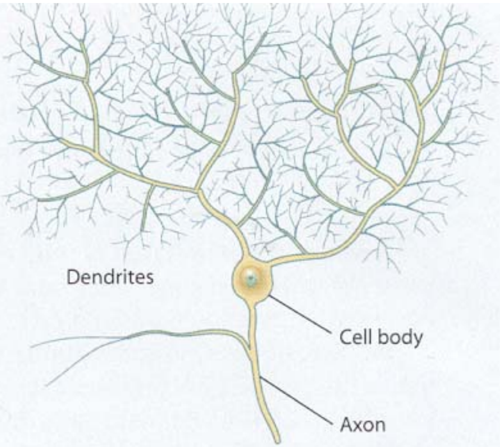


Figure 1.11 **Left:** Johannes Evangelista Purkinje, who described the first nerve cell in the nervous system. **Right:** A Purkinje cell of the cerebellum.

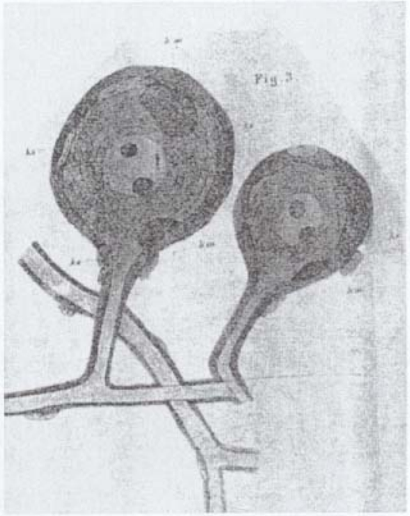


Figure 1.12 **Left:** Sigmund Freud (1856–1939). **Right:** From his work with crayfish, Freud published this illustration as an example of anastomosis of nerve fibers, a concept Cajal disproved.

Messung der Nervenleitfähigkeit (von Helmholtz)

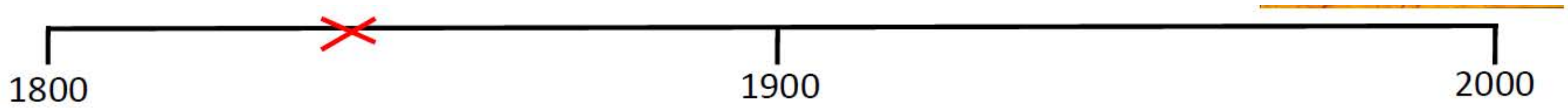
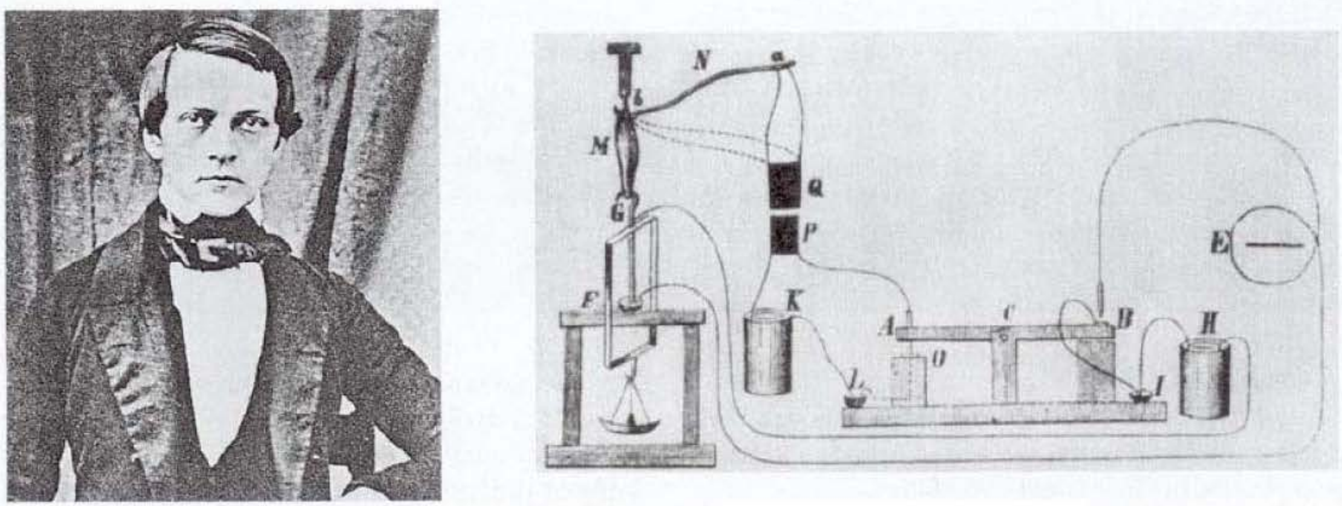


Figure 1.13 **Left:** Hermann Ludwig von Helmholtz (1821–1894). **Right:** Helmholtz's apparatus for measuring the velocity of nerve conduction.



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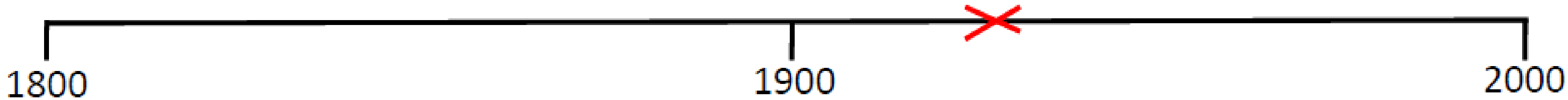
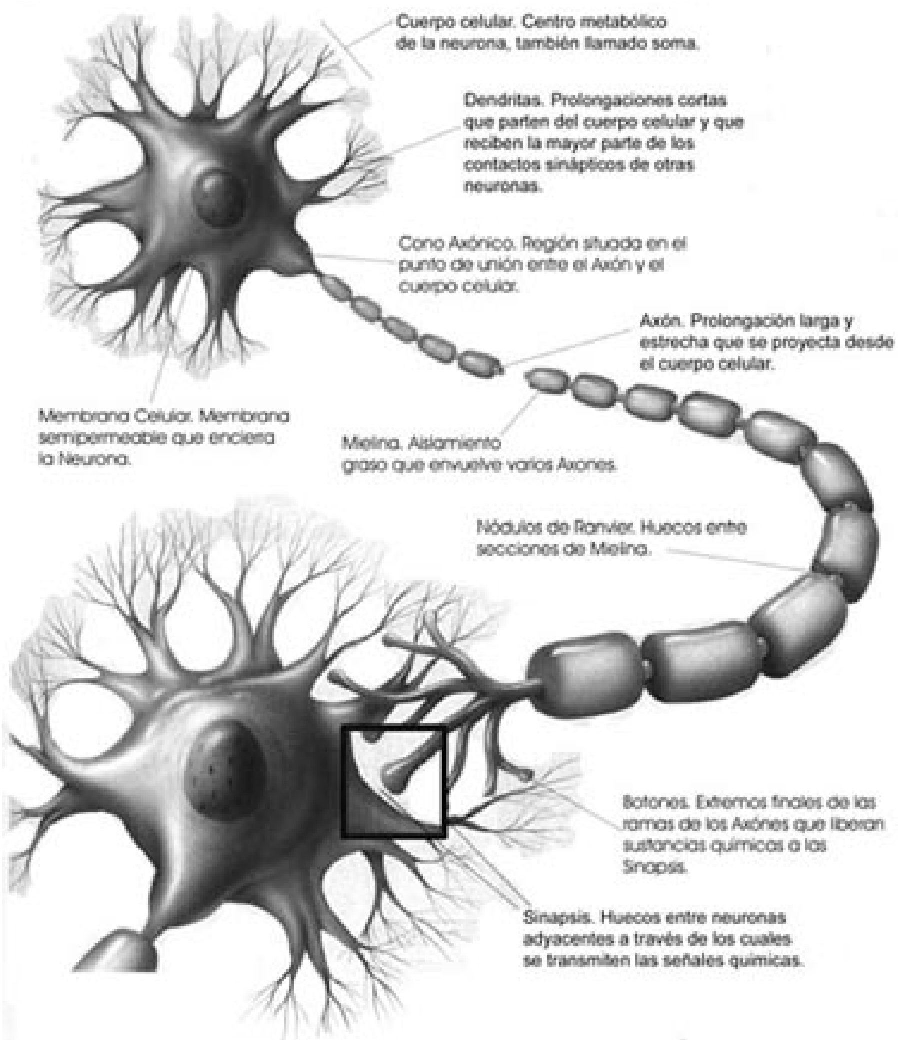
Das 20. Jahrhundert: Prinzip der synaptischen Übertragung Sir Charles Sherrington:

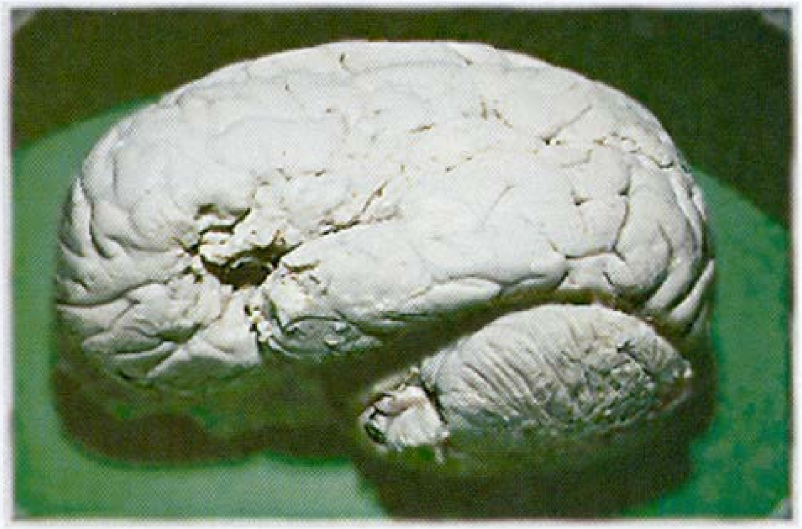




- Die Debatte zwischen Pierre Marie und Paul Broca

Figure 9.24 **(a)** The preserved brain of Leborgne, Broca's patient "
left hemisphere lesioned in Leborgne's brain and now known as *Bro*
Wernicke's area.

(a)



Nicht-Akzeptanz der Struktur-Funktions Beziehung: Friedrich Goltz

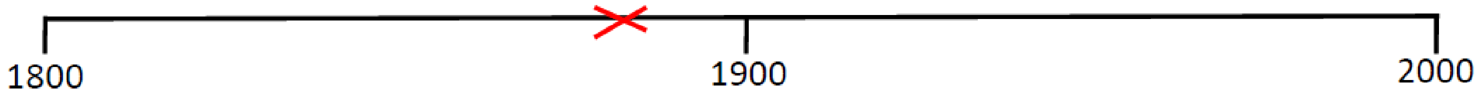
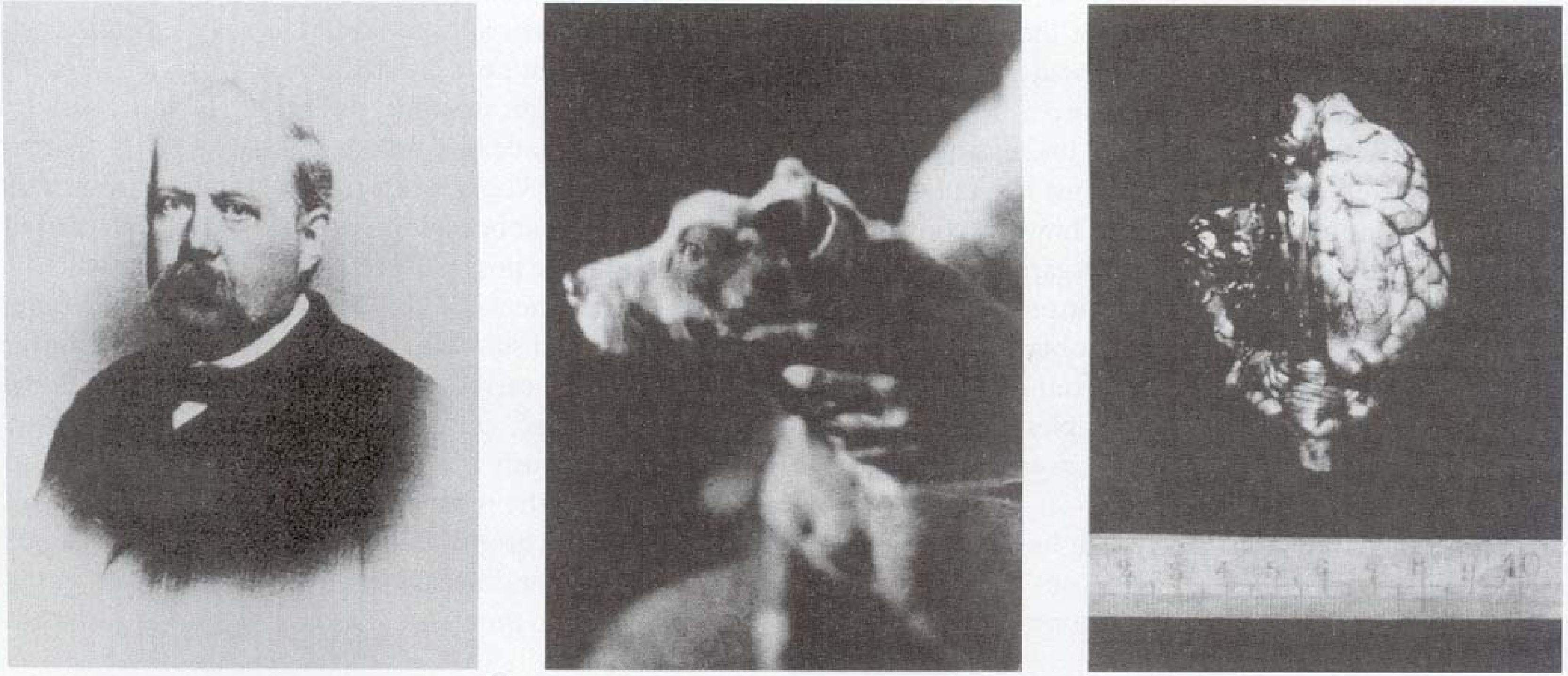
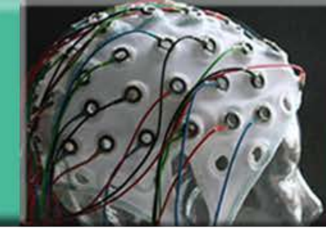


Figure 1.14 **Left:** Friedrich Leopold Goltz (1834–1902). **Center:** The dog Goltz showed to the International Medical Congress in 1881. **Right:** The brain of the dog from which Goltz removed a section of cortex.



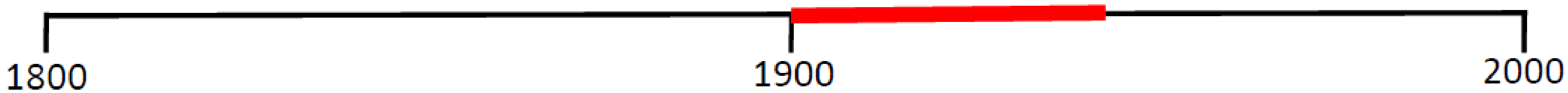


Lokalisation von Symptomen vs Funktionen
John Hughlings Jackson

Läsion kann bizarre Symptome generieren, ohne für diese Funktion spezialisiert zu sein

Lokalisierbarkeit von einfachen nicht aber komplexen Funktionen.

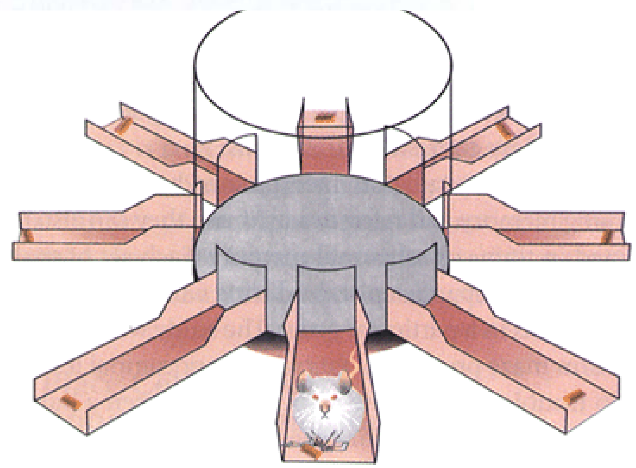
Rückkehr der holistischen Sicht: Sir Henry Head / Karl Lashley



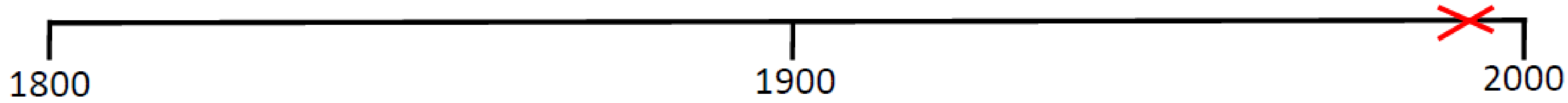
The charm of neurology, above all other branches of practical medicine, lies in the way it forces us into daily contact with principles. A knowledge of the structure and functions of the nervous system is necessary to explain the simplest phenomena of disease, and this can be only attained by thinking scientifically.

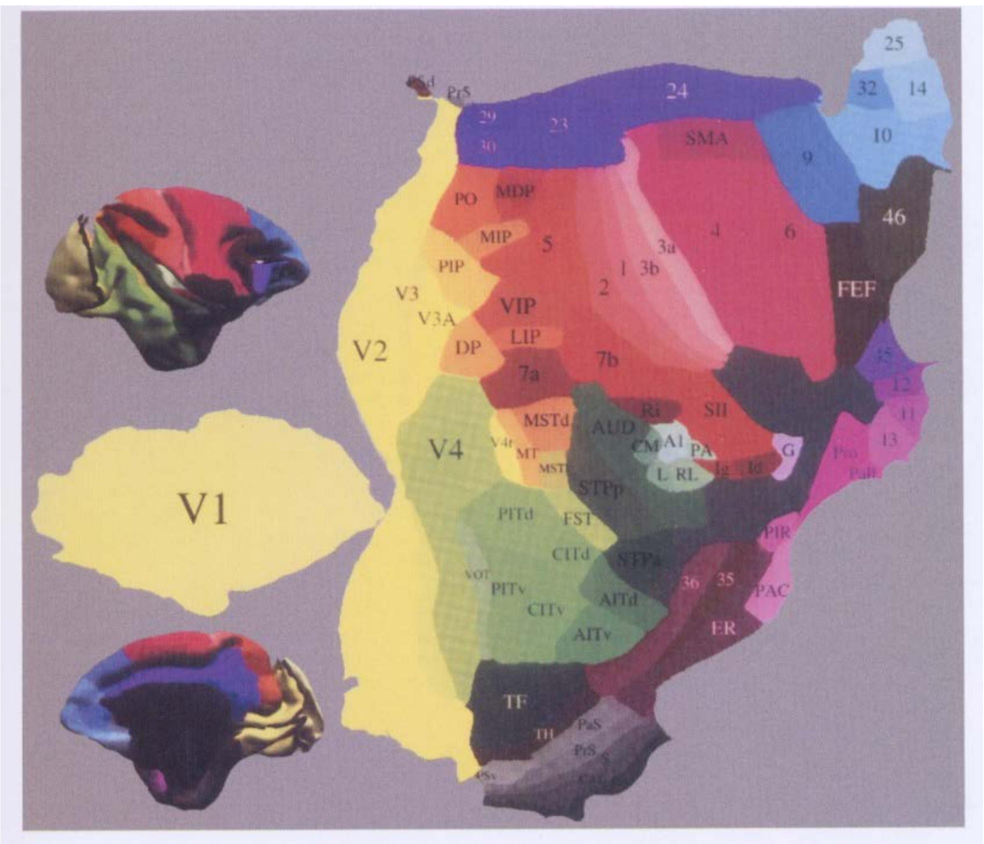
Sir Henry Head, *Some Principles of Neurology*, 1918.

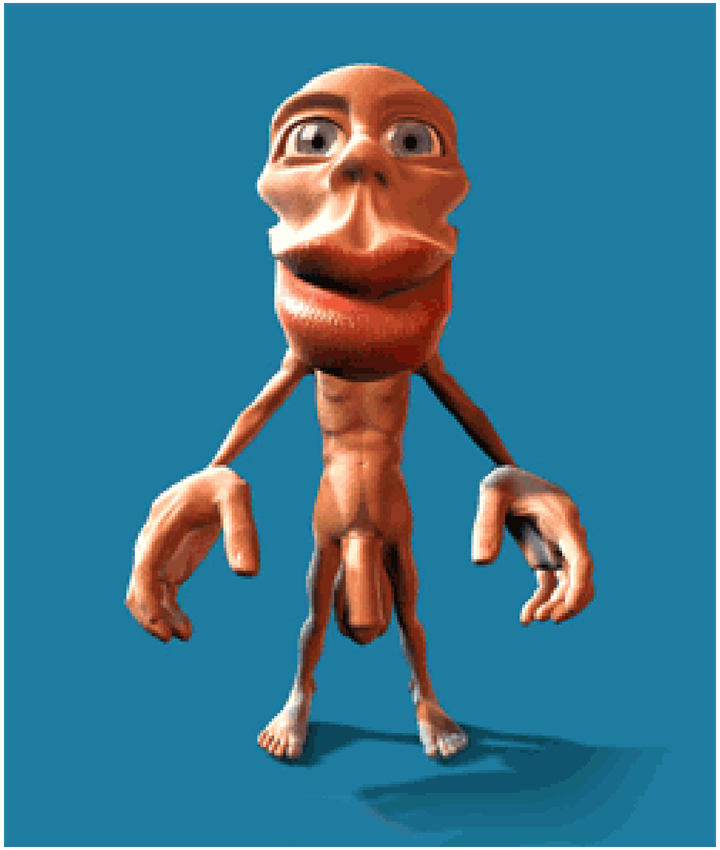
Karl Spencer Lashley
(1890-1958)



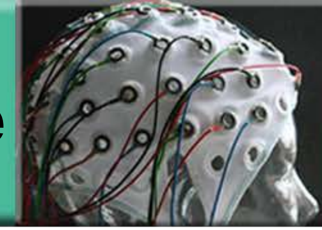
Belege für die Lokalisationssicht: Sensorische und motorische Karten

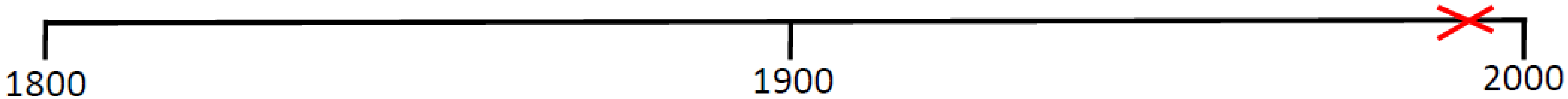






Beide Positionen haben Geltungsbereiche

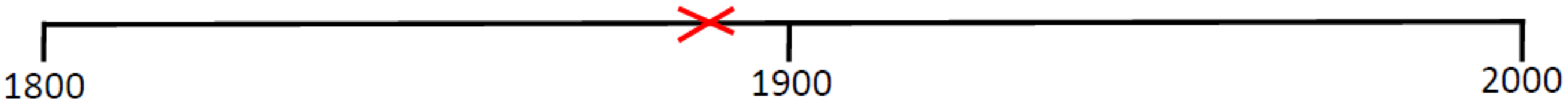




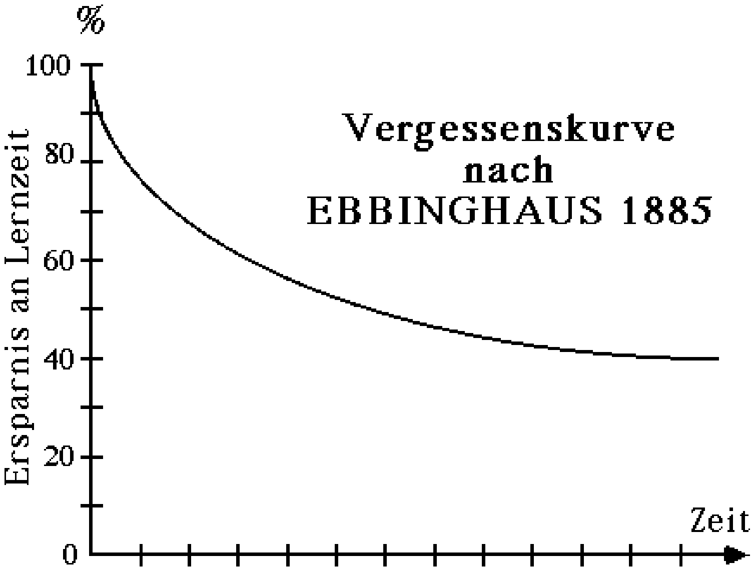
The mistake of early localizationists is that they tried to map behaviors and perceptions into single locations in the cortex. Any particular behavior or perception is produced by many areas, located in various parts of the brain. Thus, the key to resolving the debate is to realize that complex functions such as perception, memory, reasoning, and movement are accomplished by a host of underlying processes that are carried out in a single region of the brain. Indeed, the abilities themselves typically can be accomplished in numerous different ways, which involve different combinations of processes. . . . Any given complex ability, then, is not accomplished by a single part of the brain. So in this sense, the globalists were right. The kinds of functions posited by the phrenologists are not localized to a single brain region. However, simple processes that are recruited to exercise such abilities are localized. So in this sense, the localizationists were right.

Kosslyn & Anderson, 1992

Die Debatte zwischen Rationalismus und Empirismus



- Assoziationismus (Hermann Ebbinghaus)



Assoziationismus: Edward Thorndike‘s Law of Effect

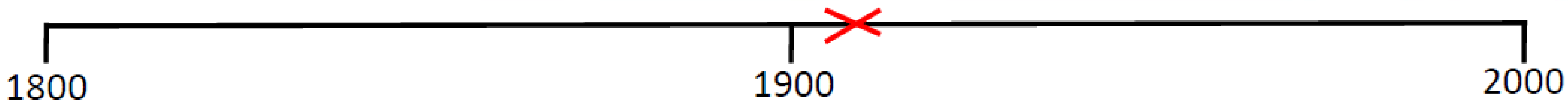
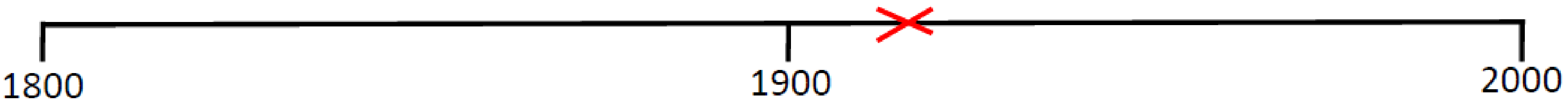


Figure 1.16 Edward L. Thorndike.

Behaviorismus und Stimulus-Response Psychologie. John B. Watson



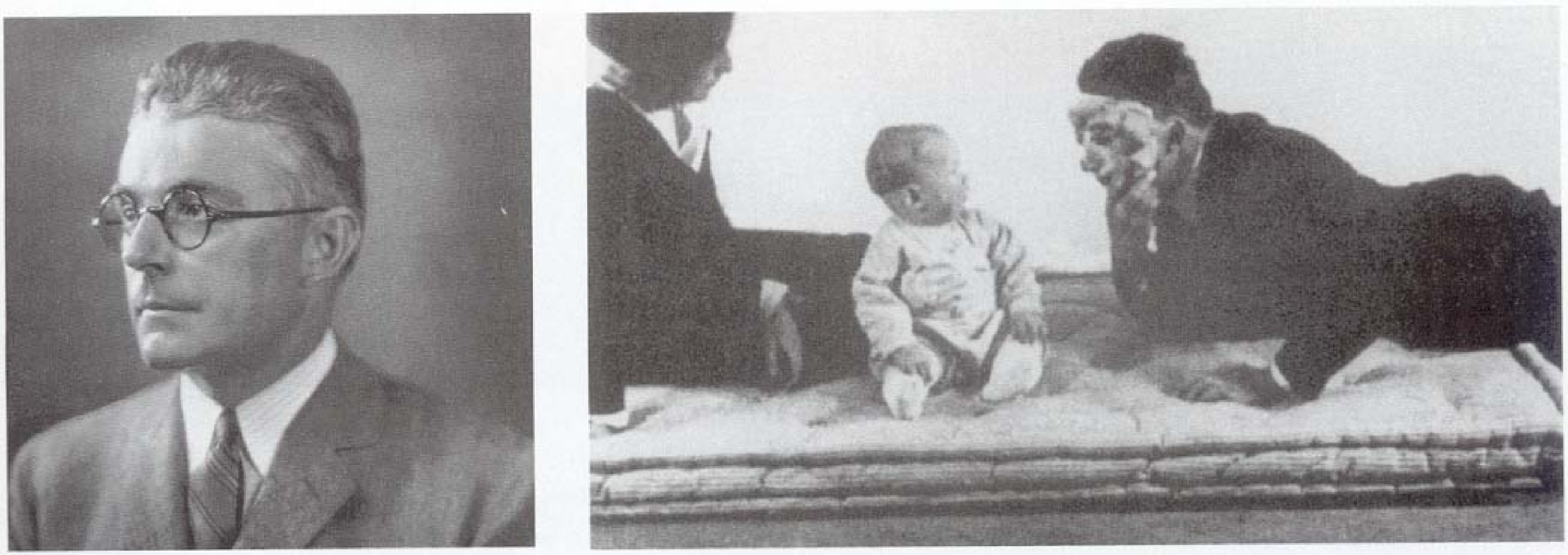
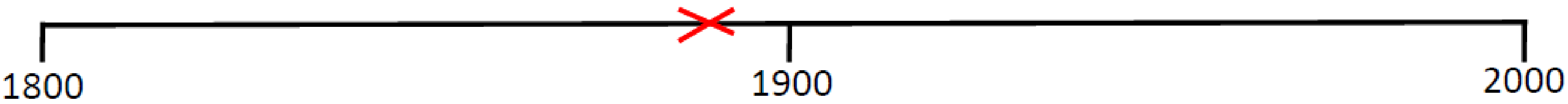
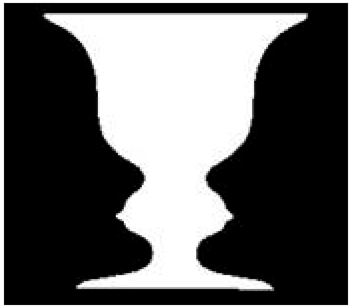
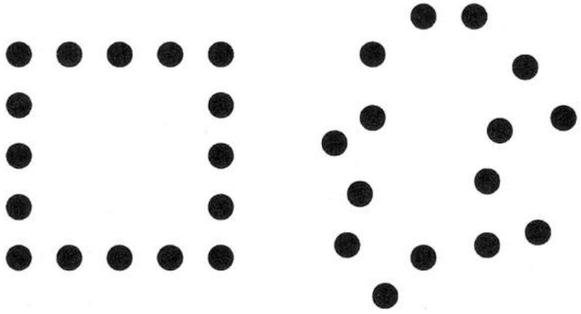


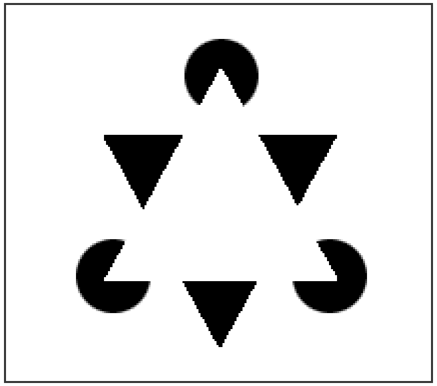
Figure 1.17 **Left:** John B. Watson. **Right:** John B. Watson and "Little Albert" during one of Watson's fear-conditioning experiments.

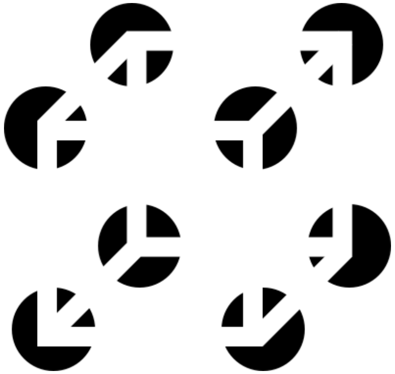
Gestaltpsychologie



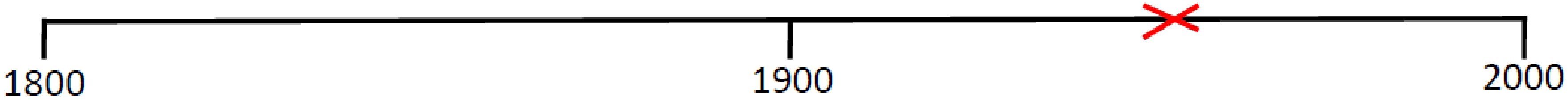






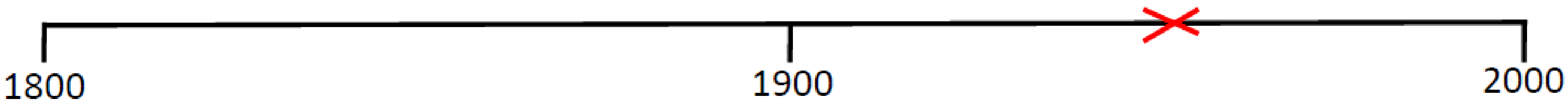


Die kognitive Wende in den 50er Jahren



Allen Newell & Herbert Simon
George A. Miller
Noam Chomsky

Die kognitive Wende in den 50er Jahren



Allen Newell & Herbert Simon
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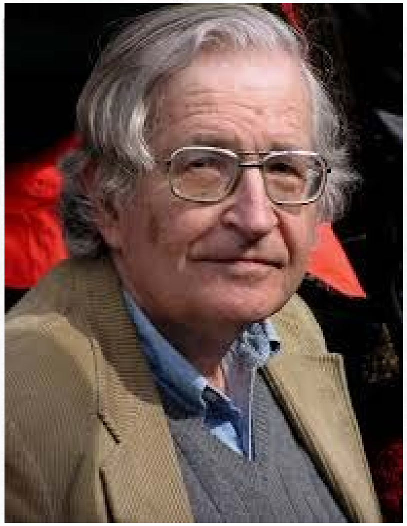
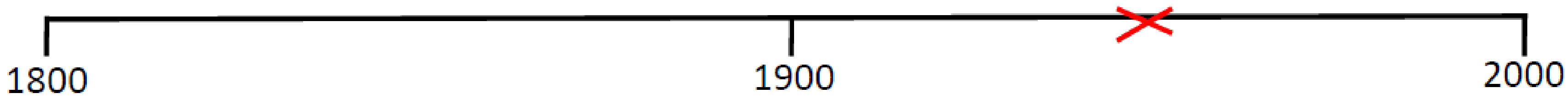


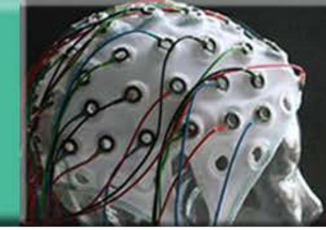
Die Theorie der Cell Assemblies
Donald Hebb

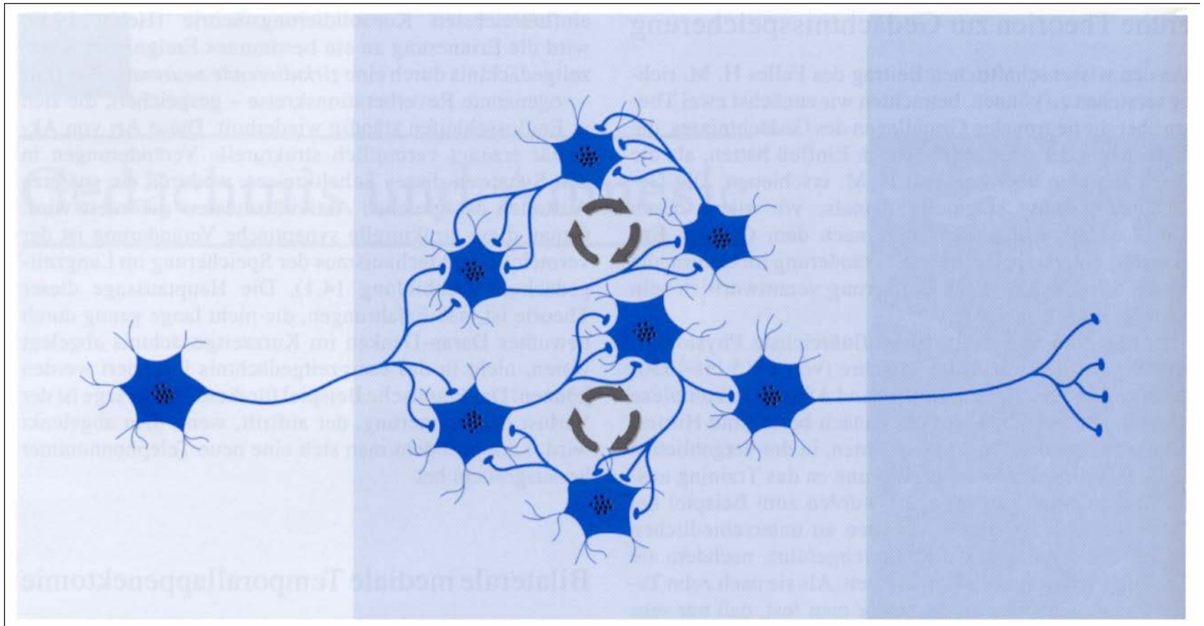


Donald Hebb (1949)

Let us assume that the persistence or repetition of a reverberatory activity (or "trace") tends to induce lasting cellular changes that add to its stability. . . . When an axon of cell A is near enough to excite a cell B and repeatedly or persistently takes part in firing it, some growth process or metabolic change takes place in one or both cells such that A's efficiency, as one of the cells firing B, is increased.

Die Theorie der Cell Assemblies (Donald Hebb)



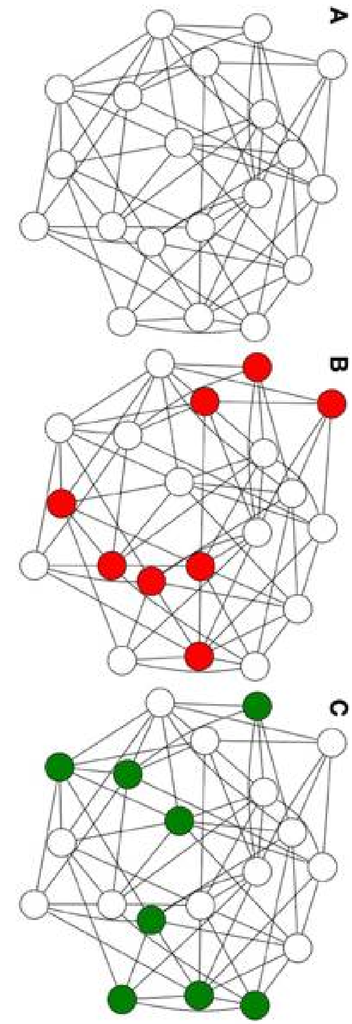


1 Eine Erfahrung aktiviert sensorische Bahnen, die neuronale Impulse zum ZNS leiten.

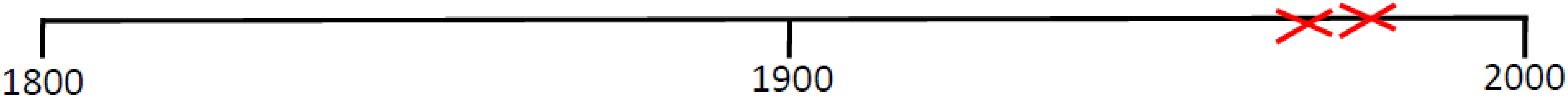
2 **Kurzzeitgedächtnis:** Hebb nahm an, daß das Kurzzeitgedächtnis für jedes Erlebnis über die neuronale Aktivität von geschlossenen zirkulierenden Schaltkreisen (sogenannten Reverberationskreisen) im ZNS gespeichert wird.

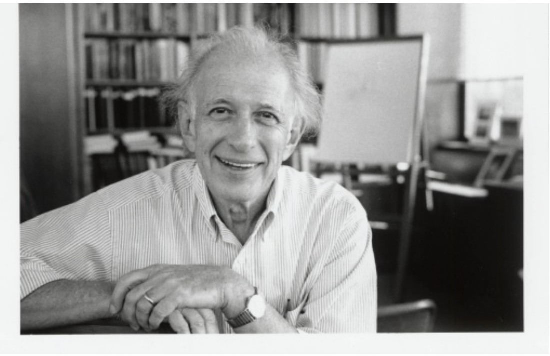
Langzeitgedächtnis: Hebbs Theorie zufolge erzeugt die zirkulierende Aktivität, wenn sie lange genug aufrechterhalten wird, strukturelle Veränderungen in den Synapsen. Diese fördern später folgende Übertragungen über die gleichen Bahnen.

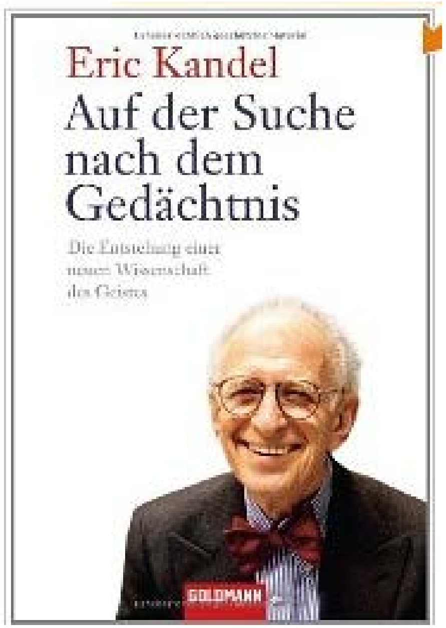
3 Solche veränderten Übertragungen können den motorischen Output und damit das Verhalten beeinflussen.



Zelluläre Mechanismen des Lernens (Eric Kandel)

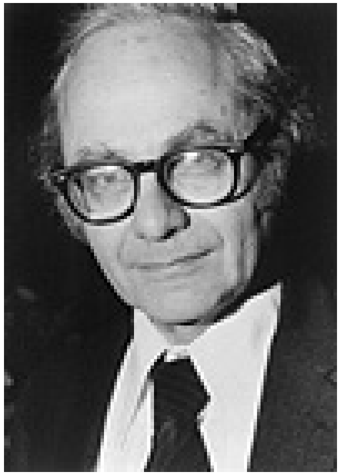


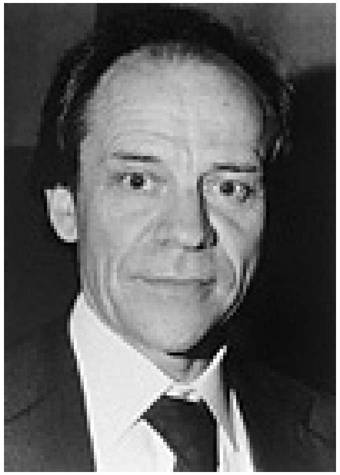




Wie verarbeitet das Gehirn einfache Reize?

David Hubel und Tosten Wiesel





Kognitiv-neurowissenschaftliche Theoriebildung:
Wie produzieren neurophysiologische Prozesse kognitive Zustände?

David Marr:

2 Ebenen der funktionellen Analyse
- Was wird berechnet
- Wie wird es algorithmisch realisiert?

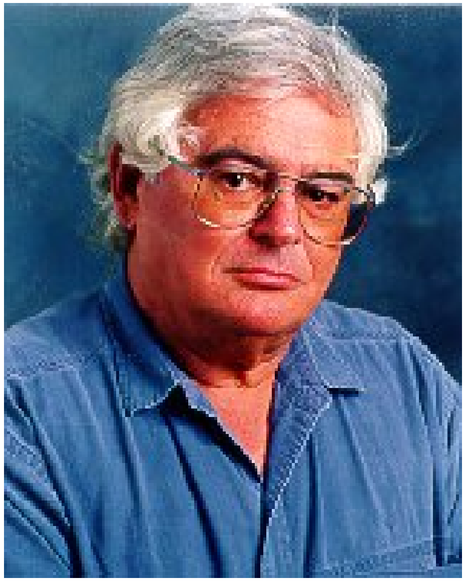
1 Ebene der physikalischen Analyse
- Wie wird es implementiert?

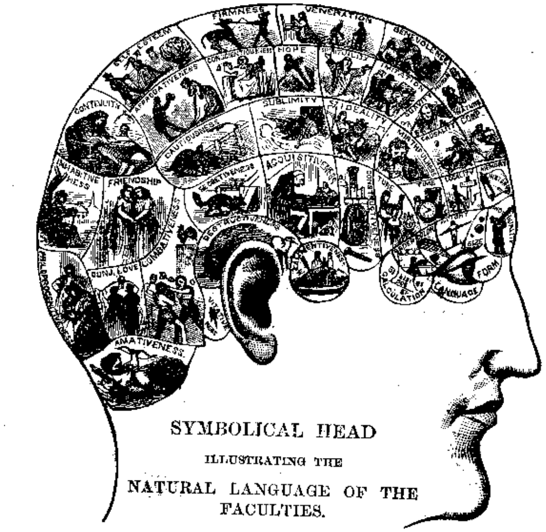
Kognitive Neurowissenschaft jenseits der Läsionsmethode:

- Modularity of Mind: Jerry Fodor

  Geist – Gehirn / Software – hardware

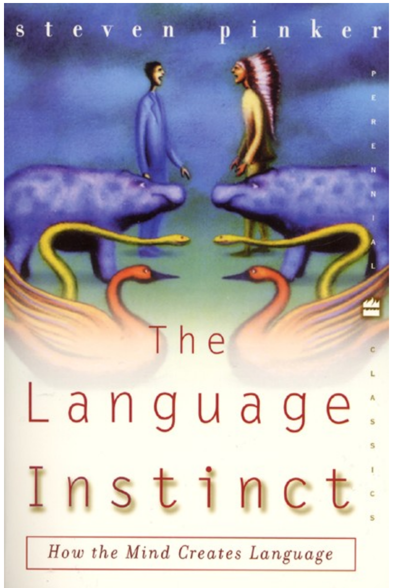
  Module (4 Kriterien)

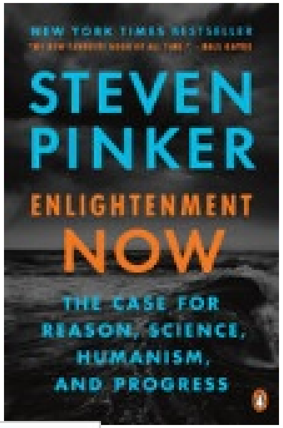


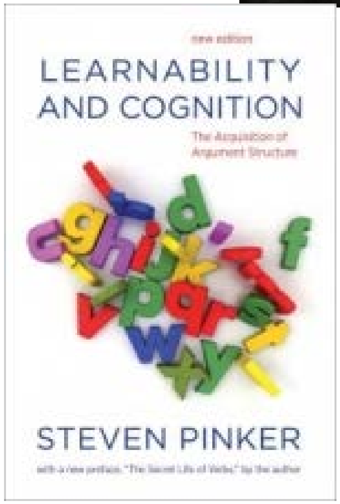


Kognitive Neurowissenschaft jenseits der Läsionsmethode:

Evolutionäre Psychologie und das Gehirn
Reverse engineering: Steven Pinker



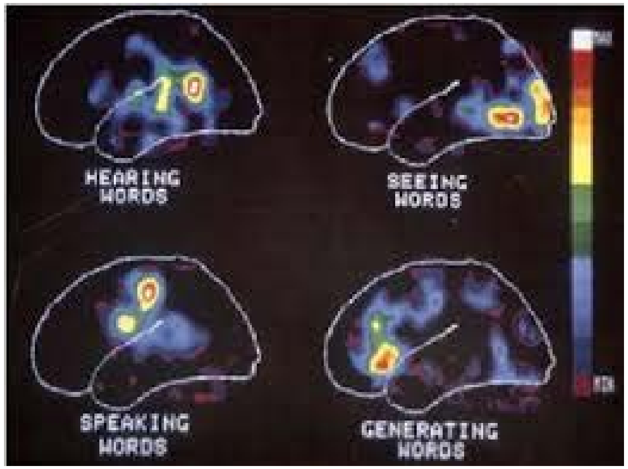


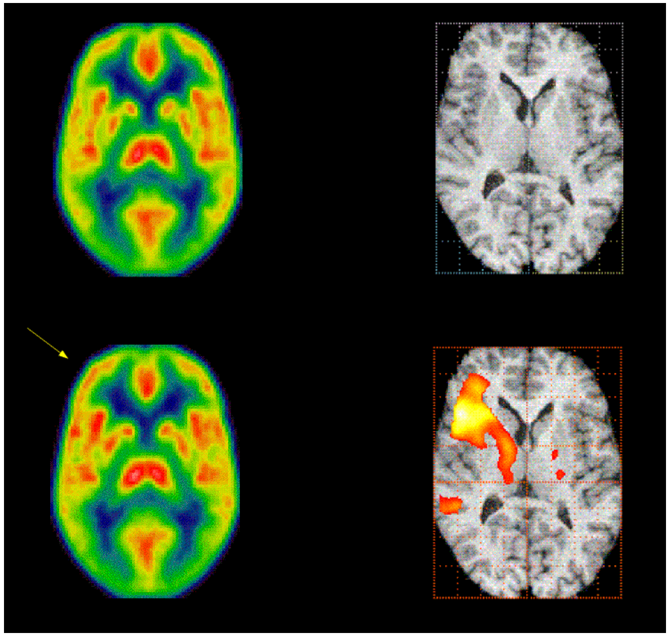


Funktion des Gehirns: Anpassung des Verhaltens an die materielle und soziale Umwelt. Fitness Maximierung

Brain Imaging: 80er Jahre: Positronen Emissions Tomographie (PET)

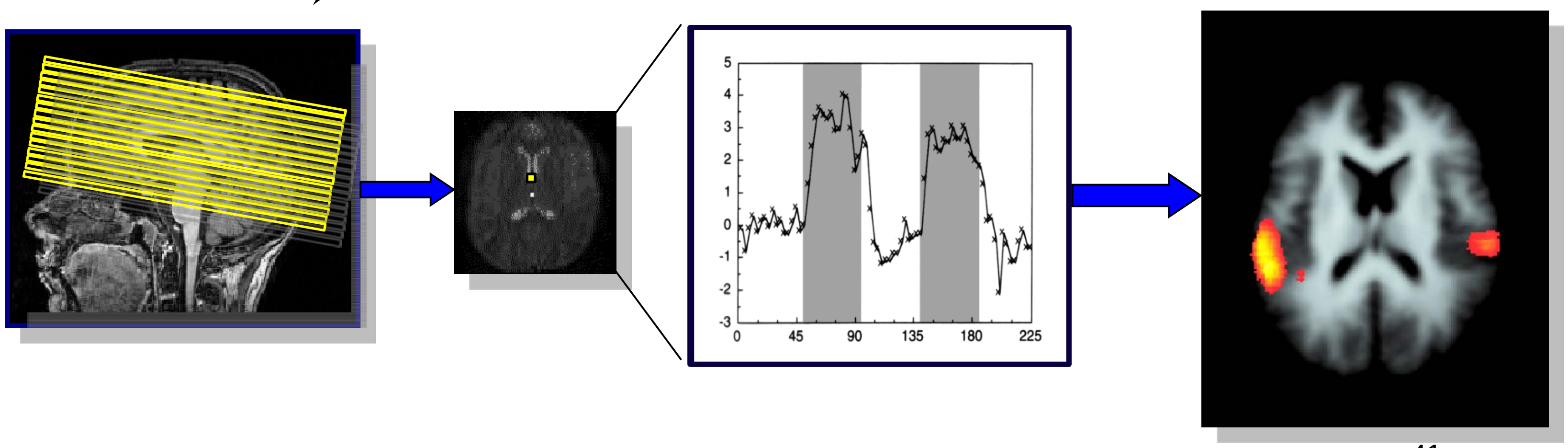
Marcus Raichle (St. Louis)





Brain Imaging: 90er Jahre: Magnetresonanz Tomographie/Imaging (MRT/MRI)

Seiji Ogawa / fMRI



- **Nobelpreis für Medizin 2014**

Edvard I. Moser

May-Britt Moser

John O‘Keefe

Place and Grid Cells in the Hippocampus: Are there GPS signals in the brain?

The Seductive Allure of Neuroscience Explanations

Deena Skolnick Weisberg, Frank C. Keil, Joshua Goodstein,
Elizabeth Rawson, and Jeremy R. Gray

Abstract

■ Explanations of psychological phenomena seem to generate more public interest when they contain neuroscientific information. Even irrelevant neuroscience information in an explanation of a psychological phenomenon may interfere with people's abilities to critically consider the underlying logic of this explanation. We tested this hypothesis by giving naïve adults, students in a neuroscience course, and neuroscience experts brief descriptions of psychological phenomena followed by one of four types of explanation, according to a 2 (good explanation vs. bad explanation) × 2 (without neuroscience vs. with neuroscience) design. Crucially, the neuroscience information was irrelevant to the logic of the explanation, as confirmed by the expert subjects. Subjects in all three groups judged good explanations as more satisfying than bad ones. But subjects in the two nonexpert groups additionally judged that explanations with logically irrelevant neuroscience information were more satisfying than explanations without. The neuroscience information had a particularly striking effect on nonexperts' judgments of bad explanations, masking otherwise salient problems in these explanations. ■

The Journal of Cognitive Neuroscience, 2008

Beispiel: The Curse of Knowledege

Researchers created a list of facts that about 50% of people knew. Subjects in this experiment read the list of facts and had to say which ones they knew. They then had to judge what percentage of other people would know those facts. Researchers found that the subjects responded differently about other people's knowledge of a fact when the subjects themselves knew that fact. If the subjects did know a fact, they said that an inaccurately large percentage of others would know it, too. For example, if a subject already knew that Hartford was the capital of Connecticut, that subject might say that 80% of people would know this, even though the correct answer is 50%. The researchers call this finding "the curse of knowledge."

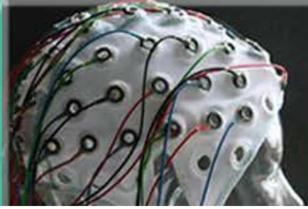


Table 1. Sample Item

	Good Explanation	*Bad Explanation*
Without Neuroscience	The researchers claim that this "curse" happens because subjects have trouble switching their point of view to consider what someone else might know, mistakenly projecting their own knowledge onto others.	The researchers claim that this "curse" happens because subjects make more mistakes when they have to judge the knowledge of others. People are much better at judging what they themselves know.
With Neuroscience	**Brain scans indicate** that this "curse" happens because **of the frontal lobe brain circuitry known to be involved in self-knowledge.** Subjects have trouble switching their point of view to consider what someone else might know, mistakenly projecting their own knowledge onto others.	**Brain scans indicate** that this "curse" happens because **of the frontal lobe brain circuitry known to be involved in self-knowledge.** Subjects make more mistakes when they have to judge the knowledge of others. People are much better at judging what they themselves know.

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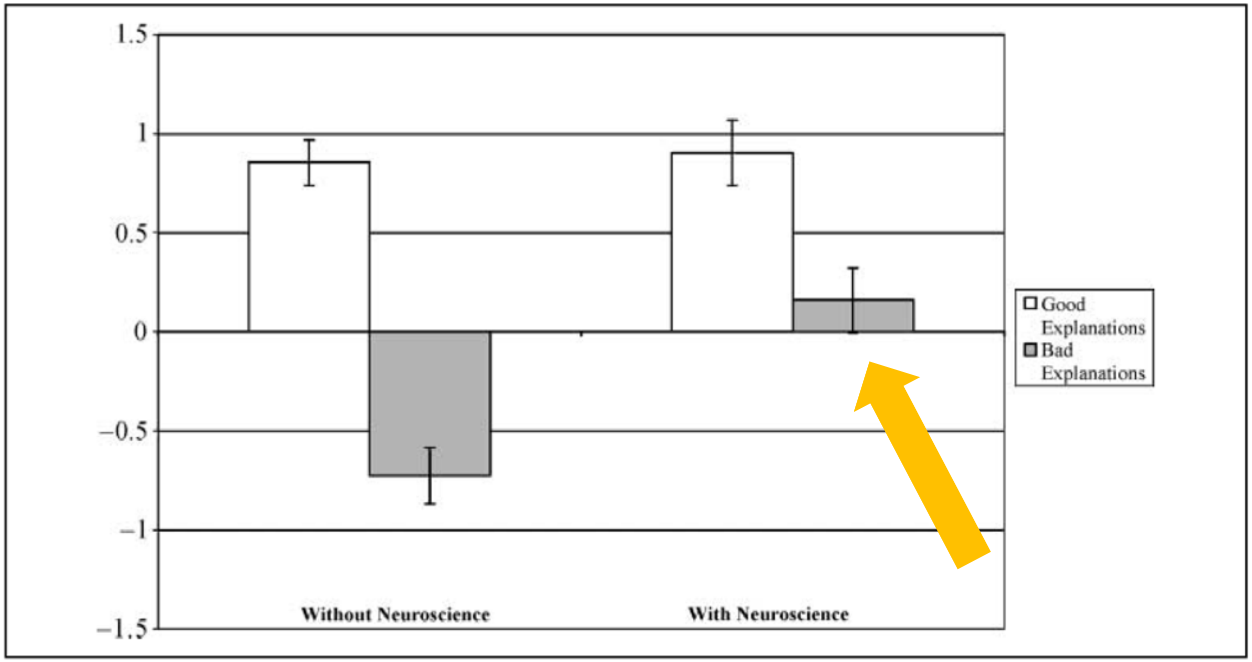
The neuroscience information is highlighted here, but subjects did not see such marking.

- N=81 Novizen, 22 Studenten, 48 Experten
- 18 Phänomene, 4 Bedingungen, 7-point-rating scale
- Neuroscience: Bekannte Gehirnregion, keine Änderungen der guten (schlechten) Erklärungen.

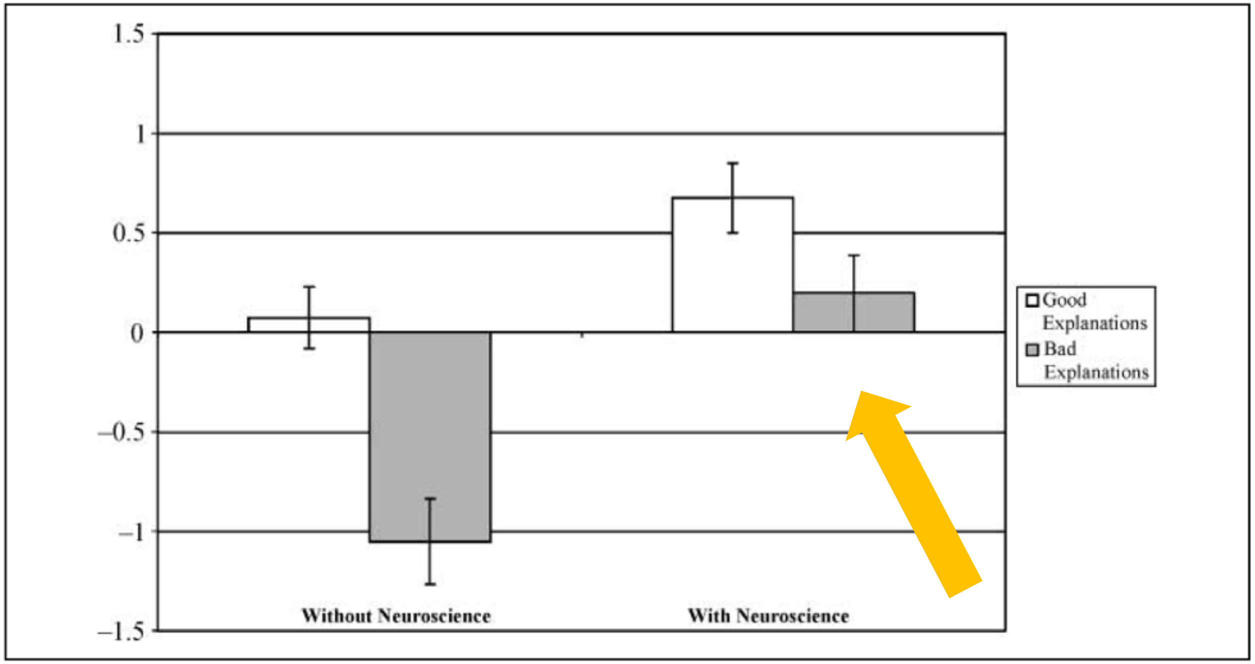
Novizen

Figure 1. Novice group. Mean ratings of how satisfying subjects found the explanations. Error bars indicate standard error of the mean.



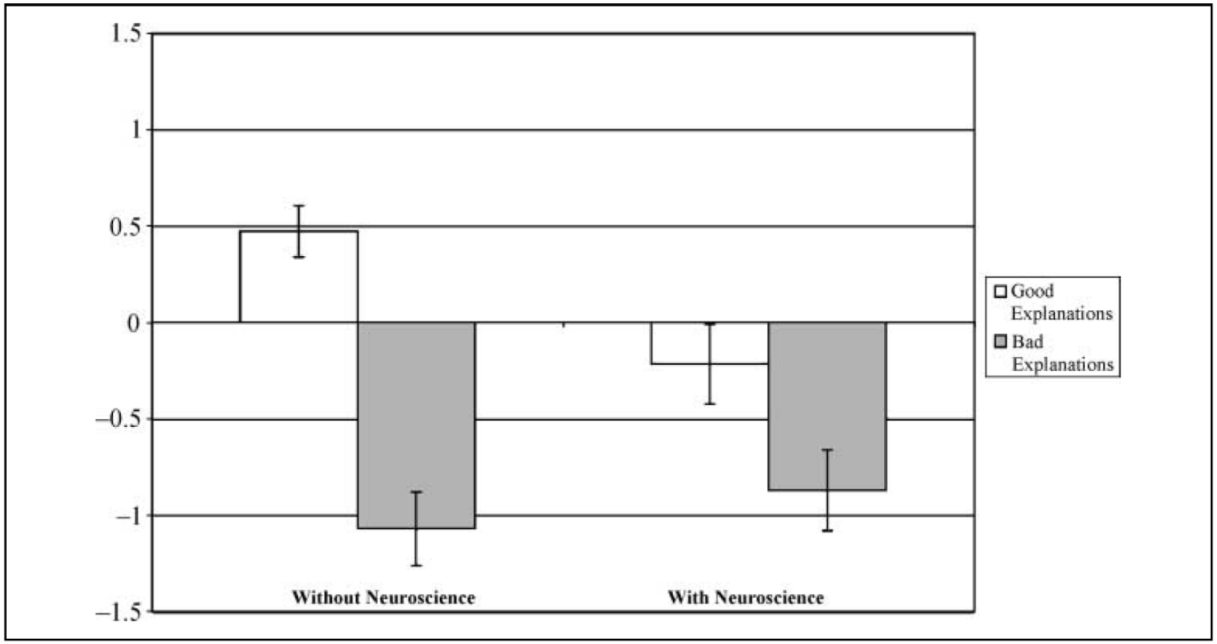
Studenten

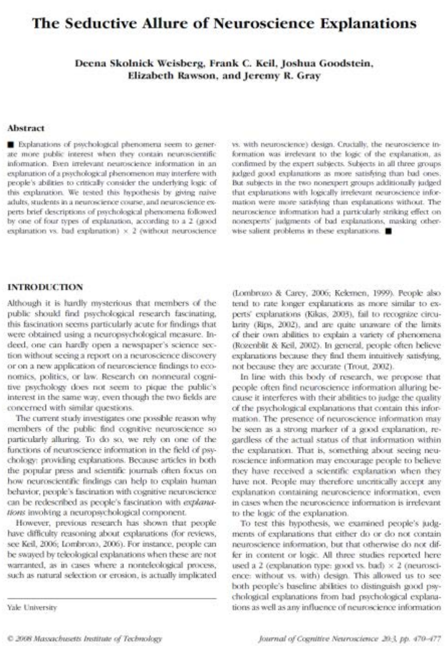
Figure 2. Student group. Mean ratings of how satisfying subjects found the explanations. Error bars indicate standard error of the mean.



Experten

Figure 3. Expert group. Mean ratings of how satisfying subjects found the explanations. Error bars indicate standard error of the mean.





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INTRODUCTION

Although it is hardly mysterious that members of the public should find psychological research fascinating, this fascination seems particularly acute for findings that were obtained using a neuropsychological measure. Indeed, one can hardly open a newspaper's science section without seeing a report on a neuroscience discovery or on a new application of neuroscience findings to economics, politics, or law. Research on nonneural cognitive psychology does not seem to pique the public's interest in the same way, even though the two fields are concerned with similar questions.

The current study investigates one possible reason why members of the public find cognitive neuroscience so particularly alluring. To do so, we rely on one of the functions of neuroscience information in the field of psychology: providing explanations. Because articles in both the popular press and scientific journals often focus on how neuroscientific findings can help to explain human behavior, people's fascination with cognitive neuroscience can be redescribed as people's fascination with *explanations* involving a neuropsychological component.

However, previous research has shown that people have difficulty reasoning about explanations (for reviews, see Keil, 2006; Lombrozo, 2006). For instance, people can be swayed by teleological explanations when these are not warranted, as in cases where a nonteleological process, such as natural selection or erosion, is actually implicated (Lombrozo & Carey, 2006; Kelemen, 1999). People also tend to rate longer explanations as more similar to experts' explanations (Kikas, 2003), fail to recognize circularity (Rips, 2002), and are quite unaware of the limits of their own abilities to explain a variety of phenomena (Rozenblit & Keil, 2002). In general, people often believe explanations because they find them intuitively satisfying, not because they are accurate (Trout, 2002).

In line with this body of research, we propose that people often find neuroscience information alluring because it interferes with their abilities to judge the quality of the psychological explanations that contain this information. The presence of neuroscience information may be seen as a strong marker of a good explanation, regardless of the actual status of that information within the explanation. That is, something about seeing neuroscience information may encourage people to believe they have received a scientific explanation when they have not. People may therefore uncritically accept any explanation containing neuroscience information, even in cases when the neuroscience information is irrelevant to the logic of the explanation.

To test this hypothesis, we examined people's judgments of explanations that either do or do not contain neuroscience information, but that otherwise do not differ in content or logic. All three studies reported here used a 2 (explanation type: good vs. bad) × 2 (neuroscience: without vs. with) design. This allowed us to see both people's baseline abilities to distinguish good psychological explanations from bad psychological explanations as well as any influence of neuroscience information

Yale University

Journal of Cognitive Neuroscience 20:3, pp. 470–477

? Neurowissenschaftliche Erklärungen sehen wissenschaftlicher aus

? Effekt verlockender Details (seductive details effect)

Aufwertung schlechter Erklärungen durch neurowiss. Sachverhalte

? Verlockende Effekte bunter Brain Scans

Implikationen darüber wie neurowissenschaftliche Information in und außerhalb des Labors verwendet wird