

# Cerebral Asymmetry and Psychiatry

Facts vs. Fiction

Godehard Oepen, MD, PhD, DLFAPA

APPA Spring Meeting April 23-24, 2021  
Montgomery, AL

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## Disclaimer

- The author has been a speaker for drug companies (Allergan, Teva, Takeda, Merck, Otsuka, Lundbeck)
- No significant conflicts are declared regarding this talk
- Drugs will be mentioned in generic terms if at all
- Ethical guidelines will be followed

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## Overview

- Review of the **History of Hemispheric Asymmetry Research**, Specialization and Dominance (Wigan, Flor-Henry, Gazzaniga)
- “**One consciousness - Two Minds**”? Gazzaniga, the LH interpreter (the brain as story-teller), the role of the RH
- “**Fake News**”: How Pop-Culture nearly killed Brain Asymmetry Research – but not **Enduring Facts of Brain Asymmetry**
- Findings of **Abnormal Asymmetry in Mental Illness**, Drug Use, and Menstrual Cycle changes: Dynamic Role of the RH
- Further Relevance for Concepts of Personality, Empathy, Delusions, Mental Health, and Transcendence

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## Heuristic Concepts in Psychiatry

### Cerebral Asymmetry : An integrative unifying Concept

- **Ancient Times:** Patients are seen as "possessed" by Gods, demons, spirits and the devil, voices (AH) & Visions (VH) "ok"  
 ● Treatments: ranging from benign (shamanism, exorcism) to terrible (burning witches), "*The Mystery of the unknowable God heals*"
- **Romantic Era, Psychoanalysis:** Carus' Discovery of the Unconscious, Janet's Multiple Personalities, Bateson's Double Bind, schizophrenogenic mother, life script, Jung's Symbols:  
 ● Treatment: Psychotherapy/Psychoanalysis, "*Conscious Insight heals*"
- **Exorcising the Subject from Subjective Disorders:** Molecular Psychiatry, DSM Checklist Disorders – danger of "Reification" (ADHD, Social Anxiety disorder): Broken Brain - "*Drugs heal*"
- **RH/LH Asymmetry:** a unifying framework for Behavioral Syndromes

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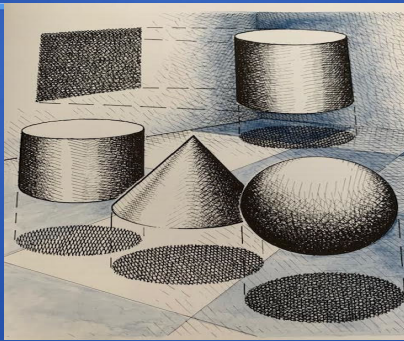
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## Perspective Matters: "Truths"




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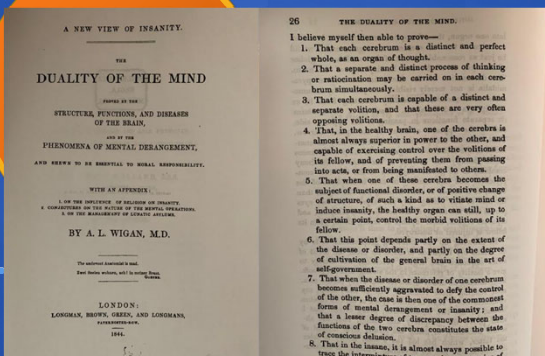
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## Arthur L. Wigan 1844




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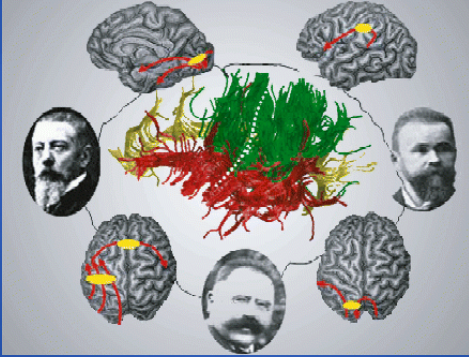
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The pioneers of disconnection syndromes



Carl Wernicke, Hugo Liepmann, Jules Dejerine

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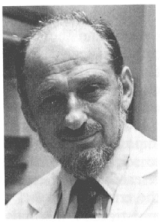
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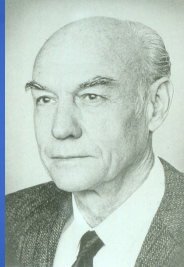
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The new pioneers of disconnection



Norman Geschwind



Roger Sperry



Joe Bogen

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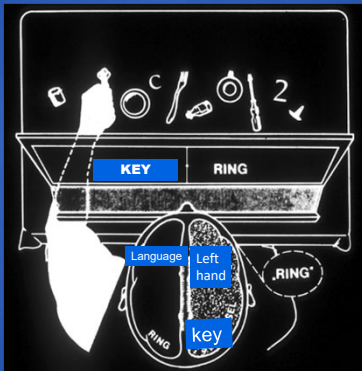
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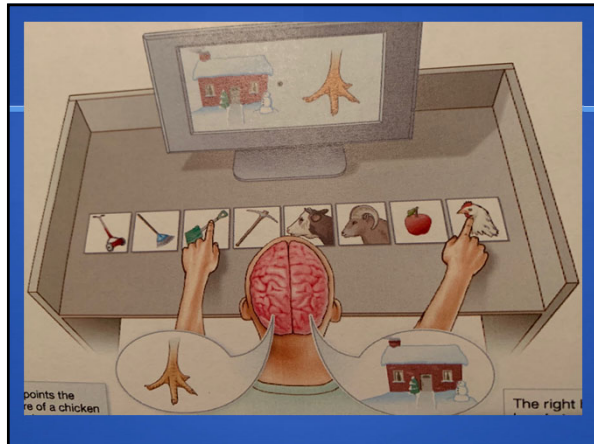
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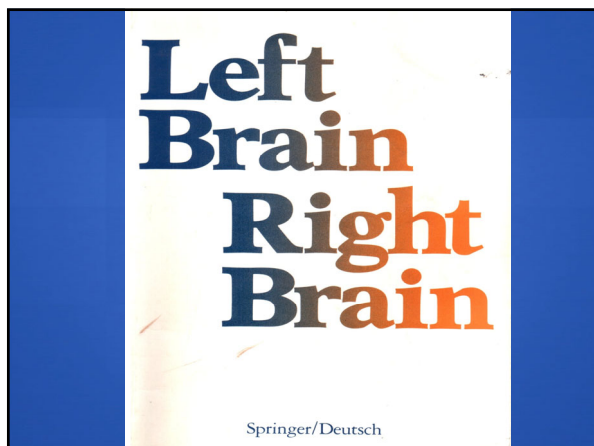
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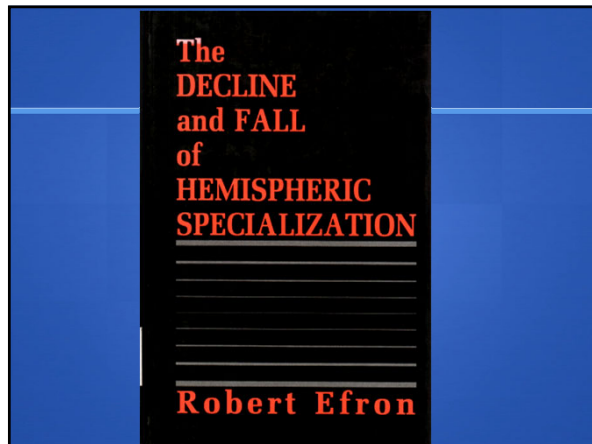
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### So does the Hype mean it's all a Hoax?

- No! The critics threw out the Baby with the bathwater!
- There are undisputed different types of cerebral asymmetries
- Asymmetries are at least 30,000 years old and found in Zebra fish, Frogs, Rats, and especially Primates
- Functional Asymmetries are dynamic, flexible & task dependent, vary with the menstrual cycle, & training
- Training changes structural & functional asymmetry: Thicker ant. callosal fibers & greater LH rhythm dominance in percussionists
- Mental Illness seems to correlate with
  - reduced asymmetry and a
  - loss of flexibility to chose between LH/RH modes

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### Laterality Myths

- "Laterality is specifically HUMAN":
  - NO: Brain Asymmetry is old and the rule in most animals, from mammals (esp. primates) down to frogs & Zebrafish (LH advantage for communications)
- "Laterality is folklore & a fad":
  - Au contraire: Recent data show it's relevant heuristically and therapeutically: RH ECT/TMS, Talk-down Tx, hypnosis, CVS for contralateral hem. activation, asymmetrical drug actions ...
- "Laterality is not clinically relevant":
  - YES IT IS: Capgras/Fregoli- & Cotard syndromes are due to RH deficits, and so are mirror agnosia (own reflection believed to be alien), asomatognosia (body part denied as one's own), anosognosia and abnormal salience in psychosis (Konrad's "increase of affective base level" in prodromal schizophrenia)
  - Helpful for bottom-up nosology to replace descriptive top-down DSM
  - Allows testable hypotheses
  - Allows to design more specific treatments and gen mapping as needed for Rdoc Matrix system

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## Structural/Functional Asymmetry

### • Structural Asymmetries

- Planum Temporale: bigger in LH than RH
  - True not just in humans, but also in primates
  - LH suppressed RH!
- Superior Temporal Sulcus;
  - bigger in RH than LH
- **Yakovlev-Torque:**
  - Frontal Lobe bigger in RH
  - Occipital Lobe bigger on LH

### • Functional Asymmetrie

- **Handedness:** LH speech dominance in 95% of R-handers and 75% of L-handers
- **RH dominance** for melodies in humans and songbirds
- **LH dominance** for vestibular functions in rats; human speech
- **Methods:** Anatomy, DVF-Tests, Dichotic Listening, Chimeric Faces, Brain Imaging

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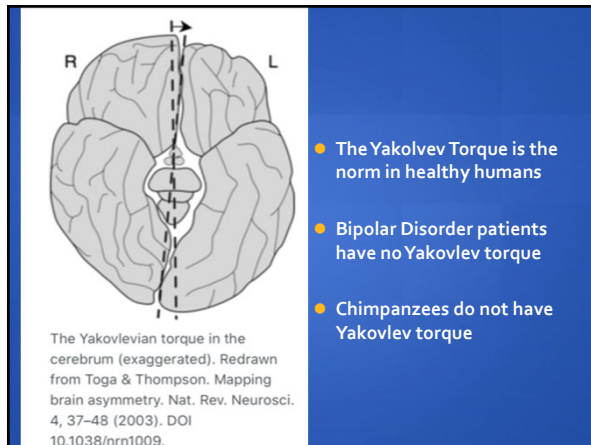
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- The Yakovlev Torque is the norm in healthy humans
- Bipolar Disorder patients have no Yakovlev torque
- Chimpanzees do not have Yakovlev torque

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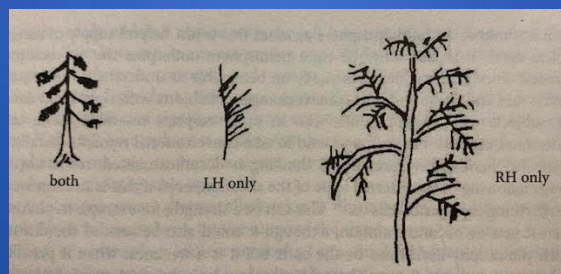
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## RH is superior for Visual Processing




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## Interhemispheric Inhibition Is a Basic Principle




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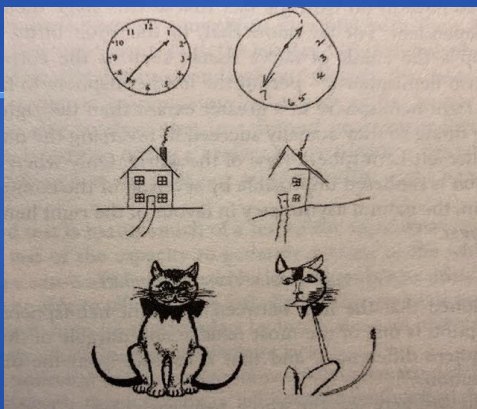
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## So what are the Facts?

- Hemispheric Asymmetry is both **structural and functional**
- Functional Asymmetry is **dynamic**
- Transcallosal inhibition can change via training, culture (art!), trauma/ACE's
- Methods to assess Hemispheric Asymmetry include
  - Anatomy/Imaging
  - tachistoscopic Divided Visual Field tests
  - Gaze direction, mouth opening
  - Dichotic Listening tests
  - Hand preference/motor skills
  - EEG, SPECT, PET, fMRI
- Hemispheric Asymmetry is an OLD principle: > 10,000 yrs (birds, mammals)
- Both Hemispheres are omnipotent, but specialized
- Strong-Handers (right more than left-handers) are more asymmetric
- Symmetric Planum Temporale (PT) are the size of the LH PT, i.e. LH exerts dominance via *suppression of the RH* (not hypertrophy of LH > RH)
- Schizophrenia, Bipolar Disorder, Autism: show *less asymmetry*
- Similarly, confirmed **Abnormal Laterality in Major Mental Illness, Drug Abuse, Psychopathy**

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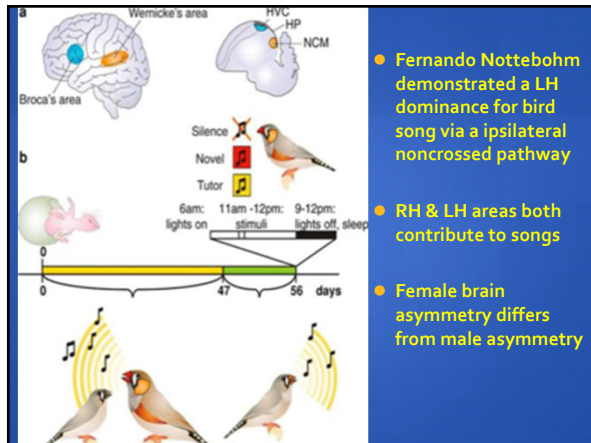
## F. i. Music: "RH", LH - or BOTH?

- RH Musical Functions
  - Pitch
  - Melody
  - Prosody
  - Meter
  - Expression
  - Gestalt
  - Quart/Fourth: Consonant
- LH Musical Dominance
  - Rhythm
  - Intervals
  - Tact
  - Reading Sheet Music
  - Details
  - Accuracy
  - Quart/Fourth: Dissonant

Oepen, G., Berthold H., Thoden U. Musikalität und Sprache. Psycho 1992 (Suppl.): 46-47

Oepen, G., Berthold H. Häufigkeit und Art anisotischer Störungen nach unterschiedlichen Hirnlesionen. In: Musik in der Medizin/Music in Medicine. R. Sprengel, R. Doh (Hrsg.) Springer Verlag Heidelberg, 1987:277-287

Oepen, G., Berthold H. Die besondere Rolle der Quart - Ergebnisse einer klinischen Amusie-Studie. Musiktherapeutische Umschau 1985:6:281-286



## Attitude and Training Effects

- Listening to Beethoven's 5<sup>th</sup> Symphony in a "layman's attitude": relaxed, relishing the waves of cords, melodies and rhythm ... "gorgeous"!
- This attitude leads to **RH activation** and global/emotional processing of this music
- Lay People who love music
- New/first experience (f.i. piano)
- Listening to B's 5<sup>th</sup> Symphony in a "Violinist's Attitude": "ah, Ben Zander takes Beethoven's fast metronome numbers literal, dynamics still develop precisely, the cello came in late"
- This leads to a **LH dominance** mode, with attention to many details
- Professional Musicians
- "It's a Choice ...": Flexible RH /LH mode
- Expert level of now familiar activities

## LH stroke: A RH world

### Stroke

- On the morning of Dec 10 1996 Dr. Jill Bolte Taylor suffered from a massive left hemisphere hemorrhage as a result of congenital blood vessel malformation:
  - I remember that first day of the stroke with terrific bitter-sweetness. In the absence of the normal functioning of my left orientation association area, my perception of my physical boundaries was no longer limited to where my skin met air.
  - I felt like a genie liberated from its bottle. The energy of my spirit seemed to flow like a great whale gliding through a sea of silent euphoria.
  - This absence of physical boundary was one of glorious bliss.
    - Taylor, JB (2008). *My stroke of insight: a brain scientist's personal journey*. New York: Viking Penguin.

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## "Wild Bill" William Douglas




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## RH stroke: A LH world!

- In 1974, William O. Douglas, Associate Supreme Court Justice, suffered a RH stroke
- He recovered quickly, checked himself out of rehab
- In court he **dozed and asked irrelevant questions and rambled on**. He was asked to resign----- *"he came back to his office, buzzed for his clerks and asked to participate in, draft, and even publish his own opinions separately; and he requested that a tenth seat be placed at the Justices' bench."* (Gardner, 1982)
- Symptoms: Anosognosia, rigid opinion, self-righteous, unable to change view/mind-set, concrete, literal

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## Abnormal Laterality in Schizophrenia and Autism: Broader Context

- In patients with **schizophrenia** and in people with **Autism**, there is an observation of **significantly more left-handedness, mixed-handedness, male gender, and immune disorders**
- This points to a likely **connection of these factors** (Norman Geschwind)

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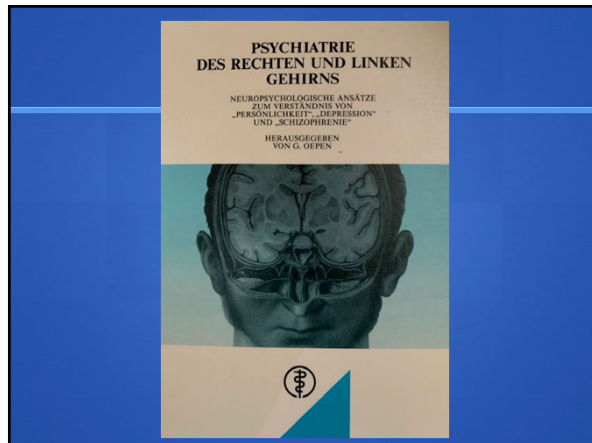
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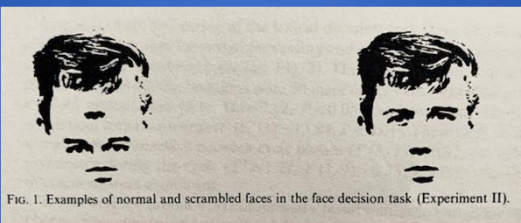
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## Face-Non-Face Decision




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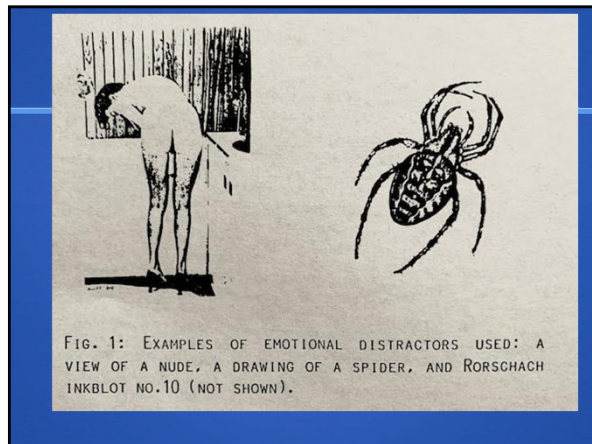
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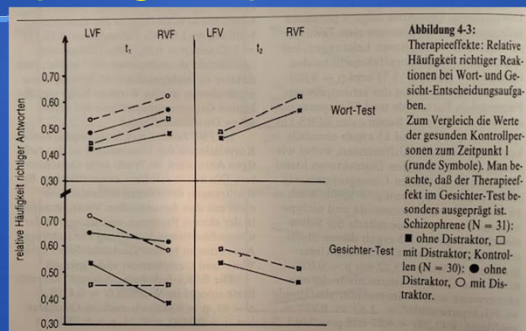
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## Antipsychotics: Asymmetric Effect - Improving mostly RH Performance




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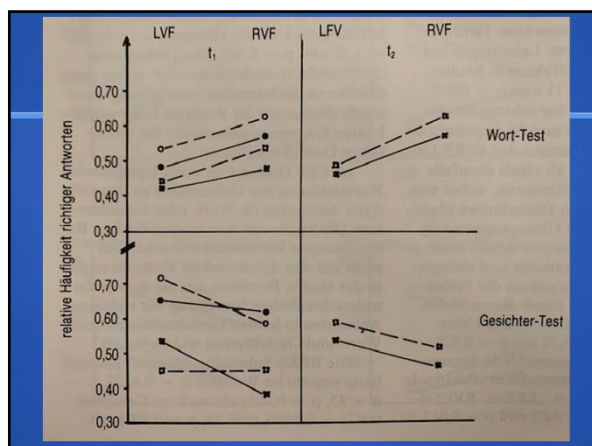
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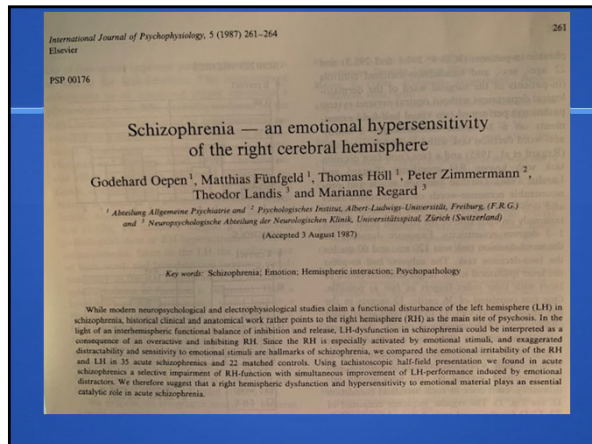
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## Abnormal RH overactivity & LH suppression in Acute Psychosis:

- Evidence for **both RH overactivation** (hyperarousal, fear) and **RH dysfunction** (unchecked LH stories to explain anomalous experiences, i.e. delusions, f.i. Capgras syndrome, or Nash's polythematic delusions)
- Evidence for **poor LH function, possibly secondary to RH overactivity via transcallosal inhibition**
- Reversing this pattern - **activating the LH** (by "talking-down" in drug-induced psychosis, or cold CVS of the Right Ear in Babinski syndrome) may temporarily suppress the RH and thus reduce psychotic symptoms

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## Mescaline: RH > LH Activation

Reprinted from  
Elsevier

### Right Hemisphere Involvement in Mescaline-Induced Psychosis

G. Oepen, M. Fünfgeld, A. Harrington, L. Hermle, and H. Botsch

In a pilot study involving six male healthy volunteers (mean age = 37.5), ingestion of 0.5 mg mescaline sulphate led to a florid psychedelic experience and striking changes in hemispheric dynamic balance. The nature and intensity of this artificial psychosis was assessed throughout the experiment using the Brief Psychiatric Rating Scale (BPRS) at ½ hour, 1½ hours, 3½ hours, and 7 hours after drug intake. After each such psychiatric assessment, subjects were required to perform a visual half-field task on a three-channel tachistoscope: a face/nonface decision task with known right

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## Mescaline: RH stimulation

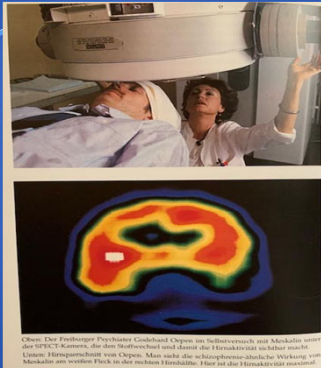







Fig. 1. Effect of mescaline in normal controls

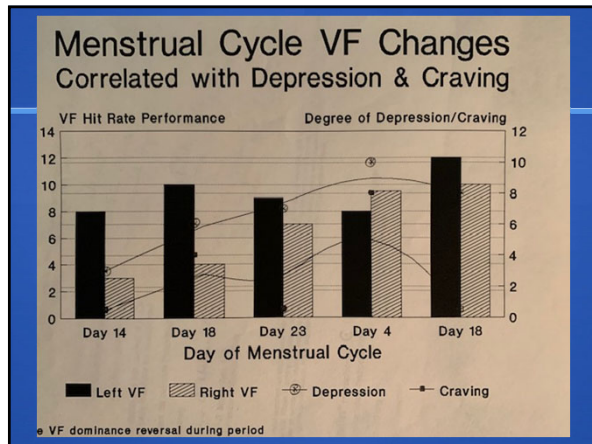
TRIALS	FT	BPRS	SPECT
	mean freq correct LVF RVF		
t <sub>0</sub>		$\bar{X} = 19.50$ $Sx = 1.52$	Ø
t <sub>1</sub> 40-60 min		$\bar{X} = 26.33$ $Sx = 6.71$	Ø
t <sub>2</sub> 95-115 min		$\bar{X} = 33.00$ $Sx = 10.32$	Ø
t <sub>3</sub> 225-245 min		$\bar{X} = 36.50$ $Sx = 10.27$	sign. CBF-increase in basal ganglia of the RH (p < .036)
t <sub>4</sub> 430-450 min		$\bar{X} = 30.17$ $Sx = 4.22$	Ø

Changes of tachistoscopic hemifield advantage, Brief Psychiatric Rating Scale (BPRS) and SPECT are shown for baseline and time intervals T1-T4. Right hemisphere, left visual field (LVF) performance of correct face recognition deteriorates steadily with increasing psychopathological features (assessed by BPRS) while LVF performance goes up (simultaneous left hemisphere release). After the peak of the psychosis at T3, revealing significant alterations of right hemisphere blood flow using SPECT, these changes begin to reverse at T4 and return to the pattern seen at baseline (T1).

## Lateralization in women varies across the menstrual cycle

Laterality is **dynamic**, regulated by external and internal factors (f.i. hormones)






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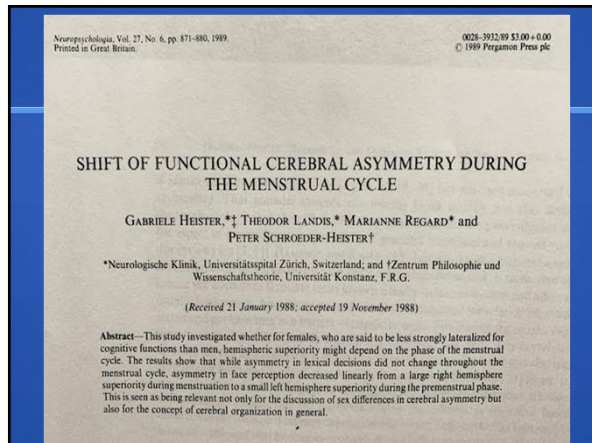
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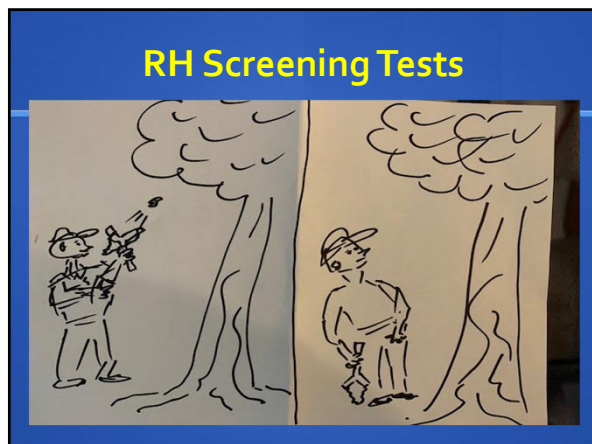
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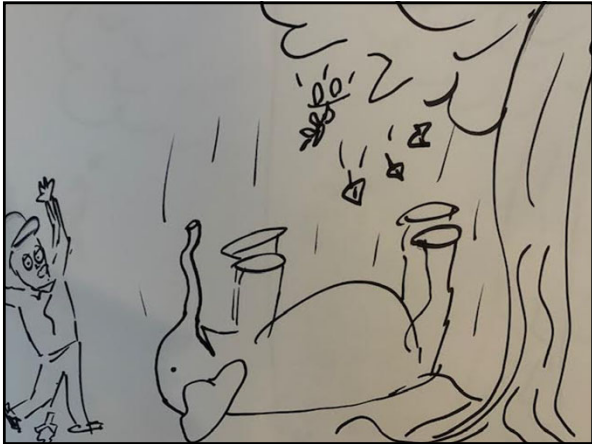
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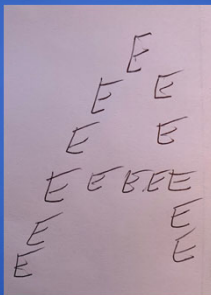
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## Describe what you see




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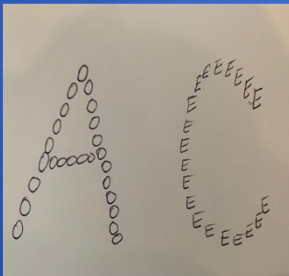
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## LH vs. RH Perception



- A patient with **LH damage** will correctly identify the dominant concept of "**A**" and "**C**", as the RH is working well
- A patient with **RH damage** will describe seeing a lot of "**O**'s" and "**E**'s" but miss the large letter concepts
- Similarly, RH damaged pts. are **unable to tell lies from jokes**, and **don't understand idioms or metaphors** (literalism & concretism); proverbs: concrete

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## Gestalt: The whole is more than the sum of its parts (RH>LH)




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## The "Thatcher Effect"

*Orientation-specific RH perception of facial emotional expressions: the immediate "AHA"-effect*




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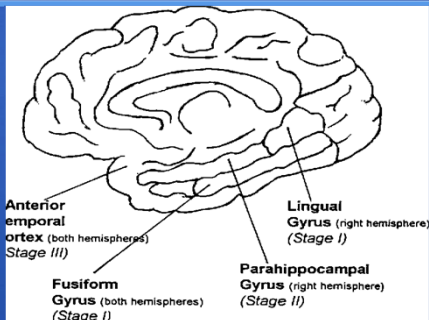
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## RH > LH: Face recognition areas




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## "Organic Capgras Syndrome"

- ◆ Brain lesions causing Capgras Syndrome involve **Bilateral (LH & RH) frontoparietal lesions**, or just **RH lesions**: RH dysfunction is pivotal! Capgras: a **DISCONNECTION SYNDROME**
- ◆ **Anosognosia (RH)** and **Confabulation (LH)** are part of it:
  - ◆ **Negative effects from RH frontal dysfunction** (Anosognosia/lack of boundaries/stimulus valence/familiarity) **combine with Positive effects from the disinhibited LH** (unleashed excessive and false explanations now unchecked) resulting in syndromes of **Delusional Misidentification: Capgras, Fregoli, Reduplicative Paramnesias**
- ◆ Capgras: A **LH Story** to explain "unfamiliar Mom: IMPOSTOR"!

Orrin Devinsky, Neurology 2009; 72(5)

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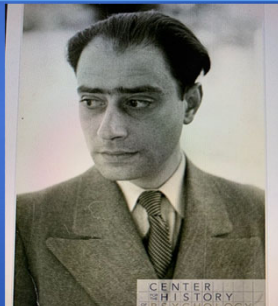
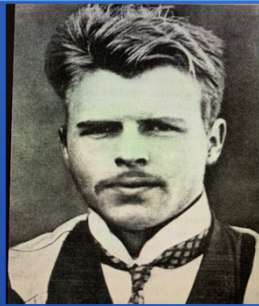
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## Hermann Rorschach and Werner Wolff, Pioneers of the Unconscious




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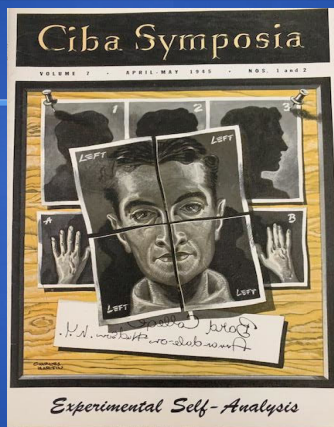
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## Experimental Psychoanalysis

Werner Wolff and his experimental psychology of the unconscious 1933/1945



- The **RH controls the left side** of the face, the LH the right side
- Asking people to recognize portraits shows they always identify their normal and chimeric RR-Faces as self, but at times **not their LL-Faces (RH)**
- When asked about **personality traits of their not-recognized LL-Selfportraits**, they ascribed **their repressed unconscious features to it ("a stranger")** that had taken months to reveal in analysis
- Pedophiles described to their unrecognized LL-face ("a stranger") their own pedophilic traits
- The **RH as the "Seat of the Unconscious"??**

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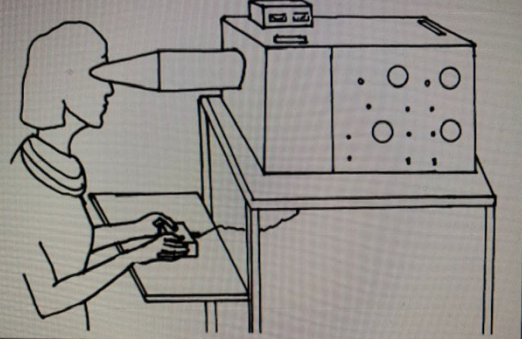


Fig. 1. Subject sitting in front of a 2-channel tachistoscope fixating on a center dot. An image is then flashed to the right or to the left of the fixation point for a very short time. The subject is asked to press the response buttons according to a given instruction.

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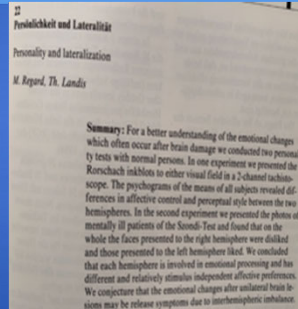
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## Different RH/LH Personality

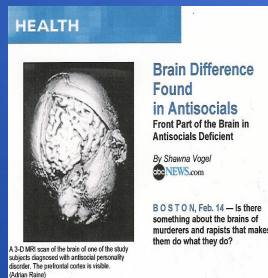
- Presentation of Rorschach Inkblots to the RH and LH in a Tachistoscope
- Blind rating of answers by world Rorschach specialist
- Answers of all LH and all RH presentations were more similar than the RH/LH answers of the same person
- This supports the concept of a RH personality different from a LH personality
- Goethe: "Two Souls, alas! are dwelling in my breast"



## Abnormal Laterality in "Hysteria"

- **Somatic symptoms** such as numbness or weakness of extremities **usually affect the left side of the body (governed by the RH)** in 2/3 of cases
- "La belle indifference" can be understood as a **deficit in awareness and significance (lost salience) caused by RH dysfunction**, similar to patients tendency after RH injury to minimize their symptoms (**anosognosia**)

## "Bad Brains" & Abnormal Laterality in People With "Antisocial Personality"?



- Damasio reports that **bilateral, right medial or right lateral prefrontal damage** are all associated with **social and moral defects** (RH dysfunction)
- **Reduced prefrontal gray matter, reduced autonomic reactivity and genetic factors** seen as most important, vs.
- **parenting, poverty or peer pressure** relatively less impact



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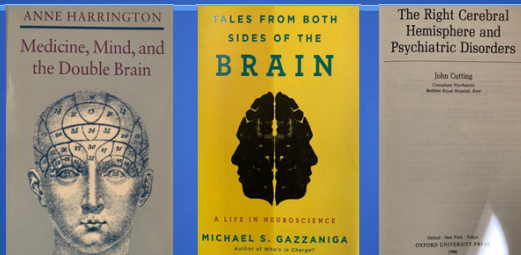
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## Books on Laterality




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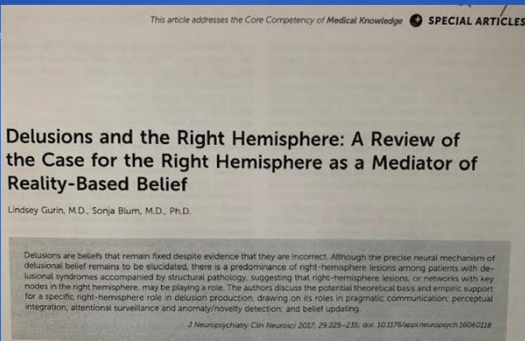
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## Current Concepts 2017




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## Delusions 1: RH Injury

Neuropsychiatry Clin Neurosci 29:3, 2017

Gurin and Blum J

- RH injury can lead to heteromodal perceptual integration deficits, deficient body image/boundaries, and a **disordered** basic "self"-experience
- The **sensory vacuum** is then filled with **imagined** or **remembered** experiences in a **LH effort to restore coherence**, at the expense of reality monitoring (**CONFABULATION**)
- So **Delusions** can be seen as a '**solution**' for **incomprehensible, incoherent multisensory experiences (Brendan Maher)** and are as such a "normal compensatory response"

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## Delusions 2: Two Factor Theory

- Most current Two-Factor-Theory of Delusions:
  - 1) A primary abnormal experience creates inconsistency in an explanatory model, which then the preserved LH tries to explain within the old model, at any cost
  - 2) The injured RH is unable to update/change beliefs/mental sets, unable to notice the bizarre nature of LH stories, and thus unable to "force a Kuhnian Paradigm Shift" in order to develop a new, more workable hypothesis. If anomalies are noted, they lack cognitive & emotional valence/salience (i.e. anosognosia!).

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## RH Impeachment?

- The RH functions (Pragmatic communications, perceptual integration, belief updating, attentional surveillance /selfmonitoring/anomaly detection) provide a RH-dominated grip on reality,
- which is lost with RH impairment, as often observed in Mental Illness (... and sometimes Politics?)
- However, "RH Dysfunction" remains a slippery suspect: present at the scene (of delusions) too often to be ignored as chance, but not often enough to be implicated directly :
- So the RH seems "Impeached - but not convicted" ...

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## Some Treatment Aspects

- RH-ECT, RH-TMS, antipsychotics (affecting RH>LH) to reduce pathological RH-overactivity
  - Evidence for RH emphasis of Haldol benefit (improving LVF/RH performance, and left-hand performance tests)
- Psychotherapy: "talking-down" Tx of drug-induced psychosis
- Overall: Let's Re-Introduce the Subject into the subjective syndromes

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## Asymmetry and Transcendence: RH Dominance

### The Neurobiology of Spiritual Purpose - Ronald Pies, MD

"There is no quality and there is no power of man that was created to no purpose."  
—Rabbi Moshe Lieb of Sasov

Are human beings "designed" to evince spiritual purpose? Is the human brain not merely a great, buzzing network of neurons, but also an organ of self-transcendence? If so, can we conclude that the movement toward spiritual and transcendental goals truly is our destiny?

- "... the capacity to achieve moral and spiritual purpose is very much a property of the human brain." (EO Wilson 1998)
- Human bonding is an activity of the RH (JP Henry 1997)
- RH is critical for feeling sympathy & empathy (Decety 2003)

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## Call for Change:

- Psychiatry has become an overly "left-hemispheric", check-list based discipline, with lots of details, data, "more of the same"
- We lost the bigger picture/context, the right-hemispheric creative aspect, the ability to change mental sets when needed
- Integrating a balanced RH/LH basis of our experience and behavior can help addressing our patient's subjective disturbances in a more humane and open way (using a "narrative approach")
- Under-used treatments such as (visual) art therapy, music therapy, Moreno's psychodrama, Milton Erickson's Trance inductions can help where "receptorology" fails
- Take time for listening, pauses, play, humor, surprises, enrich patient encounters with more right-hemispheric curiosity & wonder
- Tecum Message: **RH - DON'T LEAVE HOME WITHOUT IT!**

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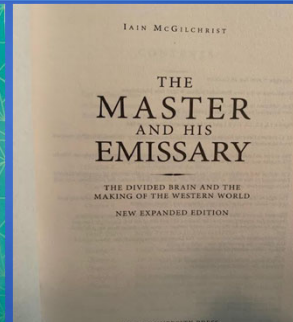
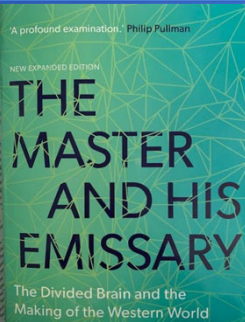
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## Cultural Implications 2019




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