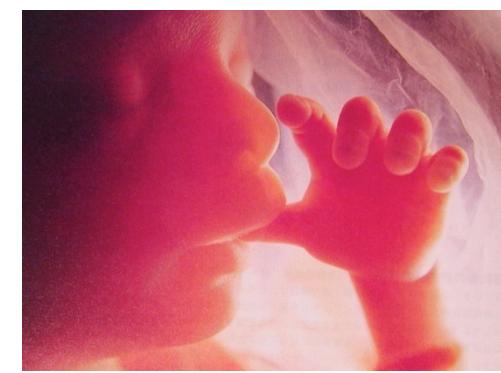


宇宙総合学研究ユニットセミナー
2010.9.28.

生命現象と電磁場



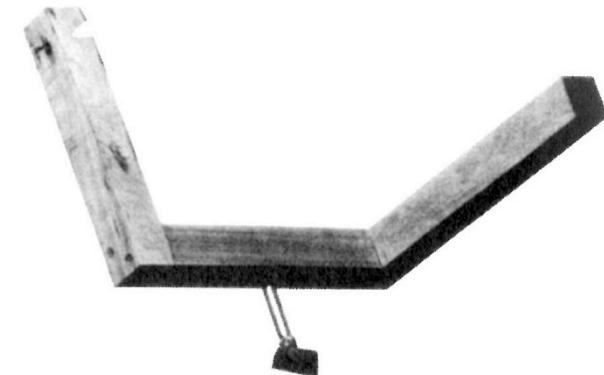
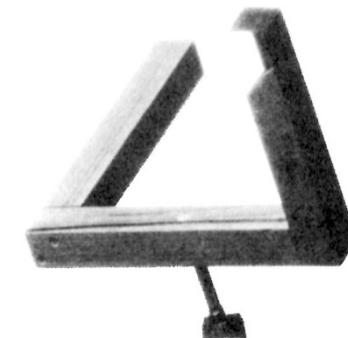
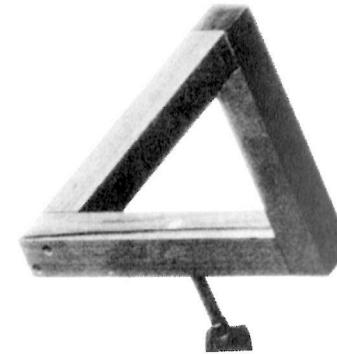
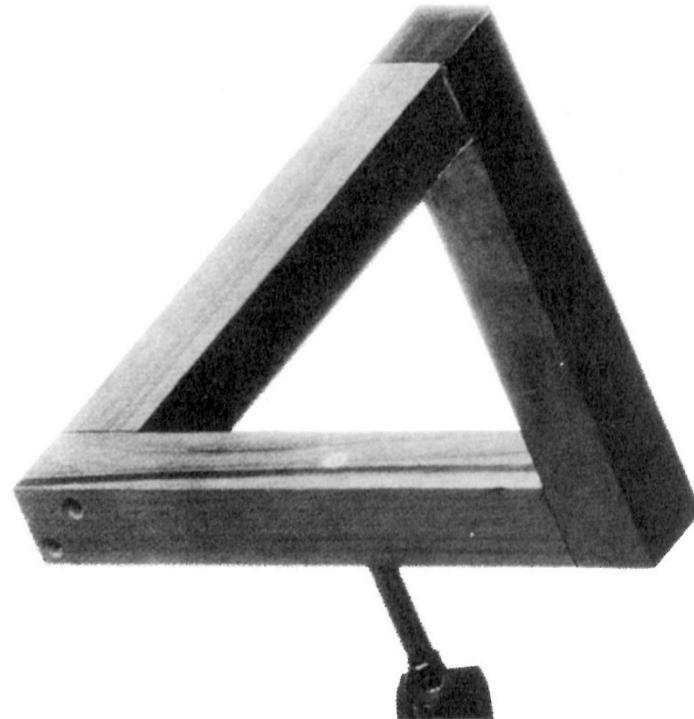
村瀬 雅俊
京都大学基礎物理学研究所

アポロ11号が月面から
撮影した「地球の出」

認識のイリュージョン —不可能な三角形—

前提：接触している対象物は観測者から等距離にある

誤った前提から逆接が導かれる

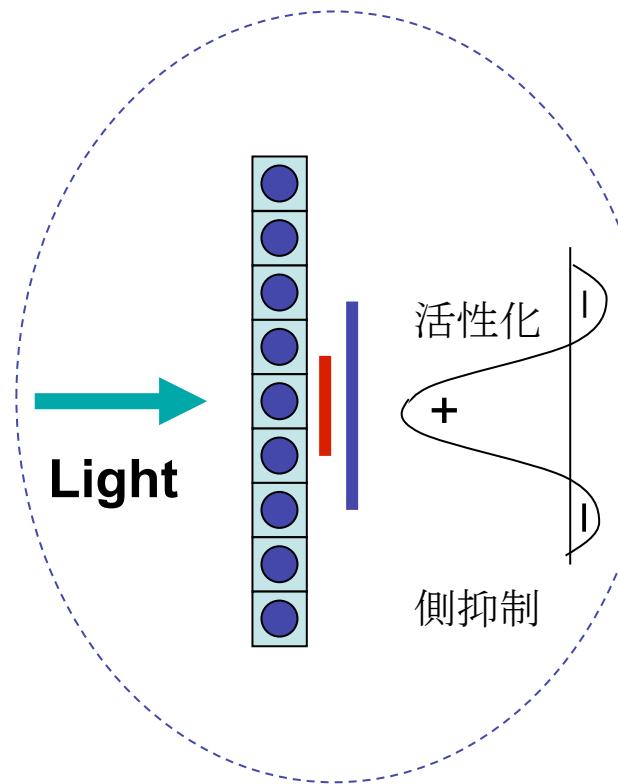
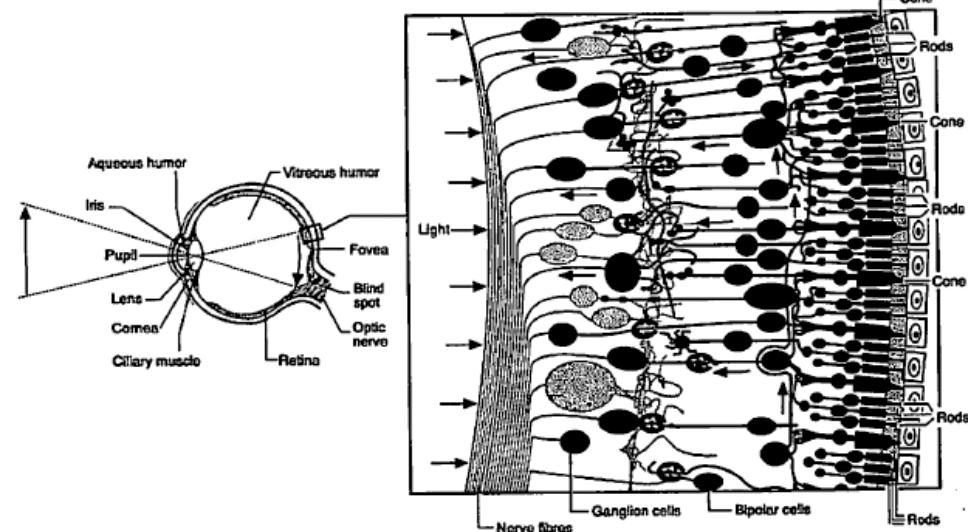
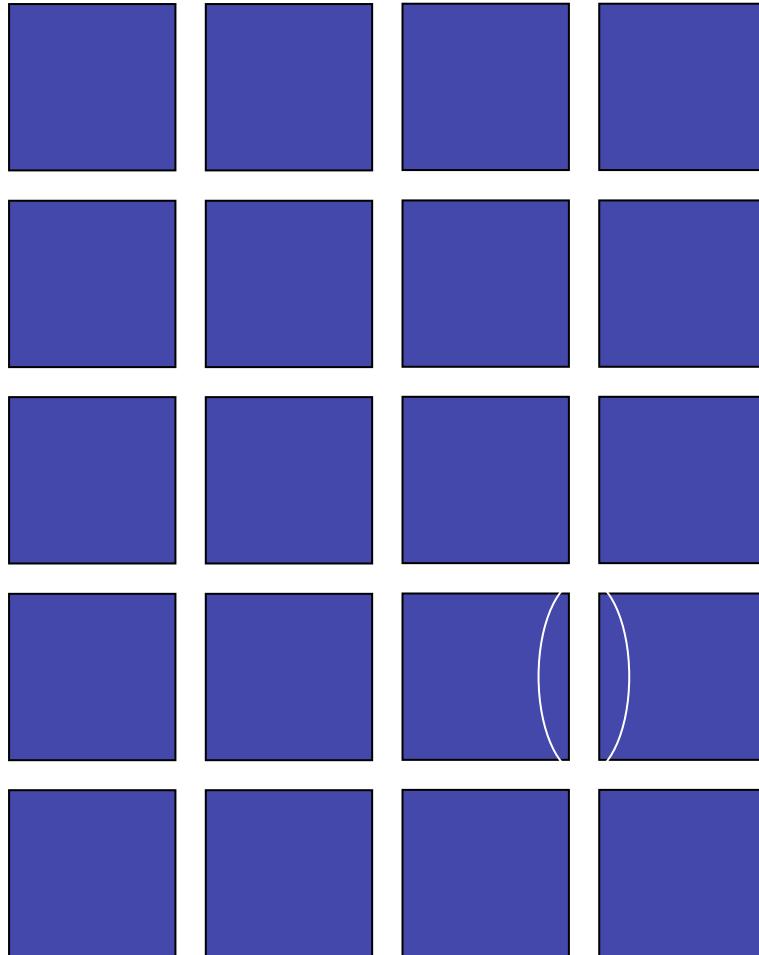


イギリスの遺伝学者リオネル・ペンローズと甥で宇宙物理学者のロジャー・ペンローズが 1958年に考案し、1967年にリチャード・グレゴリーが 3次元模型を構築。

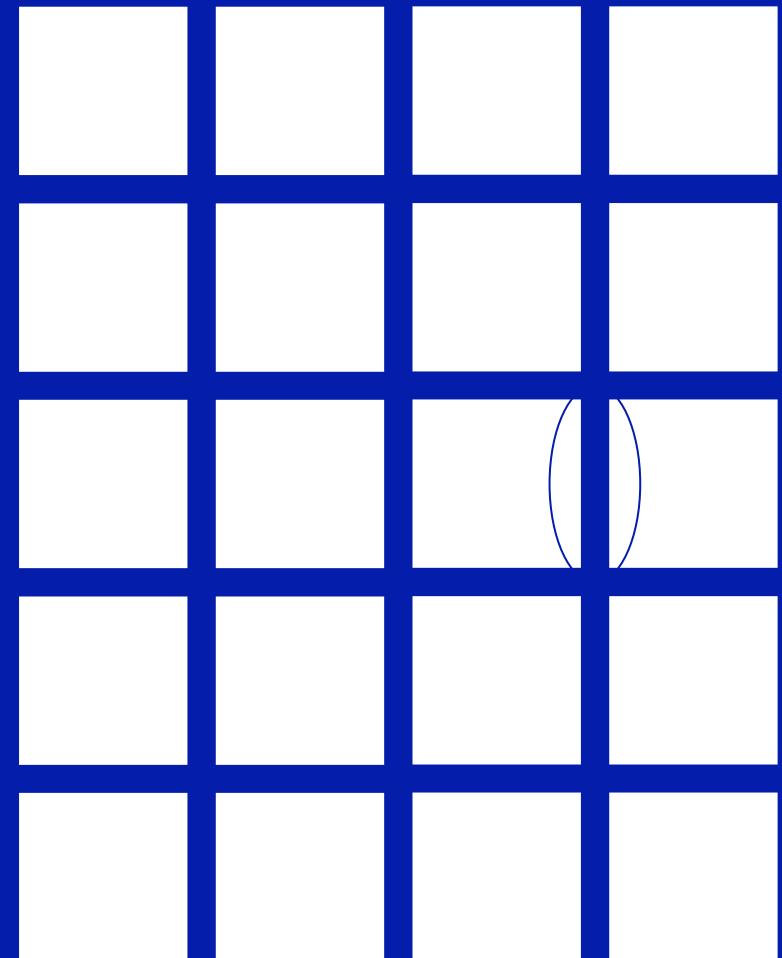
生命現象と電磁場

- 1) 知覚と運動のアナロジー
—自律性の獲得とその制御—
- 2) 環境からのインプリンティング
— 多様性と普遍性 —
- 3) インプリンティングとしての進化
— スケール不変性の発見 —
- 4) 決定論的進化論の検討
—自己組織臨界現象の可能性—
- 5) 電磁場の生体影響
— 学習過程と病気発症 —
- 6) 電磁場としての生命
— 物質還元論への反省 —
- 7) まとめ
—あらたな可能性に向けて

創発現象としての錯視



対立するシステムによる錯視

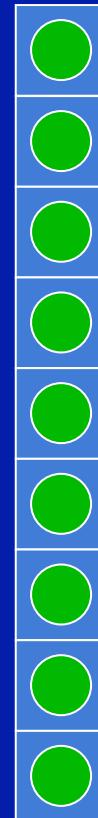


Light

Light

Light

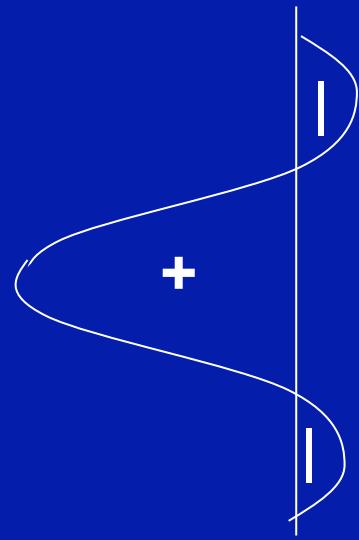
Light



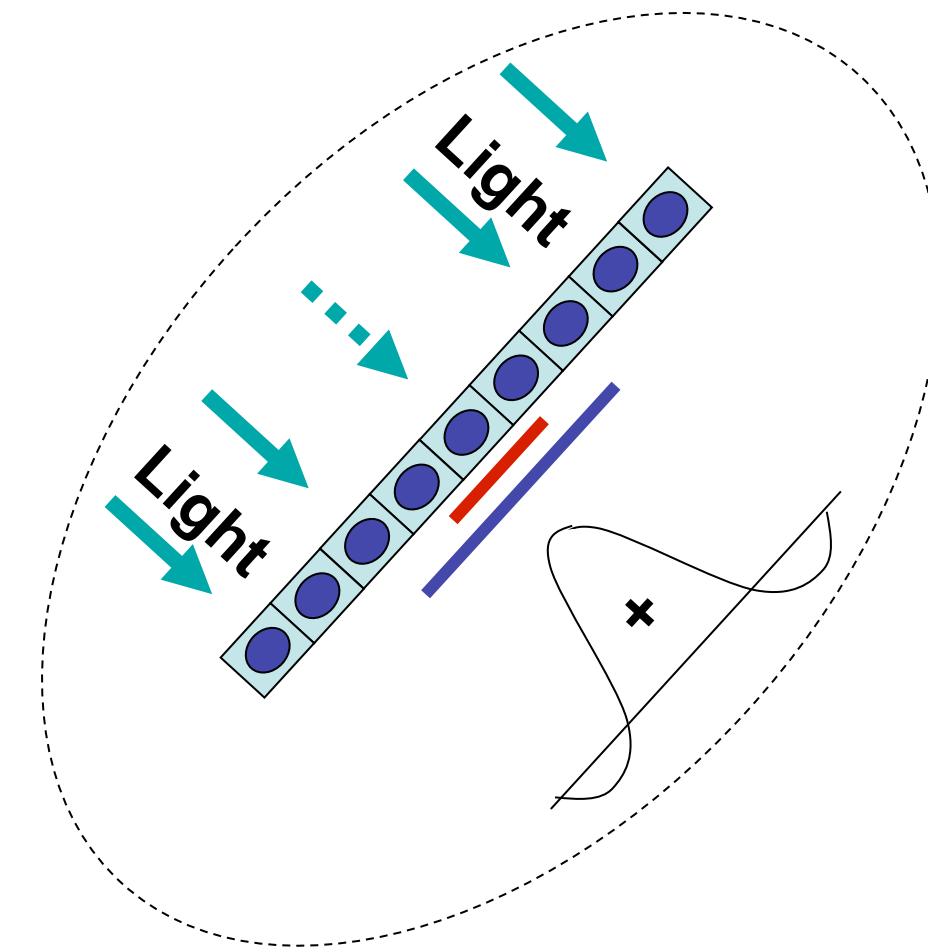
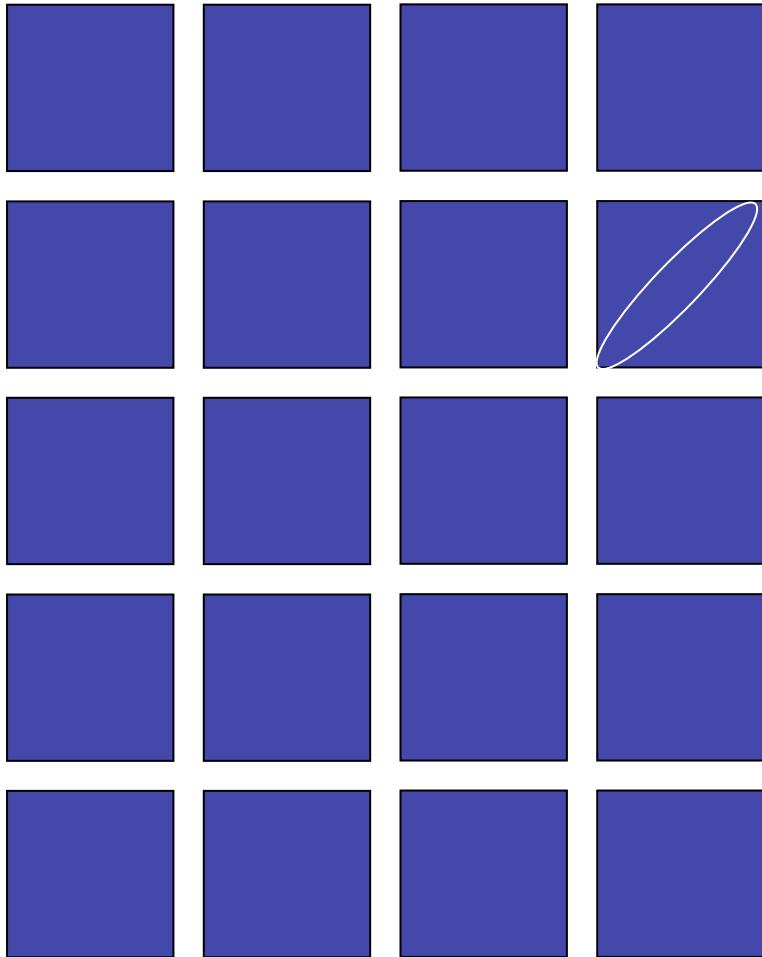
+

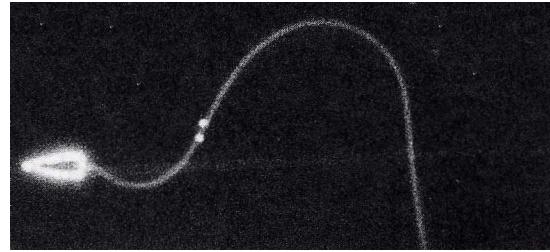
|

|



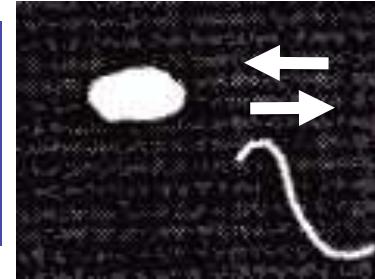
錯視についての錯視



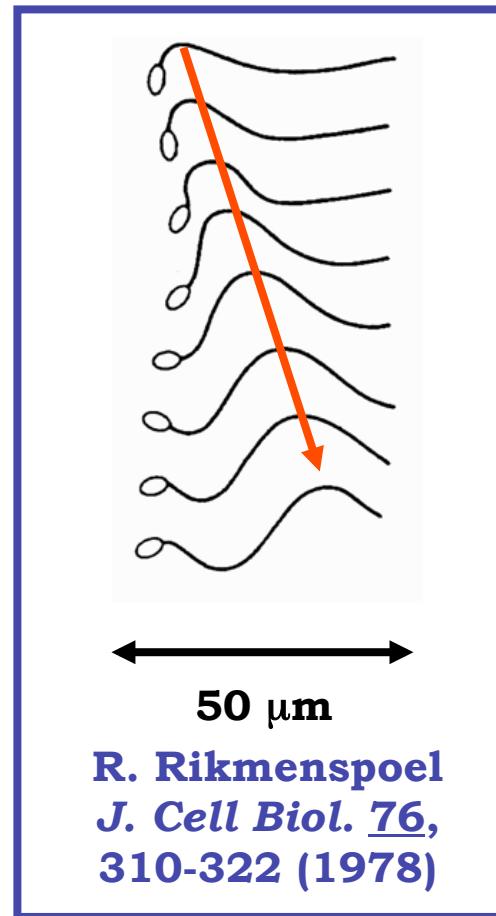


C. J. Brokaw
J. Cell Biol. 114, 6 (1991)

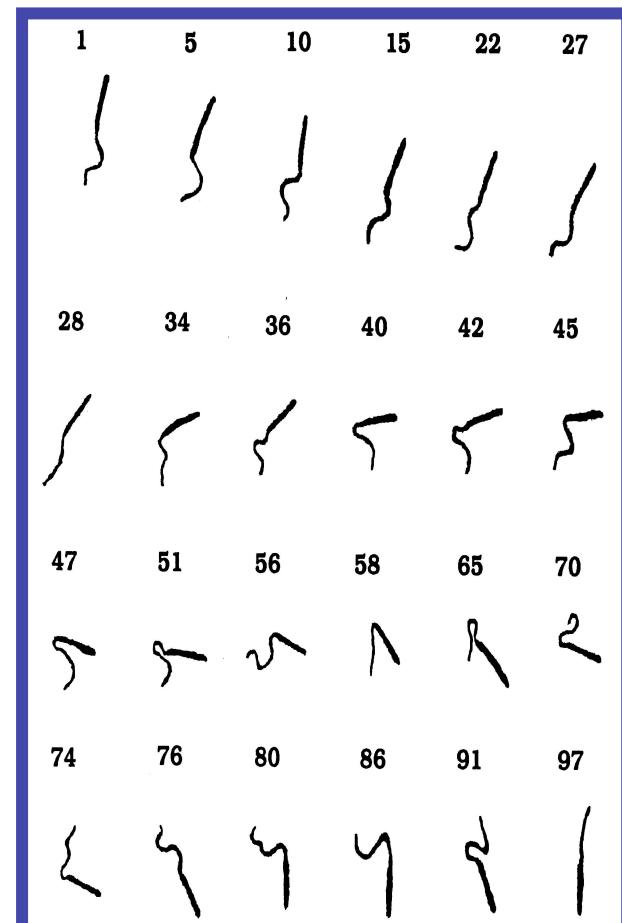
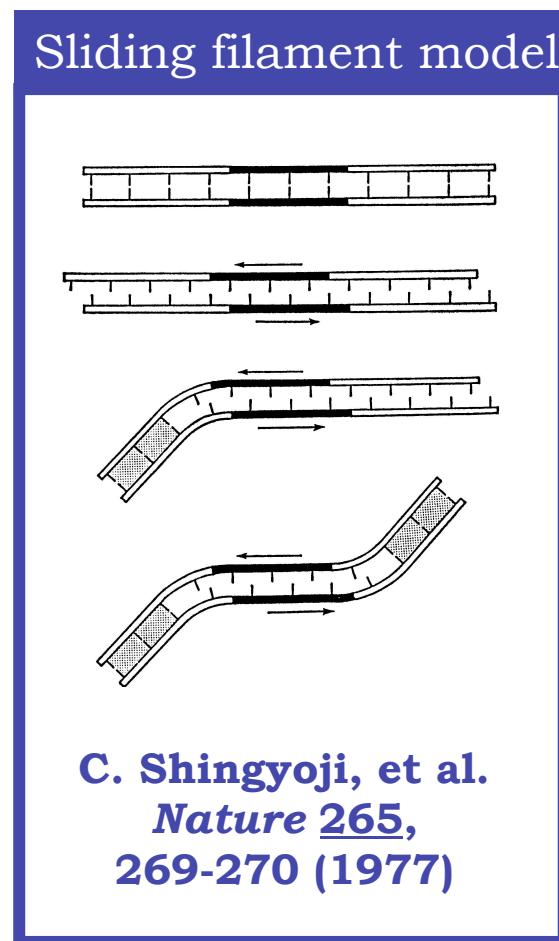
「相補性」 (ニールス・ボーア、物理学者)
「共生説」 (R.マーグリス、生物学者)
「対立物の結合」 (C.ユング、精神医学者)
「絶対矛盾的自己同一」 (西田幾多郎、哲学者)



S. F. Goldstein et al.
J. Exp. Biol. 53, 401 (1970)



R. Rikmenspoel
J. Cell Biol. 76,
310-322 (1978)



The model equation

The moment-balance equation for a flagellum is written by:

$$M_S + M_E + M_V = 0$$

where M_S , M_E and M_V are the viscous, shear and elastic moments, respectively.

↓ See Appendix

$$\frac{\partial^2(S - \gamma\dot{\sigma})}{\partial s^2} + E_B \frac{\partial^4 \sigma}{\partial s^4} + C_N \frac{\partial \sigma}{\partial t} = 0 \quad (1a)$$

$$S = F_I n_I + F_{II}(1 - n_I) - K_e(\sigma - \sigma_0) \quad (1b)$$

$$F_I = Q_I(\sigma - \sigma_1)(\sigma - \sigma_2)(\sigma_c - \sigma) \quad (1c)$$

$$F_{II} = Q_{II}(\sigma - \sigma'_1)(x - \sigma'_2)(\sigma'_c - \sigma) \quad (1d)$$

$$n_I = \begin{cases} 1 & 0 < \sigma \leq S_1 \\ 0 & S_1 < \sigma < 1 \end{cases} \quad (\text{if initially } n_I = 0 \text{ for } \sigma > S_1) \quad (1e)$$

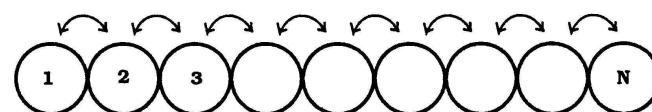
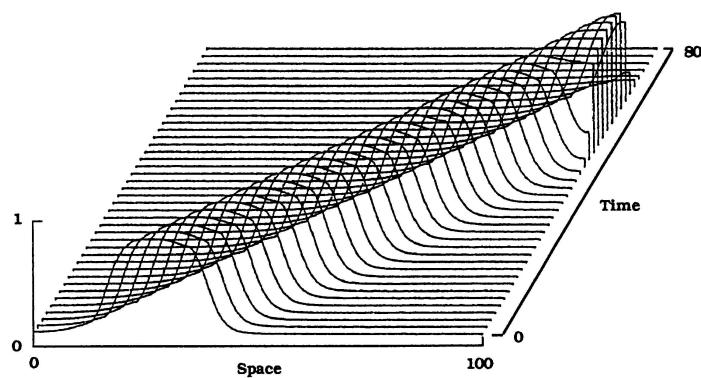
$$n_I = \begin{cases} 1 & 0 < \sigma \leq S_2 \\ 0 & S_2 < \sigma < 1 \end{cases} \quad (\text{if initially } n_I = 1 \text{ for } \sigma < S_2) \quad (1f)$$

where S is the shear force, σ is the shear, E_B is the bending resistance, C_N is the external viscous drag coefficient and γ is the internal viscous drag coefficient.

$$(S(\sigma) - \gamma\sigma_t)_{ss} + E_B \sigma_{ssss} + C_N \sigma_t = 0$$

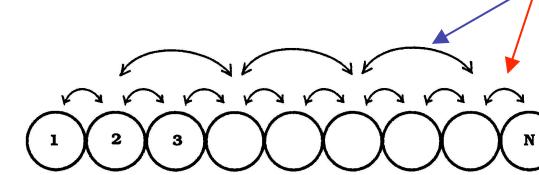
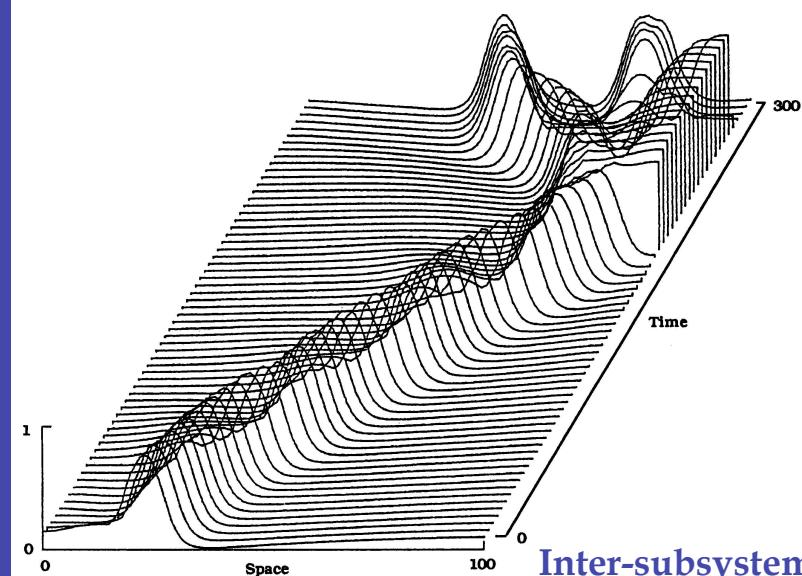
$\gamma \gg C_N$ Simplified case

$$\gamma\sigma_t = E_B \sigma_{ss} + S(\sigma)$$

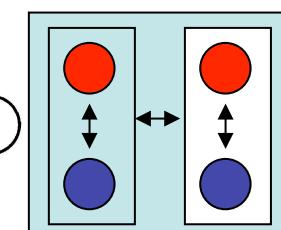


$\gamma \ll C_N$ Real case

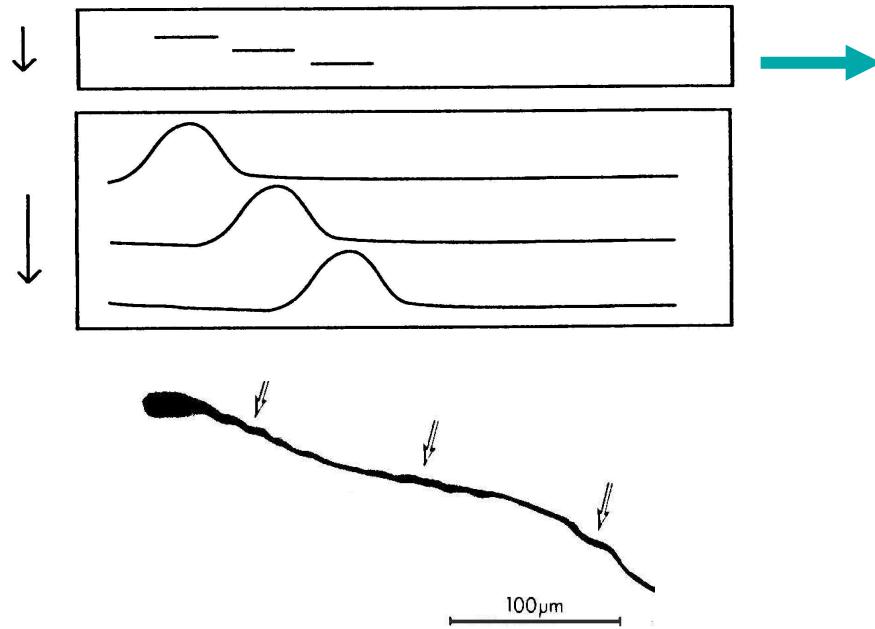
$$S(\sigma)_{ss} + E_B \sigma_{ssss} + C_N \sigma_t = 0$$



Inter-subsystems' conflicts



Conflicts between the subsystems generate rich dynamics.



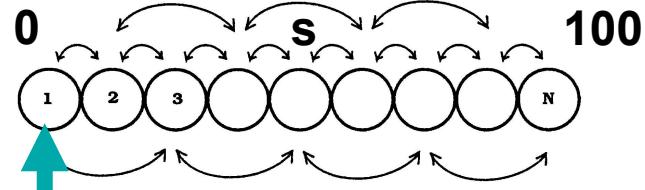
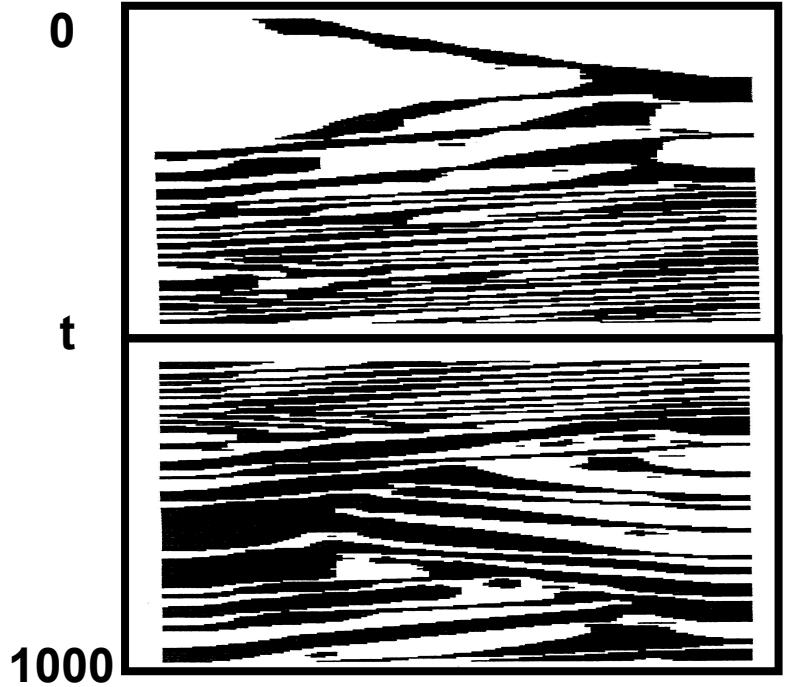
Flagellar equation can be an interesting extension of the **Kuramoto-Sivashinsky equation.**

$$\frac{\partial \phi}{\partial t} = A \frac{\partial^2 \phi}{\partial y^2} - B \frac{\partial^4 \phi}{\partial y^4} + F(\phi)$$

$$(S(\sigma) - \gamma \sigma_t)_{ss} + E_B \sigma_{ssss} + C_N \sigma_t = 0$$

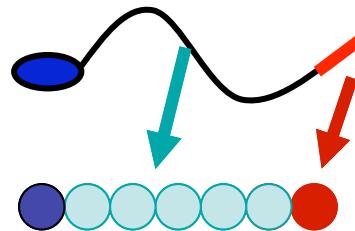
$$\gamma \ll C_N$$

$$S(\sigma)_{ss} + E_B \sigma_{ssss} + C_N \sigma_t = 0$$

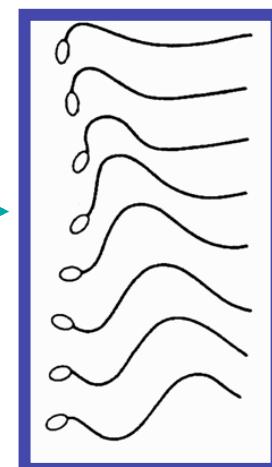
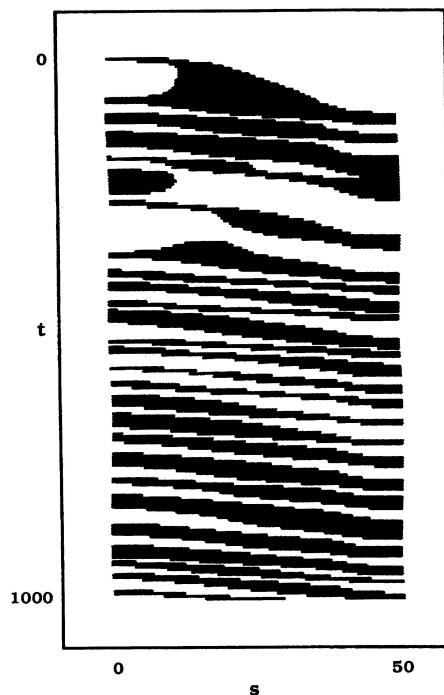


$$S(\sigma)_{ss} + E_B \sigma_{ssss} + C_N \sigma_t = 0$$

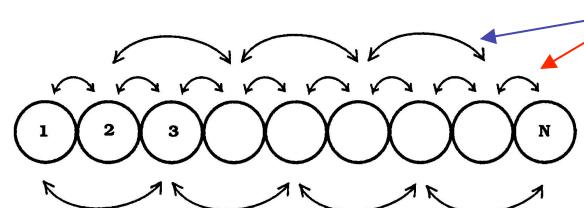
問題解決の核心は中心にあるのではなく周辺にある



Regularity

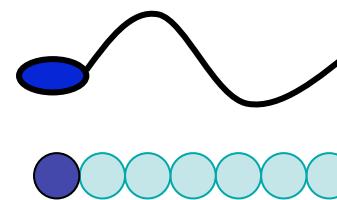


多様性・複雑性ゆえの調節

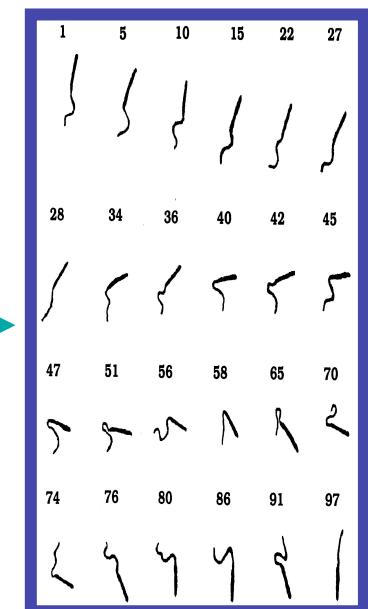
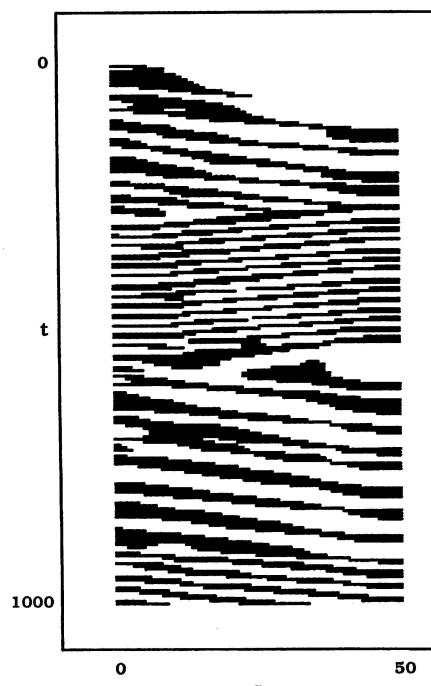


Inter-subsystem
conflicts

異常は正常よりも複雑性が
著しく増しているわけではない



Hypersensitivity

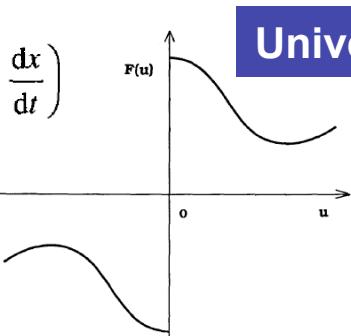
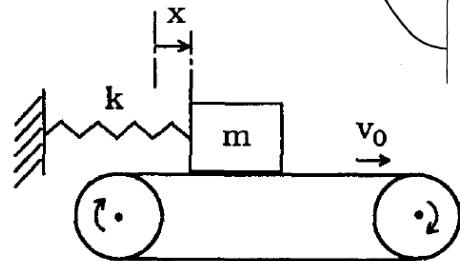


生命現象と電磁場

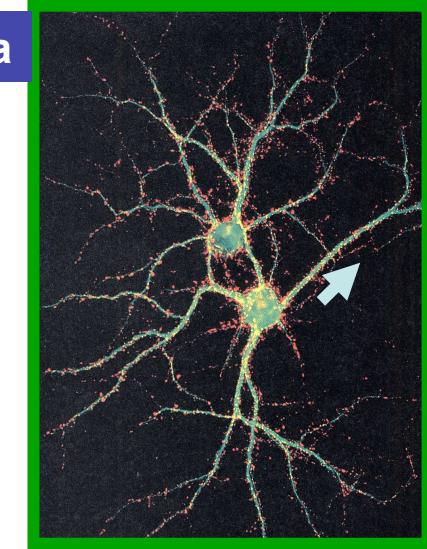
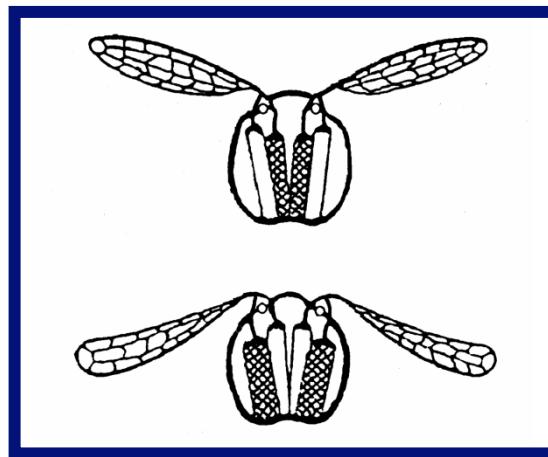
- 1) 知覚と運動のアナロジー
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- 6) 電磁場としての生命
－ 物質還元論への反省－
- 7) まとめ
－あらたな可能性に向けて

$$m \frac{d^2x}{dt^2} + kx = F \left(v_0 - \frac{dx}{dt} \right)$$

Toy Model

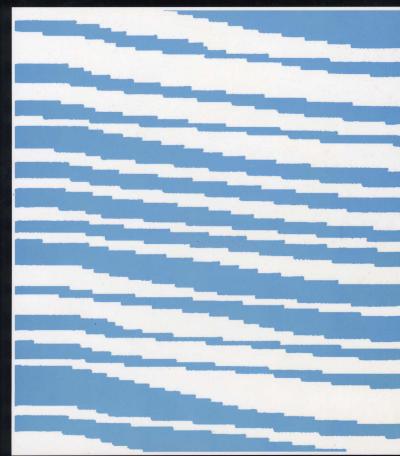


Universality among diverse phenomena



NONLINEAR SCIENCE THEORY AND APPLICATIONS

The dynamics of cellular motility



MASATOSHI MURASE

Masatoshi Murase
John Wiley & Sons (1992)



Muscle

創造性の発現とは、今まで誰も気づかなかつた類似性の発見－「同定」
－である。
(湯川秀樹、物理学者)

数学的創造とは、長い間知られていたが互いに無関係であると考えられ
ていた事実間に、思いもよらなかつた共通点を提示すること。

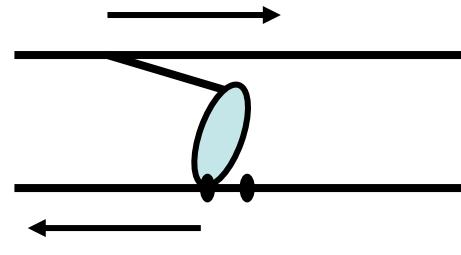
(アンリ・ポアンカレ、数学者)



Tacoma Narrows Bridge Collapse, 1940
<http://video.google.com/videoplay?docid=4558032966304637954>

Muscle

F (force)



Nerve

I (current)

Inside

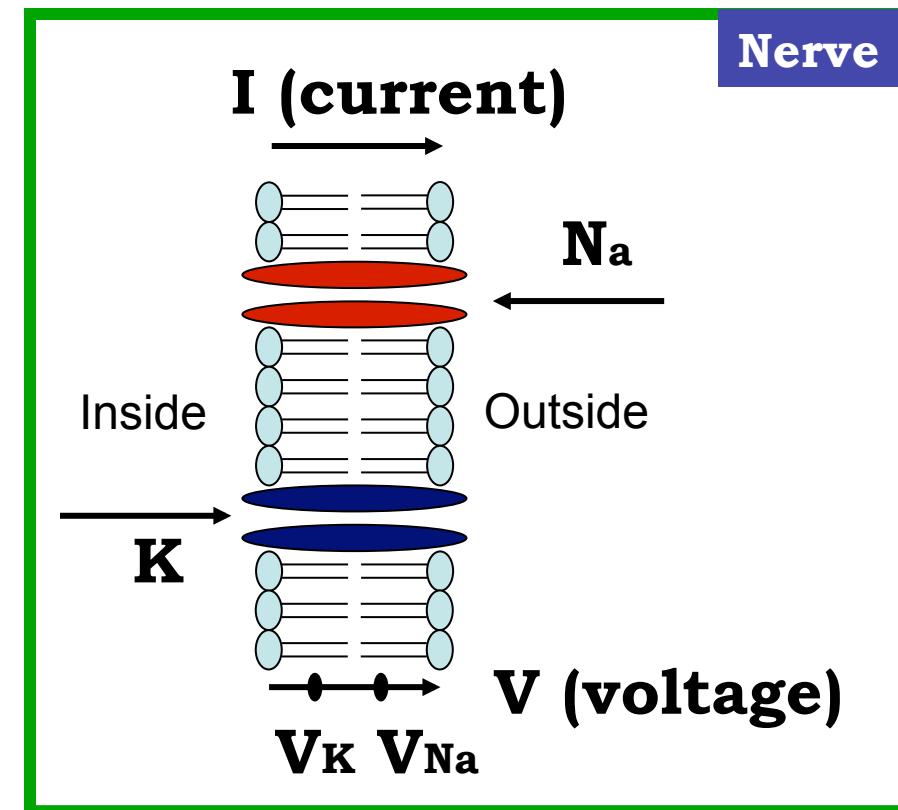
N_a

Outside

K

V (voltage)

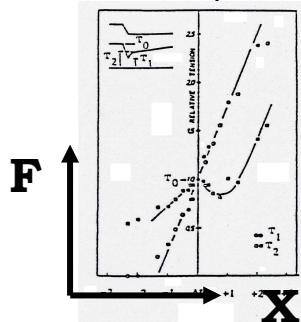
V_K V_{Na}



A single molecule has
two distinct states.

Two distinct ions have
a single equilibrium state.

$$F = F(n, x)$$

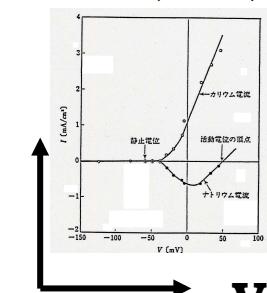
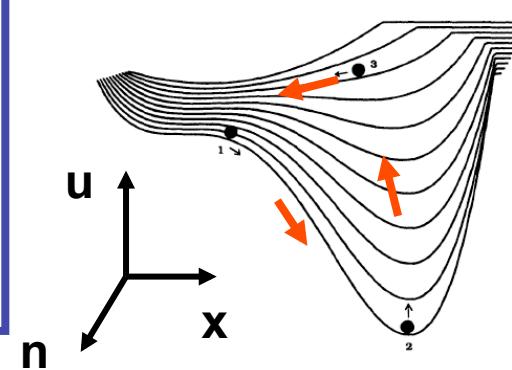


$$\gamma \frac{dx}{dt} = n f(x) - K_e x + Z$$

$$\frac{dn}{dt} = \begin{cases} b(1-n) & (x \leq x_a) \\ -cn & (x > x_a) \end{cases}$$

$$f(x) = Ax^2(1-x)$$

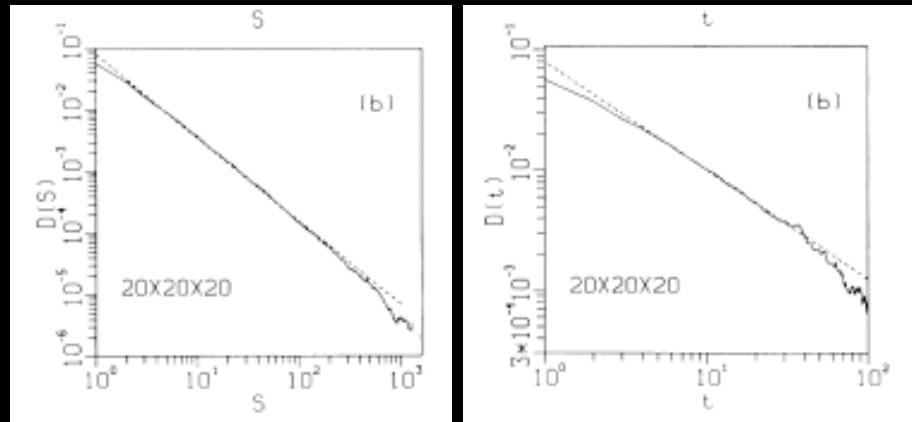
$$I = I(n, v)$$



問題は異なって見えるが どれも同じ問題の異なるバージョン

自己組織臨界現象

Earthquake



Gutenberg-Richter Law

Omori's Law

Phys. Rev. Lett. **59**, 381 (1987)

Stock market

Power Law

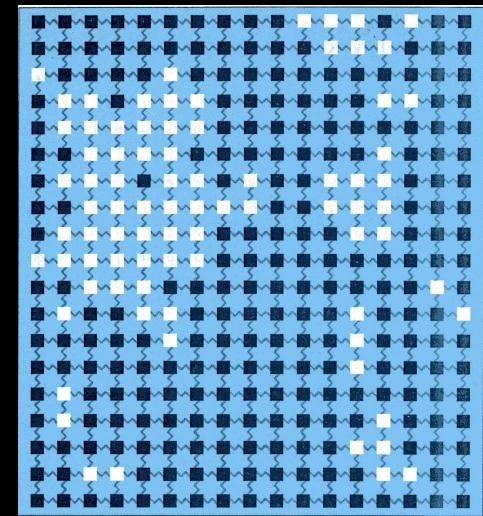
$$N = E^{-D}$$

$$P = f^{-D}$$

(1/f noise)

$$n = r^D$$

$$L = A^D$$



Sand pile

Avalanche

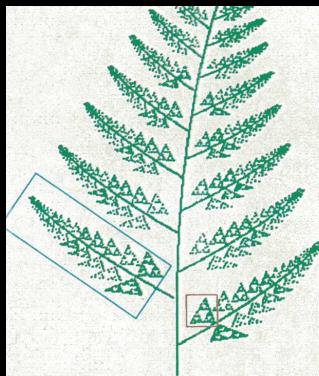
Fractal



Per Bak (1948—2002)



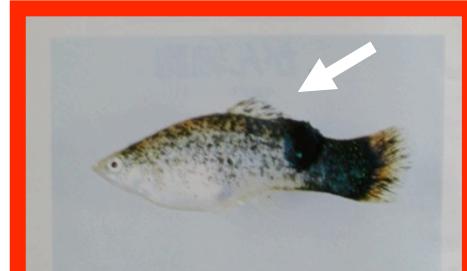
River network
Hartmann's Law



生命現象と電磁場

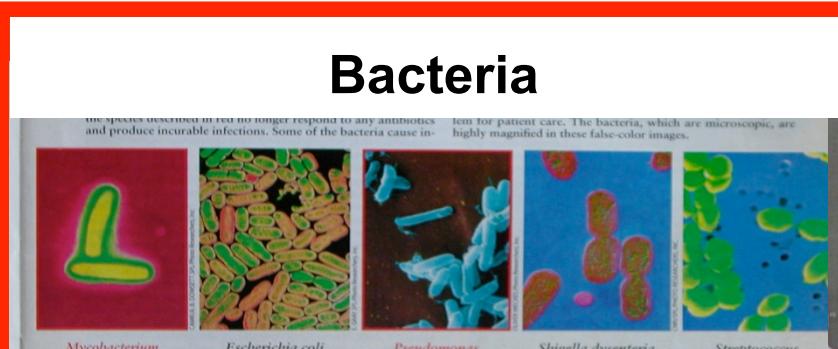
- 1) 知覚と運動のアナロジー
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－ 物質還元論への反省－
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Evolution as a double-edged sword: What is cancer?



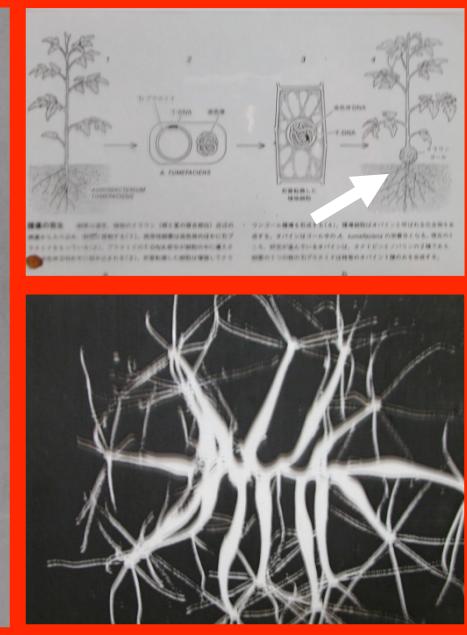
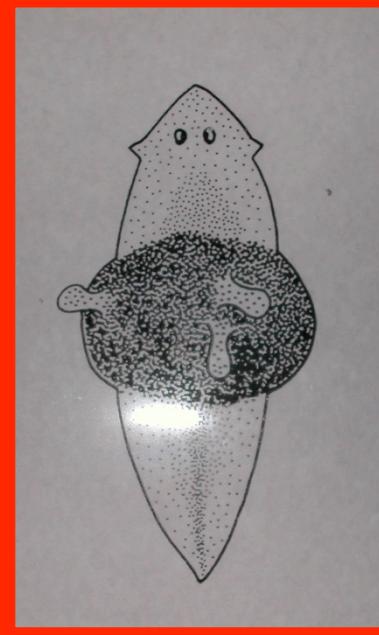
Bacteria

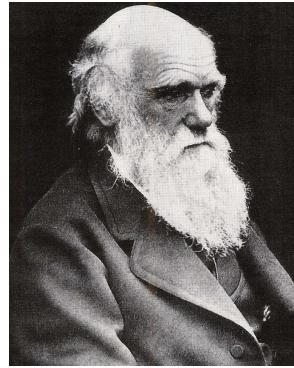
THE BACTERIA IN FEW NO LONGER respond to any antibiotics and produce incurable infections. Some of the bacteria cause infection for patient care. The bacteria, which are microscopic, are highly magnified in these false-color images.



Mycobacterium tuberculosis
Escherichia coli
Pseudomonas
Shigella dysenteriae
Streptococcus

Can we distinguish between cancer and bacteria?





1859

Charles Darwin's natural selection theory

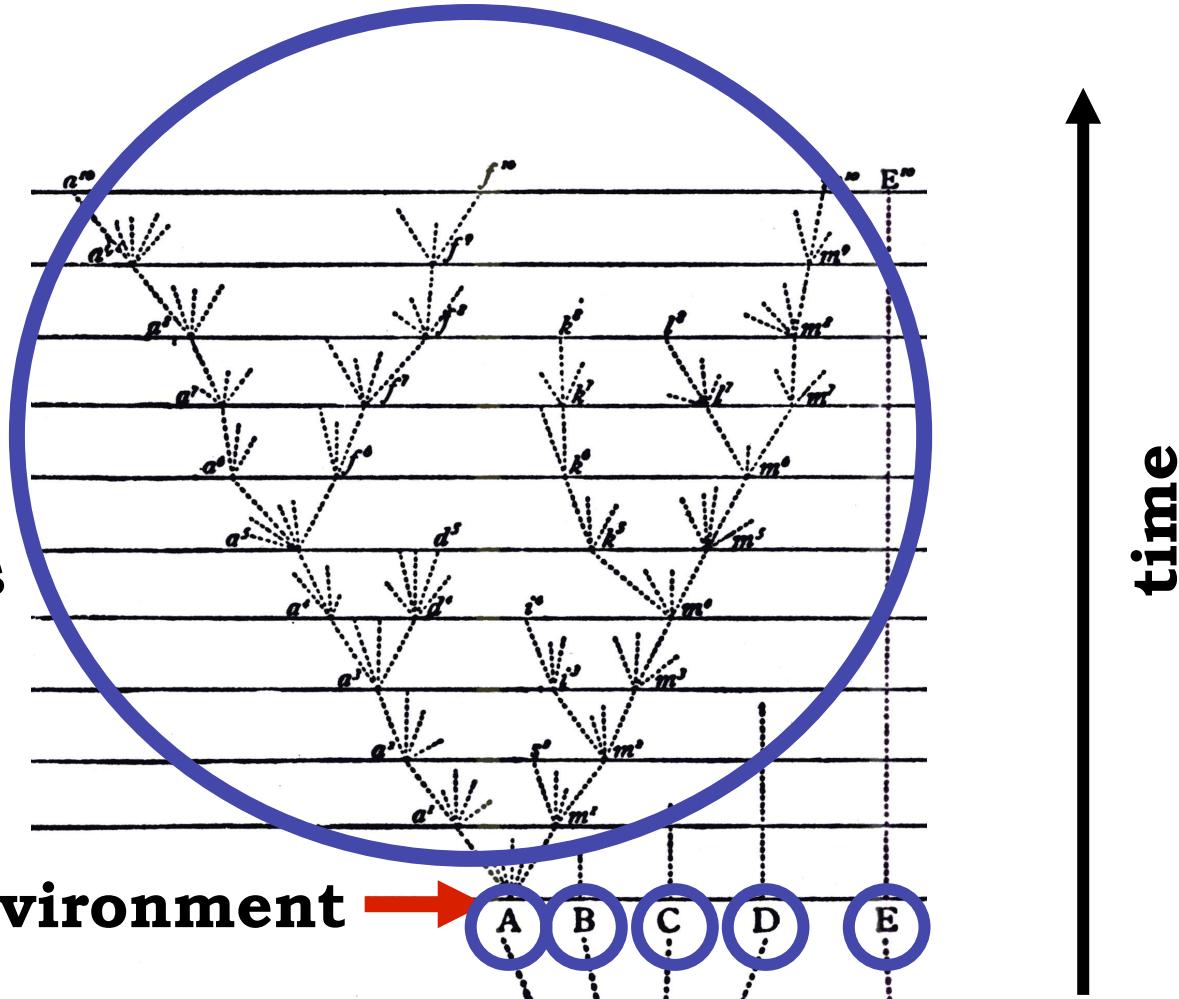
Charles Darwin
(1809 – 1882)

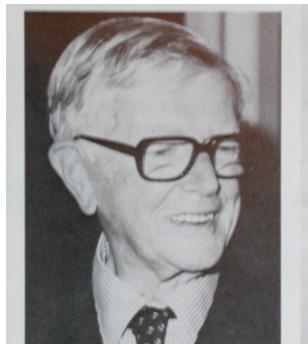
**Proliferation
to new species**

Encounter with environment

**Preexisting variability
of organisms**

From M. Murase (2008)

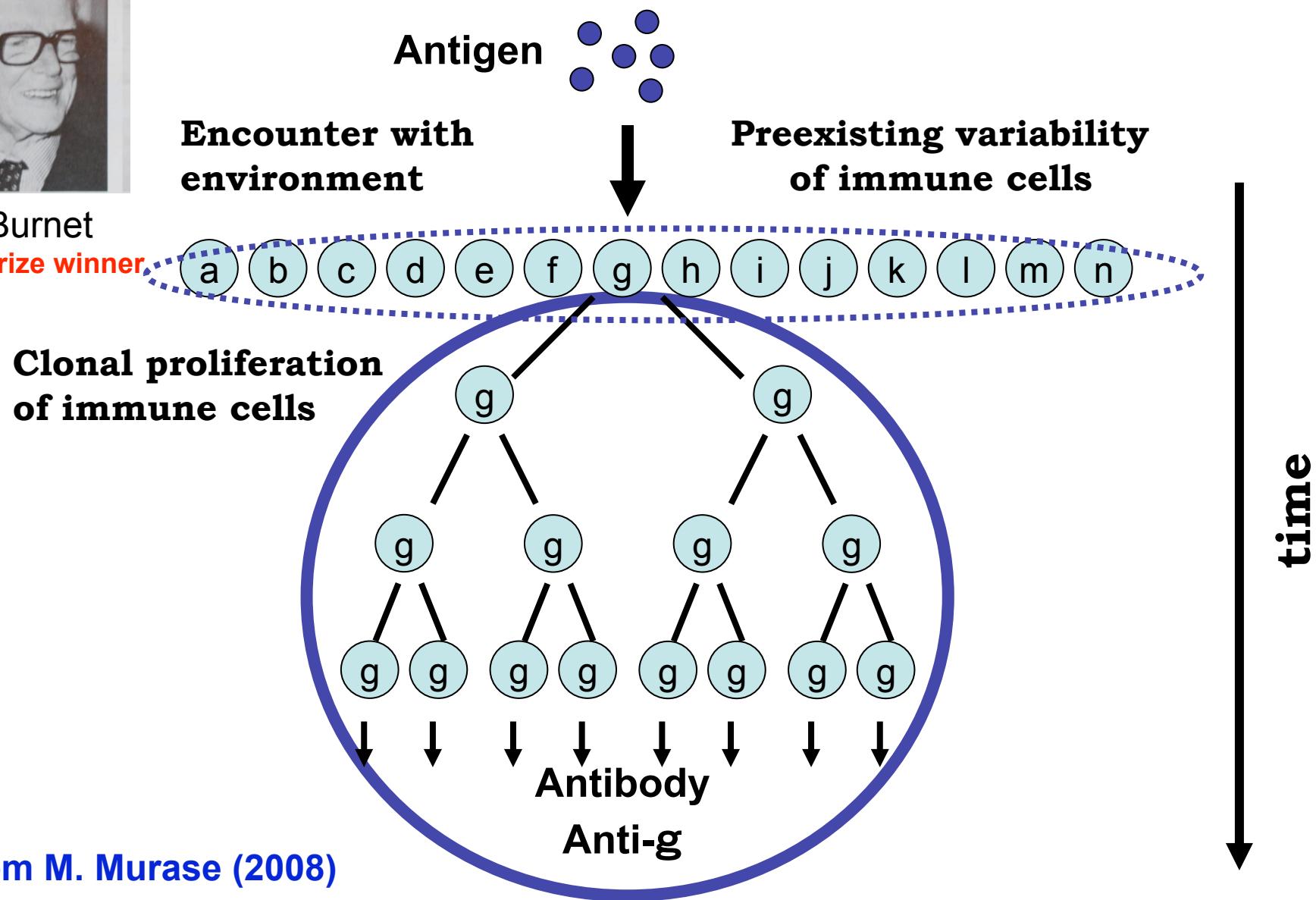




1957

Burnet's clonal selection theory

F. M. Burnet
Nobel Prize winner

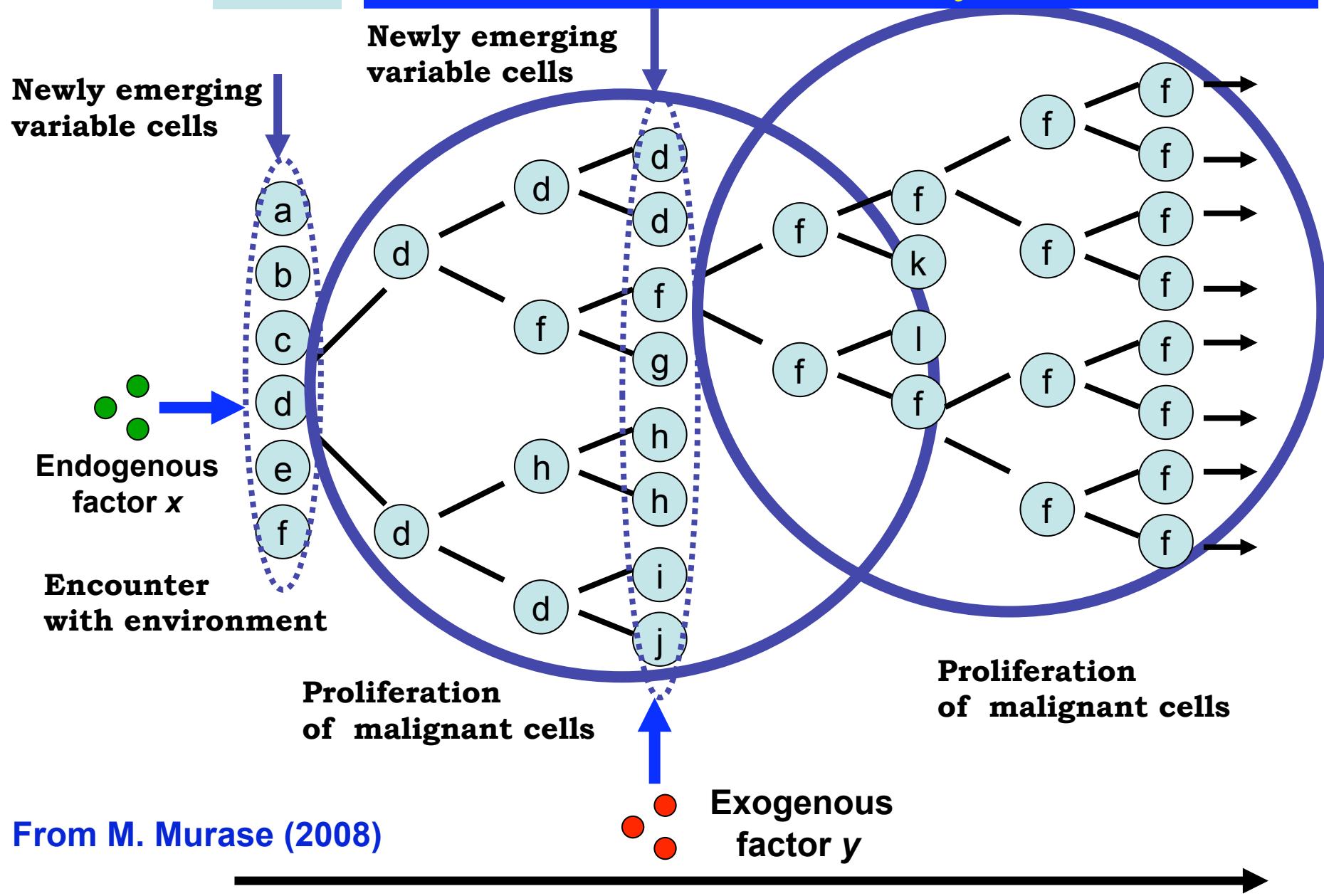


From M. Murase (2008)

The evolutionary history of Darwin's evolutionary theory

1976

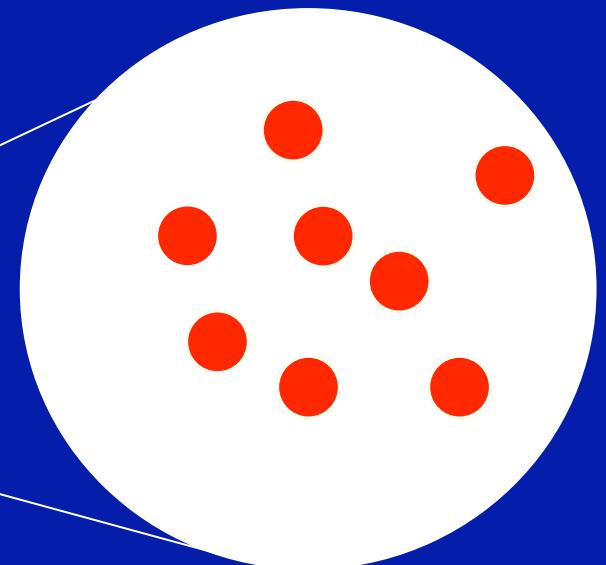
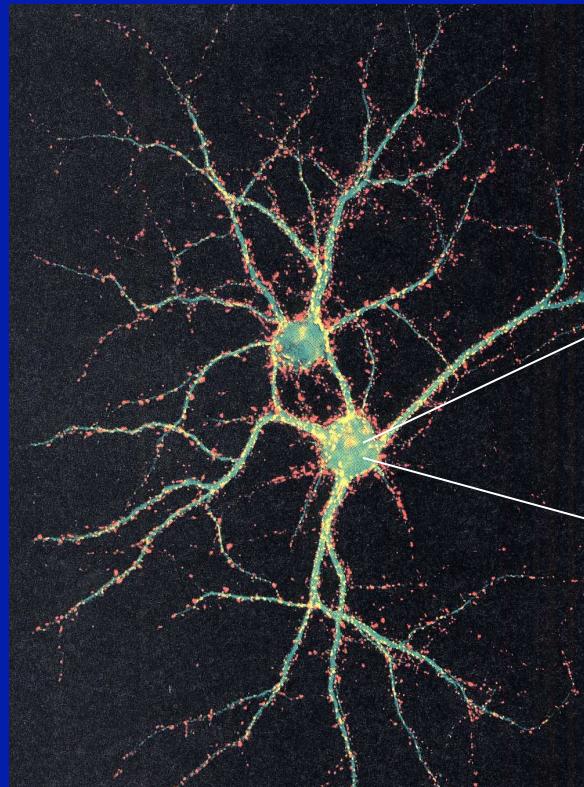
Clonal evolution theory for cancer



Cancer as cellular evolution with genomic or non-genomic variations **time**

Intra-cellular Selection Theory

Masatoshi Murase: *Prog. Theor. Phys.* **95**, 1-36 (1996)



Aging as intra-individual evolution

Preexisting polymorphism

Encounter with intra-cellular environment

Accumulation → Prion Disease **Nobel Prize awarded (1997)**

生命現象と電磁場

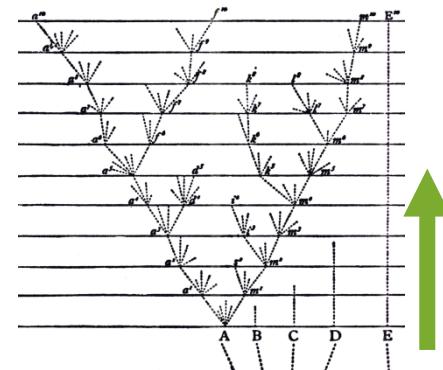
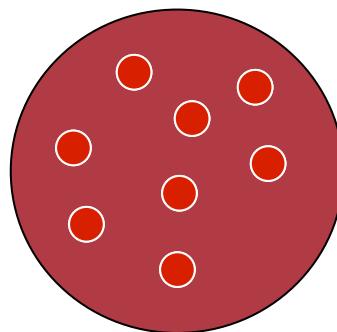
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- 3) インプリンティングとしての進化
— スケール不変性の発見 —
- 4) 決定論的進化論の検討
— 自己組織臨界現象の可能性 —
- 5) 電磁場の生体影響
— 学習過程と病気発症 —
- 6) 電磁場としての生命
— 物質還元論への反省 —
- 7) まとめ
— あらたな可能性に向けて

決定論的進化論の検討



Charles Robert Darwin (1809-1882)
On the Origin of Species (1859)

http://en.wikipedia.org/wiki/Charles_Darwin

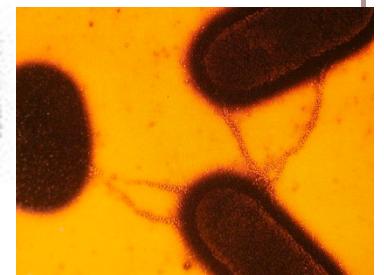
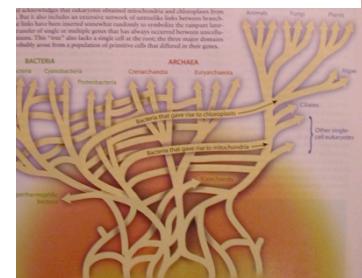
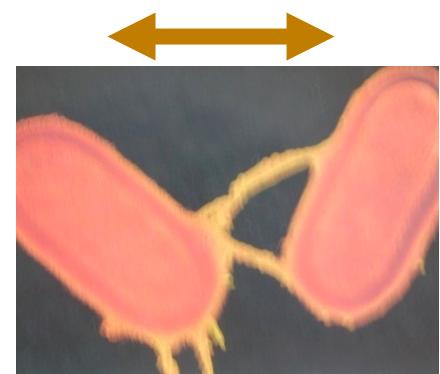
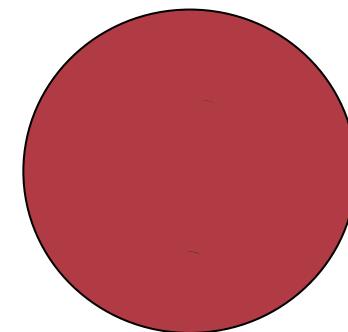


Expansion & Extinction

Jean-Baptiste Lamarck (1744- 1829)

Zoological Philosophy (1809)

http://en.wikipedia.org/wiki/Jean-Baptiste_Lamarck



**A slowly-driven non-equilibrium system
is self-organized to a critical state.**

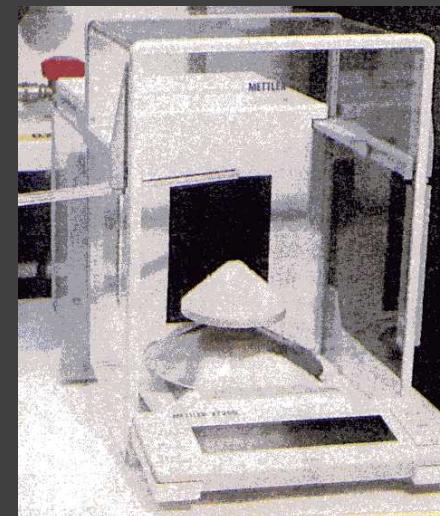
Self-organized Criticality



Per Bak (1948—2002)

http://en.wikipedia.org/wiki/File:Per_Bak.gif

Sand pile



Avalanche



Per Bak Sci. Am. 1991, Jan.

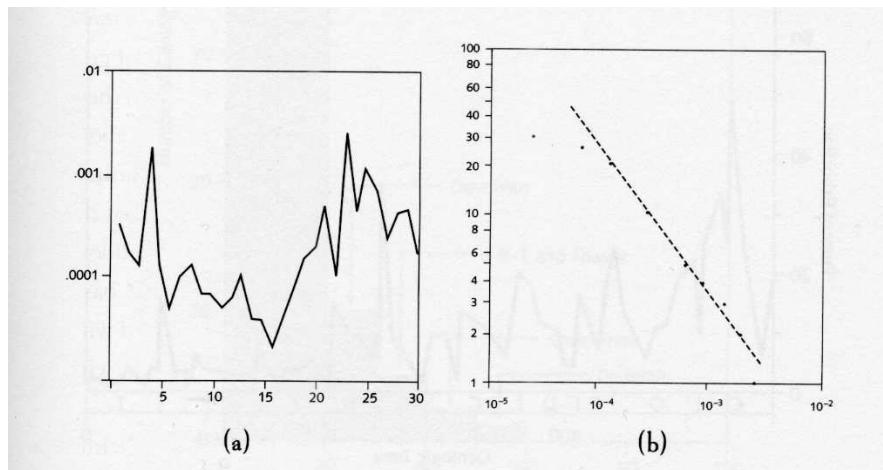
Earthquake

Gutenberg-Richter Law
Omori's Law

Stock market

Pareito's Law

**A critical state showing instability
is dynamically stable !**



Levy Distribution

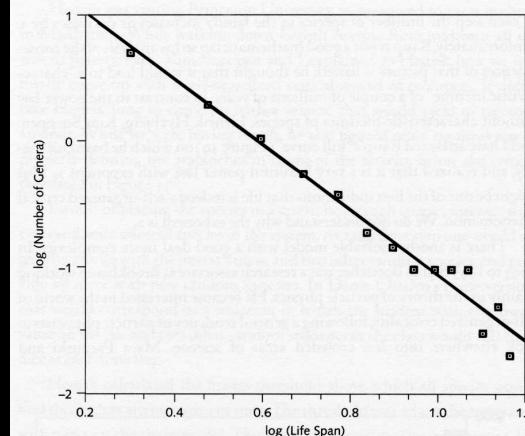
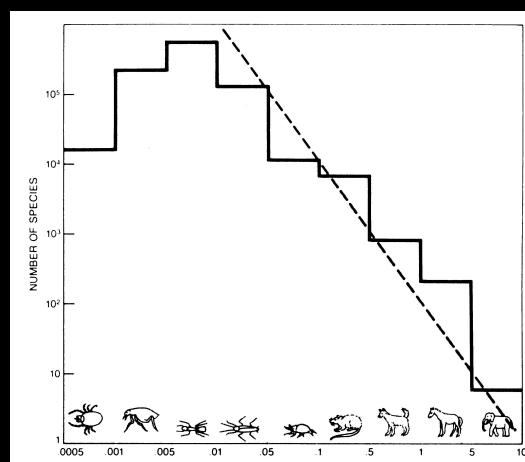
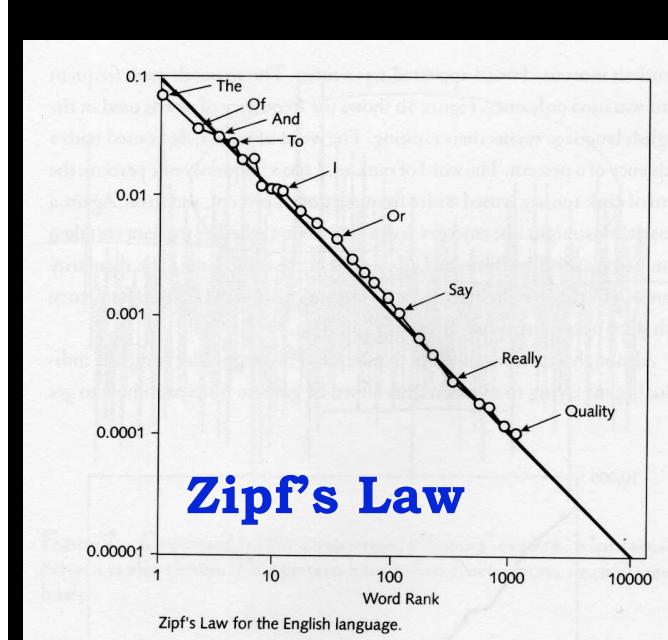
Monthly variation of cotton price during a period of 30 month
(Mandelbrot, 1963)

創造性と破壊性の両義性

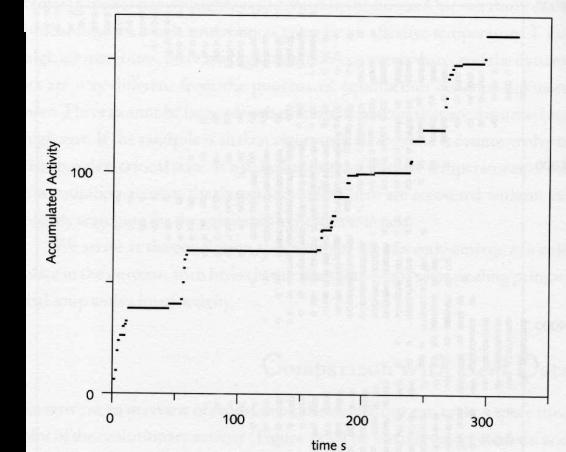
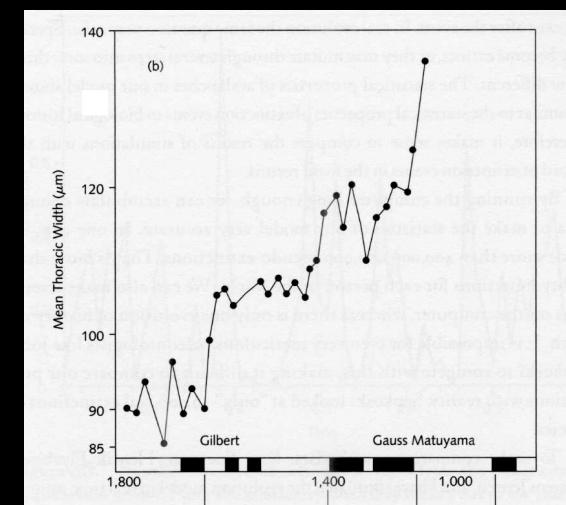
システムを生成する機構が
システムの崩壊を引き起こす

Pareito's Law

Punctuated equilibrium during evolution



Power-low species and lifetime distributions



自己組織臨界現象の教訓

刺激の大きさと反応の規模は比例しない！

- 履歴が問題

慢性暴露による生体影響の規模は未解決！

- 履歴が問題

化学物質：低濃度では安全？

低濃度環境ホルモンの驚異

- 電磁場：低エネルギーレベルでは安全？

生命現象と電磁場

- 1) 知覚と運動のアナロジー
—自律性の獲得とその制御—
- 2) 環境からのインプリンティング
— 多様性と普遍性 —
- 3) インプリンティングとしての進化
— スケール不変性の発見 —
- 4) 決定論的進化論の検討
—自己組織臨界現象の可能性—
- 5) 電磁場の生体影響
— 学習過程と病気発症 —
- 6) 電磁場としての生命
— 物質還元論への反省 —
- 7) まとめ
—あらたな可能性に向けて

Conflicting Results

Several investigators have reported robust, statistically significant results that indicate that weak ($\sim 1\mu\text{T}$) magnetic fields (MFs) increase the rate of **morphological abnormalities** in chick embryos. However, other investigators have reported that weak MFs do not appear to affect embryo morphology at all.

J. M. Farrell, et al. *Bioelectromagnetics* 18, 431-438 (1997).



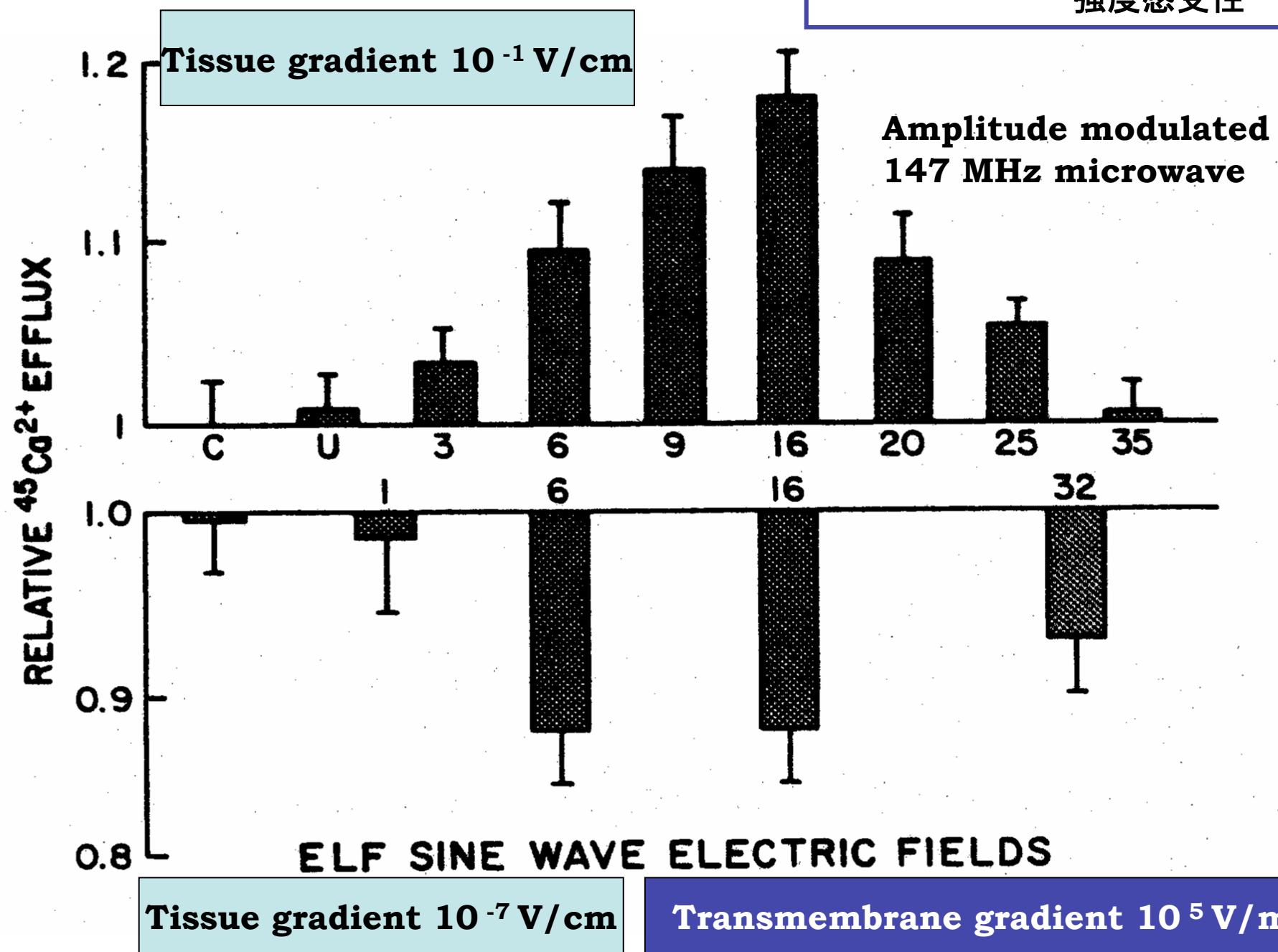
~~電磁場の生体影響に関して、「影響あり」と「影響なし」という矛盾する実験事実が報告されている。従って、現時点では、生体への影響があるか否か確定的な結論は得られていない。~~

電磁場の生体への影響のあらわれ方は多様である。

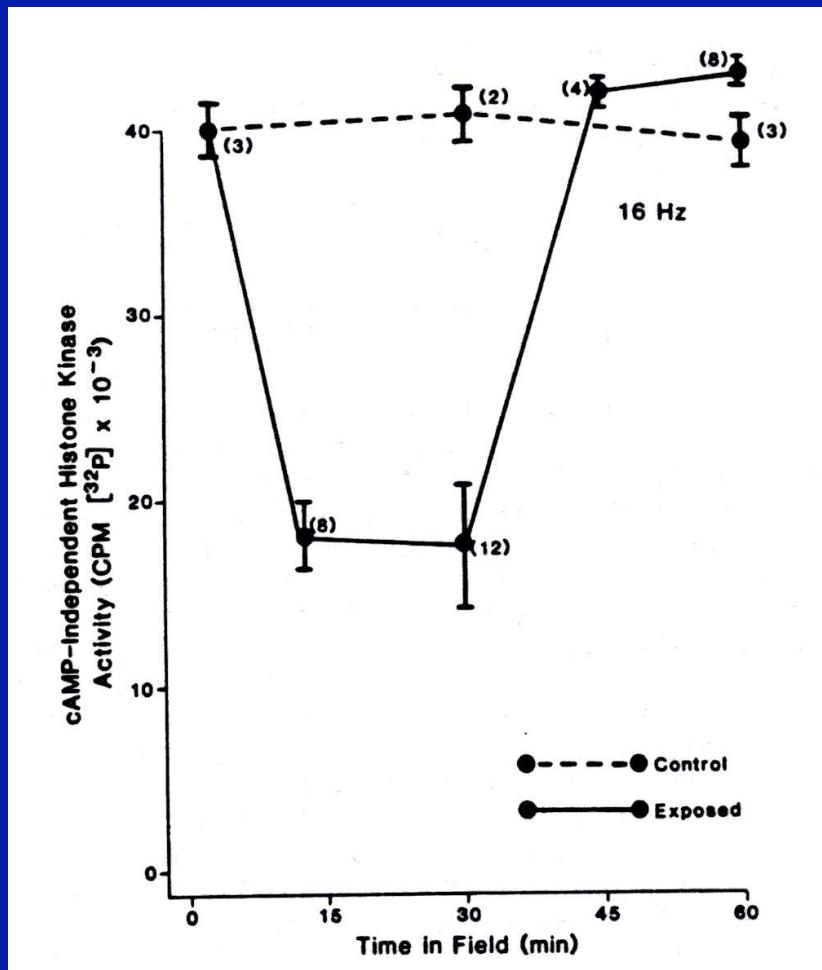
Bipolar Responses

Model system	Reference	Response
Cell Motility	Smith et al (1987)	Enhanced Inhibited
Embryonic Bone	Smith et al (1991) Regling et al (2002)	Enhanced Inhibited
Plant Growth	Smith et al (1993)	Enhanced Inhibited
Rat Behavior	Zhadin et al (1999)	Enhanced Inhibited

Window 効果 周波数感受性
強度感受性



Window 効果 時間感受性

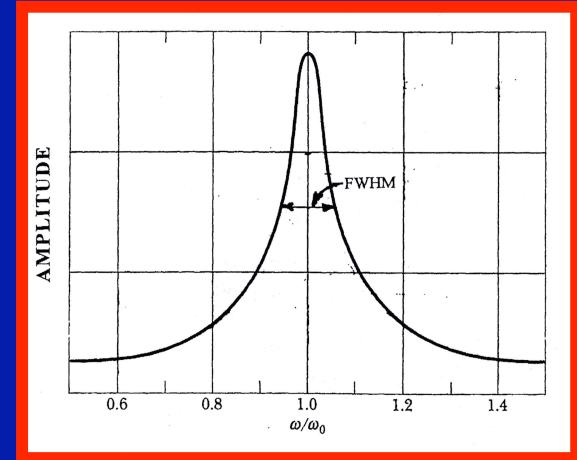
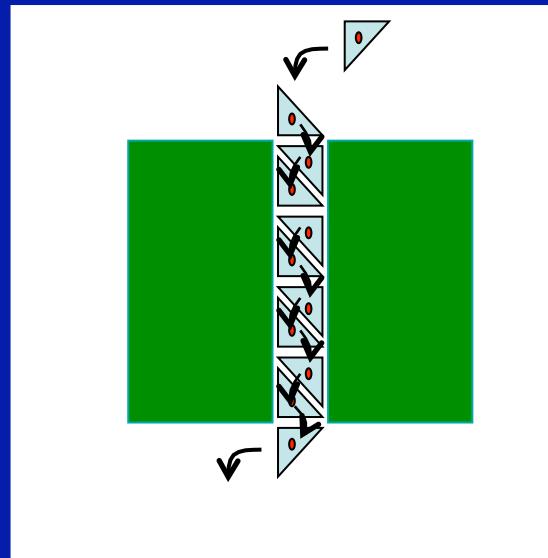
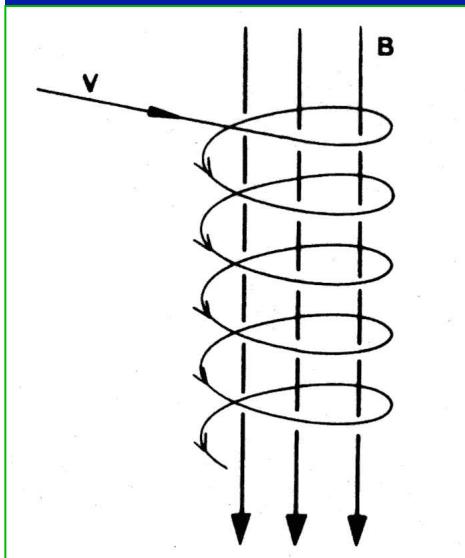


cAMP-independent protein kinase activity in human lymphocytes is sharply reduced by a 450 MHz field (10 W/m², amplitude modulated at 16-Hz) 15 to 30 min after exposure, but is at control levels thereafter despite continuing exposure (Adey and Sheppard, 1987).

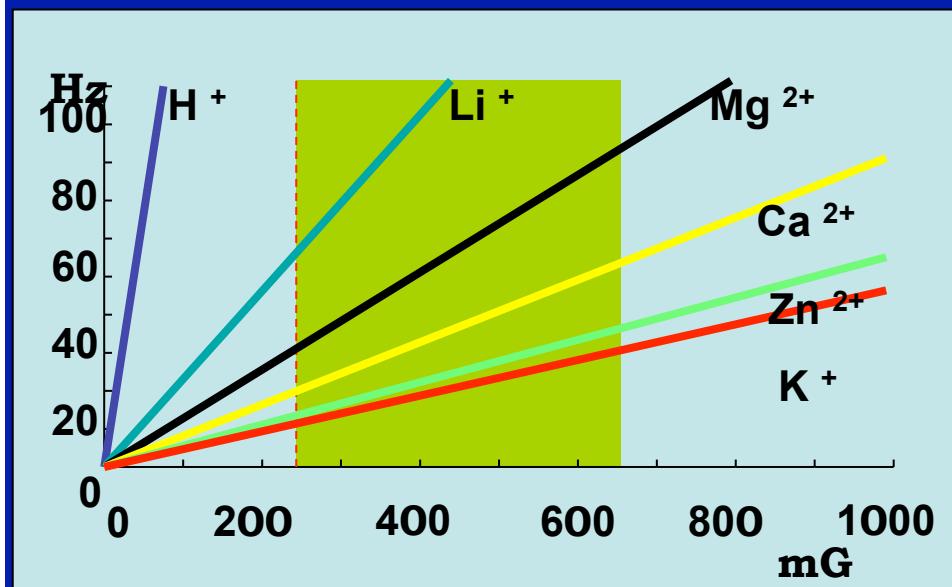
電磁場生体影響の分子機構 イオン電流への影響

第1回 2003年
第2回 2004年
研究会 村瀬雅俊

- サイクロotron共鳴



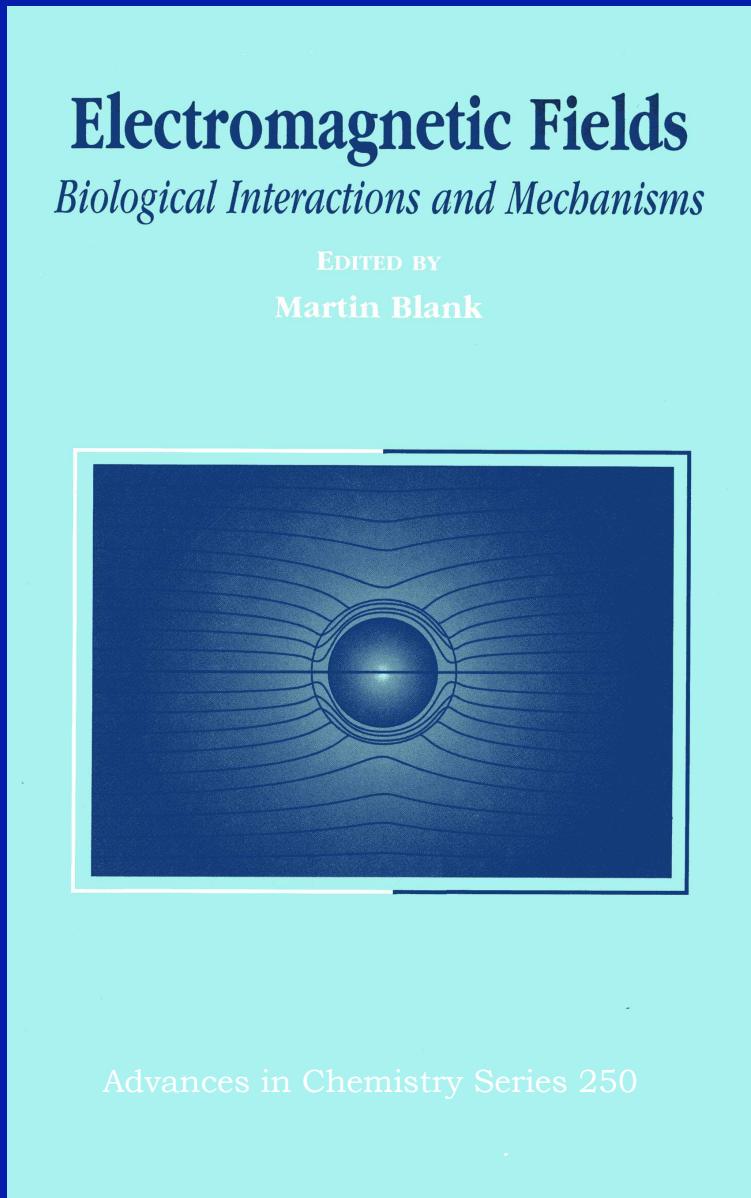
$$\omega_0 = (q/m)B_0$$



$$m \frac{d\mathbf{u}}{dt} = q\mathbf{E} + q(\mathbf{u} \times \mathbf{B}) - \frac{m\mathbf{u}}{\tau}$$

$$\sigma = \sigma' \frac{1 + (\omega_0 + \omega)^2 \tau^2}{1 + [(\omega_0^2 - \omega^2) \tau^2]^2 + 4\omega^2 \tau^2}$$

2005年研究会



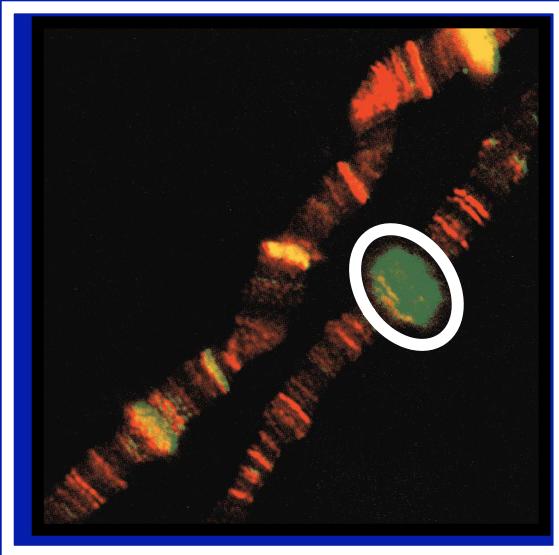
EMFs accelerate
electron transfer rate.



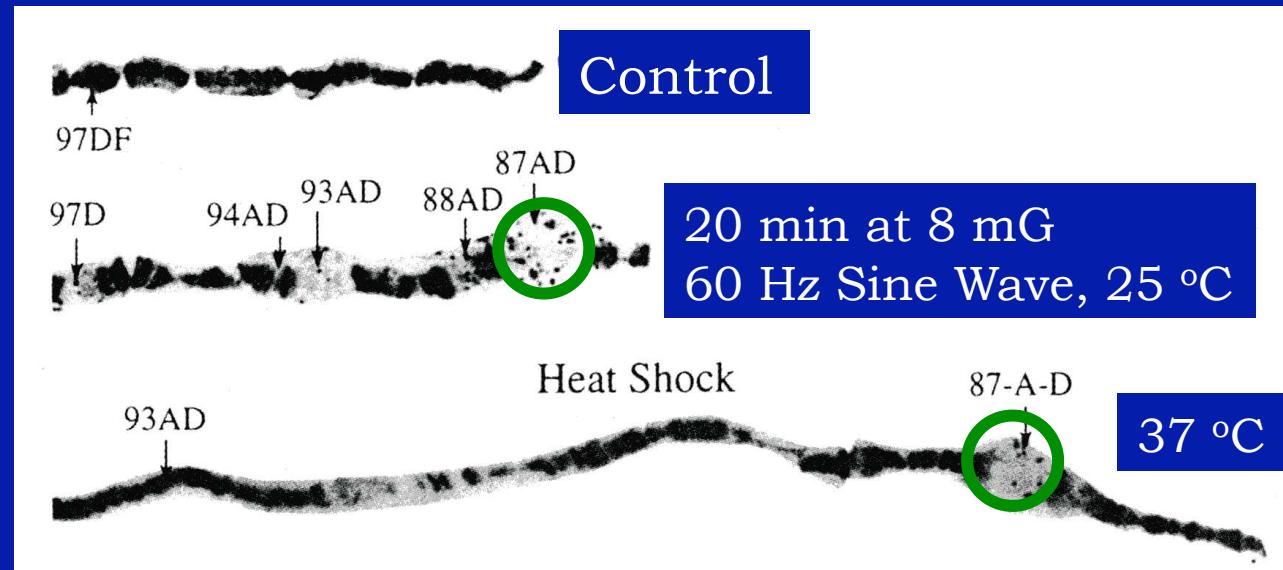
Martin Blank (1933-)
Columbia University

American Chemical
Society, Washington, DC
1995

Biological System	EM Field (mG)	Reference
DNA transcription		
HL60	< 8	Goodman et al. (1994)
Breast Cells	< 8	Lin et al. (1998)
Enzyme Reaction		
Na,K-ATPase	2 ~ 3	Blank & Soo (1996)
Cytochrome Oxidase	5 ~ 6	Blank & Soo (1998)
Chemical Reaction		
B-Z reaction	< 5	Blank & Soo (2001)
Disease Related		
Block inhibition of carcinoma cells by melatonin	2 < 12	Liburdy (2003)
Epidemiological study	3 ~ 4	Ahlbom et al. (2000)

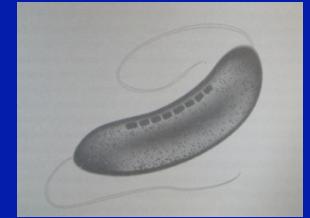


Energy	Input	Energy Density (J/m ³)
Magnetic	8 mG (0.8μT)	$B^2/2\mu = 2.6 \times 10^{-7}$
Electric	0.5 mV/m	$\epsilon E^2/2 = 9.0 \times 10^{-3}$
Thermal	+ 5.5 °C	$\Delta T c \rho = 2.3 \times 10^{+7}$



電磁場生体影響の分子機構 マグネタイト・イオン電流への影響

クジラの集団座礁
伝書バトの集団迷走
ヒトの精神活動への影響

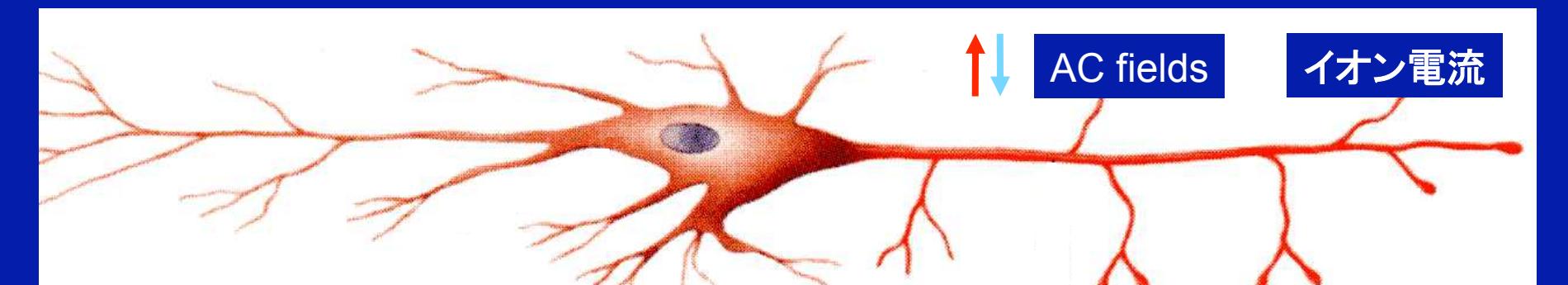
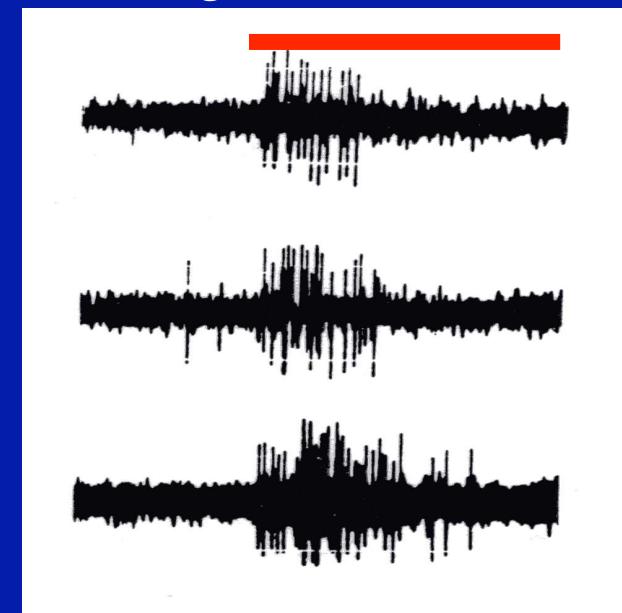
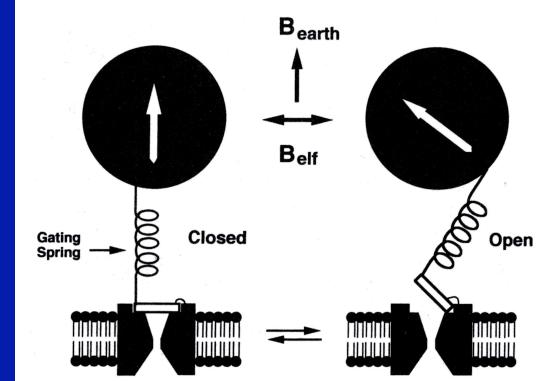
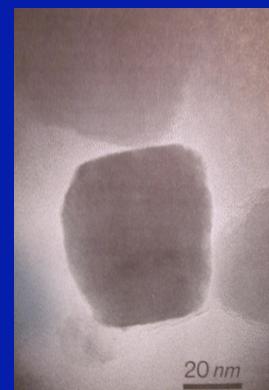


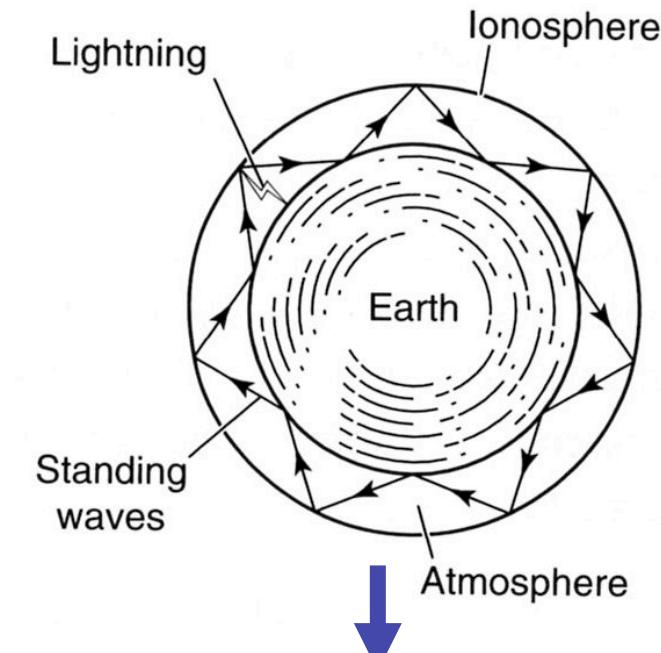
• 生体内磁石（マグネタイト）

A. Kobayashi and J. L. Kirschvink

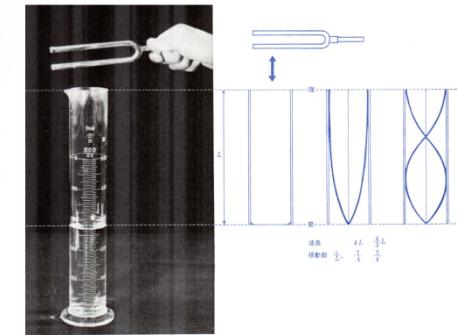
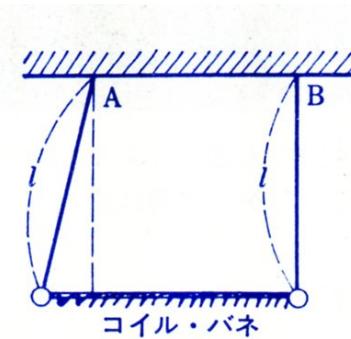
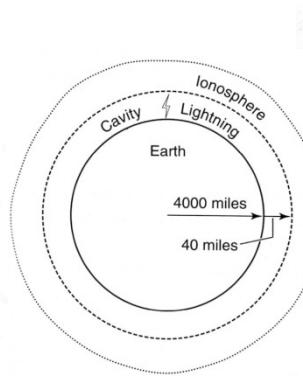
"Magnetoreception and Electromagnetic Field Effects: Sensory Perception of the Geomagnetic Field in Animals and Humans"

In: "Electromagnetic Fields: Biological Interactions and Mechanisms"
Martin Blank ed. pp367-394, American Chemical Society (1995)





James L. Oschman "Energy Medicine" p100, 185
228 Churchill Livingstone (2000)



玉川 児童百科大事典 物理 124, 152頁 1975

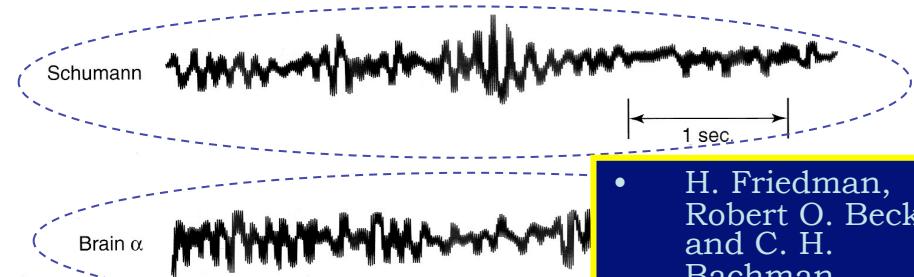
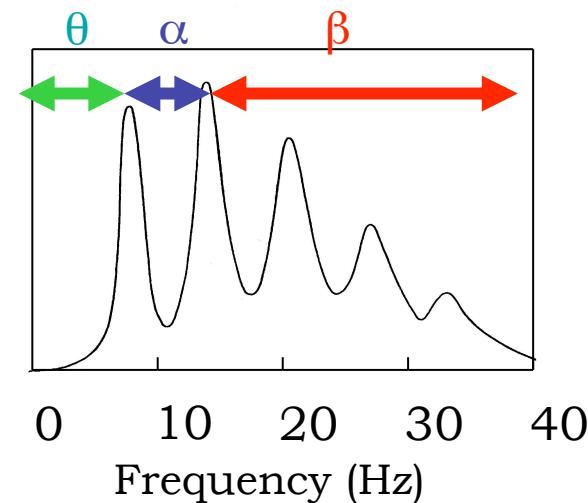


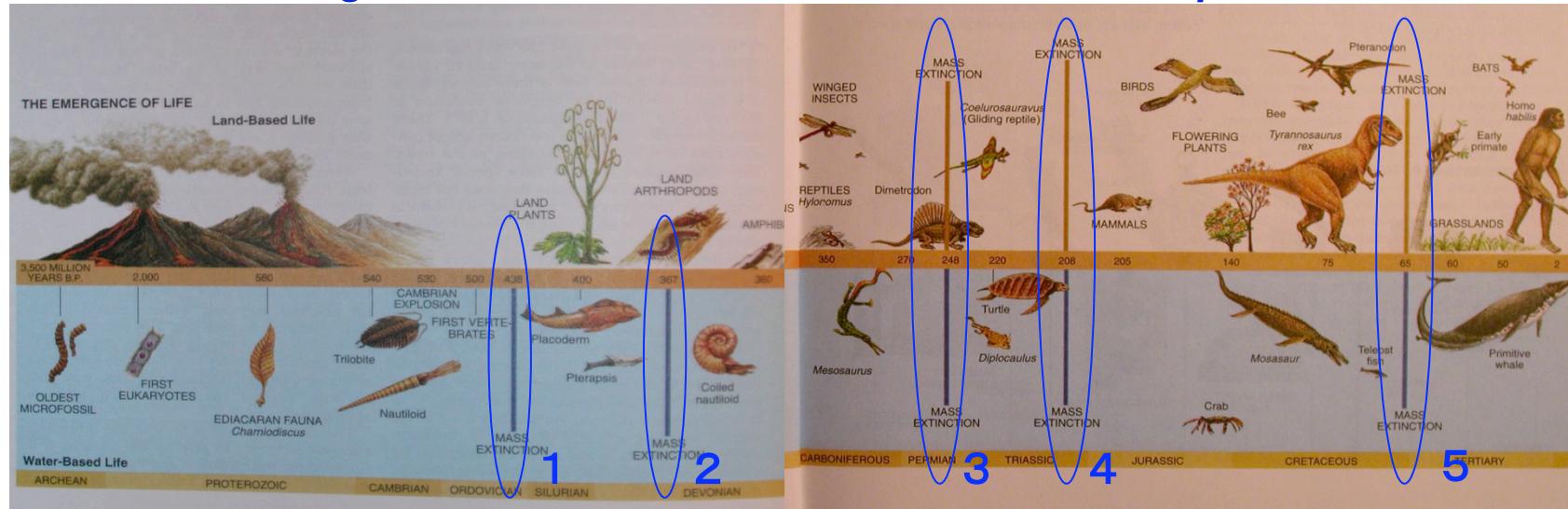
Fig. 7.5 A Schumann signal and an alpha brainwave. 1974a ELF and VLF signal properties: physical characteristics. Persinger MA (ed) ELF and VLF electromagnetic fields. Academic Press, New York, with permission.



- H. Friedman, Robert O. Becker and C. H. Bachman
"Geomagnetic parameters and psychiatric hospital admissions"
Nature 200, 626-628 (1963)
- H. Friedman, Robert O. Becker and C. H. Bachman
"Psychiatric ward behaviour and geophysical parameters"
Nature 205, 1050-1052 (1965)

The Emergence of Life

S. Weinberg "Life in the Universe" Scientific American Special Issue 1994

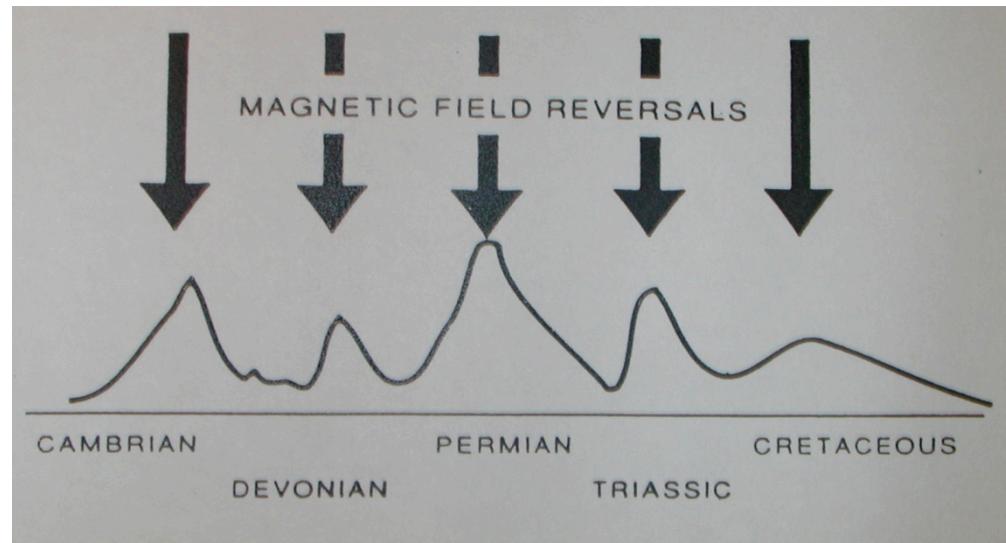


Self-organized criticality?

1) Meteorite



2) Magnetic field reversals



[http://gigazine.net/index.php?
news/comments/20080724_major_impact_craters/](http://gigazine.net/index.php?news/comments/20080724_major_impact_craters/)

R. Becker "Cross Currents" p181, 1990

地球磁場反転と放散虫の絶滅

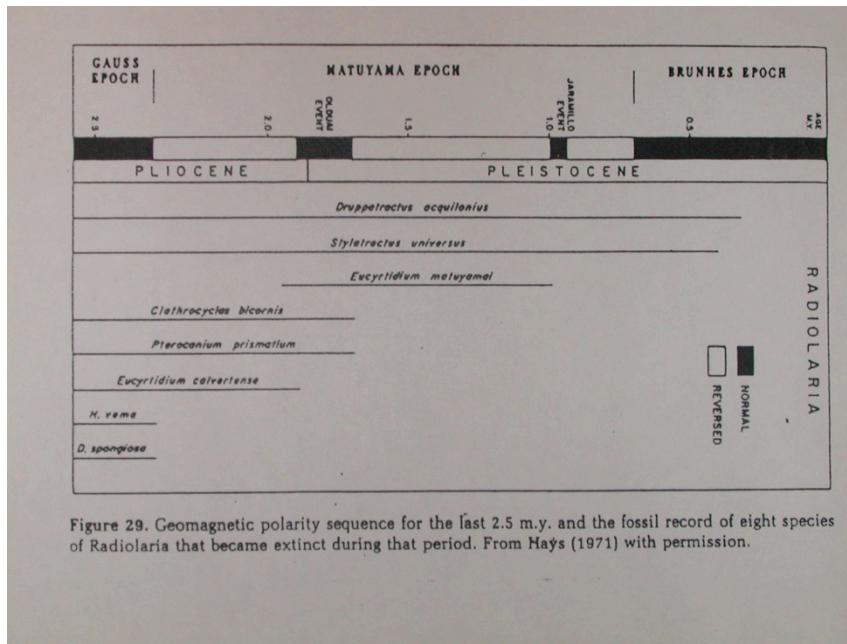
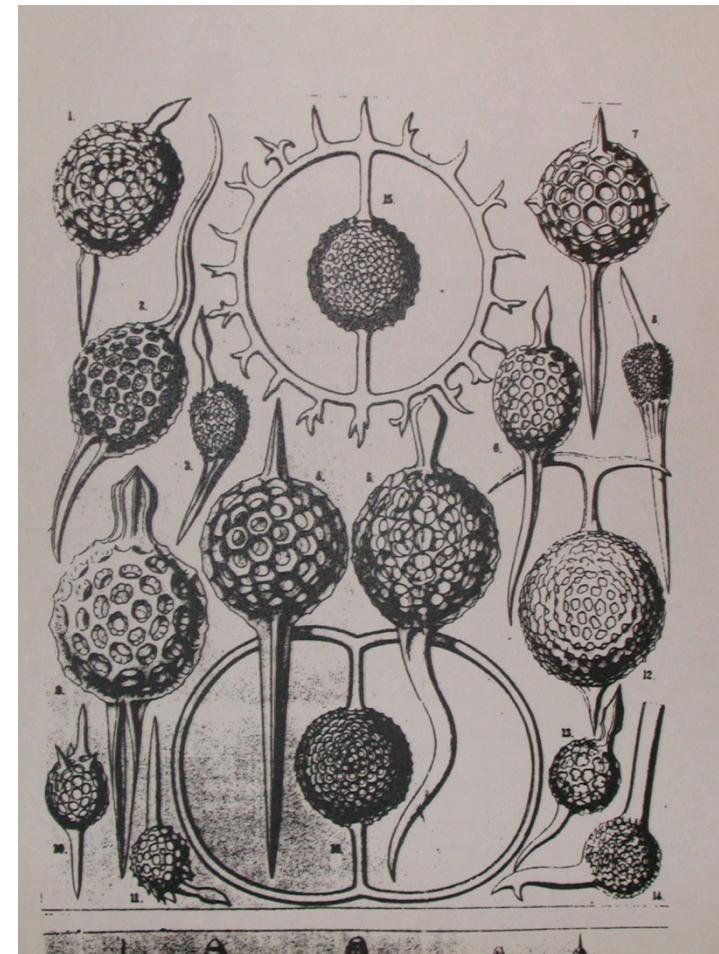


Figure 29. Geomagnetic polarity sequence for the last 2.5 m.y. and the fossil record of eight species of Radiolaria that became extinct during that period. From Haÿs (1971) with permission.



Epidemiological Studies

Nancy Wertheimer and Ed Leeper

Electrical wiring configurations
and childhood cancer

American Journal of Epidemiology
109, 273-284 (1979)

City	Author	Year
Denver	Wertheimer	1979
Denver	Savitz	1988
Los Angeles	London	1991
Sweden	Feychtung	1993

外的刺激の内在化

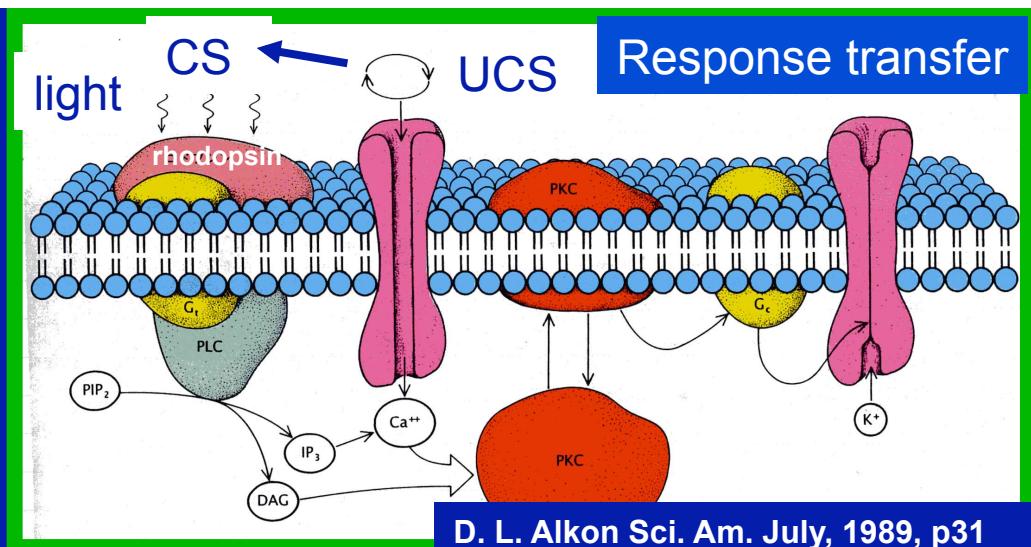
—病気とは相転移による動的記憶・学習過程—

- 1)複合刺激による連合学習
- 2)反復刺激による非神経細胞の記憶形成
微弱刺激によるKindling (キンドリング) 現象
反復刺激による光てんかん発作

2) 複合刺激による連合学習

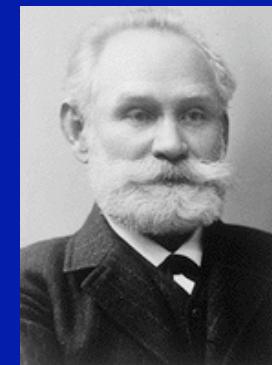
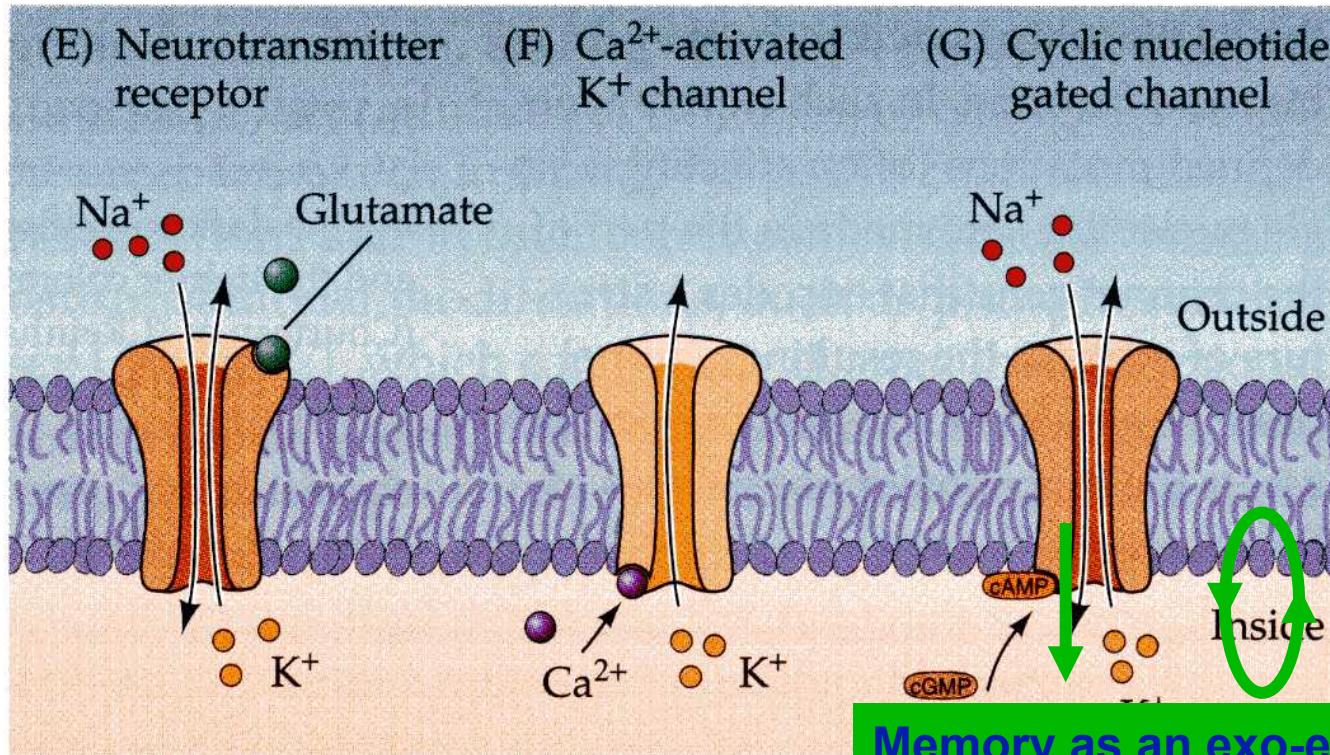
Pavlovian conditioning Associative memory formation

Acute response Chronic response
with nongenomic with genomic action



D. L. Alkon Sci. Am. July, 1989, p31

D. Purves, et al. (eds.) Neuroscience 3rd ed. Sinauer Associates p 76, p 180



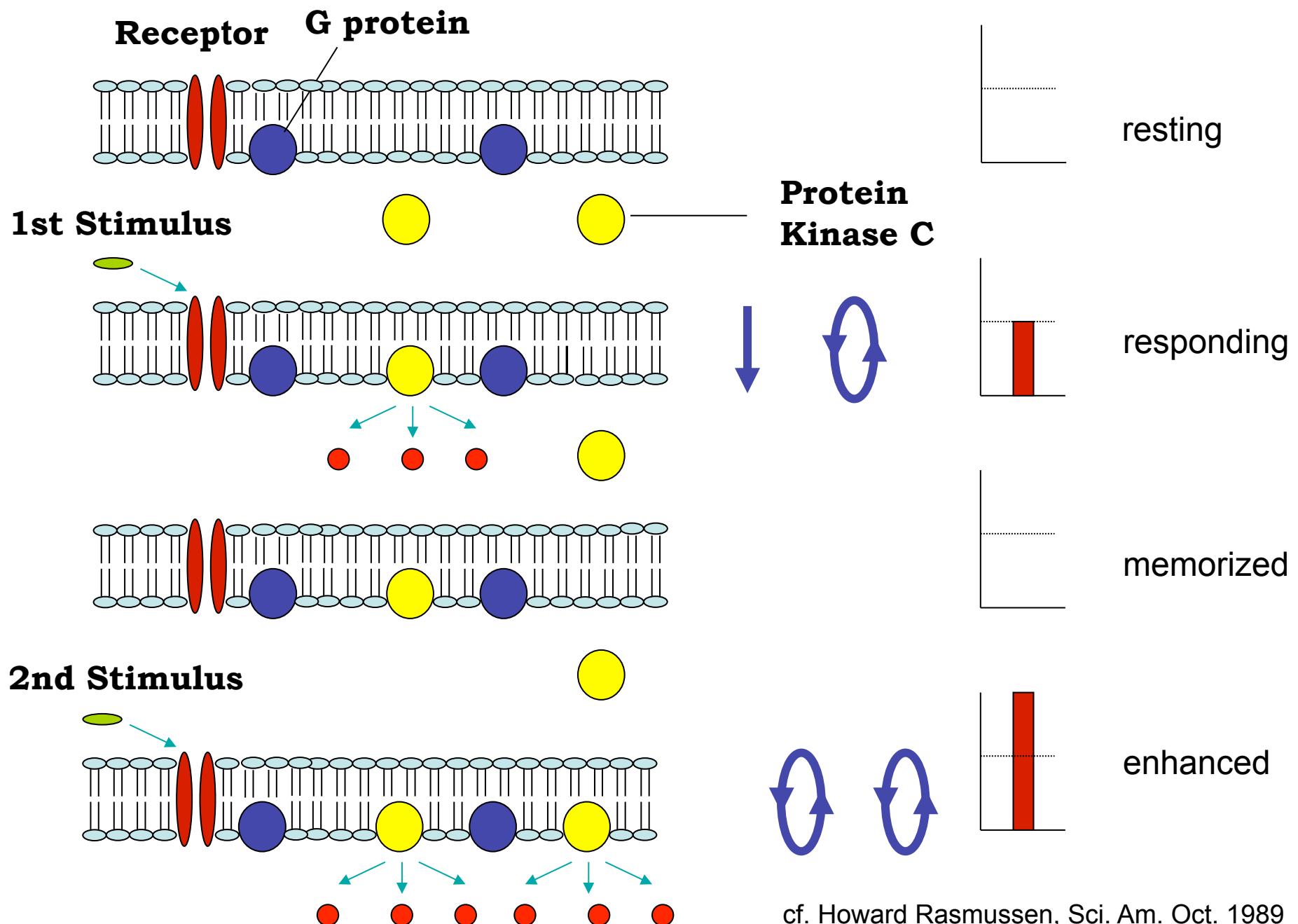
Ivan Pavlov
1849 - 1936

Reconstitution of membrane depends on temporal relation of the stimuli, but not on the stimulus themselves.

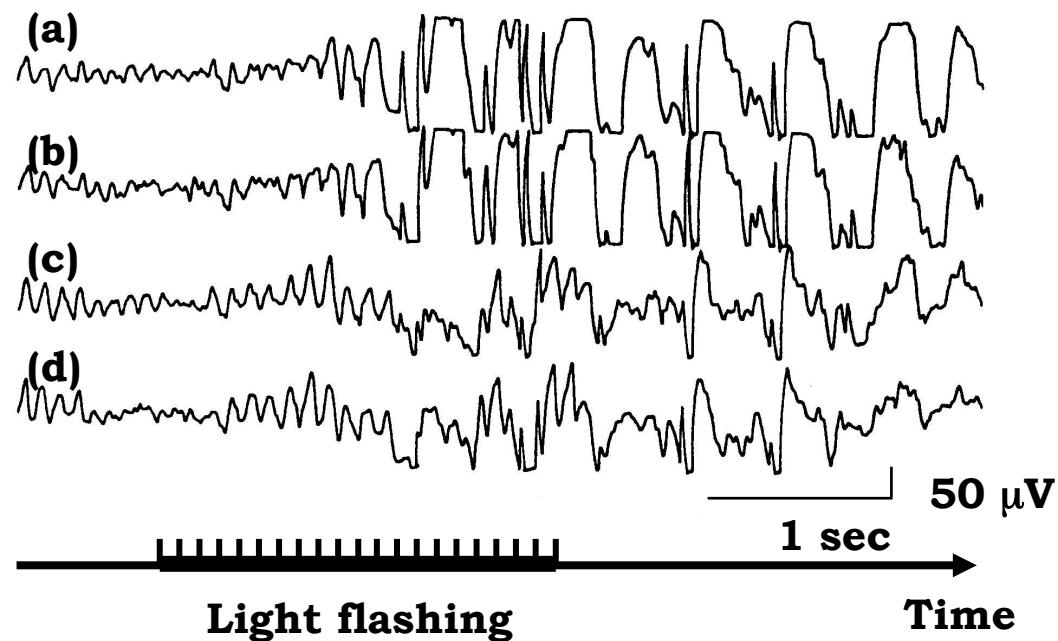
Memory as an exo-endo transition

3) 反復刺激による非神経細胞の記憶形成

Cellular Memory due to repetitive stimuli

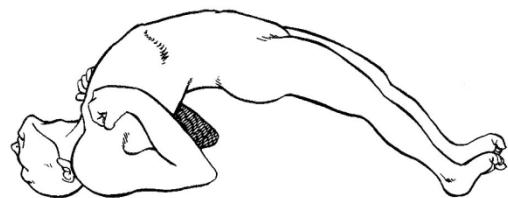


4) 反復刺激による光てんかん発作



Power Line Frequency
50 Hz, 60 Hz

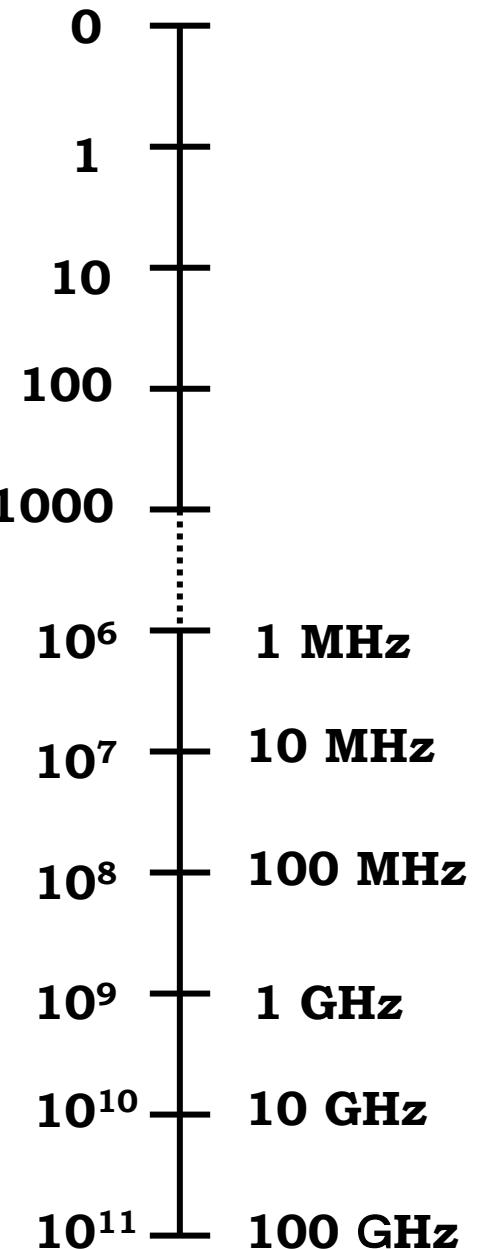
小長谷正明 著『脳と神経内科』 岩波新書1996



後弓反応（てんかん発作）
小長谷正明著『脳と神経内科』
岩波新書

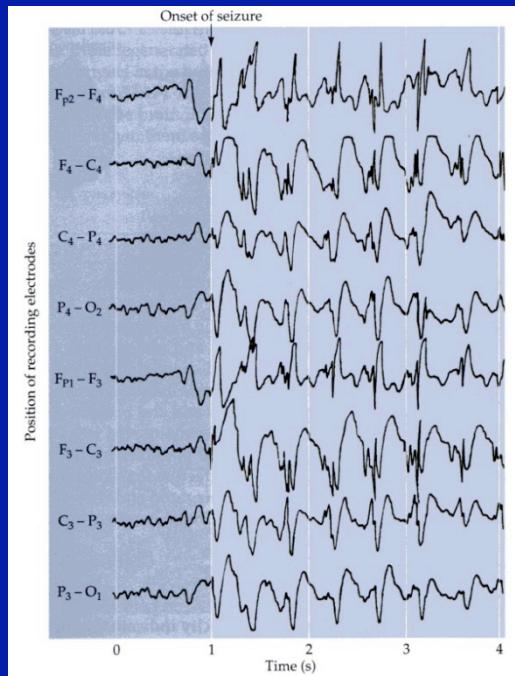
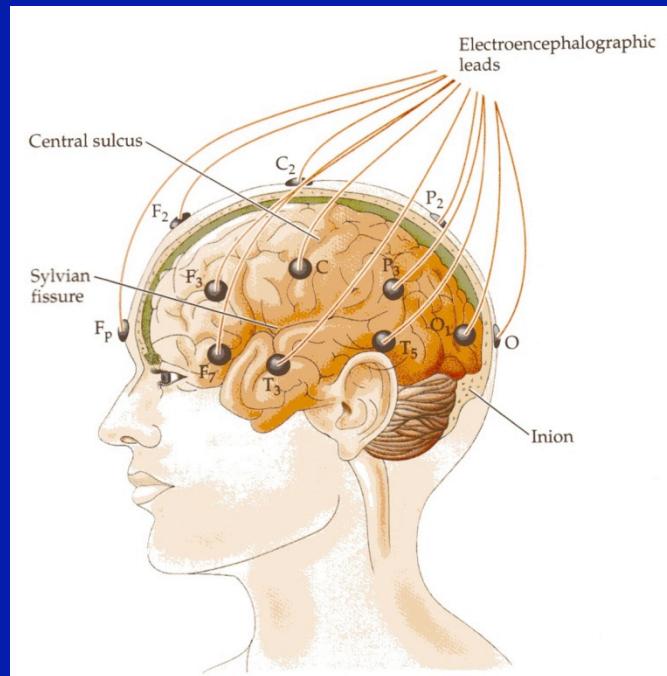
Mobile Phone 800 MHz ~ 1.8 GHz
with 2 Hz and ~ 8 Hz
Microwave Oven 2.45 GHz

Frequency (Hz)



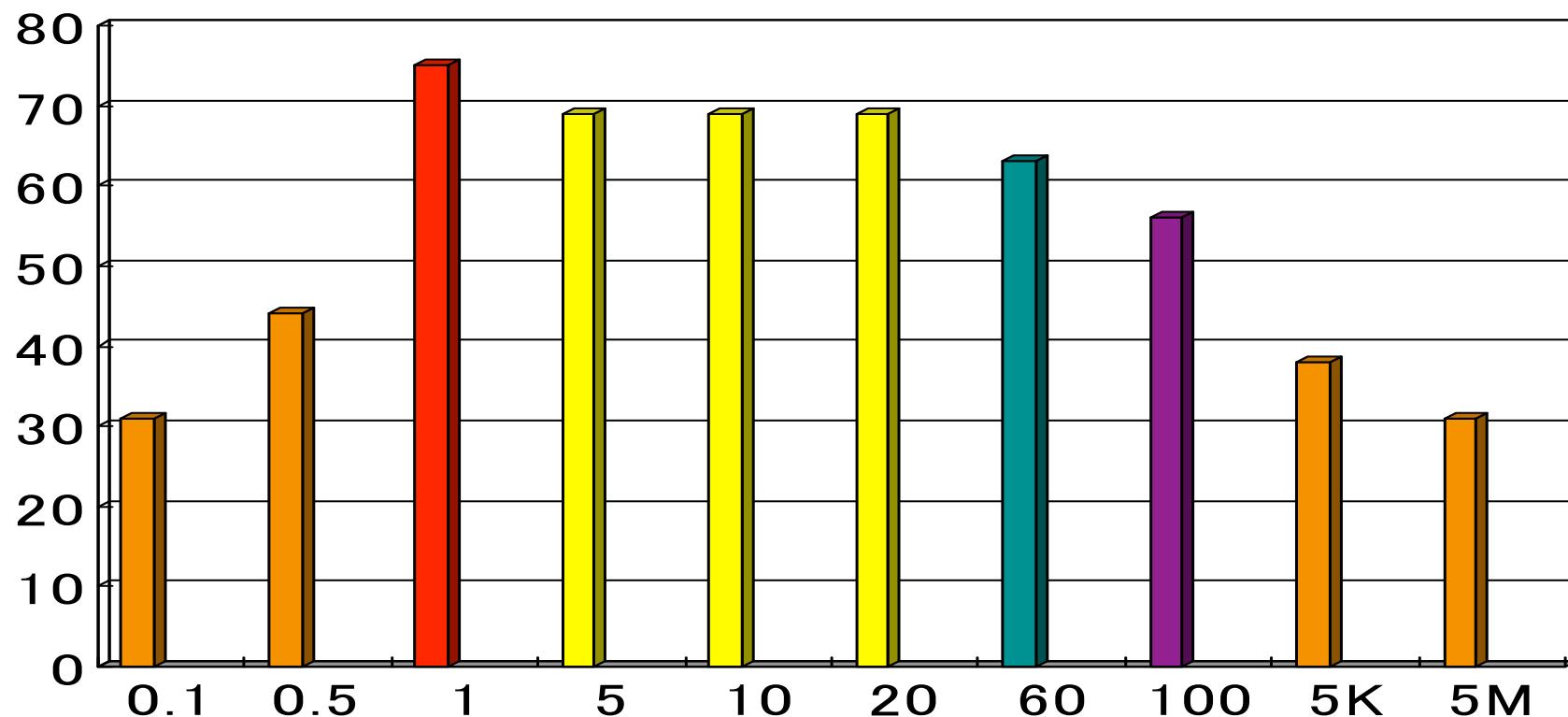
Kindling Phenomenon as Learning of malfunctioned state

- To induce kindling, a stimulating electrode is implanted in the animal brain. At the beginning, no clear effect appears. As this weak stimulation is repeated once a day for several weeks, it begins to produce seizures. This phenomenon is almost permanent even after an interval of a year.



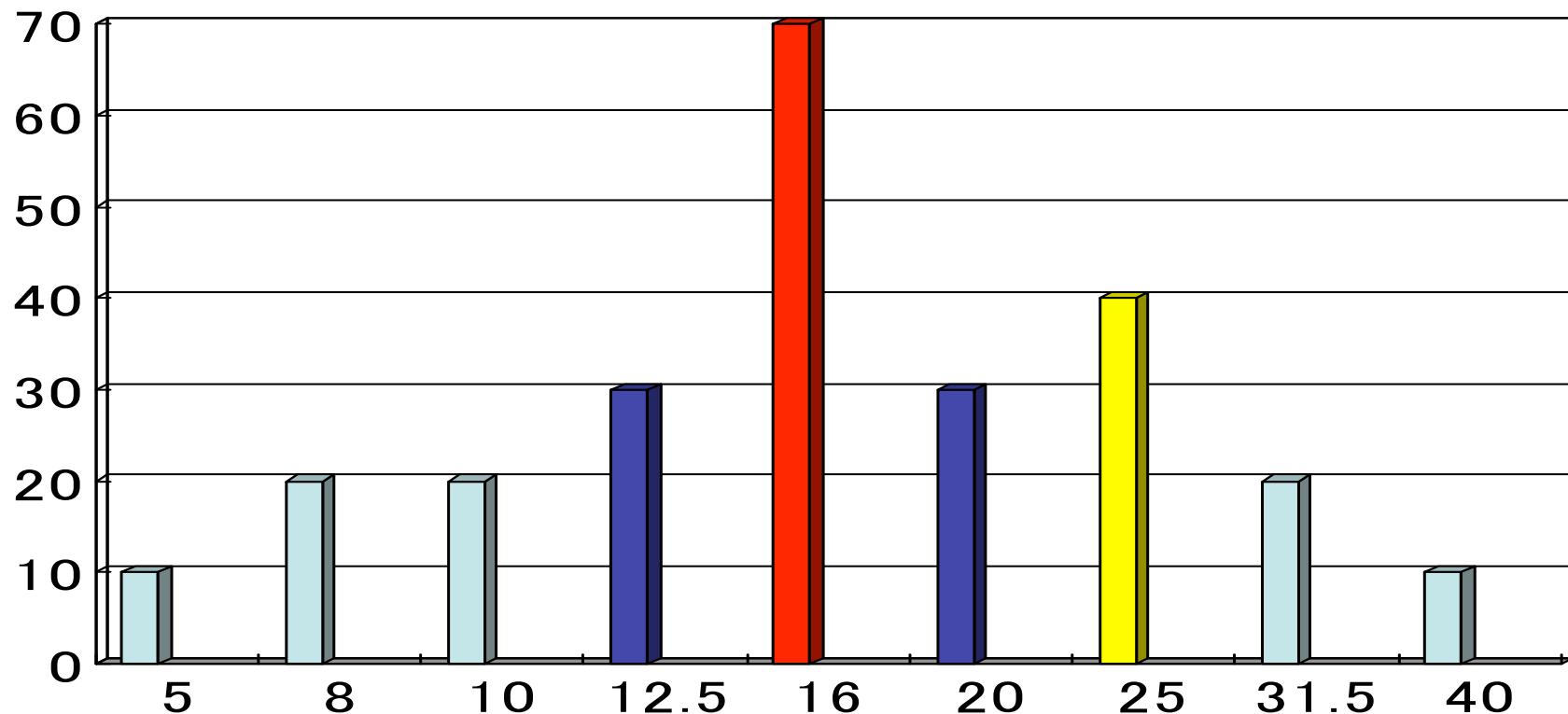
Onset of human's seizures
From *Neuroscience 3rd edition*, D. Purves et al. (2004)
Sinauer Associates, Inc. p.601, 668

Percentage of 16 patients with positive reaction to different EMF frequencies



William J. Rea: *J. Bioelectricity* 10, 241-256 (1991)

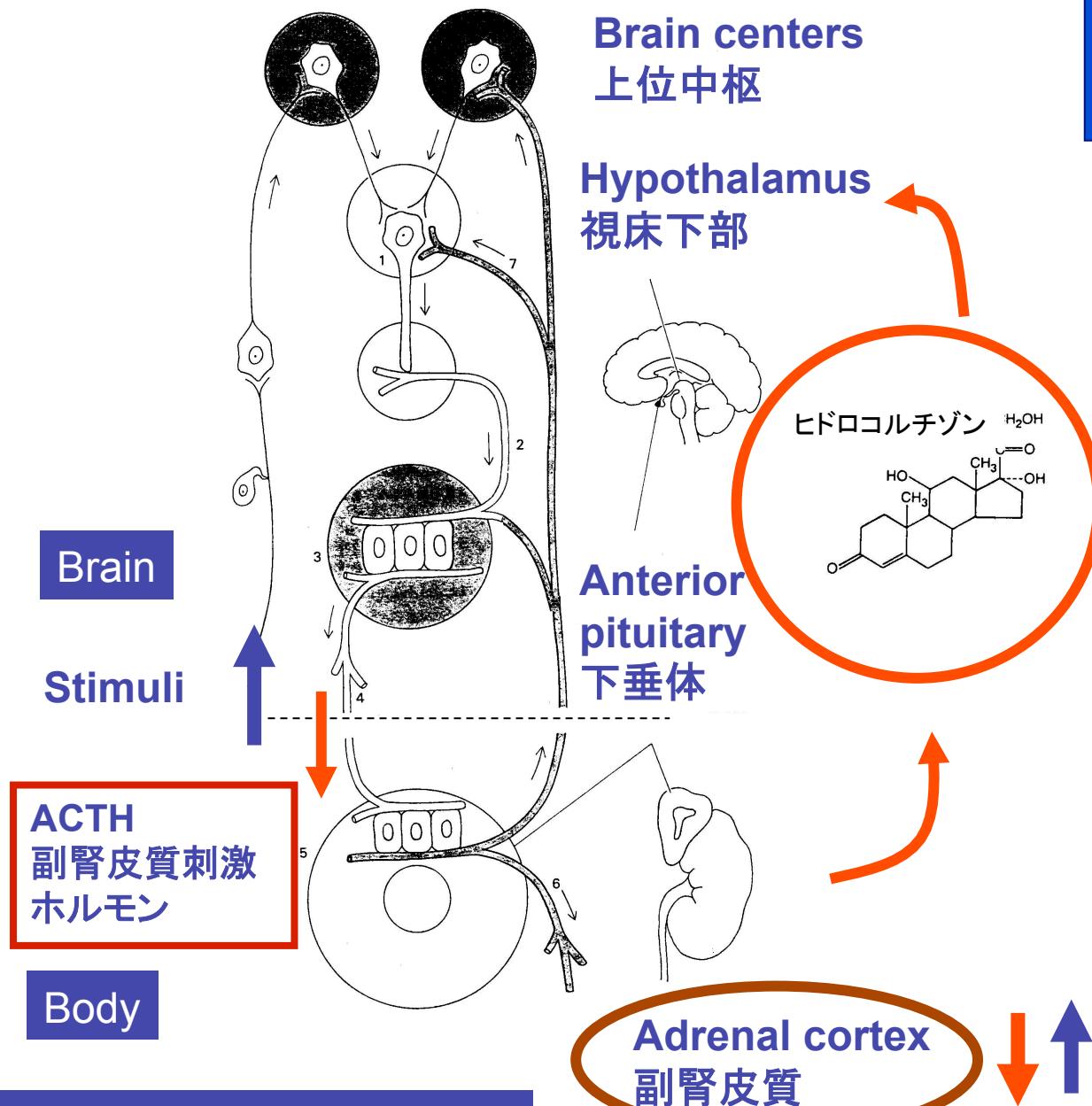
Percentage of 18 patients with positive reaction to different sound frequencies



汐見 文隆 (1994)

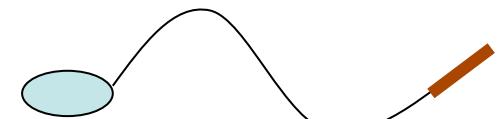
The emergence of disorder as an endo-exo transition

Murase (2008)



Cushing's syndrome
Excessive secretion from the adrenal cortex

Dulling of the sense 鈍感化

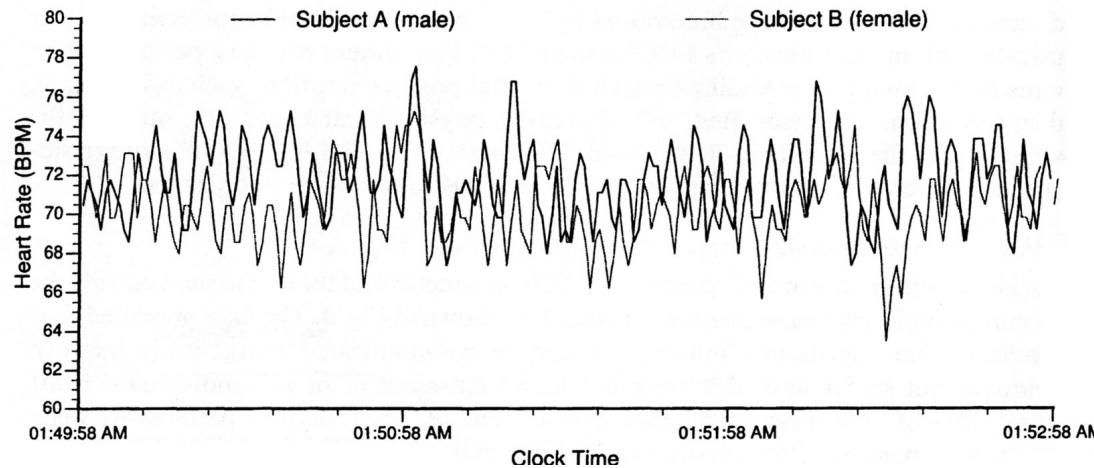


Enhanced sensing of signals 銳敏化

Poorly functioning of the adrenal cortex
過敏症候群：
副腎摘出や機能低下
味覚、嗅覚、聴覚、体性感覚の銳敏化と情報統合能力の低下(話言葉の理解困難、音調や音の大きさの変化が把握困難)

生命現象と電磁場

- 1) 知覚と運動のアナロジー
－自律性の獲得とその制御－
- 2) 環境からのインプリンティング
－ 多様性と普遍性－
- 3) インプリンティングとしての進化
－ スケール不変性の発見－
- 4) 決定論的進化論の検討
－自己組織臨界現象の可能性－
- 5) 電磁場の生体影響
－ 学習過程と病気発症－
- 6) 電磁場としての生命
－ 物質還元論への反省－
- 7) まとめ
－あらたな可能性に向けて



F R. McCraty The energetic heart: bioelectromagnetic communication within and between people. In: Bioelectromagnetic Medicine Edited by Paul J. Rosch and Marko S. Markov (2004) 541-562.

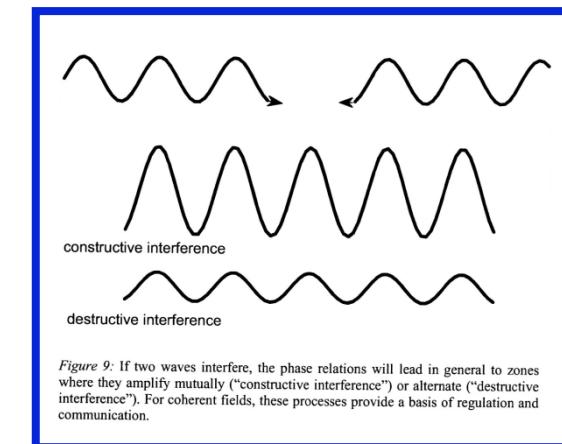
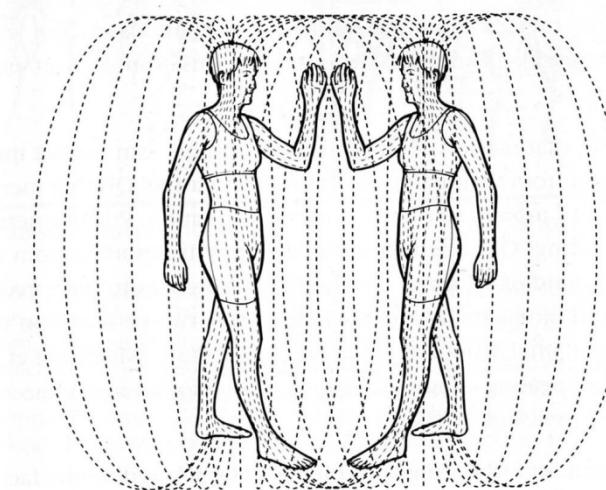
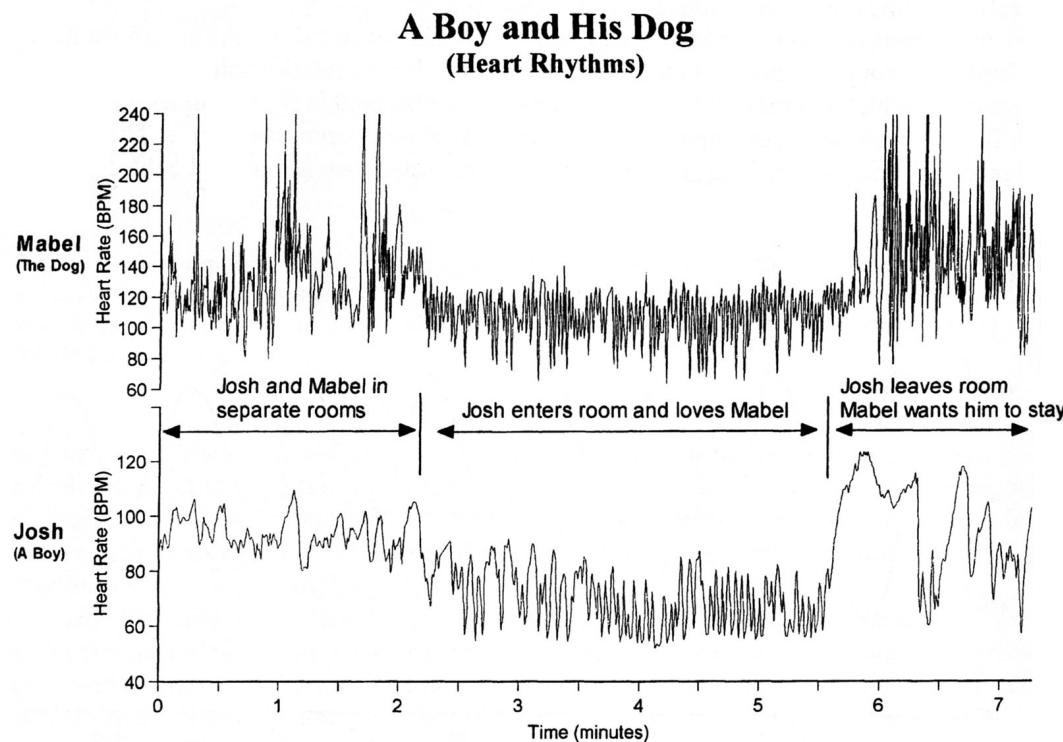


Figure 9: If two waves interfere, the phase relations will lead in general to zones where they amplify mutually ("constructive interference") or alternate ("destructive interference"). For coherent fields, these processes provide a basis of regulation and communication.

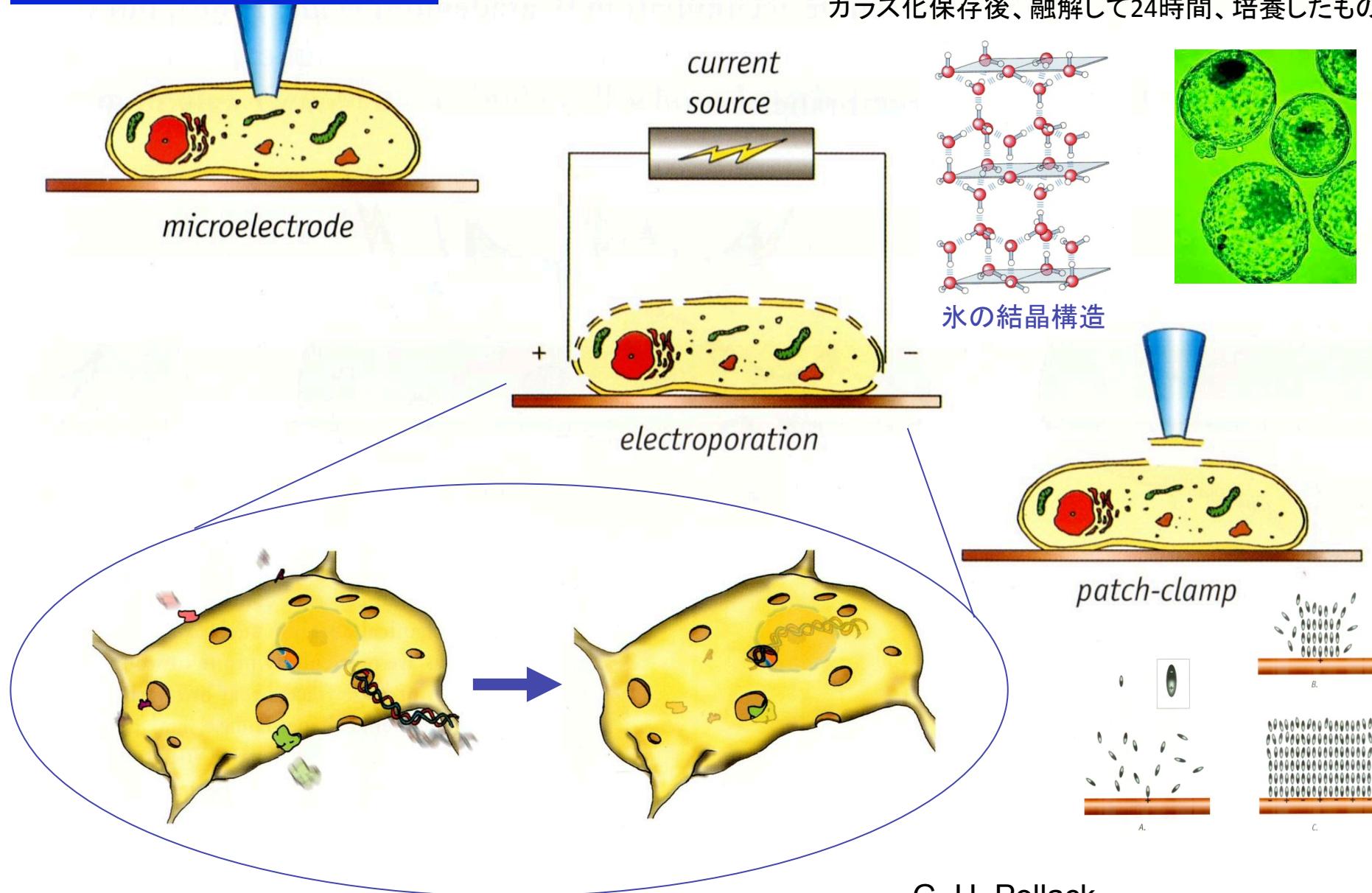
Fritz-Albert Popp Biophotonics *Integrative Biophysics* p.398 Kluwer (2003)

R. McCraty The energetic heart: bioelectromagnetic communication within and between people. In: Bioelectromagnetic Medicine Edited by Paul J. Rosch and Marko S. Markov (2004) 541-562.

覆る生命科学の大前提

<http://www.ja-awa.or.jp/information/rakunou/ai-labo/ai-labo001.html>

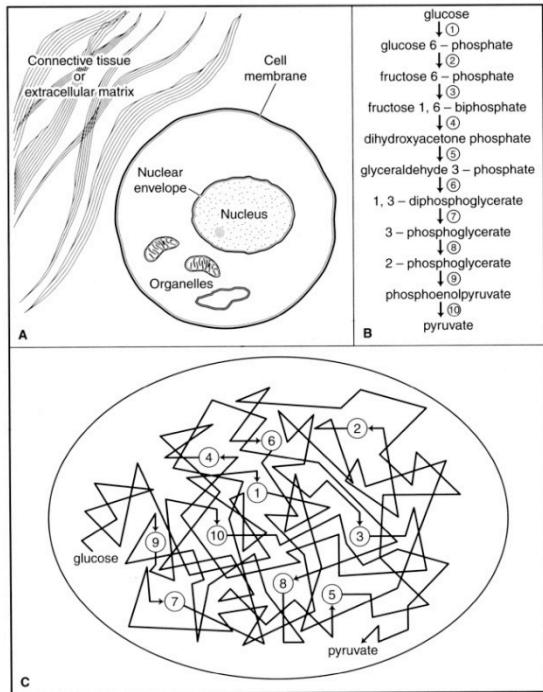
ガラス化保存後、融解して24時間、培養したもの。



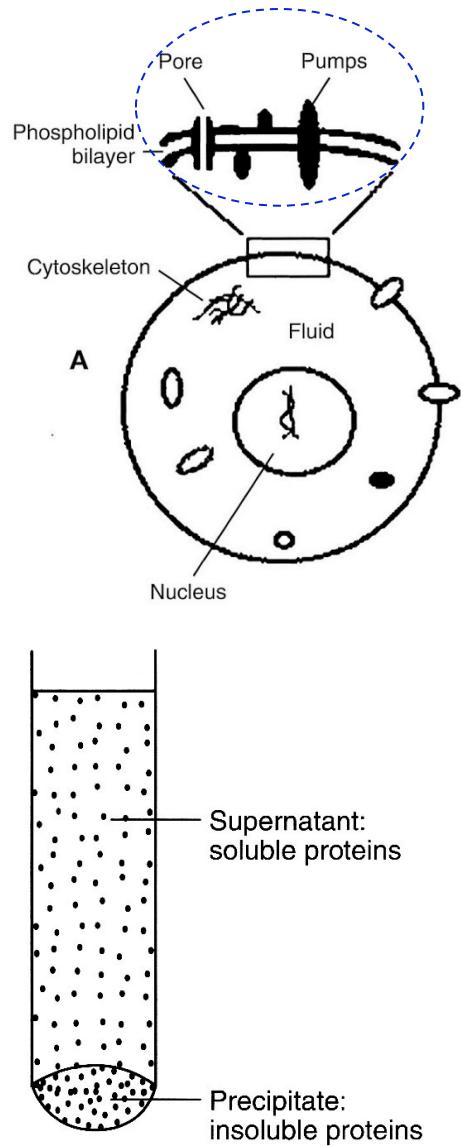
L. Lehninger, et al.
Principles of Biochemistry
(2nd ed.), pp.83, 1993

G. H. Pollack
Cells, Gels and the Engines of Life
Ebner & Sons, 2001

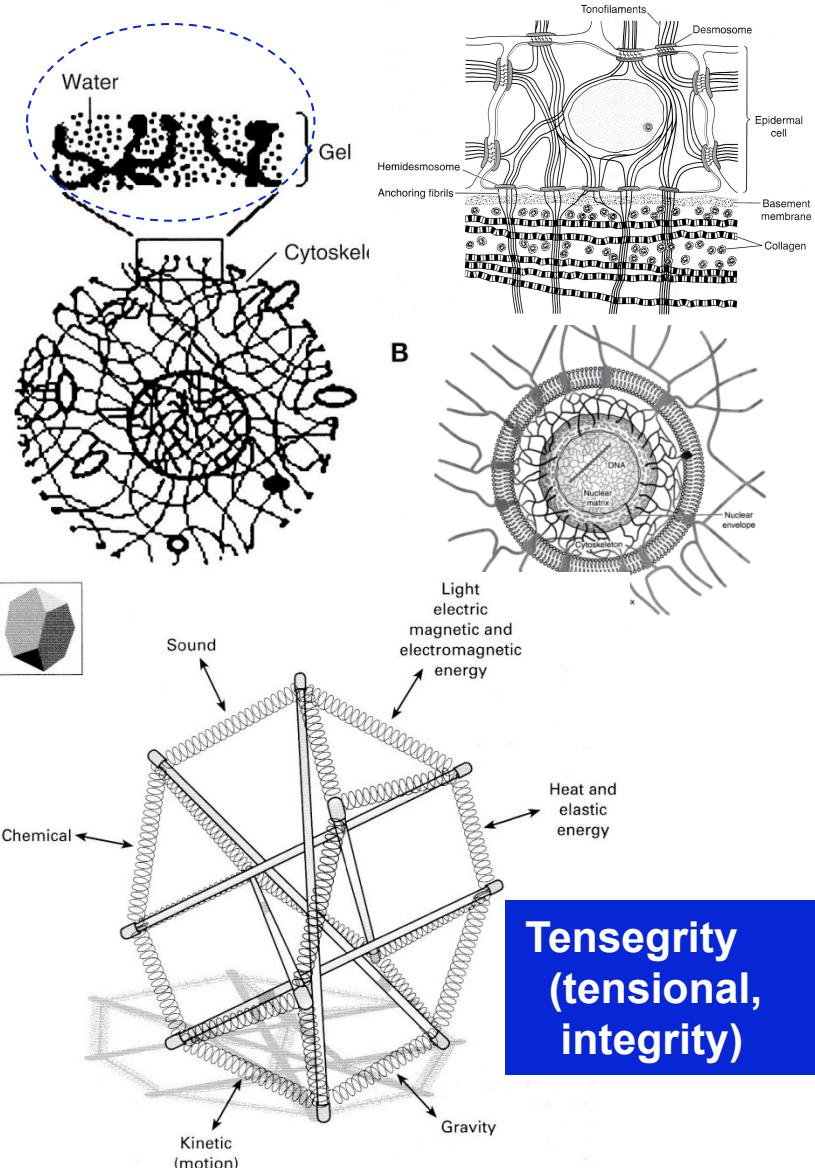
覆る生命科学の大前提



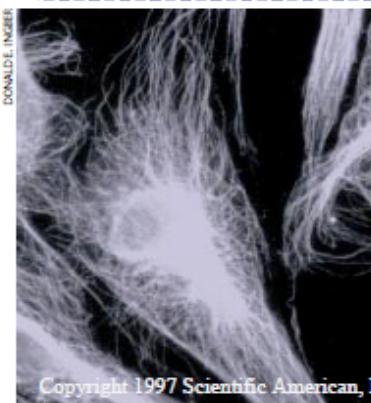
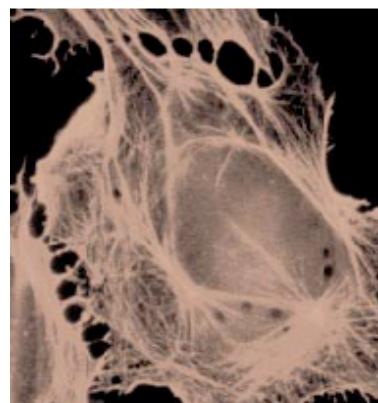
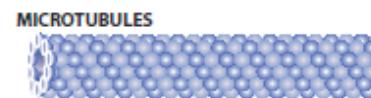
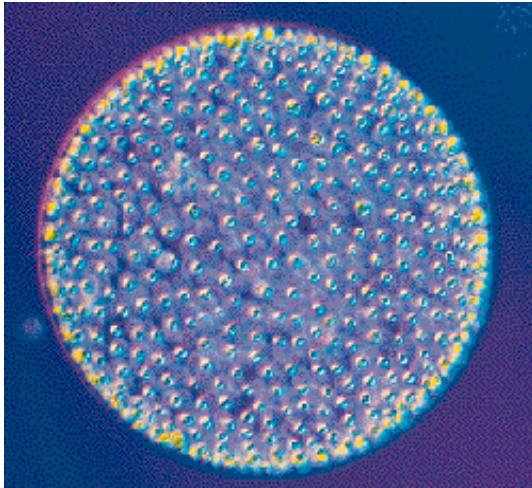
J. L. Oschman
“Energy Medicine”
P44, Churchill Livingstone
(2000)



生体マトリックス



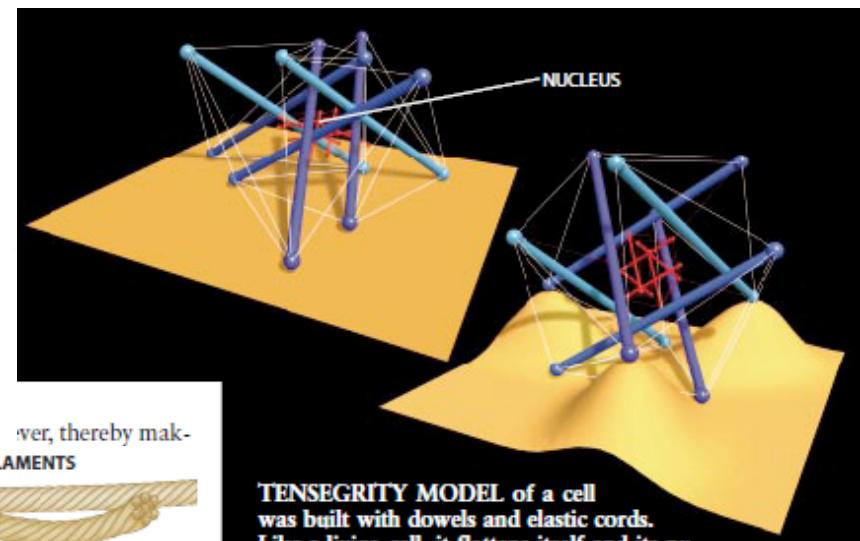
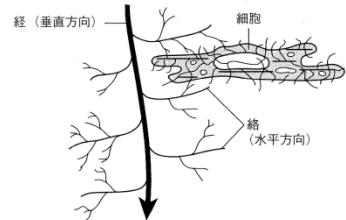
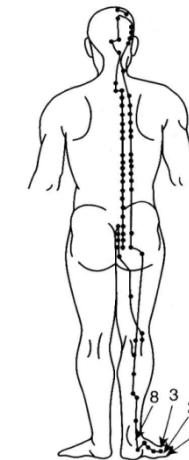
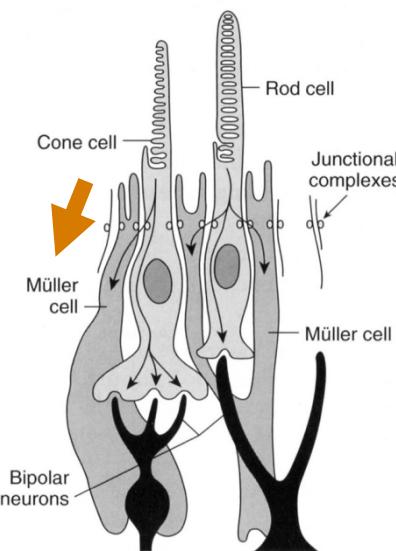
J. L. Oschman “Energy Medicine in Therapeutics and Human Performance”, Churchill Livingstone (2003)



Copyright 1997 Scientific American, Inc.

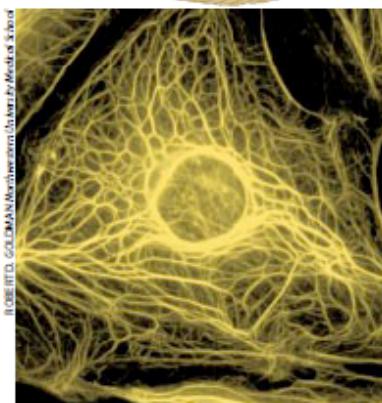
光療法:全身の組織が関係する多様な
症状が回復する。光の視覚的認識は、
関与せず。

神経系を介さない バイパス経路の存在



ver, thereby mak-

INTERMEDIATE FILAMENTS



TENSEGRITY MODEL of a cell was built with dowels and elastic cords. Like a living cell, it flattens itself and its nucleus when it attaches to a rigid surface (*left*) and retracts into a more spherical shape on a flexible substrate, puckering that surface (*right*).

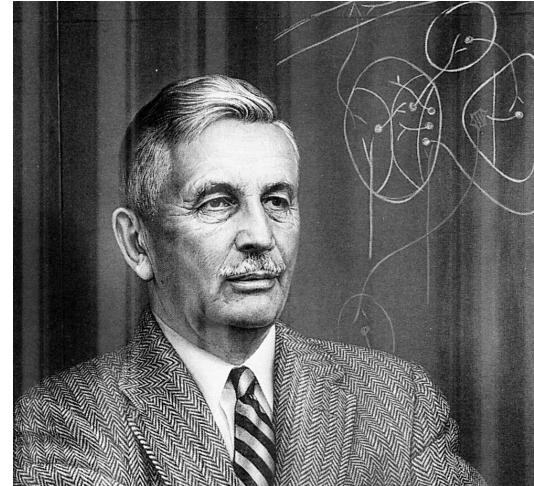
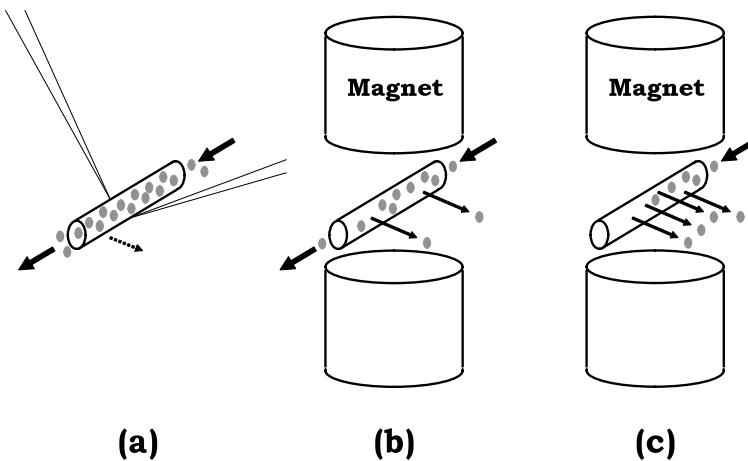
GEODESIC DOME carries a given load with a minimum amount of building materials.



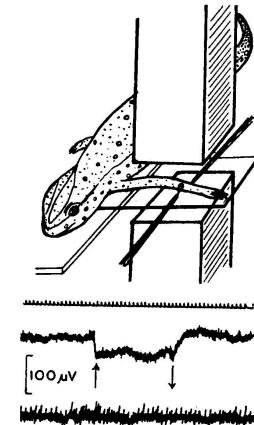
Geodesic dome (測地腺)



and Lushby
Albert Szent-Gyorgyi
Lost in the Twentieth Century
Annual Review of Biochemistry
32, 1-14 (1963)



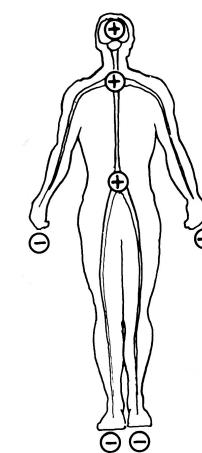
Harold Saxton
Burr
Blueprint for
Immortality
The Electric
Patterns of Life
CW Daniel,
Sffron Walden
1972



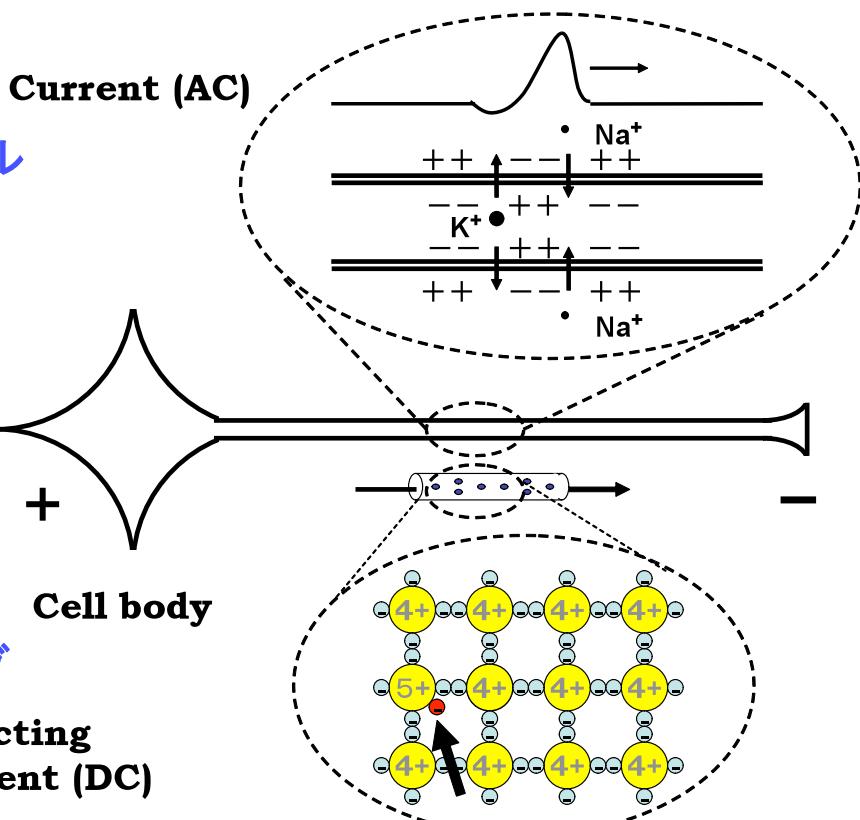
Robert O. Becker

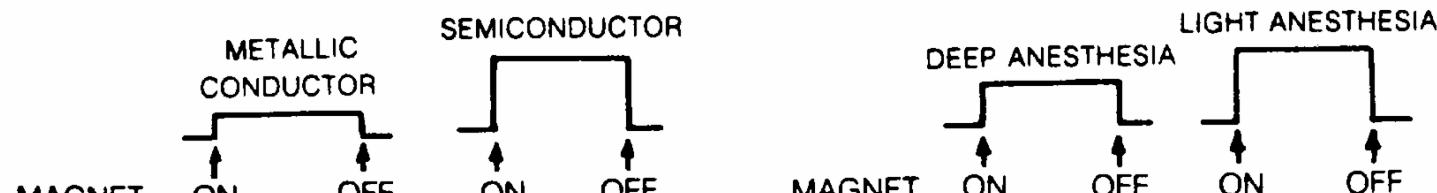
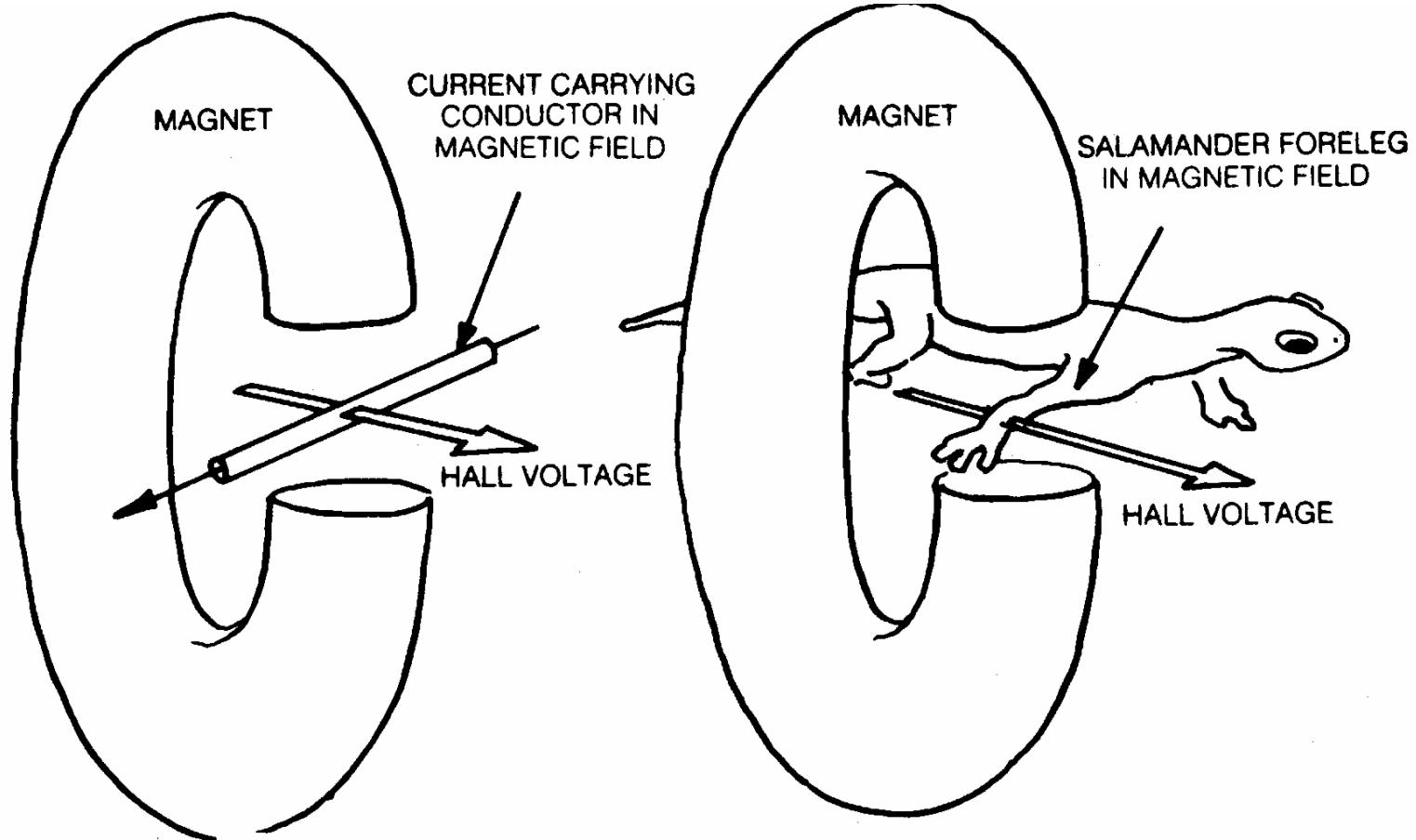
Ionic Alternating Current (AC)

デジタル

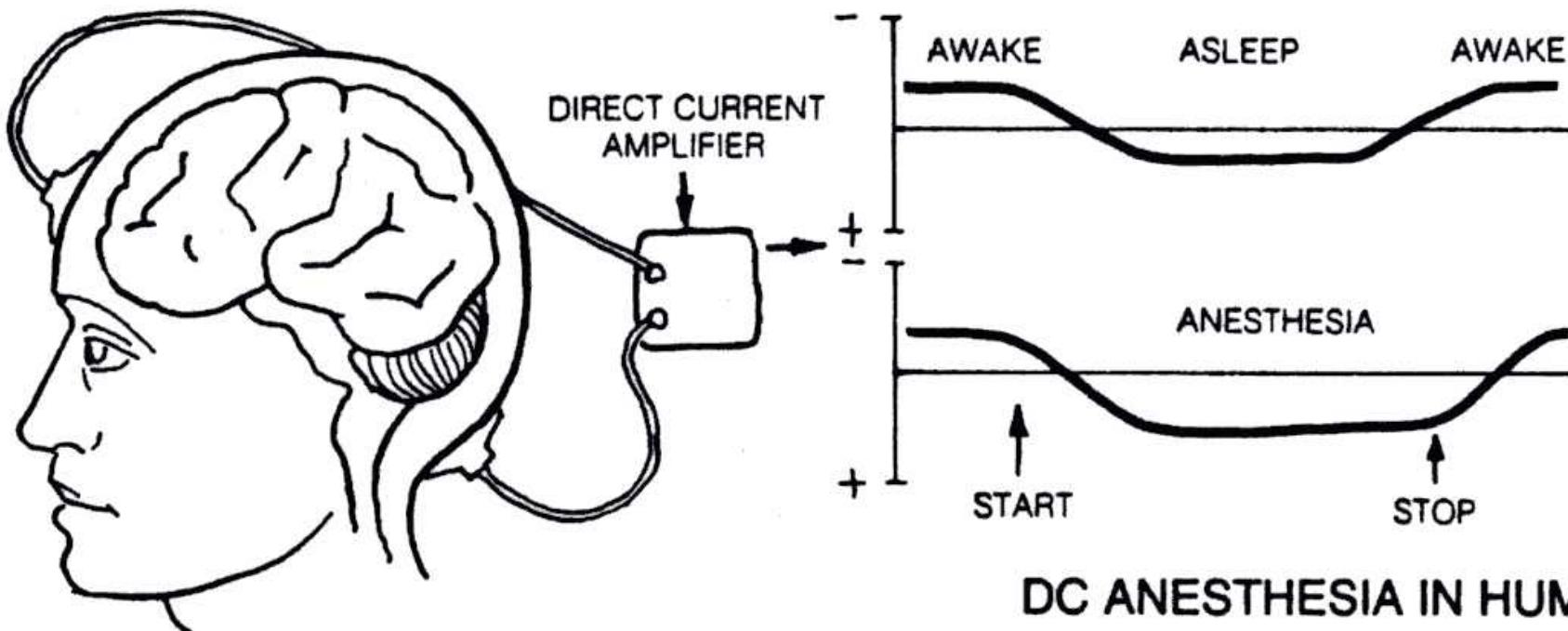


Semiconducting Direct Current (DC)

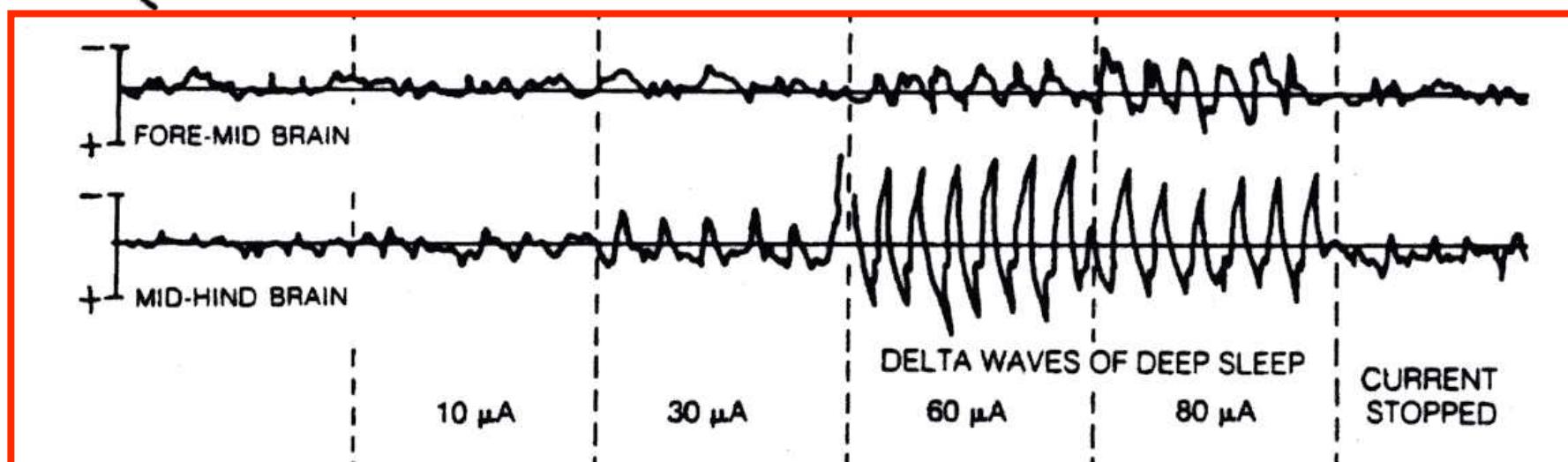




THE HALL EFFECT

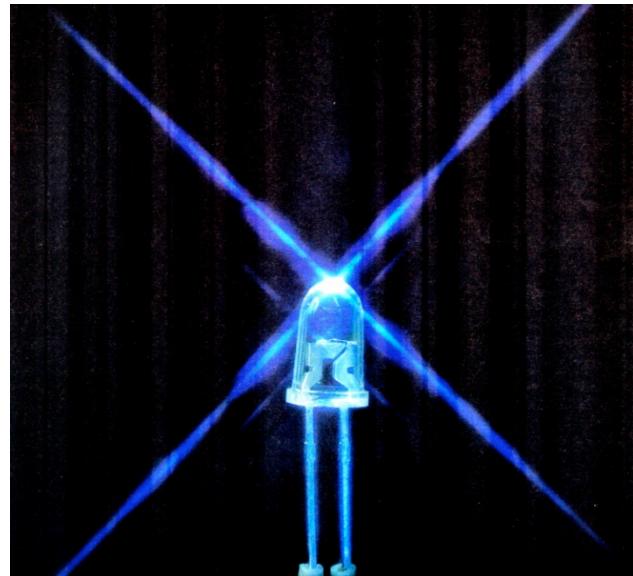
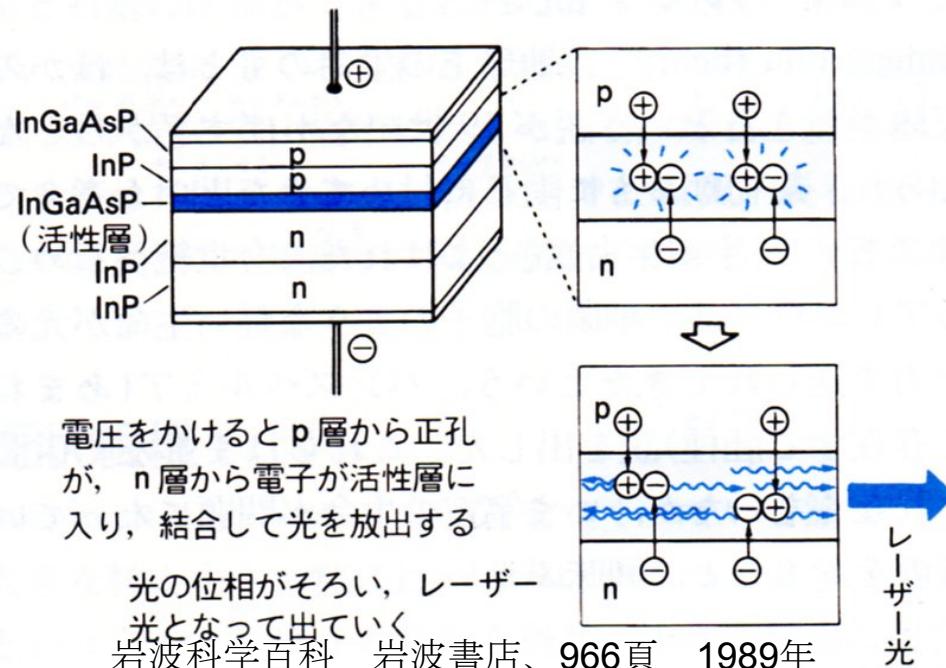


DC ANESTHESIA IN HUMANS



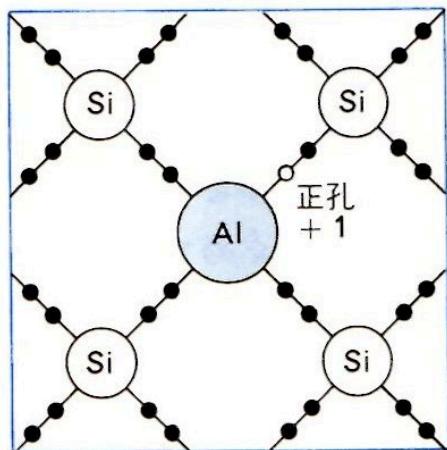
DC THROUGH THE HEAD ANESTHETIZES THE SALAMANDER

Light Emission Diode



中村修二「実現した青色の高輝度発光ダイオード」
日経サイエンス 1994年、10月号、44–55

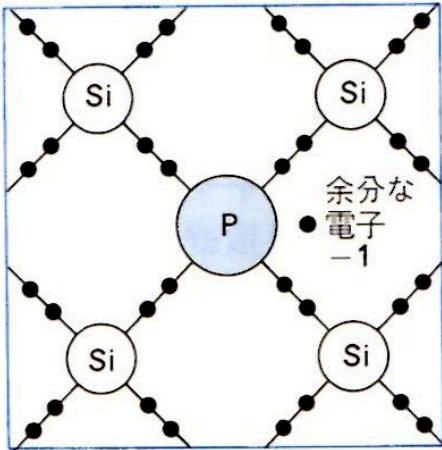
IV族SiにIIIのAlをドープ



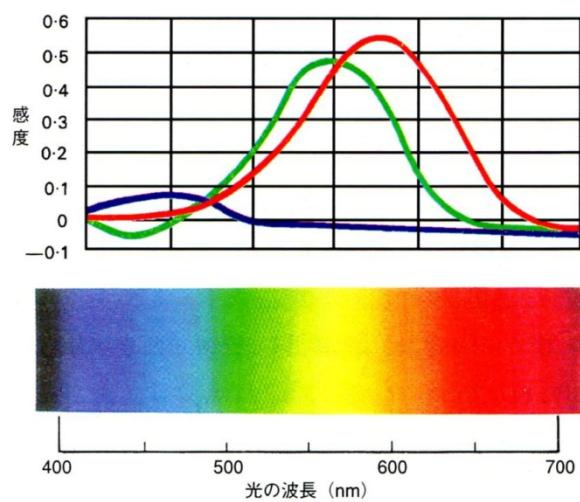
p型半導体

岩波科学百科 岩波書店 971頁 (1989)

V族のPをドープ



n型半導体

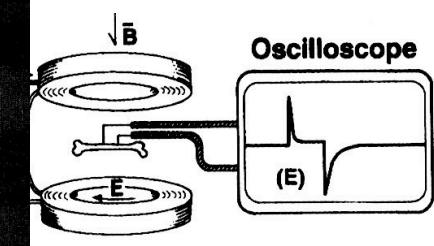
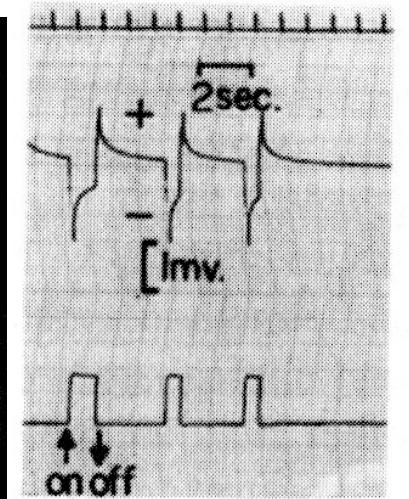
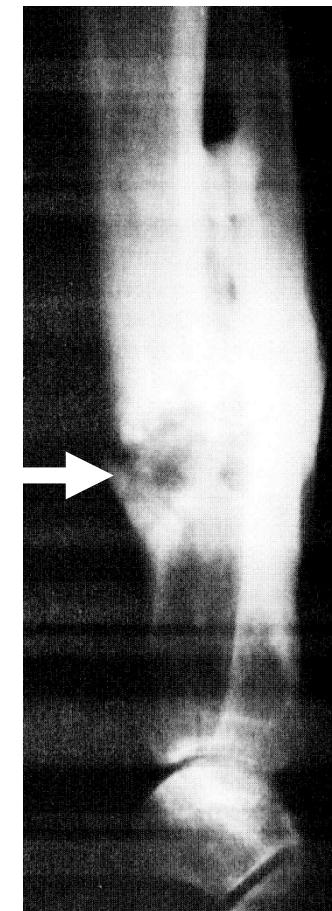
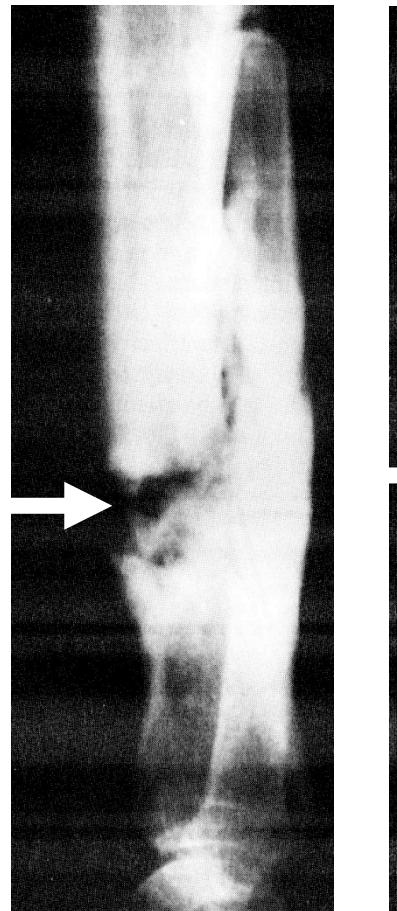
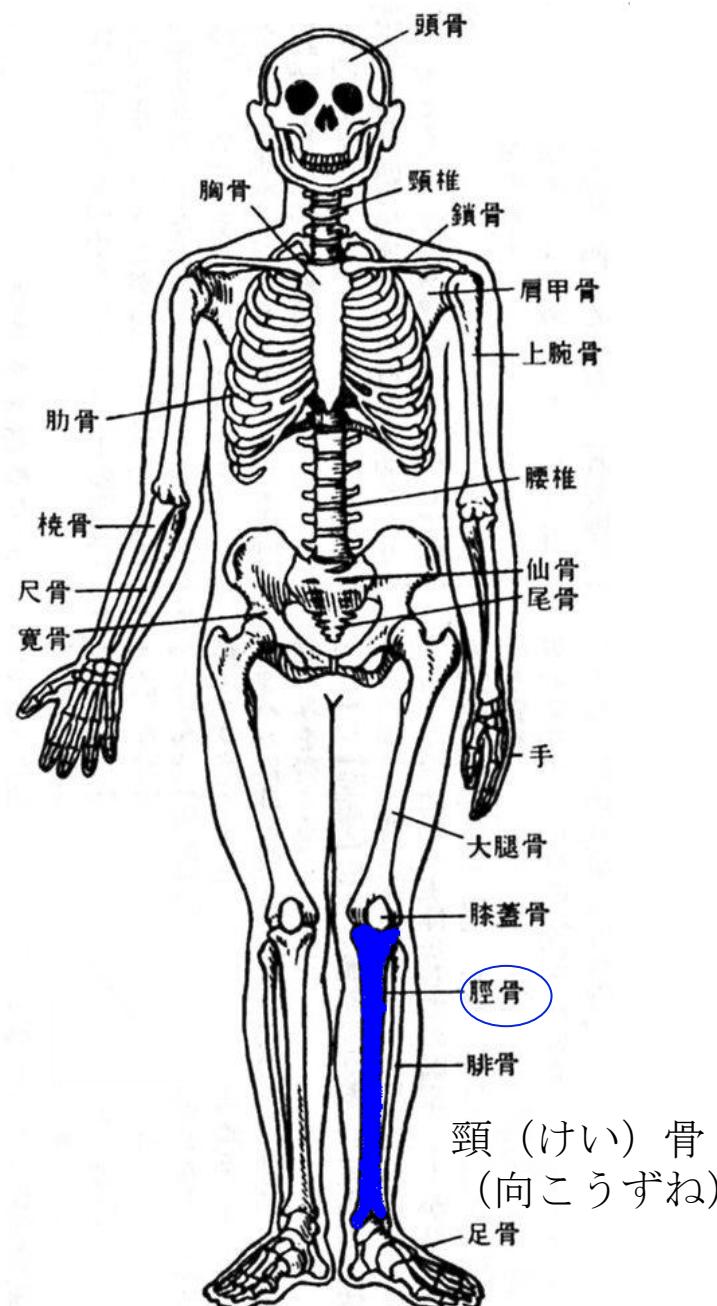


W. D. ライト (W. D. Wright) による人間の眼の基本色に対する応答曲線。
これらは色に感受性をもつ3種類の錐体色素の吸収曲線を表している。

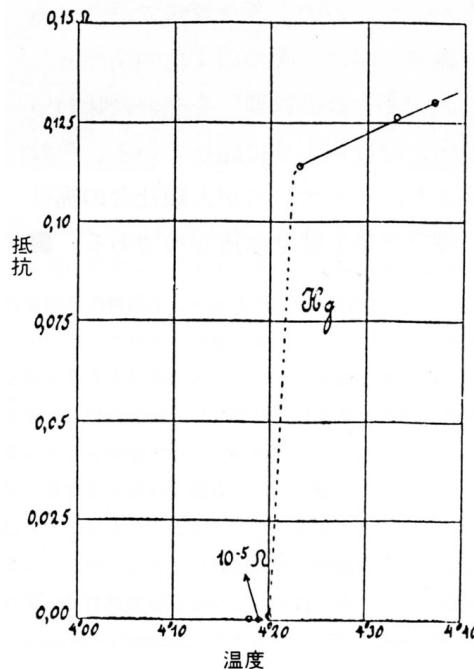
R. グレゴリー「脳と視覚」ブレーン出版 163頁、2001

生命現象と電磁場

- 1) 知覚と運動のアナロジー
—自律性の獲得とその制御—
- 2) 環境からのインプリンティング
— 多様性と普遍性 —
- 3) インプリンティングとしての進化
— スケール不変性の発見 —
- 4) 決定論的進化論の検討
—自己組織臨界現象の可能性—
- 5) 電磁場の生体影響
— 学習過程と病気発症 —
- 6) 電磁場としての生命
— 物質還元論への反省 —
- 7) まとめ
— 可能性と危険性 —

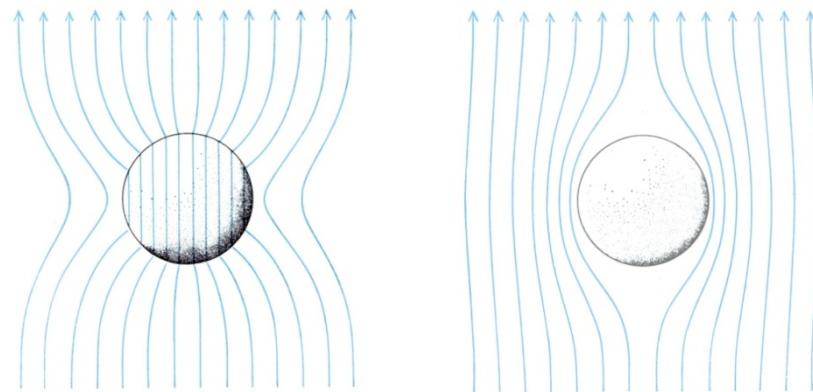


A lateral X-ray of the tibia in a 40-year-old patient Whose fracture occurred 6 years before (left). Complete bridging of the gap occurs after electro-magnetic treatment (right). Bassett (1995) in "Electromagnetic Fields" ed. Martin Blank American Chemical Society, Washington, DC. pp.261-275.



極限条件における相転移現象 —ある条件での常識は別の条件での非常識—

H. Kamerlingh
Onnes (カマリン・オン
ネス、1911)
Nobel Prize winner
4.2K 液体ヘリウム温度
水銀抵抗消失



強磁性体では磁力線が集中、反磁性体では排除
別冊 日経サイエンス「科学が変えた20年」



液体窒素で冷やされた酸化物超伝導体の上にお
いた磁石がマイスナー効果によって浮上してい
る



Online 28 April 2005



Microwaves from GSM mobile phones affect 53BP1 and γ -H2AX foci in human lymphocytes from hypersensitive and healthy persons

Eva Markovà, Lena Hillert, Lars Malmgren, Bertil R. R. Persson, and Igor Y. Belyaev

doi:10.1289/ehp.7561 (available at <http://dx.doi.org/>)

Conclusions

Non-thermal microwaves from GSM mobile phones at lower levels than the ICNIRP safety standards affect 53BP1 and γ -H2AX foci and chromatin conformation in human lymphocytes. These effects suggest induction of stress response and/or DNA damage. For the first time, we report that mobile phone MWs affect 53BP1 and γ -H2AX foci dependent on carrier frequency. We also show that heat shock induces similar responses. The same responses were observed in lymphocytes from healthy subjects and from subjects reporting hypersensitivity to electromagnetic fields.

Published online: 21 December 2004

Mobile-phone radiation damages lab DNA

<http://www.nature.com/news/2004/041220/full/041220-6.html>

**Risk Evaluation of Potential Environmental Hazards
From Low Frequency Electromagnetic Field
Exposure Using Sensitive *in vitro* Methods**

**A project founded by the European Union
1 February 2000 – 31 May 2004
Prof. Dr. Franz Adlkofer**

Epidemiology 15(6):653-659, November 2004.

*Lonn, Stefan *; Ahlbom, Anders *; Hall, Per +; Feychtig, Maria **

Mobile Phone Use and the Risk of Acoustic Neuroma

Methods: In this population-based case-control study we identified all cases age 20 to 69 years diagnosed with acoustic neuroma during 1999 to 2002 in certain parts of Sweden. Controls were randomly selected from the study base, stratified on age, sex, and residential area. Detailed information about mobile phone use and other environmental exposures was collected from 148 (93%) cases and 604 (72%) controls.

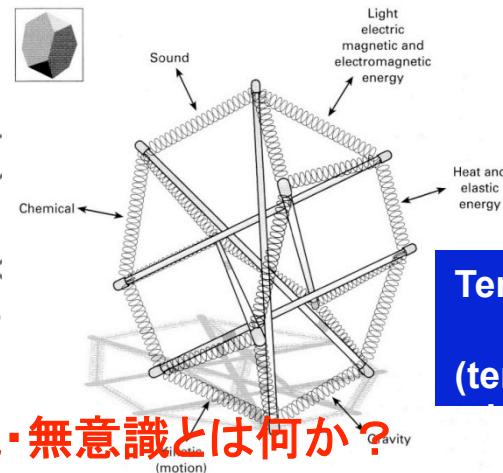
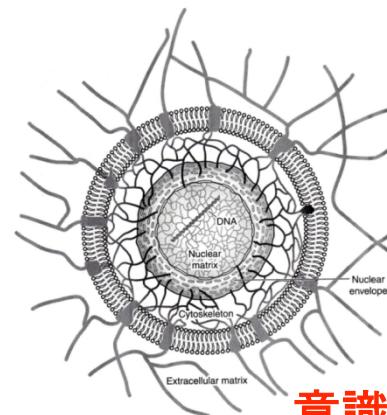
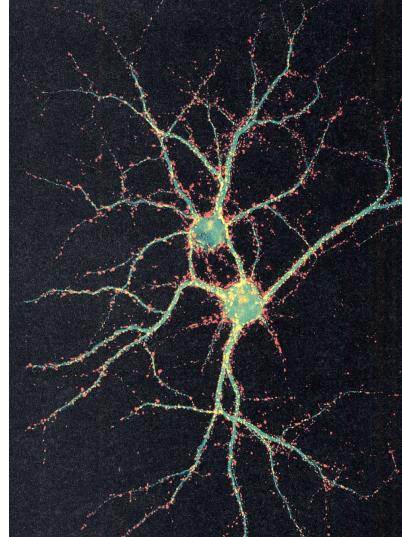
Conclusions: Our findings do not indicate an increased risk of acoustic neuroma related to short-term mobile phone use after a short latency period. **However, our data suggest an increased risk of acoustic neuroma associated with mobile phone use of at least 10 years' duration.**

電磁場ホルモン作用仮説

特定周波数・特定強度の電磁場は
特定時間作用することによって
生体にホルモン作用をおよぼす

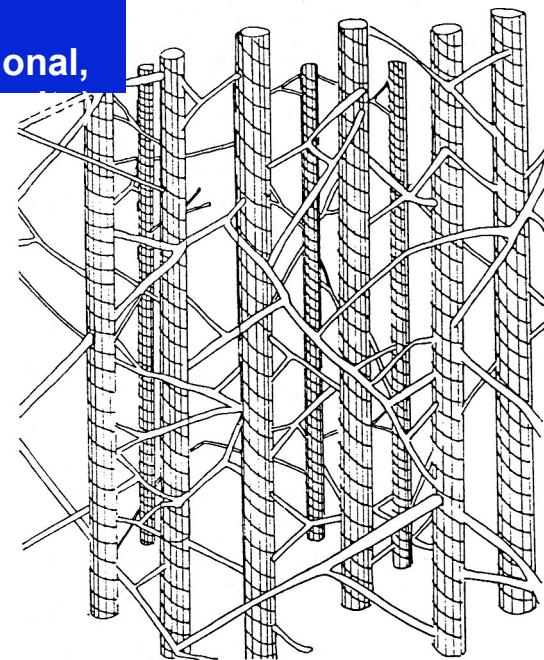
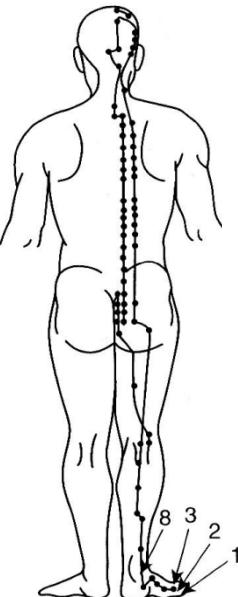
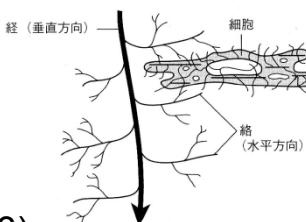
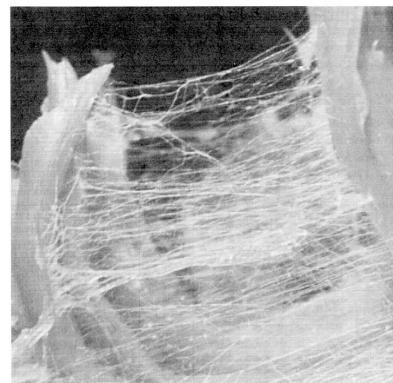
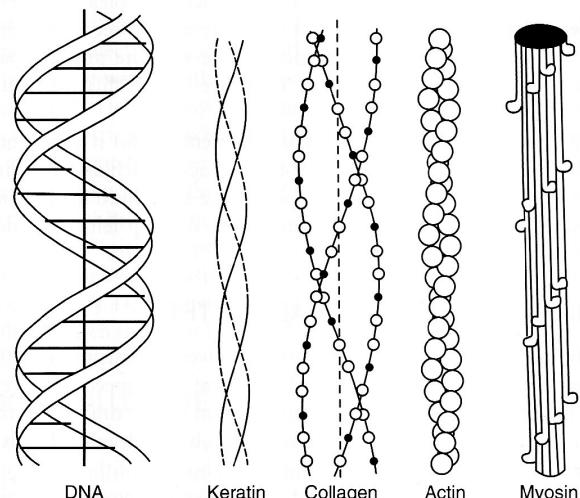
覆る神経科学の大前提

意識・無意識の基盤としての生体マトリックス
情報・構造・機能・エネルギーの互換性
(electron, photon, phonon, heart, chemical, gravity)



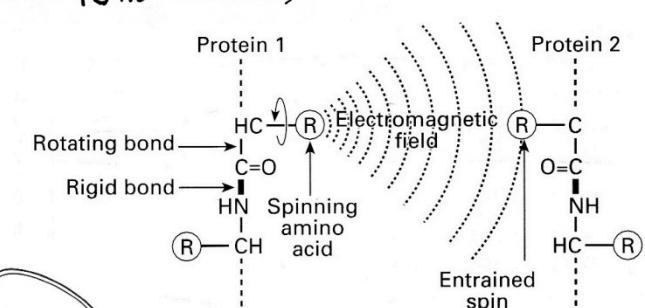
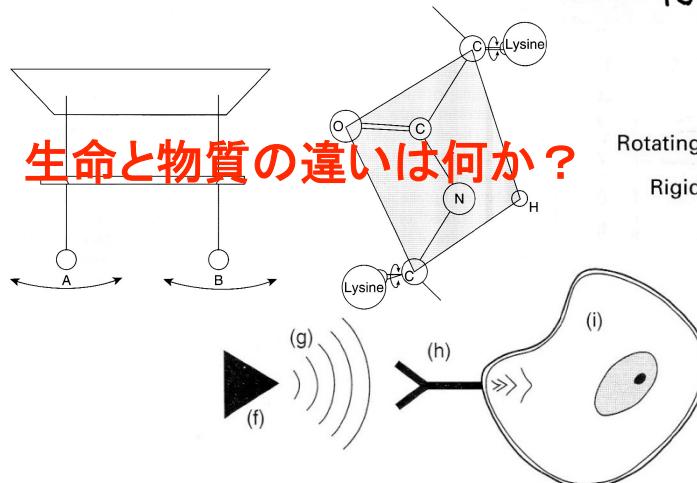
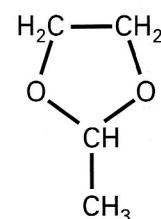
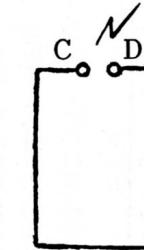
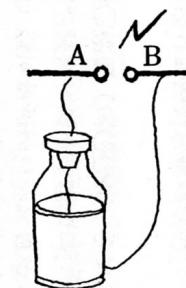
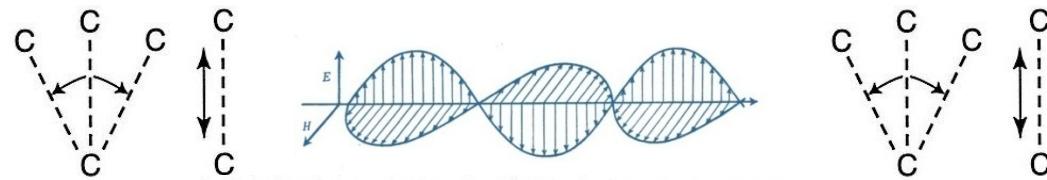
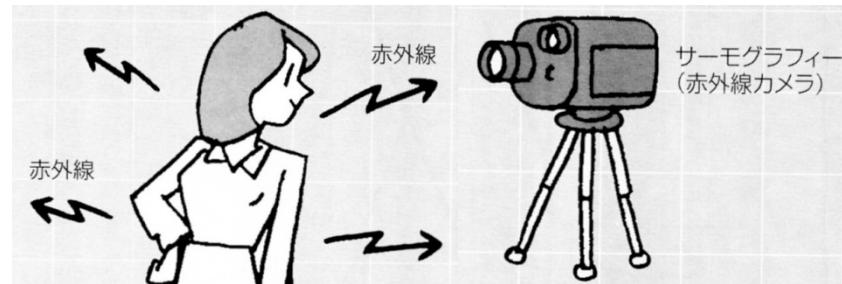
Tensegrity
(tensional,

意識・無意識とは何か?

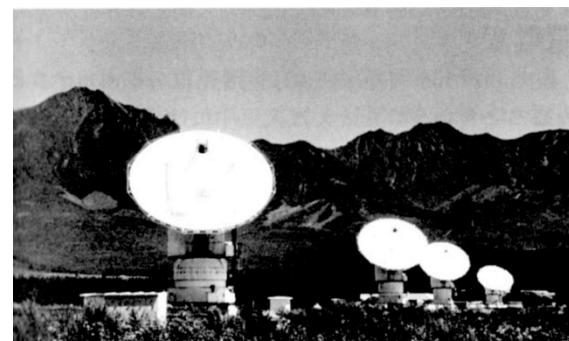


James L. Oschman "Energy Medicine"
pp.46, 47 , 53 Churchill Livingstone (2000, 2003)

S. Hameroff et al. In
"Artificial Life"
521-553 (1989)



電磁場ワクチン



野辺山の宇宙電波望遠鏡

岩波科学百科 岩波書店 785頁 (1989)

Life is beyond chemical reaction systems
Life as EMFs within artificial EMFs within natural EMFs

マクロ=ミクロ=こころの相同性による刺激の増幅と転移

James L. Oschman "Energy Medicine" Churchill Livingstone (2000)

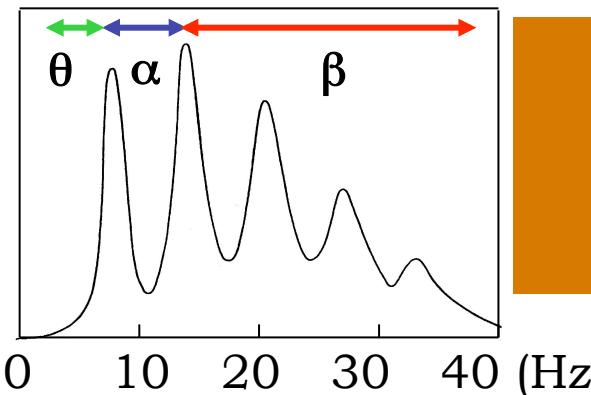
James L. Oschman "Energy Medicine in Therapeutics and Human Performance" Churchill Livingstone (2003)

Spectrums for earth's natural and artificial electromagnetic fields

(a)

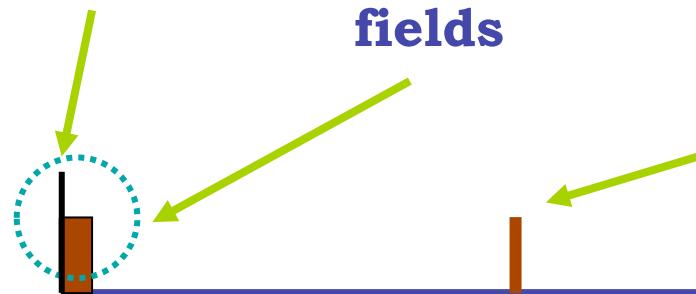
Earth's
magnetic
fields

Extremely low
frequency
electromagnetic
fields



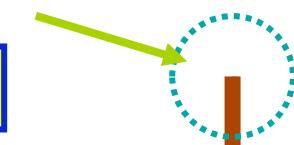
電磁場によってベース
メーカーなどの精密電
子機器が誤作動するな
らば生体への影響も無
視できない。

Window Effects



Lightning Visible light

ご静聴ありがとうございました。



(b) Electric
power

AM FM TV Microwave

Leif G. Salford
July 21, 2006
国立京都国際会館



1KHz

1MHz

1 GHz

0

10^3

10^6

10^9

10^{12}

10^{15}

Frequency (Hz)