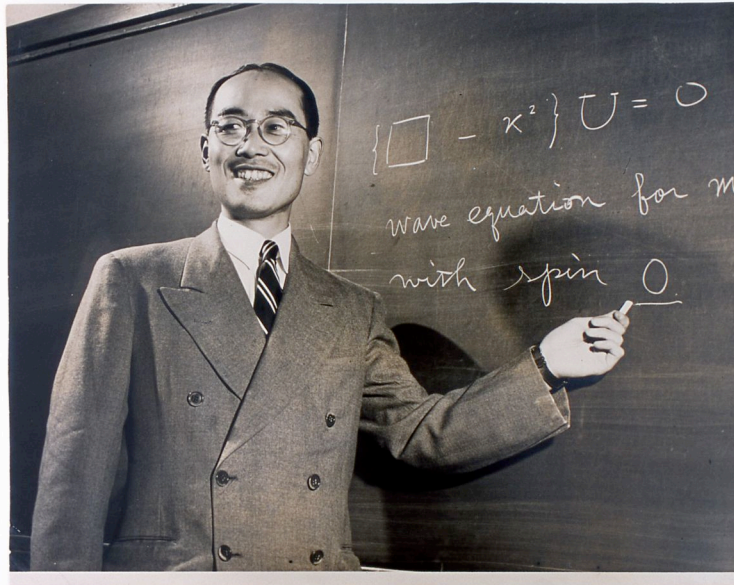


# A Centennial of Hideki Yukawa's Birth



1907 ~ 1981



Nishinomiya-Yukawa International & Interdisciplinary Symposium  
2007

*What is Life?*

*The Next 100 Years of Yukawa's Dream*

**Masatoshi Murase**





# Yukawa Institute for Theoretical Physics





Science

Philosophy

Nishinomiya-Yukawa International & Interdisciplinary Symposium 2007

# What is Life?

*The Next 100 Years of  
Yukawa's Dream*

October  
15 (Mon) ~ 20 (Sat)  
2007  
CO-OP Inn Kyoto  
Conference Hall

## Invited Speakers

Robert Arking (Wayne State Univ.)  
Carl Becker (Kyoto Univ.)  
David Deamer (U.C.Santa Cruz)  
John Evans (England)  
Luciano Floridi (Univ. of Oxford)  
Susumu Goto (Kyoto Univ.)  
Franz Halberg (Univ. of Minnesota)  
Nicholas Humphrey (London Univ.)  
Masami Ishido (Nat. Inst. Env.)  
Akio Kanai (Keio Univ.)  
Seunghwan Kim (APCTP)  
Hajime Kimata (Moriguchi-Keijinkai Hospital)  
Saburo Matsui (Kyoto Univ.)  
Tetsuro Matsuzawa (Kyoto Univ.)  
Nobuhiro Minaka (NIAES)  
Kiyoshi Miyagawa (Univ. of Tokyo)  
Yoshihiro Miyake (Tokyo Inst. Tech.)  
Alex Mogilner (U.C.Davis)  
Aage R. Møller (Univ. of Texas, Dallas)  
Vidyanand Nanjundiah (IISc, Bangalore)  
Yoshiaki Omura (New York Medical College)  
Kuniaki Otsuka (Tokyo Women College Med.)  
Donald W. Pfaff (Rockefeller Univ.)  
Raphael Pinaud (Univ. of Rochester)  
Rudy Rucker (U.S.)  
Leif. G. Salford (Lund Univ.)  
Mitsuhiro Shionoya (Univ. of Tokyo)  
Gentaro Taga (Univ. of Tokyo)  
Junji Takabayashi (Kyoto Univ.)  
Hiroyuki Takeda (Univ. of Tokyo)  
Naoko Tosa (Kyoto Univ.)  
Mark van Atten (CNRS, Paris)  
Toshio Yanagida (Osaka Univ.)  
Motohiro Yoritomi (Shuchin Univ.)

Call for Papers in Poster Session  
Deadline : June 30 (Sat) 2007

## Organizing Committee

Masatoshi Murose (Kyoto Univ. Chair)  
Kuniyoshi Ebina (Kobe Univ.)  
Yukio-pegio Gunji (Kobe Univ.)  
Tatsuyoshi Honda (Tohoku Univ.)  
Shoji Itakura (Kyoto Univ.)  
Kunihiko Kaneko (Univ. of Tokyo)  
Kazuko Kato (Kyoto Univ.)  
Tadotomi Murata (NICT, Brain Proj.)  
Shigetoshi Nara (Okayama Univ.)  
Yasumasa Nishitani (Hokkaido Univ.)  
Shingo Oda (Kyoto Univ.)  
Akira Shudo (Tokyo Metro. Univ.)  
Shigenori Tanaka (Kobe Univ.)  
Shuichi Tanaka (Waseda Univ.)  
Ichiro Tsuda (Hokkaido Univ.)  
Toshio Yokoyama (Kyoto Univ.)

## Advisory Committee

Yoji Akawa  
Kensuke Ikeda  
Tasuo Nakanka  
Kazuo Nishimura  
Masachi Ohsawa  
Takao Ohta  
Fumio Osasawa  
Masaki Sano  
Yasuji Sawada  
Yoshiomi Takagi  
Kenji Ueno  
Kazuyoshi Yoshimura

## Sponsored by

Kyoto University the 21st Century COE Program  
"Center of Diversity and Universality in Physics"  
The Kyoto University Foundation  
Grant-in-Aid for "Interdisciplinary and Advanced Study"  
from President, Professor Kazuo Oka, Kyoto University

## Coincided by

Nishinomiya City  
Asia Pacific Center for Theoretical Physics  
San-sai Gakuin, Graduate School of Global Environmental  
Studies, Kyoto University  
Bioinformatics Center, Institute for Chemical  
Research, Kyoto University  
Center for Ecological Research, Kyoto University  
Private Research Institute, Kyoto University  
Institute of Economic Research, Kyoto University  
Kokoro Research Center, Kyoto University  
Kyoto University Open Course Ware

Yukawa Institute for Theoretical Physics, Kyoto University

<http://www2.yukawa.kyoto-u.ac.jp/~ny2007/> e-mail: [ny2007@yukawa.kyoto-u.ac.jp](mailto:ny2007@yukawa.kyoto-u.ac.jp)

Murata in the background / reproduced by permission from TS-2 Temple in Kyoto

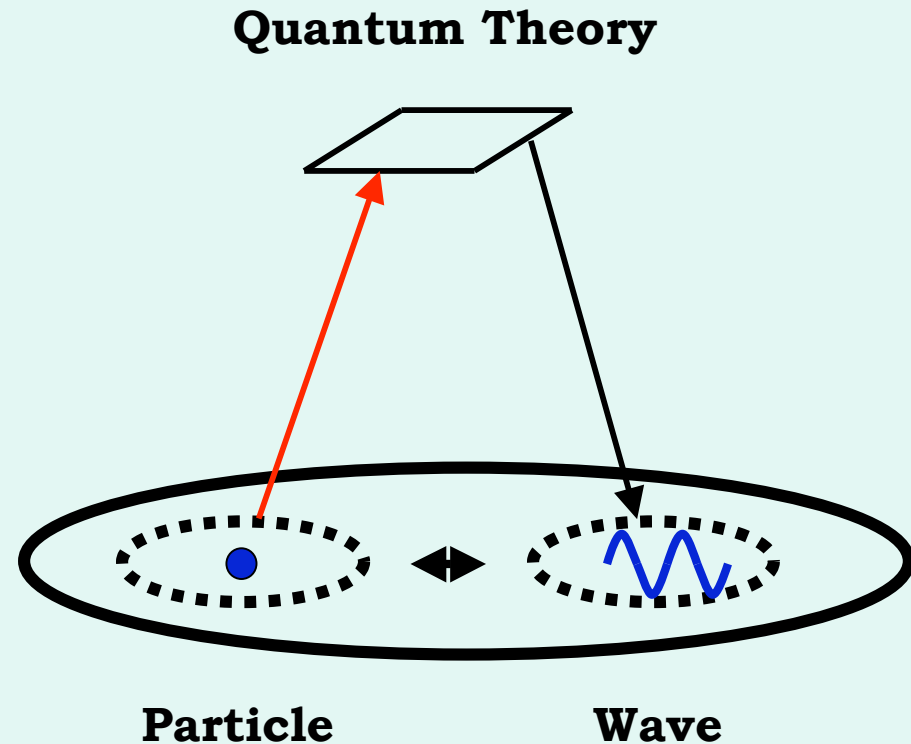
Arts

Religion

# Opposites are complementary

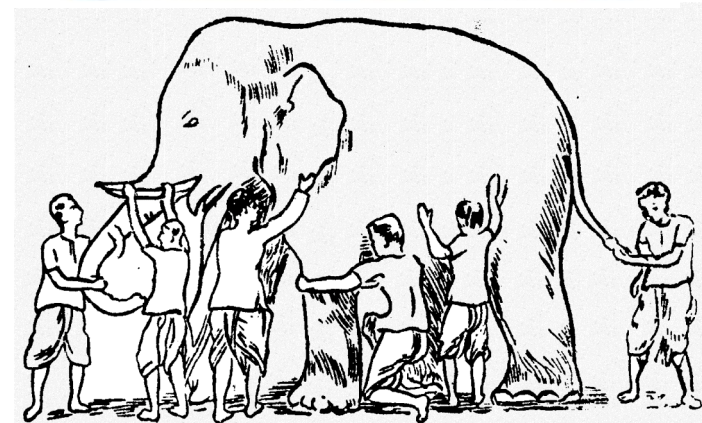
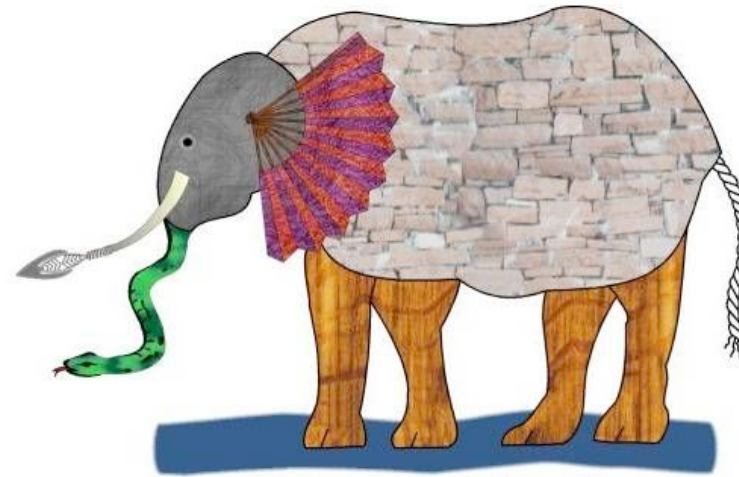
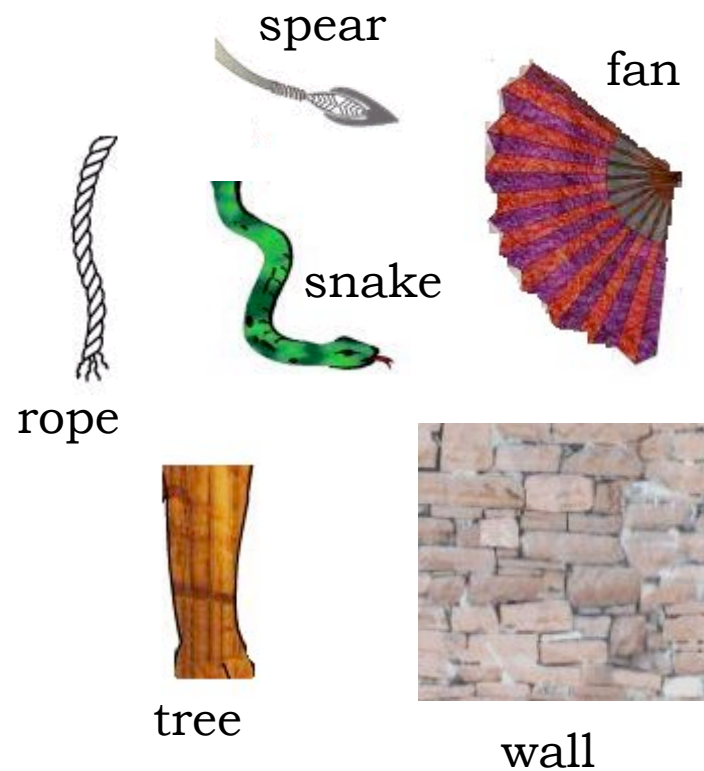


**Niels Bohr**  
1885 ~1962



## Opposites are complementary

**John Godfrey Saxe's ( 1816-1887) version of the famous Indian legend**



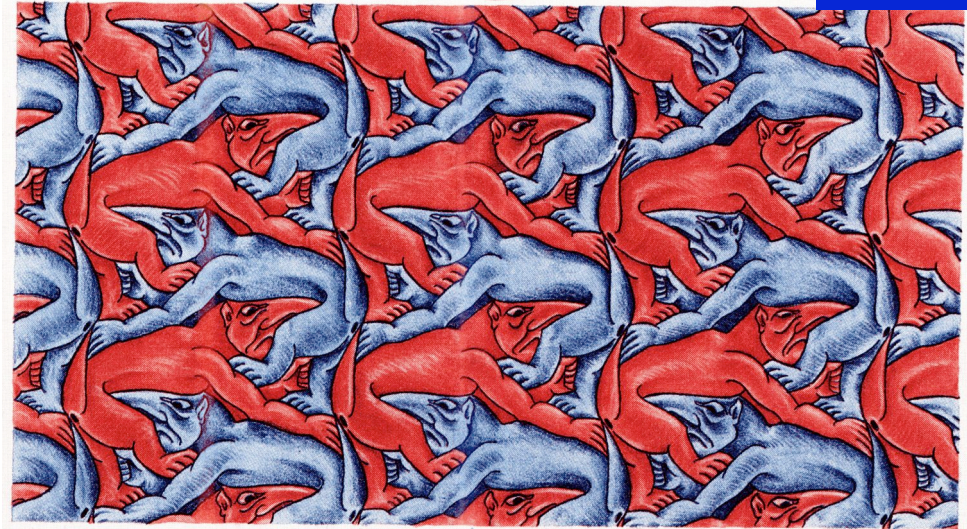
[http://www.noogenesis.com/pineapple/blind\\_men\\_elephant.html](http://www.noogenesis.com/pineapple/blind_men_elephant.html)

<http://www.jainworld.com/education/stories25.asp>





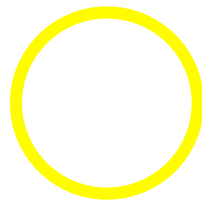
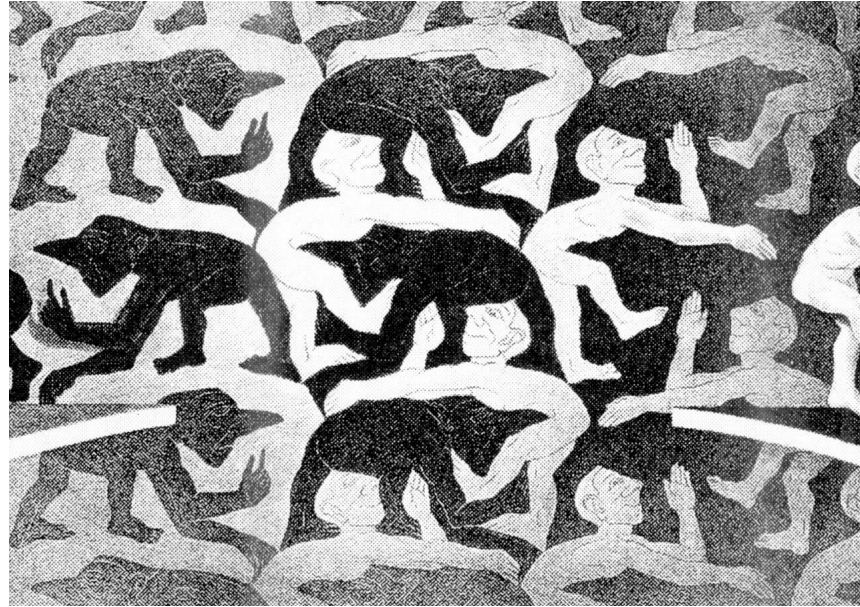
**Dutch Artist M.C. Escher**  
**1898.6.17. ~ 1972.3.27**  
From "*Visions of Symmetry*"  
by Deris Schattshneider (1990) .



**Opposites are complementary**

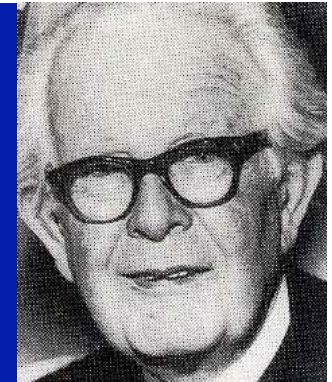
**Escher No. 62, 1944**





**Escher No. 63, 1944**

# Opposites are complementary in Life itself



**Jean Piaget**  
1806-1980

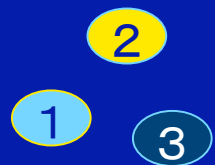
Theoretical  
domain

generalization

Specialization

Empirical  
space

Time

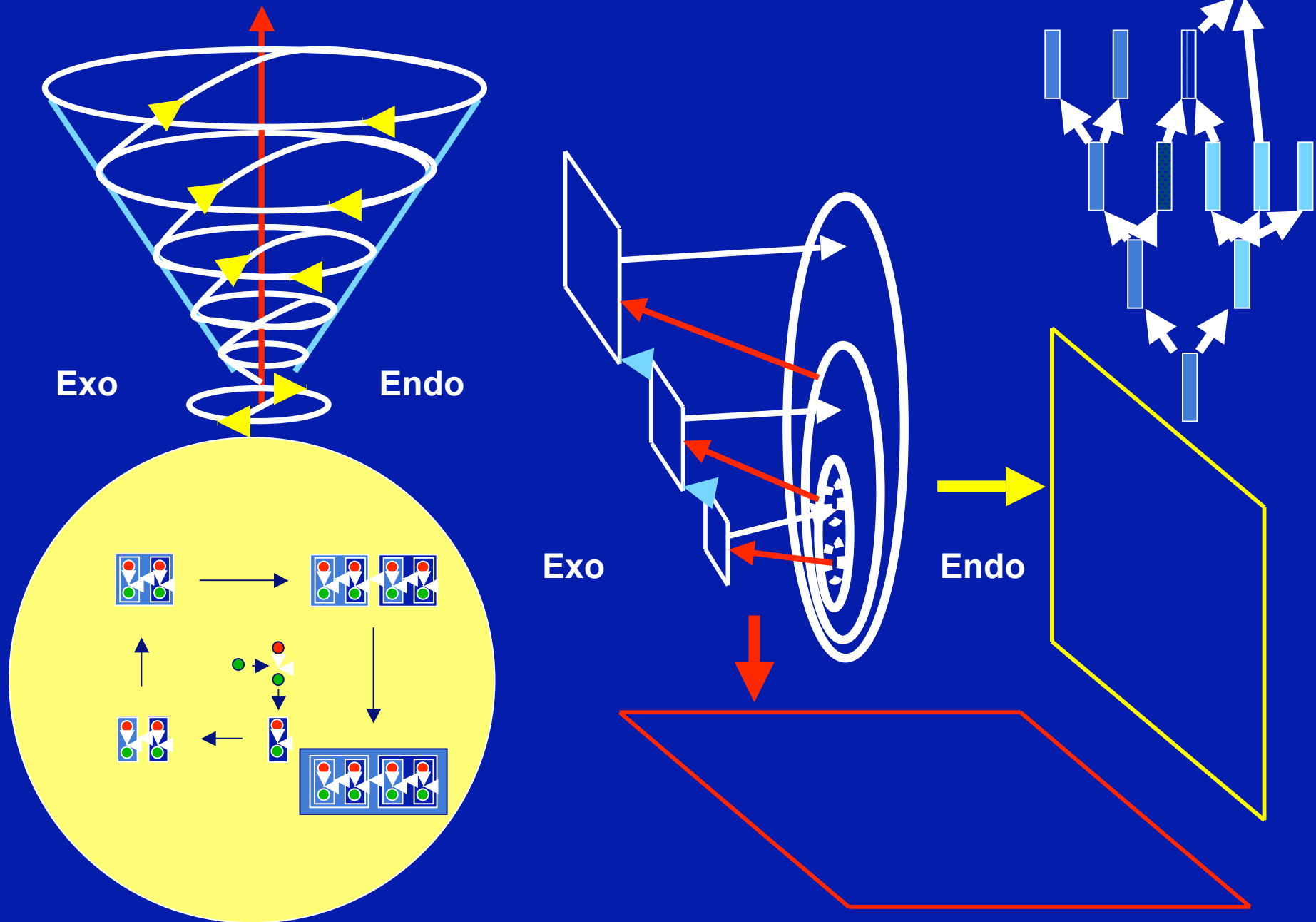


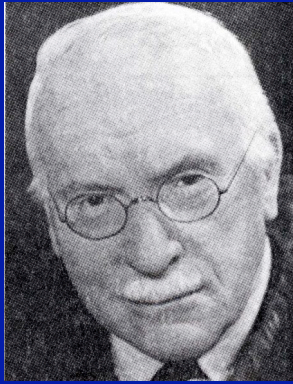
Critical Period

**Concept of  
Number**



# Life as a process of endo-exo circulation

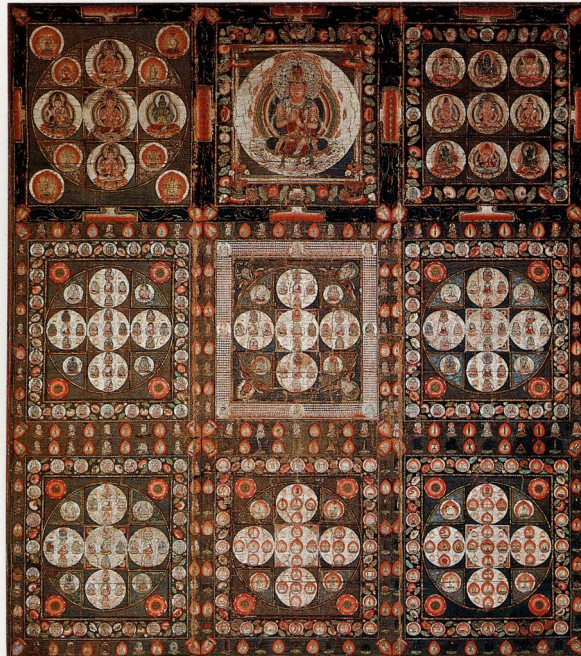




**C. G. Jung**  
**1875-1961**

## Connection of oppositions

**Mandala as a symbol of  
“Opposites are Complementary”**



伝真言院曼荼羅（金剛界） 国宝 京都 東寺蔵



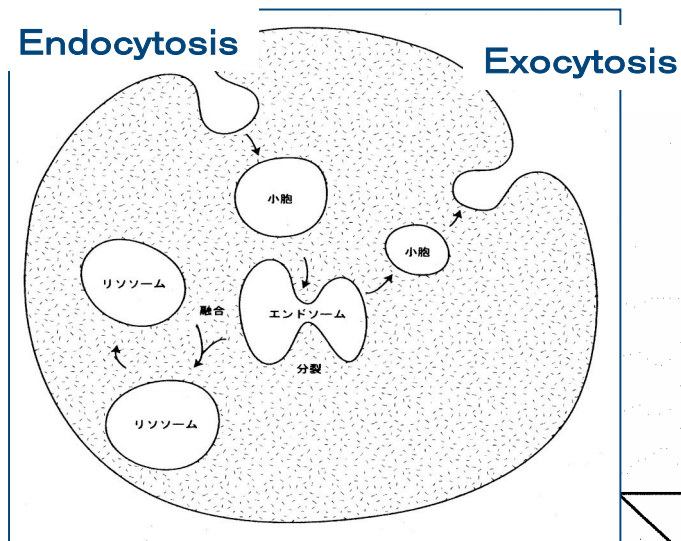
伝真言院曼荼羅（胎藏） 国宝 京都 東寺蔵

**Consciousness process**

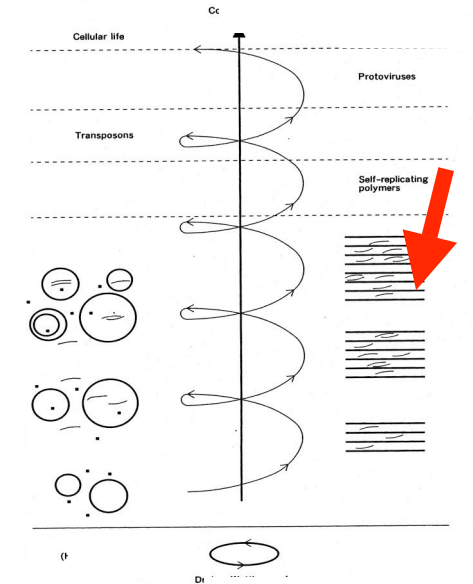
**Unconsciousness structure**



# From Life's Origin to Recognition



Evolution

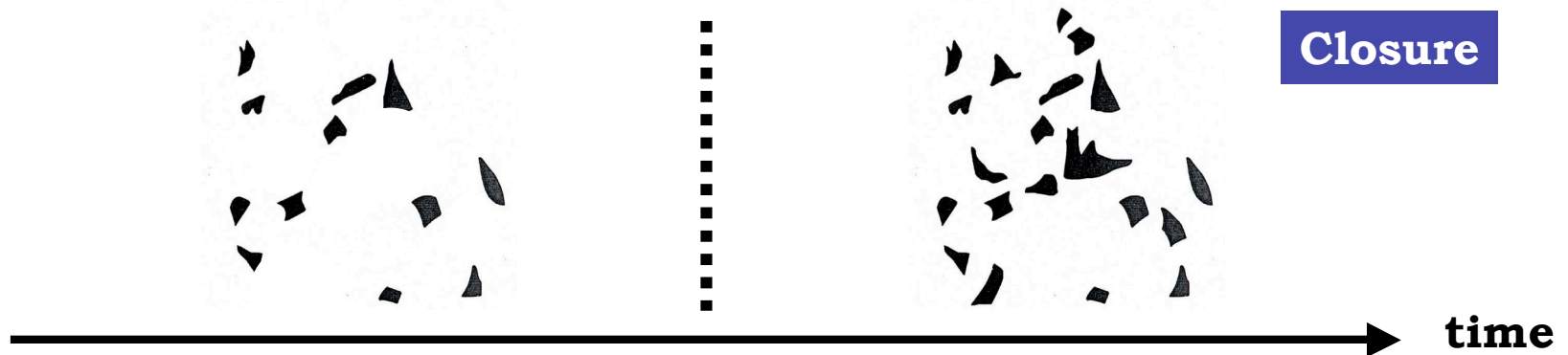


Exo-world

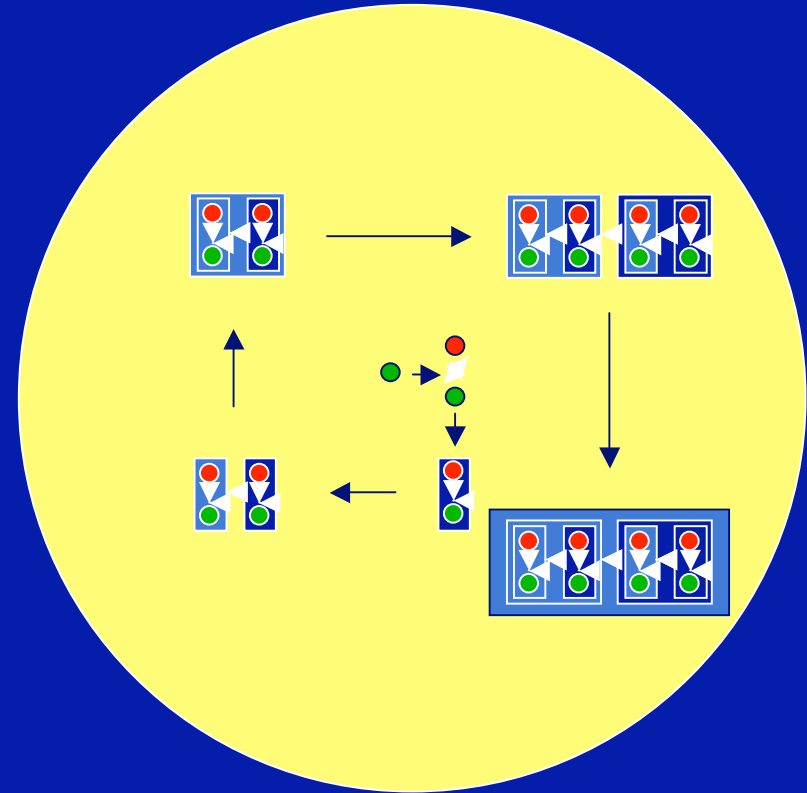
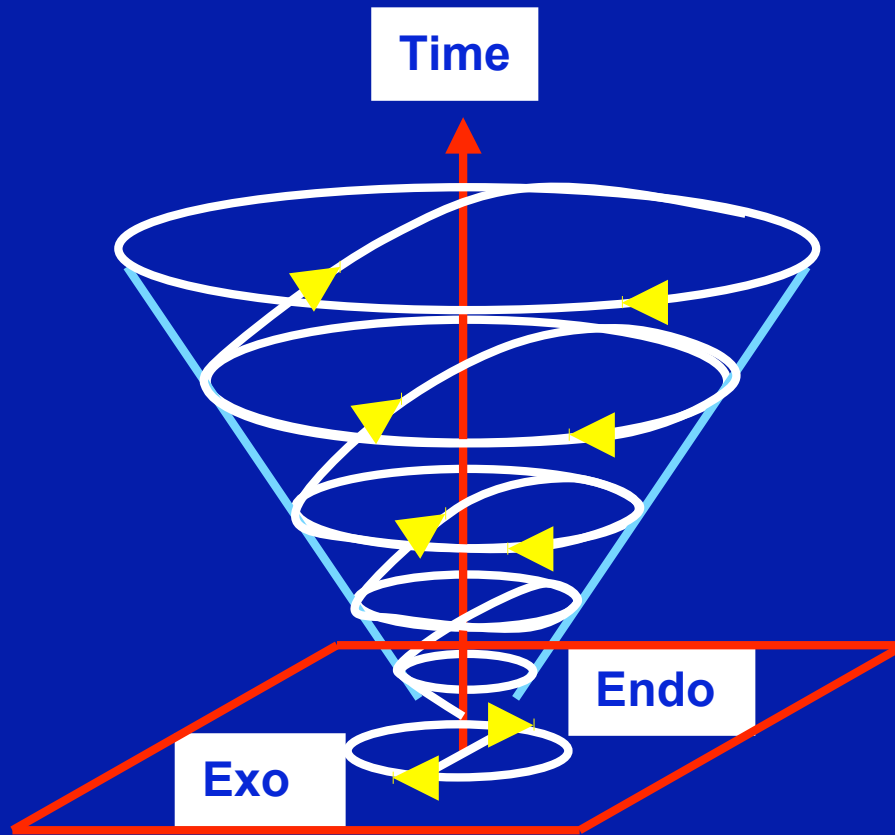
Endo-system

End-exo circulation

Closure



# Life as a process of endo-exo circulation



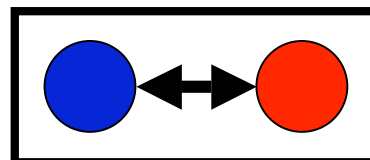
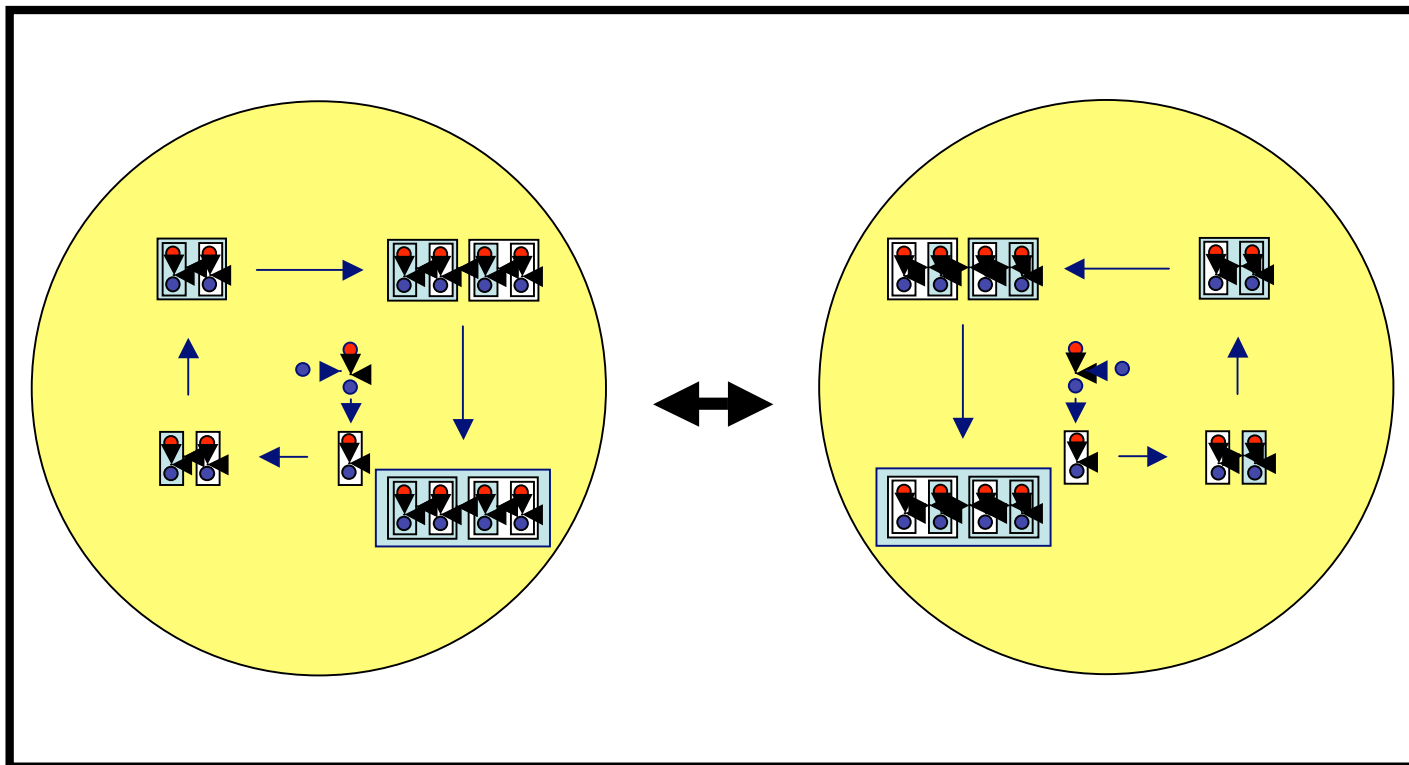
Origin, Evolution, Recognition,  
Aging, Emergence of New Diseases





## Absolutely contradictory self-identity

**Kitaro Nishida**  
**1870-1945**



## Another Inconvenient Truth

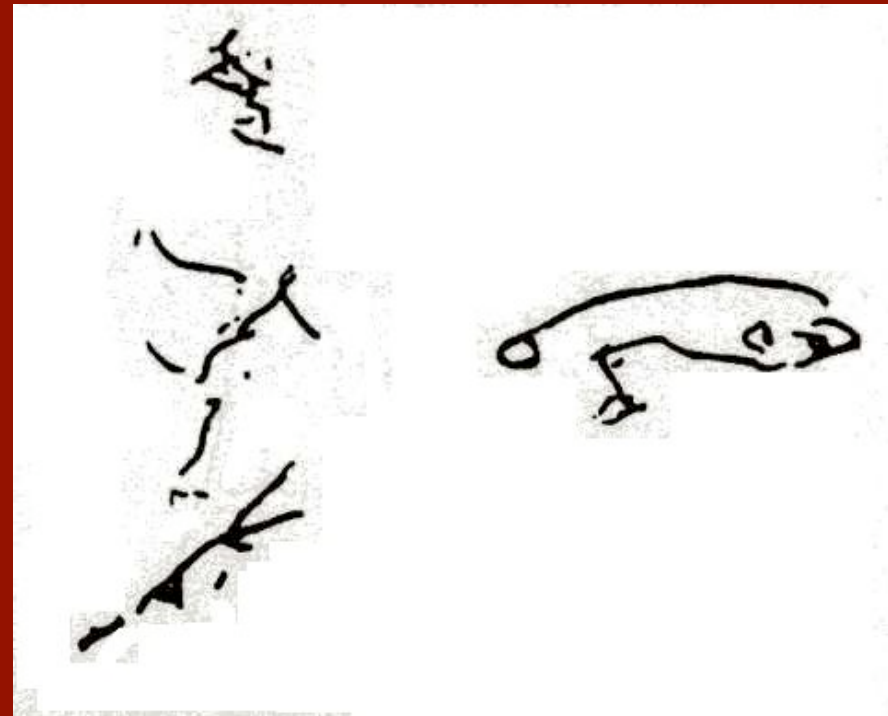
Unpolluted Environment



54-month

55-month

Polluted Environment



54-month

53-month

E. A. Guillette et al.

*Environmental Health Perspectives* **106**, 347 (1998)



# Nishinomiya-Yukawa International & Interdisciplinary Symposium 2007

## What is Life?

### The Next 100 Years of Yukawa's Dream

October  
15 (Mon) ~ 20 (Sat)  
2007  
CO-OP Inn Kyoto  
Conference Hall

#### Invited Speakers

Robert Arking (Wayne State Univ.)  
Carl Becker (Kyoto Univ.)  
David Deamer (U.C.Santa Cruz)  
John Evans (England)  
Luciano Floridi (Univ. of Oxford)  
Susumu Goto (Kyoto Univ.)  
Franz Halberg (Univ. of Minnesota)  
Nicholas Humphrey (London Univ.)  
Masami Ishido (Nat. Inst. Env.)  
Akio Kanai (Keio Univ.)  
Seunghwan Kim (APCTP)  
Hajime Kimata (Moriguchi-Keijinkai Hospital)  
Saburo Matsui (Kyoto Univ.)  
Tetsuro Matsuzawa (Kyoto Univ.)  
Nobuhiro Minaka (NIAES)  
Kiyoshi Miyagawa (Univ. of Tokyo)  
Yoshihiro Miyake (Tokyo Inst. Tech.)  
Alex Mogilner (U.C.Davis)  
Aage R. Møller (Univ. of Texas, Dallas)  
Vidyanand Nanjundiah (IISc, Bangalore)  
Yoshiaki Omura (New York Medical College)  
Kuniaki Otsuka (Tokyo Women College Med.)  
Donald W. Pfaff (Rockefeller Univ.)  
Raphael Pinaud (Univ. of Rochester)  
Rudy Rucker (U.S.)  
Leif, G. Salford (Lund Univ.)  
Mitsuhiro Shionoya (Univ. of Tokyo)  
Gentaro Taga (Univ. of Tokyo)  
Junji Takabayashi (Kyoto Univ.)  
Hiroyuki Takeda (Univ. of Tokyo)  
Naoko Tosa (Kyoto Univ.)  
Mark van Atten (CNRS, Paris)  
Toshio Yanagida (Osaka Univ.)  
Motohiro Yoritomi (Shuchin Univ.)

#### Organizing Committee

Masatoshi Murase (Kyoto Univ. Chai)  
Kuniyoshi Ebina (Kobe Univ.)  
Yukio-Pegio Gunji (Kobe Univ.)  
Tetsuichi Honda (Tohoku Univ.)  
Shoji Itakura (Kyoto Univ.)  
Kunihiko Kaneko (Univ. of Tokyo)  
Kaoru Kato (Kyoto Univ.)  
Toshio Murata (NICT, Brain Proj.)  
Shigetoshi Nara (Okayama Univ.)  
Yasumasa Nishimura (Hokkaido Univ.)  
Shingo Oda (Kyoto Univ.)  
Akira Shudo (Tokyo Metro. Univ.)  
Shigenori Tanaka (Kobe Univ.)  
Shuichi Tawaki (Waseda Univ.)  
Ichiro Tsuda (Hokkaido Univ.)  
Toshio Yokoyama (Kyoto Univ.)

#### Advisory Committee

Yoji Aizawa  
Ken-ichi Ikeda  
Yasuo Kaku  
Kazuo Nishimura  
Masashi Ohtsuka  
Takao Ohta  
Fumio Oosawa  
Masaki Sano  
Yasuji Sawada  
Yoshioji Takagi  
Kenji Ueno  
Kazuyoshi Yoshimura

#### Sponsored by

Kyoto University the 21st Century COE Program  
"Center of Diversity and Universality in Physics"  
The Kyoto University Foundation  
Grant-in-Aid for "Interdisciplinary and Advanced Study"  
from President, Professor Kazuo Oike, Kyoto University  
Co-sponsored by  
Nishinomiya City  
Asia Pacific Center for Theoretical Physics  
San-ai Gakuin, Graduate School of Global Environmental  
Studies, Kyoto University  
Bioinformatics Center, Institute for Chemical  
Research, Kyoto University  
Center for Ecological Research, Kyoto University  
Primate Research Institute, Kyoto University  
Institute of Economic Research, Kyoto University  
Kokoro Research Center, Kyoto University  
Kyoto University Open Course Ware

Call for Papers in Poster Session  
Deadline : June 30 (Sat) 2007

Yukawa Institute for Theoretical Physics, Kyoto University

http://www2.yukawa.kyoto-u.ac.jp/~ny2007/ e-mail: ny2007@yukawa.kyoto-u.ac.jp

Motives in the background : reproduced by permission from T&D Temple in Kyoto

	10/15(Mon)	10/16(Tue)	10/17(Wed)	10/18(Thu)	10/19(Fri)	10/20(Sat)
9:00	S. Nara M. Murase Kyoto Univ. Opening address	K. Kaneko Seunghwan Kim APCTP A few problems on functional self-organization in brain	K. Kato Kunihiko Kaneko Univ. Tokyo Consistency principle in biological dynamical system: Plasticity, robustness, and genotype- phenotype relationship*	Y. P. Gunji Susumu Goto Kyoto Univ. Network perspective in bioinformatics	I. Tsuda Yoshio Yokoyama Kyoto Univ. The Premodern Japanese Approach to Life: Sharing the World with Non- Humans	Y. P. Gunji Saburo Matsui Kyoto Univ. Faith Ethics for Sustainable Development
9:15	Nobuhiro Minaka NIAES Historical reasoning and abductive inference in phylogenetic reconstruction			Kiyoshi Miyagawa Univ. Tokyo Radiation and anti- cancer drug: How to cope with DNA damage?	Aage R. Møller Univ. Texas Plasticity of the brain: For good and bad*	
9:30						
0:00						
0:15	S. Nara Alex Mogilner U. C. Davis Sorting of polar filaments by multiple motor action	H. Kook I. Tsuda, Y. Yamaguti, S. Kuroda, Y. Fukushima and M. Tsukada Hokkaido Univ. A mathematical model for the hippocampus: towards the understanding of episodic memory and imagination*	K. Kato Hiroyuki Takeda Univ. Tokyo Coupled oscillators in vertebrate segmentation	D. Deamer Akio Kanai Keio Univ. Importance of periodicity in the genetic information and a new hypothesis of the tRNA evolution*	A. Kanai David Deamer U. C. Santa Cruz Self-assembly processes in the prebiotic environment	R. Pinaud Donald W. Pfaff Rockefeller Univ. The central neural foundations of awareness and self-awareness*
1:15						
1:30	S. Nara Toshio Yanagida Osaka Univ. Single molecule study for elucidating the mechanism involved in utilizing fluctuations by biological systems	A. R. Møller Tutomu Murata NICT, Brain Proj. Creativity and Consciousness of the Human Brain	K. Kato Vidyanand Nanjundiah Indian Institute of Science How important is genetic relatedness for social behaviour?	R. Rucker Mark van Atten CNRS, Paris The functions of mathematics in a study of life	Y. Takagi Robert Arking Wayne State Univ. Why and how we age, and is that process modifiable?*	K. Nishimura Naoko Tosa Kyoto Univ. Computing of Japanese Culture
2:30						
4:45	S. Kim Yukio-Pegio Gunji Kobe Univ. A minimal cell model showing both amoebic movement and network formation*	Poster Session	I. Salford John Evans Cambridge University Vertebrate growth and form: A whole- body approach	Freelance	C. Becker Motohiro Yoritomi Shuchin Univ. The multiple implications and functions in Mandalas*	J. Evans Masami Ishido Nat. Inst. Env. The modification of biochemical chemical reactions by physico- chemical stimuli in the environment Leif G. Salford Lund Univ. The mammalian brain in the electromagnetic fields designed by man*
5:45						
6:00	R. Arking Luciano Floridi Oxford Univ. What is bioinformation?	K. Yoshimura Yoshiaki Omura, MD, ScD New York Medical College Non-invasive quick diagnosis and safe & effective treatment of intractable medical problems: Anti-aging and anti-cancer	T. Murata Mitsuhiro Shionoya Univ. Tokyo Nanoscope Molecular Architectures in Supra-molecular Science	18:45-21:15 Franz Halberg University of Minnesota Life's waves in space-time in mind	A. Mogilner Junji Takabayashi Kyoto Univ. Leaf volatile ecology: multitrophic interaction networks mediated by leaf volatiles*	V. Nanjundiah Carl Becker Kyoto Univ. Life from the Outside/Life from the Inside*
7:00						
7:30	K. Kaneko Raphael Pinaud Univ. of Rochester Neural basis of vocal communication in songbirds*	Y. Miyake Kuniaki Otsuka Tokyo Women College Med. Biological clocks in the life and its clinical use	M. van Atten Rudy Rucker San Jose State University Life as a gnarly computation	T. Hondou Hajime Kimata Moriguchi-Keijinkai Hospital Environmental stress and atopic dermatitis: Cure with steroid-free treatment and mutual trust*	D. W. Pfaff Nicholas Humphrey London Univ. The necessity of consciousness. Why human zombies would be an evolutionary dead end.	S. Tsokolov Tetsuro Matsuzawa Kyoto Univ. Chimpanzee mind: The evolutionary basis of human mind*
8:30						
8:45	Reception					
9:00						
20:00	Y. Miyake Gentaro Taga Univ. Tokyo Being and Becoming Human: A dynamical systems perspective on development of brain and behavior*	K. Ebina Yoshihiro Miyake Tokyo Inst. Tech. Co-creation of presence and its application to human interface*	S. Tanaka Shoji Itakura Kyoto Univ. Understanding other's mind: Approach from the Developmental Cybernetics			
20:45						
					Reception	
						Masatoshi Murase Kyoto Univ. Closing address

Life as endo-exo  
circulation