

# The Environmental Problems as a Science of Complex Systems

## Abstract

At present, various unusual phenomena in relation to the climate change are indicated. For example, they are the heat wave and heavy rain in European summer, the severe cold and heavy snow in East American winter, and the rarely warm winter in Japan. It is not clear whether these climate changes occurred due to natural fluctuations or artificial activities, which affect the natural phenomena. Today's science can not properly answer to this question, because the climate changes as well as the earth environmental problems are the subject of typical complex systems, for which we do not get the fundamental understandings yet. In this lecture, taking up outstanding examples of globally observed phenomena in earth, the characteristics of complex systems are presented. These problems can not be solved by traditional reductionism, because several constituents composed of a system mutually interact by nonlinear interactions. Finally, I propose several suggestions on our future direction.



## Curriculum Vitae

### Satoru Ikeuchi

Professor of Graduate University for Advanced Studies

[ikeuchisr\[at\]soken.ac.jp](mailto:ikeuchisr[at]soken.ac.jp)

Cosmology; Astrophysics; Science, Technology & Society

**Place and Date of Birth:** Himeji City, Japan, 1944

### Educational Background:

1963 Entrance to Faculty of Science, Kyoto University

1967 Graduated from Faculty of Science, Kyoto University

1972 Diploma from Graduate Course of Science Faculty, Kyoto University

### Professional Career:

1972 Research Associate, Kyoto University

1977 Associate Professor, Hokkaido University

1984 Associate Professor, Tokyo University

1988 Professor, National Astronomical Observatory

1992 Professor, Osaka University

1997 Professor, Nagoya University

2005 Professor, Waseda University

2006 Professor, Graduate University for Advanced Studies

### Research Topics:

1972-1980 Evolution of Stars and Galaxies

(Advanced Stage of Stellar Evolution, Chemical Evolution of Galaxies)

1980- Cosmology (Thermal History of the Universe, Origin of Quasar Absorption Lines, Large Scale Structures of the Universe)

1985- Astrophysics (Chimney Structure of Interstellar Medium, Dissipative Structure in Galaxies, Thermal and Dynamical Evolution of Clusters of Galaxies)

2005- Science, Technology and Society (Social Acceptance of Science and Technology, Environmental Problems, Ethics and Social Responsibility of Scientists)

### Books (All in Japanese):

The Forbidden Science (2006), Dictionary of Science in Revolving Era (2006), Dialogue with my Daughter: What is Science? (2005), Physics and God (2003), Others (total 35 books)

**Awards:** Japan Science Book Award(1993), Kodansha Book Award(1997)