

EDITORIAL

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Seeking wisdom in limnology**Introduction**

With this issue, the Japanese Society of Limnology (JSL) launches a new journal. *Limnology* publishes original scientific contributions on physical, chemical, biological, or related research, including environmental issues, and on any aspect of theoretical or applied limnology. Three issues will be produced per year. The new journal is a natural progression for JSL as it has been publishing the *Japanese Journal of Limnology* in Japanese and English since its foundation in 1931. For the past 4 years the JSL Board has discussed creating separate English and Japanese versions. In commemoration of the centenary of limnological study in Japan,¹ JSL has decided to have two journals.

It is my great honor to be the first Editor-in-Chief of *Limnology*. My mission is to create an international journal containing high-quality papers, to encourage Asian/Oceanic limnologists to submit papers, and to link limnologists throughout the world with common interests in aquatic science. The journal will publish research papers, notes, review articles, Asia/Oceania reports, and comments.

On this memorable occasion, it is worth considering what limnologists are now facing and what we need to do in the 21st century. In this issue of *Limnology*, Wetzel reviews freshwater ecology in the 20th century and cautions that “Professionals in limnology and water management have a responsibility to bring understanding and action to all concerned that water problems focus on both the quality and the quantity of freshwater resources.” Also in this issue, Reynolds lists 21 topics for limnology in the new century and says that “Except in arid climates, an adequacy of high-

quality potable water has too often been taken for granted, but as the per capita demands of a growing human population increase exponentially, the issue of water quantity becomes progressively more serious.”

When I visited the University of Western Australia in Perth in 1994, I found written in stone the words “Seek Wisdom”. I was drawn to this phrase and thought that it applied to limnologists seeking solutions to our present aquatic problems. Yes, we are seeking wisdom in limnology.

Why wisdom is needed in limnology

Let us consider the definition of wisdom first. It is said that there were three ancient sages who expounded wisdom. Buddha (ca. 500 BC), the founder of Buddhism, born in ancient India, preached “Paramita wisdom” consisting of judgment and selection (Kojien 1983). Judgment means to make a decision. Buddha taught that everything is relative, and there are no absolutes. That is why we need the ability to make judgments about choices. It means that we have to judge which is the better way, and then choose that better way. This is the essence of “Paramita wisdom” taught by Buddha (Watanabe 1999).

Lao-Tzu (ca. 450 BC), a famous teacher of philosophy in ancient China, thought that the best path to wisdom is to realize self-virtue, and to search for ways existing within all things (Daigenkai 1982; Okudaira and Omura 1999).

On the other hand, Plato (ca. 400 BC), a well-known philosopher in ancient Greece, introduced two sorts of wisdom: that possessed by god and that possessed by humans. The former is eternal and the latter, temporal. The philosophical life is the pursuit of divine wisdom (Prior 1997).

It is a remarkable coincidence that the word “wisdom” appeared first in the literature of the Central and then in the Eastern and Western worlds between 500 BC and 400 BC. This concordance might suggest that something happened to require wisdom when Buddha, Lao-Tzu, and Plato were alive. In those days, people might have been

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¹The first limnological studies in Japan were done by Dr. Akamaro Tanaka (the first president of JSL) when he measured the depth of Lake Yamanaka and discovered bottom springs (Tanaka 1900)

forced to live in societies under very difficult situations such as wars, famine, disasters, and disease.

Limnology is the science of freshwater, and freshwater is the source of life for human beings. Rapid expansion of human activities and economies in the 20th century changed global climates and local environments, and as a result we face a serious freshwater crisis (Gleick 1993; McCaffrey 1997). For example, in Mongolia evaporation is increasing and the grasslands are becoming drier each year (Kumagai et al. 1999). On the other hand, there have been serious floods in southern China around the Yangtze River. In addition, areas with toxic cyanobacterial blooms are expanding throughout the world (Chorus and Bartram 1999). Environmental problems are becoming very complicated, and more and more limnologists are required to make correct assessments and then make decisions for remedial solutions. For this reason we can say that limnology needs wisdom.

Need for interdisciplinary and international collaboration in limnology

As modern limnology deals with a diversity of problems and phenomena related to the biology, ecology, chemistry, physics, sociology, economics, and anthropology of aquatic environments, we need interdisciplinary and international collaboration to effectively seek suitable solutions. Quoting Hornby (1974): "Studies of more than one branch of learning are called interdisciplinary." Why are interdisciplinary studies needed in limnology?

As limnology is a science dealing with field measurements, it essentially requires interdisciplinary approaches. Let us consider a good example. In 1993 the Biwako Transport Experiment (BITEX '93) was one of the biggest international joint experiments on a lake. More than 170 researchers, including physicists, biologists, chemists, technicians, and students from seven countries (Australia, Canada, China, Israel, Japan, Spain, and the United States), participated in this project (Kumagai and Robarts 1996). Lake Biwa is the largest lake in Japan with a volume of $27.5 \times 10^9 \text{ m}^3$ and supplies drinking water to almost 14 million people.

After BITEX, toxic cyanobacterial blooms appeared not only in the South Basin, but also in the North Basin of Lake Biwa. As the North Basin contains 99% of the total water volume of the lake, the occurrence of toxic cyanobacterial blooms had a strong impact on people. The population density of *Microcystis* spp. continues to increase. The results of BITEX '93 based on interdisciplinary and international studies taught us the importance of cyanobacterial studies. More recently (1995–1997) enclosure experiments on cyanobacterial blooming in the South Basin have been undertaken. A new international initiative called CRAB (Cyanobacterial Risk Assessment of Biwako) runs from 1997 to 2000. These activities are now producing the results needed to understand cyanobacterial

risk. If BITEX '93 had not been carried out, we might have gone in the wrong direction.

The role of *Limnology* in Asian countries

As stated above, the freshwater balance in the north-central Asian countries, including Mongolia, Korea, and China, is changing greatly. This winter more than 1,200,000 cattle in Mongolia died because of cold weather. Apparently this was caused indirectly by dry weather from the previous year resulting in insufficient grass reserves for cattle to survive the winter.

Freshwater is the key to life. Limnologists are responsible for contributing a solution to this kind of crisis caused by freshwater imbalances. In order to judge the situation correctly, we should monitor long-term changes in freshwater quantity and quality and their relation to climate and social changes.

Limnological contributions from Asian and Oceanic countries are still not numerous enough to be evaluated, but I hope that *Limnology* can foster stronger links and interdisciplinary research among the limnologists of the world. The world is shrinking with the development of information technology, but freshwater problems are expanding. As one of many scientists living in the early period of the 21st century, I believe that *Limnology* will be an important tool in developing Asian/Oceanic limnology.

I would like to express my sincere thanks to those people who have worked hard, and are still working hard, for this new journal. I am also grateful to Profs. R.G. Wetzel and R. Robarts for their review of this article.

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