

ISBN 957-671-653-5

Proceedings of PSA Symposium

Biodiversity And Allelopathy: From Organisms To Ecosystems In The Pacific

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Academia Sinica, Taipei, 1999

PREFACE

These proceedings are the result of the meeting of the "IX Pacific Science Inter-Congress on the Sustainable Development in the Pacific" held at Academia Sinica, Taipei, Taiwan on November 15-19, 1998. This book summarizes the papers presented and the discussions following the symposia held on "Biodiversity in the Pacific", and "Allelopathy in Sustainable Agriculture". The technological advances made in biodiversity and allelopathy research in recent years created by the scientific establishments of the countries of the Pacific rim are exciting, and they present intellectually challenging biological, physiological and biochemical problems which are becoming more solvable using modern techniques.

Interactions between participants during this meeting helped develop cooperative relationships, and promotes the continued assistance of research and development on biodiversity and allelopathy among scientists from the Pacific rim regions of the world. Such research and development is now revealing a large array of plants, microorganisms, and viruses from which to choose, while only a few have been studied in detail. In the future research and development techniques will be developed to utilize the plants (including trees), microorganisms, and viruses; more effectively in their varied and multiple uses by industry, agriculture, ecological, and environmental situations.

This book is divided into two sections: biodiversity which contains 21 chapters, and allelopathy which contains 10 chapters. All chapters were contributed by scientists who attended and participated in the conference.

Although this book cannot provide a complete understanding of the disciplines of diversity and allelopathy, we hope that it will serve to guide and promote others in their research and development activities.

We especially thank those scientists from the Pacific rim countries who participated in this meeting. We are very grateful to Prof. Yuan-Tseh Lee, President of Academia Sinica, for his enormous support of the Inter-Congress and to the Academia Sinica that provided excellent facilities for this Inter-Congress, as well as the outstanding trips around the beautiful island of Taiwan. Without the outstanding work of the Local Organizing Committee this Inter-Congress would not have been held.

We acknowledge with sincere appreciation the financial support for this meeting, particular for these Symposia from the following organizations: Pacific Science Association; Academia Sinica, Taipei; Ministry of Education, Council of Agriculture, National Science Council, and the Environmental Protection Administration of Executive Yuan; Taipei City Government, National Taiwan University; Central Weather Bureau, Taipei; Taiwan Endemic Species Research Institute; Taiwan Fisheries Research Institute; Taiwan Power Co., Taipei; Taiwan Cement Corporation; China Steel Corporation, Kaoshiung; Vedan Enterprise Co., Ltd., Shalu, Taichung; and the Taiwan Handicraft Promotion Center.

George R. Waller
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 June 10, 1999

Acknowledgements

The Following Organizations are Gratefully Acknowledged for Supporting
the 9th Pacific Science Inter-Congress

Pacific Science Association (太平洋科學協會)

Academia Sinica, Taipei (中央研究院)

Ministry of Education, Executive Yuan, Taipei (行政院教育部)

Council of Agriculture, Executive Yuan, Taipei (行政院農業委員會)

National Science Council, Executive Yuan, Taipei (行政院國家科學委員會)

Environmental Protection Administration, Executive Yuan, Taipei (行政院環境保護署)

Taipei City Government (台北市政府)

National Taiwan University (國立台灣大學)

Central Weather Bureau, Taipei (中央氣象局)

Taiwan Endemic Species Research Institute (台灣特有生物研究保育中心)

Taiwan Fisheries Research Institute (台灣水產試驗所)

Taiwan Power Company, Taipei (台灣電力公司)

Taiwan Cement Corporation (台灣水泥公司)

China Steel Corporation, Kaoshiung, Taiwan (中國鋼鐵公司)

Vedan Enterprise Co., Ltd., Shalu, Taichung, Taiwan (台灣味丹企業公司)

Taiwan Handicraft Promotion Center (台灣手工藝推廣中心)

Opening Ceremony

Welcoming Address

Yuan T. Lee, Nobel Laureate

President, Academia Sinica, Taipei

Professor Ward, Professor Fuchs, Professor Peng, Professor Tsay, Professor Chou, Distinguished Delegates, Participants, Ladies and Gentlemen:

I am very pleased, on behalf of Academia Sinica, to extend my cordial welcome to you all to take part in the 9th Pacific Science Inter-Congress under the theme of Sustainable Development in the Pacific. This conference is under the auspices of the Pacific Science Association and is sponsored by this Academy, Ministry of Education, National Science Council, Council of Agriculture, Taipei City Government and several other funding agencies. We are grateful to them for their generous support. It is a great honor being the first time to host the Inter-Congress at this Academy, which was founded at Nanking in 1928. The Academia Sinica is the highest ranking academic organization in Taiwan, comprising members of academicians and research institutes. Two basic missions are: conducting scientific research in its own institutes, and aiding as well as coordinating the efforts of other research institutes and universities in this country in their scientific pursuits. In legal status, Academia Sinica is a national institution and primarily financed by the Government. Yet, it holds a unique and virtually independent position in the governmental fabric of the nation. One of the most important bodies of this Academy is the Assembly of Members who are elected from among scientists and scholars of distinction. We now have 198 academicians in the Academy. The other important parts of this academy are numerous research institutes covering the areas of humanities, social sciences, mathematics, physical sciences and life sciences. Total number of research institutes is 25 at present. The Academy moved to Taiwan in 1949 and has since gradually built up its present site at Nankang, Taipei.

To my knowledge, the Academy was admitted as a member of the PSA in 1930's, and our National Committee has enthusiastically participated in the PSA activities since then. I have become familiar with the PSA organization since I became the president of the Academy four years ago.

For this big event of PSA Inter-Congress, I know that over 750 delegates and participants are coming from 25 nations in the Pacific rim to discuss the most important issue of Sustainable Development in the 21st century. Particularly, the subjects of biodiversity and sustainability are so important to all mankind regarding foods, energy, clothing, housing, transportation, recreation, and many others. Through this conference, we hope to better understand the stability of ecosystem and learn how to maintain the global biodiversity and environment, in particular in those fast developing countries in Asia and Pacific. This important meeting could result in a fruitful conclusions and resolutions that drive the future research toward the 21st century.

I take this opportunity to express my sincere appreciation to all delegates who came to attend the conference. Great acknowledgements are due to members of Local Organizing Committee and to these funding agencies mentioned earlier. Particularly, I would like to thank Professors S.F. Yang, K.S. Yang, C. H. Chou, Co-chairmen of LOC, Professor T.C. Hung, the Executive Secretary of LOC, and symposium coordinators. Without their delicate and hardworking efforts, this conference will not be possible and successful.

Once again, I am hoping that our honorable guests and participants will enjoy not only the scientific meeting but also a pleasant stay in Taiwan. Wish a Merry Christmas and a prosperous new year.

Opening Ceremony

Opening Address

R. Gerard Ward, Vice President, PSA

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On behalf of the Pacific Science Association I am honoured to welcome you to this 9th Inter-Congress. I speak on behalf of the President of the Association, Professor Akito Arima who, as many of you know, has recently become Minister of Education in Japan. These new duties have prevented him from joining this meeting but he has sent his best wishes to us for a successful Inter-Congress. So on his behalf, and on behalf of the Council, I welcome you to this PSA Inter-Congress at the Academia Sinica.

The Pacific Science Association was founded in 1920, and thus is one of the older regional multi-disciplinary science organisations. When the first Congress was held it took many delegates up to 2 weeks, by sea, to reach the Congress, and another two weeks to journey home. For most of us here today, it has taken no more than a single day to reach Taipei. Email and the World Wide Web make fast interchange of information easy and effective for many people, though not for all. Like all super-highways, we must remember that the information super-highway by-passes some places and increases their relative accessibility. Some parts of the PSA's region, and some groups within its societies, are amongst those who become relatively disadvantaged by technological change. If **all** are to share the benefits of science and technology, then ways need to be found for reducing the risk of scientific bypassing. In this context, the role of the Association must change and at the Council meetings during this week we shall looking at a forward-looking strategic plan for the Association.

The Congresses and Inter-Congresses will no doubt remain as the core of the Associations activities. In recent years Inter-Congresses have played an increased role in the Association's activities. Smaller in size than the 4-yearly congresses, and focussed on a narrower theme or sub-region, they provide an excellent opportunity for intensive interchange between scholars. We are most grateful to the Academia Sinica for the invitation to host this Inter-Congress, and also for their excellent organisation and facilities.

One increasing need is for the PSA to cooperate with other academic organisations within the regional, both national and regional. In this context it is a pleasure to have with us Prof. M. G. K. Menon, past-President of the International Council for Science (ICSU), who will be speaking after this opening ceremony. At the highest international level, the PSA's links with ICSU are very important, but at other levels we must find new avenues for linkages. Members of the Council and Executive Board of PSA would welcome suggestions from any of you for ways of furthering such cooperation.

One of the tasks of the PSA Council, and the general meeting at the end of a Congress or Inter-

Congress, is to consider resolutions that may be proposed by members of the meeting. The resolutions of the Association normally aim to contribute to policy formation in relation to some matter of scientific, environmental or social importance. Such resolutions may be forwarded by the PSA to national or regional authorities. I would like to remind participants of this role, and ask convenors of sessions to forward draft resolutions to the Council.

Finally, may I wish you all a most successful and stimulating meeting.

Thank you.

Opening Ceremony

Opening Address

Tso-Kwei Peng, Chairman

Council of Agriculture, Executive Yuan, Taipei

Professor Lee, Professor Ward, Professor Fuchs, Professor Tsay, Professor Chou, Ladies and Gentlemen:

On behalf of the Council of Agriculture, it is my great pleasure to welcome our distinguished guests to Taiwan. First of all, I would like to express my appreciation to Dr. Yuan-Tseh Lee, President of Academia Sinica, for inviting me to participate in the "Ninth Pacific Science Inter-Congress – Sustainable Development in the Pacific." I am glad that I have this opportunity to learn new ideas and future directions on sustainable development issues as well as to share our experiences in agriculture with experts and scholars from Asian and Pacific regions.

In recent years, there is a growing concern about sustainable development of human race, and sustainable agriculture has become a global trend. Agriculture is a practice of using renewable biological resources and other natural resources such as water, soil and sun to generate products for human use. Sustainable agriculture, proper management of natural resources and sustainable development of human race are tightly linked together. With ecological emphasis, modern agriculture applies advanced technology and management approaches to strike a balance between ecosystem functions and agriculture, forestry, fishery and animal husbandry. It is our hope that modern agriculture would achieve the goal of sustainable management and development without compromising the ecological environment. In order to provide the foundation for modern agriculture, this Council is carrying out projects to conserve plant and animal species and genes, to establish seed bank and nursery, and to conserve germplasm of livestock, poultry, fish, algae, etc. On the conservation front, relevant government agencies have designated various types of protected area, which comprise 12% of land area in Taiwan, to protect our environment and conserve the biological diversity of endemic species and ecosystems. All the above measures are being taken to follow the spirit of the Convention of Biological Diversity which stresses conservation of diversity in three levels: species, genetic and ecosystems.

Several focuses in this conference are related to agriculture and nature conservation, such as Symposium on "Allelopathy in Sustainable Agriculture," "Biodiversity in western Pacific and Asia," "Ecology and Conservation of Coral Reef in the Pacific," "Sustainable Fishery and Agriculture," etc. I trust that all of us will learn a great deal from these activities and I thank you all for sharing your valuable experiences with us. I believe the results of this conference will benefit the promotion of sustainable development in Asian and Pacific regions. On behalf of the Council of Agriculture, I would also like to extend

my gratitude to Academia Sinica for its great effort to make this conference possible. Finally, I wish this conference every success and I am confident that all our endeavors will make the world a better place for us and future generations to come. Thank you!

Opening Ceremony

Opening Remarks

Ching-Yen Tsay, Vice Chairman

National Science Council, Executive Yuan, Taipei

Honorable Guests, Ladies and Gentlemen:

It is my honor to participate this opening ceremony. On behalf of the National Science Council, I would like to extend my sincere welcome to all of you here today.

The need to take a balanced and integrated approach to environmental and developmental issues are well recognized. Under this premise, the idea of sustainable development is born. Sustainable development means that any development aimed at satisfying the needs of the present generation should not compromise the development of future generations by placing too much stresses on the carrying capacity of the earth system.

At the National Science Council, we have been very supportive to basic research related to the better understanding of the earth system and our environment including land, oceans, atmosphere and their interlocking biogeochemical cycles. All those efforts can lead to more accurate estimate of the carrying capacity of the planet earth and its resilience under heavy stresses placed upon it by human activities. We know that sustainable development requires taking longer-term perspectives, integrating local and regional effects of global change, and using the best scientific knowledge available to formulate good environmental and developmental policies which are flexible and scientifically robust.

Therefore, a mechanism to facilitate better communication among the scientists, decision makers and general public needs to be established. In view of this need, the Commission on Sustainable Development within the National Science Council has funded an integrated research project entitled "The Vision of a Sustainable Taiwan". Twenty some scientists of different discipline participate in the project. The principal investigator of this project is Dr. Chao-Han Liu, the President of the National Central University and a member of Academia Sinica.

One of the main objective of this study is to establish an assessment system for sustainable Taiwan. This is the first part of the project. Representative indicators relevant to our local situation, relating to the ecosystem, environment pollution, land usage, economical activity, social system and structure, etc., will be identified. These indicators can provide critical information to the government in the decision making processes concerning the sustainable development of Taiwan.

The second part of the project is to provide a vision of a sustainable Taiwan in the year 2011, recognizing the fact that Taiwan is an island with her special natural, economical and cultural characteristics. Current status in Taiwan in the area of economy, environment, social system, and resources will be reviewed. An economical model for sustainable development will be constructed, that will be used for