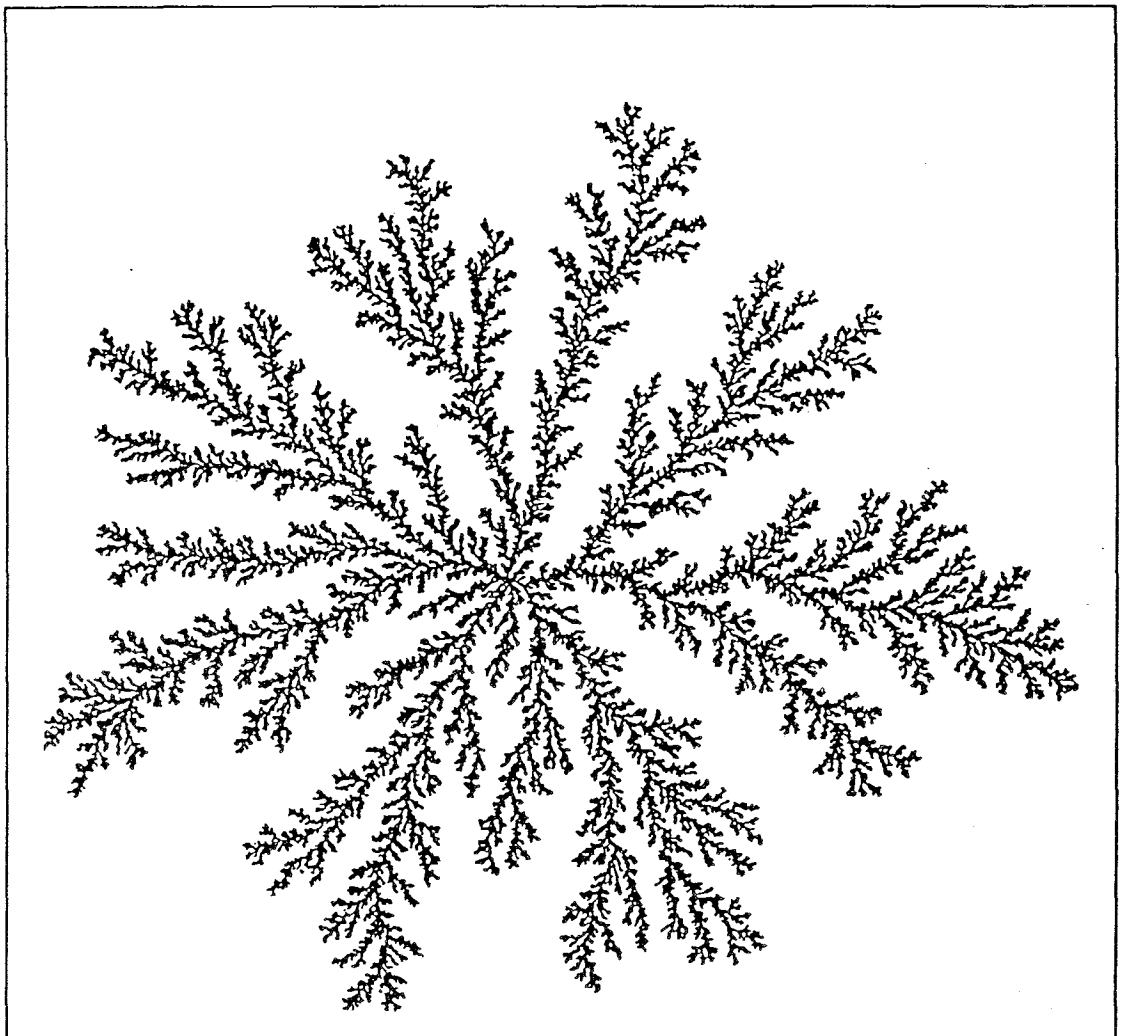
Symmetry: Culture and Science

Symmetry and Structure:
Dialogue Among Disciplines

The Quarterly of the
International Society for the
Interdisciplinary Study of Symmetry
(ISIS-Symmetry)

Editors:
György Darvas and Dénes Nagy

Volume 4, Number 4, 1993



DLA fractal cluster
of 10^6 particles

Symmetry: Culture and Science
Vol. 4, No. 4, 1993, 339-432

SPECIAL ISSUE

SYMMETRY AND STRUCTURE: DIALOGUE AMONG DISCIPLINES

(DEDICATED TO THE 25TH ANNIVERSARY OF THE UNIVERSITY OF THE SOUTH PACIFIC)

Edited by

John Hosack and Dénes Nagy

This issue is based on the symposium organized by
the Oceania Branch of ISIS-Symmetry and
the Department of Mathematics and Computing Science of
the University of the South Pacific
in Laucala Bay, Suva, the capital of Fiji,
February 25-26, 1993.

Symmetry: Culture and Science
Vol. 4, No. 4, 1993, 341-344

EDITORIAL

SOUTH PACIFIC SYMMETRIES

1 BRIEFLY ABOUT FIJI

The tropical island country Fiji is located about halfway between Hawaii and Sydney, a bit closer to the latter, in the South Pacific. Playing with geography, we may even add further data about the 'symmetric position' of Fiji: it is halfway between Tahiti and the Great Barrier Reef at the Eastern coast of Australia, and it is also halfway between the equator and New Zealand. Moreover Fiji is at the border of Melanesia ('dark islands', referring the dark-skinned native people) and Polynesia ('many islands'). The native peoples of these two divisions in the Pacific differ not only in the color of skin, darker versus lighter, but also they have very different hair: the Melanesians have curly hair, while the Polynesians have straight hair. The Fijians are a mixed Melanesian-Polynesian stock. Continuing the 'symmetries', we should note that the usual international dateline, i.e., the longitude of 180°, crosses Fiji at Somosomo village in Taveuni island. (Note that Somosomo – there are many similar names in Fiji based on reduplication – is the traditional residence of the current Paramount Chief and President of Fiji, Ratu Sir Penaia Ganilau; 'Ratu' is the Fijian equivalent of the British 'Sir', and he has both titles.) Of course Fiji avoids of the strange 'antisymmetry' of having, let us say, Monday morning on the west side and Sunday morning on the east side of the same village: the time zone is modified to have the western time in the entire country. The obvious reason for this choice is the fact that the major part of Fiji, including the largest island, Viti Levu, where the capital Suva is located, is to the west of longitude 180°. Considering this geographical location, we may easily understand why the oldest local newspaper, *The Fiji Times*, which was founded in 1869, claims proudly each morning in its masthead: "the first newspaper published in the world today". The symmetric location of Fiji has a special advantage for airlines: it is an optimal place to make a stopover between the U.S.A. and Australia or New Zealand. This fact lead to the regular modernization of the international airport near Nadi and to a flourishing tourist industry. The *Blue Lagoon* movies were shot in an island not very far from Nadi.

Almost 750 thousand people live in Fiji on about 120 inhabited islands of the total of more than 300 (18,272 sq. km). The above mentioned Viti Levu (10,388 sq. km), where both the capital Suva and the international airport are located, although at opposite sides of the island, gives more than half of the total area. The majority of the population, about 95 per cent, is given by two groups: the indigenous Fijians and the Indians, approximately the same number, while the rest are Chinese, Europeans, Rotumans (from the island of Rotuma, a dependency of Fiji to the north), and some smaller groups of people who migrated to Fiji from other South Pacific island countries. The reason for a large Indian population in Fiji is connected with an interesting fact in the history of the region. Many of the island countries of the South Pacific were British colonies. Fiji, however, was not taken by force, but its

chiefs offered their country to the British, which was accepted in 1874. The British leaders responded to this generous offer by protecting the Fijians against labor in the freshly arrived British entrepreneurs' sugar cane plantations and other businesses. Thus, they imported laborers from India in the late 19th century and early 20th century. Many of these Indian workers decided to remain in Fiji and they were joined by relatives. Both the Fijian and the Indian populations kept their traditions, which are the sources of many interesting cultural attractions. Fiji became independent in 1970. The official languages are English, Fijian, and Hindustani.

2 THE UNIVERSITY OF THE SOUTH PACIFIC

Fiji and other island countries in the region decided 25 years ago to start their own university, instead of sending their students to overseas. This decision obviously had various advantages. From a financial point of view, this form of education is cheaper than the costly overseas studies, thus providing more students with access to tertiary education. The curricula are based on international standards, which are regularly evaluated by overseas universities. These curricula, however, can better reflect the local needs than those of overseas universities. Another important advantage is the fact that there is a new South Pacific intelligentsia: many of the former students of the university hold important positions in the political, economic, and cultural life of their countries and they may find new ways of cooperation. Last, but not least, the University of the South Pacific also provides some protection against losing the intelligentsia of the region. The consideration here is that many developing countries send their students to overseas universities, but many of these never return. Luckily those countries that traditionally provide aid to the South Pacific island countries understood the importance of establishing an international university there. The main campus was built in Fiji, in the capital Suva, using the former site of a New Zealand seaplane base. The charter of the university was delivered personally by Queen Elizabeth II. The Canadian government built the School of Pure and Applied Science complex and it was opened by the Canadian Prime Minister of that time, Pierre Elliott Trudeau. The School of Humanities building was a gift of Great Britain, while the School of Social and Economic Development complex was built with Australian and New Zealand contributions. The Australian government also greatly helped more recently with the financing of a new library building. The aid from these countries also made it possible to attract some visiting distinguished scholars. Note that the overwhelming majority of the operational costs of the university are provided by the governments of the participating island countries; thus the university is not dependent on any foreign government.

The University of the South Pacific, in addition to its main campus in Fiji, has an agricultural school in Western Samoa, while the other participating island countries are served by extension centers. Students may study either at these two campuses or to enroll in courses via the extension centers. Currently the university has 12 member-states: Cook Islands, Fiji, Kiribati, Marshall Islands, Nauru, Niue, Solomon Islands, Tokelau, Tonga, Tuvalu, Vanuatu, and Western Samoa. These are independent states with the exceptions of Tokelau, which is a territory under New Zealand administration, as well as Cook Islands and Niue, which have free association with New Zealand. (Note that Marshall Islands, the latest member, as

well as a part of Kiribati, formerly the Gilbert Islands, are to the north of the equator; thus the reference to the South Pacific is not fully exact any more.) One of the documents of the university emphasizes the surprising fact that the total land area of the region is about equal to that of Denmark, while the total area more than three times the size of Europe. Serving such a large area is obviously a great challenge: the campuses and the extension centers of the university are linked by a satellite communication system and more recently many of them are connected to the Internet e-mail system. The university accepts students not only from the participating 12 countries, but also from others, including Australia, Canada, Japan, Maldive Islands, New Zealand, and the U.S.A. Currently more than half of the lecturers are from the participating island countries, and some of them are graduates of the University of the South Pacific. They work together with foreign lecturers who came from five continents. The University of the South Pacific is a broadly international institution with a beautiful Fiji campus that looks like a botanic garden with many exciting plants and trees, especially palms.

3 SYMPOSIUM *SYMMETRY AND STRUCTURE* AT THE UNIVERSITY OF THE SOUTH PACIFIC IN FIJI

The earlier described 'symmetric position' of Fiji is also a benefit to the university and its researchers. Many scholars could visit the university by making stopovers *en route* between America and Australia or New Zealand. The more recently started direct flights between Fiji and Japan also have a similar impact. Not a long ago a large group from the Japanese Soroban Association visited the university demonstrating the ancient Japanese abacus, *soroban*, and its importance in mathematics and computing education. (We plan to return to this question in a later issue focusing on the Old Japanese mathematics, *wasan*.) The Department of Mathematics and Computing Science had visitors, in a relatively short period, from Australia, England, Germany, Israel, Japan, New Zealand, and the U.S.A.

The symposium *Symmetry and Structure: Dialogue among Disciplines* (February 25-26, 1993) coincided with the visit of Andreas Dress, the Dean of Mathematics at Bielefeld University, Germany, who is a Board Member of ISIS-Symmetry. The major goal of the symposium was to provide an interdisciplinary forum where representatives of various disciplines could come together. It was prompted by the 25th anniversary of the foundation of the University of the South Pacific. Note that the topic of symmetry is useful for the above goals because the South Pacific cultures are rich in symmetry related ideas. Artists-craftsmen produced many exciting symmetric patterns and other objects that are interesting from the point of view of symmetry and asymmetry. These works of art and some related observations may inspire discussions in various fields of art and science, as well as may help education in the region. In addition some of the South Pacific languages have terms with close meanings to the Western idea of symmetry, see, e.g., the Fijian *i-vakatautauvata* or the Maori *tauahuahu*. All of these facts contributed to the decision of the Oceania Branch of ISIS-Symmetry to organize a symposium on symmetry jointly with the Department of Mathematics and Computing Science of the University of the South Pacific. During the event five Board Members of ISIS-Symmetry were present. The preliminaries of the symposium included various symmetry related activities on campus, including a special topic course given to mathematics students (Nagy) and a research seminar (organized by Hosack, Kopský, and Nagy).

The symposium had two main sessions:

– *First day: Mathematics and non-living nature*:

Dénes Nagy: Why symmetry?
John Hosack: The mathematical view of symmetry;
Vojtěch Kopský: Square-one: A new puzzle and a new algebra;
Andreas Dress: Topological aspects of molecular symmetry (Keynote talk);
Demonstration of the computer program *RepTiles* by Andreas Dress.

– *Second day: From living nature to art and humanities*:

Subramaniam Sotheeswaran: Symmetry in organic chemistry;
Dénes Nagy: Symmetry in arts and humanities;
Jan Tent: Phonetic symmetry in sound systems;
William Kenchington: Symmetry and structure in biology; From molecules to man (Keynote talk);
David Jenkins: The idea of symmetry and the symmetry of ideas;
Andreas Dress: Is Darwinism a falsifiable theory? (Public lecture).

The symposium generated some further discussions that lead to the paper by Andrew Horn, as well as Jan Tent initiated the invitation of a paper by the New Zealand linguist, Koenraad Kuiper. The topic of this paper lead to some interesting discussions between scholars in Fiji and New Zealand using e-mail facilities.

The present special issue is based on the lectures of the symposium and the mentioned additional discussions. Note that the two papers by Dress are published with coauthors elsewhere. The computer program *RepTiles* developed by Dress and his students was already discussed in this quarterly (cf., Daniel Huson's short notes, Vol. 1, No. 1, pp. 96 and 101, 1990 and Vol. 3, No. 1, pp. 30-31, 1992). The major part of Nagy's two lectures will be published elsewhere; included here, however, is a short part that has a stronger link with the South Pacific.

We invited two further contributors, D. Crowe (U.S.A.) and M. G. Sotutu (Fiji), who attended the session on "Ethnomathematics" during an earlier conference *Science of Pacific Island People* at the University of the South Pacific, July 5-12, 1992; this session was chaired by one of the editors of this issue (Nagy). While Crowe's work represents the professional mathematician's interest in patterns of decorative arts, Sotutu's work is a local craftsman's contribution to the geometry of patterns. Ms. Sotutu, with an eternal love of arts and crafts, passed away shortly after that symposium. We asked Cema Bolabola of the University of the South Pacific, who organized many workshops with her, to make a representative selection of Sotutu's work for the "Symmetric Gallery" of this issue.

It is important to note that all of the contributors of the symposium and this special issue, who originated in four continents, are associated with the South Pacific: most of them are long-term faculty members of University of the South Pacific, while Dress (Germany) had a longer invitation to New Zealand, Kuiper (New Zealand) teaches in his home country, and Crowe (U.S.A.) spent earlier his sabbatical leave in Australia and more recently visited the University of the South Pacific three times. In this sense we have here really a South Pacific special issue!

John Hosack and Dénes Nagy