AWARD OF MEDALS

The Seventy-eighth Annual Award of Medals was held on Monday, June 13, 1988, at 10:30 a.m., in the presence of His Imperial Highness the Crown Prince.

The function was opened with an address by the President, in which he made a brief statement of each award. This year, the First presentation of the Duke of Edinburgh Prize for the Japan Academy also took place at the same time. This Prize was established by the courtesy of His Royal Highness The Prince Philip, Duke of Edinburgh, Honorary Fellow of the Japan Academy.

The Medals and Prizes were presented to the following recipients.

Imperial Prize and Academy Prize to Susumu NISHIMURA
for "Biochemical and Structural Studies on Modified Nucleosides in Nucleic Acids"

Academy Prize to Takeshi TOKUDA
for "Japanese Fiction of the Edo Period and the Influence of the Chinese Novel"

Academy Prize to Miyohei SHINOHARA
for "Growth, Cycles and Structure in Japanese Economy"

Academy Prize to Kin-ichiro MIURA
for "Molecular Genetical Studies on Double-Stranded RNA Viruses, with Special Reference to the Discovery of the RNA-Cap Structure"

Academy Prize to Masaki KASHIWARA
for "Study of Algebraic Analysis"

Academy Prize to Yoshiyuki YAMAMOTO
for "Basic Studies on the Finite Element Method for Stress Analysis of Structures"

Academy Prize to Tomotari MITSUOKA
for "Comprehensive Study on Intestinal Flora"

Academy Prize to Yutaka OOMURA
for "Studies on Food Intake Regulation by Neuronal and Endogenous Humoral Control"

The Duke of Edinburgh Prize to Makoto NUMATA
for "Ecological Studies on the Structure and Dynamics of Plant Communities and their Applications"

After this, congratulatory addresses were given by the Prime Minister and the Minister of Education, Science, and Culture.

The function was closed at 11:50 a.m.

THE RECIPIENTS OF PRIZES AND THE SUBJECTS OF THEIR STUDIES

Susumu NISHIMURA

Biochemical and Structural Studies on Modified Nucleosides in Nucleic Acids

In 1968, Dr. S. Nishimura commenced his studies on modified nucleosides in nucleic acids and since that time he and his colleagues have identified many highly modified nucleosides in transfer RNA. More than 10 novel modified nucleosides have been isolated from the transfer RNAs of a variety of organisms, and their chemical structures have been determined. Dr. Nishimura has also shown that some of the modified nucleosides located in the anticodon region are essential for precise codon recognition by transfer RNA. He has also discovered unique biosynthetic mechanisms for modified nucleosides in transfer RNA. Among those, his accomplishments on modified nucleosides, the isolation, structural characterization and biosynthesis of queuosine are perhaps the most outstanding. Queuosine which is located in the first position of anticodon is particularly novel in that it is the only modified nucleoside having a 7-deazaguanine skelton, present in natural nucleic acid. The biosynthesis of queuosine in transfer RNA is catalyzed by the enzyme tRNA·guanine transglycosylase in an exchange reaction whereby the base of queuosine, i.e. queuine or its analogue, is inserted in transfer RNA molecule by replacing a guanine residue originally present in the transfer RNA.

In the field of modification of DNA, Dr. Nishimura and his colleagues have discovered a novel type of modification in DNA caused by oxygen radicals; namely; the formation of 8-hydroxyguanine. This finding may well be a milestone in opening a way to elucidate the molecular mechanisms of mutation and carcinogenesis by oxygen radicals.

The uniqueness of Dr. Nishimura's studies on modified nucleosides is that he has not only isolated and determined structures of modified nucleosides, but also he has extended his studies to elucidation of their involvement in biochemical and biological processes, such as codon recognition, biosynthesis and tumorigenesis.

Takeshi TOKUDA

Japanese Fiction of the Edo Period and the Influence of the Chinese Novel

The present work consists of four parts, thirty nine chapters, devoted to elucidate the whole situation in which storybooks (Yomihon 読本) started on the model of the Chinese novels, subsequently matured into full-length novels, and finally reached Modern novels.

Part I: Pre-Yomihon period

The author researched the original Chinese stories in detail and compared them with Japanese war stories. He explained how the Chinese novel in a colloquial style was introduced, translated, and adopted into the Japanese war stories. Moreover, he pointed out the characteristic similarities between popular war stories and storybooks. He did so by citing examples and affirmed the statement that war stories played a strong part in the formation of storybooks.

Part II: Formation of Yomihon

In regard to Tsuga Teisho's trilogy, *Hanabusa-zoshi* 英草紙, *Shigeshigeyawa* 繁野話, and *Hitsujigusa* 莠句冊, the author concluded that these stories were based on Chinese genre novels such as *Sangen* 三言 or *Ryosaishii* 聊斎志異, and that Teisho formulated the story lines from Japanese legends and historical events. The author also pointed out the influence of the Chinese novel in the work of *Shodo-kikimimi-sekenzaru* 諸道聴耳世間猿 or *Ugetsu-monogatari* 雨月物語 by Ueda Akinari. He stated that Akinari used actual characters in the first five chapters of *Shodo-kikimimi-sekenzaru* and treated them in a satirical manner: this became one of Akinari's characteristic styles in developing the stories. The author also discussed a relationship between sermon books (Dangibon 談義本) and the didactic novel *Shinsai-yago* 新斎野語.

Part III: Birth of full-length stories and their developments

During the periods between Kyowa and the end of the Tokugawa Shogunate (1801–1866), storybooks reached their zenith and full-length storybooks were most prevalent. The author explains a development of storybooks focusing on the work of Kyokutei Bakin. In the early stage of his writing career, Bakin who was influenced by the Chinese novels in a colloquial style, wrote cruel drama entitled *Wakaenohato* 稚枝鳩. He adopted the technique of developing deceiving stories from the Chinese novels, *Tohen-shinsho* 杜騙新書, and created stories such as *Kumonotaema-amayonotsuki* 雲妙間雨夜月 or *Shitenno-shotoiroku* 四天王剿盗異録. This style became one of his characteristic techniques in developing his stories as seen in *Shunden-jitsujitsuki* 旬殿実々記 or *Nanso-satomi-hakkenden* 南総里見八犬伝. Later his style changed to genre and love stories borrowing styles

from Chinese literature. In 1807 Bakin published his first historical novel, *Chinsetsu-yumiharizuki* 椿説弓張月; however, he pointed out that there were stylistic and contextual similarities between the Chinese novel *Tekisei-engi* 狄青演義, and Bakin's *Chinsetsu-yumiharizuki.* Bakin wrote seven rules for writing novels in an addendum to *Hakkenden.* The author stated that six out of the seven rules were directly copied from *Doku-sangokushi-ho* 読三国志法 by Moseizan; however, he assumed that one of the rules called *inbi* 隠微 was adopted from the article I of *Doku-sangokushi-ho. Inbi* means a writing style using hidden meanings in words and teaching didactic and causal philosophy. The author discussed Bakin's effective use of *inbi,* which was his principle style, to criticize the policies of Shogunal government.

Part IV: Yomihon and Modern novels

The author says that Tsubouchi Shoyo was critical of Bakin's *Hakkenden*; however, Koda Rohan appreciated Bakin's realistic way of description.

The success of this work accounted for the author's proficiency in the Chinese language which enabled him to read and digest a great amount of literature of the Chinese genre. This work is an excellent product of the author's assiduous labor. His contributions in the field of the comparative study of Chinese and Japanese literature are substantial and should be recognized.

Miyohei SHINOHARA

Growth, Cycles and Structure in Japanese Economy

This work consists of two books: Book I which studies economic growth and cycles; and Book II which studies the structure and policies of the Japanese economy.

In the former Book, the author deals with the high rates of growth in income in Japan. Such high rates were noticeable, according to Shinohara, in prewar times due partly to a low level of wages, and also to an increasing export trade under favorable terms at that time. The author attempts to trace the growth of Japanese economy both from a theoretical and statistical point of view. Postwar growth rates have been higher than these before the war, due mainly to both rapid technical progress throughout industry and a cheap rate of exchange between the yen and other currencies. The author stresses the fact that income growth proceeds in a cyclical nature and not in a straight line. In investigating this phenomenon he has extensively researched the vast literature dealing with the theory and statistics of trade cycles. Using such data, the author has attempted to affirm

the presence of such cycles in the Japanese economy.

In the Book II the author examines the so-called "twofold structures" which have represented the characteristic nature of Japanese economy since prewar times to the present. These twofold structures have been exhaustively examined outlining their aspects regarding income distribution, regional features, scale of enterprise, etc. The author assumes that "capital concentration" is the main cause and not the effect of the such structures. Moreover, he cites as an example, the recent rise of "high degree processing industries" as a different nature of industry from usual categories being a typical of "twofold structures". The last subject dealt with is the high rate of growth of personal savings in Japan, which he seems is relevant, not only to capital formation, but to the propensity of consumption.

In concluding the author has contributed to the analysis of the economic growth and its perspective in Japan. Particularly he has outlined the cyclical and non-uniform motion of economic growth. He has avoided following any of the established economic theories and thus has tried to verify the significance of available facts under his own assumptions and has made these assumptions on the basis of the recent change in the international status of Japan and its economy.

Kin-ichiro MIURA

Molecular Genetical Studies on Double-Stranded RNA Viruses, with Special Reference to the Discovery of the RNA-Cap Structure

Because of their small genome sizes, viruses are excellent materials for studies on gene structure and expression. Viral genomes consist of either DNA or RNA, and are either double- or single-stranded. Dr. Miura found that genomes of both rice dwarf virus (RDV) and silkworm cytoplasmic polyhedrosis virus (CPV) consist of double-stranded RNA. This finding was based on physico-chemical characterization of RNA structure using a large amount of purified viral RNA and various analytical methods.

The double-stranded RNAs from CPV and RDV were separated into 10 and 12 segments, respectively, by gel electrophoresis, each encoding a single polypeptide. The viral RNAs were not transcribed by cellular DNA-dependent RNA polymerases, but they were transcribed by virus-coded RNA polymerase. Since the viral RNA polymerase was associated with viral cores, RNA transcription could be carried out *in vitro*. Accordingly, these double-stranded RNA virus systems were quite suitable for the study of the expression of genetic

information.

After separation of the double-stranded RNA into individual chains, Dr. Miura found that the single-stranded RNA had messenger RNA activity, but that the double-stranded state did not. The genetic information resided in one of the two RNA strands. Dr. Miura found that the strand carrying protein information was methylated, and that it was blocked by a special structure at the 5′-terminus. The virus-associated RNA polymerase transcribed one of the two RNA strands into mRNA carrying protein information. Dr. Miura and his colleagues found that the 5′-terminus of mRNA was also of a special structure: 7-methyl guanosine and the 5′-terminal nucleoside (adenosine in the case of CPV) linked 5′ to 5′ in a confronting state, holding 3 phosphate groups between them. In the case of CPV mRNA, this structure is denoted as: $m^7G^{5'}ppp$-Am-G-U-$\cdots$. Such a structure had not been known previously in nucleic acid molecules. At present, this type of structure is known to be common to mRNA of eukaryotes and it is called the 5′-cap structure; it is described in almost every text book of biochemistry, molecular biology, and general biology.

Dr. Miura conducted further studies on the structure, function, and formation mechanisms of the cap structure of mRNA and found that the cap structure in mRNA was necessary for efficient formation of the initiation complex in protein synthesis and for stabilization of mRNA. Recently, he investigated the role of a leader sequence between cap and initiation codon. These studies have contributed to our understanding of the regulatory mechanisms of protein biosynthesis.

Masaki KASHIWARA

Study of Algebraic Analysis

The birth of algebraic analysis in its modern style was seen in Kashiwara's Master Thesis (1969) "Algebraic study of systems of partial differential equations", in which he proved the flabbiness of microfunctions and thereby made homology-algebraic techniques applicable to the micro-local study of partial differential equations (PDE). Kashiwara, jointly with Mikio Sato and Takahiro Kawai, played a leading role in establishing a theoretical foundation for the micro-local and homology-algebraic investigations of systems of linear PDE based upon the notions of hyperfunctions and microfunctions, introduced earlier by M. Sato. (Ref: "Microfunctions and Pseudo-differential equations" by M. Kashiwara, T. Kawai and M. Sato, Springer Lecture Notes Math. No. 287 (1973) and "Micro-local calculus" by M. Kashiwara, Springer Lecture Notes Phys. No. 39

(1975).) The Kashiwara-Kawai-Sato theory has proven to be very powerful in studying local contact transformations of PDE, local analysis of singularities of solutions and their propagations. Kashiwara's plenary lecture at the International Congress of Mathematicians at Helsinki, 1978, brought their "micro-local analysis" to the attention of the international mathematical community.

His most celebrated accomplishment is the establishment of the Riemann-Hilbert-Kashiwara correspondence, a generalization of the Riemann-Hilbert correspondence mentioned in the 21st of the 23 problems proposed by Hilbert in his lecture at the International Congress of Mathematicians 1900 in Paris. The Hilbert 21st problem which is concerned with the differential equations for functions of one variable was solved by Röhrl in 1957. Kashiwara generalized it to the case of many variables. This generalization was a revolution of which the mathematicians of Hilbert's time had never dreamed. The notions such as "regular singularities", "monodromy", etc. which were evident for one variable were no longer clear for many variables. Kashiwara's generalization of regular singularities produced many important applications to geometric problems, such as Helgason's conjecture on the boundary value problem of invariant differential operators on symmetric spaces, which was settled by Kashiwara jointly with K. Okamoto, T. Oshima and others. Kashiwara introduced the notion of "holonomic (or maximally overdetermined)" systems of PDE, which most appropriately guarantees the "finiteness of solutions". He developed the holonomic theory jointly with T. Kawai. The importance of this theory turned out to be ubiquitous in algebraic, complex-analytic, differential geometries and topology. Its applications to deformations of Hodge structures, representations of Lie groups, topology of algebro-geometric singularities, and even to Feynman integrals in physics are especially well recognized.

Kashiwara's monumental generalization of the Riemann-Hilbert correspondence was announced in 1980 and published later. It has far-reaching implications: many geometric problems can be reformulated in terms of linear PDE and vice versa. As one of its most celebrated applications, he and J.-L. Brylinski settled the Kazhdan-Lusztig conjecture.

More recently, Kashiwara, jointly with T. Miwa, M. Jimbo and E. Date, led a phenomenal advance in the study of soliton equations in connection with the theory of infinite Lie algebras, especially of Kac-Moody algebras.

Yoshiyuki YAMAMOTO

Basic Studies on the Finite Element Method for Stress Analysis of Structures

Dr. Yamamoto has made an important contribution to the fundamentals of the finite element method which has made an enormous progress as a tool for stress analysis of structures. In the case of the conventional finite element method called the displacement method, a domain to be analyzed is discretized into a number of finite elements, and in each element, displacements are assumed to be linear combinations of such functions that they satisfy the continuity condition on the inter-element boundaries. To remove this restriction, he proposed to replace the condition with that of the weak form by introducing coordinate functions corresponding to stresses acting through the inter-element boundaries; the condition is satisfied in the sense of the weighted mean. This formulation is now called the hybrid displacement method.

Dr. Yamamoto emphasized the importance of error analysis for the finite element method. Errors in finite element solutions consist of two parts; round-off and discretization errors. In general, finer mesh subdivision yields less discretization error and more round-off error. This contradiction must be settled by the error analysis of the finite element method. The round-off error is caused by rounding numerals up to a certain number of digits at each step of computation in a computer. The upper bound of its relative value can be estimated by the unit round-off error multiplied by the condition number of the equilibrium equations of nodal forces. Dr. Yamamoto showed that the condition number can be determined with the aid of vibration analysis of the domain with modified mass distributions, and he derived a simple formula for the condition number. Characteristics of round-off errors can easily be understood on the basis of the condition number. In the case of large structures, the equilibrium equations of nodal forces are often formulated on the basis of the parallel elimination concept for the sake of easy manipulation, and he showed that the parallel elimination is effective for improving accuracy from the viewpoint of stress analysis.

In the case of regularly arranged elements, the dicretization error can be investigated by deriving differential equations and boundary conditions from the equilibrium equations of nodal forces by the same method as for the difference equation. Dr. Yamamoto showed that finite element solutions are rather inaccurate near the force boundary than inside of the domain, because the boundary conditions derived at nodes on the force boundary have larger error terms, which are significant in case of stress concentration.

For structural design purposes, it is necessary to determine the peak stress at the bottom of a notch, which is caused by stress concentration. To obtain its accurate value, Dr. Yamamoto proposed a formulation on the basis of the superposition of an analytical solution for a similar problem and finite element solutions; the former is convenient to express stresses near the notch, and the latter can be regarded as the correction to the former. In his formulation, the magnitude of the analytical solution is determined by a simple formula. This method is specially effective to determine stress distributions around a crack, which have a singularity at the crack front. The stress intensity factor defined by the coefficient of the singular term plays a central role in fracture mechanics, and those for complicated structures with cracks can be determined by this method.

It should be noticed that Dr. Yamamoto has also applied the finite element method to various practical problems; causality of extraordinary disasters of ships among rough seas was revealed by him with the aid of the finite element method.

Tomotari MITSUOKA

Comprehensive Study on Intestinal Flora

Numerous and various bacteria live in intestine of humans and animals and constitute intestinal flora. Because most of these bacteria failed to be cultivated under ordinary conditions, comprehensive study on intestinal flora were not carried out at all. Dr. Mitsuoka has been engaged in this field for the past 35 years, and produced world-wide achievements.

First of all, he developed a new method for analysis of intestinal flora, including "plate-in-bottle method" for culturing fastidious anaerobes, 10 selective media and 4 non-selective media, which enables us to cultivate over 80% of the microscopic counts of bacteria in human feces. This method was highly evaluated not only in our country but also internationally, and was used widely as a standard method for culturing intestinal flora. In 1980, he published a color atlas "The world of intestinal bacteria", Sobunsha, Tokyo, which has won praise as a manual for identification of anaerobic bacteria.

With the use of the newly developed method, he isolated a lot of anaerobic strains belonging to *Lactobacillus, Bifidobacterium, Bacteroides, Clostridium* and anaerobic curved rods, and carried out taxonomic studies of these strains introducing molecular biological techniques such as DNA/DNA homology. As a result, he described 15 new species and established a classification system of intestinal anaerobes. Especially, the taxonomic work of *Bifidobacterium* opened

up a way for application of bifidobacteria to medicine, foodstaffs, feed additives, etc. These achievements have been highly evaluated as international pioneer works.

Furthermore, he carried out microecological analysis of intestinal flora and discovered several ecological rules on intestinal flora such as indigenous character of intestinal bacteria, mode of colonization and transmission, succession with aging, abnormality in stress and diseases, alteration by diets and drugs, etc. On the basis of accumulation of the microecological data, he proposed a hypothesis that intestinal flora relate to nutrition, physiological functions and drug efficacy, cancer, aging, immunity and infection of the host, and it attracted universal attention.

In order to prove this hypothesis, he studied the interrelationships among environment factors including diet, drugs and stressor, intestinal flora and the host, and demonstrated the roles of intestinal flora in immune stimulation, mutagenicity, urease activity, ammonia production, nitrosamine production, promotion or inhibition of carcinogenesis, etc. In addition, he applied his balance theory of intestinal flora that maintenance of predominancy of beneficial bacteria and suppression of harmful bacteria in intestine are important for health of humans and animals, to a diet therapy or feeding method.

Publishing 153 original papers, 86 reviews and 52 books, he built a firm foundation of intestinal flora research and developed a new interdisciplinary research field called "intestinal bacteriology", in which he always played a role as a pioneer. His outstanding achievement has been highly evaluated in the world.

Yutaka OOMURA

Studies on Food Intake Regulation
by Neuronal and Endogenous Humoral Control

Dr. Oomura has clarified central neural control of feeding; control of feeding behavior by central neurons that mutually interact in response to hunger, satiety and endogenous humoral factors. As part of the neural mechanism he has demonstrated neural responses to known chemical substances and to heretofore unsuspected humoral factors that affect central neuronal networks in ways that depend on hunger and satiety.

The first important discovery in 1964 was that feeding behavior is controlled through reciprocally correlated neuronal activity in the lateral hypothalamic area (feeding center LHA) and ventromedial nucleus (satiety center VMH) of the hypothalamus. Using electrophoretic technique, he then found, in 1969, two different kinds of

glucose responding neurons in the two areas. The activity of glucose-sensitive neurons in the LHA is suppressed by glucose which is incorporated into the cells and causes hyperactivity of the Na-K pump and hyperpolarization (1974). The activity of glucoreceptor neurons in the VMH is facilitated by glucose when it binds to membrane receptor sites and closes the K channels to produce depolarization (1986). Morphological features of the two types of neurons are different. He later found that ibotenic acid injected into the VMH lesioned neuronal cell bodies and left passing fibers intact. This produced hyperphagia and obesity in rats. Aphagia and adipsia by the LHA lesion caused by kainic acid injection had already been shown in 1982 by American groups. Thus activity of these neurons in the two areas was shown to be basic in the control of feeding behavior.

The second important discovery was that the glucose responding neurons also respond to metabolites (free fatty acids, ketone bodies etc.) and to hormones (insulin, glucagon, calcitonin, estrogen, thyrotropin releasing hormone, opioid, etc.) in blood and cerebrospinal fluid. The responses may be different during hunger than during satiety. These neurons thus work as chemosensors in the brain and contribute to the control of feeding behavior as well as to body homeostasis.

The third important step was clarification of functions of the input and output networks. The chemical information from blood and cerebrospinal fluid is processed in the LHA and VMH, and delivered to the prefrontal area and the limbic system where the hunger and satiety sensations are merged. Mutual connections with the pyramidal, extrapyramidal and cerebellar systems then initiate and govern the smooth and skilled performance of feeding behavior. The hypothalamus, including the LHA and VMH, also controls visceral function such as motility, enzyme activity, and hormone secretion through the autonomic nervous system to contribute to homeostasis.

The next step was determination of the hierarchy of chemical information processing in the system composed of the visceral organs, the medulla and the hypothalamus. Visceral chemical information, changes in metabolite and hormone concentrations in the blood and within the lumens of viscera is delivered to the nucleus tractus solitarii through afferent vagal nerves and then to the hypothalamus. The nucleus tractus solitarii also contains glucose responding neurons reported in 1984, so it also processes chemical information which it integrates with visceral information to be sent to the hypothalamus. These discoveries are important since feeding control substances work through the glucose responding neurons in the above system.

The fourth important discovery was of μM concentrations of newly found humoral factors that control feeding behavior in rat and human by changing blood concentration from hunger to satiation. These are 3(S),4-dihydroxybutanoic acid γ-lactone (3,4-DB), 2-buten-4-olide (2-B-4-O) and 2(S),4(S),5-trihydroxypentanoic acid γ-lactone. The first two induce satiety and the third induces eating behavior. This third substance dose-responsively increases the amount of food eaten whether administrated centrally or peripherally in physiological concentrations. The satiety substance 3,4-DB is effective when administered centrally but not by peripheral application. However, 2-B-4-O, in which a hydroxyl group is absent at the third carbon of 3,4-DB, effectively suppresses food intake by intraperitoneal and intragastric application. The origin of the satiety inducing substance is glutamic acid and that of the hunger inducing substance is glucose. Both substances produce their effects through the glucose responding neurons in the LHA and VMH. These substances were first found in 1980 and fully reported in 1984. The report on 2-B-4-O was in 1986.

The most recently discovered satiety inducing substance is acidic fibroblast growth factor (aFGF) found in cerebrospinal fluid. Its concentration ranges from femto to low pico M and increases more than 10^4 times for about 5 hours after feeding. aFGF was found to suppress food intake dose-dependently (pico mol) by inhibiting glucose-sensitive neurons in the LHA. aFGF is known as a potent mitogen for smooth muscle cells in the vessels and endothelial cells in the capillaries and as an inducer of atherosclerosis. aFGF in cerebrospinal fluid promotes mitotic activity of fibroblast cells in culture. Interleukin-1β (IL-1), the amino acid sequence of which is quite similar to that of aFGF, and tumor necrosis factor, which coexists with IL-1 in monocytes, also clearly suppress food intake dose-dependently, through suppression of glucose-sensitive neurons in the LHA and facilitation of glucoreceptor neurons in the VMH (1988).

Dr. Oomura has thus clarified neuronal control of food intake through the membrane functions of chemosensor neurons and their effects on neuronal networks; and he then discovered various endogenous humoral substances that contribute to the control of food intake and their effective mechanisms. For these creative studies, he has received many honors: The Japanese Medical Association Prize (1974), The Mitsukoshi Prize (1976), and The Naito Scientific Memorial Foundation Prize (1977), in Japan; and in other countries, The Anokhin Prize from the Medical Academy of the Soviet Union (1984), a Prize from the International Food and Fluid Intake Physiology Society (1986), a Prize from the Pavlovian Society of North America (1987), and the Hungarian Sámuel Rácz Medallion

from the Hungarian Physiological Society (1988). He is also appointed as an honorary member from the Bulgarian Neurological Society (1987) and from the Hungarian Physiological Society (1988).

Makoto NUMATA

Ecological Studies on the Structure and Dynamics of Plant Communities and their Applications

For more than forty years, Dr. Makoto NUMATA has been studying various types of plant communities (coastal vegetation, grasslands, weed vegetation, bamboolands, caatinga, cerrado, mountain vegetation of the Himalayas, etc.), placing the focus in particular on the quantitative analyses of their structure and succession as follows:

(1) Firstly Dr. NUMATA concentrated his studies on statistical and theoretical analyses of vegetation structure and dynamics, in particular on spatial patterns, life-forms, degree (DS) and rate (RS) of succession, ecological characteristics of seeds and seedlings, and allelopathy. His earliest papers were written on the statistical ecology of herbaceous vegetation using newly developed concepts and methods.

(2) Dr. NUMATA has been interested in the application of such theoretical analyses to plant ecology, particularly to the diagnosis of the condition and trend of grazing pastures in relation to proper utilization, management and conservation on the basis of the degree and rate of succession, the index of grassland condition, palatability ratio, forage ratio, etc.

Very few studies throughout the world have been made on the ecology of bamboo forests, even in Asia where they exist. Dr. NUMATA has conducted field experiments for many years using randomized blocks of ten treatments and five repetitions along with factor analysis. From the results of these experiments, the role of water as the limiting factor for growth and production of bamboos has been clarified.

Regarding weeds and ruderal plants, Dr. NUMATA has identified characteristics common to pioneer species in the early stage of secondary succession. These colonizing species were studied in paddy and upland fields, pastures and meadows, and bamboolands.

(3) As an extension to such applied ecological studies, Dr. NUMATA has gradually laid stress on conservation and urban ecology. During the International Biological Programme (IBP) period, he was the convener of the Conservation Section, and promoted work on the conservation of species and communities in Japan.

Integrated, interdisciplinary studies on urban ecosystems within

the framework of Man and the Biosphere (MAB) Project, have been conducted by him and his colleagues for more than fifteen years. The results have been appraised highly by UNESCO/UNEP and many ecological scientists in Asian and western countries.

Beside directing research in this area, Dr. NUMATA is also promoting an environmental and nature conservation education programme from kindergarden to university and aimed at everyone from children to adults.

(4) From his school days Dr. NUMATA has had a great interest in the ecological study of mountain vegetation. Since 1963, he has studied the Himalayan biota and vegetation in Eastern Nepal as the Leader of the Chiba University team, and recently with his colleagues he conducted a similar study in Bhutan. As a result, the relationships between the climatic zone and vegetation belts in high mountains, and the ecological basis of the plant industry and animal husbandry have been clarified.

The research activities outlined in (1)–(4) are still being continued, new ideas being presented at several international symposia and conferences in 1987.

PROCEEDINGS AT THE 820TH GENERAL MEETING

The 820th General Meeting of the Academy was held on Tuesday, June 14, 1988, at 1:05 p.m., Dr. Yoshitaro WAKIMURA, President, taking the chair. Ninety-three members were present, and the following communications were made.

Additional remarks to the system of land law in the Edo period . . . . . Ryosuke ISHII, M. J. A.

A mathematical theory of randomized computation. III . . . . . Shinichi YAMADA

Classification of normal congruence subgroups of $G(\sqrt{q})$. II . . . . . Toshikazu TAKAGI

Exponentials of certain completions of the unitary form of a Kac-Moody algebra . . . . . Kiyokazu SUTO

On Siegel series for Hermitian forms. II . . . . . Shōyū NAGAOKA

Zeta zeros and Dirichlet L-functions . . . . . Akio FUJII

Above five, communicated by Shokichi IYANAGA, M. J. A.

The Japanese Islands in the Palaeozoic age . . . . . Teiichi KOBAYASHI, M. J. A.

Localization of BLT serine esterase is distinct from that of perforin in cytotoxic T lymphocyte . . . . . Hirotaka KOIZUMI, Toshifumi TSUKAHARA, Shoichi ISHIURA, and Hideo SUGITA

Behavioral alterations in rats born to mothers exposed to a single dose of thyrotropin-releasing hormone during pregnancy . . . . . Tomoko FUJII and Nobuko YAMAMOTO

Purification and characterization of arginine kinase from scallop smooth muscle . . . . . Yoichi YAZAWA

Ca^{2+}-dependent changes in helical structure of calmodulin . . . . . Yasuhiko ABE, Haruhiko YAMAGUCHI, and Michio YAZAWA

Homology of N-termini of histones, H2A and H4 . . Masashi SUZUKI

Single P-element insertional mutagenesis in *Drosophila melanogaster* . . . . . Motojiro YOSHIHARA, Etsuko TAKASU-ISHIKAWA, Yutaka SAKAI, Yoshiki HOTTA, and Hitoshi OKAMOTO

Above six, communicated by Setsuro EBASHI, M. J. A.

Partial alteration of a protein streptomyces subtilisin inhibitor by site-directed mutagenesis . . . . . Kin-ichiro MIURA, Izumi KUMAGAI, Shusei OBATA, Shuichi KOJIMA, and Seiichi TAGUCHI

Communicated by Motoo KIMURA, M. J. A.

Boundary values of *HBD*-functions on harmonic boundaries of Riemann surfaces . . . . . Hisashi ISHIDA

Kähler diffusion processes associated with the Bergman metric and domains of holomorphy . . . . . Setsuo TANIGUCHI

On bounded positive solutions of quasilinear elliptic equations in R^n . . . . . Nichiro KAWANO

Initial boundary value problem for the equations of ideal magneto-hydro-dynamics with perfectly conducting wall condition . . . . . Taku YANAGISAWA and Akitaka MATSUMURA

Inclusion of type III factors constructed from ergodic flows . . . . . Toshihiro HAMACHI and Hideki KOSAKI

An elementary proof of a certain transformation for an n-balanced hypergeometric ${}_3\Phi_2$ series . . . . . H. M. SRIVASTAVA and Sl. Lj. DAMJANOVIĆ

Above six, communicated by Kôsaku YOSIDA, M. J. A.

Effect of skeletal muscle twitch potentiators on the contractile force and the transmembrane potential in rat cardiac muscle . . . . . Hiroyuki IWAMOTO, Rumiko SUGAYA, and Haruo SUGI

Spatial distribution of response latencies in the rat inferior colliculus . . . . . Junsei HORIKAWA and Keiichi MURATA

Above two, communicated by Yasuji KATSUKI, M. J. A.

After a recess during which the members present met in their respective Sections, the General Meeting was resumed for business transactions.

First, Dr. Noburô KAMIYA, M. J. A., Dr. Atsushi KOBATA, M. J. A., and Dr. Yoshitake OKA, M. J. A., paid a tribute of admiration to the late Dr. Kiyoshi TAKEWAKI's, the late Dr. Seiichi IWAO's and the late Dr. Hikomatsu KAMIKAWA's meritorious services to academic circles.

Then, the Chairmen of both Sections made reports of the matters dealt with at the respective Sectional Meetings.

Finally, it was reported on the result of election of half the members of the Administrative Committee, which had taken place at the Sectional Meetings. The Committee members elected are: Teiji ICHIKO, Ryosuke ISHII, Mikio SUMIYA, Masao KOTANI, Shinji FUKUI, Shingo MITSUI, and Yasuji KATSUKI.

The meeting adjourned at 6:00 p.m.

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