Award of Medals

The seventy-second Annual Award of Medals was held on Monday, June 14, 1982, at 10:00 a.m., in the presence of His Majesty the Emperor.

The function was opened with an address by the President, in which he made a brief statement of each award. Then the Medals and Prizes were presented to the respective recipients.

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

The function was closed at 11:20 a.m.

The Recipients of Prizes and the Subjects of their Studies

Kokiti Hara

L'Œuvre Mathématique de Pascal

On sait que Blaise Pascal était un mathématicien de génie en même temps qu'un philosophe et penseur religieux de premier ordre. Ses écrits philologiques et religieux ont été l'objet d'études approfondies du point de vue philologique. Or, il n'en est pas de même en ce qui concerne ses écrits mathématiques. M. Hara a signalé dès 1961 que les Œuvres Complètes de Pascal dans la Collection des Grands Ecrivains de France, référence fondamentale bien connue des études pascaliennes, contenaient dans sa partie mathématique plus de 150 fautes plus ou moins sérieuses. Et la plupart d'entre elles ont été transmises telles quelles dans d'autres éditions ultérieures des Œuvres des Pascal, sauf dans l'édition la plus récente due à M. Mesnard, maintenant en cours de publication, qui fait écho à l'observation de M. Hara.

Le présent ouvrage de M. Hara est le premier qui étudie l'ensemble de l'œuvre mathématique de Pascal, qui se divise en trois domaines: I Géométrie projective, II Arithmétique et calcul des probabilités, III Géométrie infinitésimale. L'ouvrage consiste en trois Parties correspondant à ces domaines, chacune desquelles étant composée de plusieurs chapitres, suivies d'une Conclusion et de trois Appendices, dont le second reproduit l'examen du texte des Œuvres

de l'édition de Grands Ecrivains de France, cité plus haut.

Dans le Chapitre 1 de la I^{ère} Partie, l'auteur étudie l'opuscule de Pascal: Essai pour les coniques. Il tente de deviner la nature de la démonstration du lemme 1, à savoir du théorème de Pascal pour le cas du cercle, qui n'y est pas donnée. En se gardant de tirer une conclusion trop décisive, l'auteur montre qu'il est plus naturel de supposer que la démonstration de Pascal était donnée par méthode élémentaire plutôt que par méthode projective. Il le fait d'une manière bien convaincante en examinant l'usage des lettres dans les figures. Ensuite l'auteur considère dans le Chapitre 2 "les asymptotes de l'ellipse" dont parle Carcavy dans une lettre adressée à Huygens où il les lui signale comme ayant été donnée par Pascal. Nous n'avons aucun écrit de Pascal lui-même sur ce sujet, mais M. Hara donne une interprétation plausible à cette expression étrange en se basant sur diverses sources de la même époque.

Dans la Partie II, c'est le Chapitre 3 intitulé "Induction mathématique" qui est le plus remarquable. Dans son "Traité du triangle arithmétique" Pascal a formulé clairement le principe de l'induction mathématique et l'a utilisé pour démontrer de nombreuses propositions sur le triangle arithmétique, qui ont servi à leur tour à résoudre les premières questions intéressantes du calcul des probabilités. L'auteur considère la découverte de ce principe comme la plus importante contribution de Pascal aux mathématiques et étudie le problème de savoir quand et comment Pascal a pu y parvenir. En analysant attentivement sa correspondance avec Fermat, il arrive à cerner la date de cette découverte entre le 29 juillet et le 29 août 1654.

La Partie III est de loin la plus importante de l'ouvrage. II s'agit de la théorie de la roulette ou cycloïde dont Pascal s'est occupé depuis 1658 vers la fin de sa carrière. Cette théorie est exposée dans son petit livre intitulé: "Lettres de A. Dettonville contenant quelques-unes de ses inventions de géométrie" présenté sous la forme de plusieurs lettres, avec une structure assez complexe. On y remarque en particulier l'irrégularité dans la numérotation des figures. En l'examinant de très près et en se référant aussi à d'autres sources contemporaines, M. Hara réussit à établir un ordre logique et chronologique des découvertes de Pascal et à proposer ainsi une conjecture sur la genèse de cette théorie. Nous n'entrerons pas dans les détails de cette conjecture mais mentionnerons au moins qu'elle ruine la légende bien connue d'une nuit de rage de dent et détruit l'idée reçue de l'influence directe qu'un passage de Pascal aurait exercée sur Leibniz dans sa découverte du théorème fondamental du calcul infinitésimal.

L'auteur souligne que Pascal a su manipuler les infinis avec habileté et sûreté. Mais on connait d'autre part le célèbre fragment sur les deux infinis dans ses "Pensées". Et l'auteur de conclure: "L'ordre des mathématiques et l'ordre de l'existence étaient complètement étrangers l'un à l'autre" chez Pascal.

M. Hara a achevé cet ouvrage en 1981 en poursuivant avec diligence et persévérance ses recherches qu'il a commencées en France dans les années 1960. Premier travail sérieux sur l'ensemble de l'œuvre mathématique de Pascal, il n'en épuise certainement pas les questions. Mais on peut bien dire que cet ouvrage plein d'intérêt constitue une contribution importante à l'histoire des mathématiques du 17^{e} siècle.

Shizuo KAKUTANI

Studies on the Theory of Functional Analysis

Functional Analysis is the theory dealing with operators in Hilbert and Banach spaces. Its development became decisive beginning the thirties. Dr. Kakutani contributed considerably to this theory and his results were used by him to create important and far-reaching studies, especially in the theory of stochastic processes.

In 1944 Dr. Kakutani published "Two-dimensional Brownian motions and harmonic functions" in the Proceedings of the Imperial Academy of Tokyo describing his recognition that the Brownian motions and the Newtonian potentials, seemingly unrelated, are mathematically equivalent. This pioneering research obtained in the wartime was brought to wider recognition by J. L. Doob and G. A. Hunt about 12 years later in 1956–7, who extended it to the mathematical equivalence of Markov processes and generalized potential theory. These works were still further pursued by M. Brelot, J. Deny, P. A. Meyer and others. In his subsequent paper "On Brownian motions in n-space" published in the same Proceedings of 1944, Dr. Kakutani proved that the Brownian motions in R^n with $n \geq 3$ are transient, i.e., almost all paths of a Brownian motion in R^n with $n \geq 3$ tend to ∞ as the time t tends to $+\infty$; while the Brownian motions in R^2 are recurrent, i.e., almost all paths of a Brownian motion in R^2 come back infinitely many times to within any neighbourhood of any fixed point as t tends to $+\infty$. In 1950 Dr. Kakutani further proved, in "Double points of Brownian motions in R^n" published in the Acta Sci. Math. Szeged jointly with A.

Dvoretzky and P. Erdös, that almost all paths of a Brownian motion in R^3 have infinitely many double points, while almost all paths of a Brownian motion in R^n with $n \geq 4$ have no double points.

In 1932 J. von Neumann proved the mean ergodic theorem in Hilbert space as a mathematical foundation of the classical statistical mechanics. In 1938 Dr. Kakutani published "Iteration of linear operations in complex Banach spaces" in the Proceedings of the Imperial Academy of Tokyo, extending the Neumann's result to the mean ergodic theorem in Banach spaces so as to be applicable to Hamiltonian mechanics as well as to Markov processes. In view of applying the mean ergodic theorem to function spaces L^1 and L^∞, Dr. Kakutani obtained characterizations of L^1 and L^∞ as Banach lattices. He was invited by the 1950 International Congress of Mathematicians held at Cambridge in Boston to deliver a special lecture entitled "Ergodic theory".

In 1948 Dr. Kakutani published "On equivalence of infinite product measures" in the Annals of Mathematics, where the equivalence of two measures means that the totality of the sets of measure zero are the same for the two measures. The result of this paper turned out to be a remarkable fact in mathematical statistics, as was observed by H. Kudō in 1952. It has been well recognized that the above equivalence criterion of Dr. Kakutani plays an important role in the theories of infinite dimensional measures in function spaces, such as those measures given by R. A. Minlos (1959) and L. Schwartz (1973). The other works of Dr. Kakutani are also noteworthy contributions to Functional Analysis.

Dr. Kakutani's works are the ones that can be characterized as of far-reaching insight which gave considerable influences for the pertaining fields.

Akira OTA

The Meaning of Negation:
Preliminary Studies in Semantics

The book comprises two parts. In Part I "Methodology" Dr. Ota examines all the important semantic theories published to date and clarifies the fundamentals of his research. In Part II "Semantic Interpretation of Negation" he cites copious illustrations from English and interprets their meaning by means of the basic concepts elucidated in the previous part, thus substantiating his theory. In

this way the two parts are complementary to each other in stating the results of his investigations.

Part I begins with the distinction between the meaning of a sentence and the meaning of an utterance. The former is the grammatical meaning of a sentence indicated by its syntactic structure, and the latter the contextual meaning of a sentence used in an actual situation. The study of grammatical meaning is assigned to the field of *semantics* in the narrow sense of the term, and that of contextual meaning to the field of *pragmatics*.

After expounding various semantic theories, the author takes what is called the extended standard theory of the transformational generative grammar as his framework of research. This means that he takes into consideration the pieces of information obtainable from the surface structure of a sentence as well as those given in its deep structure.

The author accepts logic as fundamental discipline for his semantic analysis of a proposition contained in a sentence, and employs logical symbols to make his statement exact. The semantic study of language, however, is concerned not only with the truth value of a proposition but also with the speaker's intentions in his speech acts. So the author attaches equally great importance to the pragmatic side of meaning which lies beyond the logical and grammatical domain of meaning. His points of discussion are the "topic" and "comment" in a sentence, the "presupposition" or given information shared by the speaker and the hearer, the "focus" or new information intended by the speaker, the "implicature" or implied meaning, and so on.

The basic concepts discussed in Part I are all demonstrated in Part II, where the author presents an abundant corpus of negative sentences cited from English and carries out thorough investigations into the nature of negation. As a negative sentence presupposes an affirmative sentence of which it is a negative, the author first gives syntactic and semantic descriptions of an affirmative sentence and then deals with its negative counterpart. Here again the difference between affirmative and negative sentences is not only in their truth value but also in their contextual meaning. Viewed from the point of pragmatics, negation is used to express the speaker's rejection of the other party's request or demand, to show his disagreement with the other party's opinion, to correct his own inadequate expression, and so on.

This book is a product of Dr. Ota's untiring study, a record of his explorations of complicated problems in semantic interpretation. It marks a highly advanced stage of semantic studies in both theory

and data.

Manabu YUNOKI

Historical Study of the Marine Transportation in Tokugawa Era, Japan

The historical researches into marine transportation in the Early Modern Period have not made any distinctive progress, since the results obtained by Prof. Ryoichi Furuta and Prof. Shoichi Sumita appeared before the Second World War. The present author, Prof. Manabu Yunoki, made a decisive challenge to this unexploited field to elucidate its actual condition, making all the results of research works carried out after the War his own, such as researches into the history of goods distribution and even into that of ship-building techniques. It is proper to say that herein lies the epoch-making features of his book.

In Section I of Chapter I, the author tried to clarify how things stood in regard to the distribution of chief products, namely, rice, sake, soya, oil, cotton, silk, sugar, timber, etc., and among others he inquired into the shipping business management, making the most use of abundant historical documents relating to the families concerned and also the sake brewers union.

In Section II, the author devoted himself to digging out the details of various aspects which had been inherent in the *Higaki Shipping Agency* and the *Taru (sake barrel) Shipping Agency.* Making full use of new historical materials he came to an excellent conclusion in regard to the mutual relations between consignor, wholesale dealer, and shipping agent, going beyond the common level of historical study of systems in the past.

In Chapter II, the author, taking up the problems concerning the business condition of *charge shipping* (public carrier) by the *Higaki transport ship* and the *Taru transport ship* and of *purchase shipping* (private carrier) by the *Kitamae transport ship,* and comparing these different two types of shipping business management, gave a thorough description regarding the procedure of joining in the shipping business in the form of joint investment in transport ships. The *Higaki transport ship* was under the command of the *Edo Ten Union of Wholesale Dealers* (Edo-Tokumi-toiya), and in the same way, the *Taru transport ship* was under the control of the members of sake brewers union, as consignors in the Hyogo-Osaka

area. Thus the development of *Nada-go-go* (Nada 5 localities), as the shipping centre for the *Kudari-saka* (sake, for transport to Edo), had the background that the transport section was subordinate to the power of capital of the said localities. In regard to the formalities to share in the transport ship, there was a difference between the *Higaki transport ship* and the *Taru transport ship* in that the former took a divided payment as enrollment fee by each union belonging to the *Edo Ten Union of Wholesale Dealers,* while the latter took a single payment by each consignor or sake brewer instead of the payment by sake brewers union. The *Higaki Shipping Agency* attached importance to the supply of capital, while the *Taru Shipping Agency* concentrated its efforts on shipping business management, especially on smooth transportation of sake.

In Chapter III, the author, taking up the problems concerning the marine transportation in the Inland Sea of Seto, referred to the *Shiwaku transport ship,* which had been active in rice transportation, especially in the transport to the *Shogunate rice granary,* and also referred to the major role played by the Port on Yura in Awaji, and the shipping business of Naoshima Island in Sanshu. After the Kyoho Period, the *Shiwaku transport ship* went under and the shipping activities, relating to the transport of rice tribute, began to be observed at the seaside or in the bay, though on a small scale. This tendency resulted from the development of goods distribution induced by the increase of peasantry goods production. Under such circumstances, a number of transport ship owners appeared in various places, and in consequence shipping agents in port towns began to find their way into a long distance transportation.

In Chapter IV, the author tried to clarify the details of marine transportation in the Nippon Sea. He reexamined the actual condition of the *Kitamae transport ship,* which had hitherto been defined as the one, peculiar to the Hokuriku area, focusing the lens only on that area. He exapanded his angle of view to the owners of the *Kitamae transport ship* in the *Tajima-Tango areas,* who had been engaged in the Hokkaido trade, and placed their activities in a good light to make clear the changing feature of shipping business, which had begun to quicken in Seto, Takeno, Hamayasugi, Moroyose of the Tajima area in the Bunka-Bunsei Period. As time passed to the last days of Shogunate, a small ship of loading capacity under 100 *koku* gradually changed into a large-sized ship in coastal trade in the Nippon Sea, and in accordance with this trend, *owner shipmaster* took the place of *employee shipmasters.* The author also made thorough researches into the functions of shipping agencies and the situation of the *Kitamae transport ship,* during the time extending

from the second half of the Early Modern Period to the Meiji-Taisho Period, by means of "Funeoaratame-hikaecho" (Memorandum Book of Ship Examination) of *Sagiura* in *Unshu*.

As stated above, in this book the author aimed at dynamic analyses of shipping business and marine transportation, performed in the three chief sea routes, between the Hyogo-Osaka area and Edo, the Inland Sea of Seto, and the Japan Sea, and also those of goods dealing, relation with wholesale dealers, constituent member of a crew, real condition of shipping business and its management, chiefly in connection with the *Shiwaku transport ship*, the *Higaki transport ship*, the *Taru transport ship* and the *Kitamae transport ship*.

For the reasons mentioned above, the book should be valued highly as an excellent fruit of the author's consistent researches.

Eiichi EGUCHI

The "Deprived Strata" in Contemporary Japan

This work, which verges on 1,500 pages in three volumes, is an attempt to explore "the deprived strata" as a specific strata in post-war Japan. It is argued here that 'poverty' has not been created only by personal or contingent causes but by post-war Japanese economic growth itself. Mr. Eguchi, the author, being stimulated by many studies on poverty in the late nineteenth century Britain, has devoted himself his whole academic life to the study of this problem. One of the features of poverty in post-war Japan is that "the deprived strata" consists not only of the protected families by such social securities as the National Assistance Law, but of a great number of underpaid persons, who are precipitated from many sources into these strata and accumulated there. The same phenomenon can be found not only in big cities but in local towns as well as in agricultural and fishing areas. It is stressed that the existence of distress and massive unemployment immediately after the war, never disappeared even at the time when Japanese economy began to develop after 1950. Rather unstability of employment was deepened, expanded and socio-economically structured, even at the time of rapid economic growth. The author indicates that the core of contemporary 'poverty' is composed of 1) the strata incapable of "catch up" to the rapidly increasing cost of living as a result of the economic growth, 2) intensified sense of distress which comes from

the growing impact of mass-consumption, and 3) the existence of the thick "deprived strata" which has accumulated at the bottom of the working population, under the prevailing so-called middle-class consciousness.

This performance by Mr. Eguchi is unique in its suggestion that the vast existence of "the deprived strata" is distinguishable apart from normal wage earners and industrial relations. This viewpoint has never been explored by any previous studies of poverty. The specific social strata, called "the deprived strata" in this book, consists not of 750,000 families whose minimum standard of living are protected by law, but of persons composed of several kinds of casual labourers of unstable employment. The author is convinced that without an integrated understanding of "the deprived strata" and the protected families, it would be impossible to recognise properly the problem of poverty in contemporary Japan. In other words, between ordinary employee (or selfemployed) and the protected families, there exists the thick "deprived strata" and their families with particular structure to their way of life. The very point has been overlooked until quite recently.

As the tool to analyse 'poverty' as one of social strata phenomenon, the author employs the term "deprivation", recently used in poverty researches, and insists that the contemporary poverty can not be understood by the so-called traditional "poverty-line" concept. The point here is that in the case of deprived families incomes are not only far below the ordinary level, but their way of life is socially isolated so far as housing, medical care, education and culture are concerned. This leads the author to his conviction that only an integrated analysis of the officially protected families and "the deprived strata" offers a way to approach contemporary 'poverty'.

The contribution of Mr. Eguchi's work lies in the fact that on the basis of the analysis of voluminous documents and figures compiled for many years and the compilation of hearings and oral investigations, it presents a new viewpoint for the study of 'poverty' in Japan. It should be especially evaluated that his success is accomplished by a kind of interdisciplinary method in the sense that the methods of economics and sociology are fully used for the purpose of analysing the 'poverty', which has been overlooked in post-war history of research in this field. The work by Mr. Eguchi will also provide not only to the future researchers on 'poverty' with a new guideline but also help to a great extent to make a decision of social welfare policies in our country.

Ikuo KUSHIRO

Experimental-Petrological Studies on Rock-forming Materials

During the last 20 years I. Kushiro has been conducting a series of experiments on the rock-forming materials under high-pressure and high-temperature conditions for the purpose of solving the problems on the generation and solidification of magmas. Followings are the major results and findings.

(1) The phase equilibrium relations in the systems containing olivine and pyroxene which are the major constituents of the earth's upper mantle have been determined at high pressures. It was found that the field of crystallization of olivine is reduced relative to that of orthopyroxene with increasing pressure under anhydrous conditions, indicating that magmas formed in the upper mantle become more silica-undersaturated with increasing depth. (2) Under hydrous conditions the field of olivine was found to expand relative to that of orthopyroxene, and the incongruent melting of enstatite, which holds only at pressures less than a few kbar under anhydrous conditions, was found to persist at least to 30 kbar. The results indicate that magmas formed in the upper mantle become more enriched in silica under hydrous conditions. (3) The solidus (beginning of melting) of a peridotite was determined for the first time under hydrous conditions up to 60 kbar. The results gave constraints on the temperature of the upper mantle under hydrous conditions. (4) Regularities were found on the shift of the liquidus boundaries between olivine and pyroxene and between pyroxene and silica minerals by addition of various oxides; oxides of monovalent cations (K_2O, Na_2O, H_2O) shift the boundaries toward silica, whereas those of polyvalent cations (TiO_2, CO_2, P_2O_5) shift the boundaries away from silica at constant pressure. This was explained by the change of the structures (especially degree of polymerization) of melts by addition of various oxides. (5) A new technique was developed for measuring viscosity and density of melts at high pressures and temperatures. It was found that viscosities of many silicate melts including natural rock melts decrease with increasing pressure at constant temperature. The viscosities of basaltic and andesitic magmas should decrease greatly with increasing depth because of the increase of both pressure and temperature. It was also found that the compressibility of basaltic magma is larger than those of silicate minerals, so that, for example, calcic plagioclase which is denser than basaltic magma at low pressures becomes less dense

than basaltic magma at high pressures (>6 kbar). Floatation of plagioclase is expected to occur under lower crustal conditions. (6) The reaction of anorthite and forsterite to produce spinel and pyroxenes was found to occur at pressures between 7 and 10 kbar. This finding clarified the stability relations of both plagioclase- and spinel-peridotites, the latter of which is a major upper mantle material. (7) The stability field of iron-free pigeonite was found in the system $MgSiO_3$-$CaMgSi_2O_6$ at 1 atm and at relatively low pressures, and the liquidus relations involving the pigeonite and other pyroxenes were determined. The results are useful for understanding the crystallization of pyroxenes in magmas. It was also found that diopside melts incongruently to diopside solid solution and more calcic liquid at 1 atm. This must be taken into account in the calibration of temperature with diopside in the 1-atm quenching experiments.

Hitoshi KAMADA

Studies on Highly Sensitive Analytical Instruments and Their Application

Recent developments in high performance and functional materials such as semiconductors and new ceramics have created a need for analytical methods which meet the most stringent requirements in terms of sensitivity and precision. Especially both ultra trace impurities and the composition of very thin surface layers have to be analyzed nondestructively, that is, without changing the chemical state of the analyte. Kamada has invented a number of unique and highly sensitive analytical instruments, and successfully applied them to both materials science and environmental science research.

1. Photoelectron diffraction method. He has improved the sensitivity of the x-ray photoelectron spectroscopic method with a position sensitive detection system, and succeeded in observing the photoelectron diffraction phenomena for electrons from each of the atoms in very thin surface layers. This method is very different from the conventional electron diffraction method in its ability to collect information connected with each of the elements in a very thin layer. This method, when applied to the study of the sites of doped elements in a single crystal, to disorder formation and recrystalization of a crystal surface and to the alloying process in a metal-metal interface, has revealed a number of diffusion mechanisms for

elements in surface layers. The chemical shifts of photoelectron spectra have also been applied to the analysis of oxidation and fractional vaporization processes in a surface. The results have made a significant contribution to fundamental research in semiconductor devices, metal corrosion, and various material processes. These achievements have received very wide international recognition.

2. High resolution x-ray spectroscopy. He has developed a two-crystal spectrometer for high resolution x-ray fluorescence spectroscopy. This spectrometer has made possible very high precision measurement of chemical shifts in x-ray spectra around 10^{-1} eV. By combining this spectrometer with sophisticated numerical data processing, he has succeeded in detecting ultra fine structures in x-ray spectra, and has established a new method of chemical state analysis for the valency state and coordination state of an analyte. He has also succeeded in developing a heavy ion excited x-ray emission method, which has made possible the analysis of elements lighter than atomic number 10. These methods are widely used for the characterization of functional materials.

3. Laser induced photoacoustic spectrometry. He has also developed a unique laser induced photoacoustic spectrometer. A piezoelectric ceramic was introduced into the system for detecting acoustic waves generated by photo-absorption. This method can detect impurities at the ultra trace level, and has important applications in environmental analysis. It has also made possible the direct observation of photo catalytic reactions on surface layers, photoelectric reactions in solid-liquid interfaces, and many other surface and solid-liquid interface reactions. One of the most widely used applications of this method is in solar energy research.

Kunio YAGI

Studies on Flavin Enzymes

Many contributions in the field of flavins and flavoproteins were made by Dr. Kunio Yagi. Among them, the most remarkable contribution was his first successful separation of the enzyme-substrate complex by crystallization. The occurrence of the enzyme-substrate complex, so-called Michaelis complex, in the enzymic reaction was predicted by the late Prof. Leonor Michaelis. Before the accomplishment of separation by crystallization, it had been a conventional

thought that the intermediate could not be isolated because of its short lifetime and high instability. The successful crystallization was essential to substantiate the occurrence of the enzyme-substrate complex as an intermediate.

For this, Dr. Yagi used D-amino acid oxidase, a flavin enzyme containing flavin adenine dinucleotide as coenzyme. After purification of this enzyme from hog kidney, he first succeeded in separating the crystals of a model of enzyme-substrate complex composed of equimolar amounts of the enzyme and a model of substrate, benzoate, which combines with this enzyme without receiving the action of the enzyme. Second, the crystallization of the real intermediate was attempted. He presumed correctly that the enzyme-substrate complex would accumulate in the equilibrium attained by the coexistence of the substrate, D-alanine and the product, pyruvic acid under anaerobic conditions. Under these conditions, the purple crystals were obtained with 0.05 saturation of ammonium sulfate at 0–5°C, and this crystal was converted to equimolar amounts of the oxidized enzyme and the product, pyruvate, upon aeration. Then, this crystal was identified spectroscopically with the intermediate appearing in a rapid reaction. The entity of this crystal was found to have a strong charge transfer complex. The kinetic isotope effect on the elimination of α-proton of the substrate using α-deuterated amino acids revealed that the substrate moiety existed in the carbanion state in the enzyme-substrate complex.

As to the reactivity of flavins, it was found by calculation of frontier orbital that N(5) atom in the isoalloxazine ring has the highest acceptability of electrons, and it was proposed that the electron transfer interaction occurs between the amino group attached to the carbanion and N(5) of the isoalloxazine ring. Furthermore, by nuclear magnetic resonance study with ^{13}C- and ^{15}N-enriched flavins, experimental evidence was provided on the possibility of the reactivity C(4a) atom in the reduced flavin to oxygen.

Other evident contributions on flavin enzymes by Dr. Yagi are as follows:

1) Substrate specificity of monoamine oxidase purified from beef heart mitochondria was found to be markedly affected by lipids.

2) A detection and purification method for covalently-bound flavin enzymes by following the radioactivity incorporated into the the covalently-bound flavins was devised.

3) The structures of flavins in galactonolactone oxidase and choline oxidase were determined.

Haruaki YAJIMA

Studies on Total Synthesis of Bovine Pancreatic Ribonuclease A by the Solution Method and Its Crystallization

Synthesis of enzymes has been one of the goals for many organic chemists starting from the days of E. Fischer early this century. The title enzyme, ribonuclease (RNase) A, is one of hydrolytic enzymes, specific for pyrimidine-nucleotide moieties in ribonucleic acid (RNA). Its structure, consisting of 124 amino acids, was firmly established in 1963 by three Nobel laureates, W. H. Stein and S. Moore at Rockefeller Institute and C. B. Anfinsen at National Institute of Health, U.S.A. This protein became the first enzyme for which the entire structure was recorded in literature. Numerous efforts have been concentrated to synthesize proteins at the enzyme level in several laboratories in the world, but an unambiguous synthesis of proteins, including RNase A, has remained to be accomplished.

Dr. Yajima succeeded in synthesizing RNase A with full enzymatic activity and finally obtained this synthetic enzyme in a crystalline form. Several new devices were explored for this synthesis. In order to construct the entire peptide backbone of RNase A by the racemization-free azide procedure, a substituted hydrazine procedure was newly introduced. After overcoming various difficulties in solubility and purification of intermediates, relatively small 30 peptide fragments of established purity were successively assembled by the azide procedure as a main tool and after each condensation, all protected intermediates were chemically characterized. In the final step of the synthesis, a new deprotecting procedure with organic sulfonic acids was employed to remove all protecting groups attached, wherein several hitherto unknown side reactions were chemically clarified and well suppressed. After formation of the disulfide bonds by air-oxidation, followed by several purifications, Dr. Yajima succeeded in obtaining a protein which has a high degree of homogeneity and possesses physicochemical properties and specific activity comparable to those of natural RNase A. Subsequently, with the use of salt-free procedure, crystals of synthetic RNase A with rosettes or stalagmitic shape were obtained from aqueous alcohol.

Dr. Yajima's study briefly outlined above is the first chemical synthesis of enzyme and one of the greatest achievements in the history of peptide synthesis. His study has contributed immensely to the progress of peptide and protein chemistries.

PROCEEDINGS AT THE 760TH GENERAL MEETING

The 760th General Meeting of the Academy was held on Tuesday, June 15, 1982, at 1:05 p.m., Dr. Hiromi ARISAWA, President, taking the chair. Ninety-one members were present, and the following communications were made:

Controversies on the interpretation of "Yì Dūan" (異端) in the Analects during the Tokugawa period . . . . . Masao MARUYAMA, M. J. A.

Near-haploid conversion in Ph^1-positive chronic myelocytic leukemia . . Takaaki ISHIHARA, Masako MINAMIHISAMATSU, and Sei-ichi KOHNO

Chromosomal alteration and the development of tumors. XXV. Quantitative changes of nucleolar organizer regions (NORs) in the Indian spiny mouse tumors developed by 3-methylcholanthrene . . . . . Tosihide H. YOSIDA

Above two, communicated by Sajiro MAKINO, M. J. A.

On boundedness of circular domains . . . . . Akio KODAMA

Logarithmic deformations of holomorphic maps and equisingular displacements of surfaces with ordinary singularities . . . . . Kimio MIYAJIMA and Shōji TSUBOI

On invariant differential operators on bounded symmetric domains of type IV . . . . . Shōichi NAKAJIMA

Above three, communicated by Kunihiko KODAIRA, M. J. A.

On the microlocal structure of a regular prehomogeneous vector space associated with $Spin(10) \times GL(3)$ . . . . . Tatsuo KIMURA and Ikuzo OZEKI

On a certain inverse problem for the heat equation on the circle . . . . . Takashi SUZUKI

Nonlinear Perron-Frobenius problem. An extension of Morishima's theorem . . . . . Yorimasa OSHIME

On Σ-product of spaces which have a σ-almost locally finite base . . . . . Munehiko ITŌ

Retraction and extension of mappings of M_1-spaces . . Takuo MIWA

The corona problem on 2-sheeted disks . . . . . Masaru HARA

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

Studies on fat-storing cells. II. Demonstration of vitamin A in isolated lipid granules . . . . . Sakae YUMOTO

Communicated by Teizo OGAWA, M. J. A.

Neomycin effect on lysotriphosphoinositide channel as a model for an acute ototoxicity . . . . . Masahiro SOKABE, Junichi HAYASE, and Kensaku MIYAMOTO

Plastic reorganization after transection of the commissure of the inferior colliculus . . . . . Ikuo TANIGUCHI and Nozomu SAITO

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

Cech cohomology of foliations and transverse measures . . . . . Shigeru YAMAGAMI

2-dimensional periodic continued fractions and 3-dimensional cusp singularities . . . . . Hiroyasu TSUCHIHASHI

Above two, communicated by Heisuke HIRONAKA, M. J. A.

Proteins from fibroblast conditioned medium mediate and enhance cell adhesion, spreading and growth . . . . . Masayasu YAMADA, Noriko IKEGAMI, and Tohru OKIGAKI
Communicated by Shiro AKABORI, M. J. A.

On the rise and fall of the Conchostraca in Eastern Asia . . . . . Teiichi KOBAYASHI, M. J. A.

Record of an ammonite from the Shimanto Belt of the Kuma area, Kyushu . . . . . Tatsuro MATSUMOTO and Minoru TAMURA

Coreanophyllum variisegmentum gen. et sp. nov. from the Daedong supergroup, Korea . . . . Tatsuaki KIMURA and Bong-Kyun KIM

Neocalamites carrerei (Zeiller) Halle (Equisetales), found *in situ* from the Daedong supergroup, Korea . . . . . Tatsuaki KIMURA, Bong-Kyun KIM, and Tamiko OHANA
Above three, communicated by Teiichi KOBAYASHI, M. J. A.

On formal groups over complete discrete valuation rings. II. Generic formal group and specializations . . . . . Keiichi OSHIKAWA

Disjointness of sequence $[\alpha_i n+\beta_i]$, $i=1, 2$ . . . . Ryozo MORIKAWA
Above two, communicated by Shokichi IYANAGA, M. J. A.

Demonstration of xenotropic murine leukemia virus-related sequences in various Rodent species . . . . . Noriyuki SAGATA, Kazuo MORIWAKI, and Yoji IKAWA
Communicated by Toshio KUROKAWA, M. J. A.

Calcium regulation of the conformational change around a specific thiol group, SH_2, of skeletal myosin . . . . . Tsuneo KAMEYAMA
Communicated by Setsuro EBASHI, 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, the President announced that Dr. Jacob G. Harrar, Honorary Member of the Academy, had died on April 18, 1982. The members rose from their seats in silence, expressing profound sense of grief.

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

Then, 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: Juichi KATSURA, Sanji SUENOBU, Kazuo OKOCHI, Kenjiro KIMURA, Kiyoshi MUTO, Kin-ichiro SAKAGUCHI, and Toshio KUROKAWA.

The Meeting adjourned at 4: 40 p.m.

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