



# Patilika

December 1981 No.3 Newsletter of the Indian Academy of Sciences

## 47th Annual Meeting of the Academy

At the invitation of the University of Kerala and the Sree Chitra Tirunal Institute for Medical Sciences and Technology, Trivandrum, the Academy held its 47th Annual Meeting at the Kanakakunnu Palace, Trivandrum from 5-8 November 1981.

The inaugural function was held at the University Senate Hall and was presided over by Dr. S. Varadarajan, President of the Academy. After a brief welcome address by Dr. M. Varghese, Vice-Chancellor, University of Kerala, the President introduced the Fellows of the Academy to the audience. In his Presidential address, he spoke on energy and India's capabilities and achievements in the field of oil exploration both on shore and off shore, national plans for the production of 29 million tons of oil by 1984, and of the work done in various research and development establishments and manufacturing units for increased output of fertilisers and petrochemicals.

The technical sessions were held at Kanakakunnu Palace and consisted of two short specialized symposia and three lecture presentations.

The first symposium on the forenoon of 6th November was on *New Frontiers in Ocean Sciences*, with talks by Dr. B. S. Ramakrishna on "Acoustic sensing of the sea", Dr. S. Sinha Roy on "Non-living resources" and by Prof. N. Balakrishnan Nair on "Conservation of living resources—problems and prospects".

This was followed in the afternoon by three lectures by new Fellows. Dr. D. Balasubramanian spoke on the "Application of photoacoustic spectroscopy in biological systems", Dr. V. M. Meher-Homji on the "Influence of forests on rainfall" and Dr. K. Venkatesan on "Molecular packing and photochemical reaction in crystals".

The evening lecture on the 6th November

was by Prof. M.G.K. Menon on *Experiments in Kolar (grand unification)*. He spoke of the various forces of nature and the structure of matter, and the behaviour of cosmic rays as a function of depth. He concluded with a description of the Background Stability Experiment and the Nucleon Decay Experiments now in progress at Kolar.

The second symposium, on the *Impact of Science and Technology on Medicine—a Cardiac Illustration*, was held on the morning of 7th November. The first speaker at the symposium was Dr. S. Padmavati, who surveyed the changing pattern of heart diseases in India. She pointed out that rheumatic heart disease dominated the picture by its high prevalence, but it could nevertheless be controlled by regular penicillin prophylaxis. She also dealt with coronary artery disease and hypertension, which had become major problems in urban areas with lengthening life expectancy. A reference was also made to cor pulmonale which is a crippling affliction of housewives who work in smoke-filled slums. While research into aetiopathologic factors was necessary, she strongly felt that effective steps for the control and treatment of the current cardiovascular problems could be taken on the basis of available knowledge.

Dr. A. S. Paintal discussed circulatory dynamics in terms of three pumps—skeletal muscle, right ventricle and left ventricle. He illustrated the effect of ventricular pump failure on the pulmonary circulation by drawing a striking comparison with the effect of sea tides on the backwaters of Kerala. He also gave a lucid description of the reflex mechanisms which are triggered by circulatory disturbances in the lung.

Dr. K. G. Nair discussed instrumentation technology which has revolutionised cardiac diagnosis in recent years. The precision, accuracy and non-invasive nature of modern instrumentation were vividly illustrated by reference to ecocardiography, telemetry, nucleide angiography, computerised tomography and several other techniques.

Dr. M. S. Valiathan concluded the

symposium by highlighting the role of technology in the current practice of cardiac surgery. He chose as examples of technological advances hypothermia, gas liquid mass transfer, hydraulic pumps and biomaterials which form the essential underpinning of open heart surgery and artificial internal organs. It was pointed out that the growing confluence of technology and cardiac surgery was bound to stimulate mutual growth.

The symposium was followed by three lectures by Dr. D. Chakravorty on "Glass metal microcomposites", by Dr. C. R. Narayanan on "The Neem tree—a Kalpavriksha", and by Dr. P. T. Manoharan on "Magnetic properties of transition ions through EPR".

In the afternoon a visit was arranged to the Vikram Sarabhai Space Centre, during which Dr. V. R. Gowarikar spoke on the "Evolution of rocket technology in India".

The evening lecture on the 7th November was given by Dr. K. N. Raj on "Technological progress and mass poverty".

On Sunday the 8th November there were four lectures by Prof. A. Abraham on "Orchids", Dr. N. Appaji Rao on "Inborn errors of metabolism and consanguinity", Dr. N. S. Rangaswamy on "Polyembryony in flowering plants—the why and how of it" and Dr. Sriramachari on "How to improve scientific presentations with properly made slides".

The 47th annual meeting was the best attended of all Annual Meetings, with 102 Fellows present at Trivandrum. The group photograph taken during the Meeting is reproduced on pages 6 and 7.

The Academy owes a debt of gratitude to the local organizers, especially Dr. M. S. Valiathan, Director of the Sree Chitra Tirunal Institute for Medical Sciences, Trivandrum, for the excellent organization of the annual meeting and to Dr. Valiathan, Mr. C. Karunakaran and Prof. N. Balakrishnan Nair for the organization of the two specialised symposia.

## Theme Journals of the Academy

---

The original purpose of the publication of a combined journal such as the Proceedings of the Academy, when it was first issued in 1934, was to provide "all scientific men with an opportunity of obtaining at least a general idea of what is being done in India in fields of knowledge other than their own speciality". The Proceedings thus originally consisted of only two series, A — Physical and Mathematical Sciences and B — Biological Sciences. With the recognition in the seventies

of the need for theme journals particularly in the emerging areas, the Proceedings were separated into six journals in 1978. These were named Proceedings — Chemical Sciences, Earth and Planetary Sciences, Mathematical Sciences, Animal Sciences, Plant Sciences and Engineering Sciences (originally started as Proceedings C). The Bulletin of Materials Science and the Journal of Biosciences were started in 1979 and the Journal of Astrophysics and Astronomy in 1980, making a total of 9 theme journals forming the Proceedings of the Academy. Pramana, a Journal of Physics published in collaboration with the Indian National Science Academy and the Indian Physics Association, was started in 1973 as a special theme journal.

In order to meet the original aim of the Proceedings and to give Fellows a general idea of the work done in India in various areas other than their own, each issue of Patrika will now contain a brief description of one theme journal, followed by a list of papers published in the journal since its inception. This issue of Patrika contains a brief account by the Editors of the Journal of Biosciences. The annexure lists all the papers published in the 12 issues of the Journal of Biosciences in 1979, 1980 and 1981.

## Journal of Biosciences

---

To meet a long-felt need for a quality journal in Life Sciences covering inter-disciplinary subjects, an additional section, Experimental Biology, was added to the Proceedings of the Indian Academy of Sciences, Series B in 1978. The enthusiastic response which this journal received from the scientific community encouraged us to start the Journal of Biosciences in 1979. The Journal is a quarterly appearing during the last weeks of March, June, September and December. Three volumes of the Journal, each volume containing approximately 500 pages, have so far appeared.

We have received during the last three years 472 papers, of which 180 have been published. The areas covered are biochemistry/biophysics, microbiology, immunology, endocrinology/reproductive biology, molecular biology, genetics/cell biology, physiology, nutrition, toxicology and neuroendocrinology. The largest number of papers is in biochemistry, reflecting a greater awareness of the Journal among biochemists and the larger number of active research workers in this area in the country. Attempts to attract research papers in other areas of biology continue and we would be glad to receive suggestions from Fellows and other scientists to achieve this objective.

An encouraging aspect has been the increase over the years of the number of papers which

can be classified as very good and the decrease in the number of papers of marginal quality. The Journal now appears in the *Current Contents—Life Sciences* section and consequently the coverage has become international. It is also included in the Science Citation index.

The refereeing policy is the same for all Academy journals. All papers received are reviewed by two independent referees, before a decision is taken on their acceptance. While the paper is accepted if both referees recommend acceptance, the paper is returned to the authors for revision, even if one of the referees offers adverse comments. The revised manuscript is then examined by one of the editors to check for general acceptability and to ensure that the referee's criticisms have been answered and then edited. If there is any doubt, the paper with the referee's comments and the author's reply are sent to the referee who made the critical comments. If there is a serious divergence of opinion among the two referees, one of the editors again examines the manuscript and acts as a third referee; in some instances depending on the referees' comments, a decision is taken either to send the paper to a third referee or to send it back to the authors, informing them that the paper is not acceptable but can be reconsidered if a satisfactory rebuttal to the referee's comments is made. When such a paper is received back from the authors, it is referred back to one of the referees or more often sent to one of the members of the Editorial Board for a final decision. If both the referees recommend rejection, the paper is automatically rejected.

Since several referees had suggested that the editors should review the papers received before sending manuscripts to referees, all papers are read by one of the editors, before they are sent to referees. Where one of the editors is of the opinion that the paper is so poor that it should be rejected outright, the manuscript is examined by another editor. A small number of about twenty papers were rejected in 1981 in this manner. If there is the slightest doubt about the quality of the papers they are processed through referees before a final decision is taken.

While some referees provide a critical evaluation of each paper and make specific recommendations, a large number merely say that the paper may be accepted. In a few instances, when both the referees had made such comments, serious errors were found by the editors in the papers while editing them. In such cases, the papers are returned to the authors and published only after satisfactory clarifications are obtained from them.

It has been our experience that almost all the papers still need extensive rewriting. Some of them have even needed recalculation of data and redrawing of figures. We have often received papers which are not even prepared in

the style of the Journal, several of them from well-recognised laboratories with good facilities for the preparation of manuscripts.

With the change-over to computer composing and photo-offset printing, the appearance of the Journal has markedly improved. But this has imposed a heavy burden on the editors, as the responsibility for proof-reading at various stages now rests with them.

We look forward to receiving high quality manuscripts from Fellows and from other scientists in the country for publication in the Journal. The quality of the Journal can reach the high standards hoped for and a wide circulation, only if our scientists decide to publish their best work in Indian journals. We on our part can assure the authors of careful scrutiny, prompt and critical refereeing and quick publication of the manuscripts submitted to the Journal of Biosciences. We have, during the past few years, received enthusiastic co-operation from the scientific community and are confident of the future success of the Journal.

## Donations to the Academy

An expansion in the activities of the Academy such as the organization of discussion meetings in important scientific areas, the preparation of special publications and the provision of essential technical and other facilities such as a library and equipment and space for the Academy's printing and publication activities, has been engaging the attention of the Council for some time. Since additional funds are required for this purpose, the Council in 1980 approved the proposals outlined by the President for obtaining donations to the Academy and the creation of a new Capital Fund. Requests made for contributions, both annual and one-time, have met with encouraging response. Contributions received from various organizations and institutes during 1981 to this new Fund are listed below.

	Rupees
Indian Petrochemicals Corporation	10,25,000
Engineers India Limited, New Delhi	10,00,000
Hindustan Lever Limited, Bombay	50,000
Indian Dyestuff Industries Limited	50,000
Larsen and Toubro Limited	50,000
Oil and Natural Gas Commission	50,000
Sarabhai Research Centre, Baroda	25,000
Hico Products Limited, Bombay	25,000
Jyoti Limited, Baroda	25,000
National Dairy Development Board	25,000
Raman Research Institute	20,000
Electronics Corporation of India	10,000
	Rs. 23,55,000

# The unpublished manuscripts of Ramanujan

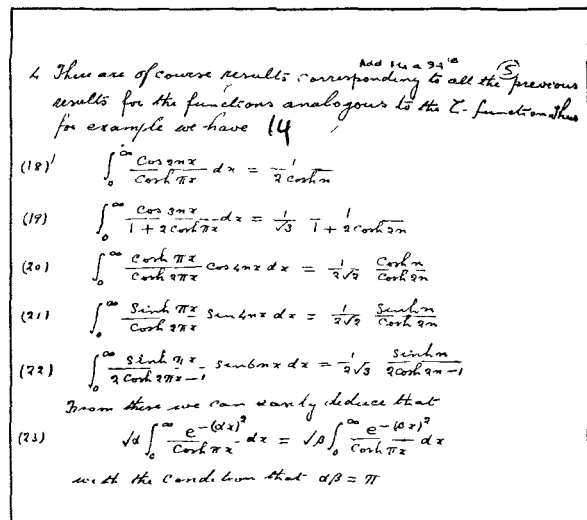
An Academy lecture given by K.G. Ramanathan

Srinivasa Ramanujan was born at Erode in Tamil Nadu on December 22, 1887. In 1914, chiefly at the instance of Professor G. H. Hardy of the University of Cambridge, he went to work in England. He fell seriously ill early in 1917 and had to spend considerable time in several nursing homes and sanatoria in England. He came back to India in February 1919 and passed away at Madras on April 26, 1920.

During his stay in England he published a large number of very important papers and collaborated with Hardy in writing some of the most brilliant papers in number theory. He also did a vast amount of mathematics during his stay at various sanatoria in England and during his last year in India, when he wrote several letters to Hardy. These letters were full of mathematics but spoke very little about his health.

Sometime in late 1918 Ramanujan began writing a long paper on the congruence properties of  $p(n)$  and  $\tau(n)$ . This paper, which seemed to be part of a series, seems to have reached Hardy sometime in 1920. After Ramanujan's tragic death in India in 1920, all the available unpublished manuscripts of his were acquired by the University of Madras on payment of a nominal sum to Ramanujan's widow. They later seemed to have reached the hands of Professor Hardy. Since Professor G. N. Watson of the University of Birmingham with Dr. B. M. Wilson had undertaken the task of editing the Notebooks of Ramanujan, the unpublished manuscripts would seem to have been deposited with Professor Watson round about 1930. However except for the paper on congruences for  $p(n)$  and  $\tau(n)$  on which Rushforth, a student of Watson's, wrote a thesis, the other manuscripts seem to have been with Watson and almost forgotten.

After Watson's death in 1965, his widow, at the instance of Professor Rankin, donated all the Ramanujan manuscripts to the Trinity College, Cambridge, of which both Ramanujan and Watson were Fellows. The Trinity College collection consists of (1) the long paper on  $p(n)$  and  $\tau(n)$ , (2) unpublished parts of some papers which appeared in British periodicals, together with edited versions of some chapters of Ramanujan's Notebooks by B. M. Wilson, (3) Letters of Ramanujan to Hardy containing interesting unpublished results and (4) a long manuscript of nearly 100 foolscap-size sheets containing results on elliptic functions,



A page from the "Lost Notebook" of Ramanujan

continued fractions etc. written, perhaps, in India during the last year before his death. There were also (5) some manuscripts donated by Watson to the Oxford Mathematical Library which contain unpublished material.

We give below some samples of the rich contents of these unpublished manuscripts.

Manuscript (1) is being edited by us. Manuscripts (1) and (5) show that Ramanujan had a complete proof of the partition congruence

$$p(n) \equiv 0 \pmod{5^a}, a \geq 1$$

if  $24n \equiv 1 \pmod{5^a}$ ,  $n > 0$ . The proof later given by Watson is substantially Ramanujan's. Manuscripts (3) and (4) are very interesting. Manuscript (3) seems to have been written after the great paper of Hardy and Ramanujan on asymptotic results in combinatorial analysis. In these Ramanujan considers "Euler products" of the type

$$f(s) = \left(1 - \frac{1}{3^s}\right) \left(1 - \frac{1}{(1+2i)^s}\right) \left(1 - \frac{1}{(1-2i)^s}\right) \left(1 - \frac{1}{7^s}\right) \left(1 - \frac{1}{11^s}\right)$$

where  $s > 0$  and  $s$  is an even integer. Ramanujan explicitly writes down the values of the infinite product  $f(s)$  for  $s=2, 4, 6 \dots$ . For example,

$$\lambda^4 f(2) = 4, \lambda^{12} f(6) = 40, \lambda^{44} f(22) = \frac{1272960000}{1607}$$

$$\text{where } \lambda = \frac{\Gamma(1/4)}{2 \cdot 4 \sqrt{\pi}}$$

This result is extremely beautiful.

The function  $f(s)$  is what is now-a-days called a Hecke Zeta function with 'groschencharaktere'. Curiously enough, Hecke was investigating in Germany such series as  $f(s)$  precisely in 1918. Such series as  $f(s)$  have now-a-days found applications in elliptic curves and  $p$ -adic  $L$ -functions.

Manuscript (4) is a beautiful collection of 'formulae' regarding continued fractions etc. It would be difficult to analyse its rich contents. We give only two samples of results on

continued fractions; the first one concerns Ramanujan's famous continued fraction:

a) If  $x = e^{(-\pi\sqrt{2/5})}$  and  $\frac{1}{t} - t = 1 + \epsilon\sqrt{5}$  where

$$\epsilon^2(1+\epsilon) = \frac{\sqrt{5}-1}{2}(1-\epsilon), \text{ then}$$

$$\frac{x}{1+} \frac{x^5}{1+} \frac{x^{10}}{1+} \frac{x^{15}}{1+} = t$$

$$\text{b) } \frac{\sqrt{3}x}{1-} \frac{1}{1+e^{x-}} \frac{1}{1+e^{2x-}} \frac{1}{1+e^{3x-}} \frac{1}{1+e^{4x-}} = \frac{\Gamma(1/3)}{\Gamma(2/3)} e^{g(x)}$$

where  $g(x) = a_2x^2 + a_4x^4 + a_6x^6 + \dots$

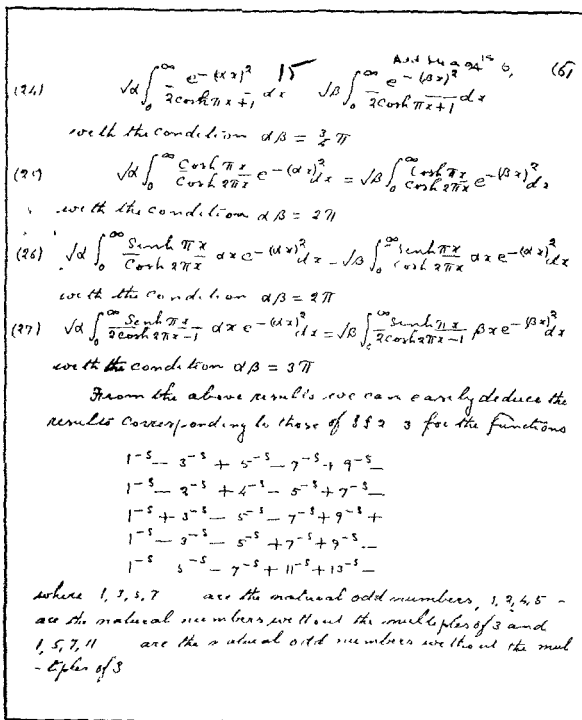
$$\text{and } \frac{a_n}{\Gamma(n)} = \frac{4\Gamma(n)}{(2\pi/\sqrt{3})^2n+1}$$

$$(1-2^{-n-1} + 4^{-n-1} - 6^{-n-1} + \dots)$$

For example

$$a_2 = \frac{1}{108}, a_4 = \frac{1}{4320}, a_6 = \frac{1}{38880}$$

Manuscript (5) contains some very beautiful results on what is now called Hecke theory, concerning the relationship between modular forms and Dirichlet series, a subject in which Ramanujan was a pioneer. Ramanujan gives explicit Euler products for certain modular



A page from the "Lost Notebook" of Ramanujan

forms even belonging to subgroups of the modular group. It shows how far ahead of his times he was (in 1918), if it is realised that Hecke theory was started only in 1937 and is now-a-days being feverishly studied by many mathematicians.

It would be a great service to mathematics, if these manuscripts are analysed and

Ramanujan's results are made more easily accessible. Copies of these manuscripts can be obtained from Trinity College. Libraries in Indian universities should obtain them so that young mathematicians in the universities can study them carefully and perhaps even edit them properly.

Thanks are due to the Master and Fellows Trinity College, Cambridge, England, for permission to print two pages from Ramanujan's unpublished manuscript

## Fellows elected in 1981

**P. R. Adiga**, Department of Biochemistry, Indian Institute of Science, Bangalore, for his work on the hormonal induction of vitamin carrier proteins and their function in transporting the vitamin from the mother to the foetus.

**R. V. Bhonsle**, Physical Research Laboratory, Ahmedabad, for his contributions to ionospheric physics, solar-terrestrial physics and solar radio-astronomy.

**M. N. Bose**, Director, Birbal Sahni Institute of Palaeobotany, Lucknow, for his contributions in the field of mesozoic palaeobotany of India and the palaeozoic and mesozoic palaeobotany of Zaire.

**V. L. Chopra**, Division of Genetics, Indian Agricultural Research Institute, New Delhi, for his work in the field of plant and microbial genetics.

**B. A. Dasannacharya**, Nuclear Physics Division, Bhabha Atomic Research Centre, Bombay, for his contributions in the area of dynamics of liquids and solids, through neutron scattering.

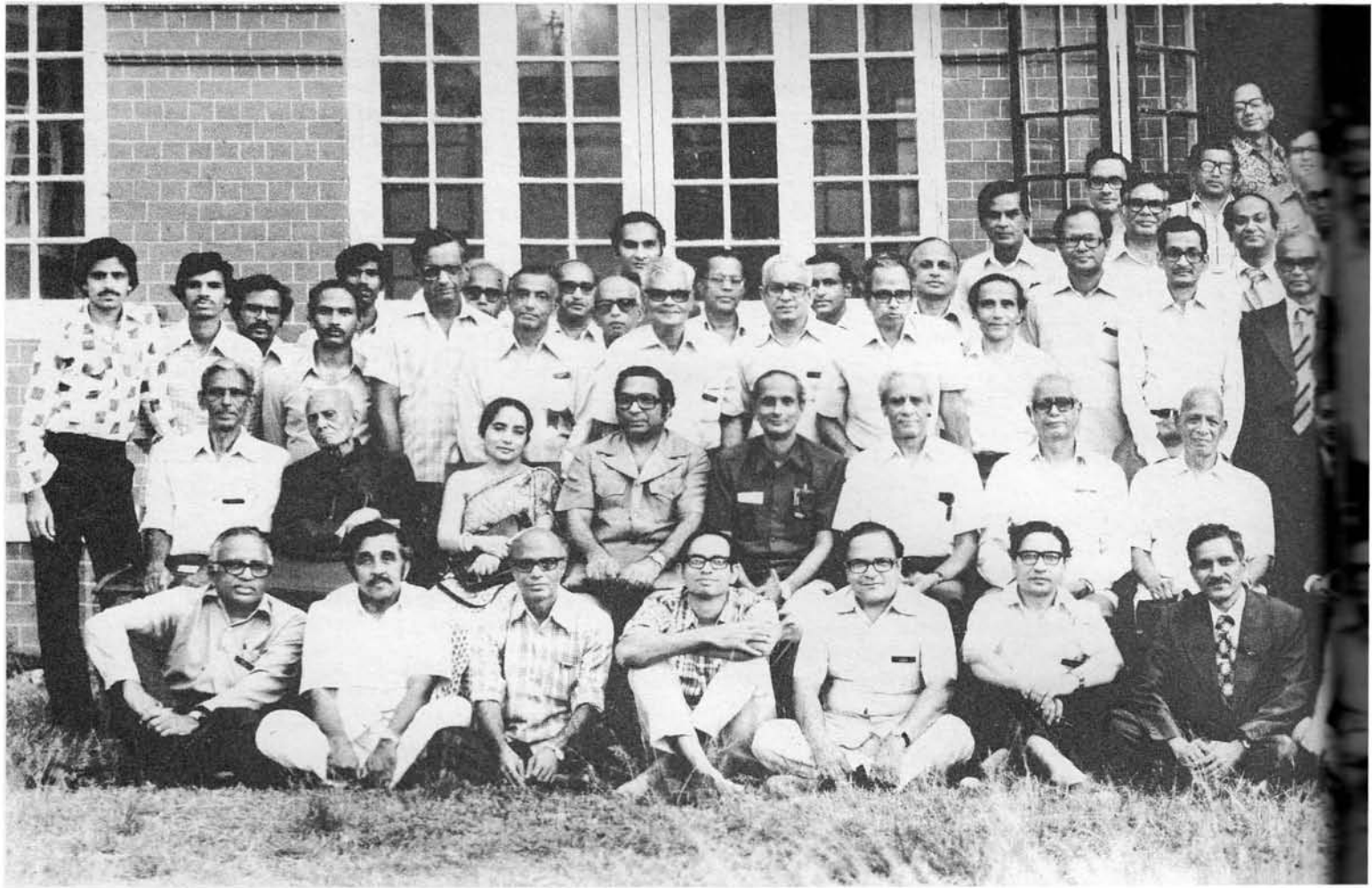
**J. David**, CIBA-GEIGY Research Centre, Bombay, for her contributions in the field of neuropharmacology.

**A. Ghosh**, Department of Zoology, University of Calcutta, Calcutta, for his contributions on the comparative endocrinology of birds, with particular reference to adrenals.

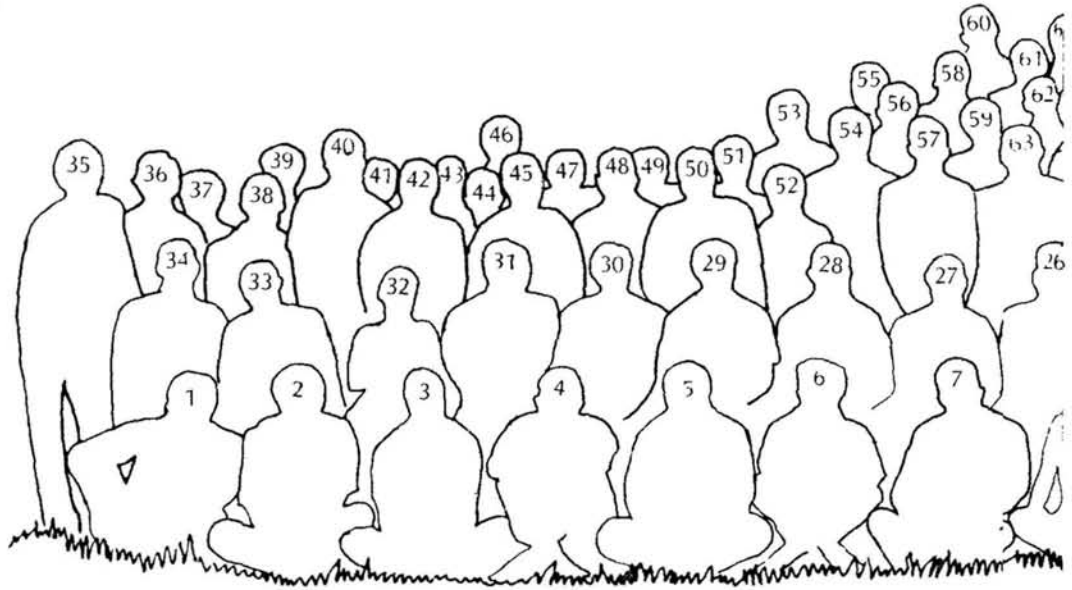
**R. J. Hans-Gill**, Mathematics Department, Panjab University, Chandigarh, for her work on non-homogeneous indefinite quadratic forms.

**R. Krishnan**, Metallurgy Division, Bhabha Atomic Research Centre, Bombay, for his contributions in the field of physical metallurgy of nuclear metals, rare metals and their alloys, with special reference to phase transformations in zirconium, titanium and their alloys.

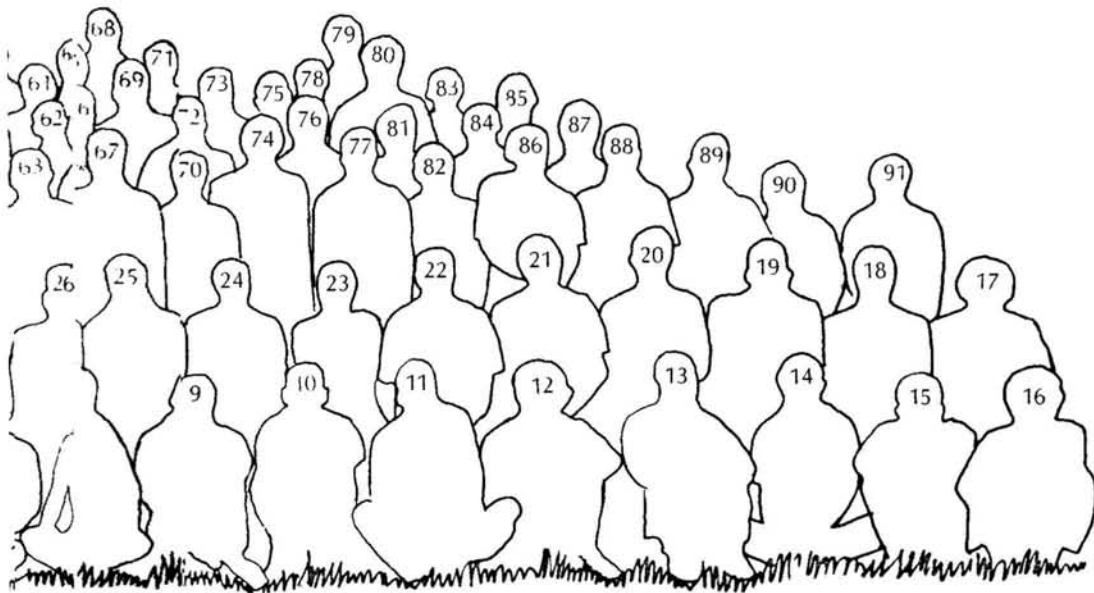
**C. L. Mehta**, Department of Physics, Indian Institute of Technology, New Delhi, for his



## Participants at the 47th Annual Meeting of the Academy



- |                   |                   |                     |                        |                   |                      |
|-------------------|-------------------|---------------------|------------------------|-------------------|----------------------|
| 1 S Sriramachari  | 9 H Y Mohan Ram   | 17 V Radhakrishnan  | 25 D K Banerjee        | 33 S Paramasivan  | 41 K Venkatesan      |
| 2 R M Varma       | 10 E S Raja Gopal | 18 M S Valiathan    | 26 S Varadarajan       | 34 C R Narayanan  | 42 C V Subramanian   |
| 3 K S Viswanathan | 11 G P Talwar     | 19 D Lal            | 27 K R Ramanathan      | 35 G Raju         | 43 Cecil J Saldanha  |
| 4 Madhav Gadgil   | 12 V K Gaur       | 20 P C Vaidya       | 28 S Jones             | 36 U L Bhat       | 44 T V Venkatraman   |
| 5 S K Trehan      | 13 S K Joshi      | 21 T R Govindachari | 29 S Dhawan            | 37 G Chandramohan | 45 P K Bhattacharyya |
| 6 L K Pandit      | 14 G Venkataraman | 22 R S Krishnan     | 30 S Ramaseshan        | 38 G Madhavan     | 46 G Mehta           |
| 7 R G Rastogi     | 15 John Barnabas  | 23 Anna Mani        | 31 N Balakrishnan Nair | 39 N Sheriff      | 47 M V George        |
| 8 N K Notani      | 16 R Narasimha    | 24 P R Pisharoty    | 32 Archana Sharma      | 40 N R Moudgal    | 48 N Appaji Rao      |



- |                   |                     |                       |                      |                     |                     |
|-------------------|---------------------|-----------------------|----------------------|---------------------|---------------------|
| 49 K Nagarajan    | 57 A K Sharma       | 65 C V Vishveshwara   | 73 P Kumaraswamy     | 81 S Ranganathan    | 89 L K Ramachandran |
| 50 B Venkataraman | 58 K S Valdiya      | 66 Virendra Singh     | 74 K G Nair          | 82 B C Subba Rao    | 90 C N R Rao        |
| 51 P K Iyengar    | 59 K P Sinha        | 67 J C Ahluwalia      | 75 T Pradhan         | 83 K P Abraham      | 91 P T Narasimhan   |
| 52 P K Maitra     | 60 P M Bhargava     | 68 D R Sikka          | 76 K K G Menon       | 84 S P Pandya       |                     |
| 53 M S Kanungo    | 61 V M Meher-Homji  | 69 D V S Jain         | 77 T Ramakrishnan    | 85 A N Mitra        |                     |
| 54 S Ranganathan  | 62 R Ananthkrishnan | 70 P T Manoharan      | 78 P N Ganapati      | 86 B S Joshi        |                     |
| 55 D Chakravorty  | 63 G K Manna        | 71 T N Ananthkrishnan | 79 D Balasubramanian | 87 R Srinivasan     |                     |
| 56 R P Bambah     | 64 B S Ramakrishna  | 72 P M Mathews        | 80 A Chakravorty     | 88 C S Vaidyanathan |                     |

contributions in the field of quantum optics.

**S. Mitra**, Tata Institute of Fundamental Research, Bombay, for his work in the magneto-chemistry of metalloporphyrins and phthalocyanins and the use of the magnetic anisotropy technique in chemistry.

**R. Parthasarathy**, School of Mathematics, Tata Institute of Fundamental Research, Bombay, for his contributions in the theory of representations of semi-simple groups.

**S. Rajappa**, CIBA-GEIGY Research Centre, Bombay, for his work in heterocyclic and medicinal chemistry and natural products chemistry.

**M. Nageswara Rao**, Physical Research Laboratory, Ahmedabad, for his studies on the formative and evolutionary stages of the solar system, based on clues provided by noble gas components in meteorites and in lunar materials.

**A. K. Raychaudhuri**, Department of Physics, Presidency College, Calcutta, for his contributions in general relativity and cosmology.

## First Annual Meeting of the Academy

---

Presidential Address by Sir C V Raman  
18 December, 1935, Bombay

The Indian Academy of Sciences was registered at Bangalore on the 24th of April 1934, and was formally inaugurated at a public meeting held at the Indian Institute of Science on the 31st July 1934, by Amin-ul-Mulk Sir Mirza M. Ismail, Dewan of Mysore. In the ordinary course of events, the Annual Meeting should have been held in July last. But for various reasons it was felt desirable to postpone it till the cold weather so that it would be possible for the Meeting to be conveniently held at some centre outside Bangalore where our Fellows could assemble. There is a peculiar appropriateness in that the Academy which was inaugurated at Bangalore should hold its first annual meeting at Bombay. It is known to all of you that if Bangalore to-day occupies a significant position in the world of science, it is to no small extent due to the far-sighted generosity of a great and enterprising citizen of Bombay, the late Mr. Jamsetjee Nusserwanjee Tata. At a time when the Universities of India were few in number and were purely examining bodies, Mr. Tata conceived the idea of creating an Imperial Teaching and Research University for the whole of India which would have aims and ideals approximating to those of such ancient

foundation of learning as Oxford and Cambridge. In Mr. Harris's life of Tata, we have an authoritative account of the early history of Mr. Tata's scheme. We read that the two reasons which finally lead to Bangalore being the recipient of his princely benefaction to the cause of learning were firstly, the agreeable climate of Bangalore which he regarded as particularly suitable for a centre of advanced teaching and research, and secondly, the generous offer of the Maharaja of Mysore of half a square mile of land, five lakhs of rupees as a capital grant and an annual subsidy of one lakh of rupees towards the establishment of the Institute at Bangalore. Forty years ago, in this way was forged an intellectual link between Bangalore and Bombay which is now indissoluble and which has had and will, I believe, continue to have a far-reaching influence on the progress of science in India.

The idea of establishing an All India Academy of Sciences was first clearly put forth in an editorial article in the Journal "Current Science" published from Bangalore in May 1933. After a period of discussion and consultation with scientific men all over India, the decision to inaugurate the Academy with its provisional headquarters at Bangalore was finally taken in April 1934. I shall, in the course of this address, refer more in detail to the progress which has since been achieved by the Academy and which has amply justified that decision. But even at this early stage, it is appropriate to mention the large part which our friends in Bombay have played in achieving that progress. At the present time, no fewer than thirty-eight of our Fellows are resident in the Bombay Presidency. The election of such a large number to the distinction of the fellowship has been a natural consequence of the remarkable development in recent years of scientific research activities in the Bombay Presidency. I shall have more to say about this later in my address, and it will be sufficient to remark now that the published Proceedings of the Academy bear ample witness to the scientific energy of Dr. T. S. Wheeler and his colleagues at the Royal Institute of Science and to the deep interest taken in the progress of the Academy by the officers of the Meteorological Department of Poona, and the schools of scientific research which have developed at Poona and other parts of the Bombay Presidency. For all these reasons, it is very appropriate that we meet to-day at Bombay. I hope that this gathering will be the first of a series to be held year after year at various centres of scientific research in India. It is desirable that the annual meetings of the Academy should serve to bring together its Fellows from various parts of India at least once a year and thus to strengthen the feeling of scientific comradeship that unites them. Science like other products of human activity, stands to gain immensely from the personal

contacts of leading workers. It is earnestly to be hoped that our present meeting will furnish opportunities for such contacts and thus serve to promote the cause of the advancement of science in our great country.

Before I pass to review the work and progress of the Academy since its foundation, I must express the gratitude of the Council to Your Excellency in having consented to grace the occasion to-day and encourage us by your presence here. I must also express the gratitude of the Council to the Fellows of the Academy in Bombay headed by Dr. Wheeler, our Vice-President, and to the Reception Committee presided over by you Mr. Vice-Chancellor, who have been at immense pains to organise this our first Annual Meeting on a scale worthy of the occasion.

When the Academy was inaugurated, it commenced its activities with 65 Fellows. The Council obtained permission from the General Body of Fellows to elect fresh Fellows up to a maximum of 200 and also Honorary Fellows up to a maximum of 30 from amongst the most distinguished scientists of the world. This permission has been acted upon and we have to-day 173 Fellows in India and 30 Honorary Fellows. Our Honorary Fellows include some of the most active and influential scientific men in Europe and America, whose sympathy and co-operation will, I am sure, be of the greatest benefit to the Academy.

The British list of Honorary Fellows includes Lord Rutherford, Sir William Bragg, Sir F. Gowland Hopkins, Sir John Russel, Prof. O. W. Richardson, Prof. Robert Robinson, Prof. A. V. Hill, Prof. P. A. M. Dirac, Prof. A. C. Seward and Prof. G. H. Hardy. The American list includes Prof. R. A. Millikan, Prof. A. H. Compton, Prof. N. L. Bowen, Prof. Harvey Cushing, Prof. D. D. Van Slyke and Prof. G. N. Lewis. The German list includes Prof. A. Sömerfeld, Prof. W. Heisenberg, Prof. Hans Fisher, Prof. H. Wieland and Prof. F. Paschen. From France we have Prof. A. Cotton and Madame Irene Curie-Joliot. From Sweden we have Prof. K. M. G. Siegbahn and Prof. Th. Svedberg. From Denmark and Holland we have respectively Prof. Niels Bohr and Prof. P. Zeeman. From Italy we have Prof. E. Fermi and Prof. S. Belfanti and from Russia Prof. I. P. Pavlov.

It is noteworthy that the list of 30 includes one woman scientist, Madame Irene Curie-Joliot. It must have given our Fellows great pleasure to read the recent announcement of the award of the Nobel Prize in Chemistry to this lady and her husband jointly.

Our list of Fellows in India is representative of every important branch of science. Physics and Meteorology are represented by 34 Fellows, Mathematics and Astronomy by 18, Chemistry by 40, Zoology and Anthropology by 17, Agriculture, Forestry and Botany by 35,

Medicine by 15 and Geology by 8. We have only 6 Engineering Fellows but they include some very distinguished names including some very familiar in Bombay, viz., Sir M. Visvesvaraya and Dewan Bahadur N. N. Iyengar. Our list of Fellows is also representative of all parts of India. Bombay heads the list with 38 Fellows, closely followed by the Madras Presidency by 35 and Mysore State by 33. Other provinces are also well represented. We have 21 Fellows in the United Provinces; 13 from the Punjab, 11 from Bengal, 8 from the Central Provinces; Bihar and Orissa, Hyderabad, Travancore and Burma are also represented in our list.

The scientific activities of the Academy may be considered under the three heads:—

Meetings for discussion of research papers.  
Symposia on special subjects.  
Publication of the Proceedings.

I shall consider the last first because in a country like India separated by great distances, by far the most important service that can be rendered to science by the Academy is the regular issue of a scientific journal of high standing in which scientific papers of its Fellows can find prompt publication. I think it will be generally agreed that the Academy has achieved very gratifying success in this direction. Ever since the formal inauguration of the Academy, the Proceedings have appeared month after month with unbroken regularity on the due date. A very great amount of material has reached the Academy from many quarters. The examination of this material and the selection of suitable papers has naturally been a formidable task. That it has so far been accomplished without any signs of breakdown is largely due to the co-operation which the Academy has been so fortunate to secure. A special word of praise is due to the Superintendent of the Bangalore Press who has maintained a high standard of printing both as regards accuracy and technical finish and has enabled the Journal to appear with unflinching punctuality. To the numerous Fellows who have acted as referees for papers often at great cost of time and trouble, the Council are deeply indebted. A heavy burden has also fallen on the Secretaries and on the Manager of the office which they have discharged with conspicuous devotion and success. I believe our Fellows have by this time learnt to look forward to the appearance of the Proceedings on the first of every month and to peruse its contents with eagerness and satisfaction. The volume of published material has grown so rapidly that commencing from July 1935 it was found necessary to separate the Proceedings into two parts, A, Physical and Mathematical Series, and B, Biological Series respectively. The two numbers of the Journal appearing in each month have each contained roughly 100 pages of printed matter together with a very substantial number of illustrated plates. In

view of the volume of published matter, the Council have decided in future to issue two volumes instead of one per annum for each of the two sections of the Proceedings.

I will next refer to the Symposia organised by the Academy. There was one in August 1934 on Molecular Spectra which was attended by 50 Fellows from all over India. The shorter papers submitted for this symposium have all been published in the Proceedings. A very valuable and detailed report by Prof. R. Samuel of the Aligarh University has already been printed and circulated to leading specialists on the subject. A detailed report by Mr. N. S. Nagendra Nath on the subject of Dynamics of Molecular Vibrations is also to be printed and issued shortly together with Dr. Samuel's report as a special publication. In October 1935, a symposium on Disease Resistance in Plants was held at Coimbatore. This was largely attended and was a successful gathering, mainly as the result of the efforts of our Coimbatore friends who worked hard to organise the function. At the present meeting in Bombay, a symposium on Colloid Science has also been arranged.

An important part of the regular work of the Academy is the holding of scientific meetings at which papers presented to it are read and discussed. While such meetings are usually held at Bangalore, the Council have also encouraged the idea of meetings being held at other centres for the reading of papers on the occasion of special gatherings such as Symposia and the annual meetings.

A matter of great concern to the Academy is the question of providing money for these activities, especially for the cost of publication of the Proceedings which is very heavy. That it has been possible at all to carry on the work of the Academy without a complete financial breakdown is largely due to the generosity of the external authorities who have come forward to help us. Chief amongst these, I should mention the Government of His Highness the Maharaja of Mysore who have sanctioned a grant of Rs. 3,000 per annum for a period of five years. His Highness the Ruler of Bhopal has been pleased to sanction an annual recurring grant of Rs. 500, and the Government of His Highness the Maharaja of Cochin have also sanctioned an annual recurring grant of Rs. 250. The Imperial Council of Agricultural Research have sanctioned a grant of Rs. 500 per annum for 3 years. The latest benefaction to the Academy is from the Government of His Highness the Maharaja of Travancore of Rs. 1,000 for this year. The Council of the Indian Institute of Science sanctioned a grant of Rs. 2,000 for the current year. The University of Nagpur have given us Rs. 100 and one of our Fellows, Mr. T. W. Barnard, has made a special contribution of Rs. 50.

It must be obvious that the publication of a

scientific journal rather of two scientific journals appearing month after month, is a very expensive proposition. Unless we have an assured income of at least Rs. 25,000 per annum, it will not be possible to carry on this work in a satisfactory manner. Only about one-third of this sum can be found from the regular subscription of our Fellows. In these days, the building up of a subscription list for a new scientific periodical is a slow and difficult business. It is here, however, that great assistance can be rendered to us by the educated public in India. If every college, every scientific institution and every department of the local Governments subscribed, as it should, for one copy of the Proceedings of the Academy, our financial problem would be greatly eased. I earnestly appeal to all the other Governments and Universities in India to come to our aid. Even a modest annual contribution from each of them would aggregate to a total sum which would enable the Academy to go forward in its great task without fear of financial breakdown.

I think it would be not inopportune to consider at this stage the nature of the services which the Academy can render to science in India. We live in an era of scientific progress and it is a very gratifying feature that India is beginning to pull its weight in this respect. Modern scientific progress shows side by side two apparently contradictory features. On the one hand, we have an enormous accumulation of raw scientific material, the significance of which, in many cases, is hardly apparent except to specialists in very limited fields of investigation. On the other hand, we have a great process of scientific synthesis going on tending towards the simplification and unification of the fundamental principles of natural knowledge in all its ramifications. It should never be overlooked that science is in reality a great impartible estate and that the boundaries drawn across it to divide it into restricted fields are in essence artificial. I think the history of science has shown over and over again that it is only by boldly cutting across these artificial boundaries that progress of real significance can be achieved. It is precisely this feature that lends importance to the activities of such an Academy as ours where men of science of widely different scientific interests come together in a common endeavour and seek to understand each other's points of view. While specialisation is necessary, an excessively narrow outlook defeats the primary purpose of science which is to advance our essential comprehension of nature as a whole. It is, therefore, one of the most important functions of our Academy to promote co-operation between men who profess knowledge of different branches of science. This is effected in various ways. In the Proceedings of the Academy the Fellows and indeed all scientific men have an opportunity of obtaining at least a general idea of what is

## Volume 1, Number 1, March 1979

### Biochemistry/Biophysics

Interaction of amino acids with glycyl glycine transport in the mammalian intestine; V. Ganapathy, M. D. Hellier and A. N. Radhakrishnan. Studies on glutamine synthetase. Purification of the enzyme from mung bean (*Phaseolus aureus*) seedlings and modulation of the enzyme-antibody reaction by the substrates; S. Seethalakshmi and N. Appaji Rao. Changes in carbohydrates and lipids during embryonic development of *Antheraea mylitta* (Lepidoptera); Radha Pant, Suman Kumar and Shiva Dhar Singh. Metal binding to pyridoxal derivatives. An NMR study of the interaction of Eu(III) with pyridoxal phosphate and pyridoxamine phosphate, B. N. Narasinga Rao, C. Ramakrishnan and P. Balaram. A rapid and gentle method for the salt extraction of chromatin core histones H2A, H2B, H3 and H4 from rat liver nuclei, M. Jamaluddin, Mohanan Philip and H. Sharat Chandra. Studies on plant gums. Role of calcium in polysaccharide-protein interaction in the Neem (*Azadirachta indica*) gum; B. Ramakrishna Nayak, B. C. Shenoy and T. N. Pattabiraman. Distribution of acid and alkaline deoxyribonucleases in white and grey matter regions of growing and aging chick brain; K. Subba Rao and K. P. Shrivastava

### Molecular Biology/Cell Biology/Radiobiology

Effect of phospholipase-D on rat kidney mitochondria; S. N. A. Zaidi, A. C. Shipstone and N. K. Garg. Alteration of the structure of the *Escherichia coli* ribosomes on treatment with Fab fragment of immunoglobulin raised against the ribosomes; M. Das and D. P. Burma. Inhibitory effect of penicillin on spore-specific functions in *Bacillus polymyxa* 2459; Anil K. Goel and Kunthala Jayaraman. Removal of radioactive strontium from the rat by feeding stable strontium; S. G. Kshirsagar

## Volume 1, Number 2, June 1979

### Biochemistry

Diamine oxidase of *Lathyrus sativus* seedlings: Purification and properties; M. R. Suresh and P. R. Adiga. Interaction of allylisothiocyanate with bovine serum albumin; N. V. Kishore Kumar Murthy and M. S. Narasinga Rao. Uterine RNA synthesis during protein deficiency and steroid maintained pregnancy in rats; R. K. Singh and S. K. Roy. The effect of copper on histidine biosynthesis in *Neurospora crassa*; C. Subramanyam and C. Venkateswerlu. Effect of cholesterol on multiplication, lipid metabolism and lysosomal enzymes of *Hartmannella culbertsoni*; A. A. Lal and N. K. Garg. Alpha-tocopheryl acetate hydrolase in chicken liver: Characterisation and properties; V. N. R. Kartha, N. Jayanthi Bai, Thomas George and S. Krishnamurthy.

### Molecular Biology/Cell Biology

Effects of ethidium bromide and berberine on protein synthesis; Zileedar Ali and D. P. Burma. Species variation in the localisation of esterases in the cerebellar cortex of mouse and bat; P. P. Sood, M. H. Bohra and Hafiza Banu.

### Endocrinology/Reproductive Biology

Light microscopic features of the rete testis, the vas efferens, the epididymis and the vas deferens in the adult rhesus monkey; Asha Prakash, M. R. N. Prasad and T. C. Anand Kumar. The role of fat body in testicular spermatogenesis and steroidogenesis in *Rana hexadactyla*; Lesson, S. Kasinathan, A. Balasubramanian, S. Ramakrishnan and S. L. Basu. Reduction in population growth under different contraceptive policies; S. N. Singh and K. N. S. Yadava

### Nutrition

Toxic and antigrowth effects of raw and processed field bean (*Dolichos lablab*) on albino rats; S. Ramamani, N. Subramanian and H. A. B. Parpia.

### Microbiology

Microbial transformation of isonicotinic acid hydrazide and isonicotinic acid by *Sarcina* sp.; R. C. Gupta and O. P. Shukla.

## Volume 1, Number 3, September 1979

### Immunology/Immunochemistry

Preparation of standard amoeba-antigen from axenic *Entamoeba histolytica* and its use in the serodiagnosis and seroepidemiology of amoebiasis; S. R. Das, S. A. Kidwai and A. K. Gupta

### Microbiology

Synthesis of L-asparaginase by *Serratia marcescens* (Nima); C. P. Sukumaran, D. V. Singh and P. R. Mahadevan. Effectiveness of beta exotoxin of *Bacillus thuringiensis* var. *thuringiensis* on the ability of *Meloidogyne* sp. from brinjal (*Solanum melongena* L.) to survive; G. P. Rai and R. S. Rana. Beryllium toxicity in *Neurospora crassa*; A. Naidu, J. Nirmala and K. Sivarama Sastry.

### Biochemistry

Delta-9-tetrahydrocannabinol and human spermatozoa; Indra Chakravarty, Girish Shah, Anil R. Sheth and Jagat J. Ghosh. Characterisation of lactic dehydrogenase from *Lactobacillus casei*; Vanita A. Padgaonkar, S. F. D'Souza and G. B. Nadkarni.

### Molecular Biology/Cell Biology

Characterisation of rinderpest virus RNA and the action of actinomycin D on its replication; K. Prakash, A. Antony and T. Ramakrishnan. Isolation of sheep anterior pituitary messenger RNA and its translation in heterologous cell-free system; M. S. K. Prasad and P. R. Adiga. Effect of phytohormones on nuclear RNA synthesis in germinating seeds of *Trigonella foenum-graecum* and its callus; P. K. Asha, M. S. Shaila, C. S. Vaidyanathan and T. Ramakrishnan. RNA synthesis in maturing avian erythrocyte nuclei; S. Ganguli and B. B. Biswas. Studies with RPI deletion plasmids, incompatibility properties, plasmid curing and the spontaneous loss of resistance; Habibul Haque

## Volume 1, Number 4, December 1979

### Biochemistry

Stimulation of valyl- and isoleucyl-tRNA synthetase reactions by polyamines; *V. Natarajan and K. P. Gopinathan* Studies on the inhibition of fatty acid synthesis in the chicken liver by adenine compounds *in vitro*; *N. R. Bhat, G. R. Kulkarni, A. Madhava Rao and S. K. Murthy* Evidence for the possible involvement of the superoxide radicals in the photodegradation of bilirubin; *Ravi Kaul, Hari K. Kaul, Prakash C. Bajpai and C. R. Krishna Murti* Studies on hemolysis of human erythrocytes by linoleic acid; *Thomas George, N. Jayanthi Bai and S. Krishna Murthy* Studies on plant gums: Proteases in neem (*Azadirachta indica*) gum; *B. Ramakrishna Nayak, N. Mallikarjuna Rao and T. N. Pattabiraman*. Isolation and characterisation of cathepsin-B from bovine pancreas; *Renu Bansal and J. R. Kidwai* Comparative studies on glucoamylases from three fungal sources; *P. Manjunath and M. R. Raghavendra Rao* Adaptation to salinity by fish: Macromolecular changes in mitochondria and microsomes of the gill; *S. Meenakshi, C. Rajamanickam and J. Jayaraman* Cobalt transport in a cobalt-resistant strain of *Neurospora crassa*; *G. Venkateswerlu and K. Sivarama Sastry* The effect of exposure to low temperature on the metabolism of carbohydrates, lipids and protein in the larvae of *Philosamia ricini*; *Radha Pant and Dwijendra K. Gupta*

### Microbiology

Extracellular polypeptides of *Anabaena* L-31: Evidence for their role in regulation of heterocyst formation; *K. A. V. David and Joseph Thomas*

### Endocrinology/Reproductive Biology

*In vitro* responsiveness of hamster corpora lutea undergoing luteolysis to luteinizing hormone; *Venkat Ramaiah Mukku and N. R. Moudgal*

## Volume 2, Number 1, March 1980

### Biochemistry

High resolution nuclear magnetic resonance studies of hen's egg yolk plasma lipoproteins; *K. R. K. Easwaran, K. S. Raju and S. Mahadevan* Regulation of rat liver NADP<sup>+</sup>-isocitrate dehydrogenase during aging; *R. N. Singh Yadav and S. N. Singh* Interactions of progesterone with D-amino acid oxidase. Different effects on apo- and holo-enzyme; *Faizy Ahmed and Mahatab S. Bamji* Lectin from rice; *P. Indravathamma and H. S. Seshadri* Impact of malathion on acetylcholinesterase in the tissues of the fish *Tilapia mossambica* (Peters): A time course study; *I. Kabeer Ahammad Sahib, D. Sailatha and K. V. Ramana Rao* Studies on the oxidation of tannins by *Aspergillus flavus*; *M. Mallika and S. C. Dhar*

### Molecular Biology

Preliminary studies on the toxicity and mutagenicity of 1-amino-2-naphthol-4-sulphonic acid in *Drosophila melanogaster*; *M. V. Gayathri and N. B. Krishnamurthy* Immunoprecipitation of 70S, 50S and 30S ribosomes of *Escherichia coli*; *D. K. Lahiri and D. P. Burma*

### Microbiology

Chromatic adaptation and photoreversal in blue-green alga *Calothrix clavata* West; *A. S. Ahluwalia, R. K. Rai and H. D. Kumar*

### Endocrinology

The role of follitropin and lutropin on the ovarian function in rats; *A. Jagannadha Rao and Choh Hao Li*

Modulation of testicular lutropin receptors in the developing male rat; *M. S. K. Prasad and P. R. Adiga*

## Volume 2, Number 2, June 1980

### Biochemistry/Biophysics

Adaptation to salinity by fish: Alterations in energy transducing status of muscle mitochondria; *Indu Bashyam, Suresh Narayan and J. Jayaraman* The role of free amino groups of peptides and proteins in the Folin-Lowry and biuret methods; *B. R. Srinivasa and L. K. Ramachandran* On the regulation of L-hydroxyproline dissimilatory pathway in *Pseudomonas aeruginosa* PAO; *T. Herbert Manoharan* Synthesis *in vitro* of cholesterol by mitochondria in the shrimp *Penaeus aztecus* (Ives); *R. V. Krishnamoorthy, G. J. Lakshmi and A. Venkataramiah* *In vitro* hemolytic activity of *Plasmodium berghei* on red blood cells; *Sudhir Gupta and K. C. Saxena* Effect of sciaticotomy and induced ammonia stress on Mg<sup>2+</sup>-adenosine triphosphatase activity in frog tissues; *C. Sreeramulu Chetty, R. Chandramohan Naidu and K. S. Swami* Effects of dynamic impacts on human bones; *Meera Ramrakhiani, D. Pal and T. S. Murthy*

### Molecular Biology

Proteins of the brain and body wall in larvae of *Drosophila melanogaster*; *Sheela U. Donde and Obaid Siddiqi*

### Endocrinology

Effect of copper intrauterine contraceptive device on carbohydrate metabolism in rat endometrium; *Rakesh K. Johri and P. R. Dasgupta*

## Volume 2, Number 3, September 1980

### Biochemistry/Biophysics

Immunochemical relationship between glucoamylases I and II of *Aspergillus niger*; *P. Manjunath and M. R. Raghavendra Rao* A comparative study of 5'-nucleotidase and alkaline phosphatase in human placenta during development; *A. S. Chakraborti, P. Roychowdhury, A. Das and M. Mukherjee* Hepatic and extrahepatic glutathione-S-transferase activity in wild pigeons (*Columba livia*); *Ashwini Kumar, M. M. Husain, Hasan Mukhtar and C. R. Krishna Murti* Galactosyltransferase from buffalo milk: Further characterization; *P. B. Mahajan, G. W. Rembhotkar and R. B. Mawal* Hexokinase isoenzymes in diabetes; *F. Ali, A. S. N. Murthy and N. Z. Baquer* Comparison of the conformation and stability of the native dimeric, monomeric, tetrameric and the desensitized forms of the nucleotide pyrophosphatase from mung bean (*Phaseolus aureus*) seedlings; *A. R. Venugopala Reddy, C. V. Balakrishnan, J. Sobhanaditya, S. D. Ravindranath, V. S. Ananthanarayanan and N. Appaji Rao* Spectroscopic studies on the denaturation of papain solubilized and Triton X-100-solubilized glucoamylase from rabbit small intestine; *S. Sivakami and D. Chatterji*

### Microbiology

Lipid requirements for axenic cultivation of *Entamoeba histolytica*; *N. K. Garg and S. R. Das*

### Molecular Biology

Age-related qualitative and quantitative changes in tRNA population of rat skeletal muscle; *Manjula and R. M. Sundari* Bacteriophage burst size during multiple infections; *Raghavendra Gadagkar and K. P. Gopinathan*

## Reproductive Biology

Ultrastructural studies on the epididymal spermatozoa in the rhesus monkey; *Asha Prakash, M. R. N. Prasad and T. C. Anand Kumar.*

## Volume 2, Number 4, December 1980

### Biochemistry

Arginase from rat fibrosarcoma. Purification and properties, *R. Gopalakrishna and B. Nagarajan.* Arginase from rat fibrosarcoma. Its possible role in proline, glutamate and polyamine metabolism; *R. Gopalakrishna and B. Nagarajan.* A specific effect of copper on methylene blue sensitized photodegradation of nucleic acid derivatives, *P. Maruthi Mohan, J. Nirmala and K. Sivarama Sastry.* Preparation and properties of L-asparaginase from green chillies (*Capsicum annuum L.*), *Mozeena Bano and V. M. Sivaramakrishnan.* A comparative study of the composition of the collagens of the foot of two lamellibranch molluscs occurring in different habitats, *Geetha Vasanthakumar, Gowri Chandrakasan and G. Krishnan.* Effect of ethrel treatment on the postharvest changes in the turnover of ascorbic acid and reducing sugar in *Achras sapota* fruits, *P. M. Mehta, T. K. Suma and T. K. Prasad.* Effect of L-cystine on macromolecular changes during spore and parasporal crystal formation in *Bacillus thuringiensis* var *thuringiensis*, *S. Rajalakshmi and Y. I. Shethna.*

### Microbiology

Spore and crystal formation in *Bacillus thuringiensis* var *thuringiensis* during growth in cystine and cysteine, *S. Rajalakshmi and Y. I. Shethna.* Intra- and inter-generic homology in polysaccharide structure of *Rhizobium* and *Alcaligenes*, *Suresh Kumar Ghai.* Growth of *Mycobacterium smegmatis* in minimal and complete media, *Raghavendra Gadagkar and K. P. Gopinathan.*

### Endocrinology/Reproductive Biology

The binding of progesterone in different parts of the rabbit uterus during implantation, *Raj K. Puri and S. K. Roy.* The cytosol receptors for progesterone in the different parts of rabbit fallopian tube and uterus during ovum transport, *Raj K. Puri and S. K. Roy.*

### Cell Biology

Abnormalities in the fine structure of the spermatids of rats injected with cadmium, *N. H. Gopal Dutt and Kan Kobayashi.* Evolutionary trends in the haemoglobins of murine animals, *P. G. Pratap, J. Nandi and John Barnabas.*

### Molecular Biology

Presence of precursor ribosome in the ribosomal preparation from chloramphenicol-treated *Escherichia coli* AB301/105 (R<sup>Nase III</sup>-), *D. K. Lahiri and D. P. Burma.*

## Volume 3, Number 1, March 1981

### Biochemistry/Biophysics

Antifungal activity of bacitracin and its interaction with metals, *G. Venkateswerlu.* Immobilization and properties of  $\beta$ -D-galactosidase from *Lactobacillus bulgaricus*, *H. P. S. Makkar, O. P. Sharma and S. S. Negi.* Effect of malathion exposure on some physical parameters of whole body and on tissue cations of teleost, *Tilapia mossambica* (Peters), *I. Kabeer Ahammad Sahib, K. S. Jagannatha Rao and K. V. Ramana Rao.* The inhibition of photosynthetic electron transport by methyl parathion; *P. R. Anbudurai, R. Mannar Mannan and Salil Bose.* Structure of presynaptic toxins. Crystallization and preliminary x-ray diffraction data on Notechis II-5, a presynaptic toxin phospholipase; *K. K. Kannan, S. Singh, M.*

*Ramanadham and D. Eaker.*

### Microbiology

Action of 2, 4-dichlorophenoxyacetic acid and rifampicin on heterocyst differentiation in the blue-green alga, *Nostoc linckia*, *D. N. Tiwari, A. K. Pandey and A. K. Mishra.* Canavanine-induced inhibition of growth and heterocyst differentiation in *Anabaena doliolum* and isolation of a canavanine-resistant mutant; *A. Kumar and H. D. Kumar.* Excretion of lysine by *Micrococcus glutamicus*; *Meena Lakshman and M. R. Raghavendra Rao.* Aspartokinase of a lysine producing mutant of *Micrococcus glutamicus*, *Meena Lakshman, B. C. Shenoy and M. R. Raghavendra Rao.*

### Immunology

Nature of leukemia-associated antigenicity of dinitrophenylated human lymphocytes and lymphoblasts, *S. S. Joshi, V. S. Basrur and M. B. Sahaşrabudhe.* Animal model for testing human *Ascaris* allergens; *Krishna Mukerji, R. P. Saxena, S. N. Ghatak and K. C. Saxena.*

### Reproductive Biology

Effect of human chorionic gonadotropin on serum levels of progesterone and estrogens in the pregnant bonnet monkey (*Macaca radiata*), *A. Jagannadha Rao, S. G. Kotagi and N. R. Moudgal.*

## Volume 3, Number 2, June 1981

### Biochemistry/Biophysics

Purification and properties of diaminopimelate decarboxylase of *Micrococcus glutamicus*, *Meena Lakshman, B. C. Shenoy and M. R. Raghavendra Rao.* Purification and physicochemical properties of  $\alpha$ -amylase from irradiated wheat, *J. P. Machaiah and U. K. Vakil.* In vitro and in vivo nitrogenase activity of *rhizobium* mutants and their symbiotic effectivity; *K. R. Dadarwal, B. S. Kundu and P. Tauro.* Localization of glucose-6-phosphatase and fructose-1,6-diphosphatase in subcellular fractions from different regions of the rat brain, *Gurucharan Kaur, Rameshwar Singh and N. Z. Baquer.* Toluene toxicity. Effects of sublethal levels on enzyme activities in seawater adapted tilapia (*Sarotherodon mossambicus* Peters), *Ajit D. Dange and Vasant B. Masurekar.* Spectrophotometric assay of immobilized tannase; *L. C. Katwa, M. Ramakrishna and M. R. Raghavendra Rao.* Embryonic control of isocitrate lyase activity in cotyledons of germinating soybean, *Balwant Singh, P. S. Sukhija and I. S. Bhatia.* Cardiotoxin of the Indian cobra (*Naja naja*) is a pyrophosphatase; *K. E. Achyuthan and L. K. Ramachandran.* Transport of retinol in the duck plasma, *B. Sridhara Rao, N. Appaji Rao and H. R. Cama.* Allosteric serine hydroxymethyltransferase from monkey liver. Correlation of conformational changes caused by denaturants with the alterations in catalytic activity; *Kashi S. Ramesh, V. S. Ananthanarayanan and N. Appaji Rao.* Allosteric serine hydroxymethyltransferase from monkey liver: temperature induced conformational transitions; *Kashi S. Ramesh, V. S. Ananthanarayanan and N. Appaji Rao.*

### Genetics

Expression of Hb $\beta$ -T and Hb $\beta$ -E genes in Eastern India. Family studies; *Manju Ajmani, Geeta Talukder, Archana Sharma and D. K. Bhattacharya.*

### Reproductive Biology

A probability model for the number of births in an equilibrium birth process; *S. N. Singh and V. K. Singh.* A conception dependent probability distribution of couple fertility; *I. J. Singh.*

## Volume 3, Number 3, September 1981

### Biochemistry

Functional change in rat liver tRNA following aflatoxin B<sub>1</sub> administration; R. K. Bhattacharya and V. S. Aboobaker. Chemical modification of bacitracin A and the biological activity of modified bacitracins; S. Rambhav. Combined stress of low environmental pressure and temperature on sodium and potassium homeostasis in rat blood; S. R. Sarkar, L. R. Singh, B. P. Uniyal and B. N. Chaudhuri. Biochemical studies on the origin of the ATPase of the avian myeloblastosis virus; Ranajit K. Banerjee. *In vitro* formation of thyroid hormones from 3,5-diiodothyronine by supernatant of submaxillary gland; Mitali Guha, Ratha N. Hati and Asoke G. Datta. Effect of nitrogen, phosphorus and potassium deficiency on the uptake and mobilization of ions in Bengal gram *Cicer arietinum*; B. K. Das and S. P. Sen. Response of blood glucose, hepatic glycogen and pancreatic islets to treatment of sulphhydryl inhibitors in *Clarias batrachus* L; Shankar D. Bhatt and Purnan S. Bora. Cytokinin binding proteins from mammalian sera; C. Jayabaskaran, P. Senapathy and T. M. Jacob. Changes in native alcohol dehydrogenase activity of *Drosophila* upon treatment with guanidine hydrochloride, urea and heat; Curbachan S. Miglani and Franklin R. Ampy. Binding of arylsulphatase B to isolated rat liver lysosomal membranes; H. R. Adhikari, Ateeq Ahmed and U. K. Vakil. A rapid method for preparation of sarcolemma from frog skeletal muscle; S. I. M. Zaidi, R. N. Pandey, A. M. Kidwai and C. R. Krishna Murti.

### Biophysics

The tensile properties and mode of fracture of elastoidin; A. Rajaram, R. Sanjeevi and N. Ramanathan. Model flavoproteins. Interaction of riboflavin-5'-monophosphate with poly-( $\alpha$ -L-lysine) and poly-( $\alpha$ -L-histidine); Shyam Singh, Gyan P. Srivastava and Chanan Singh.

## Volume 3, Number 4, December 1981

### Biochemistry/Biophysics

Fructose diphosphate aldolase-Class I (Schiff base)-from *Mycobacterium tuberculosis* H<sub>37</sub> Rv.; N. Jayanthi Bai, M. Ramachandra Pai, P. Suryanarayana Murthy and T. A. Venkatasubramanian. Studies on carbohydrate moieties of *Aspergillus niger* glucoamylase II. Isolation, purification and characterization of glycopeptides; P. Manjunath and M. R. Raghavendra Rao. Studies on carbohydrate moieties of the glycoprotein, glucoamylase II of *Aspergillus niger*. Nature of carbohydrate-peptide linkage and structure of oligosaccharides; P. Manjunath and M. R. Raghavendra Rao. Alterations in the activities of the enzymes of proline metabolism in Ragi (*Eleusine coracana*) leaves during water stress; Rajendra P. Kandpal, C. S. Vaidyanathan, M. Udaya Kumar, K. S. Krishna Sastry and N. Appaji Rao. Enzyme inhibitors from plants: Enterokinase inhibitors in tubers and seeds; P. Gopalakrishna Bhat, Raju Thomas Jacob and T. N. Pattabiraman. Studies on the uptake of benzanthrone by rat and its efflux through serum; A. Joshi, S. K. Khanna, G. B. Singh and C. R. Krishna Murti. Study of sodium homeostasis in blood in whole body gamma-irradiated rats; S. R. Sarkar, L. R. Singh, B. P. Uniyal and B. N. Chaudhuri. Metabolism of echitamine and plumbagin in rats; B. Chandrasekaran and B. Nagarajan. *In vitro* effect of prostaglandins, prostaglandin endoperoxides and thromboxane on rat intestinal alkaline phosphatase and (Ca<sup>2+</sup> + Mg<sup>2+</sup>) adenosine triphosphatase; R. Parthasarathy and K. Radha Shanmugasundaram. Effect of denaturants on the oligomeric structure of the 11 S protein of sunflower (*Helianthus annuus*); E. H. Rahma and M. S. Narasinga Rao.

### Molecular Biology

DNA sequence organisation in finger millet (*Eleusine coracana*); Vidya S. Gupta and P. K. Ranjekar. Genetic and molecular events in transformation of *Haemophilus influenzae* with plasmid RSF 0885 carrying cloned segments of chromosomal DNA; N. K. Notani.

### Microbiology

Microbial load in mass cultures on green algae *Scenedesmus acutus* and its processed powder; M. Mahadevaswamy and L. V. Venkataraman.

### Nutrition

Effect of protein malnutrition on the metabolism of uterine collagen in the rat; J. Sambasiva Rao and V. H. Rao.

### Aquatic Toxicology

Toxicity of carbaryl and 1-naphthol to four species of freshwater fish; K. S. Tilak, D. Mohanaranga Rao, A. Priyamvada Devi and A. S. Murthy.

### Neuroendocrinology

Dopaminergic mediation of  $\gamma$ -aminobutyric acid in the control of prolactin release; Plasma prolactin and brain tyrosine hydroxylase levels in overiectomized conscious rats; G. Nagesh Babu and E. Vijayan.

being done in India in fields of knowledge other than their own speciality. In the scientific meetings of the Academy and especially in the Symposia, they have a valuable opportunity of discussing problems of common interest from different points of view.

I will also say a word about the Academy in relation to the nation at large. It is inevitable that the Academy, consisting as it does of the most active workers in the country who are representatives of the different parts of India and of different branches of science, will soon come to be regarded as the most authoritative body to speak in the name of India on all matters touching the progress of science. The potentialities of such an Academy in the way of national service are almost unlimited. What it can actually achieve depends on the measure of support and recognition that it receives from the Government of India and from the general public. I do not think that any calls for service from responsible quarters will find us unwilling or unprepared.

According to the Memorandum of Association, the headquarters of the Academy has been fixed at Bangalore for a period of three years in the first instance. I have no doubt it is the general feeling of all our Fellows that this location has fully justified itself. In this connection, I should mention the generous personal gift by His Highness the Maharaja of Mysore of ten acres of land in the vicinity of the Indian Institute of Science as a permanent location for the Academy. The location selected is a historic spot close to one of the four towers set up by Kempe Gowda, a former Hindu ruler, as a limit for the extension of his city. A relief map shows this site to be the highest spot in Bangalore. Indeed, standing on it at ground-level we see a magnificent panorama stretching out towards the horizon in all directions with Nandidroog in the blue distance towards the north, Sankey's Reservoir and the City of Bangalore to the south, the Palace Gardens to the east and the Indian Institute of Science to the west with the Sivaganga hills looming in the distance. Such a spot is indeed a worthy site for the location of an Academy of Sciences intended to play a great part in the intellectual life of the nation. Such a site also demands a noble edifice which would catch the eye and strike the imagination of both the present and future generations. Has not Bombay some far-sighted and philanthropic donor who would come forward to build an Academy of Sciences for all India and thus immortalize himself and find a place in the memory of India side by side with Jamsetji Tata. The permanent location at Bangalore of an Academy of Sciences would indeed be a fitting completion of Tata's great work. The Academy would serve as a link between the Institute and the outer world of science, each strengthening the other and helping it to reach the full fruition of its aims.

## Obituaries

---

**Major General Sohan Lal Bhatia** was born in Amritsar and had his early schooling at Lahore. Following medical studies at St. Thomas Hospital, London, he graduated in medicine from Cambridge. He joined the Indian Medical Service in 1917 and won the Military Cross during his service with the Egyptian Expeditionary Force during the First World War.

After the war, he joined the Grant Medical College, Bombay as Professor of Physiology and Hygiene and soon established a reputation for excellence in teaching. His achievements as a scientist, scholar and teacher won him many honours and awards.

Gen. Bhatia's many sided personality included great administrative skill which was amply demonstrated during his tenure as Dean of Grant Medical College and subsequently as Deputy Director General of the Indian Medical Service. As a member of the Bhor Committee and founder member of the Indian Medical Council, he also made a major contribution to the restructuring of medical education in India.

Gen. Bhatia took keen interest in the history of medicine on which he lectured and wrote extensively. He will long be remembered as a scientist, a great educationist, administrator and author.

**Sir Hans Adolf Krebs**, one of the greatest biochemists of this century, was born in Hildesheim in Germany on August 25, 1900. Starting his professional life as a physician, his initial research work at the University of Gottingen and Freiburg on the physicochemical basis of histological staining made him realise the need for training in organic and physical chemistry if he were to tackle biological problems. His association with Prof. Rona and later with Prof. Otto Warburg was instrumental in providing the necessary impetus for his later work on oxidative metabolism.

Working in the Department of Medicine at Freiburg with the assistance of a medical student, K. Henseliet, he discovered the ornithine cycle for the synthesis of urea. This was followed by a series of excellent papers on the enzymes catabolizing amino acids, especially their oxidation and deamination. The turbulence of war time Germany and the wave of anti-semitism forced him to leave Germany for Cambridge, England, where in addition to continuing his work on amino acid metabolism, especially the biosynthesis of glutamine, he studied the synthesis of uric acid and the formation of ketone bodies.

His most celebrated work, on the oxidation of di- and tricarboxylic acids, was carried out

at the University of Sheffield during 1935 to 1945. This discovery is a landmark in our understanding of carbohydrate metabolism and paved the way for the elucidation of the intricate metabolic interrelationships during the next two decades. The Medical Research Council established a Unit for research in cell metabolism at Sheffield and in the next ten years Hans Krebs and his band of dedicated workers established there a centre of international repute.

Sir Hans Krebs was appointed in 1934 to the Whitley Chair of Biochemistry at the University of Oxford where he continued to work on metabolic regulation, ketoneogenesis, pyridine nucleotides, folate enzymes, etc., until his retirement in 1967. After his retirement from the University, he continued research activities at the Metabolic Research Laboratory in the Radcliffe infirmary with the support of the Medical Research Council.

Sir Hans Krebs' contributions to biochemistry have been widely recognised; he was awarded the Nobel Prize in Physiology in 1953 and the Royal Medal and Copley Medal of the Royal Society. He passed away on 22 November 1981 at his home in Oxford.

**Professor Santi Ranjan Palit** was one of our foremost chemists who contributed widely to various areas of physical chemistry including thermodynamics of solutions, nonaqueous solvents, electrochemistry and polymer chemistry. Polymer chemistry was in particular the area where he made major contributions. He was the author of the first textbook of physical chemistry which was used extensively in the country.

Prof. Palit was born in Calcutta where he had his education up to the D.Sc degree. He worked in many educational and research institutions in and near Calcutta until 1947, when he was appointed Professor of Physical Chemistry in the Indian Association for the Cultivation of Science. He worked in the Association till his retirement in 1976.

Prof. Palit trained a large number of doctoral students and will always be remembered for his great enthusiasm for physical chemistry. He was the author of over 300 research papers and continued to take direct interest in chemical research till the last day of his life.

**Professor Donald Dexter Van Slyke**, a distinguished scientist and teacher, started his research career at the Rockefeller Institute for Medical Research in 1907, which was the beginning of a forty-two-year period of outstanding productivity in biological chemistry. He had earlier done his doctoral work at the University of Michigan. He soon published his famous paper in collaboration with P. A. Levine, on the method for estimating amino acids. He worked for a short while in the laboratories of Emil Fisher and Emil Abderhalden in Germany. He was managing editor of the Journal of

Biological Chemistry from 1914 to 1924 and editor till 1949.

His research work was characterised by thoroughness and in-depth examination of a single area. This approach is exemplified by his versatile use of the gas analyser to measure  $O_2$ ,  $CO_2$ , etc. in blood under various physiological situations such as diabetes and cyanosis. These measurements on patients suffering from haemorrhagic pneumonia during the influenza pandemic led him to the observation that oxygenation of haemoglobin in the lungs of these subjects was affected. The analogous situation at high altitudes and the beneficial effects of breathing air with higher oxygen content provided him the clue to devising the first effective therapy for pneumonia with oxygen tents. The cyanosis markedly disappeared when the oxygen concentration in the tent was increased to about three times that present in air. In addition to this important development, he evolved methods for estimating clearance of urea, amino acids and a number of other body constituents by the kidney, discovered hydroxylysine, an important amino acid, and simplified enzyme kinetics.

All his research work until his retirement was carried out at the Rockefeller Institute, New York. After his retirement, until his death 22 years later, he carried out his work at the Brookhaven National Laboratories in Upton, New York. During his long and distinguished career he published six books and over 475 papers and trained a large number of students who are leaders in American science today.

Van Slyke received several awards and honorary degrees, notable among them being his election as the first honorary Doctor of Medicine by the University of Oslo. He was among the first 30 Honorary Fellows elected by the Indian Academy of Science in 1934.

Editor Anna Mani

Published by S Ramaseshan, General Editor of Publications for the Indian Academy of Sciences, Bangalore 560 080 and printed by him at Nataraj Printers, Bangalore.