

cal research or any other type of Indian research is that the atmosphere of questioning is lacking from the very beginning of education. When all education is memory-based and questioning by students is positively discouraged from early childhood, how can the country expect researchers to bloom when they enter

universities or research institutions? If there is still so much good research in India, this is despite the system of education and despite the ignorant political masters who have no concept of the importance of research for the overall development of the country in the modern era of science and technology. So after

all Valiathan's statement may have some justification!!

B. RAMAMURTHI

*Dr Achanta Lakshmipathi
Neurosurgical Centre,
Voluntary Health Services, TTTI Post,
Chennai 600 113, India*

NEWS

Scientific Advisory Committee to the Cabinet

The Government of India has constituted a 35-member Scientific Advisory Committee to the Cabinet (SAC-C) under the chairmanship of C. N. R. Rao (Jawaharlal Nehru Centre for Advanced Scientific Research, Bangalore) with the following terms of reference.

1. Tendering advice on the implementation of Science and Technology policy of Government.
2. Identifying and recommending measures which would enhance the country's technological self-reliance, with particular reference to Government's policy on foreign collaboration and import of technology.
3. Considering policy issues relating to the development and application of Science and Technology which may be referred to it by the Prime Minister or by the Cabinet Committee on Science & Technology.
4. Considering organisation aspects of S&T organisations/institutions, including

measures to provide adequate linkages between the scientific community, educational institutions, R&D establishments, industry and governmental machinery, and 5. Considering – a) filling critical gaps in national competence; b) promoting technical cooperation among developing countries; c) emerging changes from international competitiveness in S&T and also in industry and commerce; d) meeting and anticipating the conflicts that arise in society because of new technologies, and e) other issues concerning science in international relations.

The other members of the committee are: A. K. Basu (Society for Rural Industrialization, Ranchi), V. P. Bhatkar (CDAC, Pune), Asis Datta (JNU, New Delhi), R. Gadagkar (IISc, Bangalore), Ashok Ganguly (ICI, New Delhi), Indira Nath (AIIMS, New Delhi), S. S. Jha (TIFR, Mumbai), Pradip Khandwala (IIM, Ahmedabad), G. Mehta (University of Hyderabad), R. Narasimha (IISc, Banga-

lore), Parvinder Singh (Ranbaxy, New Delhi), S. Ramani (National Centre for Software Technology, Mumbai), M. M. Sharma (University of Mumbai), Bikash Sinha (SINP, Calcutta), K. K. Subramaniam (Centre for Development Studies, Thiruvananthapuram) and Vijay S. Vyas (Institute of Development Studies, Jaipur).

The ex-officio members are: Secretaries to the Departments of Science and Technology, Space, Atomic Energy, Electronics, Ocean Development, Biotechnology, Agricultural Research and Education, Non-Conventional Energy Sources, Scientific and Industrial Research, Industry, Education, Environment and Forests, and Rural Development; Scientific Adviser to Defence Minister; Director-Generals of CSIR, ICAR, ICMR; Secretary, Department of Expenditure; Secretary, Planning Commission; Secretary, Ministry of Welfare; and Secretary (Co-ordination) of Cabinet Secretariat.

Commercial R&D companies to enjoy tax holiday

THROUGH a little-noticed incentive that should attract retired scientists and other technical personnel wishing to cash-in on their experience in R&D, the Union Budget for 1996-97 introduced a provi-

Further details on, and applications for seeking approval of, commercial R&D companies can be had from the Adviser (RDI), Department of Scientific & Industrial Research, Ministry of Science & Technology, Technology Bhavan, New Mehrauli Road, New Delhi 110 016.

sion of a 5-year tax holiday under Sec. 80-1A of Income Tax Act, 1961 to approved companies engaged in scientific and industrial research and development activities on commercial lines. This incentive will be available to any company organized as an industrial-service enterprise that has as its main business objective the provision of scientific and industrial research and development services ('commercial R&D companies').

The tax holiday shall be available to any company, whether new or existing, which is accorded approval by the Prescribed Authority (Secretary, DSIR) at any time before 1 April 1998. The 100% deduction for a 5-year period shall commence from the assessment year relevant to the previous year in which the approval by the prescribed authority is accorded to such a company. The above provision took effect on 1 April 1997 and will,

accordingly, apply in relation to the tax-assessment year 1997-98 and subsequent years.

Commercial R&D companies qualifying for approval by DSIR are expected to be engaged in industrial research and development activities, i.e. research, design, development and engineering. The R&D would include efforts for product development, process development, design development, process improvement, quality improvement, cost reduction, export promotion, import substitution, development of new techniques and technologies, design and engineering, testing, analysis and evaluation in relation to these efforts, discovering new methods for tests and analyses, productivity improvement research, research in improving the effi-

ciency in use of natural resources and industrial wastes, capital equipment and materials development, fuel efficiency, energy conservation, pollution management and mitigation, recycling of wastes, research for efficient use of scarce materials, research in new and frontier areas, discovery of new molecules and synthesis of new compounds, software development, prototype development, etc.

The commercial R&D companies are expected to be registered companies in the small, medium or large-scale sector. They will function on lines identical to any other registered company under the rules and regulations applicable to such companies. The output from the commercial R&D companies will be industrial know-how and technology including

associated intellectual property rights, whether legally-protected or otherwise, *and not in the form of products offered for commercial sale.*

Approved commercial R&D companies shall not be engaged in any kind of manufacturing activity or undertake any routine testing and analysis activities which are not regarded as R&D activities. There should be clearly defined teams of researchers for undertaking the research programmes and also for transfer of technologies/know-how generated in these commercial R&D companies. The companies should also identify well-defined research programmes with clearly defined goals. Such companies can also undertake sponsored research programmes from other agencies on commercial lines.

National seminar on conservation of endangered species and ecosystems: Biotechnological and ecological approaches – A report

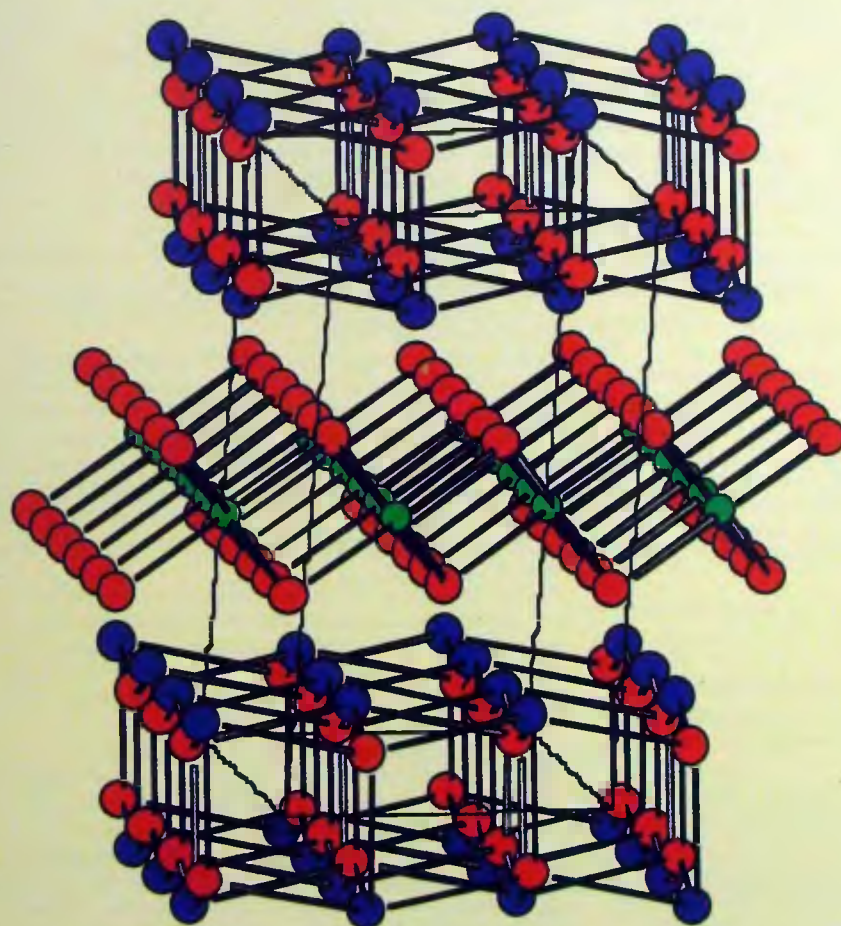
A national seminar on 'Conservation of Endangered Species and Ecosystems: Biotechnological and Ecological Approaches' was organized jointly by the Department of Botany (Centre of Advanced Study), Banaras Hindu University, Varanasi, and Ecotransformation: Center for Environment and Rural Upliftment, Delhi, during 5-7 December 1996. The seminar, held at the Department of Botany, Banaras Hindu University, attracted participants from all over the country; thirty-two presentations, including two special lectures and five key-note addresses, were made. J. S. Singh, the chairman of the seminar, expressed concern over the alarming rate at which the ecosystem degradation has occurred globally during the present century. Of the multitude of anthropogenic activities contributing to ecosystem degradation, ever-increasing shrinkage of forest cover, land degradation and emission of pollutants are of paramount importance. These activities have not only led to the loss of species and strains of medical, agricultural and industrial importance, but have impaired natural ecological processes crucial to our well-being and have affected the resilience of these systems. Restoration of species and rehabilitation of degraded ecosystems will together help in

maintaining or enhancing biodiversity and environmental quality. The presentations encompassed the focal themes of the seminar: survey and monitoring of terrestrial and aquatic ecosystems; concepts and strategies for restoration of degraded ecosystems; conservation of threatened species; *in situ* and *ex situ* conservation of crop genetic resources; environmental impact assessment of development projects; afforestation and wasteland management; and utilization of microbes for environmental protection.

R. R. Rao (National Botanical Research Institute), while giving an account of the problems of conservation of endangered plant species, mentioned that 20-25% of existing plant species of India are endangered. Species made rare by anthropogenic activities deserve more attention than species that are naturally rare. In order to conserve endangered species, the following steps were recommended: extensive species-specific surveys, regular assessment and monitoring, distribution map and quantitative data on endangered species, and continued publication of red data book. Citing *Parthenium hysterophorus* as an example, he discussed how one species can endanger other plant species and disturb the entire plant community. Based on a survey of 167 sacred

groves of Kerala, M. Rajendra Prasad (Tropical Botanic Garden and Research Institute) presented data on the pattern of biodiversity and the factors controlling it. Almost 65% species occurring in these areas fall under 'rare' category. Topography and anthropogenic activities have an important bearing on the floristic diversity of these groves. There is a great deal of similarity in floristic diversity of sacred groves of Kerala. In a similar study, Subrata Sharma (G. B. Pant Institute of Himalayan Environment and Development) discussed a method developed by the early settlers of the central Himalaya for the conservation of plant resources. This method involves identifying a worship point, which is often a tree, and defining a small area around this point where no human interference is allowed. It appears that these religious points were established as a mechanism of *in situ* germplasm collection centers for the conservation of resources, and to provide the 'elite' stock material for future multiplication. U. Dhar (G. B. Pant Institute of Himalayan Environment and Development) gave details about the distribution of certain endemic species in the Himalayan region and discussed the conservation strategies with special reference to the Himalayan endemics. He advocated

CURRENT SCIENCE



● La

● S

● Cr



CrS₆ octahedron

SOLID STATE CHEMISTRY WITH HOLES

BANGLADESH'S ARSENIC CALAMITY

VACCINES FOR THE 21ST CENTURY

INFORMATION FOR CONTRIBUTORS

GENERAL

All manuscripts should be addressed to the Editor, *Current Science*, P. B. No. 8001, C. V. Raman Avenue, Bangalore 560 080. Submission of an article will be held to imply that it has not been previously published and is not under consideration for publication elsewhere; and further, that if accepted, it will not be published elsewhere. *Three copies of contributions of all categories* are required, with a letter of transmittal giving (i) names and complete addresses of the authors and (ii) title of the contribution and the category in which it is submitted (see below).

Current Science is a multidisciplinary journal and therefore research and review papers of general significance that are written clearly and well organized will be given preference. All papers will be first assessed by a Reviewing Editor. Papers found unsuitable in terms of the overall requirements of the journal will be returned to the authors. The others will be sent for detailed review. *Both solicited and unsolicited material will be reviewed.* Authors of these papers will be notified of acceptance, rejection, or need for revision of the paper. Returned papers cannot be resubmitted. Illustrations and other material to be reproduced from other publications must be properly credited; it is the authors' responsibility to obtain permission for reproduction (copies of letters of permission should be sent).

CATEGORIES OF MANUSCRIPT

General articles (not exceeding 5000 words) discuss current trends in research in a field that will be of interest to readers outside the field; interdisciplinary topics: science policy and administration; or some aspect of the application of science and technology to human needs or the impact of science and technology on society/ecosystems/life. They should include a summary not exceeding 100 words, introductory paragraph(s), brief subheads at appropriate places to point to what follows, illustrations that will help a general reader, and references.

Review articles (not exceeding 5000 words) are expected to survey and discuss recent developments in a field. They should be well focused and organized, and avoid a general, 'textbook' style.

Research articles (not exceeding 4000 words) should report research results of fairly major significance. They should include an abstract not exceeding 100 words, introductory paragraph(s), and brief subheads.

Research communications (not exceeding 2000 words) should contain important findings that are novel and of fairly broad interest. They should include a brief abstract and an introductory paragraph. Text should not be broken up under subheads.

Correspondence includes letters, not exceeding 500 words, that are of general interest to scientists. All letters cannot be published. **Scientific correspondence** contains technical comments, including those on articles or communications published in *Current Science* within the previous six months. Letters may be reviewed and edited. **Research news** articles are intended to inform nonspecialists about recently published advances or important findings discussed at a meeting. Authors should also send a copy of the paper(s) on which the article is based. Meeting reports should avoid merely listing brief accounts of topics discussed, and must convey to readers the significance of an important advance.

Research accounts articles are intended to be personalized reviews of research from the authors' own laboratory, based on a body of published work. The articles must provide appropriate background to the area in a concise introduction, which should also serve to place the author's work in proper perspective. Articles will normally

not exceed 8 to 10 printed pages.

Opinion articles present views on issues related to science and scientific activity. **Commentary** articles should contain expository notes on issues related to science and scientific activity.

Book reviews. Unsolicited reviews will also be considered. Reviews that merely 'list' brief descriptions of the contents cannot be published. Reviews should have 'context' and convey some information about the subject of the book.

Historical commentary and notes inform readers about interesting aspects of personalities or institutions of science or about watershed events in the history/development of science; most are expected to relate to India. Illustrations are welcome. Brief items will also be considered.

MANUSCRIPT PREPARATION

Manuscripts should be typed double-spaced on one side of white bond paper (21 × 28 cm). The pages should be numbered consecutively, starting with the title page and through the text, reference list, tables and figure legends. The title should be brief, specific and amenable to indexing. Not more than five keywords should be indicated separately; these should be chosen carefully and must not be phrases of several words. **Summary** and **abstract** should not have more than 100 words and should convey the main point of the paper, outline the results and conclusions, and explain the significance of the results.

Text. All papers should have a brief introduction. The text should be intelligible to readers in different disciplines and technical terms should be defined. Tables and figures should be referred to in numerical order. All **symbols** and **abbreviations** must be defined, and used only when absolutely necessary. Superscripts and subscripts and ambiguous characters should be clearly indicated. **Units of measure** should be metric or, preferably, SI. Methods should, as far as possible, be described briefly in appropriate table and figure legends.

Figures. In the case of line drawings one set of originals (without any lettering) is sufficient, with two copies containing lettering. In the case of photographs good prints are required with each copy of the manuscript; photocopies are not acceptable. Line drawings should be roughly twice the final printed size. The correct orientation should be indicated if not clear.

Photomicrographs and other photographs that require it must have a scale bar, which should be defined clearly in the legend. Primary data should be submitted as far as possible (e.g. actual photographs of electrophoretic gels rather than idealized diagrams).

References should be numbered in the order in which they appear, first through the text and then through table and figure legends. The following are examples of ways of writing references.

1. Mukundan, T. and Kishore, K., *Curr. Sci.*, 1991, 60, 355-362.
2. Constantine, G., in *Biology of Bats* (ed. Wimsatt, W. A), Academic Press, New York, 1970, vol 1, pp. 319-322.

Acknowledgements should be brief. Footnotes are not allowed except to identify the corresponding author if not the first.

Cover photographs. Good photographs (colour or black and white) that pertain to a submitted paper will be considered for use on the cover. Good prints and a legend should be submitted with the manuscript. In the case of a colour picture, a transparency will be required for printing if accepted.

PROOFS AND PUBLICATION

Two sets of galley proofs are sent to the corresponding author. A reprint order form accompanies the proofs.

for emphasis on the habitat characteristics and population size while classifying any species as endangered. Certain species may occur only in localized habitats and their conservation should get top priority. For future studies, focus be laid on identification, mapping, selection and prioritization of endangered species.

G. Kallu (Project Directorate of Vegetable Research) pointed out significance of wild relatives of vegetable plants as these have proven extremely helpful in transferring disease/pest resistance to commercially important vegetable crops. It is of great concern that many of these plants are disappearing rapidly, although it is imperative to conserve them for improving existing varieties. Similar views were echoed by U. P. Singh (Banaras Hindu University) for conserving biodiversity of horticultural crops. P. S. Yadav (Manipur University) discussed various strategies for conserving *Lilium macklineae*, a threatened lily, endemic to the Shiroy hill ranges in the Ukhrul district of Manipur.

B. B. Singh (National Bureau of Plant Genetic Resources) articulated the efforts currently being made by NBPGR in collaboration with active germplasm sites, crop-based national institutes and state agricultural universities, to collect, characterize, evaluate and conserve germplasm seeds of crops and endangered species. Dry seeds can be kept at room temperature or -20°C for short- and long-term storage, respectively. Seeds of more than 155,000 accessions have been conserved as the base collection with the National Gene Bank.

Medicinal plants of India are threatened due to their ever-increasing demand, especially in the Indian system of medicine, over-exploitation by the manufacturing sector, destruction of habitat, and unsustainable harvesting practices. N. C. Jain (University of Delhi) reported that the existence of over 35 native medicinal plants has been threatened in India, there may be many more species which are facing a similar threat. S. Dwivedi (Central Institute of Medicinal and Aromatic Plants) appraised the efforts currently underway at his institute for *ex situ* conservation of these plants and for studying their conservation biology (reproductive mechanism, large scale propagation mechanism including micropropagation, appropriate size and season for harvesting the plant propagule for the alkaloid).

R. P. Shukla (Gorakhpur University) discussed the role of six woody shrubs belonging to the genus *Desmodium* (*D. triangulare*, *D. pulchellum*, *D. heterocarpon*, *D. gangetium*, *D. triquetum* and *D. latifolium*) in improving nitrogen status of soil and in contributing towards alpha-diversity of the sal community.

Several participants presented their results relating to micropropagation of threatened species. S. P. Vij (Punjab University) pointed out that of nearly 1200 species of orchids found in India, more than 25% are endemic. Many Indian orchids are becoming endangered due to habitat destruction and pressure from commercial collectors. He stressed the need of mass propagation for relieving anthropogenic pressure from orchid populations growing in nature. In conclusion, he observed that the procedure for replenishing our natural stocks using *in vitro*-raised plants is still to be developed. A. Gangaprasad (Tropical Botanic Garden and Research Institute) discussed micropropagation and reintroduction of *Ipea malabarica* and *Vanda spathulata*, the two exquisite orchids of the Western Ghats. The most important part of the study was reintroduction of the micropropagated plants on the host trees in the Silent Valley National Park in Palakkad district and Ponmudi reserve forest in Thiruvananthapuram.

Strategies for micropropagation of *Bacopa monniera* (common name 'brahmi'), a threatened medicinal plant, were discussed at length by Gayoor Ali (Hamdard University). M. Hasseb Mughal (Hamdard University) pointed out difficulties in maintaining and propagating trees of *Butea monosperma*, a well-known medicinal plant, through conventional means. He presented a method for *in vitro* mass propagation of this tree species. Mass propagation of tree species through biotechnological means was discussed by Prabhakar Dubey (Forest Research Institute). He recounted the high and low cost technologies currently being employed at different forest nurseries, including Forest Research Institute at Kanpur. According to him, it should be possible to multiply the planting stock of some of the species 5 to 6 times in a year with a moderate input. However, he stressed the need to further improve methodologies for different species.

Several participants discussed the impact of environmental perturbation on

organisms and ecosystems. P. K. Mishra (Vinoba Bhave University) revealed that the pattern of vegetation in coal mine areas of Dhanbad is markedly different from the undamaged site. *Farthenium hysterothorus* may become a potential danger to the native vegetation of these areas. Analysis of the structure of plant community of the Valley of Flowers National Park and adjacent areas by C. P. Kala (Wildlife Institute of India), showed higher species diversity in the Valley of Flowers due to its landscape diversity and protection from grazing. V. P. Bhatnagar (Dayalbagh Educational Institute) reported that due to immense biotic pressure, the natural flora and the edaphic components of the floodplain ecosystems are being increasingly disturbed. He also suggested ways to mitigate further deterioration of such natural ecosystems.

Two papers were devoted to mechanisms of stress tolerance in plants. P. K. Rai (Banaras Hindu University) showed that development of acid tolerance in *Chlorella vulgaris* occurred due to increase in ATPase activity, accumulation of betaine and other metabolic changes. Acid tolerance also led to tolerance against metal ions due perhaps to their repulsion. Ritambhara G. Kumar (Banaras Hindu University) discussed cadmium toxicity and tolerance in rice. She related cadmium tolerance to accumulation of osmolytes (like proline and glycine betaine), and formation of an 18 kDa Cd-inducible protein.

A number of papers were devoted to rehabilitation of endangered ecosystems and improvement of environmental quality. Usefulness of perennial plant species for the development of wastelands was stressed by G. Prabhakar Rao (Rubber Research Institute of India). Conifers, teak, semul, sal, deodar, poplar, mahua, acacia, bamboo, eucalyptus, jackfruit, tamarind, cashewnut, palm, neem and rubber are some of the plant species identified for this purpose. He recommended the use of stress-resistant crops to suit the specific requirement for various types of wastelands. Pawan Kumar (Indore) appraised of the steps already taken towards revegetation of the huge wasteland of the catchment of Narmada river. He pointed out the primary and secondary benefits of the project, predicting substantial improvement in the agricultural and forest wealth of the area. Potential of *Eichhornia crassipes* as a green manure

for rice cultivation was elaborated by R. P. Singh (Banaras Hindu University). A saving of 40 kg N ha⁻¹ was observed by using *Eichhornia* leaf as green manure at 10 tons ha⁻¹. Three papers were devoted to use of microorganisms for the removal of pollutants. Arvind Kumar (Banaras Hindu University) described a strain of *Pseudomonas* capable of degrading phenol as well as acrylamide. V. Mishra (Delhi University) demonstrated degradation of phenol and BHC (an insecticide) by *Nocardia* sp. and *Sphingomonas paucimobilis*, respectively. Sarita Singh (Banaras Hindu University) discussed the use of microalgae for stripping toxic metals from wastewaters. Immobilized algae and encapsulated *Microcystis* were found to have exceptionally high metal-binding abilities.

The following recommendations were made: (i) Mass awareness campaigns be launched with a larger participation of school/college students, NGOs and mass media. (ii) Conventional and biotechnological methods be adopted to save the

existing population of species listed as threatened or known to be sensitive. (iii) Management of national parks, wildlife sanctuaries and biosphere reserves be done in a more effective manner, keeping in view also the needs, aspirations and concerns of local people. (iv) Restoration of natural populations can be promoted only by acquiring information on floristics, populations, reproductive biology, genetic diversity, microclimatic condition and structure and functioning of ecosystems. Three or four multidisciplinary centers be created for training people in the above aspects. Such centers should be located at places, like the Botany Department of Banaras Hindu University, widely known for its infrastructural facilities and expertise. These centers should also be involved in mass awareness campaigns. (v) There should be greater cooperation between universities and institutes for conserving species and ecosystems. (vi) Multidisciplinary courses on conservation biology at the post-graduate level be started at select universities and

institutes including the Banaras Hindu University. (vii) Static and predictive inventories of biodiversity for various regions be prepared. Environmental 'hot spots' be identified and their biodiversity assessed. (viii) Botanical gardens for *ex situ* conservation be set up in various phytogeographical regions. (ix) Appropriate technologies be evolved for managing species diversity of small protected systems (patches). (x) Taxa which are not only threatened but have economic potential as well be prioritized. (xi) Wild relatives of cereal, fruit, and vegetable plants be conserved. (xii) Site-specific technologies be developed for rehabilitation and restoration of degraded/derelict ecosystems.

R. S. Upadhyay, J. P. Gaur and V. S. Jaiswal, Department of Botany, Banaras Hindu University, Varanasi 221 005, India.

RESEARCH NEWS

Chronobiology hits pay dirt: The identification and cloning of the first circadian clock gene in mammals

M. K. Chandrashekar

The first recorded circadian rhythm was for the 'sleep' movements of the leaves of the tamarind tree by the Greek philosopher Androstenes when he joined Alexander the Great in his march on India in the fourth century BC. Two hundred years ago Lamarck had constructed a 'floral clock' based on his knowledge of opening of flowers at different hours of day. The French astronomer de Mairan performed in 1729 a blemishless experiment in the modern experimental tradition and established that the closing and opening leaf movements of the touch-me-not plant *Mimosa pudica*, were endogenous. He removed *M. pudica* plants into a deep cave and demonstrated that the sleep movements *persisted* in the continuous darkness of the cave¹. Buening² demonstrated through means of crossing experiments that the daily rhythms in the sleep movements of the

leaves of the bean plant *Phaseolus multiflorus* were heritable, i.e. had a genetic basis. Thus, there were early and convincing leads pointing to the genetic basis for the ubiquitous circadian rhythms (from the Latin *circa* and *dies* (day) and not *diem* as most authors writing in English write, e.g. ref. 3) which characterize the behaviour and physiology of organisms from fungi to humans. It will be of much interest to the students of the history of scientific ideas that until about 1960, even to proclaim the existence of an endogenous diurnal rhythm was regarded, even by some well-known biologists, as subscribing to a mystical or metaphysical notion. It was with the symposium on Biological Clocks (1960) held at Cold Spring Harbor, New York, with E. Buening in the Chair, that an era of intensified experimental work was ushered in. Today several laboratories the world over are

working on the molecular biology and behavioural expressions of circadian rhythms. With customary foresight The National Science Foundation in the USA, has established a full fledged Center for Biological Timing. This Center brings together geneticists, molecular biologists, endocrinologists and statisticians from Brandeis University, Rockefeller University, Northwestern University and the University of Virginia.

Defining features of all circadian rhythms are (i) persistence in constant light (LL) or darkness (DD) with a *circa* 24 hour period, (ii) compensation of period in the face of changes in temperature and (iii) entrainability to LD cycles. The importance of circadian rhythms in human physiology and well-being is now widely recognized. The human circadian system is directly implicated in jetlag, shift work, space travel, sleep disorders, endogenous