possible. A newly constructed building, which is barely ready, cannot possibly have a guest room for anybody, leave alone worthy of a prime minister.

The early years of the autonomous Institute were quite stressful for Bappu, because of the intransigence displayed by some members of the Governing Council. Much to Bappu's embarrassment, a Council member from a University remarked to the effect that Bappu had a budget of 40 lakh rupees and an output of 40 research papers, meaning that each paper cost a lakh of rupees.

In 1975, the Institute's total budget was 58 lakh rupees. In four decades it has gone up to about 52 crores, a 900% increase. There is great virtue in adversity while easy money tests the mettle of the recipients. The Bappu era came to an end soon after Bhattacharyya's retirement. Bappu's bust for which subscription came from Bappu's friends, students and admirers in India and abroad and which was formally unveiled by M. G. K. Menon in the presence of Yemuna Bappu, Bappu's wife, was detached from its substantial base and shifted to an inconspicuous location inside the library.

The Institute now has a number of field stations, including a remotely controlled 2 m telescope at Hanle, Ladakh. It would be instructive to commission a scientometric study of astronomical output during the last six decades, not only from the IIA, but from other centres also, to see how trends have changed over time; how observational astronomy fares vis-à-vis theoretical studies; what percentage of observational papers are based on data taken with Indian facilities, and what is the nature of collaboration within India and overseas.

There is no gainsaying the fact that Bappu's legacy survives. He transformed modern astronomy into a vibrant collective research area. Not only was he a source of inspiration to his students and colleagues, but also served as a role model for those from other optical astronomical centres. He had consciously modelled himself after a 19th century English gentleman. There was nothing petty or crude about him. There were cleverer people around him, but he would deal with them only according to the standards he had set for himself; his angriest outburst was 'these sons of bachelors'[16].

If the author had written the biography in Bappu's lifetime and shown the manuscript to him, he would have in all likelihood beamed a charming smile at the prospective author and told him: 'I say, why don't you drop the idea'.

1. This and subsequent statements are based on personal conversations with Bappu during 1974–1982. I quote from memory and have made no effort to seek corroboration from official records or elsewhere.
2. Kochhar, R. K. and Menon, M. G. K., *Bull. Astron. Soc. India*, 1982, **10**, 275–289.
3. This was narrated to me by Bappu while he was signing a bundle of certificates to be awarded at the first staff club function. While narrating this story, he automatically began writing his name as M. K. Vainu Bappu than the usual M. K. V. Bappu. Based on personal conversations with Bappu during 1974–1982.
4. Bappu, M. K. V., *Indian J. Phys.*, 1951, **1**, 1–14. Interestingly, this and other papers were obviously sent when Bappu was in USA, but they carry his college affiliation.
5. Bappu, M. K. V., *Curr. Sci.*, 1946, **15**, 18–19; 190–191.
6. Raman Research Institute owned three telescopes: with a 5-in Bausch and Lomb lens, 4½ – in Watson lens, and 4-in Zeiss lens (personal letter from S. Ramaseshan to R. Kochhar; 16 April 1993).
7. Bappu, M. K. V., *Astrophys. J.*, 1950, **111**, 201–202.
8. The beneficiary who retired recently corroborates the narration.
9. Kapoor, R. C., *Curr. Sci.*, 2013, **105**, 116–121 discusses the question at length.
10. Huntington Library Archives, Ira Sprague Bowen Inventory, Box 18.277 A. This valuable primary source does not seem to have been tapped before.
11. Ali, A., *Mon. Not. R. Astron. Soc.*, 1954, **114**, 338.
12. Kochhar, R., *Curr. Sci.*, 2008, **94**, 813–816.
13. Muir-Harmony, T., *Globalizing Polar Science: Reconsidering the International Polar and Geophysical Years* (eds Launius, R., Fleming, J. and DeVorkin, D.), Palgrave Macmillan, New York, 2010, p. 289.
14. Kochhar, R. K., Indian Institute of Astrophysics [an official brochure]; reprinted and revised many times, 1986.
15. Satish Dhawan, Personal conversation, 1986.
16. Kochhar, R. K., *The Week*, 9–15 February 1986, pp. 22–24.

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The last five years have seen a remarkable development in high throughput technologies such as DNA sequencing and gene disruption methods that are now being used by vast majority of geneticists for addressing many genetic questions. This volume of the *Annual Review of Genetics* (*ARG*) has many articles that review the progress of genetics using these new technologies. Similar to previous volumes of *ARG*, this one has covered several areas of genetics, including population genetics, epigenetics, bacterial genetics and molecular genetics, giving a gist of overall developments in the field, during the past few years.

In spite of their implication in cancer, ageing and a number of rare genetic diseases, the sources of genome instability have not yet been studied in detail. The high frequency of externally caused DNA damage can be one of the main sources of genome instability. In this issue, Anguilera and Muse review the causes of genome instability as well as how it results in hyper-recombination, genome rearrangements, and chromosomal fragments and loss. In the related subject of genetic mutations, Nakamura *et al*. review the effect of radiation on human heredity. According to them, environmental contamination resulting from massive releases of radionuclides has caused concern over the resulting health risks from exposures to low doses of radiation.

Cancer is believed to be autonomous to a cell with mutations in tumour suppressor genes and the oncogenes leading to tumour formation. An article by Pastor-Pareja and Xu suggests that tumours are composed of different types of cells that function in tandem as complex and as tissue-level communities. Studies carried out on *Drosophila* have shed light on the social nature of these cancer cells and the interactive behaviour of these complexes of cells resulting in the generation of tumours, further elucidating the possible underlying mechanisms/pathways. Mutations in all genes do not have to be always harmful. An article by Pan shows that cells benefit from expressing these mutant proteins. Studies in yeast model system have demonstrated that frame-shift mutations in genes resulted in enhanced production of antizyme, which is required for degradation of harmful polyamines in the cell, and hence reducing cellular toxicity. How does one actually understand how these proteins end up being expressed in an organism? An interesting article by Long *et al.*, suggests that genes are either added to or deleted from the genome in a micro evolutionary process. It is believed that during new gene evolution, a protogene structure is generated first by mutation and this gene would eventually spread through the population, tested through the process of natural selection until it gets fixed. This and genetic drift result in new modifications incorporated into an organism. Proteins, thus expressed by a cell, are to be degraded or protected from degradation. Small ubiquitin-like modifiers (SUMO) play a major role in the modification of proteins and thus regulate many cellular processes. Acting synergistically to ubiquitination, SUMOylation is known to result in proteins not getting degraded. A review by Jentsch and Psakhye suggests that SUMOylation is more of a common process in targeting groups of proteins rather than individual proteins. New findings demonstrate that SUMO-interaction motifs (SIMs) present on proteins enhance SUMO binding to preassembled protein complexes (SUMO–SIM interactions), eventually resulting in delivering the desired function.

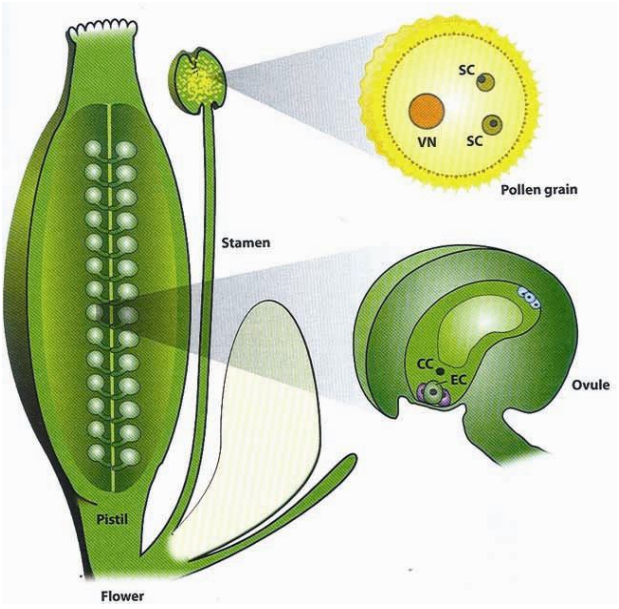
This volume of *ARG* has many articles which describe the study of genetics using next generation sequencing (NGS) technologies. Vinkhuyzen *et al*. review and compare three mixed linear model (MLM)-based whole-genome methods to estimate genetic variation, in which variation is estimated from the relationship between close/distant relatives and/or single nucleotide polymorphisms (SNPs). The authors suggest that, rather than using genome-wide data, the genome-wide association studies are more helpful in determining the role of SNPs contributing to these genetic variations. In a comprehensive outline of detecting natural selection in genomic data, Vitti *et al*. describe methods which have been used to study macro- and micro-evolution of many organisms, including humans, explain their motivations and statistical interpretations. The authors emphasize the importance of follow-up studies of investigating evolutionary history.

Archaea is a unique domain of prokaryotes, but with similarities to eukaryotes with respect to metabolic pathways and the genes involved. However, archaea detection in its habitat is possible only through molecular analysis of its nucleic acids, which also emphasizes the significance of expanding the genetic approaches required for its study. Farkas *et al*. detail numerous recent advances in genetic techniques required for understanding the molecular basis of metabolism and diversity of this abstruse third domain of life. In the field of bacterial genetics, there is a stimulating review by Mitri and Foster on evolution of social interactions in microbial communities. The genotypic view of microbial interactions suggests that cells of the same genotype will cooperate, whereas different genotypes will typically compete.

'Animal genes predate the origin of animals', is what Richter *et al*. discuss in their review by describing the genomic and cellular foundations of evolution of the hypothetical last common ancestor of all animals, Urmetazoa. The review also elucidates the reconstruction and development of the first animal, based on the genetics and genomics of its closest non-animal relatives.

Gastrulation triggers a cascade of molecular events during the fate determination and morphogenesis of fruit fly digestive tract. Lemaitre *et al*. emphasize the significance of genetic studies in the development and physiology of gut, besides summarizing the interfacial benefits of the study in diverse fields of human interest.

RNA is involved in nearly everything in a cell. It carries out a broad range of functions, from translating genetic information into the molecular machines and structures of the cell to regulating the activity of genes during development, cellular differentiation and changing environments. Every year researchers are identifying new roles of RNAs in cellular processes. This volume of *ARG* samples the RNA biology in a few chapters. Popp and Maquat have effectively covered the latest research over non-sense mediated mRNA decay pathway, comparing it with the protein quality control pathway



Gametophyte development in plants. Gametophytes develop in flowers.

in mammals. The review gives a clear concept of these pathways, side by side, explaining the mechanism of detection, tagging and destruction of defective polymers (protein and mRNA). A relatively new field of research, bacterial small RNAs (sRNAs), has been reviewed by Bobrovskyy and Vanderpool. They explain the basic characteristics and functions of sRNAs in the regulation of metabolism in bacteria. Another review on RNA editing in plants by Takenaka *et al*., focuses on the RNA editing process in terrestrial plants, where this is an essential step of RNA maturation in mitochondria and plastids.

The genetics, function, structure and mechanism of RNAase III, a global regulator of gene expression in *Escherichia coli*, important for the maturation of ribosomal and other RNAs, has been described in detail by Court *et al.* They have examined how RNAase III, the endonuclease, is autoregulated in response to growth and other factors and how it controls the expression of genes. The authors conclude discussing the different modes of dsRNA processing and give details on the factors that uncouple RNA-binding and processing activities. This article is an informative source for newbies.

Ageing, known to be regulated by various mechanisms, has shed light on the role of bacteria. A report put together by Kim from the findings in *Caenorhabditis elegans* has underlined the role of microbial environment in ageing and longevity. The basic criteria, which have been suggested to play a role in the ageing of *C. elegans* are: (1) bacteria available as food source regulate ageing and longevity; (2) these bacteria infect the host and thus induce stress responses, thereby resulting in toxicity-mediated ageing and cell death and (3) regulation of neuronal activity that results in activation of endocrine signalling pathways that in turn playing a role in longevity of the organism.

This volume of *ARG* summarizes significant developments which occurred in the field of genetics over the past few years and is an informative source for geneticists working in all sub-fields. Every aspect of genetics, be it classical or molecular genetics, be it genetic interaction or reproduction, be it gene regulation or mutation has been reviewed and discussed in this volume, making it an ideal guide for researchers. Elaborate discussions of the underlying mechanisms, methods, conclusions, summaries, open questions and future challenges in each chapter will help geneticists incite thought-processes that would foster innovative research in this scientific field. This volume provides comprehensive reviews with topics ranging from gene functions to their significance, underlying mutations of proteins to their expressed disease states providing insights into unknown mechanisms and new methodologies, which will be helpful for practical applications such as drug design, as well as for persisting research in the field.

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PERSONAL NEWS

Parthasarathy Ganguly (1942–2014)

Parthasarathy Ganguly, a distinguished solid state chemist who worked at the Indian Institute of Technology (IIT), Kanpur; Indian Institute of Science, Bangalore, and later at National Chemical Laboratory, Pune passed away on the night of 6 May 2014 following a massive heart attack. He was an unconventional chemist. The moment he met someone whose work he followed, Ganguly would straightaway start discussing his ideas on that work. Invariably, newer ideas emerged. He was a unique person, always thinking and sometimes floating new ideas.

Ganguly, born on 20 January 1942 at Hooghly, West Bengal, had his early education in Chennai, where he obtained his M Sc and Ph D degrees from Loyola College. He worked with Father Lourdus Yeddanapalli at Loyola College in 1971 in the area of heterogeneous catalysis. After his Ph D, Ganguly moved to the Chemistry Department at IIT Kanpur and joined C. N. R. Rao as a Research Associate. When Rao moved to IISc in November 1976 to start the Materials Research Centre (MRC) and the Solid State and Structural Chemistry Unit (SSCU), Ganguly came with him to Bangalore and started setting up research facilities to study solids. A year later, he became a faculty member and continued working in SSCU until 1990, when he left for NCL to head the Physical Chemistry and Materials Chemistry Division. He also served as Chairman of SSCU before leaving for NCL. Ganguly retired from NCL in 2002 and continued as a CSIR Emeritus Scientist for five more years. After retirement, he settled in Pune.

At IIT Kanpur, Ganguly worked with C. N. R. Rao on perovskite oxides having general formula ABO_3 and oxides having K_2NiF_4-related structures. Because of his deep involvement in solid state chemistry at Kanpur, Ganguly moved with Rao to IISc. Ganguly was the first faculty member of SSCU recruited by Rao. He was primarily responsible for setting up research facilities to study solids at SSCU, such as high temperature furnaces, Gouy balance and Faraday balance magnetometers to study magnetic properties, electrical conductivity measurements (both high and low temperature), thermopower measurements,