

EDITORIAL

The issue (*IJHS*, 49.4, 2014) contains a bunch of a seminar papers presented at the IISER, Mohali, organized under the guidance of its Director, N. Sathyamurthy, a well-known theoretician in chemistry and molecular reaction dynamics, in November 2013. The papers are all peer-reviewed as per norms of *IJHS* and accommodated giving an account of history of chemistry and researches in chemistry in the 20th century India. The picture is by no means complete. A complete picture will emerge after several such publications are attempted and brought out.

Indian subcontinent is one of the oldest civilizations and its heritage in alchemy, iatro-chemistry and chemical studies & researches is quite vast and wide. Acharya P.C. Ray in his *History of Hindu Chemistry* has given an account of ancient and medieval alchemical and iatro-chemical traditions with extracts from major texts. It is shown how it came into practice initially in connection with the preparation and search for herbal medicine for rejuvenation and prolongation of life, and subsequently how gold as a medicine of immortality, and mercury (*rasa*) & mercury compounds (sulphide) as drugs for rejuvenation and longevity were recognized and flourished through the process of transmutation (of baser metals into gold and silver) in the Tantric and *Rasāyana* traditions. These involved a large number of alchemical processes like extraction of zinc, purification of mercury and copper, preparation of crystalline red sulphide of mercury (*svarṇasindura* or *makaradhvaja*), a medicament which is still used by the physicians as a panacea for almost all diseases. The texts also contain the names of more than two dozen varieties of apparatus (*yantras*) for carrying out various physio-chemical processes like distillation, sublimation, extraction, calcination, digestion, evaporation, filtration, fumigation, fusion, pulverization, preparation of metals and metallic compounds, heating by steam, heating by sand etc for preparation of drugs and their application to medicine (iatro-chemistry). A list of manuscripts on *Rasāyana* and other texts with details on their editions, translations and commentaries has also been added in this issue to show the range and distribution of this tradition.

The 20th century chemistry world-wide has however advanced greatly and grown at an exponential rate. The growth remained not as an extension of the scale of operations, rather it has developed newer techniques, newer theoretical approaches and newer insights coupled with revolutionary break-through having wide applications and implications. During the last few decades, the inorganic chemistry as the chemistry of mineral kingdom, organic chemistry with focus on carbon compounds providing alone thousands of multifarious combinations, the physical chemistry dealing with the study of physical changes in chemical reactions and physical properties in chemical compositions, and so on have developed systematically. With increasing specializations, newer sub-disciplines like organometallics, polymer chemistry, agricultural chemistry, spectroscopy, nuclear chemistry, electrochemistry, enzyme chemistry, transition metal chemistry, cosmo-chemistry, chemistry of the solid state and others are added. The branch of biochemistry dealing with life processes with rapid progress in the field of synthesis of genes and possibilities of even genetic engineering has grown into an independent science creating hopes as well as fear for humanity for the risks and hazards involved.

In India the professional work in chemistry started actually with Acharya P.C. Ray who published his first research paper on *Mercuronitrit* in Germany in 1876. Some informal articles were however published before him by Piddington (meteorologist cum mineralogist, Secretary Agri-Horticultural Society of Bengal), O'Shaughnessy (a medical man serving as professor of chemistry in Medical College, Calcutta), and others. The pioneer researches of P.C. Ray and his pupils at the Presidency College, Calcutta, however created a spirit of enquiry in the 20th century among young chemists. The need for scientific research gained wider recognition in India due to the efforts of the Indian Science Congress (1914), and Indian Chemical Society (1924) through its Quarterly Journal, now known as *Journal of the Indian Chemical Society*, with P.C. Ray as its founder president. The first Science Congress in 1914 recorded only eight papers in chemistry which shows a tardy rate of progress at the initial stages, which alone however raised to 400 in

1973, beside others. The research work in chemistry, as in all other disciplines, received encouragement after Independence but even then the fundamental research work in pure chemistry continues to be main responsibility of the post-graduate colleges and universities, and a few other institutions. As regards chemical industry and planned research is concerned, the pre-Independence days witnessed the growth of organizations like the Bengal Chemical and Pharmaceutical Works in Calcutta (1901), Calcutta School of Tropical Medicine (1914, originally affiliated to CU, now attached to University of Health Science), and the Institute of Nutrition, Coonoor (1918, later shifted to Hyderabad in 1958 and renamed as National Institute of Nutrition), and All India Institute of Hygiene and Public Health, Calcutta (1932). The Cotton Technological Laboratory in Bombay (1924), the Lac Research Institute at Ranchi (1924) and the Institute of Sugar Technology at Kanpur (1936) are examples of Institutions intended for solving problems of scientific industries. The number of institutions have however grown from 18 in 1947 to about 115 in 1978 with emphasis on two broad segments—organic industries dealing with petrochemicals, drugs, cosmetics, agrochemicals etc, and inorganic comprising alkalis, dyes, dyestuffs. Concerted efforts were also made after Independence in this direction by CSIR (about 30 laboratories and 10 co-operative industrial research associations) and BARC (Chemistry Division). The major urge was mostly given to the development of self-reliant processes in addition to carrying out relevant researches of a high caliber. The objectives were oriented also to support research efforts in universities and IIT's and to establish an informal

link between educational institutions and the industry. The Department of Science and Technology urged from time to time through various study groups to assess the future needs of the country and take corrective measures for shortage of food, newer technologies, essentials for meeting requirements of metals & materials, chemicals etc. and in the process recommending further researches in chemistry.

Chemistry has now emerged as the school of chemical science, the main emphasis of modern chemistry is now focused on structure, dynamics and synthesis. This has made it unique, quite different from biology and physics. This thematic issue has given emphasis on structure and this approach has made a great headway to the solution of many a pressing problem making chemists a largest body of professionals. Thousands of chemicals have also been synthesized based on different models, and of these a few may be effective for a particular disease. Similarly among hundreds of chemicals so synthesized, only one chemical may be effective as a good insecticide. Likewise, a large number of antibiotics, chemotherapy, drugs useful in medical treatment have been synthesized by chemists. This is true in every area, whether it be energy, food and new materials. However a lot more is required for the development of new areas, new technologies, and interfaces of new science in Indian chemistry.

We are indeed thankful to Kavita Dorai and N. Sathyamurthy of IISER Mohali, the guest editors, for their excellent cooperation and to all contributors & reviewers for making this issue so exciting.

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