

28 February, 2022

Issue No: 07

HERscope

Vol: 01

## Fellows of the Royal Society from Punjab

## KS Bawa: Preserving the Biodiversity



Kamaljit Singh Bawa is a Distinguished Professor of Biology at the University of Massachusetts. Boston. He has worked extensively studying issues related to the biodiversity and conservation of the Himalayan region.

Dr Bawa was born on 7 April, 1939 in Punjab. He obtained his B.Sc., M.Sc. and PhD - all from Panjab University, though the departments were not yet functioning from Panjab University, Chandigarh at the time. Dr Bawa pursued his B.Sc. from Khalsa College. Amritsar, which was then a part of Panjab University. Since the Department of Botany at Panjab University was working out of Khalsa College, Amritsar, Professor Bawa completed his M.Sc. from there as well. The University of the Punjab, established in 1882 at Lahore, post-partition, was split with campuses only on the Pakistani side of Punjab. Hence, it was deemed necessary by the Indian government, particularly by the government in East Punjab, to bring in an ordinance to establish a new university on September 27, 1947. In the early years, some departments of Panjab University, operated from colleges spread across different parts of North India.

In 1967, he went to the United States as a postdoctoral research associate and instructor at the School of Environmental and Forest Sciences,

University of Washington. In 1973, he received a fellowship to work at Grey Herbarium at Harvard University (1973-1974). He, subsequently, went on to join the faculty of the University of Massachusetts.

Today, Professor Bawa is an internationally renowned evolutionary ecologist and conservation biologist. He is the author of over 200 academic papers, author/editor of eleven books, monographs or special issues of journals. He has published two coffee table books, Sahyadris: India's Western Ghats – A Vanishing Heritage (2005) and Himalaya: Mountains of Life (2013).

He is an editor-in-chief of Conservation and Society, associate editor of Ecology and Society: A Journal of Integrative Science for Resilience and Sustainability and academic editor of PLOS ONE. He has been, over the years, member of other prestigious editorial boards as well. He has headed/ served on a number of scientific panels/ governing board of several national and international organisations.

Professor Bawa is the Founder President of Ashoka Trust for Research in Ecology and Environment (ATREE), Bangalore. He has been a Charles Bullard Fellow at Harvard Forest (1972 & 2009), Maria Moor Cabot Fellow (1973), Guggenheim Fellow (1987-88), a Pew Scholar in Conservation and the Environment (1992) and a Giorgio Ruffolo Fellow (2009) in Sustainability Science at Harvard's Centre for International Development. He is an Honorary Fellow of the Association for Tropical Biology and Conservation, National Academy of Sciences, India, and American Association for the Advancement of Science (AAAS), American Academy of Arts and Sciences, the Royal Norwegian Society of Letters and Sciences, Royal Society, ... Continued on page 3



#### **Dimple Bhatia**

Indira Nath, born on January 14, 1938, was an influential scientist who served as a role model and inspiration to the scientific community. She received her M.B.B.S. from the All India Institute of Medical Sciences (AIIMS) in 1961, as well as her M.D. in Pathology from the same institution in 1969. She was a Nuffield Postdoctoral Fellow (1971) at the Royal College of Surgeons and National Institute for Medical Research, London, UK. Nath was also awarded an honorary doctorate - Docteur Honoris Causa - in 2003 by the Pierre and Marie Curie University, Paris, France. In 1972, she joined AIIMS as faculty in the Department of Biochemistry (1972-80) and later switched to Pathology (1980-86). Though the shift gave her a new set of service responsibilities, her dedication to immunology remained unchanged. She was awarded Membership of the Royal College of Pathologists (MRCPath) in 1983. This also initiated her long scientific association with late Professor John Turk at the Roval

### College of Surgeons and late Dr R. J. W. Rees at the National Institute for Medical Research, London. Nath was best known for her work in immunology of infectious diseases, especially the immunology of leprosy. Her contributions were recognized both in India as well as across the world as they included valuable insights into the unresponsiveness of stable lepromatous leprosy patients towards the bacillus, a specific kind of immunological blindness. Another important contribution was the identification of the LSR2 gene and characterization of the critical residues/ motifs of the LSR2 protein recognized by patients in reaction. Leprosv reaction is a condition characterized by a heightened inflammatory response which results in tissue damage, especially nerve damage, triggered by chemotherapy. In some cases, it occurs even after the completion of treatment. After formal superannuation in 1998, Indira Nath continued as the INSA S.N. Bose Research Professor at AIIMS (1998-2003). A brief stint as Dean, School of Medicine, Asian Institute of Medical Sciences and Technology in Sungai Petani, Malaysia was followed by her appointment as Director, Lepra Society-Blue Peter Public Health Research Centre, Hyderabad (2006-2008). She became Emeritus Professor and Raja Ramanna Fellow, National Institute of Pathology (ICMR), New Delhi from 2009. Her civilian awards include Padma Shri (1999) and Chevalier le Ordre National du Merite (Knight of the National Order of Merit) in 2003, a civilian honour decreed by the then President France, Jacques Chirac. Indira Nath was a trailblazer and a role model for women in science.

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**Guest Column** 

## INDIRA NATH: A Trailblazing Immunologist

## Science as a Knowledge System



#### Amitabh Joshi

In most ancient civilizations, including India, there is discussion considerable about present-day science versus traditional systems of

knowledge. These discussions (b) their readiness to challenge how we study facts and infer than uncritical belief. However, are often emotionally charged accepted explanations, (c) their explanations from them. Science the other unfortunate side and affected by socioreliance on plausible arguments is, therefore, more about how of these very successes is a political beliefs. When hard versus empirical support, and we conceptualize explanations tendency to dismiss alternative (d) their relative reliance upon positions are espoused in such about real world phenomena, knowledge systems as 'useless' debates, some fundamentally scepticism and rationality. 'meaningless' and test them empirically, or without carefully studying or analysing nuances important and In this perspective, present-day rather than merely being the body of knowledge that results them. The irony is that such an distinctions get lost and it is science is characterized by an acceptance that understanding these that I wish to address. from making, testing, and a priori dismissal of alternatives In my view, the crucial distinction is provisional and will be revising our conceptualizations. is fundamentally unscientific and between any two knowledge modified in the face of new The many successes of presentis, moreover, a form of hubris. empirical evidence, or new systems is not whether one is day science, which permeate No doubt, some aspects of old and the other new. Rather, conceptualizations that garner almost every aspect of our traditional knowledge systems lives, are largely because of empirical support. Science is, be rejected without the relevant distinctions need to can thus, both rational, and sceptical rigorous empirical be drawn around the following its reliance on scepticism and testing, of arguments from authority rationality rather than accepting questions: do the systems simply because they violate differ in (a) whether or not or antiquity. More importantly, explanations based on antiquity many tenets of our present science is not a collection of they believe understanding or or authority, and giving primacy ... Continued on page 2 knowledge to be provisional, to continued questioning rather facts but rather a process of

	•	Atomic energy: ਪ੍ਰਮਾਣੂ ਊਰਜਾ	٠	Fibrous: ਰੇਸ਼ੇਦਾਰ			
TECHtionary	•	Explosive: ਵਿਸਫੋਟਕ	•	Observatory: ਰਸਦਗਾਹ			
				·		Curated: Alisha K	Caushik
					(Courtesy: Takniki Shabdavali,	Punjabi University,	Patiala)



## An Ode to Science

## "The Secret of the Machines" (Modern Machinery)

## Rudyard Kipling

We were taken from the ore-bed and the mine, We were melted in the furnace and the pit We were cast and wrought and hammered to design, We were cut and filed and tooled and gauged to fit. Some water, coal, and oil is all we ask, And a thousandth of an inch to give us play: And now, if you will set us to our task. We will serve you four and twenty hours a day!

But remember, please, the Law by which we live,

We are not built to comprehend a lie, We can neither love nor pity nor forgive. If you make a slip in handling us you die! We are greater than the Peoples or the Kings Be humble, as you crawl beneath our rods!

Our touch can alter all created things, We are everything on earth—except The Gods!

Though our smoke may hide the Heavens from your Eyes, It will vanish and the stars will shine again, Because, for all our power and weight and size, We are nothing more than children of your brain!

(*A Choice of Kipling's Verse*: Made by T.S. Eliot, Faber and Faber Ltd., 1973, pp 293-294, lines 1-8, 37-48.)

## Wonders

### Tarun Kumar

The Department of Pharmaceutical Sciences and Drug Research was inaugurated on November 24, 1995 by S. Harcharan Singh Brar, the Chief Minister of Punjab. The establishment of this Department was an endeavour of Dr Joginder Singh Puar, the then Vice-Chancellor of Punjabi University with the vision of opening research avenues, training and educating Punjabis at the graduate, postgraduate and doctoral levels in the field of Pharmaceuticals. The Department is duly approved by the Pharmacy Council of India (PCI) and All India Council of Technical Education (AICTE). By maintaining a high level at h-index of ten, the Department has a huge impact with 900+ publications on various national and international journals like the Journal of Alzheimer's Disease, International Journal of Pharmaceutics, European

Journal of Pharmaceutical Sciences, Carbohydrate Polymers. According to a survey in 2021 conducted by NIRF under the Ministry of Education, Government of India, the Department ranked second in Punjab and eighteenth in the country. In the last twenty-seven years, the Department has added many feathers to its cap, including a number of enlisted U.S. and European patents. Recently, a faculty member, Dr Vikas Rana successfully patented a lubricant for drv eve disease. Due to this productive research work, the Department is granted financial assistance under the Fund for Improvement of Science & Technology (FIST) Scheme of the Department of Science and Technology as well as SAP-I (2009-14) and SAP-II (2015-20) Scheme of the University Grants Commission. The thrust area of the Department includes the Pharmacology division which is engaged in studies on new target sites in Epileptology, Neuroprotection, Ischemia, Ischaemic myocardium, **Diabetes-induced** Neuropathy Biochemical Pharmacology and of Memory. Pharmaceutical Chemistry group is involved in the design (QSAR studies) and synthesis of nonpeptide angiotensin receptor antagonists, insulinsensitizing agents and anti-adhesion molecules. Work on stress-testing and degradation studies on drugs also forms a part of the research pursuits of this Group. The Pharmacognosy division is pursuing research related to phytochemical investigations on anti-anxiety and anti-diabetic drugs. Research interests of Pharmacy Practice division include assessment of anti-arthritic drugs, cardiovascular dysfunction and diabetic complications in patients. New leading target areas are in ischemic myocardium, spermicidal dosage (birth control), neuropathy, QSAR studies. cardiovascular dysfunction etc. The students of the Department are working as scientists and professors in India as well as in foreign universities/ institutes/companies, as managers companies in pharmaceutical and consultancies; as directors in other senior positions in various government-related departments. More importantly, many students are successful entrepreneurs as well.

## Guest Column ... Continued from page 1

## Science as a Knowledge System

knowledge and hence are no longer plausible though they might have been very plausible when they were proposed.

Other aspects of traditional knowledge systems that do not fundamentally violate basic tenets of present-day understanding should be examined rigorously and in detail, rather than being summarily rejected. We should bear in mind too that much that would have been

unexplainable without recourse to supernatural powers just a few centuries ago, is today explained at a purely material level. For example, in a very evocative scene in the Hindi movie *Mirch Masala*, uneducated villagers are convinced, upon hearing a gramophone record being played, that their sahib has imprisoned a spirit in that small box and can force it to sing on command.

Unfortunately, the way we often

teach science as a collection of facts or explanations that should be accepted 'on faith', without much questioning, is itself denying science its unique approach and strength.

(The author is an evolutionary biologist, geneticist and a Professor at Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR), Bengaluru.)

Iconoclast

## Musa al-Khwarizmi: An All-rounder Par Excellence

# At the Forefront of Drug Research

#### **Parvinder Singh**

One of the greatest minds of the early mathematical production in Arabic was Abu Abdullah Muhammad ibn Musa al-Khwarizmi (circa 780 - 850) Khwarazm, Persia who was a mathematician and astronomer as well as a geographer and a historian. Al-Khwārizmī worked at, and then became director of, the House of Wisdom in Baghdad, in modern-day Irag, which was the capital of the Islamic empire at the time. At this centre of scientific research and teaching, he oversaw the translation of many major Greek and Indian mathematical and astronomy works into Arabic. The terms algebra and algorithm are derived from al-Khwārizmī's name and his work. The word algebra comes from al-jabr in the title of a landmark book he wrote in about AD 820, al-Kitāb al-Mukhtasar fī hisāb al-Jabr wa'l-Muqābalah, or The Compendious Book on Calculation by Completion and Balancing. The book introduced fundamental methods for solving equations and established the discipline of algebra. Influenced by the translations done in the House of Wisdom, al-Khwārizmī came to see the great potential of the Hindu numerical system. His work on



arithmetic using one to nine and the number zero was ultimately responsible for introducing what we now call Hindu-Arabic numerals or Arabic numerals, first to the Islamic world and then to the Western world. The other area that al-Khwārizmī produced significant

works in was geography. His Kitāb sūrat al-ard (The Image of the Earth; and often translated as Geography), essentially covered the world as it was known then. Supervising some seventy geographers, he revised and expanded Egyptian polymath Ptolemy's earlier work on geography to cover the coordinates of some 2400 places throughout the world, particularly around the Mediterranean Sea and cities in Africa and Asia, including lists with latitudes and longitudes, cities, seas, mountains, islands and rivers. The works that al-Khwārizmī conducted went far beyond maths. He made important contributions to astronomy, developing the first quadrant for determining the time by observing the sun or stars. He compiled a set of astronomical tables, known as Zīj al-Sindhind (Astronomical tables of Siddhanta). based on many Hindu and Greek sources, and covering aspects including calculating the positions of the sun, moon and planets, and when eclipses would happen.

(Source: www.newscientist.com/people/muhammadibn-musa-al-khwarizmi/)



## Archives

Jyotsna Bharti

## **CURIEtherapy: Breaking Barriers**

## Do you Know?



## C. V. Raman (1888-1970)

Sir Chandrasekhara Venkata Raman, FRS (1924) was born on 7, November 1888. He was interested in optics and acoustics. He worked on Indian musical instruments such as the Mridangam and the Tabla to understand how different notes are produced.

He discovered that when light interacts with material, it gets scattered in different directions and small portions of this scattered light change their wavelength. This indicates that there is exchange of energy between Photons (Light Particles) and atoms or molecules of the material. This phenomenon is known as 'Raman Scattering' and the effect is known as the 'Raman Effect'. It was Raman who accurately explained that the colour of the sea is blue because of elastic scattering of light reflected from the sky. This came to be known as the Raman Effect.

He was awarded the Nobel Prize in Physics for his work in 1930, making

Marie Curie is a famous scientist who paved the way for nuclear physics and cancer therapy through her discovery of radium. She is one of the select few to have won two Nobel Prizes in different fields. In 1903, Marie Curie was iointly awarded the Nobel Prize in Physics with Pierre Curie and Professor Antoine Henri Bacquerel. For her remarkable contribution in the field of Chemistry, she received the Nobel Prize in the year 1911. Marie Curie was the first woman to win this prestigious award. Throughout her life, Marie Curie worked for the advancement of Chemistry. She discovered the elements radium and polonium, and became famous for her research in radioactivity. Curie was born in Warsaw, Poland on November 7, 1867 as Maria Sklodowska. A brilliant student, she always nurtured the dream of making a career in science. But in those days a scientific career was inconceivable for a woman. So in 1891, Maria went to Paris to study at the Sorbonne.

Later, she would become the first woman appointed to teach there. While in France, she adopted the French spelling of her name, Marie. In 1894, she met her future husband Pierre Curie. He was a freethinker, taught physics at University of Paris and was acknowledged for his work on crystallography and magnetism. They married in 1895. During the early years of their marriage, the couple had to face difficult financial conditions. In spite of these hardships, Marie and Pierre Curie teamed up to conduct various scientific researches. In 1897, Marie Curie decided to get a physics doctorate. During that period, Antoine Henri Becquerel, the French physicist, was studying X-rays. He had recently observed that uranium salt left an impression on a photographic plate in spite of its protective envelope. The Curies began to research the characteristics of uranic rays, a pioneering research for the source of radioactivity. Together, they demonstrated in a major discovery that radioactivity was not the result of a chemical reaction but a property of the element or, more specifically, of the atom. Marie then studied pitchblende, a uranicmineral, in



which she measured a much more intense activity than is present in uranium alone. Marie noted that another substance, thorium, was radioactive.

The Curies announced the existence of two new chemical elements. The first they named as "Polonium" after Marie's native country; and the other was named as "Radium" from its intense radioactivity. However, the Curies had to face problems in obtaining advances or loans. They were advised to patent the radium isolation process, which would have secured them financially. But Marie and Pierre Curie refused to file a patent application. For these dedicated researchers, more than their own financial security it was important to enable any scientist, French or foreign, to find applications radioactivity. Meanwhile, for Pierre tested radium on his skin. It caused a burn, and then a wound, thus proving its effect on man. Soon radium was being used to treat malign tumours. Thus was born 'Curietherapy'. In 1903, Marie became the first woman in France to complete her doctorate. The same year, Pierre Curie, Marie Curie and Professor Antoine Henri Bacquerel were jointly given the Nobel Prize in Physics. Marie Curie became the first woman to be awarded a Nobel. The Curies were held in high esteem and admiration by scientists throughout the world. But Pierre's sudden demise in 1906 left Marie in shatters. Yet she did not lose heart and continued her work on radioactive elements. Very soon, she took up the position which her husband had finally obtained at the Sorbonne. Thus,

Marie Curie became the first woman to be appointed Professor at the Sorbonne. However, she also had to fight the prejudices of her day. She had to face the hatred of foreigners and sexism. In 1911, she was honoured with a Nobel Prize for Chemistry. Marie Curie soon realized that true joy lay in the ease of human suffering.

To fulfil her humanitarian wish. Marie helped establish the Radium Institute by the University of Paris and the Pasteur Institute in 1914. She was the first director of the Radium Institute. Marie now came to be known as Madame Curie. Then the First World War broke out. Marie instantly donated her and her husband's gold Nobel Prize Medals for the war effort. X-rays would help to locate shrapnel and bullets, and facilitate surgery, Marie thought. So she pushed for the use of mobile radiography units for the treatment of wounded soldiers. These units were powered using tubes of radium emanation, a colorless, radioactive gas given off by radium, later to be identified as radon. Marie personally provided the tubes, derived from the radium she purified. It was also important not to move the wounded, so she created X-ray vans. She also went on to provide equipment for hospitals. The only protection at that time was a metal screen and fabric gloves. It was important to convince reticent doctors and find well-trained manipulators. Marie efficiently trained 150 female manipulators. In her later years, she was to become disappointed by the myriad physicians and makers of cosmetics who used radioactive material without precautions. Marie Curie was one of the most significant researchers of radiation and its effects. All through her life, she had been exposed to incredible levels of radiation. By the onset of 1934, she was completely exhausted and almost blinded. Finally, on July 4, 1934, Madame Curie died of leukaemia. It was believed to be caused by exposure to radiation involved in her research. After her death, the Radium Institute was renamed the Curie Institute in her honour.

him the first Indian or Asian to receive the Prize in any branch of science. Among other things, the Raman Effect and Raman Spectra are used to study the properties of materials and their chemical composition. He was knighted in 1929 and awarded the Bharat Ratna in 1954. India celebrates National Science Day on February 28 to commorate the discovery of 'Raman Effect'.

(Sources: www.nobelprize.org/ prizes/physics/1930/raman/ biographical/ www.optica.org/en-us/history/ biographies/bios/c-v--raman/)

**Curated: Aryan Chugh** 

Fellows of the Royal Society from Punjab .. Continued from page 1

## KS Bawa: Preserving the Biodiversity

London.

Dr Kamaljit Singh Bawa's research on the conservation of forests includes the development of a new class of DNA markers (microsatellites) of tropical trees. These DNA markers are proving useful in studying the effects of deforestation and forest fragmentation on genetic diversity of tropical forests today.

(Courtesy: S.K. Sahni and R.K. Kohli eds., *Sparkling Punjabi Scientists*, SLM Publishers, 2018. www.pewtrusts.org/en/projects/ marine-fellows/fellowsdirectory/1991/kamaljit-bawa) (Courtesy: *Marie Curie*, Spider Books, 2012.)

HERscope ... Continued from page 1 INDIRA NATH: A Trailblazing Immunologist She saw herself as a scientist, first and foremost. She passed away on the night of October 24, 2021. (Source: Personal Interview by Subrata Sinha & H. Krishna Prasad, *Current Science*, Vol. 121, No. 11, 10 December, 2021.)



## Quiz

- Which principle is used for making Hydrogen bomb?
- 2. Who discovered properties of zero for the first time?
- 3. How can we determine the age of trees?
- 4. If each body have gravity then why earth is not moving towards us but we are moving towards it?
- 5. Which was the first transgenic animal?

Only the first three (3) respondents will be aptly rewarded.

Submit your answers on: daljitami@ pbi.ac.in

Curated: Radhika

## Science on Reel

## "Oppenheimer Vs Heisenberg" *American Genius,* Episode 7

Starring: Ryan Wesley Gilreath and Yosef Pobloski

American Genius is a documentary series focussing on the lives of famous inventors and scientists. In this series, things heat up between two great physicists, J. Robert Oppenheimer and Werner Karl Heisenberg, as they race to the make first atomic bomb. Aired on *National Geographic* on June 22, 2015, the episode covers different aspects of the discovery, the politics of World War II and the devastating consequences of man's deadliest invention of all time.



## Rocket Boys, 2022

Starring: Jim Sarbh and Ishwak Singh

A web series, *Rocket Boys*, based on the lives of two of India's greatest visionary scientists: Homi J Bhabha and Vikram Sarabhai, is currently being aired on *Sony LIV*. It has been created by Nikkhil Advani and directed by Abhay Pannu.



Curated: Rumanipreet Kaur

# **Photo Gallery**

Glimpses of Activites at Punjabi University Campus and Constituent Colleges during Science Week



Editor: Daljit Ami

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Courtesy: The required material for the print version has been made possible by the Tarksheel (Rationalist) Society, Canada.

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