

recombinant proteins lay in the future. As a bystander, witnessing the growth of the discipline, I can testify to the heroic efforts made to raise funds for equipment, negotiate a bureaucratic maze to place equipment orders and to create local conditions to maintain sophisticated equipment, when even air conditioners were a rarity. The structure determination of peanut lectin, which he accomplished in close collaboration with his biochemist colleague, A. Surolia, in 1985, marks a milestone in the history of crystallography in India. As the discipline grew in India, with new centres establishing facilities, Vijayan describes with evident satisfaction a presentation on macromolecular crystallography made to the Science and Engineering Research Council of the Department of Science and Technology: 'Macromolecular crystallography in India now is more than a gleam in the eye'.

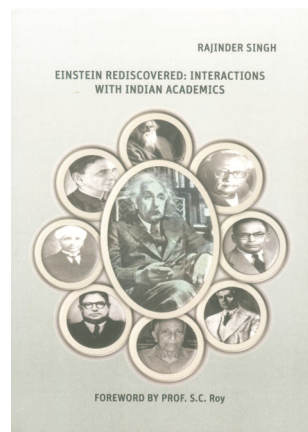
Vijayan narrates his memories of the early, turbulent, years of the department he joined, Molecular Biophysics Unit (MBU), established by GNR, with a vision to develop a new discipline, what would in time come to be known as, Structural Biology. In his later years, GNR was pleased that his expectations of the young men he recruited had, in large measure, been realized. Critical to the growth and development of MBU in the post-GNR years was Vijayan's unbounded energy and enthusiasm. By the mid-1980s a new talent was visible in Vijayan, one that comes through exceptionally well in his telling of the story. He welcomed and enjoyed administrative responsibility, bringing his considerable energies to the solution of institutional problems, of which there is no shortage in India's large institutions. In the period between the mid-1980s and his eventual formal retirement in 2004, Vijayan was involved in a multitude of activities both in IISc and elsewhere as the scientific establishment in India grew in size and scope.

In all successful careers, there are times of disappointment, of hopes dashed. Vijayan recounts, without rancour, the events of 1998, when he was passed over for the Directorship of the institution he loved, IISc. He was the clear front runner for all those inside the institution. Yet, when the time came he was ignored. His reaction to this event demonstrated both his loyalty and commitment to IISc and also the strength of

his personality, that permitted him to not only continue to serve the institution, but also to practically run the organization as the second in command. His remarkable memory for the many institutions he has been associated with testifies to the depth of his involvement, when assigned responsibility. His writing reveals not only his obvious enjoyment when confronted with protein structures, but also his great degree of comfort with academic administration. His devotion to the cause of science in India is clearly evident even in his recent writings in this journal, where he makes impassioned pleas for support of basic science by funding agencies, which increasingly demand unrealistic promises of instant translation to useful products. Vijayan's career spanning the years from the early 1970s to the first two decades of the 21st century has been a very important period in the growth of science in post-independence India. Vijayan has been an influential figure in Indian science over the decades. His story is one worth telling and certainly one that should be read.

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**Einstein Rediscovered: Interactions with Indian Academics.** Rajinder Singh. Shaker Verlag GmbH, Am Lagen Graben 15a, 52353, Düren. 2019. xii + 163 pages. Price: 21.90€/27.40CHF.

The name Einstein has turned out to be almost like a dictionary word over various communities, scientific and otherwise. Being one of the great pillars of

modern physics and generally science, Albert Einstein had been approached by academicians all over the world to resolve their scientific issues and/or otherwise. The Indian community was also in touch with Einstein on various occasions. The book under review deals with this topic.

The book is particularly relevant at present, when many Indians are involved with the verification of gravitational waves, one of the most important outcomes of general relativity proposed by Einstein, which was confirmed observationally only in 2015–2016. Generally when the topic of Einstein and Indian science is brought in, the Bose–Einstein statistics is triggered in academicians' minds. The author, however, in this slim and concise book particularly aims to uncover Einstein's interaction and association with other Indians. It attempts to remove the myth that apart from S. N. Bose (hereinafter SNB), Einstein's association with Indians means that with politicians Mahatma Gandhi, Jawaharlal Nehru, and literature Nobel laureate Rabindranath Tagore (hereinafter Tagore), and so on. The book is timely, when we are not too far from 100 years of general relativity and discovery of gravitational waves. I find it a beautiful contribution with a nice writing skill. This is quite informative too. I however have some doubts and disagreements as well.

I proceed summarizing author's description and narrating my own view on the respective matters. The author begins by recalling Einstein's help to an Indian who was in a personal crisis. Aurobindo Mohan Bose (hereinafter AMB), who was incidentally nephew of famous scientist and academician Jagadish Chandra Bose (J. C. Bose), while in Germany had faced personal problems including financial issues. AMB had translated Tagore's poems and from his correspondence with Einstein it is evident that he had personal contact with Tagore. All the correspondence imply his very personal association with Einstein. However, given that AMB was also nephew of J. C. Bose and associated with Tagore, one wonders if Einstein allowed such a private relation because of AMB's personal background.

Next is the famous Einstein–SNB correspondence. However, as the main theme of the book is Einstein's correspondence with other Indians, the author has kept this part relatively brief.

Nevertheless, the author has raised some related issues and analysed them. One question keeps coming up whether Einstein betrayed SNB regarding the spin of photon which SNB originally included in the calculation, though not in the same physical spirit as it finally turned out to be, but Einstein removed it. The author appears to be completely in favour of Einstein in this respect. While criticizing E. C. G. Sudarshan, who accused Einstein in this respect, the author questions how many Indian professors follow the teachings of 'Vedas' and 'Bhagavad Gita', which Sudarshan himself quoted in the first place to describe how a teacher should be. The episode is quite important even in the current context, when often the mentor–mentee relation is talked about. Often Indian mentors are respected by their mentees like parents, particularly in many University cultures.

I analyse the entire episode in the following.

It is immaterial what other Indian professors would do when the question is about Einstein. Also, the author's statement about SNB's declining help to Amal Kumar Raychaudhuri (hereinafter AKR) does not fit in assessing Einstein's act. If Einstein was a superior personality, why would his stand point be dependent on others. What I rather would like to say, as also stated by the author, is indeed for the sake of (quick) publication, as the matter was not very clear then, Einstein might have removed it from the draft. However, why subsequently after the things settled down, did Einstein not acknowledge SNB for the same? I also find the logic, as the author proposes, unfounded that Einstein could easily, if he wanted to deprive SNB, publish the work alone, as SNB was not good in preserving notes to prove his credit. First, Einstein was not supposed to know SNB's nature during the early interactions. Second, this is the question of actions by a big personality like Einstein. A big person is expected to be bigger in heart. Overall, I feel the author appears to be unnecessarily subjective in order to justify Einstein. At the same time, I also do not agree that Einstein betrayed SNB, based on the evidence in the book.

Regarding SNB's working with Einstein after establishment of Bose–Einstein statistics, it is quite possible that the problem suggested by Einstein was not the topic of SNB's interest, hence SNB got demotivated. If this is the case, a

great mentor might like to check with the mentee(s) if the problem suits them. However, it is also true, why did such controversial issues arise after death of SNB? There seems to be no direct proof at hand that SNB complained against Einstein even indirectly, on any issue.

The correspondence between Einstein and Debendra Mohan Bose (hereinafter DMB) has been discussed. It appears that DMB was influenced by Einstein's work, when he himself worked and interacted with other renowned scientists. However, the main correspondence between them is related to seeking permission for translating an Einstein book and subsequent logistic dispute about its sale, nothing related to direct science.

One point to notice is that Einstein kept confusing between DMB and SNB, even during his lectures and in written documents related to their joint work. Therefore, how serious Einstein himself was to remember SNB's name is a question. These days, in a similar context, it creates a not too positive impression about the mentor–mentee relation.

There appears to be much evidence that Meghnad Saha (M. N. Saha, hereinafter Saha) and Einstein interacted. Saha even requested for a recommendation letter, but Einstein's reply/action is not evident. As evident from Saha's personal diary, they discussed about the Stern–Gerlach experiment, electron problem, Schrödinger theory and its consequences.

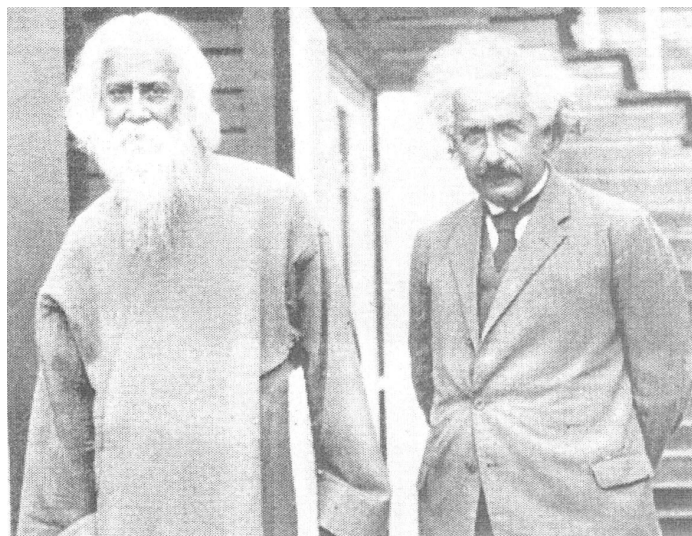
Later, in the 1950s, Saha wrote to Einstein from Geneva, when the former

was attending the ECOSOC meeting, seeking support to reform calendar based on India's proposal. His proposal was opposed by a few determined Jews on religious grounds. It seems however that Einstein, who by this time was already 75, did not help Saha, when Einstein himself was strongly a follower of Jewish religion throughout.

As I understand, overall, Saha was never directly benefited by Einstein. There is nothing special that in various meetings a person like Einstein would be approached with questions/opinions by others, like Saha. However, on the request of Saha's student D. S. Kothari, on the occasion of the inauguration of a new Physical Laboratory in Delhi, Einstein wrote a few words as general remarks.

There was no personal communication evident between C. V. Raman (hereinafter Raman) and Einstein. However, Raman was influenced by Einstein's work. In fact, the famous Nobel winning work: Raman effect was initiated based on the Einstein–Smoluchowski equation. This was mentioned by Raman while writing Einstein's obituary in 1955. Also, Einstein himself regarded Raman's work highly in his quotation on the occasion of 25th anniversary of Raman effect and Raman's 65th birthday. I find nothing special however in this with respect to Einstein's interactions with Indian academics.

The book recalls how scientists all over the world considered Einstein's idea of light-quanta, often with scepticism, in early 1900s. This kind of scepticism is quite common even today, whenever a



Rabindranath Tagore and Albert Einstein (1930). Credit: Wiki.

## BOOK REVIEWS

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new theory and/or idea is proposed, even with observational/experimental connections. Hence, general attitude of scientific community remains unchanged. Indian scientists were not falling behind about the latest developments of physics then. Teachers and scientists in their lectures used to mention Einstein's work of light-quanta and relativity. Generally speaking, Indian scientists and academicians, like SNB, Saha, Raman, B. Misra, were supportive to Einstein's concept of light-quanta. However, the proposed theory by B. M. Sen questioned Einstein's concept. More interestingly, his objections remained unanswered by Einstein and the community.

Overall, it clearly establishes that some Indians had been in contact scientifically with Einstein. Also even in the early- to mid-1900s, some scientists remained neglected, like the case today.

With the rich history and tradition of working on relativity and astronomy by Indians, there are other academicians with whom Einstein had direct communication. For example, Jyotirmay Ghosh, a mathematician in the University of Dhaka, who solved some problems related to the Einstein equation, communicated with Einstein. Also the correspondence with Einstein by a 14-year-old student of SNB, later best known for his biochemistry research, Ratan Lal Brahmachary is known. Also, Einstein had correspondence with Panchanon Bhattacharyya of Krishnagar College, West Bengal, a Mathematics faculty member, correcting his confusion related to relativity. This confirms that Einstein was open to discuss matters with any academician. This example perhaps is important to put forward in the present context, when often there seems to be a tendency to narrow down the scientific window.

The book recalls a fundamental work related to general relativity and cosmology done by an Indian academician, AKR, namely the Raychaudhuri equation, even without any communication with Einstein, contrary to other cases. The book emphasizes that in the University of Calcutta syllabus, general relativity used to be taught in early 1900s itself. Astronomers in the Kodaikanal Observatory and Raman in his laboratory in Calcutta with Nihal Karan Sethi of Benaras Hindu University, performed experiments to confirm Einstein's theory.

However, Shah M. Sulaiman opposed Einstein's idea of general relativity. He

argued that observation could not confirm Einstein's theory, rather data are in accordance with his semi-classical theory. While some Indians opposed Sulaiman, some others, like Saha, A. C. Banerjee, who supported Einstein's work, also appreciated Sulaiman's independent theory. This confirms open mindedness of Indian scientists during those days.

To summarize, Indian scientists seemed to be well aware of the developments of modern theories. Many deserving Indian candidates were funded to go abroad and interact with well-known scientific personalities of the West, apart from Einstein. Many libraries had adequate books and journals even in early 1900s.

In this context, it has been attempted to establish that Einstein had communications with many Indian academicians, apart from SNB. Nevertheless, I do not think that the number is very appreciable, particularly in terms of positive science exchanges and their output, contrary to the main claimed theme of the book. I however agree with the author that the question related to 'Einstein's betraying SNB' emerged publicly only after death of SNB. The same goes with the Raman-Krishnan controversy. I do not think that Indians are too shy to speak out against their mentors when it is the question of academic integrity, definitely not in the current era. It is not easy to accept that about 60 years ago, even after passing away of Einstein, the situation was completely different, particularly in the eastern part of India, where most of the stories of the present book are based.

Overall, this book brings in many issues to trigger further discussion. While I personally do not agree with some of the conclusions drawn by the author, that does not go against the book's standing. Various facts provided in the book appear to be of excellent and unique value. I believe, the readers will enjoy it.

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### **Annual Reviews of Biochemistry, 2019.**

Roger D. Kornberg, James E. Rothman, JoAnne Stubbe and Jeremy W. Thorner (eds). Annual Reviews, 4139 El Camino Way, P.O. Box 10139, Palo Alto, California 94303-0139, USA. Vol. 88. x + 837 pages. Price: US\$ 116.

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The *Annual Review of Biochemistry* is a popular and well accepted science publication on Biochemistry since its inception. It has already played a pivotal role in modern biochemistry and it publishes quality review articles in biological chemistry and molecular biology. Even after 88 years of its initiation, this publication is serving as an indispensable resource for both the practising biochemists as well as elementary students of biochemistry. Every year, the Annual Review of Biochemistry contains many important review articles on advanced aspects of modern biochemistry and serves as an important source of classical and canonical knowledge.

The book under review has various kinds of review articles on interdisciplinary subjects, including on structural biology, cell biology, cancer biology, molecular biology, genetic engineering, neurodegenerative disorders, microbiology and also an autobiographical sketch by Judith P. Klinman. As a woman, her journey in science and life is truly an inspiring story and will motivate many next generation students and scientists. This volume sheds light on advanced aspects of biochemistry and molecular biology. Biophysical techniques also played major role and have great importance in modern biochemistry and still holds good and have lot of applications in structural biology and biochemistry in depth. X-ray free-electron lasers are helping to elucidate the structural dynamics of various macromolecules such as bacteriorhodopsin. Membrane protein-lipid interactions play a major role in cellular functions. Probing the membrane protein-lipid interactions using mass spectrometry will aid in understanding cellular signalling.

Understanding the rapid changing and advanced aspects of biochemistry and molecular biology is the need of the hour. Christopher M. Dobson reviews the emergence of structural biology, multiplicity of biophysical techniques, heterogeneity of macromolecular structures, the characterization of macromolecular