# Teaching and research

An editorial[1] and two correspondence[2,3] in this journal discussed aspects related to teaching and research. Swarup[2] mentioned the need for utilizing the scientific manpower and facilities at CSIR, DAE, DRDO, etc. to supplement the efforts of IITs, IISERs and universities. The best places for developing young scientific manpower are the universities and academic institutions. When the need arises, many universities are opened with Government funding. However, the associated problem of getting good faculty and students remains. Balaram[1] refers to slogans such as 'more Ph Ds', 'more patents', etc. that are often repeated. The slogan should rather be 'more quality' because opening of too many ill-equipped private engineering colleges, for instance, has not enhanced the prestige of the engineering profession.

In defining their roles, scientists should not be made devoid of their teaching roles. Competent scientists willing to teach should be recommended to universities. Balaram also refers to two apprenticeships – stints at the Ph D and postdoctoral levels. I would suggest CSIR and other such research organizations to cater to the second type of apprenticeship. Such provisions are already available, but how vigorously they are followed is another issue. The main thrust should be to intake people with high calibre and effectively utilize their skills. This is important to avoid mediocre candidates from getting promoted; otherwise they bring in structural weakness.

Sangal[3] proposed a new model for upcoming universities based on a not-for-profit public–private partnership. It is a welcome initiative, but a good non-partisan management is the first requisite for its success. He hopes that the constraints that appear in autonomous functioning of Government universities would not be present in this model. I have apprehensions about this. Even now the Government can loosen restrictions in the universities. By this I do not imply rampant freedom, but checks and balances. The Ministry of Human Resource Development thus needs to organize brainstorming sessions and circulate the recommendations among educators before implementation, and engage with the academicians.

1. Balaram, P., *Curr. Sci.*, 2009, **97**, 1515–1516.
2. Swarup, G., *Curr. Sci*., 2009, **97**, 1518.
3. Sangal, R., *Curr. Sci*., 2009, **97**, 1517.

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# Ganot's books on physics in 19th and early 20th century Bengal

What we understand by modern science (and technology) today is about 400 years old. By the 16th and 17th centuries, it had developed and started to flourish in Western European countries. As many of these countries had business and colonial interests in India, we received the first insight into modern science through them mainly during the 18th century. From the end of the 18th century, it was chiefly the British who controlled the promotion of modern science in India for about 150 years[1]. The epoch-making incident that set the stage for modern science education in India was a meeting between Edward Hyde East, the Chief Justice in the Supreme Court of Calcutta and more than 50 Hindu gentlemen on 14 May 1816. It resulted in the establishment of the Hindu College (formally started on 20 January 1817) which was later renamed as the (Calcutta) Presidency College. In the same year, a Schoolbook Society was also established for the preparation of suitable textbooks in English and in vernaculars[2].

Being acutely aware of the importance of spreading science among learners for the development of the country, the Fathers of Bengal vis-à-vis Indian Renaissance tried to start educational institutions in the Western (or rather English) model and to publish textbooks. To prepare these books, they had to primarily take help from the available textbooks in European languages, particularly in English[3]. In this regard, perhaps the best known example was the textbooks on physics written by Pierre Binjamin Adolphe Ganot, commonly known as Adolphe Ganot. His two most renowned books were *Traité élémentaire de physique expérimentale et appliqué* (= *Elementary Treatise of Experimental and Applied Physics and Meteorology*) and *Cours de Physique purement expérimentale* (*Purely Experimental Physics Course*). The first book, initially published in 1851, was translated and used almost throughout the world: Italian (1852), Spanish (1856), Dutch (1856), German (1858), Swedish (1857–60), Spanish (Paris, 1860), English (1861–63), Polish (1865), Bulgarian (1869), Turkish (1876), Serbian (1876–77), Russian (1898) and Chinese (1898)[4].

Adolphe Ganot (1804–1887) was born at Rochefort in France. After graduating in Arts and Science, he took up a teacher's job at the Royal College of Bourbon-Vendée where he taught mathematics for two years. Later, he taught physics in a school established by the French chemist Alexander Baudrimont. In 1835, he started his own school in Paris. The change in secondary education in France in 1852 with the introduction of a separate science section inspired him to publish his initial lecture notes in physics in book form – *Traité élémentaire*. Till the 18th edition (1882), Ganot was the author cum publisher of his book, for 30 years with 204,000 copies printed[5].

The main attraction of the books by Ganot was the lucidity of language, cohesive organization of contents and minimum use of mathematics. The translator, A. W. Reinold, of the 10th edition of his *Natural Philosophy for General Readers and Young People* mentions that 'Mathematical formulae were as far as possible carefully avoided'[6]. Perhaps this was a reason why Ganot was not so popular in Germany and Austria, where people were more inclined towards mathematics in their physics textbooks. Recent researchers have identified a number of unique features in *Traité* such as: woodcut figures at appropriate places in the book, targeted to a larger audience

than a specific group of students, presentation of ample solved problems, continuous updating and revision[5]. He took very little time to update his book after a new invention or discovery in physics. For example, Helmholtz (1821–1894) first described ophthalmoscope in his *Treatise of Physiological Optics* in 1856. Ganot introduced it in the 9th edition (1860) of his book[5].

An English translation of *Traité* was published in India[7]. At that time, Calcutta (now Kolkata) was the capital of British rule in India and Bengal had the privilege of modern Western education. We assumed possibility of wide use of Ganot's books and systematically attempted to trace the usage and availability of Ganot's book in Bengal during that period from five different angles. First, its use by Bengali vernacular writers to prepare their physics textbooks. Second, its use by educational institutions as a textbook of physics at the first year college level. Third, its availability in libraries attached to scholarly institutions. Fourth, its use outside formal academic courses for self-study. Last, mention of Ganot's book in literary writings of the day.

During this period, a large number of physics textbooks were written in Bengali, most of them influenced by Ganot's *Traité*. According to B. Bhattacharya, the historian of Bengali science literature of 19th and early 20th centuries, the book *Prakritibijnan* (= Physical Science) by Surya Kumar Adhikari was first published in 1884. It was the first book in Bengali where the concepts on sound, heat, light and electricity were introduced. To write it, the author had referred to books by Balfour Stewart, Tyndall and above all Ganot[8]. Ramendrasundar Tribedi (1864–1919) is thought of as the most important Bengali author on science and philosophy of science in the late 19th and early 20th centuries, and his knowledge of physics was considered up-to-date. His first textbook on science in 1892 was *Padarthabidya* (= Physics). Bhattacharya says that Tribedi avoided the erroneous and rather dated information in Ganot's book and prepared his own after carefully removing these lacunae[8]. Certain defects in Ganot's book were also pointed out by E. Atkinson, the English translator of *Traité* in the preface of its first edition in 1898. Atkinson indicated a 'too close adaptation to the French system of instruction'[9] in Ganot's *Traité*.

It is evident that Ganot's books were used as textbooks to teach physics in colleges in Bengal from their availability in these institutions. We found two of his books at the Presidency College library and the Scottish Church College (established in 1830) library, Kolkata, viz. *Elementary Treatise on Physics, Experimental and Applied: for the Use of Colleges and Schools* and *Natural Philosophy for General Readers and Young People*. The English translation of his *Traité* is also available at the Bethune College library (established in 1879) and the Asiatic Society (established in 1784) library, Kolkata. It is also reported that the Hooghly Mohsin College, established in 1836, had a copy of Ganot's *Traité* in its library (Sengupta, P., pers. commun.). But most libraries did not care to preserve obsolete textbooks as is the norm with libraries worldwide.

Ganot finds mention in popular literature written by famous authors of that time. The most prominent among them was Rabindranath Tagore (1861–1941). In his poem *Unnati Lakshan* (= Signs of Progress), first published in 1899 in *Bhārati*, a famous literary magazine of the time, Tagore wrote: '. . . The Thakaur studied a lot – /At least a book by Ganot/But Helmholtz is terrible/Made a mess of all'[10]. Tagore also mentioned Ganot and his book in his article *Oitihāsik Chitra* (= Historical Scene) in his book *Ādhunik Sāhitya* (= Modern Literature)[11], which was first published in 1898 in *Bhārati*. Rajanikanta Sen (1865–1910), another famous poet of the same period, cites Ganot's name in his poem *Jātiya Unnati* (= National Development). It was published in his book of poems *Bāni*[12] in 1902. The similarity of theme and approach in the poems of Tagore and Sen is noteworthy.

Ganot's book is exceptional in the sense that a physics textbook originally published in French in 1851 continued publication till 1931 in France and became popular all over the world. The translated versions probably influenced two generations of educated persons – from science students, teachers and textbook writers to literary figures; from science classrooms to popular culture – of a distant land, Bengal.

1. Subbarayappa, B. V., In *A Concise History of Science in India* (eds Bose, D. M., Sen, S. N. and Subbarayappa, B. V.), Indian National Science Academy, New Delhi, 1971, pp. 763–817.
2. Raj, K., *Relocating Modern Science: Circulation and the Construction of Knowledge in South Asia and Europe, 1650–1900*, Palgrave Macmillan, Hampshire, 2007.
3. Then and now, a lot of research work is going on; some examples are: Lourdusamy, J., *Science and National Consciousness in Bengal: 1870–1930*, Orient Longman, New Delhi, 2004; Roy, B. B., *Unis Satake Deshiya Bhāsāy Chikitsābijnān Charchā*, Ananda Publishers, Kolkata, 1995.
4. Simon, J. and Llovera, P., *J. Electrostat.*, 2009, **67**, 536–541.
5. Khantine-Langlois, F., Un siècle de physique à travers un manuel à succès: le traité de physique de Ganot; http://www.societechimiquedefrance.fr/fr/resume-et-article.html (accessed on 14 April 2010). (An English translation/version was made available to us by the author.)
6. Ganot, A., *Natural Philosophy for General Readers and Young People*, Longmans Green, London, 1905.
7. Blackmore, J. T., Itagaki, R. and Tanaka, S., *Ernst Mach's Vienna 1895–1930: Or Phenomenalism as Philosophy of Science*, Kluwer, Dordrecht, 2001.
8. Bhattacharya, B., *Bangasāhitye Bijnān*, Paschimbanga Bangla Akademi, Kolkata, 2004.
9. Ganot, A., *Elementary Treatise on Physics, Experimental and Applied: for the Use of Colleges and Schools* (translated and edited from Ganot's *Éléments de physique*), Longmans Green, London, 1898.
10. Thakur, R., *Kalpanā*, Visva Bharati, Kolkata, 1900.
11. Thakur, R., *Ādhunik Sāhitya* (Internet Ed.), Visva Bharati, Kolkata, 1907.
12. Sen, R., *Bāni*, Gurudas Chattopadhyay and Sons, Kolkata, 1902.

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