

## Resolving the confusion over J. C. Bose's education in England

Many biographers<sup>1-8</sup> have discussed the education of Jagadis Chandra Bose (1858–1937). Unfortunately, none of them gives a complete and correct picture. Along with providing some previously unknown information, we try to remove some of the confusion and wrong notions regarding Bose's education in England.

Some biographers<sup>1,2,4-7</sup> have noted that Bose received B Sc degree from the University of London. Some<sup>4,5</sup> also mention his year of passing B Sc as 1884. However, the University of London Graduates List<sup>9</sup> mentions that he received the B Sc (Honours) degree in 1883. Prior to his admission to Tripos in Natural Sciences, Bose was in Christ's College, Cambridge, for three terms as a non-collegiate student. He passed matriculation from the University of Cambridge as a non-collegiate affiliated student in the Lent Term of 1881 (the second term of the academic year, running from January to March)<sup>10-12</sup>. According to the records at Christ's College<sup>10</sup>, as mentioned in Peile<sup>11</sup>, and also according to the records at the University of Cambridge<sup>12</sup>, Bose took admission there on 24 January 1882 as a pensioner (fee-paying student) under Messrs Peile and Cartmell. He was elected as a scholar of the College on 24 October 1883. He sat for the Natural Sciences Tripos examination in 1883. Amongst his examiners were Lord Rayleigh, A. Vernon Harcourt, L. Fletcher, J. N. Langley, R. D. Roberts, Sydney H. Vines, Alex Hill and A. Milnes Marshall<sup>13</sup>. Bose graduated (B A) in Natural Science Tripos in 1884 with a second class. At that time, this degree was officially called A B (Artium Baccalaureus)<sup>14</sup>.

There is confusion over the subjects Bose studied for his Tripos in Natural Sciences<sup>6-8</sup>. Available records<sup>10-12</sup> show that neither Christ's College nor University of Cambridge has precise information regarding the specific subjects Bose studied for Tripos examination. From *Cambridge University Examination Papers*<sup>15</sup> and *Ordinances of the University of Cambridge*<sup>16</sup>, we come to know the subjects on which questions were set in the Natural Sciences Tripos examination during this period. There were fixed subjects which the students needed to study. The list of examiners also shows that these subjects match with the profiles of

the examiners mentioned above<sup>14</sup>. Hence, it is clear that none of the biographers<sup>6-8</sup> gives us complete information.

At that time, the examination of Tripos in Natural Sciences was conducted in two parts. But Bose never sat for Part II of the examination<sup>13</sup>. However, according to the rules prevalent at that time (i.e. it was possible to award an Honours degree on the basis of passing Part I of the Tripos examination), he was awarded the degree for Tripos in Natural Sciences<sup>16</sup>.

In 1896, Bose obtained his M A degree from the University of Cambridge<sup>10-12</sup>. It may be noted here that during this period the University of Cambridge used to confer M A only to the holders of the B A degree. Bose was also awarded M A degree following this norm<sup>17</sup>.

We do not exactly know about the subjects Bose studied for B Sc (Honours) Course<sup>9</sup> from his existing biographies<sup>1-8</sup>. The University of London General Register<sup>18</sup> mentions the following: Basu, Jagadish Chunder (B.A. Calcutta.)-Prel. Sci. and Intermed. Sc. Math. 1882, Christ's Camb., 2nd in 2nd Class in Bot.; B.Sc. 1883, Christ's Camb., 2nd in 2nd Class in Exper. Physics; D.Sc. Exper. Physics 1896, Presidency Coll. Calcutta – *Presidency College, Calcutta*.

According to Bengali tradition, Bose was named *Jagadis Chandra Basu* and the anglicized version of his name is Jagadis Chunder Bose. In the records of the University of London, Christ's College and University of Cambridge, we find both names being used. In the University of London Graduates List<sup>9</sup> and University of London General Register<sup>18</sup>, his surname is given as Basu. Interestingly, Peile<sup>11</sup> gives his name as Bose, Jogodish Chunder. Bose's first name was Jogodish in the records of Christ's College, as well<sup>10</sup>. On the other hand, the University of Cambridge gives his name as Bose, Jagadis Chandra in its alumni database<sup>12</sup>. From this, we come to know that he studied here simultaneously with his Tripos in Natural Sciences at Christ's College.

Bose's name is also listed in the examination list of the University of London Calendar of 1885–86 as he received second class degree in experimental physics while also being a student at Christ's College<sup>19</sup>. According to the prevalent

rules of the University of London at that time, any student was allowed to sit for the Pass examination of the University either from London or under special arrangements from elsewhere in England. But, a student could sit for the Honours examination only at London<sup>19</sup>. From this, it is clear that Bose, while studying at Christ's College also sat for the B Sc (Honours) examination at the University of London, which he passed in second division.

Another notable point is that Bose never studied higher mathematics in his student life. There is no clear information about his knowledge and training in higher mathematics<sup>20-22</sup>. The University of London General Register<sup>18</sup> shows that he studied intermediate-level mathematics in his B Sc (Honours), which is by no means a higher-level mathematics course. Mathematics as a subject was not a part of Natural Sciences Tripos<sup>15,16</sup>.

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## CORRESPONDENCE

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SILADITYA JANA<sup>1,\*</sup>  
SUBIR K. SEN<sup>†</sup>

<sup>1</sup>*Department of Library and Information Science, University of Calcutta, Kolkata 700 073, India, and Indian Institute of Science Education and Research – Kolkata, Mohanpur Campus, BCKV Main Campus Office, Mohanpur 741 252, India*  
\*e-mail: [siladityajana@gmail.com](mailto:siladityajana@gmail.com)  
<sup>†</sup>Since deceased.

## Two great historical earthquake ruptures revealed in Nepal

Earthquakes along the Himalayan arc happen because of continent–continent collision, where the Indian plate is colliding with the Eurasian plate at geologic and geodetic convergence rates of 30–50 mm/yr (refs 1 and 2). About 20 mm/yr of this convergence is mainly absorbed by the Main Himalayan Thrust<sup>3</sup>, which thus accounts for about half of the total convergence rate between the Indian and Eurasian plates<sup>2</sup>. It is therefore an active tectonic boundary along which accumulated stress is primarily released through earthquakes. It reaches the surface at the Main Frontal Thrust fault<sup>4</sup>, that marks the southern margin of the Himalayan range<sup>5</sup>. Thus, it is not surprising that the ongoing collision has resulted<sup>6–9</sup> in more than six major earthquakes along the Himalayan arc in the past ~100 years.

None of the historical earthquakes is reported to have produced primary surface rupture<sup>10</sup> and it has generally been assumed on the basis of isoseismals and location, that the earthquakes are the result of slip on the Himalayan Frontal Thrust<sup>10</sup>. However, the consensus that no primary surface rupture is associated with historical earthquakes was questioned after the 2005 Kashmir earthquake, which, although was relatively small ( $M_w$  7.6), did produce co-seismic surface faulting<sup>9,11</sup> for a distance of ~80 km. This was subsequently con-

firmed by the field evidence, which found extensive thrust surface rupture<sup>12</sup>.

Therefore, the 2005 earthquake was a wake-up call to scientists to rethink and re-evaluate the accepted consensus by using modern techniques to collect the pieces of evidence left by historical ruptures along the Himalayan front. Thus, the long-standing consensus was finally challenged by Sapkota *et al.*<sup>13</sup>, by providing strong evidences that the  $M_w$  8.2 Bihar–Nepal earthquake on 15 January 1934 did break the surface.

Using the extensive geomorphological mapping of fluvial deposits, palaeo-seismological logging of river-cut cliffs and trench walls, together with modelling of calibrated <sup>14</sup>C ages, their study demonstrated that the  $M_w$  8.2 event has left clear traces of rupture along at least 150 km of the Main Frontal Thrust fault in Nepal<sup>13</sup>. This is the minimum rupture length, which means that the total length of the rupture could be larger. Furthermore, they found an earlier earthquake of 7 June AD 1255, which has also ruptured the surface along this stretch of the mega-thrust<sup>13</sup>. This earthquake is believed to have destroyed one-third of the population in the Kathmandu valley<sup>13</sup>.

The significance of this work lies in the fact that the surface ruptures of other reportedly blind great Himalayan events might exist and thus, evidences need to be recollected. This will be useful to un-

derstand the historical earthquakes and to re-evaluate the seismic risk along the Himalayan front.

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A. A. SHAH

*Department of Applied Geology, Curtin University, 98009 Miri, Sarawak, Malaysia*  
e-mail: [afroz.shah@curtin.edu.my](mailto:afroz.shah@curtin.edu.my)