

REPORT

OF THE

FOURTEENTH ANNUAL MEETING

OF THE

INDIAN ASSOCIATION FOR THE CULTIVATION OF SCIENCE

*Held April 1891.*

Calcutta :

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THE FOURTEENTH ANNUAL MEETING OF THE INDIAN  
ASSOCIATION FOR THE CULTIVATION OF  
SCIENCE, HELD, THURSDAY,  
30TH APRIL, 1891.

PRESENT— *Members* :—

- The Hon'ble Sir Charles Elliott, K.C.S.I., &c. &c., Lieut.-Governor of Bengal, President, (in the chair)  
The Rev. Father E. Lafont, S.J., C.I.E., (Vice-President)  
His Highness The Maharaja of Bettiah, K.C.I.E.,  
Nawab Abdool Luteef, Bahadur, C.I.E.,  
Hon'ble Justice Gooroodas Banerjee, D.L.,  
Rai Radhica Prasanna Mookerjee, Bahadur,  
Dr. Sambhu Chunder Mookerjee,  
Kumar Rameswar Malia, Bahadur,  
Babu Iswara Chandra Mitter,  
,, Jadu Lall Mullick,  
,, Jadu Nath Mookerjee, (Medical Practitioner)  
,, Docowri Ghose, L.M.S.,  
,, Nilmani Mookerjee,  
,, Ram Akshaya Chatterjee,  
Rai Prasanna Kumar Banerjee, Bahadur,  
J. Ghosal, Esq.,  
Babu Anurup Chandra Mookerjee,  
,, Hem Chandra Kar,  
,, Chandi Lal Singh,  
Nawab Mir Muhammad Ali,  
Moulavi Muhammad Yusuf,  
Babu Ananda Chandra Chatterjee,  
,, Nabin Chandra Pal,  
,, Prabodh Chandra Chatterjee,  
,, Jadu Nath Ray,  
,, Saroda Prasad Ray,  
,, Amrita Lal Sircar,  
Kabiraj Brajendra Kumar Sen,  
Babu Ishan Chandra Bose, M.A., B.L.,  
,, Khetter Mohun Bose, B.A.,  
,, Nilmani Kumar,  
Hon'ble Dr. Mahendra Lal Sircar, M.D., C.I.E. Hon. Secy.



Amongst the guests present were :—

Hon'ble Justice R. L. Tottenham,  
 Dr. W. J. Simpson,  
 Moulavi Abdur Rahaman,  
 Babu Ashutosh Mookerjee, M.A., F.R.C.E.,  
 „ Mahendra Nath Ray, M.A., B.L.,  
 „ Umesh Chandra Dutta, B.A.,  
 H. M. Rustomjee, Esq.,  
 Babu Jogesh Chandra Dutta,  
 Syud Amir Hossein, C.I.E.,  
 Babu Srinibash Ghose,  
 „ Bipin Bihari Ghosh, M.A., B.L.,  
 „ Atal Bihari Ghosh, M.A., B.L.,  
 „ Sashi Bhusan Sen, B.A.,  
 T. N. Mookerjee, Esq.,  
 Babu Ram Brahma Sanyal,  
 Moulavi Mirajuddin Ahmad,  
 &c., &c., &c.;

The proceedings of the last annual meeting were confirmed.

The Honorary Secretary announced the accession of two life-members, Babus Prabodh Chandra Chatterjee and Saroda Prasad Roy, who have each subscribed Rs. 500 in aid of the Association.

The Honorary Secretary, on being called by the President, read the following report of the Committee of Management for the past year :

*Report for the year 1890.*

1. The Committee of Management beg to submit the following report showing the progress the Association has made during the year 1890.
2. During this year the following subjects were lectured upon :—

PHYSICS, by Rev. Father E. Lafont,  
 and Dr. Mahendra Lal Sircar,  
 CHEMISTRY, by Babu Ram Chunder Dutt,  
 PRACTICAL CHEMISTRY, by Babu Ram Chunder Dutt,  
 MIXED MATHEMATICS, by Babu Ashutosh Mukhopadhyay,

3. The attendance at the lectures on Physics was very satisfactory, the audience numbering on an average two hundred. Some of the lady students from the La Martiniere Institution and the Doveton College attended the lectures regularly. Miss Adams, of the La Martiniere Institution, and Miss Taylor, of the Doveton College, took a great deal of interest in the lectures on Physics: they attended personally and watched over the regular attendance of the lady pupils under their superintendence.

4. The lectures delivered from January to March formed the concluding portion of the courses of the session 1889-90 and were 7 in number. From July to December 100 lectures were delivered and they were the major part of the courses for the session 1890-91. Altogether there were 107 lectures delivered during the year under review.

5. Of these 21 lectures were delivered by Rev. Father E. Lafont; 20 by Dr. Sircar; 37 by Babu Ram Chunder Dutt; 29 by Babu Ashutosh Mukhopadhyay.

6. Of the 21 lectures delivered by the Rev. Father E. Lafont, 5 were on Sound and the remaining 16 were on Light. Of the 5 lectures on Sound 4 formed the concluding lectures of the course begun in the previous year. The subjects were as follows:—The nature and production of musical sounds; the velocity and propagation of sound; the theory of various musical instruments; optical study of musical sounds.

At the beginning of the session 1890-91 the lecturer finished the course of his lectures on Sound by one lecture the subject of which was,—the new Phono-

graph of Edison with numerous illustrations. The remaining 16 lectures were on Light. The lecturer explained the nature of Light on the Undulation-Theory, and advanced many reasons which gave this theory a probability amounting almost to certainty. Photometry was clearly defined and the principle of the law of squares underlying all photometers was demonstrated by numerous practical experiments. The laws of Reflection were illustrated by plane, concave and convex mirrors, in which the actual formation of real or virtual images was placed before the audience, at the very same time that the theory of their formation was duly explained. The same process of experimental and ocular demonstration was followed to explain the various phenomena of Refraction, in lenses, prisms, etc., a very detailed account being given of the important branch of optics—Spectroscopy, which has enabled us to discover new elements, and furnished us with a knowledge of the composition of the heavenly bodies, a knowledge which could never be acquired by any other means of research. The phenomena of Dispersion gave the lecturer an opportunity to explain the theory of colour. Finally the principal optical instruments were shown and explained in detail: the Telescope, Microscope, projection apparatus for vertical and horizontal phenomena, the human Eye, its internal construction, its defects, with their remedies, its illusions (and here a lucid explanation was given of the phenomena of optical illusions exhibited at Dhurmtollah under the sensational designation of Metempsychosis) concluded Geometrical Optics. The remaining lectures were devoted to an

experimental study of Physical Optics, furnishing a necessary preliminary basis to the elaborate mathematical lectures on the same subject delivered by Babu Asutosh Mukhopadhyay. The physical meaning of Polarisation, the various ways of producing polarised light, plane, circular, rotatory, elliptical, with an interesting study of chromatic effects of polarised light, took about half a dozen lectures, concluding with one on the phenomena of Diffraction and Interference.

7. Of the 20 lectures delivered by Dr. Sircar 3 were on Electricity which formed the concluding lectures of the course of Electricity begun in the year previous. The first of these lectures was devoted to the phenomena and laws of Thermo-electricity. The discovery of thermo-electricity was due to Professor Seebeck of Berlin, who in 1821 showed that Volta's Law, that there is no resultant electro-motive force in a circuit formed solely of different metals, holds good only when all the junctions of the metals are of the same temperature, but that when the junctions are at different temperatures, there is a resultant electro-motive force. This was demonstrated experimentally by Seebeck's apparatus, both with the single and the astatic needle. It was shown how by experimenting with different substances their arrangement in what has been called thermo-electric series may be formed. The thermo-electric current passes from the positive to the negative metal across the heated junction. The laws of thermo-electricity were enunciated under three heads, viz., (1) that the current is rigorously constant when the difference of temperatures of the two junc-

tions remains constant, (2) the intensity of the current increases with the difference of temperatures of the two junctions up to a certain limit, after which, as first shown by Cumming, inversion of the current takes place, (3) intensity is proportional to the number of couples. The phenomenon of inversion was shown experimentally by means of wires of iron and copper. The construction of thermo-piles was explained. Experiments were performed to show that dissimilar metals were not necessary for the production of a thermo-electric current. Dissimilarity in molecular arrangement in different parts of the same substance was enough to give rise to such a current. The different kinds of thermo-electric batteries were shown and explained. The identity of thermo-electricity with ordinary voltaic electricity was demonstrated by other than magnetic effects, by chemical decomposition, &c. The Peltier effect was experimentally demonstrated, and the Thomson effect explained.

In the second lecture electric-lighting was treated of. A short history was given of the subject. The two kinds of lamps used, the arc and the incandescent, were described, and their actions explained. The chief distinguishing peculiarity of incandescent lamps, viz., that the carbons are enclosed in vacuum tubes so as to prevent their combustion, was pointed out. The two chief modes of preparation of carbon filaments for incandescent lamps and the ingenious method of securing uniformity of thickness of the filaments were described and explained.

In the third lecture the subject of electric telegraphy was treated of. The lecturer related how, before and

even after the discovery of dynamic electricity, attempts were made by means of static electricity to transmit signals to distant places. This was done by means of wires to cause divergence of pith balls at their remote ends on being electrified at their proximal ends, or by means of sparks from Leyden jars. After the discovery of dynamic electricity Soemering of Munich in 1808 took advantage of the electrolysis of water to transmit signals. It was Ampere who was the first in 1821 to suggest the utilization of Oersted's discovery for purposes of telegraphy. It was not till 1833 that Schilling and Weber actually employed the deflections of the magnetic needle to the right and left to signal an alphabetic code of letters. Cook and Wheatstone improved upon this and introduced in 1837 the needle Telegraph. Professor Henry of New York in 1831 used the electro-magnet to attract soft iron armatures and thus produce sounds. Morse of the same place in 1837 used the same means to mark dots and dashes upon a moving slip of paper. These instruments were shown and their uses demonstrated. The lecturer then showed experimentally how the earth could be used in place of the return wire, and thus the expenses of telegraphy immensely reduced. The lecture was concluded by a short reference to the necessity and use of the Relay, and the modes of working of submarine and duplex telegraphy.

The remaining 17 lectures were on Heat and they embraced the following subjects :—The various sources or rather modes of production of heat, mechanical, chemical, electrical, and magnetical, were experimentally examined, and the inference from this examination

was inevitable that heat was due to motion, but motion retarded or arrested, and that heat itself was a mode of motion. The effects of heat were then examined, in each case illustrated by experiments, under the heads of luminous, chemical, electrical, magnetical, and mechanical. The distinction between heat and temperature was shown. A short history was given of the progress of discovery of the various points in connection with thermometry or the measurement of temperatures. The various kinds of thermometers, including the differential thermometers, and the self-registering maximum and minimum thermometers, and the thermo-graph for continuous record of temperatures by means of photography, were described. The mechanical effects of heat were then treated in detail. The various methods for determining the coefficients of expansion of solids, liquids and gases were described and explained, and the numerous applications of the general law of expansion by heat were pointed out. Exceptions to the general law of expansion offered by some substances, notably by water, were mentioned, and some experimentally demonstrated, and the vital importance of this exception in the case of water in the economy of nature was fully shown. The laws of the expansion of crystals as arrived at by Mitscherlich were enunciated, and were shown to point to the tendency of heat to equalize the axes of the crystals. The change of state produced by heat was next dwelt upon; it was shown to be but an extreme case of expansion. Experimental demonstration was then given of fusion and its laws, of the fact of the melting points of alloys and fluxes being less than those of their in-

gredients, of the influence of pressure on the melting point. Solution was shown to be a form of fusion. Heat was shown to disappear during fusion and solution, and this was the simple explanation of the action of freezing mixtures. The most recent researches on the subject by Guthrie and others were laid before the audience. The remarkable phenomenon of Regelation was shown and explained. Vaporization was next treated of under the heads of slow evaporation from the surface of solids and liquids, of ebullition, and of vaporization in the spheroidal state, and the laws stated and demonstrated experimentally. In this connection the use of Papin's digester and of the hypsometer were pointed out. The paradoxical phenomena of matter in the spheroidal state were all shown by experiment. The lecturer drew attention to them as offering a satisfactory explanation of the immunity enjoyed by plumbers when they hold molten metals on their moistened hands, and even plunge their moistened hands into molten metal, the higher the temperature of the molten metals the greater being the protection, and also lending probability to the ancient stories of safe ordeals through fire. The reverse processes to liquefaction and vaporization were then briefly dwelt upon, and it was shown how by pressure and abstraction of heat combined even the gases hitherto believed to be permanent have not only been liquefied, but even solidified, and how by this means the metallic character of Hydrogen hitherto only suspected has been established. The concluding lectures were devoted to the consideration of the transmission of heat by conduction, convection, and radiation, and to the determin-



ation of the specific heats of bodies. The phenomena and laws of radiation were demonstrated by Melloni's apparatus.

8. Twenty-five lectures were delivered by Babu Ram Chunder Dutt. The subjects were as follows ;— General properties of matter and chemical affinity ; laws of chemical combination and the atomic theory ; chemical nomenclature ; hydrogen and its properties ; oxygen ; composition and properties of water ; peroxide of hydrogen ; nitrogen and atmospheric air ; ammonia ; nitric acid ; remaining oxides of nitrogen ; chlorine ; hydrochloric acid ; oxides of chlorine ; bromine ; iodine and fluorine ; carbon ; oxides of carbon ; compounds of carbon and hydrogen ; sulphur ; and sulphuretted hydrogen ; oxygen compounds of sulphur, phosphorus and its compounds ; boron ; silicon ; arsenic.

9. Twelve practical demonstrations in Chemistry were held by Babu Ram Chunder Dutt. They were on the detection of non-metallic elements, the detection and test of lead, mercurous and mercuric salts, copper and bismuth, cadmium and tin, arsenic, antimony, aluminum, chromium, nickel, cobalt, zinc, iron, barium, strontium, calcium, magnesium, potassium and detection of acids.

10. Twenty-nine lectures were delivered by Babu Ashutosh Mukhopadhyay on Mathematical Physics, of which seven formed an introductory course treating of portions of Analysis which are of frequent application in physics, five were upon Elastic Solids, and eighteen were upon Physical Optics.

The subjects of the lectures forming the introductory course were as follows :—

The first lecture treated of Definite Integrals, with special reference to such as occur in the theory of conduction of heat and diffraction of light ; the validity of imaginary transformations was discussed.

The second lecture treated of Definite Integrals regarded as functions of an arbitrary parameter, and special attention was directed to the limiting values attained in certain remarkable cases when the parameter was increased indefinitely.

In the third lecture, an exposition was given of the Functions of Bessel and Heine. The genesis of the different forms of series by which these functions can be represented was explained, and a new proof was given of the theorem about the reality of the roots ; finally, it was shown how a definite integral the element of which consists of the product of two Bessel's functions, can be evaluated, and the analogy to Laplace's functions was pointed out.

The fourth lecture dealt with Fourier's theorem on the expansion of a function, between given limits of the variable, in a trigonometrical series. Attention was drawn to the different forms assumed by the formulæ according as the function is odd or even. In addition to analytical examples, geometrical illustrations were given ; and it was shown that the theorem might be utilized in symbolizing discontinuous functions like the contour of a trapezium or a triangle, or the form of a staircase.

The fifth and sixth lectures treated of spherical harmonics, and the subject was discussed both by geometrical and analytical methods. Proofs were given of the different forms of Legendere's coefficients,

*viz.*, Legendere's form as a series, Rodrigue's form as a differential coefficient, and the forms of Laplace and Dirichlet as definite integrals; a modification of Laplace's form was obtained from the geometry of the circle.

The seventh lecture gave a discussion of line, surface and volume integrals; Green's theorem was deduced, and its applications to spherical harmonics was explained; the method of developing a function of one variable by spherical functions was also proved, and a sketch was given of Darboux's method for the case of functions of two variables.

The subjects of the five lectures on Elastic Solids were as follows:

The first lecture dealt with the elementary notions lying at the root of the mathematical theory; the stress-equations were obtained from a consideration of the equilibrium of an elementary parallelepiped and an elementary tetrahedron in the interior of the solid.

The second lecture treated of the stress-ellipsoid and the determination of principal pressures.

In the third lecture, the equations of stress-equilibrium in cylindrical and in polar coordinates were obtained by geometrical methods by dividing the solid into suitable elements.

The fourth lecture gave a short account of Helmholtz's theorem on molecular rotation, which was used to obtain the general expression for the component of pressures. The method of reduction of the number of coefficients in the general expression, under special circumstance, was explained and the following cases were considered in detail: (1) One plane of elasticity,

(2) Two rectangular planes of elasticity, (3) Three planes and one axis of elasticity, (4) Three planes and two axes of elasticity (isotropic solid). It was lastly shewn how these reductions lead at once to the equations of equilibrium and motion, in terms of the displacements.

The fifth lecture gave a short account of Poincaré's method of discussing the vibrations of an elastic solid by Lagrange's equations.

The eighteen lectures on Physical Optics treated both of the elastic solid and the electro-magnetic theory, and their subjects were as follows :

In the first lecture, the equations of vibration of the luminiferous medium were worked out on the elastic solid hypothesis.

In the second lecture, an explanation was given of the modified form assumed by the general equations according as the vibrations are transversal or longitudinal ; the elementary theory of plane waves was fully explained ; and this furnished the explanation of the existence of evanescent rays in Fresnel's experiment, where by placing a plate of glass at a small distance from a surface at which there was total reflexion, he obtained obscure luminous fringes.

In the third lecture, starting with the assumption that the intensity of a luminous vibration is proportional to the *vis-viva* of the molecule in motion, the mode of measuring luminous intensity was explained. The interference of ordinary and polarized light was then considered in detail, and the full mathematical explanation of the laws of Fresnel and Arago was furnished.

The fourth lecture was devoted to an exposition of

Huyghen's principle and its justification. The equations of transversal vibrations were integrated, first, for the particular case of spherical waves, and then, for the general case by Poincare's method, and from the solutions it was shown that the principle in question led to consistent results.

The fifth lecture gave an account of Fresnel's memoir on double refraction as explained in Senarmont's commentary. The hypotheses which underlie the theory were enumerated; an analytical expression for the elastic force developed by the displacement of an individual molecule was obtained, and from it was deduced the principle of the superposition of elasticities. This naturally lead to the inverse ellipsoid of elasticity, the directions of the principal axes of which are such that the small displacement of a molecule parallel to one of them produces an elastic displacement parallel to the displacement, and, in general, no other directions enjoy this property. The properties of the inverse ellipsoid were further considered with reference to the singular directions of the plane of displacement, and these theorems were applied to establish Fresnel's theorem that to any normal direction of propagation correspond two systems of plane waves of which the elements depend on those of the inverse ellipsoid.

In the sixth lecture, Fresnel's theory was further considered; the equation of the surface of elasticity was formed, and from it was deduced the equation of the wave surface; the relations between the direction of normal propagation of plane waves, the direction of radius vector of the wave surface, and the direction of vibration, were also proved.

The seventh lecture treated of double refraction in biaxial crystals ; the properties of the wave surface were discussed in detail ; the positions of the singular points and singular tangent planes were calculated, and thence followed the explanation of internal and external conical refraction ; the cone of contact was, from the properties of the reciprocal cone, shown to be one of the second order. The relation between the velocity of propagation of a plane wave and the position of this wave with reference to the optic axes, was also proved.

The eighth lecture dealt with the dynamical theory (Green and Fresnel) of reflection. It was shewn as a consequence of the theory that the conversion of plane polarized light into circularly polarized light by *one* reflection is impracticable, and the theory of Fresnel's rhomb was explained.

The ninth lecture gave an account of MacCullagh's theory of metallic reflexion, based, after Fresnel's method, on a hypothetical interpretation of an imaginary formula.

In the tenth lecture, the interference of polarized light (plane, circular or elliptic) was considered in great detail ; and the theorem of Stokes that, in general, any stream of light may be regarded as composed of two streams,—one of natural light, the other of elliptically polarized light,—was completely established ; the intensity of the first and the elliptic constants of the second, were calculated.

In the eleventh lecture, the theory of the colours of thin crystalline plates was discussed, and the formula for the intensity of illumination at any point was

proved. The properties of the isochromatic surface in uniaxal and biaxal crystals were proved ; the particular cases when the sections of the isochromatic surface are a circle, hyperbola or lemniscate, were treated by Bertin's method.

The twelfth lecture treated of rotatory polarization. An account was given of (1) the theory of Fresnel in which a rectilinear vibration is regarded as the resultant of two opposite circular vibrations, (2) the theory of Airy, where the resolution is into elliptic vibrations, (3) the theory of MacCullagh, based on a modification of the fundamental equations of vibration in the ethereal medium. Especial attention was directed to MacCullagh's dynamical explanation of the modified equations, which has been uniformly overlooked by physicists. An account was also given of the theory of the coloured rings.

The thirteenth lecture treated of Stokes's dynamical theory of diffraction. Rayleigh's method was followed in calculating the disturbance at any time and at any point of an elastic medium, produced by a given periodic disturbance which was initially confined to a finite portion of the medium. The law of disturbance in a secondary wave was then calculated, and a full analysis was then given of the results obtained in Stokes's great paper.

In the fourteenth and fifteenth lectures, some illustrations were given of the theory of diffraction. An expression for the disturbance propagated in any direction from a particle upon which a beam of light strikes (the particle being small in comparison with even the wave length of violet light), was calculated.

It was shewn that when light is scattered by small particles, the ratio of the intensities of the scattered and incident lights varies inversely as the fourth power of the wave length ; -this led to Rayleigh's theory of the colour of the sky. Fraunhofer's diffraction phenomena were discussed in detail ; the forms of the diffraction patterns in the case of rectangular and circular apertures were determined, including the case where the source is not seen in the focus. Bridge's theorems were established ; the theory of Talbot's Bands was worked out ; and a proof was given of Stokes's theorem that the total intensity is proportional to the area of the aperture, whatever its form may be.

In the three remaining lectures, an account was given of the electro-magnetic theory of light. The theory of electric oscillations and of the Hertzian vibrator for detecting them, was fully explained. A summary was given of Maxwell's dynamical theory of the electro-magnetic field, with applications to the propagation of plane luminous waves, their reflection and double refraction. The effect produced by the motion (rotational or translational) of the dielectric on the velocity of light was calculated, and this furnished an explanation of Fizeau's experiment showing that the velocity of light passing through a tube containing water in motion exceeds the velocity of light passing through still water by half the velocity of the water.

11. On account of the dilapidated condition of the old laboratory building no new instruments of noteworthy character were purchased during the year save a tangent galvanometer and an incandescent lamp which were required for lecture illustration.



12. For the Library *The Scientific American* and *Nature* were purchased as usual. The Government of India presented to the Library of the Association the Geological Memoirs and Records of the year. The Meteorological Department of the Government of India presented the Association with the following publications :—The daily weather chart, the weekly weather report, the monthly summary. The Association received from the Government of Bombay the following publications during the year : (1) A brief sketch of the Meteorology of the Bombay Presidency, (2) The administration and progress Report of the Lunatic Asylums in the Bombay Presidency, (3) Report of the Chemical Analyser to Government of Bombay, (4) Crop Experiments, (5) Twenty-sixth annual report of the Sanitary Commissioner for the Government of Bombay, (6) Report of the Khandesh experimental farm, (7) Preventives against attacks of weevil upon corn and grain, (8) The Magnetical and Meteorological Observations, (9) Annual Report of the Director, Land Records and Agriculture, for the year 1889-90. The report of the Lewis Jubilee Sanitarium of the year 1889-90 was also received by the Association. Mr. Patrick Doyle, Editor and Proprietor of the *Indian Engineering*, has been supplying the Association with his valuable Journal since its commencement.

13. The principal items of receipts of the Association during the year were as follows :—

	Rs.	A.	P.
From Subscription	1,030	0	0
„ Donation	15	0	0
„ Interest General Fund	3,456	0	0
„ Rent from Roadside Shops	2,352	0	0

14. The principal items of expenditure of the Association during the year were as follows;—

	Rs.	A.	P.
Lecture Charges	146	4	3
Charges General	526	4	9
Establishment	1,033	0	0
Scientific Instrument Account (K. K. Tagore's Fund)	71	0	0
Rates and Taxes	565	8	0
Lighting Charges	81	2	6

15. On the 31st December 1890 the Association had in the custody of the Bank of Bengal Government securities of the value of Rs. 88,400, a floating balance of Rs. 19,525-11-9 and a cash balance in the office of Rs. 103-12-3, amounting in all to Rs. 108,029-8-0

On the 31st December 1889 the Association had in the custody of the Bank of Bengal Government securities of the value of Rs. 88,400, a floating balance of Rs. 13,637-13-0 and a cash balance in the office of Rs. 47-10-9.

16. The thanks of the Association are due to the following members who are kind enough to give monthly, quarterly or yearly subscriptions:—

Maharaja Sir Jotendra Mohun Tagore Bahadur, K.C.S.I.

Raja Peary Mohun Mookerjee Bahadur, C.S.I.

Rai Radhica Prasanna Mookerjee Bahadur.

Babu Kally Charan Ghosh

„ Nilmani Mitter

„ Nilmani Kumar

„ Khetter Mohun Bose

„ Nilmani Mookerjee, M.A., B.L.

„ Gonesh Chunder Chunder

„ Soshi Bhusan Chatterjea

„ Nrisinha Chandra Mukhopadhyaya

17. The Committee of Management have to record with great sorrow the death of Babu Mahesh Chunder

Chaudhuri who was a Member of the Committee of Management from the very foundation of the Association.

18. The thanks of the Association are due to their lecturers, their auditor, Babu Isan Chunder Bose, and their Engineer colleagues, Babus Nilmani Mitter and Khetter Mohan Bose, for their gratuitous services.

19. At the last annual meeting held on the 21st March, His Highness the Maharaja of Vizianagram expressed his desire to bear the entire cost of building a new Laboratory, which was estimated for at a figure not exceeding Rs. 50,000. This munificent offer was most gratefully accepted, and it was unanimously resolved to name the Laboratory after His Highness. His Excellency the Viceroy, the Patron of the Association, was graciously pleased to lay the Foundation-Stone of the Vizianagram Laboratory on the 27th of the same month. Tenders were called for for the building of the Laboratory by public advertisements. Fourteen tenders were received. Of these that of Babu Mohendra Lal Chundra, who had built the Lecture Hall, was accepted by the Committee at their meeting held on the 16th June. The Agreement between the Honorary Secretary and the contractor was signed on the 28th August. The work of excavation was begun, but owing to continued untimely rains, the building could not proceed beyond the stage of the foundations during the year.

20. The Committee regret that the subscription-list for the Ripon Professorship, which was opened so far back as 1884, under the auspices of Lord Ripon

himself, has not shown any progress ; and it is feared that out of Rs. 19,550 subscribed up to 1886, at least Rs. 5,000 will probably have to be set down as unrealizable. However this may be, the Committee still hope that the country, of which Lord Ripon is such a true friend, will not allow the project of the first professorship which it was resolved to name after the noble Lord, to remain a myth to our lasting disgrace. As a set-off to this lamentable state of things about the Ripon Professorship Fund, the Committee have to announce with gratitude that His Highness the Maharaja of Cooch Behar has been contributing since April of last year the sum of Rupees one hundred a month in aid of the establishment of a Permanent Professorship, it being left to the Committee to decide the branch of Science for which the Professorship should be established. The Committee at their meeting held on the 30th May 1890 decided that the Professorship should be in chemistry, and that it should be called the Cooch Behar Professorship of Chemistry. The Honorary Secretary has been ever since trying his best to get a suitable person for the post, but up to this time he has not succeeded in finding one who will accept it for Rs. 100 a month, and besides he has not come upon any one who is competent to fill it so that the Association may be induced to pay a certain sum monthly in addition to the Maharaja's contribution. The money received from the Maharaja is accumulating. The Committee is anxious to know how best to utilize it so as to give effect to the Maharaja's intentions. The gentlemen who have been hitherto gratuitously lecturing in chemistry are

Babu Tarapasanna Roy and Babu Ram Chundra Dutt. The Committee beg to suggest that for the present, and till a competent man be found, these gentlemen be remunerated for their services out of the Maharaja's subscription, and called Cooch Behar Lecturers on Chemistry.

21. The office of President of the Association became vacant on the retirement of Sir Steuart Bayley, and was very kindly accepted by His Honor Sir Charles Elliott.

After the reading of the Report, DR. SIRCAR addressed the meeting as follows :—

YOUR HONOUR AND GENTLEMEN,—

The Report, which with your permission I have read, has been a rather tediously long one, and it would be cruel if I were to prolong the tedium by any idle words of mine. Before an audience like this, and indeed before any audience in the present day enjoying blessings which Science has made Nature scatter broad-cast over the world, any attempt to discourse on the advantages of Science would be unjustifiable impertinence. And though in view of the progress, the very small progress, which this Institution has made in the course of upwards of fifteen years, during which time Science has made rapid strides in the favored countries of the West, giving birth to marvellous discoveries followed by equally marvellous inventions, all tending to the comforts and happiness of man, I say, though in view of this lamentable state of things in my own country, the temptation is great of reiterating what I have been saying for nearly a

quarter of a century, about the absolute need of the physical sciences for the regeneration of the Indian races, I must resist that temptation.

The time has come when I may fairly assume that all this is fully understood, that the utility of this Institution is no longer a matter of doubt, and that all that is needful now is to find out ways and means to bring out that utility. The Association has already a good lecture-hall which will serve its purpose for some time to come ; and will soon have, through the magnificent liberality of His Highness the Maharaja of Vizianagram, a splendid building for the Laboratory. But the building, to use the words of Clerk Maxwell, is but the outward shell of the Laboratory proper. The life-blood, I need hardly say, is constituted by instruments of illustration and research, and the animating spirit must be the men who will devote their lives in it to use those instruments for the exploration of Nature. Through the munificence of one of Bengal's noble sons the Association has hitherto been enjoying the advantage of a good collection of scientific apparatus with which it is working up to this day. But when it is said that this collection is being worked for upwards of a dozen years, it will be easily understood in what state they must be now, and how needful it must be to replace and supplement them by newer and more modern instruments if the Association must keep pace with the progress of discovery.

This means the expenditure of a good sum of money, and the Association ought to be enabled to command it. It is due to Babu Kali Kissen Tagore who has

hitherto helped us so generously and that at a time when without his help we could not have commenced operations at all, that our millionaires who have not yet come forward in aid of the Association should follow his noble example, and that others whose means will not permit them to imitate him in the magnitude of his liberality will not deem it unworthy to come forward each according to his means. Nothing, in my humble opinion, is a greater mistake than to measure the value of a charitable contribution by its amount. And I am afraid it is this mistake which prevents the majority of my countrymen from taking that active part in all movements for the public good which but for it they would take, and it is thus that this fatal mistake deprives such movements in our country of their really public character.

But suppose we succeed, as I believe we shall, in having a well-equipped Laboratory, there will yet be wanting some thing, the most essential thing, to vitalize it, that is, actual workers to work it. How to get them is the most difficult problem in our country. The time has not come when we may have faith in unremunerated workers. The men of leisure are not the men in any part of the world who contribute by their intellectual work towards the intellectual advancement of the race. The Counts du Moncel are solitary examples even in Europe. It is the poor student who must be furnished with leisure, that is with freedom from anxiety for the satisfaction of irresistible animal wants and cravings, in order that his mental energies may be conserved and utilized for the conquest and annexation of nature's domains in the service of man.

But this again means the outlay of a large sum of money, much larger than is necessary for the equipment of the Laboratory. The Report has told you what the state of the funds is for the endowment of a professorship to be called after Lord Ripon. At the time the proposal for such a professorship was made it was hoped that, considering the imperative necessity of a professorship and the dear and honored name with which it was intended to be associated, the citizens of Calcutta would not allow a long time to intervene between the proposal and the endowment ; and indeed, to quote the words Sir Steuart Bayley used when presiding at our annual meeting in 1888, "if ever there was a project which deserved the enthusiastic reception of the people of this town it was one projected for their benefit by Lord Ripon, twice urged on their attention in public by him, subscribed to by him, and to be called after his name." In view of the project of the professorship falling through from want of funds, Sir Steuart was quite justified in reproachfully asking, "in this wealthy city is Lord Ripon's name then forgotten?" and in leaving us to draw the moral. Sir, I must confess I have been the principal delinquent in this matter. I am afraid I have not been able, from a variety of causes which I need not here enumerate, to move about it with sufficient energy to acquaint my countrymen with the project itself to gain for it their support and aid. And I therefore hope with our Committee of Management that my countrymen will not allow it to remain a myth, but will now come forward the more readily to make amends for their past neglect and make it ere long a reality.



The Report has told you of His Highness the Maharaja of Cooch Behar's handsome monthly contribution towards the establishment of a permanent professorship, and also how the money, being as yet inadequate for the remuneration of a full-time professor, is proposed to be utilized for the present, till either the Association is in a position to add its own quota to it, or which is a greater probability, till the Maharaja may see fit to increase the amount of his contribution. At any rate there seems to be every prospect of this professorship soon passing beyond the nebular stage and settling down into a permanent endowment.

In this way by a gradual but a very slow process the Association may rise to the dignity of a scientific institution, fulfilling in a humble way the functions of diffusing and, may be, of making small additions to scientific knowledge. But it must be remembered that by the time it attains to this dignity Science will not remain in *statu quo* in Europe and America, but will have advanced, and if that advance be, as it is very likely to be, at its present accelerating rate, our poor institution will suffer immeasurably by comparison. To avert this catastrophe, for a catastrophe it will be in view of our glorious past and the promising present when the progress of enlightenment has become so rapid under the blessings of western education and the fostering care of a beneficent Government,—to avert such a catastrophe must be the earnest endeavour of every patriot. And the only way, which I can think of, by which this may be effected, is to set free and properly direct the two forms of

energy that are to be found in the country, partly latent and partly working or rather, to speak in more appropriate terms, being dissipated in wrong directions, I mean the energy of intellect and the energy of hoarded wealth. We have ample and satisfactory evidence of the existence of astonishing amounts of both forms of energy. To liberate and properly direct the former in order to get the maximum of work from it, it is absolutely necessary to liberate and properly direct the latter; and when this is done, when wealth becomes the help-meet of intelligence, the arrears due to a variety of causes will, I am confident, be made up, and the time hastened when India shall regain her lost prestige.

“My people are perishing for lack of knowledge,” is literally applicable to the people of India. Ignorance of the eternal laws by which the universe is governed has brought death into this country, death physical, death intellectual, death moral. And is this ignorance to continue here when the rest of the world is ablaze with the light of knowledge? The light of knowledge elsewhere, unless we can make it our own and add to it, will not avail us but will only render the darkness of our ignorance the more visible. It is to help in reluming the light of knowledge in the breasts of my countrymen in order to restore their old Aryan vigour of intellect, that this Association has been established, and that I have nearly sacrificed a whole life-time. I trust that I have not done so in vain, for I believe every one will admit with Shaik Saadi that—

بنی آدم از علم یابد کمال  
نه از حشمت و جاه و مال منال  
چو شمع از پی علم باید گداخت  
که بی علم نتوان خدا را شناخت

Which being interpreted means :—

The children of Adam through knowledge attain perfection,  
Not through pomp or splendour, riches or possessions ;  
For the sake of knowledge you should consume yourself  
like a candle;  
For without knowledge God cannot be known.

The following Resolutions were then unanimously carried :—

I. Proposed by Kumar Ramessur Malia,  
Seconded by His Highness The Maharaja of Bettia, K.C.I.E.,  
That the Report of the Committee of Management be adopted and  
that the accounts be passed.

II. Proposed by Rev. Father E. Lafont S.J., C.I.E.,  
Seconded by the Hon'ble Dr. Mahendra Lal Sircar, M.D.,  
C.I.E.,

That as suggested by the Committee of Management, till a permanent Professor can be appointed, the present lecturers on Chemistry be remunerated out of H. H. the Maharaja of Cooch Behar's contribution towards the establishment of a permanent professorship, and that they be called Cooch Behar lecturers of chemistry.

III. Proposed by Nawab Abdul Luteef, Bahadur, C.I.E.,  
Seconded by Babu Jadu Lal Mullick,  
That the office-bearers of the Association for the current year be as follows :—

PRESIDENT.

THE HON'BLE SIR CHARLES ALFRED ELLIOTT, K.C.S.I., &c. &c.,  
Lieutenant-Governor of Bengal.

VICE-PRESIDENTS.

REV. FATHER E. LAFONT, S.J., C.I.E.

RAJA PEARY MOHAN MOOKERJEA, C.S.I.

HONORARY SECRETARY.

HON'BLE DR. MAHENDRA LAL SIRCAR, M.D., C.I.E.

HONORARY ASST. SECRETARIES.

BABU KHETTER MOHUN BOSE, B.A.

„ NILMANI KUMAR.

HONORARY AUDITOR.

BABU ISHAN CHANDRA BOSE, M.A., B.L.

IV. Proposed by Babu Chandi Lal Sing.

Seconded by Rai Prasanna Kumar Bannerjee, Bahadur,

That the Committee of Management for the current year be constituted as follows :—

PRESIDENT.

The Hon'ble Sir Charles Alfred Elliott, K.C.S.I., &c. &c.,  
*Ex-Officio.*

VICE-PRESIDENTS.

Rev. Father E. Lafont, S.J., C.I.E., *Ex-Officio,*

Raja Peary Mohan Mookerjee Bahadur, C.S.I., *Ex-Officio.*

MEMBERS.

H. H. Maharaja of Cuch Behar, G.C.I.E.,

H. H. Maharaja of Vizianagram, K.C.I.E.,

H. H. Maharaja of Durbhanga, K.C.I.E.,

H. H. Maharaja of Bettia, K.C.I.E.,

Maharaja Sir Joteendra Mohan Tagore Bahadur, K.C.I.E.,

Maharaja Sir Narendrā Krishna Bahadur, K.C.I.E.,

Raja Sir Sourendra Mohan Tagore Bahadur, Kt., C.I.E., &c.,

Sir Ramesh Chunder Mitter, Kt.,

Babu Cally Kissen Tagore,

Rai Kanai Lal Dey Bahadur, C.I.E., F.C.S.,

Babu Issur Chunder Mitter,

„ Nilmani Mitter,

Nawab Abdul Luteef Bahadur, C.I.E.,

Mahamahopadhyaya Mahesh Chunder Nyayaratana, C.I.E.,

Babu Jadu Lal Mullick,

A. M. Bose, Esq., M.A.,

Hon'ble Dr. Gurudas Banerjee, D.L.,

Babu Gonesh Chunder Chunder,  
Dr. Sambhu Chunder Mookerjee,  
Rai Tara Prasanna Roy Bahadur, F.C.S., F.I.C.,  
Babu Surendra Nath Banerjee,  
Rai Raj Kumar Sarbadhikari Bahadur, B.L.,  
O. C. Dutt, Esq.,  
Kumar Indra Chunder Singh Bahadur,  
,, Sarat Chunder Singh Bahadur,  
Babu Chundra Nath Bose, M.A., B.L.,  
,, Nilmani Mookerjee, M.A., B.L.,  
,, Ishan Chunder Bose, M.A., B.L.,  
Kumar Nilkrishna Bahadur,  
Rai Radhica Prasanna Mookerjee, Bahadur,  
Babu Radhica Prasad Mookerjee, M.I.C.E.,  
,, Docowary Ghose, L.M.S.,  
Shastri Golap Chandra Sarkar, M.A., B.L.,  
Pandit Prannath Saraswati, M.A., B.L.,  
J. Ghosal, Esq.,  
Babu Peary Mohun Roy,  
Maulavi Muhomad Yusoof, Khan Bahadur,  
Babu Ramakhoy Chatterjee,

SECRETARY.

Hon'ble Dr. Mahendra Lal Sircar, *Ex-Officio*.

ASSISTANT SECRETARIES.

Babu Khetter Mohan Bose, B.A., *Ex-Officio*,  
,, Nilmani Kumar, *Ex-Officio*.

His Honor the Lieutenant-Governor then addressed the meeting as follows :—

YOUR HIGHNESS AND GENTLEMEN,—

I feel rather embarrassed at having to address such an audience as this, because it is a well-established doctrine that a speaker ought to know more of his subject than the people whom he addresses ; where-

as it so happens that while almost all of those whom I see around me are old supporters of, or are familiar with, this Association, this is the first occasion on which I have been present at any of its meetings. I am satisfied, however, that I did not make a mistake in assenting to the request that I should become President of this Association, and so take the place of my predecessor in the Lieutenant-Governorship, Sir Steuart Bayley ; for I see, on looking through your past reports, that for many years either the Lieutenant-Governor or the Viceroy has generally been present at your annual meetings ; and it is quite right that Government should support and encourage everything that is done to promote the growth of the love of science in India. Now this Association has one peculiar merit, in that it affords opportunities to young men to pursue their studies in science after they have gone through their usual curriculum and taken their University degree, that is, at a time when many of them are apt to think that they have learnt all that there is to learn and know all that needs to be known, and that they may as well go out into the world and cease improving their minds and begin to earn money for themselves. But we who are old and grey-headed know that the time never does come when there is nothing left to learn or when education should cease ; and therefore I think that the society of Bengal generally, and of Calcutta in particular, owes a great debt to those devoted and public-spirited gentlemen who have carried on the series of useful and valuable, if somewhat abstruse, lectures of which we have heard an account given in the report which has been read

this evening. Now, gentlemen, I am not going to say anything in praise of Physical Science to-night. Your presence here and your connection with this Association shows that you already know and realize all that I could say on such a subject. But I wish to submit to you one particular illustration of the direction in which a spread of the study of Physical Science must benefit this country. You have all of you read the results of the Census which has recently been taken and you have no doubt pondered with some alarm and anxiety over the fact which it discloses, that the population of India has increased by 22 millions during the last ten years. Just think what an enormous figure 22 millions is ; it is a larger number than the whole of England contained 20 years ago—a larger number than the whole of Great Britain contained 40 years ago. It is a very serious thing to think that every ten years this country has to provide additional food for such an immense population. It is a commonplace saying that India is a very poor country—so poor that it can hardly provide food for the whole of its population ; and yet here we have an increase of 20 millions every ten years to scramble with the existing crowd for their scanty portion of food. I don't suppose anyone who is at all a student of Political Economy can look without anxiety on the prospect of what the country will come to if the population goes on steadily increasing at this rate. You have no doubt seen a letter which Sir J. Caird wrote to the *Times*, in which he urged that the difficulty should be met and the increase of food provided by introducing a more scientific agriculture. This recommendation of Sir J. Caird's makes one think

of the saying, "Vous êtes orfèvre, Mons. Josse." Mons. Josse, you remember, was a jeweller in one of Molière's plays, and whenever any trouble happens to the house he is interested in, whether it be the illness of the daughter or the misconduct of the son or the incapacity of the head of the house, the only advice he can give them is to buy more jewels. Similarly Sir J. Caird is famous as a scientific agriculturist, and his advice is to introduce more scientific agriculture. Now I do not wish in the least to decry scientific agriculture. I believe it will do much good; and I trust that one of the results of the lectures given here will be to direct practical chemical knowledge to the improvement of agricultural processes. But though I am not a jeweller, I have a nostrum of my own, and it is one that impressed itself upon me when I was employed along with Sir J. Caird on the Famine Commission, and was led in that way to make a special study of this branch of economics. The doctrine, which I specially recommend as the true remedy for supplying food to the ever-increasing population, is the introduction of a Diversity of Occupations. The great misfortune of India is the absence of such diversity. Almost the whole of the population, or at least 90 per cent., is employed in agriculture; and hence it happens that if anything goes wrong with the crops—I do not speak of any such wide catastrophe as famine, but even if there is any temporary drought or any excessive flooding—prices go up, panic sets in, and a general distress occurs. Now the great object of those who are interested in the welfare of this country



should be to take them off the land ; to provide a diversity of occupations, through which they may obtain wages and subsistence, irrespective of agriculture. And it is to Physical Science that we mainly owe the possibility of offering to the people these different kinds of occupation. Take railways, for instance. I daresay you know that the Indian railways employ about 200,000 Natives of this country ; 200,000 people who, but for the railways, would be jostling each other on the fields, and by their competition would be raising the rate of rent and lowering the rate of agricultural wages. Now railways owe their entire existence to the Physical Sciences. Science invented the steam-engine—science taught how to roll iron and to cast steel for the girders and the permanent-way. But science has now done all that it can for railways ; we do not hope for much further development in them, though we hope for an immense extension of them, and that there may be soon 10 or 20 miles of railway for every mile that exists now. In what other direction, then, could science promote Diversity of Occupations ? There is the great field of mining to which science opens the door. You have, within 200 miles of Calcutta, one of the greatest coal-fields in the world : and yet it has been so little worked that not many years ago more coal was brought to Calcutta from England than was excavated by the total output of the Bengal coal-fields. Already there has been much development of these mines. At the present day the whole of the railways in these parts are worked with Bengal coal, and

700,000 tons of coal are annually used by the steamers that leave this port. In a very few years I hope that the import of English coal will totally cease ; and in this and many other ways there is immense scope for development in coal mines. For it is not in Bengal alone that coal is found ; we have also found it in Palamow ; we have found a large field on the skirts of Rewah, into which as yet we have only put down two or three insignificant boreholes ; we have found it in Behar, and we have recently found traces of it at the foot of the Himalayas near Darjeeling. It is Physical Science that will teach your young men to go about with open and intelligent eyes to understand the stratification of the rocks, and to read the indications which the strata give as to the probability of finding coal or other mineral wealth ; and wherever mineral wealth exists and is exploited, there a new source of employment is created which takes the people off the land. Then look again at petroleum. India some day will be an immense producer of petroleum. There are great acres of it in Beloochistan and near Rawal Pindi in the north-west, in Assam and Burmah in the north-east, which we are only now just beginning to touch, because, although we have long known of them, we have not the trained scientific and experienced men required to work them. Why, in upper Assam alone there is an enormous tract well known to be extremely rich in petroleum. I myself saw it 10 years ago, and its existence has been known for more than 30 years. But it was only last year that for the first time a successful experiment was made and a boring sunk which tapped the oil so that it spouted up just as you have

read of it spouting up at Baku on the Caspian shores or in the great oil-fields of Canada. All we need is the growth of a knowledge of Physical Science to teach the Natives of India how to deal with these natural resources, and then we shall no longer import kerosine from Canada or from Russia, but shall produce all that is required for our own consumption, and in producing it shall afford employment to a great body of labourers who will be independent of agriculture. Thus far I have only spoken of mines ; but I might have easily said just as much on the subject of factories, which, as you know, have provided a new source of employment which has added greatly to the well-being and comfort of the industrial population of this part of Bengal. And what could factories have done without science ? Not only has it given them their motive power, the steam-engine, but the spindles which spin the thread and the looms which weave the fabrics in every part and detail of their machinery, owe their existence to the lessons taught in the laboratory or by practical mechanics. I think, gentlemen, that I have now said enough to illustrate this doctrine that the great want of India is Diversity of Occupations ; that the growth and spread of Physical Science is the only means of relieving the competition among agricultural labourers and diverting them to other fields of useful work ; and that few men can deserve better of their country than those who have devoted themselves by their support of this Association to the spread of science in India. The labours of such men as Father Lafont and Dr. Mahendra Lal Sircar are given without remuneration for the pure love of their

subject; and I trust that the benefits which will flow from their devotion will long be remembered among you, and that they will have the highest of all rewards, the reward of feeling that they have spent themselves for the good of the country, and not spent themselves in vain.



THE INDIAN ASSOCIATION FOR THE CULTIVATION OF SCIENCE.

DR.

Balance Sheet as at 31st December 1890.

CR.

	Rs.	As.	Ps.		Rs.	As.	Ps.
To Bank of Bengal Account .....	19,525	11	9	By General Fund Account .....	1,80,053	3	10
„ Range of Shops (East side) .....	2,516	10	9	„ Old House Materials Sale Account ...	2,900	0	0
„ Do. Do. (West side) .....	2,308	5	0	„ Ripon Professorship Fund .....	2,210	0	0
„ Tools and Implements Account .....	56	4	3	„ Interest Account (Ripon Prof. Fund)	498	12	6
„ Scientific Instruments Account				„ New Building Fund Account .....	12,022	10	9
(General Fund) .....	6,110	0	6	„ H. H. Maharaja of Cooch Behar's			
„ Do Do (K.K. Tagore's Fund)	20,270	9	10	Professorship Fund .....	800	0	0
„ Premium Account (Ripon Prof. Fund)	11	14	0				
„ Commission Account (Ripon Prof. Fund)	6	7	0	Total Rs.	1,98,484	11	1
„ House Account (Building, &c., Purchase)	31,680	11	9				
„ Library Account (Books, &c) .....	1,725	1	0				
„ New Lecture Hall and Gallery Account	23,465	5	3				
„ Darwan's Room .....	303	13	9				
„ Advance for Building Viziana-							
gram Laboratory .....	2,000	0	0				
„ Government 4% Securities in Custody							
of the Bank of Bengal (General							
Fund) .....	86,400	0	0				
„ Government 4% Securities in Custody							
of the Bank of Bengal (Ripon Pro-							
fessorship Fund) .....	2,000	0	0				
Cash in hand on 31st December 1890 ...	103	12	3				
Total Rs.	1,98,484	11	1				

I have examined the Cash Book with vouchers and the Bank's Pass Book and have found all the entries correct. The Cash Book has been compared and found to agree with the Ledger. I have examined the Bank's statement of Government Securities of the Association. The books are all kept in good order.

MAHENDRA LAL SIRCAR, M.D.,  
Hony. Secy.

I. C. BOSE,  
Hony. Auditor.

# The Indian Association for the Cultivation of Science.

(210, Bow-Bazar Street.)

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*Established 1876.*

The OBJECT of the Institution is the Cultivation and Diffusion of the Physical Sciences.

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## PATRON.

HIS EXCELLENCY THE MOST HON'BLE THE MARQUESS OF LANSDOWNE, G.C.M.G., G.M.S.I., G.M.I.E., &c., &c., Viceroy and Governor General of India.

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C.I.E.

Raja Piyari Mohun Mookerjee  
Bahadur, C.S.I.  
Babu Jadoo Lall Mullick  
Dr. Mahendra Lal Sircar, M.D.,  
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## HONORARY ASST. SECRETARIES.

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„ NILMANI KUMAR.

## HONORARY AUDITOR.

BABU ISHAN CHANDRA BOSE, M.A., B.L.

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Rev. Father E. Lafont, S.J., } *Vice-Presidents,*  
Raja Peary Mohun Mookerji } *Ex Officio.*

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H.H. Maharaja of Bettia, K.C.I.E.	„ Sarat Ch. Singh Bahadur
Maharaja Sir Joteendra Mohan Tagore Bahadur, K.C.S.I. &c.	Babu Chandra Nath Bose, M.A., B.L.
Maharaja Sir Narendra Krishna Bahadur, K.C.I.E.	„ Nilmani Mookerjee, M.A., B.L.
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Sir Ramesh Chunder Mitter, Kt.	Kumar Nilkrishna Bahadur
Babu Cally Kissen Tagore	Rai Radhica Prasanna Mookerjee Bahadur
Rai Kanai Lal Dey Bahadur, C.I.E., &c.	Babu Radhica Prasad Mookerjee, M.I.C.B.
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Hon'ble Dr. Gurudas Banerjee, D.L.	Hon'ble Dr. Mahendra Lal Sircar, C.I.E., <i>Ex Officio.</i>
Babu Gonesh Chunder Chunder	Babu Khetter Mohun Bose, B.A., <i>Ex Officio.</i>
Dr. Sambhu Chunder Mookerjee	„ Nilmani Kumar, <i>Ex Officio.</i>
Rai Tara Prasanna Roy Bahadur, F.C.S., &c.	
Babu Surendra Nath Banerjee	



LECTURERS (1890).

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Rev. Father E. Lafont, S.J., C.I.E.

Hon'ble Dr. Mahendra Lal Sircar, M.D., C.I.E.

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Babu Ram Chandra Datta, F.C.S.

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Babu Ram Chunder Dutt, F.C.S.

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Babu Ashutosh Mukerjee, M.A., F.R.S.E.

PURE MATHEMATICS

Babu Ashutosh Mukhopadhyay, M.A., F.R.S.E.

Babu Mahendra Nath Raya, M.A.

## SUBSCRIBERS (GENERAL FUND).

		Rs.
1870		
24th Jan.	Babu Joykissen Mookerjee ... ..	1,000
"	Raja Kamala Krishna Bahadur ... ..	2,000
31st "	Raja Degumber Mitter, C. S. I. ... ..	1,000
"	Babu Jogeshwar Singh and Brothers ... ..	1,000
7th Feb.	Pandit Iswara Chandra Vidyasagara, C. I. E. ... ..	1,000
14th "	Maharaja Sir Joteendro Mohun Tagore Bahadur, K. C. S. I. &c. ... ..	2,500
21st "	Dutt Family of Wellington Square ... ..	1,000
7th March	Babu Dwijendra Nath Tagore ... ..	1,000
"	" Gunendranath Tagore ... ..	1,000
18th April	" Dwarka Nath Mitter, Sreekissenpore ... ..	1,000
30th June	" Janakinath Mookerjee, Boinchee ... ..	2,000
5th Sept.	Hon'ble Dwarka Nath Mitter ... ..	4,000
"	Babu Annada Prasad Banerjee ... ..	1,000
31st Oct.	" Jadulal Mullick ... ..	1,500
28th Nov.	Kumar Grish Chunder Singh and minors, Paikparah Raj Family ... ..	2,000
5th Dec.	Hon'ble Ramesh Chandra Mitter ... ..	2,000
12th "	Hon'ble Anukul Chandra Mookerjee ... ..	2,000
1871		
16th March	His Highness the Maharajah of Pattiallah ... ..	5,000
"	Babu Mahesh Chandra Chaudhuri ... ..	1,000
"	" Kalimohan Das ... ..	1,000
"	" Soorjee Kumar Sarvadhikari ... ..	1,000
17th April	Srimati Darimba Devi, Raniganj ... ..	1,000
"	Babu Jogendra Narayan Ghose ... ..	1,000
1872		
29th April	" Rakhal Chandra Roy, Zemindar, Lakotea ... ..	1,000
20th May	" Jogendra Chandra Ghose, Kidderpore ... ..	1,000
2nd Sept.	" Kaliprasanna Ghose ... ..	1,000
12th Nov.	Maharani Sarnamayi, C. I. ... ..	8,000
1873		
26th Jan.	Babu Mohini Mohan Roy ... ..	1,000
"	Dr. Mahendra Lal Sircar, M. D., C. I. E. ... ..	1,000
Carried forward		50,000

		Rs.
Brought forward		50,000
1875		
1st March	Babu Sarat Kumar Ghosal, M. A. ... ..	100
7th "	Rai Kanai Lall Dey Bahadur, C. I. E., F. C. S.	1,000
20th "	Babu Omesh Chunder Dutt ... ..	1,000
23rd "	" Bamacharan Banerjee ... ..	100
29th "	" Khetter Mohun Chatterjee, Dakhineswar	100
"	" Issur Chunder Mitter ... ..	600
"	" Nilmony Coomar ... ..	180
"	" Brindaban Chunder Chatterjee ... ..	150
"	" Nobin Chunder Pal, Metiabruz ... ..	100
31st "	" Dwarka Nath Biswas, Jan Bazar ... ..	1,000
"	" Sam Chand Coomar ... ..	500
"	" Kali Prasanna Dutt ... ..	250
"	" Omesh Chunder Mitter, L. M. S. ... ..	250
2nd April	Raja Harendra Krishna Dev Bahadur ... ..	500
"	Babu Nil Kamal Mitter ... ..	100
"	" Nilmani Mitter, Engineer ... ..	200
"	" Piyari Charan Sircar ... ..	200
"	" Ramanath Law, Attorney-at-Law ... ..	250
"	" Sam Lall Mitter ... ..	200
3rd "	" Srinath Das ... ..	500
"	" Rajkrishna Banerjee ... ..	100
"	Pandit Pran Nath Saraswati, M. A., B. L. ... ..	100
"	Babu Jadu Nath Ghose, Sankaritola ... ..	200
"	" Gangadhar Chatterjee ... ..	150
"	" Sambhu Chunder Mookerjee ... ..	100
"	" Ganesh Chunder Chunder, Attorney-at-Law	300
"	" Docowry Ghose, L. M. S. ... ..	100
"	" Rajkrishna Mitter ... ..	100
"	" Jadu Nath Dey ... ..	100
4th "	" Harish Chandra Sarma ... ..	50
"	" Sib Chandra Dev ... ..	50
"	" Nrisinha Charan Mookerjee, M. A., B. L. ... ..	50
"	" Isan Chandra Banerjee ... ..	100
"	" Luckhy Narain Bose, L. M. S. ... ..	100
Carried forward		58,880

		Rs.
	Brought forward	58,880
4th April	Kaviraj Brajendra Kumar Sen and brother, in honor of the memory of their father the late Kaviraj Haradhan Sen ... ..	500
"	Babu Russick Lal Pyne ... ..	100
"	Maharaja Ramanath Tagore Bahadur, C. S. I. ...	1,000
5th	" Babu Braja Nath Dey, Bhandardaha ...	50
"	" Hon'ble Kristodas Pal, C. I. E., Rai Bahadur ...	200
"	" Nawab Abdul Luteef Bahadur, C. I. E. ...	100
"	" Babu Jadu Nath Mookerjee, Bhadrakali ...	50
"	" " Shashi Bhushan Chatterjee ...	50
"	" " Nilmani Mookerjee, M. A., B. L. ...	50
9th	" " Bhagabati Charan Mullick ...	200
"	" " Nafar Chandra Bhatta, Sub. Judge ...	100
10th	" " Shamchand Mitter ... ..	500
"	" " Hemchandra Banerjee, Kidderpore ...	250
"	" Anonymous ... ..	5
12th	" Maharaja Sir Narendra Krishna Dev Bahadur K. C. I. E. ... ..	1,000
"	" Raja Durga Charan Law Bahadur, C. I. E. ...	500
19th	" Raja Rajendra Mullick Bahadur ...	1,000
21st	" Dr. G. C. Roy, M. D., F. E. C. S., ...	50
23rd	" Rai Mahendra Nath Bose Bahadur ...	500
"	" " Brajendra Kumar Seal Bahadur ...	300
24th	" " Ramsankar Sen Bahadur ...	300
26th	" Babu Dinabandhu Mookerjee, Sibpore ...	100
"	" " Subaldass Mullick ... ..	500
27th	" " Khettermohun Bose, B. A. ...	300
29th	" " Kalikadass Dutt, Kuch Behar ...	200
"	" " Radhikanarayan Ghose, Ichapore ...	100
4th May	Babu Amritlal Chatterjee, Sub. Judge ...	200
9th	" Rai Radhikaprasanna Mookerjee Bahadur ...	200
"	" Babu Brajanath Mookerjee, Krishnagar ...	100
"	" Rai Kalicharan Ghose Bahadur, Dy. Mag. ...	200
16th	" Babu Jadunath Bose, Deputy Magistrate ...	100
"	" Raja Ram Ranjan Chakravarti Bahadur, Hitampore	500
	Carried forward	68,185

		Rs.
Brought forward		68,185
17th May	M. M. Mahesh Chandra Nyayaratna, C. I. E. ...	1,000
19th "	Babu Madhab Chunder Roy, M. I. C. E. ...	200
20th "	" Kalikissen Tagore ... ..	2,500
24th "	" Radhikaprasad Mookerjee, M. I. C. E. ...	300
31st "	Rai Rajendranath Mitter Bahadur ...	100
8th June	Babu Prankissen Mookerjee, Tallah ...	50
13th "	Rai Annadaprasad Roy Bahadur, Kasimbazar	4,500
15th "	" Bipinbihari Dutt Bahadur, Medinapur ...	500
25th "	Babu Srinath Mookerjee ... ..	50
21st July	" Mahendranath Mookerjee, Meherpore ...	50
24th "	" Ramaksaya Chatterjee, Dy. Magte. ...	100
1st Sept.	Nawab Mir Mahomed Ali ...	500
16th Oct.	Babu Dwarkanath Banerjee, Allahabad ...	250
7th Nov.	" Rakhaldas Halder ... ..	200
"	" Rajkrishna Mookerjee, M. A., B. L. ...	100
17th "	" Ashutosh Dhur, Attorney-at-law ...	500
"	" Prasannakumar Sarvadhikari ...	200
19th "	" Janaki Nath Ghosal ...	100
20th "	Rev. E. Lafont, S. J., C. I. E., St. Xavier's Coll.	100
23rd "	Babu Kanti Chandra Banerjee ...	100
28th "	" Ananda Chandra Chatterjee ...	250
1st Dec.	" Paramartha Ganguli ... ..	100
3rd "	" Chandi Lal Singha ... ..	1,000
"	" Chandra Sikhar Banerjee, Dy. Magte. ...	100
4th "	" Russick Lal Banerjee ... ..	200
12th "	Raja Odoy Pertap Singh Bahadur, Bhinga ...	500
"	Babu Nilmadhab Mookerjee ...	500
"	Dr. Gurudas Banerjee, M. A., D. L. ...	100
"	Babu Mahendranath Mookerjee ...	50
18th "	" Bhudev Mookerjee, C. I. E. ...	400
"	" Durgamohan Dass ... ..	250
"	" Anurup Chunder Mookerjee, Jonyo ...	100
21st "	" Baikuntha Nath Sen, Saydabad ...	150
28th "	" Radha Charan Sen, Berhampore ...	100
31st "	Maharani Shama Mohini, Dinagepore ...	2,000
Carried forward		85,385

		Rs.
Brought forward		85,385
Dec. 31st	Rai Radhagobinda Raya Bahadur, Dinagapore	1,000
1876		
1st Jan.	Babu Kashi Nath Biswas, Sub. Judge	... 100
10th	„ „ Chhakkanlal Rai, Chuckdighi	... 500
11th	„ „ Keshab Chandra Sen	... 50
12th	„ „ Surendra Nath Banerjee	... 500
„	Raja Rajendralala Mitra Bahadur, LL. D., C. I. E.	100
14th	Babu Ananda Mohan Bose, M. A., Barrister-at-Law	100
„	„ Sarat Chundra Ghose	... 50
„	Dr. W. E. Dhanokati Raju, Rao Bahadur, Madras	... 50
„	Babu Bankim Chandra Chatterjee	... 500
3rd Feb.	„ Ram Doss Sen, Berhampore	... 150
28th Feb.	„ Brahma Mohan Mallik	... 200
7th March	„ Sri Nath Chunder, Attorney at law	... 100
6th April	Sir Richard Temple, Bart., G. C. I. E., &c.	... 500
7th	Babu Tarini Charan Ghose	... 100
„	„ Jadu Nath Ghosh, Thakoordas Palit's Lane	50
„	„ Khetter Mohan Banerjee, Sibpore	... 100
„	„ Ram Chandra Mookerjee, Sibpore	... 50
„	„ Hem Chandra Mookerjee, L. M. S., Sibpore	50
„	„ Kisor Mohan Sen	... 100
26th June	„ Bijaya Kissen Mookerjee, Uttarpara	... 500
„	„ Mahendra Nath Ghosh	... 100
1st July	„ Kali Prasanna Mookerjee	... 100
„	„ Hara Govind Mookerjee	... 100
„	„ Piyari Lal Sen	... 50
9th July	„ Jogendra Chandra Mookerjee	... 50
„	„ Nilambar Mookerjee, M. A., B. L.	... 1,000
15th	Raja Piyari Mohan Mookerjee Bahadur, C. S. I.	300
22nd July	Kumar Rameswar Malia Bahadur	... 1,000
„	Rai Grish Chandra Dass Bahadur	... 500
23rd	Babu Ashutosh Dhur (Junior)	... 100
14th Aug.	„ Bhujendra Bhusan Chatterjee	... 100
„	„ Pramada Charan Banerjee, Munsif	... 100
Carried forward		93,735

			Rs.
Brought forward			93,735
24th	„	Piyari Mohan Banerjee	100
„	„	Jogendra Nath Banerjee, Dy. Mag.	50
28th	„	Bhairab Chunder Banerjee	200
25th Sep.	„	Nilmani Mitter (Additional)	216
10th Oct.	„	Hem Chandra Kerr, Dy. Mag.	200
14th	„	Ram Kanai Adhikari	100
„	„	Kissen Mohan Mullick	50
1st Dec.		Srimati Nimi Dasi	100
1877			
7th Feb.		Babu Rammaya Raya, L. M. S.	100
23rd	„	Jadu Nath Mookerjee, Medical Practitioner	100
24th	„	Jadu Nath Roy	100
„	„	Dwarka Nath Sen	100
3rd March		Rai Kristo Mohun Mookerjee Bahadur	100
21st	„	Babu Amrita Lal Sircar	50
14th Sept.		Babu Purna Chunder Kumar	60
8th Nov.	„	Sama Charan Lahiri, L. M. S.,	250
1st Dec.	„	Nilmani Dey	100
„	„	Nobin Chunder Coar	50
22nd	„	Kumar Kanti Chunder Singh Bahadur	2,000
1878			
10th Jan.		Babu Chandra Nath Bose, M. A., B. L.	100
„		Rai Prasanna Kumar Banerjee Bahadur	512
9th Feb.		Babu Kissory Mohun Roy	100
6th May		Raja Surja Kanta Acharyya Chaudhury Bahadur, Mymensing	500
18th	„	Babu Kally Kissen Tagore (additional)	25,000
16th June		Raja Poorna Chandra Singh Bahadur	2,000
15th Dec.		Babu Saroda Charan Mitra, M. A., B. L.	500
1879			
25th July		Babu Amrita Lal Chatterjee (additional)	300
11th Dec.	„	Chandra Nath Biswas	10
1880			
18th March		Raja Koomud Narayan Bhoop, Bijni	1,000
14th April		Babu Govin Chunder Dutt	250
Carried forward			128,033

				Rs.
Brought forward				128,033
1881				
5th May	Babu Akhoy Coomar Dutt	...	...	50
1889				
11th Feb.	Babu Pramada Charan Banerjee (additional)	...	...	20
	Late Babu Akhoy Coomar Dutt	...	...	3,000
1891				
20th April	Babu Probodh Chandra Chatterjee	...	...	500
30th April	„ Saroda Prasad Roy	...	...	500
				<hr/>
	Total Rs.	.....	.....	132,103



## SUBSCRIBERS (BUILDING FUND).

				Rs.
1882				
9th Jan.	Babu Piyari Mohan Roy ... ..	...	...	1,000
23rd "	" Cally Kissen Tagore ... ..	...	...	5,000
6th March	Babu Raj Kumar Sarvadhikari, B. L.		...	500
10th "	Kumar Indra Chandra Singh Bahadur		...	5,000
11th "	Maharaja Kamal Krishna Bahadur ...		...	1,000
"	Raja Kumud Narayan Bhup, Bijni		...	5,000
"	Raja Sir Sourendra Mohan Tagore Bahadur,		...	
	Kt., C. I. E. ... ..	...	...	1,000
"	Dr. Mahendra Lal Sircar ... ..	...	...	500
17th "	The most Hon'ble the Marquis of Ripon,		...	
	K. G., &c. &c. ... ..	...	...	1,000
30th "	H. H. the Maharaja of Cooch Behar, G. C. I. E.		...	1,000
4th April	H. H. the Maharaja of Benares, G. C. S. I., &c.		...	500
24th "	H. H. the Maharaja of Darbhanga, K. C. I. E., &c.		...	5,000
7th May	Babu Jogendra Nath Roy ... ..	...	...	1,000
12th "	Rai Prasanna Kumar Banerjea Bahadur		...	100
5th Aug.	Babu Ramaksay Chatterjea ... ..	...	..	100
1884				
20th March	H. H. the Maharaja of Burdwan ... ..	...	...	1,000
"	Kumar Sarat Chandra Singh Bahadur		...	2,000
1886				
12th Jan.	H. H. the Maharaja of Cashmere ... ..	...	...	3,000
"	H. H. the Gaekwar of Baroda, G. C. S. I., &c.		...	1,000
18th May	Babu Ramkissen ... ..	...	...	1,000
5th Sept.	Kumar Nil Krishna Bahadur ... ..	...	...	500
3rd Nov.	Babu Bhudeb Mookerjee, C. I. E. ... ..	...	...	250
20th Dec.	George Yule Esq. ... ..	...	...	500
1887				
20th June	Babu Gonesh Chunder Chunder ... ..	...	...	1,000
1888				
5th March	" Golap Chandra Sarkar, M. A., B. L.		...	500
20th July	H. H. Maharaja of Vizianagram ... ..	...	...	25,000
1890				
8th Feb.	Babu Shib Chunder Deb ... ..	...	...	20
Carried forward				63,470

		Rs.
Brought forward		63,470
14th March	Raja Pyari Mohun Mukherjee, Bahadur ...	1,000
20th „	Moulavi Mahomed Yusoof Khan, Bahadur ...	500
21st „	Babu Peary Mohun Roy ... ..	1,000
„ „	H. H. Maharaja of Vizianagram (additional) ...	15,000
26th „	H. H. Maharaja of Bettia... ..	10,000
27th „	H. E. The Most Hon'ble The Marquess of Lansdowne, Viceroy and Governor-General of India. ... ..	
28th April	Raja Ramranjan Chakrvarti, Bahadur ...	200
Total Rs. ....		91,170

SUBSCRIBERS (RIPON PROFESSORSHIP FUND).

		Rs.
1884		
12th March	H. H. Maharaja Holkar, G. C. S. I., &c. ...	1,000
18th „	Raja Samananda Dey Bahadur and his son Kumar Baikunta Nath Dey Bahadur	1,000
6th April	H. H. the Maharaja of Darbhanga, K. C. I. E., &c.	10,000
27th April	The most Hon'ble the Marquis of Ripon, K. G., &c., &c. ... ..	1,000
„	Babu Rakhai Das Haldar ... ..	50
1885		
19th Jan.	Babu Parvati Charan Roy ... ..	500
25th Feb.	H. H. the Nizam of Hyderabad, G. C. S. I., &c.	3,000
„	Nawab Sir Salar Jung, K. C. S. I., &c. ...	1,000
7th May	Babu Isan Chander Bose, M. A. ... ..	500
1886		
18th May	Babu Ram Kissen ... ..	1,000
5th Sept.	Kumar Nilkrishna Bahadur ... ..	500
Total Rs. ....		19,550

THE HINDOO PATRIOT ON THE REPORT OF THE  
FOURTEENTH ANNUAL MEETING.

I. (May 4, 1891.)

The Fourteenth Annual Meeting of the above Association was held at the Association rooms on Thursday last, the 30th ultimo, at 5-30 P.M., under the Presidency of His Honor the Lieutenant-Governor of Bengal, President of the Association. The Report of the Committee of Management, showing the working of the Association during the past year, which at the call of the President was read by the Honorary Secretary, differed from its predecessors in that it gave summaries of the lectures delivered during the year. This is as it should be, inasmuch as it gives the public a better idea of the character of the lectures, than the mere heads of them which previous reports used to give. We wish that the summaries were even fuller than they are. Of course we are aware that the lecturers of the Association are all honorary, and that it would be no small burden upon them to be obliged, in addition to the pretty heavy work of delivering systematic lectures, to furnish the Association with summaries of their lectures; and, therefore, so long as we have not paid professors, we must be content with what we have.

It appears from the Report that the subjects lectured upon were Physics, Chemistry including practical demonstrations, and Mixed Mathematics, and that altogether 107 lectures were delivered, of which 21 were delivered by the Rev. Father E. Lafont on Sound and Light, 20 by Dr. Sircar on Electricity and Heat, 37 by Babu Ram Chunder Dutt on Chemistry, and 29 by Babu Ashutosh Mukhopadhyay on Mathematical Physics. For summaries of these lectures we would refer the reader to the Report which we intend to publish in our next.

The most noteworthy events of the Association were the laying of the foundation-stone of the Vizianagram Laboratory by His Excellency the Viceroy, the receipt of monthly contributions of Rs. 100 a month by His Highness the Maharaja of Cooch Behar towards the endowment of a permanent professorship, and the acceptance of the office of President by His Honor Sir Charles Elliott on the retirement of Sir Steuart Bayley. His Highness the Maharaja of Cooch Behar has, we are glad to learn, with characteristic liberality, made these monthly payments a permanent charge upon the State. If we may

venture to suggest, it would be better if His Highness were to enable the Association to capitalize it by making the necessary donation. The Committee have not yet succeeded in getting a suitable man to fill the post of Cooch Behar Professor of Chemistry. We know well the difficulty of procuring such men. The Corporation of Calcutta had to train two men for their analytical department, at the Medical College Laboratory under Dr. Warden. We think the Committee have done well in suggesting, and the Association has acted wisely in adopting the suggestion, that their present lecturers on Chemistry be remunerated out of the Maharaja of Cooch Behar's contribution. We think that zealously as they have been working gratuitously for the benefit of the Association, which means the benefit of the country, the present lecturers will work yet more zealously, not for the remuneration they will now receive but to set examples to the young graduates of our colleges to work similarly, unmindful of the smallness of the remuneration they may get.

We would draw attention to the Secretary's eloquent appeal for the equipment of the Laboratory and the endowment of professorships. With reference to the former he said :—

The Association has already a good lecture-hall which will serve its purpose for some time to come ; and will soon have, through the magnificent liberality of His Highness the Maharaja of Vizianagram, a splendid building for the Laboratory. But the building, to use the words of Clerk Maxwell, is but the outward shell of the Laboratory proper. The life-blood, I need hardly say, is constituted by the instruments of illustration and research, and the animating spirit must be the men who will devote their lives in it to use those instruments for the exploration of Nature. Through the munificence of one of Bengal's noble sons the Association has hitherto been enjoying the advantage of a good collection of scientific apparatus with which it is working up to this day. But when it is said that this collection is being worked for upwards of a dozen years, it will easily be understood in what state they must be now, and how needful it must be to replace and supplement them by newer and more modern instruments if the Association must keep pace with the progress of discovery.

This means the expenditure of a good sum of money, and the Association ought to be enabled to command it. It is due to Babu Kali Kissen Tagore, who has hitherto helped us so generously and that at a time when without his help we could not have commenced operations at all, that our millionaires, who have not yet come forward in aid of the Association, should follow his noble example, and that others, whose means will not permit them to imitate him in the magnitude of his liberality, will not deem it unworthy to come forward each according to his means. No-

thing, in my humble opinion, is a greater mistake than to measure the value of a charitable contribution by its amount. And I am afraid it is this mistake which prevents the majority of my countrymen from taking that active part in all movements for the public good which but for it they would take, and it is thus that this fatal mistake deprives such movements in our country of their really public character.

With reference to the endowment of professorships Dr. Sircar made the following just and equally forcible appeal :—

But suppose we succeed, as I believe we shall, in having a well-equipped Laboratory, there will yet be wanting some thing, the most essential thing, to vitalize it, that is actual workers to work it. How to get them is the most difficult problem in our country. The time has not come when we may have faith in unremunerated workers. The men of leisure are not the men in any part of the world who contribute by their intellectual work towards the intellectual advancement of the race. The Counts du Moncel are solitary examples even in Europe. It is the poor student who must be furnished with leisure, that is with freedom from anxiety for the satisfaction of irresistible animal wants and cravings, in order that his mental energies may be conserved and utilized for the conquest and annexation of nature's domains in the service of man.

We shall resume the subject in our next, and especially consider the various points touched upon by Sir Charles Elliott in his admirable address.

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## II. (May 11, 1891.)

We gave in our last extracts from Dr. Sircar's speech in appeal for the equipment of the Laboratory for which a splendid building has been supplied by the munificence of His Highness the Maharaja of Vizianagram, and an appeal for the endowment of professorships. The life-blood of a scientific laboratory, as Dr. Sircar has rightly remarked, is constituted by instruments of illustration and of research, and its animating spirit by whole-time professors. When it is remembered that in India scarcely any instrument can be repaired or replaced, and that it is almost impossible that even the humblest and the most modest instruments can be made, it will be understood how much more money must be required to fit a laboratory here than in Europe. And when it is remembered how even European men of science on coming out to India soon find themselves behindhand of their confrères at home, in knowledge, and how they require to be furnished with the latest scientific apparatus to barely keep themselves *au courant* with the progress of Science in their native lands, it will be understood how Indian professors, who have to begin at the very

a professorship. Why should they not come forward and hasten the day when "India," to use Dr. Sircar's words, "shall regain her lost prestige?" We must gratefully admit that Bengal, and especially the Metropolis, has done much for the cause of science. But it must be equally admitted that much more that could have been done has not been done. We see only the names of a few millionaires on the subscription list, and it is their names which recur on different occasions. How many there are who can come forward very liberally, but have not done so! What more convincing proof do they require of the utility and the importance of the Association than the testimony, in eloquent, earnest and often impassioned words, borne of that utility and importance by successive Viceroys who have been its patrons, and by successive Lieutenant-Governors who have been its presidents?

But it is not our millionaires alone who are to blame for their apathy and indifference to the Science Association. The institution has not met with that appreciation from the bulk of our community which it was expected in the beginning that it would. This means the apathy and indifference of the educated classes, who are and ought to be the proper representatives of the country. Education has not, it is true, reached the masses. But what increasing numbers of graduates are being turned out year after year by our universities! To them the advantages of Science cannot be unknown, and the supreme necessity of science-cultivation in this country cannot be a matter of doubt. And yet we do not see that they have moved in the matter adequately to their numbers and to their culture. We do not see that they have come forward either with their purse or with other help at their easy command. We do not mean to say that there are not honourable exceptions, but how few, how solitary these exceptions are! We do not exaggerate when we say that we have scarcely found a single graduate who has tried to persuade others to help the institution. If our graduates had shown any earnestness in the matter, and acted the part of the missionary in the cause of science, the Association would have worn a different and brighter aspect. The rules for membership have placed it within reach of everyone with moderate income. Dr. Sircar has drawn attention to them in his appeal for funds with which he prefaced the twelfth annual report. "By payment," says he, "of the

trifling sum of Rs. 24 a year, which means Rs. 2 a month, any one can become a member of the Association and thus directly and indirectly help in the cultivation of science in this country." Every hundred and fifty such members would enable the committee to employ a whole-time professor, which means a man who will be able to devote himself to the experimental study of a particular branch of science and deliver regular lectures in it to a class and to the public. "Is it too much to expect," asks he, "that at least five hundred persons in the Metropolis, and five hundred more from the country generally, may, for such a purpose, the purpose of enabling the Science Association to have permanent professorships, become ordinary members of the Association?" Here is an easy method of increasing the revenues of the Association. What is it that prevents its adoption?

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### III. (May 18, 1891.)

Referring to the easy method, provided by its rules for ordinary membership, of increasing the revenues of the Association, we asked the question in our last, "What is it that prevents its adoption?" One word, in our opinion, furnishes the answer to this serious question, and that is, ignorance. Though the idea of the Association was broached so early as 1869, though the Association was not established till after half a dozen years' discussion of the project in public prints, and especially in these columns, and though it has been in actual working existence for fifteen years, there are yet people, strange to say, who are ignorant of that very existence. Of those who are well aware of its existence there are very few who are not ignorant of its scope, its aim and objects; and fewer still who are not ignorant of the requirements of a scientific institute. It is this three-fold ignorance which has been seriously in the way of the advancement of the Association.

It is only the other day that a contemporary, commenting on the speech of Sir Charles Elliott at its annual meeting, wrote as follows: "The Association is doubtless useful in its way, as it enables the students of private educational institutions to hear lectures on Chemistry and Electricity. But what other good purpose has the Association, with its very large capital, served till now? The cause of Physical Science owes much to Dr. Sircar, but we must say, his

Association cultivates that science in one or two of its branches only. The Association has most influential patrons, and it is, therefore, in its power to be much more useful to the people than it has hitherto been. Why not convert the Science Association Hall into the Calcutta Technical Institute? Surely there cannot exist insuperable difficulties in the way. Already large funds exist for a purpose like that. All that is wanted is the consent of Dr. Sircar and his friends. We simply throw out this suggestion to-day, and will pause to watch how and in what spirit it will be taken up or rejected." We are almost afraid to comment on the above suggestion, lest we be charged with rejecting it in an ungenerous spirit. But in the interests of the Association with which we believe the dearest interests of the country are involved, we are constrained to say our say on the subject. In the first place we would observe that it would have been fairer and wiser if our contemporary, before criticizing the working of an institution which is heroically struggling for existence with the scantiest means of subsistence, had endeavoured to acquaint himself with the facts in connection with the Association, and above all taken the trouble to acquaint himself with the expenses of the humblest scientific institution, not to speak of the big polytechniques, of Europe.

Our contemporary speaks of the *very large capital* which the Association has in its possession. This very large large capital is constituted by the eighty thousand and four hundred rupees which the Association has invested in Government securities yielding the very large income Rs. 294 a month! With this capital and this monthly income our contemporary wishes the Science Association to convert its lecture hall into the Calcutta Technical Institute! He does not see any insuperable difficulties in the way, for "all that is wanted is the consent of Dr. Sircar and his friends." Certainly, Dr. Sircar must be a very perverse man not to give his own consent and procure the consent of his friends for such an easy conversion of his lecture hall into a technical institute. Poor Dr. Sircar! How is he being misjudged and misunderstood by his compatriots who ought to have known better, and who, if they had taken the trouble to know better, would have, we doubt not, zealously earnestly and substantially seconded his untiring efforts in the cause of science cultivation in this country. The Association has certainly "most influential patrons," without whose liberal, and in many cases truly princely,



patronage it could not have been started into existence, far less could it have been advanced to its present position. But we cannot help saying, though we say so with deep regret, that to the great misfortune of the country the influential patrons almost without exception have persuaded themselves into the belief that their duty had ended with the paying down of their subscriptions. There is scarcely an influential patron whom Dr. Sircar has not taken on the Committee of Management. But the meetings of this Committee are very rarely favored with the dust of their feet. If they had attended these meetings, if they had attended the lectures delivered year after year by the honorary lecturers, they could have convinced themselves of the actual requirements of the Association, and then they would have felt a genuine affection for it and would not have suffered it to pine for want of proper nourishment.

Dr. Sircar is not, as he has been persistently represented or rather misrepresented to be, an opponent of technical education: The object with which the Association was established, was, to quote the words of the very first Resolution founding the institution, "to enable the natives of India to cultivate science in all its departments with a view to its advancement by original research, and (as it will necessarily follow) with a view to its varied applications to the arts and comforts of life." Thus, as Dr. Sircar has very justly said, "the founders of the Association were not only not unmindful of technical education, but fully understanding its importance and its requirements, they wanted to place it on a solid and substantial footing, that is, on the basis of a preliminary scientific education." Again: "Those, who have carefully considered the avowed object with which this Association was established, must have seen that not only purely scientific but technical education was embraced in its wide scope. The management of the Association has not hitherto been able to direct attention to the latter for the simple reason that preliminary scientific education must precede technical education, and that before making provision to establish the former on a secure basis, it would be madness to waste energy and fritter away funds for the mere name of technical education." Dr. Sircar has, in this matter, the support of the highest authorities on the subject. Scott Russel, one of the most earnest advocates of technical education, has put it emphatically that "Science is the sole foundation of skill. Above

the skilled doers we must have the skilled thinkers." The Royal Commission on Technical Education have come to the conclusion that, "if instruction (in technical schools) is to be really useful, it must be made as thorough and scientific as possible. The indifferent technical school will soon be found out, despised, and deserted." Dr. Sircar, therefore, is perfectly justified in asking, "if this is likely to be the case in England, what must it be here in India?" and in giving it out as his strongest conviction that "scientific education must permeate the country, before technical education would be even possible."

We are at one with our contemporary so far that if Calcutta is to have, as it is very desirable that it should have, a Technical Institute, that institute should be a part and parcel of the Science Association. We say this not from any partiality for the Association, but for reasons of economy, which have been so well put by Dr. Sircar, that we quote his words. "The funds required for carrying on technical education," says he, "must be adequately large, or failure must be the result. With inadequate funds, there may be a mockery and name of technical education, but not technical education properly so called. The humblest institution for imparting technical instruction even on a single subject of art or branch of industry must have a good collection of scientific instruments and apparatus and a laboratory for teaching the elementary principles of Science, that is, must have what the Science Association already has and what it still wants to have. Hence, in the present state of the country, to attempt to establish a separate and distinct institution for technical education would be, to say the least of it, uneconomical." The inevitable and indisputable conclusion from this is what Dr. Sircar has drawn, "that as the Science Association has for one of its objects the carrying on of Technical Education, any contribution to the Association, would in reality be a contribution to the cause of Technical Education." We have a very great respect for our contemporary as a zealous patriot and as a sincere and candid man who will not for the sake of consistency persist in error if convinced of it. We have, therefore, every confidence that he will not hesitate to lend his advocacy to any cause which tends to the good of the country, but which he might mistakenly have supposed to be otherwise. We believe we have been able to convince him that if the Science Association has not yet done anything

for technical education, it is because of want of funds, and not from any reluctancy and opposition from Dr. Sircar himself, whom we quote again to make things more clear. Having said, as already given above, that "scientific education must permeate the country, before technical éducation would be even possible," he goes on: "I do not say, that it is altogether beyond the range of possibility that the two may not be made to go side by side, or rather, that technical education may not be made to follow closely upon the heels of scientific education. But before thinking of realizing this possibility, consider the amount of money that would be necessary to bring about the desired result. Archimedes could move the earth if he had a lever of sufficient length. The Committee of Management of the Science Association would, I believe, be able to make thorough scientific and thorough technical education a reality even in this country, if sufficient funds were placed at their disposal." Can we expect that our worthy contemporary will now use his powerful pen in favor of the Science Association to enable it to command the necessary funds in order that it may efficiently carry on within its walls scientific education both in its abstract and practical aspects?

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#### IV. (*May 25, 1891.*)

In our last we dealt with an objection preferred against the Science Association by a contemporary that it has not taken up the subject of Technical Education and converted its lecture-hall into the Calcutta Technical Institute, for which nothing was needed beyond the consent of Dr. Sircar and his friends. We believe that our contemporary has been satisfied from what we put before him that with the scanty means at its disposal it would have been madness on the part of the management of the Association to embark on the project of technical education, and that the work of the Association so far as done, the work namely of diffusing a knowledge of the principles of Science, is all that could possibly be done. The lectures of the Association are open to all, and it is no fault of the management that the audience at those lectures is composed chiefly of the students of private educational institutions. No one, we know, regrets this more than Dr. Sircar himself, and this is due to our present national characteristics, idleness and conceit—characteristics, which we are sorry to observe, are unhappily the predominant traits in the character of our educated youths.

In the present number we purpose to deal with the utterances of another contemporary, and we confess that we scarcely know in what light to take them. In commenting upon Sir Charles Elliott's speech, our worthy brother begins by saying: "We have no intention of depreciating the value of the service performed by Sir Charles Elliott in presiding at Thursday's meeting of the Indian Association for the Cultivation of Science, when we say that his address on the occasion was well-meaning, rather than convincing; and, with a similar proviso, we may, perhaps, say the same thing of the scheme of the Association itself." Does our contemporary wish us to understand by this last sentence that the *Scheme* of the Science Association is well-meaning, rather than convincing? If so, we fail to understand what he means. However that may be, here we have our contemporary's opinion on Dr. Sircar's scheme published some years ago: "Since Dr. Sircar in 1869 in the *Calcutta Journal of Medicine*," said he in 1877, "urged the necessity for an institution in this country and under native control for the cultivation of Science, up to the present year when his idea has found practical realization, his patient, persistent and single-minded devotion to the object he had set before him has been such as may well enlist the sympathy and admiration, not only of every devotee of science, but of every friend of human progress, of every admirer of unselfish heroism, of every reformer, and of every patriot. At one time, his enterprise seemed so hopeless that many men would have set him down, as some we suppose did set him down, as an unpractical dreamer. He seemed like a gifted architect spending his life and genius in planning an edifice for the erection of which no materials existed. Time and the result have already justified him, and we doubt not that coming generations will preserve his name as one of the worthiest pioneers of the splendid future which we all hope is in store for India. We do not believe that we use the language of exaggeration, but the simplest language to describe a notable fact, when we say that a new era dawned on this country when Dr. Sircar published, and resolved to act upon, his conviction, that 'the only method by which the people of India can be essentially improved, by which the Hindu mind can be developed to its full proportions, is by the cultivation of the physical sciences.'" After this appreciative opinion on the scheme of the Science Association, and this glowing tribute paid to "the patient, persistent and single-minded devotion"

of its founder, it was rather disappointing to be told by our contemporary that "that scheme is well-meaning rather than convincing," especially as we know him to be one of the few sincere and genuine friends which our country has in the present day. The drift of the article under comment appears to us to be to encourage the establishment of "an Association for the systematic examination, from an economic point of view, of the vast number of little known vegetable products, to be found in the country, which are at present either wholly neglected or only imperfectly utilized according to traditional methods; and a similar study of indigenous industrial processes, with a view to ascertaining where and how they could be rendered more efficient by changes compatible with the general conditions of the industries concerned." The two-fold object here aimed at is very laudable, inasmuch as it is very necessary for the advancement of this country. But is this any reason why other equally laudable objects should be decried as "well-meaning, rather than convincing?" Our contemporary himself says "that between scientific knowledge and its application to the practical pursuit of these (coal and gold) and other industries in India, there is a great gulf fixed, and that this gulf is due to conditions which mere science is powerless to remove—which are, indeed, the despair alike of the *savant* and the statesman. In the vast majority of cases, the application of science to industry or art is not a simple operation which can be performed off-hand by either the man of science or the man of practice, or even by both together, but an extremely difficult operation, success in which implies long and patient and costly experiment." And because the Science Association has not done what mere science is powerless to do, because it has not, with its capital of eighty-eight thousand rupees, engaged in an operation which implies long and patient and *costly* experiment, in which "the pioneers, who bear the cost of the operation must generally be prepared to incur heavy risks," therefore the scheme of such an Association must be denounced as well-meaning, rather than convincing! What better vindication of the wisdom of the management of the Association could be offered than what has thus been urged by our contemporary in its disparagement? What our contemporary says about the importance and influence of unselfish commercial enterprise on the advancement of Science itself are so sound, and we are so completely at one with him in all that he says, that we are really sorry

that in his zeal for the encouragement of such enterprise he should have been betrayed into an unguarded expression of opinion which looks like a depreciation and condemnation of the objects of the Science Association. Our contemporary feels it, for after lamenting "the want of capitalists ready to sink money for indeterminate periods, or possibly sink it beyond recovery, in the tedious and speculative operation of applying science to industry," he goes on and says, "while this state of things lasts, we fear the practical achievements of science in India, are destined to be meagre, and the progress of such institutions as the Indian Association for the Cultivation of Science must needs be slow and disappointing. We do not, however, say this from any wish to throw cold water on endeavours of the kind. Far from it. If scientific knowledge were more widely diffused among the well-to-do classes of the natives of India, there would be far more chance of capital being devoted to the work of practical research and experiment than there is at present." Why then speak of the scheme of the Science Association as well-meaning, but not convincing? One of the objects of the Association is the diffusion of scientific knowledge from which not only no one is debarred, but to which all are invited, from the millionaire to the student of the humblest means. It is no fault of the Association, of its founder and of its patrons, if as yet so few even of the student class, and scarcely any of the well-to-do class, systematically avail themselves of the very valuable lectures delivered within its walls. This very circumstance constitutes, in our humble opinion, the very *raison-d'être* of the institution.

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#### V. (June 1, 1891.)

We are glad to observe that our contemporary of the *Statesman* has returned a satisfactory answer to our questionings regarding certain remarks he made about the scheme of the Science Association. The answer has come, with our contemporary's characteristic candour, in the shape of a free confession and a generous disavowal of any hostility to the scheme of the Association in itself. Our questionings are admitted to be "not altogether unreasonable." The words we had quoted, though in his opinion, "are adequately explained by the context, might, if isolated, seem to imply dissatisfaction with the scheme of the Association in itself." Our comments on our contemporary's remark amounted to this much and no more. We know

him to be a sincere and warm friend of our country, and we, therefore, expressed our regret that in his zeal for the encouragement of unselfish commercial enterprize "he should have been betrayed into *an unguarded expression of opinion which looks like a depreciation and condemnation* of the objects of the Science Association." We are now glad to see that he has explained his meaning more fully and clearly. "The fact is," says he, "that our remark had reference, not to the scheme considered in relation to the object proposed by the founders of the Association, or to the worth of that object, but to the scheme considered in relation to certain expectations very commonly entertained regarding its results. What seemed to us was that the terms in which Sir Charles Elliott spoke of the possibilities before the Association, implied oblivion of the vast changes which must take place in its environment before any extensive practical results can be looked for from its operations; and that the very scheme of the Association, which is to impart the principles of Science, and not to assist directly in its technical application, was such as, from its nature, to imply the disappointment of these roseate applications, pending the vast, and, very probably, slow changes in question. We did not mean for a moment to imply either that the teaching of the principles of science, under these circumstances, is not a worthy object, or that the Association ought to do more than this. On the contrary, not only is it impossible to know at what happy moment such a revolution in surrounding circumstances may take place, as to invest the knowledge imparted by it with the highest practical value, but it may be reasonably hoped that the diffusion of the knowledge will tend, in some degree, to hasten the advent of that moment." On this we have only to remark that it is not quite correct to say that the object of the Science Association is only to impart the principles of Science, and not to assist directly in its technical application. Dr. Sircar has again and again said that both these objects are contemplated by his Association, and if it is now engaged in the carrying out of only one of these objects, namely, the former, it is because of want of funds. If our contemporary by "*directly* assisting in the technical application of the principles of Science," means more than technical education such as a polytechnique can impart, if he means commercial speculation, as we suspect he does, then we agree with him in asserting that that is not, and should never be, the object of



the Science Association. The institution ought not to embark in any enterprize in which it must be prepared "to sink money for indeterminate periods, or possibly sink it beyond recovery, in the tedious and speculative operation of applying science to industry." Such enterprizes are taken up, and can only be taken up by individuals who can afford to lose any amount of their wealth, or by companies of individuals who can command by joint contribution any amount of money. We do not believe men have ever embarked in such enterprizes from purely disinterested, unselfish, or patriotic motives. They have always done so with a view to gain and profit, immediate or prospective. Large enterprizes are not attended with immediate gain. And it is only the short-sighted that are content with undertakings which yield some immediate profit. This is the case in our country. The cure for this short-sightedness is an extended knowledge of Science, and this our contemporary has himself admitted. We are, therefore, unwilling to agree with him when he says that "in the mean time (that is, till speculators willing to sacrifice come forward) we must accept, without repining, the probability that, as far as practical results go, ninety-nine-hundredths of the knowledge imparted (by the Association) will be absolutely thrown away. We must be prepared to see possibly generation after generation of students pass through the Association, only to find that, unless they are fortunate enough to get paid for handing on the torch to others, their only reward is the consolation which the knowledge acquired affords them. It is better that this should be understood and faced, than that unreasonable expectations should be fostered, and disillusion leads to disgust and the premature condemnation of the institution as a failure." Our contemporary will, we hope, bear with us when we say that the above remarks could not have been made with a full knowledge of the present state of the various branches of physical science, and of the scientific requirements of the modern industries and arts. It is a notorious fact that in a large number of industries and arts the rule of thumb to a large extent still prevails, which means that science has not yet advanced so far as to guide their processes and their developments. Here then there is ample room for the cultivation of those special branches of science which are likely to find their application in these industries and arts. Then again it is a matter of daily observation that the discoveries in science never



remain barren for a long time, but that they lead to new inventions, give rise to new industries and arts, all tending to the amelioration and advancement of the condition of mankind. So that the fear entertained by our contemporary is altogether groundless, that in the absence of commercial enterprize in this country, "the pursuit of science itself would become little better than a pastime, and, losing its present practical bent, would be diverted, as in the past, to abstract enquiries, or to visionary objects like the philosopher's stone or the *elixir vitæ*." The state of things described here can never occur anywhere in the world, far less in this country. Science can never lose its present practical bent. It has long passed that stage. If our country had been isolated from the rest of the world there might have been danger of its reverting to profitless speculative habits of thought of old. It is with a view to divert the mind of the natives of this country from the channels of barren speculation to those which lead to the observation and investigation of Nature that the Association was established. The level of scientific knowledge here stands many degrees below zero, and it will take long to bring it up to the point it has reached in Europe and America. There is no danger of its ever overflowing to abstract enquiries or visionary pursuits.

Another contemporary, taking his cue from the observations of the *Statesman* on our criticism, but completely misinterpreting them, has deemed it fit to make some discouraging and unfriendly remarks on the Association. "We have *never* been deeply impressed with the value of the work of the Association, and have hinted as much some times without wishing to show discouragement towards any possible means of promoting the welfare of the country. Indeed, we have rather regarded the working of the concern as a fad of the gentleman most immediately associated with it, and have yet felt some admiration for gentlemen who have rendered willing service in an ungrateful cause." We have italicized the word "never" in order to emphasize the fact how oblivious our contemporary is of the enthusiastic and warmly sympathetic words with which he greeted the scheme of the Association at its very inception. "With a view to promote the objects," said he twenty years ago, "to which a high-minded patriot may legitimately aspire, Dr. Sircar advocates the formation of an Institution of Science, in which the indisputable truths of physics and the material sciences comprehended under that term may be taught,

and thoroughly engrafted in the minds of his countrymen. He believes that this would lead to habits of thought and investigation, and establish principles of induction that would tell in morals as well as in physics, and thus train the mind of his countrymen to independence and the abandonment of prejudices, formulas, and superstitions which degrade them, and lead them nearer to an equality to the more advanced nations of the Earth. \* \* \* He advocates the study of physical science, not to worship it as an *ultimatum* or a first and last principle, but as a means of attaining other portions of the great whole which is Truth itself. He regards physical science, so to speak, as the alphabet of truth, to be first learnt to enable us to spell out other truths less palpable or more complex in their nature, but, if possible, still more important to be acquired. The idea is worthy of encouragement even though we fear it may not be likely to be realised for some time to come. For if it requires the advocacy of men like Dr. Lankester to urge its value and importance upon a people so advanced as the English, how nearly hopeless is the task of making an impression upon the stolid millions of India! Nevertheless, the work is important, and Dr. Sircar is not the man to be discouraged merely because the task is difficult. He believes in the possibility, and posterity will justify his faith." Again: "It is a sad comment upon the zeal we pretend to for the welfare of the people, when on the ground of cost, the sciences suffer comparative neglect in our public institutions. It is, therefore, refreshing to turn to independent efforts of individual men in this direction. Dr. Sircar's Association, limited as its operations and influence must be at the commencement, ought to prove the beginning of a movement which is calculated, above all others, to promote the social and material progress of the people." We have quoted at length these words of warm encouragement which in the true spirit of philanthropy our contemporary accorded to the project of the Association in order to mark their contrast with the opinions he has deemed fit to hold about the institution now that it has been working against almost insuperable difficulties for fifteen years. Does our good brother regret the friendly support he so generously gave it at the very beginning, or has the pretty long period of twenty years told upon his memory so as to make him forget his own words? We have a very great respect for him as the Nestor of the Press, and we regret very much that with

the decadence of the memory decadence of the judgment should have come on. For, how otherwise can we reconcile the almost prophetic words he used twenty years ago,—“how nearly hopeless is the task of making an impression upon the stolid millions of India! Nevertheless the work is important, and Dr. Sircar is not the man to be discouraged merely because the task is difficult,”—words which have been and are being literally fulfilled, with the words he has now chosen to use to give expression to his unfavourable opinion about the Association, —“we have *never* been deeply impressed with the value of the work of the Association,”—Words which are being daily belied by the steady, though slow, progress of the Institution?

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#### VI. (June 29, 1891.)

In our issue of the 18th ultimo we said that it is ignorance which has stood seriously in the way of the advancement of the Association, —ignorance of its aims and objects, and ignorance of the ways and means by which those aims and objects can be carried out. This ignorance is not confined to the masses, most of whom are innocent of the very knowledge of its existence. This ignorance is observable in our millionaires on whose aid the working of the institution must for a considerable time to come entirely depend. And this ignorance is painfully observable in those whose education should have shown them in better light, we mean the graduates of our Universities. The advantages of science can no longer be a matter of doubt, inasmuch as they are being reaped by the rich and the poor, the educated and uneducated alike. But singularly enough no anxiety is felt as to the necessity of making science-cultivation indigenious. So long as they enjoy the benefits which flow from the practical applications of science, so long as they have their pins and matches and soaps and clothes and almost all the other necessaries of life easily and cheaply, people do not spend a thought as to whence they are obtained, and whether these importations are seriously and injuriously affecting the arts and industries of the country. With characteristic Asiatic apathy and indifference we are looking on, eating, drinking and making ourselves merry, while the country is being ruined and impoverished in every sense of the term. It is only very recently that the patriots seem to have been aroused from their stupor, and are stirring themselves to do something. But one cannot fail to observe that these

are spasmodic efforts, in mere imitation of the serious efforts that are being made in England to remedy the great defects which have been prevailing up till lately in her educational system. Our efforts are spasmodic and share all the aimlessness and fruitlessness of spasmodic efforts, because being mere imitations only they have not the steadiness which can only proceed from a full comprehension of the nature of the evil and of the means of its removal. Technical education is the cry in England, and we must cry for technical education here in India, absolutely unmindful of the preliminary requirements of such education. What matters it if there is a vast, an almost immeasurable, difference between the two countries in point of those preliminary requirements? We must have technical education here, though we may not have those requisites at all, for "all that is necessary is the consent of Dr. Sircar and his friends!" The prospects of technical education in this country must be very remote indeed when such is the ignorance of its enlightened leaders. Dr. Sircar has been trying to dispel that ignorance, and this he has been doing for nearly the last quarter of a century, and yet we are sorry to see that that ignorance is as profound as ever.

Believing as we do that no nation can hold its own, can lay claim to the title of civilized, which has not provision for the cultivation of Science in full measure, we hailed the project for the establishment of an association with that object in view here in India, and have ever since been doing our humble best in helping the projector to bring his project down from the region of possibility to the region of practicability and reality. The best way to advance the interests of the Association, with which, we cannot repeat it too often, the dearest interests of the country are involved,—the best way to advance those interests is to co-operate with Dr. Sircar to dispel the ignorance of which we have complained. We wish we could hope with Dr. Sircar that the time has come when we may fairly assume that the utility of the institution is no longer a matter of doubt. As it is the only national institution in all India for the cultivation of science, we should expect to see it supported by the nation without stint or grudge. With adequate, liberal support from those for whom it is intended, it will be an institution worthy of the Indian nation with all its glorious antecedents. With grudging, inadequate, nominal support it will only reflect the present degeneration of that nation.

Dr. Sircar has depicted what the prospects of the institution are likely to be with such half-hearted, inadequate support. "In this way," says he, "by a gradual but a very slow process the Association may rise to the dignity of a scientific institution, fulfilling in a humble way the functions of diffusing and, may be, of making small additions to scientific knowledge. But it must be remembered," continues he, "that by the time it attains to this dignity Science will not remain in *statu quo* in Europe and America, but will have advanced, and if that advance be, as it is very likely to be, at its present accelerating rate, our poor Institution will suffer immeasurably by comparison." And this, Dr. Sircar looks upon in the light of a catastrophe. The expression is a strong one, but to the true and ardent patriot it is a just expression, "for a catastrophe it will be in view of our glorious past and the promising present when the progress of enlightenment has become so rapid under the blessings of western education and the fostering care of a beneficent Government." Is there any means of averting such a catastrophe, of wiping off such a disgrace which will involve the whole nation? Dr. Sircar has not left the question unanswered, and we should wish all our countrymen to consider attentively and well that answer. "The only way, which I can think of," says he, "by which this may be effected, is to set free and properly direct the two forms of energy that are to be found in the country, partly latent and partly working or rather being dissipated in wrong directions, I mean the energy of intellect and the energy of hoarded wealth. We have ample and satisfactory evidence of the existence of astonishing amounts of both forms of energy. To liberate and properly direct the former in order to get the maximum of work from it, it is absolutely necessary to liberate and properly direct the latter; and when this is done, when wealth becomes the help-mate of intelligence, the arrears due to a variety of causes will be made up, and the time hastened when India shall regain her lost prestige."

But it is not simply the question of the restoration of lost prestige of the country which has to engage the attention of the patriot and the statesman interested in its welfare. A much more serious question is demanding earnest thought and the deepest reflection for its speedy solution. It is the question of the life and death of thousands, nay of hundreds of thousands and even millions of the population of this country, vast in itself and multiplying at a fearfully rapid rate of

increase year after year. It is with the true instincts of a far-sighted statesman and philanthropist that our Lieutenant-Governor has pointedly drawn attention to this fact, in his capacity of President of the Science Association. "You have all of you read the results of the Census, which has recently been taken," said His Honor in his presidential address at the last annual meeting of the Association, "and you have no doubt pondered with some alarm and anxiety the fact which it discloses, that the population of India has increased by 22 millions during the last ten years. Just think what an enormous figure 22 millions is ; it is a larger number than the whole of England contained 20 years ago—a larger number than the whole of Great Britain contained 40 years ago. It is a very serious thing to think that every ten years this country has to provide additional food for such an immense population." The remedy proposed by Sir James Caird for this alarming increase of population is the introduction of a more scientific agriculture than what prevails in the country. Now, we showed in our issue of the 18th ultimo, as indeed was shown by Sir James Caird himself ten years ago, that the Indian ryot was not such a stupid and obstinate conservative as he is represented to be, that he "knows very well the value of manure, of rest to the soil, and of rotation of crops," that unless the boon of a permanent settlement be conferred on the people throughout the length and breadth of the country, it will be a mockery to ask for the introduction of a more scientific agriculture. But even if scientific agriculture had given to it all possible facilities, it would not strike at the root of the evil, which is the extreme poverty of the people, the cause of which is not the mere absence of scientific agriculture. Sir Charles Elliott has made a very sagacious guess at the cause of this poverty and offered a very wise suggestion for its alleviation. We quote his own words : "The doctrine which I specially recommend as the true remedy for supplying food to the ever-increasing population is the introduction of a Diversity of Occupations. The great misfortune of India is the absence of such diversity. Almost the whole of the population or at least 90 per cent., is employed in agriculture ; and hence it happens that if any thing goes wrong with the crops,—I do not speak of any such wide catastrophe as famine, but even if there is any temporary drought or any excessive flooding—prices go up, panic sets in, and a general distress occurs. Now the great object

of those who are interested in the welfare of this country should be to take them off the land, to provide a diversity of occupations, through which they may obtain wages and subsistence, irrespective of agriculture. And it is to Physical Science that we mainly owe the possibility of offering to the people these different kinds of occupations." Sir Charles then cites a few instances in which Science has already in India offered employment to thousands, and others in which there are similar prospects for many more. He could have easily multiplied these instances, but for purposes of illustration it was not necessary. He has thus placed the importance of the Science Association in the clearest and strongest light, leaving no excuse for the people to keep themselves aloof from it. Science is no longer a mere luxury of our intellectual nature, it has become the very necessity of our existence. The struggle for that existence is destined to become severer every day, and the only means whereby that severity may be mitigated is the cultivation of science, which by the beneficent law of our being will enable us not only to live, but to live a better and a higher life. We hope our countrymen will understand this and act accordingly; and then, we have full confidence, we shall have every reasonable support and encouragement from Government, of course, we mean such support as will not interfere with the independence of the Association as a national Institution. Such independence is essential to the very life of the Institution as calculated to engender the spirit of self-reliance which has well-nigh become extinct. At the same time it must not be forgotten that it is impossible in the present day to cultivate science in all its branches and to the fullest extent without aid and encouragement from those who have all the resources of the country at their command. It is, therefore, refreshing to see the same view taken by Sir Charles Elliott. For in the very opening words of his admirable speech, he said: "I am satisfied that I did not make a mistake in assenting to the request that I should become President of this Association, and so take the place of my predecessor in the Lieutenant-Governorship, Sir Steuart Bayley; for I see, on looking through your past reports, that for many years either the Lieutenant-Governor or the Viceroy has generally been present at your annual meetings; and *it is quite right that Government should support and encourage every thing that is done to promote the growth of the love of science in India.*" Government has already done much

for the Association by its moral support, and by acquiring the land for it on which its premises stand ; and it can do much more in a variety of other ways. It can furnish the institution with instruments made at its workshops for its meteorological, mathematical, telegraphic and other departments, at little or no cost. It can supply it with spare specimens from its geological and other museums. And it can order copies of all its scientific publications to be sent for the library of the Institution. All this Government can do without touching the independence of the Association, and then, we have no doubt, with such aid and encouragement, the Association will make much more rapid progress than it can with its own unaided resources.

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