posing that the works were in the market. But many of them are out of print and have become scarce; and a large grant of public money would perhaps raise the market price almost in proportion to its magnitude. This being so, it has been thought best, on the whole, by the Government to make an annual grant to be expended from time to time as favourable opportunities for purchase may offer. If it should prove possible, and on other grounds desirable, to allow the Banks' Library to follow the collections with which it has always been practically connected, the wants of the Natural History Departments would (so far as books up to the date of its bequeathment are concerned) be in a great measure supplied.

Another of the duties which falls officially on your President is to take part in the organisation of technical education as promoted by the City and Guilds of London Institute, which is now incorporated under the Companies Acts, 1862-80, as a registered association, and of which the Presidents of the Royal Society, the Chemical Society, the Institute of Civil Engineers, and the Chairman of the Council of the Society of Arts, are members. In the Memorandum and Articles of Association of the Institute, its objects are fully set forth. They may be summarised under the following heads:—

1. The establishment of a central technical institution for instruction in the application of science and art to productive industry.
2. The establishment of trade and technical schools in London and in the country.
3. The development of technical education by means of examinations held at the Central Institution, or at other places.
4. To assist by means of grants existing institutions in which technical education is being promoted.
5. To accept gifts, bequests, and endowments for the purposes of the Institute.

The Institute is supported by subscriptions from sixteen of the City Companies, of which the largest contributors are the Mercers, Drapers, Fishmongers, Goldsmiths, and Clothworkers.

The Institute has been in active operation not much more than a year, and during the last six months the work of the Institute has developed considerably in each of its several departments. These may be considered under the following heads:—

1. Technical Instruction.
2. Examinations in Technology.
3. Asssistance to other Institutions.

1. Since November last courses of lectures and laboratory instruction have been given in the temporary class-rooms of the Institute, at the Cowper Street Schools, under the direction of Prof. Armstrong, F.R.S., and of Prof. Ayrton. The subjects of instruction have included Inorganic and Organic Chemistry, with special reference to their industrial applications; Fuel, Electro-depositions of Metals, and Photographic Chemistry; General Physics, Steam, Electrical Engineering, Electrical Instrument Making, Electric Lighting, Weighing Appliances, and Motor Machinery.

During the term ending July last the number of tickets issued to students, most of whom belonged to the artisan class, exceeded three hundred. A considerable accession of students is expected as soon as the building in Tabernacle Row, the plans of which are already settled, shall be erected. This building, which is estimated to cost £20,000*l.*, will provide accommodation for schools of Technical Physics, Technical Chemistry and Applied Mechanics. Many of the day students at these classes are pupils of the Cowper Street Schools, and it is expected that, by adapting the course of technical instruction to be given in the College to the wants of these boys, a very complete technical school for the children of artisans will have been established.

The evening lectures and laboratory instruction, which are more advanced and more special, are attended very largely by external students, for whom the present temporary accommodation is already too limited.

At Kensington, schools have been established in which practical instruction is given in various art subjects, such as Painting and Drawing, Modelling, Designing, and Wood Engraving. These schools are attended by both sexes, and are under the immediate direction of Mr. Sparkes. The numbers in attendance last term were as follows:—

Wood Engraving . . .	8 Students,	3 Men,	5 Women.
Modelling	28 ,,	26 ,,	2 ,,
Drawing and Painting from Life	42 ,,	19 ,,	23 ,,
Designing	33 ,,	3 ,,	30 ,,

The Central Institution for instruction in the application of the higher branches of science to industrial pursuits is about to be erected on a plot of ground in Exhibition Road, granted by the Commissioners of 1851. The construction of this building, which, when completed, will cost 50,000*l.*, has been entrusted to Mr. Alfred Waterhouse, who is now engaged in the preparation of plans.

2. In the year 1879, the examinations in Technology, which had been initiated by the Society of Arts, were transferred to this Institute. Various charges where introduced into the regulations. New subjects were added, and in order to stimulate the teaching of Technology throughout the country, the principle of payment to teachers on the results of the examinations was adopted. The encouragement thus afforded to teachers gave a great impetus to the formation of classes throughout the country in technological subjects. Last year the number of candidates for examination was 202, while at the recent examination, held in May, 816 candidates presented themselves, of whom 515 satisfied the Examiners. During the last few months the number of classes throughout the country, in which technical instruction is being given, has considerably increased, and, judging from the returns already received, there is reason to believe that the number of candidates, who will present themselves for examination next May will be much greater than in either of the preceding years. The new programme, which is just issued, contains a syllabus of each subject of examination, and every effort has been made, short of testing the candidates' practical skill, to make the examinations as efficient as possible. To obtain the Institute's full certificate, each candidate is required to give evidence of having obtained some preliminary scientific knowledge.

3. In order to take advantage of efforts that are already being made to advance technical education, the Institute has given sums of money for specific objects to several institutions in which technical instruction is provided. The schools, colleges, and other bodies which have received grants from this Institute, are University College and King's College, London, the School of Art, Wood Carving, and Mining Association of Devon and Cornwall, the Nottingham Trade and Science Schools, the Artisans' Institute, the Birkbeck Institute, the Lancashire and Cheshire Union, and the Horological Institute.

The Artisans' Institute gives practical instruction in several of the humbler crafts in which artisans are engaged, such as carpentry, zinc work, and plumbers' work; and corresponds, therefore, to some slight extent with the apprenticeship schools of the Continent, from which, however, it differs in many important particulars. A similar experiment is being tried at the Horological Institute, where, at the expense of the Guilds, classes have been organised, in which apprentices receive practical instruction in the various branches of the watch-making trade.

It is found that the demand for technical instruction in London and throughout the provinces is very great, and the efforts that have been so far made by the City and Guilds of London Institute have been received with considerable satisfaction by artisans and others engaged in industrial pursuits, and promise, when further extended, to be of the utmost service in the development of technical education in this country. Turning now more particularly to the progress and the applications of science, I venture to make mention of a few topics which have come under my own observation.

(*To be continued.*)

OUR ASTRONOMICAL COLUMN

LUNAR ECLIPSES, 1880-84.—The total eclipse of the moon is only partly visible in this country, the middle occurring at 3h. 39m. Greenwich time, and the moon not rising until seven minutes later; the end of the total phase takes place at 4h. 24m., and the last contact with the earth's shadow at 5h. 33m. In Australia the whole eclipse may be witnessed to advantage. On December 5, 1881, there will occur an almost total eclipse (magnitude 0·97), again only partly visible here; the first contact with the shadow at 3h. 28m., and the moon rising at 3h. 50m.; greatest phase at 5h. 8m. In 1882 there will be no lunar eclipse. On October 16, 1883, a partial eclipse is barely visible here; first contact with the shadow at 5h. 59m. a.m., the moon setting at 6h. 25m. The next favourably-circumstanced lunar eclipse, as regards observation in this country, will take place on the evening of October 4, 1884; first contact with shadow at 8h. 15m., beginning of total phase at 9h. 16m., middle of the eclipse

at 10h. 2m., ending of total phase at 10h. 48m., and last contact with shadow at 11h. 49m.

A PROBABLE VARIABLE STAR.—On November 25 Swift's comet was compared with the star No. 4339 of Lalande, by Mr. Talmage at Mr. Barclay's Observatory, Leyton, the magnitude of the star being estimated 8, as it was also by Lalande. Argelander, in the *Durchmusterung*, gives it 6·4, and Heis made it a naked-eye star (6·7), but errroneously identifies it with Lalande 4359. It escaped observation in the Bonn Zones, and may be worth occasional examination as likely to prove an addition to our variable star list.

FAYE'S COMET.—In the *Berliner atsronomisches Jahrbuch* for 1882, Prof. Axel Möller, of Lund, has given an ephemeris of Faye's comet extending to the end of March next. On comparing the theoretical intensity of light appended to the ephemeris with that corresponding to particular epochs in other appearances, it will be found that there is a probability of observing the comet for some weeks from this time without difficulty if the larger instruments be employed. Thus at the beginning of January the calculated degree of brightness is more than twice that appertaining to the dates when the comet was first and last observed with the Northumberland telescope at Cambridge, during the return of 1850-51, and the geocentric position is favourable for observation; a month later the intensity of light is still equal to that at the time of the first observation with the Copenhagen refractor in 1865, and even at the close of Prof. Axel-Möller's ephemeris it is equal to that at the first and last Cambridge observations above alluded to; the comet's place, however, will then be drawing into the evening twilight. We have already remarked that the magnitude of the planetary perturbations of the comet's motion during the revolution 1873-1881 is greater than in any other revolution since the comet's discovery in 1843, and the success which has again attended his prediction of its apparent track in the heavens must have excited the admiration of those who have any experience or knowledge of such investigations, and the immense amount of skilled application involved in them.

SWIFT'S COMET.—The following elements depend upon Mr. Chandler's observation on October 25, one at Strassburg on November 9, and a third at Mr. J. G. Barclay's Observatory, Leyton, on November 25:—

Perihelion passage 1880, November 8·3691 Greenwich M.T.

	° ′
Longitude of perihelion	42 15·2
,, ascending node	294 46·6
Inclination	7 21·3
Log. perihelion distance	0·04188

Motion—direct.

The close resemblance to the orbit of the third comet of 1869, it will be seen, is maintained. The elements give these positions for Greenwich midnight:—

	R.A. h. m.	Decl. ° ′	Log. distance from Earth.	Sun.	$\frac{1}{r^2.\Delta^2}$
Dec. 2	3 44·1	+50 57	9·3188	0·0680	16·8
3	3 53·6	50 10			
4	4 2·5	49 21	9·3366	0·0721	15·2
5	4 10·7	48 32			
6	4 18·5	47 41	9·3556	0·0765	13·7
7	4 25·6	46 50			
8	4 32·3	+45 59	9·3756	0·0811	12·2

UNIVERSITY AND EDUCATIONAL INTELLIGENCE

OXFORD.—No further regulations have been issued by the University Commissioners for the Professoriate. Opinion is much divided in the University itself as to the operation of the new rules. There have been several memorials to the Commissioners got up, some praying that no alterations be made, others approving the new Councils of the Faculties. There seems to be a general feeling against insisting on the professors examining their classes every term, and against making attendance at their lectures compulsory. The Councils of Faculties are regarded by many with favour as a means of bringing the tutors and lecturers of the various colleges who are engaged in teaching the same branch of learning into closer relationship, and enabling them better to divide the work among them.

At Balliol College an extra scholarship on the Brakenbury Foundation has been awarded to Mr. A. D. Hall of Manchester Grammar School, for Natural Science.

A MEETING of the Convocation of Victoria University was held at Owens College, Manchester, on Friday, Dr. Greenwood presiding. A resolution was received from the Associates of the College expressing their gratification at the creation of the University, and pledging themselves to perform their part in maintaining the welfare, dignity, and fame of the University, and promoting its objects. Standing orders for the regulation of the proceedings of Convocation were adopted, and the Rev. C. J. Poynting was appointed clerk.

THE recently-presented budget of Prussia shows that, despite the financial straits of the kingdom, no considerations of economy are allowed to hamper the growth of its scientific and educational system. First on the list come the nine universities with an allotment of 7,050,000 marks (352,500*l.*). Berlin receives the lion's share, 1,378,348 marks, an increase of about 37,000 marks on its last annual subvention. Bonn and Königsberg each have 740,000 marks, Breslau 600,000, Kiel 404,000, Marburg and Halle each 430,000, Göttingen 201,000, and Greifswald 136,000. Of the above-mentioned sum about 1,306,000 marks are appropriated for extraordinary expenses in connection with the construction of university buildings, and of this amount Berlin absorbs over one-half, viz., 766,000 marks. The other chief items in the Budget of Public Instruction are: Gymnasia and Realschulen, 5,000,000 marks; primary schools, 14,500,000; orphanages, schools for the blind, deaf and dumb, &c., 300,000; technical schools, and for the general furtherance of science and art, 3,000,000 marks.

THE number of pupils of Lycées and Colleges in the French Republic is 87,000 (46,500 for Lycées and 40,500 for Colleges). Last year it was only 84,700. These establishments may be considered as analogous to the English grammar-schools.

SCIENTIFIC SERIALS

Journal of the Franklin Institute, November.—The metric system: is it wise to introduce it into our machine-shops? by C. Sellers.—The weakening of steam boilers by cutting holes in the shell for domes and necks, by W. B. Le Van.—Observations in Brazil, by W. M. Roberts.

Rivista Scientifico-Industriale, October 31.—*Résumé* of solar observations at Palermo Observatory in the third quarter of 1880, by Prof. Ricco.—Experimental researches on the action of light on transpiration of plants, by Dr. Comes.—Dynamometric break with circulation of water, by Prof. Ricco.

Journal de Physique, November.—On the combination of phosphuretted hydrogen with hydrochloric acid, by M. Ogier.—An amplifying barometer, by M. Debrun.

SOCIETIES AND ACADEMIES

LONDON

Linnean Society, November 18.—Robt. McLachlan, F.R.S., in the chair.—Dr. Geo. E. Dobson exhibited a remarkable parasitic worm from the intestine of *Megaderma frons*, from the Gold Coast. It appears allied to *Pterygodermatites plagiostoma*, Wedl, from the Long-eared Hedgehog, though on first hasty examination he (Dr. Dobson) had been disposed to regard it as a new genus, *Metabdella*. Dr. McDonald further drew attention to its peculiar anatomical structure and relationships. Dr. Cobbold agreed to the importance of the observations as verifying previous discoveries, with addition of novel structural details. He considered the worm as identical with the *Ophiostomum* of Rudolphi and Willemoes Suhm, with *Pterygodermatitis* of Wedl, and with *Rictularia* of Froelich, and he regarded it as an aberrant member of the Ophiostomidæ, whereas Wedl thought it came nearest the Cheiracanthidea.—Dr. Cobbold also exhibited specimens of *Distoma crassum*, Busk (previously in 1875 shown to the Society), from a Chinese missionary who, on return to China with his wife and daughter, were again all attacked by the parasite, and obliged to return to England.—A paper was read on a proliferous condition of *Verbascum nigrum*, by the Rev. G. Henslow. The upper part was very diffuse with leafy axes produced from the centres of the flowers, while the lower part had flowers with very large ovaries adherent within to arrested proliferous branches. These differences may be attributed to the general tendency of