

227) may bring into profitable use stretches of vegetation in the tropics that have hitherto been regarded as perfectly useless. Amongst new economic plants should be mentioned *Coffea stenophylla*, the highland coffee of Sierra Leone (*K.B.*, 1896, 189), which in certain localities may prove a formidable rival of the Arabian coffee.

The publication of a note on Jarrah timber (*K.B.*, 1890, 188) has led to the extended use of this and similar Australian hard woods for the purpose of paving the carriage-ways of London streets instead of the cheaper but less durable white pine. The collections of Australian timbers in Museum III. were of special service in this direction.

A paper on Natural Sugar in Tobacco (*K.B.*, 1896, 49-55) recorded some scientific facts of great novelty and interest, and solved an important fiscal problem.

#### DRUGS.

Many little-known drugs have been investigated. The seeds of *Sophora secundiflora* have a singular use among the Indians of Mexico, where they are taken as an intoxicant. Half a seed is said to produce exhilaration followed by sleep lasting two or three days (*K.B.*, 1892, 216).

*Derris elliptica*, now growing in the Economic House at Kew, yields the Malayan fish poison known as "Aker Tuba" (*K.B.*, 1892, 216). From the account given of Natal Aloes and of the plants supposed to yield this product (*K.B.*, 1890, 163) it appears that it differs in some important respects from the more commonly known Cape Aloes. The discovery of the plant, also in the Kew collection, yielding the true Star Anise of commerce is noticed (*K.B.*, 1888, 173). The manufacture of quinine in India, and the wide distribution at a nominal price of this valuable medicinal agent amongst the natives (*K.B.*, 1890, 29), is one of the most important services which European rule has rendered to the Indian Empire. Paraguay Jaborandi (*Pilocarpus*) is discussed (*K.B.*, 1891, 179) from materials sent to this country by H.M.'s *chargé d'affaires* at Buenos Ayres in 1881. The origin of myrrh and frankincense is discussed in considerable detail (*K.B.*, 1896, 86), while the first authentic information respecting the district whence Siam Benzoin or Gum Benjamin of commerce is obtained is the subject of another article (*K.B.*, 1895, 154). Next to Gum Benjamin, Siam Gamboge is the most interesting of Siamese products (*K.B.*, 1895, 139). The peculiar Ai Camphor prepared in China from a shrubby composite, a species of *Blumea*, is described (with a plate) from information supplied by Dr. Augustine Henry (*K.B.*, 1895, 275). The plants yielding the leaves known as coca, and the drug cocaine, with their characteristics, are discussed (*K.B.*, 1889, 1), with a suggestion that a plant long cultivated at Kew (*Erythroxylon Coca*, var. *novo granatense*) might be suited for cultivation at a lower elevation than the type. The little-known Iboga root of the Gaboon and Bocca of the Congo, possessing tonic properties, is traced to *Tabernanthe Iboga*, Baill. (*K.B.*, 1895, 37); the tree yielding the Ipoh poison of the Malay peninsula is identified with that yielding the Upas poison of Java (*K.B.*, 1891, 24); but the remarkable point is brought out that while in Java the Upas tree (*Antiaris toxicaria*) furnishes a very effective arrow poison, in the Malay peninsula the juice of what is regarded as an identical species is apparently innocuous, and the defect is remedied by the use of arsenic.

#### FOOD GRAINS.

A series of articles on the food grains of India by Prof. A. H. Church, F.R.S. (1888 to 1893), supplements the information contained in his published handbook on the same subject. The materials for these investigations were supplied from the Museums of the Royal Gardens.

#### MISCELLANEOUS NOTES.

In 1891 a series of miscellaneous notes was begun, in which were recorded appointments on the Kew staff as well as those made on the recommendation of Kew by the respective Secretaries of State to Colonial and Indian Botanical Gardens. The notes also included a record of contributions made to the gardens, herbarium, and museums, the movements of expeditions and travellers engaged in botanical exploration, notices of Kew publications, and facts of interest connected with the daily work of the establishment. Later there were added paragraphs on general economic subjects too short to appear as separate articles. The detailed index now published will afford the means of reference to these scattered notices.

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#### APPENDICES.

The Appendices remain to be noticed. Of these three have been regularly issued at the end of each volume since 1891. Previously the information contained in them had appeared as one of the monthly numbers of the *Bulletin*. (1) Lists of seeds of hardy herbaceous and of trees and shrubs offered in exchange by Kew to Colonial, Indian, and foreign botanical gardens; (2) Lists of new garden plants annually described in botanical and horticultural publications. These are indispensable to the maintenance of a correct nomenclature in the smaller botanical establishments in correspondence with Kew, and afford information respecting new plants distributed from this establishment in regular course of exchange with other botanic gardens; (3) Lists of the staffs of the Royal Gardens, Kew, and of botanical establishments at home and in India and the Colonies in correspondence with Kew.

In Appendix III., 1890, will be found a complete index to the Reports on the Progress and Condition of the Royal Gardens, Kew, from 1862 to 1882. This index is useful as a means of easy reference to the numerous notices respecting economic and other plants.

#### CORRECTIONS.

In so varied a range of subjects some amount of error, it is hoped not considerable, doubtless exists. A few statements which subsequent research have shown to be probably erroneous must be corrected.

The case of poisoning from Turnsole (*Chrozophora tinctoria*) described in *K.B.*, 1889, 279-280, was in all probability not due to that plant, but to *Datura Stramonium*.

The source of the well-known Chinese preserved ginger, which in *K.B.*, 1891, 5, was attributed to *Alpinia Galanga*, ultimately appeared to be, as pointed out in *K.B.*, 1892, 16, the ordinary commercial plant, *Zingiber officinale*. Some mistake had been made apparently in the plants transmitted to Kew as yielding the commercial product.

The figure of a *Musa* given in *K.B.*, 1894, 247, as *Musa Fehi* may be identical with that species. But all that is certain about it is that it represents *M. Seemanni* of Baron von Mueller.

#### THE DUKE OF DEVONSHIRE ON SCIENTIFIC EDUCATION.

IN opening a new technical college at Darlington on Friday last, the Duke of Devonshire made some valuable remarks upon the advantages of scientific instruction, and the need for the organisation of secondary education. Subjoined are a few extracts from the *Times* report of the address.

#### SCIENCE AND ART ESSENTIAL TO COMMERCIAL PROSPERITY.

The case for technical education, and for the improvement of technical education, the case for the adequate provision of the scientific and artistic education of our people, is within our judgment essential to the continued efficiency of our manufacturing and commercial interests, without the prosperity of which the people could not continue either to prosper or even to exist. Science and art now enter so largely into the practical conduct and management of every one of our industries that a knowledge of the principles of science and of art is as indispensable to their successful conduct as the possession of bodily strength is necessary for the working of the raw materials. Take the case of the industries in which you yourselves are specially interested—the mining, the iron, and the steel industries. Science enters into every operation by which you extract coal or iron from the earth; science enters into every process by which you convert coal into coke, into every operation in which iron ore, with the aid of coke, is converted into iron. Again, into every process in which the iron is converted into steel, and into every one of those processes by which steel is converted into the thousand articles in which it serves the purposes of the community, it is science and science only which has created, and which continues to improve, those vast and powerful machines by means of which the heat which is generated from coal is converted into power, and applied to the service of man. In every one of these processes—to speak only of those with which you are most familiar in this district—improvement and development are constantly taking place; and if in any respect

your knowledge of any one of these latest discoveries and any one of these processes is deficient, by that extent you are placed at a disadvantage in the competition which you have to carry on with the other nations of the earth. I am not going to say that the theoretical knowledge of the principles of science is indispensable to every manual worker, but I do not think that it can be denied or doubted that the higher the average intelligence of the manual worker, the more valuable are his labours. It is also an undoubted fact that there are an increasing number of positions, ranging from that of the chief manager of a manufacturing establishment which may employ thousands of hands, to that of the foreman or superintendent of a subordinate branch of such an establishment, to whom the knowledge of what I have spoken is indispensable. It is also undoubted that that supply of knowledge and intellectual ability cannot be found unless we give access to the attainment of such knowledge to the most of the working classes. These are not altogether theoretical speculations, but I think they are at the present moment, at all events, matters of practical interest.

#### FOREIGN COMPETITION DUE TO SUPERIOR TECHNICAL INSTRUCTION.

Many of you will remember that last year, or the year before, there was a great deal of discussion on the subject of the intense competition to which some of our principal industries were exposed. Although I believe that this scare was to a great extent exaggerated, I do not think that any one will say it was altogether without foundation, or that to-day the condition of some of our industries does not require close examination, probably some caution, and certainly considerable energy, in order to retain it in its present position. And if this panic, exaggerated as it may have been, has led us to anticipate and to ward off the blow, rather than to wait until it has actually been received, I do not think that it can have done anything but good. I think you ought to remember that even those who have been the foremost in combating anything in the nature of alarm or panic, have been forced to admit that there are certain of our industries on which serious inroads have been made by foreign competition. All, almost without exception, agree that in cases where such successful inroads have been made the cause is, in a great degree, due to the superior excellence of the technical preparation of the workers of foreign countries. I am quite aware that there are many other causes which may, in the opinions of many, be supposed to hamper us in the industrial race; but most of those causes are subjects of a controversial character, into which I do not think I have either time or inclination to enter to-day. But whatever the opinion on the subject of those causes may be, at any rate there can be no reason why we should not address ourselves at once, and with energy, to attempt to remove one cause at least which is obvious, which is patent, which is not controversial, and in the removal of which employers and workmen should seek to co-operate without the slightest antagonism or opposition of interests.

#### EXTENSION OF TECHNICAL EDUCATION.

It is very satisfactory to know that we have been doing of late years a good deal to remove any inferiority under which we may labour in respect of the technical training of our people. If we compare the position of the technical instruction of the present day with that which existed ten or even five years ago, there is ample ground for congratulation. Many, I think I may say most, of our counties and county boroughs have displayed great energy in framing and carrying into effect large schemes for the scientific education of the people. Public opinion was never at any time so favourable to institutions adapted to provide for the local needs of the districts, even though those institutions might involve the community in considerable expense. The nation realises, as it never has at any previous period, that the welfare of its industry depends upon the training of its workers, and, still more, upon the training of the directors of its industries. It is understood that it is not enough to start a scheme of technical education and to expect that it will go of itself; and the only means for preserving its continued efficiency is an incessant watchfulness, and a readiness to adopt and seize upon every improvement which the development of science or of manufacture itself may suggest. A body of experienced teachers, such as many counties now possess, aided, supported, and encouraged by intelligent committees, is capable at the present day of rendering enormous services not only to your own community, but to the nation at large. We ought to remember

that this work is only begun, that whatever progress we have made we are far from having attained the perfection which has been attained by some of our competitors; and if I may recur once more to the subject of competition, I may say that I believe that in the opinions of some of the most competent and thoughtful observers much more alarm is felt on account of what they know has been done on the subject of a scientific and an artistic training of the population of other countries, and by what they know of the inevitable results which will follow from that completeness of training, than from any actual inroad which has yet been made upon our industrial and commercial supremacy.

#### THE ORGANISATION OF SECONDARY EDUCATION.

But there is, as I believe, an urgent necessity for action, both swift and prudent. While much, I think most, depends upon what may be done by local effort, I admit that something yet remains to be done by the Government with the assistance of Parliament. The progress which we have already made, and the tentative struggle in which we have been engaged for the last few years, have revealed the existence in our educational system of a considerable gap which requires to be filled. All the experts agree, in order that the people should take full advantage of the special scientific courses now provided for them, that they must go to them better prepared than they are now. Your own expert, Mr. Robson, the secretary of the county education centre, has called attention to that point. He says:—"The lesson has been learned by the many which was only realised at that time (a few years ago) by the few—namely, that before specialised technical instruction can be given in an ideal form we require not only a larger supply of competent instructors, but the students must have gone through a course of secondary education not at present available. In other words, there must be an organised system of secondary education provided beyond and above our most admirable elementary school course, instead of the present chaotic jumble existing between the elementary school and the University." Accordingly, I am glad to see from the same report that the county committee of education have devoted a considerable amount of attention to the improvement of the secondary schools in the county. But their powers should be extended, and that was one object of the measure which was brought before Parliament in the session before last. I hope that, at all events, the part of the measure which referred to secondary education will very speedily reappear; and not only reappear, but that some of the difficulties, some of the controverted questions connected with elementary education have been, for a time, at all events, disposed of, and that it will reappear with some of its revolutionary provisions extended. A reform of secondary education, no doubt, will require great energy and some self-sacrifice on the part of many. Probably also it may require some expenditure of money. I do not see why it should require any large call upon either Imperial or local resources. The large majority of secondary schools are now in private hands, and I know no reason why they should not continue to remain so, provided the local authorities are able to secure some guarantee of their efficiency. Secondary schools, such as they might be when reformed, would very soon furnish the technical classes, such as those you are establishing here, and increase the number of students qualified, as they cannot be now, to take advantage of those courses for their own benefit, and for the benefit of the community in which they exist. I hope that, although I have devoted my remarks almost exclusively to one topic—the necessity for improving the scientific and commercial education of our people—you do not imagine for a moment that I feel indifferent to the higher aspect of education which concerns the training and the character of the students. That is the work, however, rather of the school and for the schoolmaster, than of the science class or scientific teacher. The two need not conflict together, nor exclude each other. I know that the highest province of education is to raise the character of the student, and to make him not only an accomplished workman, but a good citizen. Do not suppose for a moment that those who, like myself, are merely interested in the promotion of technical education are indifferent to the higher side of the question; but it is because of the urgent necessity which we feel exists at the present moment to cultivate more than we have hitherto done the study of certain sciences and certain arts which are ultimately connected with the industrial training and prosperity of the people, that I on this, as on other occasions, have ventured to urge the subject most strongly upon you.