

apart from the personal qualities of those working under it; and having formed a very decided opinion to this effect, we feel it our duty to call attention to the subject, in the interests of economy as well as of efficiency. The responsibility for the formation and supervision of these collections should certainly be of a more definite kind.

14. Suggestions have been made that these collections might encroach on the field occupied by other scientific museums. With regard to this point we would call attention to the evidence of Prof. Judd as showing that a practical distinction can readily be drawn even at a point where two Museums closely approach one another in character.

15. In conclusion, we may summarize the results of our inquiries by expressing the opinion that little, if any, space can be gained by weeding the existing collections, and that, subject to the reservations we have made as to effective organization and administration, and as to the character of the buildings to be assigned to the collections, an exhibition space of about 90,000 square feet should be provided without delay, and would suffice for the requirements of a creditable Science Museum, with adequate space for all the departments for which it appears at present necessary to provide. This space includes provision for a scientific structural collection on the lines indicated in paragraph 5 of this Report, but does not include any provision for offices, warehouses, workshops, or other accessories to such a Museum.

JOHN EVANS.
FRANCIS HERVEY.
RAYLEIGH.
B. SAMUELSON.
DOUGLAS GALTON.
HENRY E. ROSCOE.

STEPHEN E. SPRING RICE, Secretary.
July 23, 1889.

AN ITALIAN'S VIEW OF ENGLISH AGRICULTURAL EDUCATION.¹

IN this brochure, M. Italo Giglioli, Professor of Agricultural Chemistry at Portici, has collected together a large amount of information upon agricultural education and agricultural research as carried out in the United Kingdom. A similar work upon the teaching of agriculture throughout Europe, by the same author, appeared last year. It is, however, noticeable that the volume on English agricultural education is three times the bulk of the earlier effort. M. Giglioli, as a foreigner, has considered our methods worthy of a much more detailed Report than those of the Continent. This can only be regarded as a tribute to the excellence of English agriculture. We have heard a great deal of late upon the small amount of interest taken in agricultural education in England compared with Continental countries. An Italian Professor finds material for a portly volume on our systems of agricultural education and research, while he is able to compress his information upon the German, French, and Hungarian systems into a pamphlet of comparative thinness.

As a matter of fact, the Continental nations have been, at least in the past, ahead of us in these matters. The value of what is done in England rests rather upon the quality of our agriculture than upon our efforts to systematically teach it. Continental Professors of Agriculture find it as essential to visit England and to study English agriculture, as would an American Professor of History to visit Europe, or a Biblical student to visit Egypt and Palestine. The most noted breeds of cattle, sheep, and pigs, the best types of implements and machinery, the best artificial manures, the best systems of farming, have originated in England and Scotland, and hence the attention which is paid to agricultural research as prosecuted in Britain. So far, however, as the study of Agriculture is concerned, or painstaking and wide-spread investigation goes, the Continental nations are before us. It is not by any means certain that with these advantages they will excel us in the actual practice of agriculture. As a nation we are more adapted for doing than for study, and our progress is generally the result of pressure under competition, and the spontaneous adoption of the best practices, as they are published in the press. Our

¹ "Educazione agraria Britannica," relazione di Italo Giglioli. (*Annali di Agricoltura*, 1888.)

improvements are less likely to emanate from technical schools than from the promulgation of new ideas, new processes, new material, new appliances, adopted by leading agriculturists, exhibited and reported upon.

M. Giglioli, like all Continental visitors to England, wonders with great admiration at the spontaneous character of our efforts. Here, we succeed without Government help. There, both teaching and research often languish, although supported by huge grants, and are always discontentedly asking for more. "Il carattere più saliente che le distingue da tutte le altre scuole agrarie di Europa, è quello della loro completa autonomia, anche finanziaria. Esse non ricevono sussidio alcuno nè dal Governo, nè da provincie, nè da associazioni agrarie: vivono completamente sopra quello che guadagnano. Il contrasto tra le scuole inglesi e le continentali appare nel seguente quadro." The author then recounts, in tabular form, the cost to the student, and the incomparably greater cost to the State, of agricultural education in Germany, France, and Italy; and, after showing that each student costs his State from 700 to 2500 lire, in addition to his own costs, he triumphantly writes "*niente*" in the column showing the cost to the State opposite the chief English agricultural schools.

The author's introductory remarks having been concluded, the principal Societies engaged in agricultural education in these countries are next passed in review, and their methods, examinations, prizes, diplomas, are described. Such matter will no doubt be more interesting to Italian agriculturists than to ourselves. The number of these means of instruction is probably greater than many Englishmen are aware of, and, as a point of considerable interest at the present time, we take the following list from M. Giglioli's book:—

- The Royal Agricultural Society of England (an examining body).
- The Rothamsted Experimental Station (for-research only).
- The Royal Agricultural College, Cirencester (instructional and examining body).
- The College of Agriculture, Downton (instructional and examining body).
- The Colonial College, Holesley Bay (instructional and examining).
- The Department of Science and Art, South Kensington (instructional and examining).
- The Darlington Chamber of Agriculture (Lecturer employed).
- The Normal School of Science, South Kensington (Agricultural Professorship).
- The University of Oxford (Sibthorpe Professorship).
- King's College, London (Agricultural Lectureship).
- City of London College (Agricultural Lectureship).
- The Worleston Dairy School, Cheshire.
- The Sudbury Dairy School.
- The Weald of Kent College of Agriculture.
- The School of Agriculture, Aspatria, Cumberland.
- The Agricultural School at Alvecote, Tamworth.
- The agricultural instruction given at various County Schools.
- The facilities for agricultural instruction in rural Elementary Schools.
- The Forestry Department at Cooper's Hill.
- The Surveyors' Institution, 12 Great George Street, Westminster (examining body).
- The Royal Veterinary College, Camden Town.
- The Brown Institute.
- The Highland and Agricultural Society (examining body).
- The Agricultural Department of the University of Edinburgh.
- The Agricultural Department of the College of Science and Technology, Edinburgh.
- Course of Agriculture at Glasgow Technical College.
- The Agricultural Department in Aberdeen University.
- The Royal Veterinary College, Edinburgh.
- The New Veterinary College, Edinburgh.
- The Veterinary College, Glasgow.
- The Agricultural School at Templemoyle, Ireland.
- The Royal Albert Institution, Glasnevin, Dublin.
- The Dairy School for Females, Glasnevin.
- The Munster Dairy School, near Cork.
- Canon Bagot's Creameries, Ireland.
- The Governmental agricultural instruction in Elementary Schools, Ireland.

The above Societies, Colleges, and Schools engaged in the work of agricultural education are all carefully described. The list might have been made longer, as M. Giglioli does not seem

to be aware of various dairy and other agricultural schools which have been recently founded, or are now being promoted. Among these may be especially mentioned the Travelling Dairy School of the Bath and West of England Society.

JOHN WRIGHTSON.

"INFERNITO."

SOME strange natural phenomena are described in a recent report from the United States Consul at Maracaibo in Venezuela. That part of the department of Colon situated between the Rivers Santa Ana and Zulia and the Sierra of the Colombian frontier is very rich in asphalt and petroleum. The information we have regarding this extensive and interesting region, which is an uninhabited forest, is derived chiefly from the reports of the searchers after balsam copaiba, which abounds; but the following data were taken from the personal observations of an American gentleman who made a special exploration. Near the Rio de Oro, at the foot of the Sierra, there is a very curious phenomenon consisting of a horizontal cave which constantly ejects thick bitumen in the form of large globules. These globules explode at the mouth of the cave with a noise loud enough to be heard at a considerable distance; and the bitumen, forming a slow current, falls finally into a large deposit of the same substance, near the river bank. The territory bounded by the Rivers Zulia and Catatumbo and the Cordillera is rich in deposits and flows of asphalt and petroleum, especially towards the south, where the latter is very abundant. At a distance of a little more than 7 kilometres from the confluence of the Tara and the Sardinete, there is a sand mound of from 25 to 30 feet in height, with an area of about 8000 square feet. On its surface are a multitude of cylindrical holes of different sizes, which eject with violence streams of petroleum and hot water, causing a noise equal to that produced by two or three steamers blowing off simultaneously. For a long distance from the site of this phenomenon the ground is covered or impregnated with petroleum. The few explorers for copaiba who have visited this place call it the "Infernito" (little hell). Among other things, it is stated that from one only of these streams of petroleum was filled in one minute a receptacle of the capacity of four gallons. This represents 240 gallons in an hour, or 5760 gallons in 24 hours; and even if this calculation be somewhat exaggerated, the fact remains that such a considerable number of petroleum jets in constant active operation must produce daily an enormous quantity. This petroleum is of excellent quality, with a density of 83°, which is a sufficient grade for foreign markets. Considering the immense amount of inflammable gases which must be given out by the flows and deposits of petroleum as described above, it may be easily believed that this has a direct bearing upon the phenomenon known since the conquest as the Faro of Maracaibo. This, consisting of constant lightning without explosion, may be observed towards the south from the bar at the entrance to the lake, and Coddazzi in his geography explains it as being caused by the vapours arising from the hot water swamp situated about one league to the east of the mouth of the Escalante, at the southern extremity of the lake. Near the mountains, and not far from the River Torondoy, there are various flows of a substance which seems to be distinct from either asphalt or petroleum. It is a liquid of a black colour, with little density, and strongly impregnated with carbonic acid, and is almost identical with a substance met with in the United States among the great anthracite fields.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, May 2.—"On the Spectrum, Visible and Photographic, of the Great Nebula in Orion." By William Huggins, D.C.L., LL.D., F.R.S., and Mrs. Huggins.¹

It might be suggested that the want of coincidence observed between the nebular line and the magnesium band, amounting to $\lambda 000 \cdot 9$ nearly, might be due to a motion of translation of the nebula towards the earth. The motion required to produce this shift of position is about sixty-seven miles in a second. [The earth's motion at the time of comparison with magnesium band may be taken at nearly seventeen miles in a second of re-

¹ Continued from p. 407.

cession from the nebula. This motion would bring the nebular line nearer the red, and diminish the apparent interval between that line and the termination of the band. If the nebula has a motion of approach, the earth's motion would bring the line back again, to an extent corresponding to about seventeen miles in a second, towards its true plane.—May 18.]

I showed in my paper on this subject in 1874 (Roy. Soc. Proc., vol. xxii. p. 253), that, in the case of the Orion nebula and six other gaseous nebulae—namely, 4234, 4373, 4390, 4447, 4510, 4964, of Sir J. Herschel's "General Catalogue of Nebulae"—"in no instance was any change of relative position of the nebular line and the lead line detected." We should have to resort, therefore, to the overwhelmingly improbable supposition that all seven nebulae were approaching the earth with velocities such that, having respect to the earth's motion at the different times of observation, they all gave a sensible shift corresponding to 67 ± 15 miles in a second.¹ There is little doubt in my mind, therefore, from these comparisons, which, considering the strong evidence we possessed before of the relative positions of the nebular line and of the magnesium line, are, strictly speaking, supplementary and confirmatory evidence only, that this line of the gaseous nebulae is not produced by "the remnant of the magnesium fluting."

In the diagram on p. 134 (Roy. Soc. Proc., vol. xliii.), Mr. Lockyer represents this nebular line followed by fine lines, which give it the appearance of a fluting similar to that of the magnesium band placed above. I am unable to find in the paper any authority for this representation of the line. In another place (Programme Royal Society *Séance*, May 9, 1888, p. 12) Mr. Lockyer says: "On one occasion, at Greenwich, it was recorded as a fluting in the spectrum of the nebula in Orion." Mr. Maunder's words are ("Greenwich Spectroscopic Results," 1884, p. 5): "None of the lines (with two-prism train) are very sharp. $\lambda 5005$ showed a faint fringe mainly on the side nearer the blue."

Mr. Maunder has recently sent a note to the Royal Astronomical Society, in which he explains that the observation was made with a second half-prism added to the half-prism spectro-scope. He says:—"The three principal lines of the nebular spectrum were seen as very narrow bright lines, but none of them were perfectly sharp, each showed a slight raggedness at both edges; but in the case of the line near $\lambda 5005$ it was clear that this fringe, or raggedness, was more developed towards the blue than towards the red. In the case of the other two lines, they were not bright enough for it to be possible to ascertain whether the fringes were symmetrical or not. But $\lambda 5005$ was clearly a single line. There was no trace of any bright line, or series of bright lines, close to it on either side; no trace of a fluting, properly so called. The entire line, fringes and all, was only a fraction of a tenth-metre in total breadth" (*Monthly Notices R.A.S.*, vol. xlix., 1889, p. 308). [It should be noticed that, with the instrumental conditions under which Mr. Maunder observed, the second and third lines were not sharp, but also showed fringes.—May 18.]

My own observations of this line, since my discovery of it in 1864, with different spectroscopes up to a dispersion equal to eight prisms of 60°, show the line to become narrow as the slit is made narrow, and to be sharply and perfectly defined at both edges.

¹ [The following observations of Orion for motion in the line of sight have been made at Greenwich:—

1884. February 15.—About thirty-one miles approach. Note, *measures purely tentative.*
 February 18.—About fifty-one miles approach. Note, *the measures are not trustworthy.*
 March 10.—*Direct comparison.* With neither one nor two prisms, after very careful direct comparison, could any displacement be detected; the coincidence of the two spectra was evidently very close.
 March 12.—*Direct comparison.* . . . Direct comparison with one prism-train showed coincidence as complete as could be detected, considering the faintness of the two spectra. . . . No part of the nebula showed any marked displacement, but at a point a little preceding the Trapezium the pointer did not seem perfectly central on the line, but a little (perhaps one-tenth, certainly not more) towards the red.
 1887. October 25.—Six measures, three of which show approach, and the other three recession. Note, lines in nebula faint, and bisections very rough.

In a letter dated May 17, Mr. Maunder permits me to state that the measures and estimations made in 1884 and 1887 are of no weight, but that he considers the comparisons in March 1884 to be as satisfactory as possible with so faint an object, and to show that the nebula has very little, if any, *versus* the motion in the line of sight.—May 18.]