

expenses of the department in 1910 were exactly 1901. This last detail is one of the most instructive facts in the whole business.

The receipts of the Caisse in 1910 amounted to 18,000*l.* Its income is derived thus: the greater portion is allotted annually by the State from the State revenue as part of the National Budget; this averages about 8000*l.* Investments of capital bring in an increasing sum. Lastly, there are bequests, subscriptions, and gifts, from corporate bodies, societies, and individuals. This last source naturally fluctuates. In its ten years' history the Caisse has distributed 56,000*l.*, of which 36,000*l.* was allotted to biological researches, and 16,000*l.* to investigations and experiments connected with the purification of water supplies.

M. de Foville points out that the financial needs of science increase with the scale of scientific operations and with progress generally, and recommends the Caisse as a channel for private donations which has the advantage of imposing no restrictions or death-duties on bequests made to its funds.

France is also to be congratulated on possessing a society, *de Secours des Amis des Sciences*, the object of which is to aid men of science and inventors who are in material difficulties, and to relieve their widows and children from destitution. Founded by Baron L. J. Thenard in 1857, the society has distributed up to the present time more than 95,000*l.* (not a million pounds, as the *Athenaeum* of October 14 states). Prof. G. Darboux makes an eloquent appeal on its behalf to those who, like great industrial and commercial capitalists, owe so much to science, pure and applied. He points out that as the number of engineers, chemists, naturalists, biologists, and inventors increases, the risks increase proportionally, and the numbers, both of martyrs of science and of victims of *la misère*, with them. Charity of this kind, to those who have assisted to prevent human suffering, is, as the founder of the society remarked, "a work of reparation and of social justice."

England has only the precarious and arbitrary awards of the Civil List. The French charitable society is a complementary institution to its State aid of research. In it there is a channel for the charitable impulse, more humane and more patriotic than many of the usual forms of relief of destitution. As for the Caisse des recherches scientifiques, France has practically instituted (and the institution will grow) the Establishment of Science. In this is the Erastianism, and a sound Erastianism, of the future.

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### FACTS OF MIGRATION.<sup>1</sup>

FOR learned and unlearned alike there is a peculiar fascination in the migrational movements of birds, and the more we know about them the more the wonder grows. The problems now clearly discerned will probably afford material for several centuries of inquiry, and there are others which we have not yet learned to state. In all such cases it seems to be in accordance with sound scientific method that we should tackle the more tangible problems first, that we should accumulate facts on all sides, and that we should pursue different paths of inquiry in the hope that their convergence may lead us to discovery. That

we should occasionally relieve tension by flying a speculative kite will do no harm to anyone.

Of the various paths of inquiry three stand out prominently, and as each is not only theoretically reasonable, but has already led to something definite, it is gratuitous to pit one against another when more than all are needed. First, there is the method of registering the arrivals and departures, the changes and movements, in a small area, like Helgoland or Fair Island, which can be thoroughly explored. Second, there is the method of marking large numbers of migrants with indexed aluminium rings, in the hope of hearing again of the whereabouts of a small percentage. How this method has already led to the marking out of a more than provisional migrational-route for the white stork is well known. Third, there is the method of collecting data, year after year, from observers scattered over a wide area, both inland and on lighthouses and lightships, who record times of arrival and departure, great wave-like incursions, marked increase and decrease in numbers, and the like.

It is this third method which has been followed with praiseworthy persistence during the past six years by the British Ornithologists' Club, the facts reached being recorded in a series of reports, of which the sixth is now before us. What we have we are grateful for, and we would claim recognition for the industry and patience which the preparation of these reports has demanded from the members of the Migration Committee of the club, from the editor, Mr. W. R. Ogilvie-Grant, and from the large body of observers throughout the country. It is no disparagement, however, to point out that the report has scarcely as yet got beyond the raw materials of science. As the introduction states emphatically enough:—"When these investigations were first undertaken it was decided that they should be carried on over a period of ten years before any attempt was made to generalise, or draw deductions from the facts collected."

In the introduction a reference is made to a notice of last year's report (*NATURE*, March 9, 1910), in which a reviewer suggested (among other things) that a systematic "ringing" of the birds at the light stations would probably produce good results. To us also this seems a good suggestion, and the members of the committee are theoretically of the same mind. We regret to see, however, that they regard it as "quite impracticable." "We owe much to the courtesy of the Elder Brethren for allowing their keepers to fill in our schedules, but the latter could not be expected to 'ring' birds, nor is it to be expected that the authorities would allow unofficial observers to remain at the lights during the migration-season." We wonder, however, whether the difficulties are insurmountable. If so, it is a great pity. The lights are strategic points, the number of birds that might be "ringed" is often large, and a little "ringing" might save some of the keepers from life-harming heaviness.

The arrival of our summer migrants began in 1910 on March 5 (with the chiffchaff), but it proceeded slowly through that somewhat exceptionally fine month. Except in the case of a few species, the immigration did not begin until April 2, and continued until May 23. After that there was little movement observed, but a few species were unusually late (most of May was cold, inclement, and wet). The main body of spotted flycatchers did not arrive until June, and in some places sedge-warblers had not reached their breeding haunts by May 13. It will be very interesting to compare the data for 1910 with those for the extraordinarily fine summer of 1911, and it

<sup>1</sup> Bulletin of the British Ornithological Club, edited by W. R. Ogilvie-Grant. Vol. xxviii. Report on the immigration of summer residents in the spring of 1910: and also notes on the migratory movements and records received from lighthouses and light vessels during the autumn of 1909. By the Committee appointed by the British Ornithologists' Club. August, 1911. Pp. 313. Many maps. (London: Witherby and Co.) Price 6s.

may be that the final comparison of year with year will furnish a basis for conclusions which will justify the details and labour of these reports.

"The larger waves of migration were not very clearly marked, but there were smaller ones on April 12 and 13, and on May 15. The largest movement occurred on May 2, when no less than twenty-five species arrived simultaneously on our coasts." If these facts are really significant, we naturally wish to see whether they are correlated with weather conditions, and the report, like its predecessors, gives us facilities for speculation on this subject by giving a meteorological summary for each day. Special attention has been paid to the conditions observed over the north coast of Spain, the Bay of Biscay, the coast of France, bounding the Bay, the English Channel, and our southern shores. But the report remains firm in affording us neither countenance nor aid in this speculation. We must wait until the ten years are accomplished before there is any relaxation in the conspiracy of silence, which is a thoroughly scientific procedure.

In saying a moment ago, "if these facts are significant," we were not indulging in a superiority of tone begotten of our own enlightenment on the subject; we simply mean that in the long run the question must be faced whether the net of observation is spread sufficiently widely, and has mesh sufficiently narrow to warrant one in speaking very definitely of waves of different magnitudes, or, in some cases, of waves at all. It is difficult to get rid of the uncomfortable suspicion that what is recorded may be in many cases the exceptional, the normal passing unobserved because there is no one there to see. We wish, therefore, that a large addition to the body of observers throughout England could be secured, so that it might be seen whether a marked narrowing of the mesh is followed by any marked alteration in the general tenor of the records. It may also be that the detailed comparison of one year with another may afford an answer to our difficulty.

There are some interesting remarks in the introduction on the variable length of the immigration period. "The immigration of the wheatear (including both races) extended over a longer period than that taken by any other species, the first arrivals being observed on March 6, the last on May 19. Other species occupying a prolonged period were the willow-warbler (March 19 to May 19) and the whinchat (March 26 to May 23), while the shortest time seems to have been taken by the wood-warbler (April 11 to May 6). The average length of the arrival period for 1910 was about five or six weeks."

We may refer also to the provisional classification of the birds observed into four sets according to their general routes. (a) There are those that arrive *solely* on the western half of the south coast—ring-ouzel, pied-flycatcher, and landrail; (b) there are those that arrive along the *whole* of the south coast, but first and chiefly on its western half—wheatear, redstart, common whitethroat, garden-warbler, chiffchaff, willow-warbler, spotted flycatcher, swallow, house-martin, sand-martin, and swift; (c) there are those that arrive along the *whole* of the south coast, but first and chiefly on its eastern half—whinchat, black-cap, grasshopper-warbler, reed-warbler, nightjar, cuckoo; (d) there are those that arrive along the south-east coast, from Essex to Hampshire—nightingale, white wagtail, yellow wagtail, tree-pipit, red-backed shrike, wryneck, turtle-dove. This grouping is still, as we have said, provisional; but there is in it, so to speak, the bud of a generalisation. In some of the items of fact which form the body of the book, there doubtless lurks the beginning of a discovery.

#### THE POSITION OF TECHNICAL INSTRUCTION IN ENGLAND.

DURING the last six months or so there have been issued several reports which deal in broad outline with the position of technical instruction in England. The last annual report of the British Science Guild deals with the financial position of higher technical education and with the need for coordination and centralisation of our resources. Attention is directed to the close connection between scientific research and prosperity of national industries, which more and more closely follows the encouragement of scientific investigations. The report of the Imperial Education Conference contained a strong indictment by Mr. J. H. Reynolds, director of higher education for Manchester, of the lack of appreciation of science shown by many political and industrial leaders. The discussion at the Portsmouth meeting of the British Association Section L report on overlapping of educational work brought clearly into view the lamentable truncation of our secondary education, which fails to provide, except in the case of a small minority of pupils, any adequate foundation for higher study of a proper university grade. The Board of Education has quite recently published statistics which emphasise the poor attendance of students at places of higher technical instruction. Readers of NATURE are already aware of the main facts; unfortunately they are not sufficiently realised by the general public.

##### Present Shortcomings.

The essential features of the present position appear to be:—

(1) The low leaving age of secondary schools, and therefore the low standard of entrance into technical schools. The average school life in our secondary schools does not exceed three and a half years, whereas German technical universities require the completion of the full nine years' secondary-school course before admission of fully qualified students.

(2) The preponderance of evening work in English technical institutions. A few evening students are doing amazingly good work under very difficult conditions; but however creditable this may be, and indeed is, to these overworked men and their teachers, it does not seriously affect the following statement in the latest Board of Education report:—"The total amount of advanced instruction of the kind provided in technical institutions is still disappointingly small. In some of the more important industries, as, for example, engineering, the instruction is largely used by students; but in a great many others the supply of students is very small. It is to be deplored that there are several schools in which the well-equipped staffs and the excellent equipment practically stand idle in the daytime through lack of students." There are no evening students at German universities.

(3) The majority of evening students are doing work of a continuation-school character; moreover, for many of them regular attendance is impossible.

(4) Speaking generally, technical teachers are underpaid to a degree which in the long run will surely result in impaired efficiency. Incidentally it may be remarked that the value of the annual production of the German chemical industries alone is about 50,000,000*l.*, so that the expenditure by Germany of half a million per annum in excess of England's provision for higher technical instruction yields a good business profit.

(5) Taking the relative populations into account, England stands below the United States, Germany, and Switzerland as regards the training and output of industrial experts having the highest scientific and