

fossils are to be found here, nor can I hear of any having been found elsewhere.

With reference to the suggestion of the Rev. J. E. Tenison-Woods (NATURE, May 22, p. 76), that the tin is probably derived from below the gneissose formation and above the granite, this seems to me a most probable conclusion, although I have seen no more of the clay-slate than water-worn blocks mixed with the blocks of quartzose granite in this mine; but I do not feel quite certain that the so called laterite is derived from this clay-slate formation, as it contains very much quartz sand, and, so far as I have seen here, nothing that resembles a sand resultant from the decomposition of the clay-slate.

I was over in Kintah the other day, and heard of a hot spring at a village called Samban, near Ipoh; there are, I believe, several others about in the peninsula, and I understand that sulphuric acid is emitted from the bottom of some of the mines at Lahot, especially M. De la Croix'. These are the only signs of volcanic action since the granite that I have heard of or seen.

In conclusion I cannot help indorsing the Rev Tenison-Woods' opinion that there are great quantities of tin here only waiting to be worked.

Ulu Bakow, Perak River, July 25

A. HALE

Repulsion

SIR W. THOMSON, in his address at Montreal, asks: "May it not be that there is no such thing as repulsion, and that it is solely by inertia that what seems to be repulsion is produced?" And he proceeds to illustrate this by the case of two mutually attracting bodies approaching, then dashing past one another in sharply concave curves round their common centre of gravity, and so flying asunder again. He adds that this idea was suggested to him thirty-five years ago by an observation of Sir H. Davy. And I think one may gather that his impression is that it is one that has not presented itself to other minds in the interval.

I cannot but think that such an idea must have been "in the air," among mathematicians, from the time when first any similarity was thought of between the action of molecules and masses. At any rate, I certainly never read Davy at first hand, and yet, in 1874, I published an "Elementary Exposition of the Doctrine of Energy," intended for schools (which I fear fell dead from the press), and in a section on "Molecular Theories" I wrote as follows:—

"Two bodies subject only to their mutual attraction, if their motions at any one moment are not in the same straight line will never come in contact. . . . The orbit may be like a comet's, very nearly a straight line in the greater part of it, turning sharp round at each extremity, . . . at the nearest with enormous impetus. This shows that what we call elasticity in a mass *may*, wholly or in part [this was meant to exclude the case of *direct* collision, as to which Sir W. Thomson also enters a *caveat*], be the result of *attractive* force combined with motion. A blow given on the surface of the solid mass drives the particles inwards; but the result may be a pirouette round some of their inner neighbours, and an equally strong outward impetus driving back the hammer with an energy proportionate to that which it had given."

My intention in that section was to excite thought in school teachers and apprehensive and energetic scholars; but I did not imagine I was starting a novelty. He who propounds a working hypothesis of molecular action in which this idea plays a part will have the whole credit.

D. D. HEATH

Kitlands, Dorking

Fellow-Feeling in House-Flies and Swallows

THE moral feelings of animals being as interesting as their intelligence, perhaps the readers of NATURE would care to hear of a curious instance that I just now witnessed of fellow-feeling in the common house-fly. A number of them had collected in the top of a window, and I was about to open it to let them out, when I saw a wasp seize one, as I have seen many seized this year, but never before, though I have often seen them feed greedily on maimed *bees*. The wasp was about to sever the head from the body of his victim, when a fly—by no means a large one—flung itself violently against the captured one, trying apparently to knock it away from the wasp; it did not attack the wasp. This was done again and again, whether by the same fly or another I could not tell, the action was so rapid; at

last the body of the fly was knocked away, but the wasp retained the head and devoured it. It then grasped another, and again a fly dashed at it, and another, and another, though they were all evidently afraid of the wasp; and no wonder; it seemed very fierce and hungry. The action of the flies was quite unmistakable. I called another person to watch it with me, and she was as much surprised as I was, and inclined to kill the wasp; but I thought we could spare a few flies, notwithstanding this unexpected discovery of fine feeling in them, and I would not let her disturb the balance of Nature.

I was once a delighted witness of a still more curious instance of fellow-feeling in some young swallows. Six of them were sitting on a low roof, and were being fed by the old bird, who flew by from time to time, and put something into one or two of the open beaks. Each time, as soon as they saw the parent coming, which was some time before I did, they all stood up, whirring their wings and chattering; all, that is, except the last but one, and that seemed to be weak and unable to rise, and so got nothing. At last the two that flanked it, after a great deal of chattering over it, managed to raise it up by putting their beaks under its little white bosom; and then and there the dear little brotherly things wedged it up between them with the prettiest air of compassion and patronage, so that it had a fair chance with the others. And it seemed quite a chance which was fed, yet all sat down apparently perfectly contented and good-humoured afterwards. It was a pretty sight, and I was grieved when, some boys coming by, they took to flight.

Sidmouth, September 13

J. M. H.

Rainbow on Spray

THE appearance noticed by "G. H." in last week's NATURE (p. 464) is a well-known sight at sea under certain conditions. I first saw it from the deck of the Anchor Line s.s. *Bolivia*, about two hundred miles east of Cape Cod. It lasted for half an hour between 10 and 11 a.m. The sea was going down after heavy weather: the sun was shining brightly in a clear blue sky, with light, fleecy clouds scudding along. A fresh westerly breeze cut the tops off the rollers and cast the spray high in the air. When the procession of waves passed through an area more or less opposite to the sun, their crests took up beautiful rainbows; there were thousands of them, and as the steamer rolled and pitched, the changing angle caused the spray on some waves to take more of one or other primary colour, seeming now blue, now red, and again yellow golden.

Leeds, September 13

FRANK E. CANE

JAPANESE EDUCATION

THE Japanese Government, having decided to take a more prominent part in the Health Exhibition than they did last year in the Fisheries—due, we believe, in the latter instance to the fact that they had a Fisheries Exhibition of their own in Tokio at the same time—have appointed a Commission to superintend the Japanese Section, among the members of which is Mr. S. Tegima, the Curator of the Tokio Educational Museum, who has been specially appointed to superintend the Educational Section. To accompany the exhibits in this Section the Government have published a little hand-book, which has been reproduced in the *China Telegraph*, and which contains the most exhaustive account of modern Japanese education, its system, and results, that we have seen in any European language. The Annual Report of the Minister of Education is little more than a mass of statistics; the number of children attending primary, secondary, &c., schools for some years past is carefully given, but we are left to guess at the subjects taught and the course of instruction in these establishments. We are not grumbling at the Report on this ground; it is what it professes to be; we merely desire to point out the special interest of the present little work. The Japanese can look back with pride on a large—a very large—portion of the national work of the past fifteen years; and in education, whatever it may have been in other departments, there has never been the slightest faltering or doubt as to the wisdom of extending the benefits of an improved system to every village and hamlet in the Em-

pire. And perhaps the statesmen who have steadily pursued their policy in this respect when the cry for economy, even at the expense of efficiency, was rising round them, have their reward even now. A Minister of State who recently visited Europe, talking to an English friend of the future of his country, stated that in Japan they trusted to their system of popular education acting on the intelligence of their people to prevent the spread of revolutionary doctrines; the schoolmaster was abroad in the land, and its rulers could rest safe from that danger at least.

The Education Department in Japan is one of the ten principal offices of State, its head ranking as a first-class Minister. It has the usual staff of Vice-Ministers and Secretaries, who carry on the business, and from time to time visit and inspect the various districts. All the local governors are, in educational matters, directly under the control of the Minister. The salaries of professors range from about 1000*l.* per annum (foreigners probably) to 250*l.*, and those of teachers from 100*l.* to 30*l.* The latter are, we believe, considerably higher in proportion than those of Board-school teachers in this country. School text-books are chosen with great care, and by the Department itself; indeed almost all the books are compiled and published by the Government. In the capital two establishments have been organised in the interest of education—one a library where works in all languages are collected, and placed, under certain slight restrictions, at the disposal of the public; the other the educational museum, in which objects necessary to general education are collected for the benefit of those engaged in it. The rules by which all schools are governed, whether they are local, general, or private, appear ultimately to come under the notice of the Minister of Education for his approval, so that the administration is a highly centralised one. An important feature of the work is the number of students sent abroad by one or other of the Departments of State. The Education Department has sent fifty in the past seven years, and there are at present twenty-two abroad, of whom seventeen are in Germany, one in Austria, two in England, one in France, and one in America. All these are graduates of the Tokio University, who were specially selected by the Minister of Education for the purpose of being sent abroad. The great preponderance of these in Germany is remarkable, and would appear to show that the Japanese are inclined to discard English and American educational institutions (which have had their day in Japanese estimation) for those of Germany. On the other hand, it may be that those are mostly medical students, who have from the beginning been sent to German Universities. Before coming to the various classes of schools, the statistics had perhaps better be given. The following are for 1882, the details for 1883 not being yet forthcoming:—

	Number	Professors and Teachers	Pupils
Elementary schools...	28,908	76,769	2,616,879
High schools	173	934	12,315
Normal schools	71	602	5,275
Universities	2	135	2,035
Technical schools	98	975	8,829
Other schools	1,026	2,598	72,260

Of the 2,616,879 pupils at the elementary schools, only 733,691 are girls. Nearly the whole of these schools are maintained by the various local Governments, *i.e.* out of local, not Imperial, taxes. The whole system is administered under a code first promulgated in 1872, re-issued in an improved shape in 1879, and again revised in 1881.

The lowest schools of all are the Kindergarten, where children under school age are taught for three years reading, writing, ciphering, embroidery, paper-plaiting, drawing, &c. The next grade is the elementary schools, where a general education is given, and at which attendance is compulsory. The district for such a school varies with

the population and resources; but theoretically, and as a rule in practice, one exists in every ward and in every village. The course of these schools is divided into lower, intermediate, and higher grades. The lower grade course comprises the elements of morals, reading, writing, arithmetic, singing, and gymnastics; the intermediate, besides these, includes geography, history, drawing, physics, and natural history; while the higher grade adds chemistry, geometry, physiology, and political economy. Teachers receive certificates either for a certain class of schools or for a special subject from the normal schools, or from the local inspectorates. Committees or Boards, similar apparently to our School-Boards, are formed in each district, but their functions are limited to seeing to the attendance of the children, and they seem to have no power over the finances of the school. The next grade of schools is the "middle schools," organised in each district according to the local conditions and demands. Their object is to give higher instruction in the ordinary branches of study, so as to prepare students for liberal pursuits or for the more advanced schools. In addition to the subjects already specified, we find the middle-school course including elementary mathematics, natural science, geology, Japanese law, and one European language. To provide a model for these schools, the Minister of Education established a middle school at Osaka, to which reference can be made. There is only one University, that of Tokio, with four departments, law, science, literature, and medicine. Nothing need be said of this, as it is organised in the usual way. There are two preparatory schools for it, and the department of science appears to be well equipped with astronomical and meteorological observatories, botanical gardens, and museums.

In addition to these, which may be called the ordinary educational institutions, there are special colleges attached, or under the control of certain Departments. Such are the Military Academy, the Engineering College, the Training Schools for the Navy and Army, the School of Marine Engineering, of Forestry, Law, Telegraphy, &c. The normal schools for the training of teachers should also be noticed. They are established in almost every district, and now number seventy-six. The Government has provided two model normal schools in Tokio, one for male teachers, the other for females, and it is worth noticing that the latter was opened by the Empress herself. There are two schools of agriculture, one near Tokio, the other at Sapporo in Yezo. In the former the students are instructed in the science of agriculture, in veterinary science and agricultural chemistry, while in the latter stock-rearing and cultivation are taught.

These appear to be the chief features of the Report, and it is much to be wished that the compilers had given some information regarding the part played by Europeans in Japanese education. A comparative statement of the number of Europeans employed in the Department or in local schools eight or ten years ago, and now how far the posts they occupied have been abolished, or occupied by Japanese found suitable for the work, would have been interesting.

BRITISH BIRDS AT THE NATURAL HISTORY MUSEUM

VISITORS to the new Natural History Museum can scarcely have failed to notice the many improvements which have been made in the re-arrangement of the zoological collections since their removal from Bloomsbury to South Kensington. Not only is there greater space now available for exhibiting the contents of each gallery, but a large proportion of new specimens have been introduced into the cases.

It is of course not to be expected that stuffed animals, however well preserved, will last for ever, and some of the