

How was Wallace led to the Discovery of Natural Selection?

THE reviewer of Osborn's "From the Greeks to Darwin" (*antea* p. 362) says that Marshall quotes the fact of Wallace's being led "to the discovery of natural selection as he lay ill of intermittent fever at Ternate," and refers one to the abridged form of the "Life and Letters of Charles Darwin" for this statement. Having only the original edition in three volumes, from the year 1887, at my disposal, wherein I cannot find it, I would draw attention to my having published the fact as far back as 1870 ("Charles Darwin and Alfred Russel Wallace. Ihre ersten Publicationen über die Entstehung der Arten, nebst einer Skizze ihres Lebens und einem Verzeichniss ihrer Schriften." Erlangen, E. Besold, Svo, pp. xxiii. and 56, on page xviii.) The remarks to be found there are based upon a letter of Mr. Wallace's dated November 22, 1869, and now before me, a passage of which runs thus:—

"The paper No. 9 ['on the law which has regulated the introduction of new species' A.N.H. 1855] should be read along with No. 19 ['on the tendency of varieties to depart indefinitely from the original type' P.L.S. 1858]. When I wrote it I was firmly convinced of the derivative origin of species, but had not arrived at an idea of the process. When I wrote No. 19 at Ternate [in the year 1858] I did not [know] what were Mr. Darwin's views or the nature of the work he was engaged on, except generally that it was on 'Variation.' I hit upon the idea of 'Natural Selection' (though I did not give it that name) while shivering under the cold fit of ague, and I was led to it by Malthus' views on population applied to animals. As soon as my ague fit was over I sat down, wrote out the article, copied it, and sent it off by the next post to Mr. Darwin. It was printed without my knowledge, and of course without any correction of proofs. I should, of course, like this fact to be stated."

This I did in my pamphlet of 1870 on the page quoted, and on page 39, and I hope Dr. Wallace will forgive me for now making known the whole of his highly interesting statement *in his own words*. Of course I am not sure whether he did not tell or write the same to some one else, though I am not aware that it has been published.

Ordinary mortals dream nonsense in their fits of fever, a philosopher of Dr. Wallace's standing conceives original ideas!

A. B. MEYER.

Zoological Museum, Dresden, August 19.

THE letter to Prof. Newton, published in the abridged "Life of Darwin," was written in 1887. I had entirely forgotten that I had written on the same subject to Dr. Meyer in 1869, or that he had published anything in reference to it. That letter probably contained my earliest statement on the subject, and it agrees substantially with my later statements.—A. R. WALLACE.

A Problem in Thermodynamics.

SIEMENS taught us how, by using the heat of the gases escaping from a furnace to heat the gas and air before entering the furnace, we could obtain temperatures limited only by the fire-resisting quality of the materials of which the furnace is constructed. Now, it occurred to me whether on the same principle very low temperatures might not be reached. My idea is this: If compressed air is expanded to atmospheric pressure, the gas does work in overcoming the resistance of the atmosphere, and is cooled to a corresponding amount.

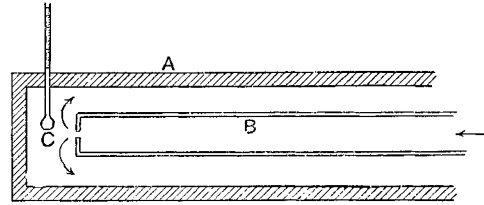
Suppose, for instance, the gas is compressed to 1/100 of its volume, then 1 cubic metre would perform, in expanding against the atmospheric pressure of 1 kil. per 1 square centimetre, or 10,000 kilos per square metre, an amount of work equal to $10,000 \times 0.99 = 9900$ kilgr.-metres, and absorb ⁹⁹⁰⁰₄₂₄ units of heat.

Now, 1 cubic metre of air weighs 1.24 kil., and, having a specific heat of 0.24, the temperature of the expanded air would be lower 78° than before expanding.

Now suppose A is a tube of a material impervious to heat—that is, a perfect non-conductor—and B a tube made of a perfect conductor of heat; the tube A being closed at one end, and B having a small opening in the end.

Now, if a continuous supply of compressed air is kept up in

tube B, this air will come down in temperature, and, passing along between A and B, cools the compressed air before it expands.



I should be glad if any of your readers could give me the theoretical minimum of temperature produced at c.
Essen-Ruhr, Germany.

E. BLASS.

A Remarkable Flight of Birds.

ON September 30, 1894, about 3 p.m., I was observing the sun through an 8-inch telescope. I noticed some dark figures of birds passing, like shadows, across the sun. I was using a dark glass, and the birds were, consequently, only visible when seen against the bright solar disc. The silhouettes of the birds were very sharply and clearly cut. Every few seconds a bird would emerge from the darkness, pass slowly across the sun and disappear on the other side. I watched them for over ten minutes without any decrease in their numbers. The whole number of birds must have been enormous, otherwise it would have been impossible for some of them to have passed as frequently as they did between my telescope and the sun. The birds were flying in a southerly direction, and were quite invisible to the naked eye. I was, therefore, unable to determine their distance, but should think they must have been two or three miles away, for the telescope was in focus for the birds and sun at the same time. I do not know what birds they were. Comparing the spread of their wings with the solar disc, I should say their wings subtended an angle of about two minutes. The place from which I observed them was Shere, a village between Guildford and Dorking. I am told that such a flight of birds has not before been recorded in this country, and have been urged to publish an account in the hope that other astronomers, who may have seen a similar thing, may be led to mention the fact.
Shere, Guildford.

R. A. BRAY.

THE IPSWICH MEETING OF THE BRITISH ASSOCIATION.

IN our last article we gave a general outline of the local arrangements for the Meeting. The programme, as a whole, is now fairly complete. A slight alteration has been made with reference to the soirées; the first will be given by the Ipswich Scientific Society and the Suffolk Institute of Archæology jointly, and the second by the Mayor of Ipswich (Mr. J. H. Bartlet). The fitting up of the Section Rooms is proceeding rapidly, and arrangements are being made for the darkening of those in which a lantern will be used. In the case of Sections A and B, which meet in the same building, only the room allotted to Section B will be fitted up with dark blinds and a lantern screen, and the Sections will be asked to exchange rooms on days when papers requiring lantern illustration are read in Section A. The same arrangement will be made as to Sections D and K, which meet in the two rooms at the Masonic Hall. For the President's address in these Sections, the Lyceum Theatre, which is a short distance off, will be placed at the disposal of the Sectional Committees, as the Masonic Hall rooms may be hardly large enough to contain all those who would probably wish to be present on these particular occasions. For a similar reason, Section G, which meets in the Co-operative Hall, will be asked to allow the President's addresses in Sections A and B to be delivered there. A spacious room adjoining the main

street, and within two minutes' walk of the reception room, will be set apart for a ladies club-room.

The excursions will be of a more varied character than usual. On the Saturday afternoon the geologists will visit the well-known crag district, including Orford, Sudbourne, and Chillesford. This will give an opportunity for the examination in the field of many of the deposits to which the previous days' discussions have been devoted. On the same afternoon, there will be a dredging excursion down the Orwell, whilst other parties will go to Bury St. Edmunds (on the invitation of the Mayor), to Helmingham Hall, and to Southwold (where also the Mayor and a Local Committee will act as hosts). On the Thursday afternoon after the meeting, there will be another dredging expedition, and also an excursion to Colchester (on the invitation of the Mayor), to the Flint Napping Works at Brandon, and to the Broads, on which occasion the party will be entertained *en route* by the Mayor of Yarmouth. The geologists on this day will go to the Norfolk coast to examine the Glacial and Pliocene deposits in the neighbourhood of Cromer, where arrangements will be made so that those, who wish, may stay the night. Other short afternoon excursions will be made near Ipswich whenever time allows.

The programme of work in the Sections is rapidly filling up. In Section A, the President, Prof. W. M. Hicks, will take as the subject for his address, "The Fluid Theories of Ether and Matter." On the Friday a joint sitting will be held with Section B, when Prof. A. Schuster will open a discussion, in which Lord Rayleigh and Mr. Crookes are expected to take part, on the evidence to be gathered as to the simple or compound character of a gas from the constitution of its spectrum. On the same occasion, Captain W. de W. Abney and Mr. C. H. Bothamley will read papers on orthochromatic photography. There will also be important discussions in Section A, on the question of a new practical unit of heat, introduced by a paper from Mr. E. H. Griffiths, and on the objective character of combination tones, opened by Prof. Rücker. Other papers to be read in the Section will be on the teaching of geometrical drawing in schools, by Prof. O. Henrici, on the electrification and diselectrification of gases, by Lord Kelvin and Messrs. Maclean and Galt, on vertical (earth-air) electrical currents, by Prof. Rücker, on the events that go on within molecules, by Dr. Johnstone-Stoney, on the velocity of light in a rarefied gas through which a current is passing, by Messrs. Edser and Starling, on a dynamical top, by Mr. G. T. Walker, and on Boltzmann's minimum theorem, and the question of reversibility in the kinetic theory of gases, by Mr. E. P. Culverwell.

In Section B, the President, Prof. R. Meldola, will deal in his address with the relations of physiology and chemistry. The Monday will be devoted chiefly to papers dealing with the relation of chemistry to agriculture, which are already anticipated locally with considerable interest, on account of the large stake the district has in agriculture. Prof. Warrington will be amongst those to read papers on the question. The Tuesday will be given up to papers on organic chemistry.

In Section C, the address of the President, Mr. Whitaker, will be devoted to the subterranean geology of the Eastern Counties, as exhibited in various deep borings and wells. Mr. Whitaker will also have a paper on the latest results in the boring for coal, now being made at Stutton. The other papers on local questions will probably deal mainly with newer Tertiary geology; Ipswich being a capital centre for the study of our Pliocene and Pleistocene deposits. Besides the local papers, communications have been promised from certain of the foreign visitors, on the correlation of our British Tertiary deposits with their continental equiva-

lents. A paper by M. Gustave Dollfus, of Paris, on the extent of the Tertiary seas of Western Europe, will give his views of the physiography of the south and east of England in Pliocene times, and is likely to lead to some discussion. Glaciation, as was to be expected at Ipswich, will occupy a good deal of time. Prof. Francis will exhibit the "pitch-glaciers," by which he has produced in the laboratory many of the obscurer phenomena of glaciation. Mr. Robert White communicates a paper on the glaciation of tropical South America.

Of the miscellaneous communications likely to be brought forward, we can only mention a few. Mr. Joseph Francis, the engineer to the New River Company, will have one on the method adopted to ascertain the direction of the dip in the Palæozoic rocks met with in the deep borings at Ware and Cheshunt. It may be observed that while there is no difficulty in obtaining the amount of the dip, when a solid core is brought up, it has always been a difficult problem how to obtain the far more important data as to its direction. Papers are also expected from Prof. Nicholson and Mr. Marr, on the phylogeny of the graptolites; from Messrs. Garwood and Marr, on zonal divisions of the Carboniferous system; from Mr. T. V. Holmes, on the ancient physiography of South Essex; from Messrs. Reid and Ridley, on the Arctic and Palæolithic deposits at Hoxne. Others, on American palæontology, have been promised by Profs. Claypole and Marsh.

Section D meets this year under the presidency of Prof. W. A. Herdman, and, for the first time in the history of the Association, it will be a section of zoology alone. Botany now forms a separate section, and although physiology is nominally attached to Section D for this meeting, it will in fact be unrepresented. The work of Section D will be largely devoted to questions of marine fisheries and marine zoology. On the Friday of the meeting, Prof. McIntosh will open a discussion on fishery questions, and an interesting debate is expected. Prof. Haddon will read a paper on the Royal Dublin Society's Fishery Survey; Dr. Bashford Dean, of New York, will give a paper on apparatus for catching oyster spat and its failure in practice, and will also exhibit an interesting collection of eggs and larvæ; Prof. Herdman will give an exhibition of lantern slides illustrative of fishery problems, and will explain the method of "zoning" of shores, &c., and, in conjunction with Prof. Boyce, will give a paper on oysters and typhoid. Other papers will be read by Prof. Miall, on pupation in insects; by Prof. Ritter, of New York, on budding in Tunicata; by Prof. Lloyd Morgan, on experiments on instinct in young birds; by Dr. H. O. Forbes, on the Antarctic continent, and on seals; and by Dr. Otto Maas, of Munich, Prof. Gilson, of Louvain, Prof. Howes, Mr. Moore, Mr. Hoyle, Dr. Hurst, and others on various subjects.

The following is the provisional programme for Section G:—Thursday, 12.—Address by the President, Prof. Vernon Harcourt; light railways in agricultural districts, by Major-General Webber; congelation of soil for foundation purposes, by M. Gobert; Bentley coal borings (a local work), by R. C. Rapier. Friday, 13.—The growth of the port of Harwich, by W. Birt; notes on improvement of Maas in connection with Hook of Holland route, by the President; Snowdon tram-road, by Sir Douglas Fox; notes on autumn floods of 1894, by W. H. Symons; river weirs and flood prevention, by F. G. M. Stoney. Saturday, 14.—Dredging operations at Mersey Bar, by A. G. Lyster; carbonic anhydride refrigerating machinery, by E. Hesketh; deodorising sewage by Herzite process at Ipswich, by J. Napier.—Monday, 16, will be devoted to electrical papers, among which will be the following:—Induction telegraphy, notes on further advance, by W. H. Preece; glow lamps, by W. H. Preece;

modern applications of electricity to traction, by P. Dawson; the chloride battery, by W. H. Earle; extension and development of the telephone in agricultural districts, by Major-General Webber; telephony, by A. R. Bennett; the field telegraph in Chitral campaign, by P. V. Luke; a new portable photometer, by W. H. Preece and A. P. Trotter. Tuesday, 17.—Interim report of committee on standardising; modern flour-milling machinery, by F. W. Turner; paper-making machinery, by Mr. Mason; printing without use of movable types, by J. Southward; incandescent gas lamps, by C. Cooke; B.A. Standard small screws, by R. B. Compton; uniform factor of safety in steam boilers, by J. Key.

The provisional programme for Section H is as follows:—Thursday, September 12.—Address by Prof. Flinders Petrie; skulls of the aborigines of Jamaica, by Sir W. H. Flower; skulls of the Neolithic invaders of Egypt, by Dr. J. G. Garson; Andamanese, by Morris Portman; Neolithic invaders of Egypt, by Prof. Flinders Petrie. Friday, September 13.—Worked flints from South Africa, by H. W. Seton Karr; flint and metal working in Egypt, by Prof. Flinders Petrie; flints found at Thebes, by Gen. Pitt Rivers; plateau flints of North Kent, by B. Harrison;

A SOUVENIR OF "CHALLENGER" WORK.

A MEDAL has been prepared as a souvenir of the scientific work connected with the *Challenger* expedition. The medal, which is in bronze, is three inches in diameter, and was modelled by Mr. Birnie Rhind, sculptor, from designs by Mr. William S. Black, both of Edinburgh. It was cast in Paris, and is being presented by Dr. John Murray to the naval officers of the expedition, the contributors of memoirs to the report on the scientific results of the expedition, and to members of the civilian scientific staff, as a souvenir of *Challenger* work.

The accompanying illustrations have been reproduced from two photographs of the casts forwarded to us by Mr. Black, and show the two sides of the medal. On the front of the medal, the head of Athena with owl occupies the centre, and is placed on the globe, which in turn is surrounded by a border of water indicating the voyage of the expedition around the world. Out of the water rises Neptune, with trident and a trawl disclosing the treasures of the deep-sea. The decoration of the border is completed with a dolphin and two mer-



graving tools from terrace gravels of the Thames valley, by H. Stopes; Palæolithic projectiles, by the same; megaliths of Tripoli, by Swainson Cooper; kitchen midden at Hastings (report), by W. J. Lewis Abbott. Saturday, September 14.—North-west tribes of Canada (report), by Prof. E. B. Tylor; Samoyedes of the Arctic tundras, by A. Montefiore; language illustrating primitive warfare, by Rev. Hartwell Jones; ethnographical survey (report), by E. Sidney Hartland; deviations of children (report), by Dr. Warner. Monday, September 16.—Cannibalism, by Captain Hinde; folk-lore of Ipswich, by Miss Layard; ethnographical conclusions, by G. Laurence Gomme; general conclusions, by Edward Clodd; folk-lore illustrated, by Prof. Haddon; religious origin of dances, by Mrs. Grove. Tuesday, September 17.—On interference with the civilisation of other races, by Lord Stanmore, Prof. Douglas, Prof. Haddon, and Dr. R. N. Cust, and letters of the late R. L. Stevenson; southern Arabians, by Theodore Bent; the Eskimo, by F. Linklater and J. A. Fowler. Wednesday, September 18.—Lake village of Glastonbury (report), by Dr. R. Munro; prehistoric Greek idols, by Arthur Evans; Neolithic station of Butmir, by Dr. R. Munro.

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maids supporting a ribbon with the words "Voyage of H.M.S. *Challenger*, 1872-1876."

The back of the medal bears the crest of the *Challenger*—a mailed warrior throwing down the gauntlet to Neptune, whose trident appears above the waves. This central figure is surrounded by a scroll bearing the words, "Report on the Scientific Results of the *Challenger* Expedition, 1886-1895." The name of the recipient of each medal is engraved around the edge.

It is hardly necessary to say that the medal has been very much appreciated, and appears to have been received with special satisfaction by foreign contributors to the *Challenger* Report, who regard it as a pleasing recognition of their assistance in the great work which has now been completed.

DR. FRIEDRICH W. G. SPÖRER.

IN a recent number of NATURE we unfortunately had to record the loss of an astronomer, Dr. Friedrich Tietjen, who devoted himself to computation, or, we should say, to that branch of astronomy which deals with