salts composed according to analyses of blood-ash. The relationship of degree of alkalinity of blood and the incubation period of infections, as well as the immunity enjoyed by the black races, as also instances among the white race, and especially with lower animals compared with man, are hinted at.

No definite results as a therapeutic measure are claimed, but the author wishes to suggest a new trend of thought which will attack disease at its very foundations, altering the composition of the blood and body juices to make them uninhabitable for germ propagation. Introduction by means of infusion into the veins at the elbow instead of subcutaneously is resorted to on account of the pain and possible change of composition in the latter method. 500–1,000 cc. of the 1-per-cent. salt solution are infused at one time, controlled by the condition of arteries and heart. With this strength neither a dissolution nor a crenation of the corpuscles takes place, as demonstrated under the microscope, the isotonic coefficient of human blood compared with various strengths of this solution varying from .44–.58 per cent. No harmful effects have been noticed and venesection, to rid the body of some of its toxines in serious cases, is considered a valuable adjunct to the new form of treatment.

24. 'Cold as a Causal Factor in the Blood Changes due to High Altitude': JOHN WEINZIRL, Albuquerque, New Mexico.

Up to the present time no satisfactory explanation of the blood changes due to high altitude has been offered. The more commonly accepted hypothesis that the increased blood counts are due to diminished atmospheric pressure, or that more red corpuscles are required to furnish sufficient oxygen to the tissues when the oxygen supply is diminished, has serious objections to it. In the first place, the oxygen absorption by the hemoglobin of the red cells is a chemical phenomenon independent of the partial pressure of oxygen. Secondly, it is not at all plain why an increased number of red cells should be required to carry a given amount of oxygen, for, as Paul Bert has shown, the amount of oxygen actually used by an animal is constant even when the supply is diminished by one-half, or when pure oxygen is respired. Nor are the various other hypotheses that have been offered more satisfactory than the above. An experiment with common white rabbits, planned to test some of these hypotheses, accidentally revealed the fact that extreme temperature changes or a change from a warm to a cold temperature, produced all the phenomena of high altitude; and that when the animals were subsequently taken to a higher altitude the usual phenomena did not ensue.

That the blood counts made in winter are higher in red cells than those made in summer has been previously observed, and comparative tests by the writer confirm this fact. An important factor in altitude changes is a change in temperature, and since cold is capable of producing phenomena of the blood identical with those produced by high altitude, it would appear that cold is an important factor in accounting for the blood changes due to high altitude. That cold is the only factor the writer does not maintain.

HENRY B. WARD,
Secretary.

THE GLASGOW MEETING OF THE BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

THE enterprise of the city of Glasgow in holding this year a large and successful industrial exposition attracted to that great commercial center a large number of congresses, and among others the British Association for the Advancement of Science, which held its sessions under the presi-

dency of Professor Arthur W. Rücker in the university building during the week beginning September 11. In attendance the meeting was not quite so successful as in previous years, the total number of members registered being 1,912. The following Americans had the honor of attending as guests of the Association: Chancellor MacCracken of the University of New York, Mr. Edward Atkinson of Boston, Professor Arthur Michael of Tufts College, Professor Edward W. Morley of Cleveland, Professor A. Lawrence Rotch of the Blue Hill Observatory and Professor J. Playfair McMurrich of the University of Michigan. The papers presented to the meeting reached the usual standard of excellence, and reports of the proceedings of the various sections will appear in later numbers of Science.

The usual public lectures were given by Professor W. Ramsay, on 'The Inert Constituents of the Atmosphere,' and by Mr. Francis Darwin on 'The Movements of Plants.' As is customary, numerous receptions were held in honor of the Association, and the majority of the members took advantage of the suspension of meetings of the sections, on the Saturday, to make excursions to various points of interest in the western Highlands or to visit some of the numerous great industrial enterprises which have made Glasgow famous.

THE GEOLOGICAL SECTION.

As might have been expected from the place of meeting of the Association, much of the material presented to the Geological Section dealt with the geology of Scotland. The president of the section, Mr. John Horne, acting director of the Geological Survey of Scotland, gave as his address a review of the progress in our knowledge of Scottish geology during the quarter-century which has elapsed since the last meeting of the Association in Glasgow, and furnished such abundant evidence of the activity and skill of the Scotch geologists in recent years as to justify the hope which was expressed that their work might form a fitting sequel to the labors of such men as Hutton, Hall, Murchison, Lyell, Hugh Miller, Fleming, Nicol and Ramsay, all of whom claimed Scotland as the land of their birth. It would be difficult to satisfactorily abstract the address, since from the wealth of material with which it had to deal, it in itself was but an all too brief synopsis; but there may be mentioned, among the important additions to geology to which reference was made: the tabulation of the various divisions of the Torridonian sandstones by the Geological Survey and the determination of the pre-Cambrian age of that formation; the collection of evidence of post-Cambrian terrestrial movements in the northwest Highlands resulting in the production of reversed faults and thrusts for which a parallel can be found only in the Alps and Provence, the determination of the order of succession of the Silurian rocks of the south of Scotland by Professor Lapworth, the unraveling of the history of the secondary rocks by Professor Judd; and the study of the Tertiary volcanic rocks of the western coast.

In connection with this last-named topic attention was called to the recent discovery, in the island of Arran, of a volcanic vent covering an area of about eight square miles and now filled with volcanic agglomerate and large masses of sedimentary material which has yielded Rhætic and Lower Triassic fossils. And in a special paper Sir Archibald Geikie described an interesting circumstance which gave a basis for estimating the time intervals between successive lava flows in the inner Hebrides. This was the occurrence in the basalt of the west coast of Mull of a fossil tree whose roots were apparently imbedded in a lower sheet of lava, in which were signs of soil. The

tree, which was penetrated by calcite, extended to about five feet above this old soil, and above this was a hollow in the basalt about forty feet high, which evidently represented a cast of the tree. The conditions indicated an old lava flow which had later undergone a certain amount of disintegration and afforded a soil upon which the tree established itself; then a period succeeded during which the tree grew until it reached a diameter of eight feet and an estimated height of eighty feet; then an outflow of lava around the tree was followed by an interval during which the decay of the tree took place; and finally the outflow of the sheet of basalt, which covered and sealed up the top of the hollow left by the decay.

The geology of the nearly related north coast of Ireland also received its due share of attention, papers being presented by Messrs. McHenry and Kilroe, of the Geological Survey, on 'The Relations of the Old Red Sandstones of Northwest Ireland to the Adjacent Metamorphic Rocks and their Similarity to the Torridon Beds of Sutherland,' and on 'The Relation of the Silurian and Ordovician Rocks of Northwest Ireland to the Great Metamorphic Series.' This latter paper, which attempted to refer the metamorphic rocks of Mayo and Galway to the Lower Silurian period, awakened a considerable amount of discussion and some adverse criticism, since, if the views of the authors were correct, it became a difficult matter to explain the present difference between these rocks and the fossil-bearing Lower Silurian beds of adjoining areas. Papers were also read by Mr. G. H. Kinahan, entitled, 'Notes on the Irish Primary Rocks and their Associated Granite and Metamorphic Rocks,' and on 'Some Laccolites in the Irish Hills.'

Papers on the geology of foreign areas were comparatively few. Miss Raisin gave an account of a lithological study of volcanic rocks collected on Perim Island and took occasion to refer to the geological history of the Red Sea area, inferring that this sea formed part of the Great Rift Valley, extending from Lake Tanganyika to the Jordan and displaying at many places volcanic outbursts on a large scale, at different periods. Dr. Logan Jack, formerly head of the Geological Survey of Queensland, gave an account of the 'Artesian Water in the State of Queensland.' The greater part of the western interior of Queensland is composed of soft beds of lower Cretaceous rocks so disposed as to crop out on the western flanks of the coast range where the elevation and rainfall are greater than in the downs of the west. Along the eastern margin of the Cretaceous outcrop is a porous sandstone whose outcrop forms a belt of from five to twenty-five miles in width, the strata dipping at a low angle beneath the clayey and calcareous beds which form the surface of the downs. The conditions accordingly seemed favorable for boring artesian wells, and a successful beginning of the development of a water supply of this nature was made under the supervision of Dr. Jack in 1885 and up to June, 1900, one hundred and eighty-five miles of boring had been made in the district, the majority of the borings being successful. Owing, however, to the fact that the artesian basins are imperfect, a considerable amount of leakage takes place from them, the water probably finding an outlet into the Great Australian Bight or the Gulf of Carpentaria.

In a paper on 'The Physical History of the Norwegian Fiords,' Professor Edward Hull described six important stages in the development of these characteristic features of the Norwegian coast. First there was the continental condition with archæan rocks; when the river erosion began, and this was succeeded by a second stage of partial submergence in early Silurian times. The third stage was the elevation of the land

during Mesozoic and Tertiary periods, accompanied by a deepening of the river channels; the fourth was the early glacial period, during which the elevation reached its greatest development. The fifth period was the post-glacial, characterized by subsidence and partial submergence of the land; and the sixth and recent stage was a stage of reëlevation to the present conditions, the process being accompanied by the formation of raised beaches.

On the mineralogical side papers were read on 'The Copper-bearing Rocks of South Australia,' by Mr. E. P. Manuell; on 'Scottish Ores of Copper in their Geological Relation,' by Mr. J. G. Goodchild; on 'The Occurrence of Barium Sulphate and Calcium Fluoride as Cementing Substances in the Elgin Trias,' by Dr. W. Mackie; and on 'The Source of the Alluvial Gold of the Kildonan Field, Sutherland,' by Mr. Malcolm Maclaren, who took occasion to advocate a return in certain cases to the old theory of the precipitation of gold from solution by carbonaceous matters, a theory which has been almost forgotten since Skey's demonstration of the power possessed by sulphides to produce complete precipitation.

Of paleontological papers there may be mentioned that by Professor Smith Woodward on 'The Bone Beds of Pikermi, Attica, and on Similar Deposits in Northern Eubœa,' giving an account of the excavations made by the trustees of the British Museum at the suggestion of Sir E. H. Egerton, British Minister at Athens. These researches have added but little to the list of forms already known to occur in the beds, though much important material was obtained, and excavations at Achmet Aga, northern Eubœa, revealed bone beds similar to those of Pikermi and containing similar fossils. The most plausible explanation of these bone deposits seems to be that the bodies of animals were carried by torrential floods through tree-obstructed water courses to lakes in which they collected, the broken limbs and torn fragments of trunks affording evidence of the violence of the passage to the lakes. Mr. J. L. Beadnell of the Geological Survey of Egypt gave a preliminary notice of the discovery of a rich deposit of new Pliocene and post-Pliocene fossils in the Fayum depression, situated in the Libyan desert some fifty miles southwest of Cairo, and Mr. B. N. Peach presented a contribution to the Cambrian fossils of the northwest Highlands, in which he pointed out that the fossils in the Balnakiel group of the Durness dolomities present a remarkable American facies and suggested the existence in Cambrian times of a large continent extending from the north of Scotland to America, an idea which, as was pointed out by Professor Lapworth, was supported by the fact that the succession of beds in northern Scotland was paralleled only on the American continent.

Professor Sollas described a method by which serial sections, similar to those employed by zoologists, might be made of fossils, and exhibited a machine designed for the purpose by the Rev. G. Smith and also showed wax models reconstructed from serial sections of a Graptolite, of an Ophiuran and of *Palæospondylus*.

Finally reference may be made to a suggestive paper by Mr. J. R. Kilroe on 'Geology regarded in its Economic Application to Agriculture by means of Soil Maps,' in which he claimed that the geologist could furnish much information regarding the profitable localization of certain branches of agriculture, such as stock-breeding, dairying and tillage, and advocated the publication of maps which would give information as to the nature of the soil in different localities. The author believed that much of practical value could be done by the geologists even without an extensive

set of soil analyses, and described a scheme of coloration which might be employed to indicate different qualities of soil.

THE ZOOLOGICAL SECTION.

The address of the President of the zoological section, Professor J. Cossar Ewart, was entitled, 'The Experimental Study of Variation,' and was a consideration of the results of experimental breeding in their bearing on the causes of variation and on certain theories which have been more or less generally accepted. Especial interest was given to the address by the fact that the conclusions reached were based for the most part on the results of experiments conducted by the author at his Penycuik station, and the members of the association had the pleasure of studying for themselves three of the now celebrated zebra hybrids which Professor Ewart has bred.

In opening his address Professor Ewart assumed that the primary cause of variation is always the effect of external influences acting directly upon the germ-cells and proceeded to discuss certain influences which might be supposed to be active in the production of variability.

1. Age was found to have a decided effect upon the character of the offspring. A young blue-rock male pigeon was mated with a well-matured and vigorous black barb; the first pair of birds resulting from the mating were almost exactly like the female parent except that the beaks were rather longer; one of the second brood resembled the barb, while the other was of a grayish color with slightly mottled wings and a tail bar; in the third brood both birds were of a grayish color with indistinct wing bars as well as a tail bar; while in the fourth brood one bird resembled the birds of the third brood, while the other resembled closely its blue rock sire. Similar results were obtained by mating a young blue rock male with a white fantail, and also by pairing young gray quarter-wild rabbits with an old white Angora buck, and Professor Ewart regards the gradual, 'almost mathematical' change in the coloration of the offspring as due to the gradual increase of vigor or prepotency of the young sires. The phenomena might possibly be explained by the doctrine of 'saturation' popular among breeders, but such an explanation is overthrown by the occurrence of the same results in the crossing of young females with old males.

2. Ripeness of the germ-cells. In studying the effect of this condition the Penycuick experiments confirmed the results obtained by Mr. H. M. Vernon from the hybridization of Echinoderm ova, 'the offspring resulting from the union of equally ripe germ-cells differing from the offspring developed from the conjugation of ripe and unripe germ-cells, and still more from the union of fresh and over-ripe germ-cells.'

3. The condition of the soma. Undoubtedly the germ-cells may be influenced by a diminution of the vitality of the soma, but there is no evidence to show that they are modified in such a way as to transmit definite modifications in the offspring.

4. Change of habitat. This factor acts by influencing the vigor of the soma, but 'there is no evidence whatever that definite changes of the soma, due to the direct action of the environment, can be imprinted on the germ cells.'

5. Intercrossing and interbreeding. Intercrossing in general tends towards reversion and never results in the production of characters absolutely new to the species. It may, however, indirectly tend towards progressive variation by imparting additional vigor to the offspring, which when intercrossed frequently give rise to 'an almost infinite diversity of character.' Interbreeding, on the other hand, may be a cause of progressive variation. Vigor, however, plays a very important part in the de-

termination of the characters of the offspring and if interbreeding be performed with animals lacking in vigor or with too closely related individuals, it leads to what may be termed degeneration, the offspring being frequently delicate, of impaired fertility and, what is remarkable, frequently either entirely or nearly white.

In connection with the question of intercrossing Professor Ewart considered the swamping effect upon new varieties, pointing out how important the decision of this point is upon the validity of the doctrine of natural selection. Darwin himself nowhere suggests how new varieties escape swamping, although Wagner by his theory of isolation, and Romanes by that of physiological selection, have indicated special methods by which it may be avoided. It seems certain, however, that new varieties make their appearance even in the absence of such barriers to intercrossing, and Professor Ewart points out that it does not seem to have occurred to biologists that a new variety may be sufficiently vigorous or prepotent to swamp the old, since it is unquestionable that the vigor of the parents has much to do with the character of the offspring. Professor Ewart possesses a skewbald Iceland pony which produces richly striped hybrids to a zebra, but to whole-colored bay, Arab, or Shetland ponies invariably gives offspring colored exactly like herself. So too, black Galloway bulls frequently produce, through long-horned, brightly colored Highland heifers, offspring which would readily pass for pure Galloways, and it is known that the wolf is prepotent over the dog and the wild rabbit, rat and mouse over their tame relatives. Granting, therefore, a variety more vigorous than the ancestral form, intercrossing, instead of swamping it, would only increase the number of individuals representing it, even without any such barriers as are demanded by the theories of Wagner and Romanes.

6. Maternal impressions. There is no evidence to show that such impressions affect in any way the offspring.

7. Needs of the organism.

8. Direct action of the environment and use-inheritance. Neither of these causes is believed by Professor Ewart to have any action in the production of definite variations.

9. Telegony or infection. Referring to the celebrated case of supposed telegony described by Lord Morton, the author produced evidence showing that the observed case was more probably due to reversion than to infection, and furthermore he added to his original observations on the subject by stating that since 1895 twelve mares, after producing sixteen zebra hybrids, have given birth to twenty-two pure-bred foals, in none of which is there any indication of the action of telegony. It was also pointed out that the observations of Baron de Parana in Brazil upon the pure-bred offspring of mares previously mated with zebras, as well as his results obtained from several mule-breeding establishments which are in reality carrying on telegony experiments on a large scale, were entirely negative.

The address concluded with a brief appeal for the establishment of a well-equipped institute for biological experimentation on a large scale.

The address of the President was followed by the report of the special committees appointed at the last meeting of the Association. That on bird migration in Great Britain dealt with the migration of larks and swallows, while progress was reported by the committee on the Index Animalium, the Natural History and Ethnography of the Malay Peninsula, the coral reefs of the Indian regions and the Zoology of the Sandwich Islands.

Of the special papers presented it must suffice to mention but a few. Mr. J. Stan-

ley Gardiner gave an account, illustrated by excellent lantern slides, of his observations upon the coral islands of the Maldives, the evidence obtained seeming to indicate that they had been formed during a period of elevation. Dr. J. Y. Simpson gave the results of his observations on the occurrence of variation in binary fission. It has been generally accepted that this method of reproduction is merely a duplication and that variation does not occur in connection with it, but only as the result of a commingling of the chromatin of two individuals in conjugation. Testing this generalization by observation of successive generations of *Paramœcium* and *Stylonychia*, it was found that variation may accompany fission, modifications occurring in the general outline of the body, in its total length, in its greatest breadth, in the distance between the contractile vacuoles of *Paramœcium* and in the length of the median caudal bristle of *Stylonychia*. From the fact that such variations do occur and may be transmitted to the succeeding generation, it would seem that fission is the primary method of reproduction among the Ciliate Infusoria, and that conjugation is merely a method of compensating for the waste involved in that process.

The President of the Section gave some observations, additional to those contained in his address and illustrated by lantern slides, on zebras and zebra-hybrids. He pointed out that the stripes of the zebra were undoubtedly protective, causing the animal to become indistinguishable at a comparatively short distance, and he was able to render a dun-colored pony similarly indistinguishable by tying ribbons upon it so as to break up the uniform coloration. The lion is the most inveterate enemy of the zebra, which is protected by its coloration as well as by the rapidity of its movements, for there is no animal which the author knew which could turn about and break into a trot so quickly as the zebra. As to the original nature of the coloration of the zebra, it was pointed out that although the forms such as the Chapman zebra, which were less striped, might be supposed to be most primitive, yet it was an interesting fact that zebra-donkey hybrids were more richly striped than pure-bred zebras.

Professor W. E. Hoyle described an interesting sub-pallial luminous organ in certain forms of Cephalopods, and Mr. J. Graham Kerr read a suggestive paper on the 'Origin of the Limbs of Vertebrates,' in which, after pointing out the unsatisfactory nature of the theories at present existent, he suggested the possibility of the limbs being derived for external branchiæ, such as are found in *Polypterus* and in certain Urodele amphibians. It may be stated, however, that from the discussion which followed, the new suggestion did not seem to be received with any great amount of favor. Major Ronald Ross gave an account of the experiments on the destruction of the mosquito now being carried on in Sierra Leone by the Liverpool School of Tropical Medicine, and stated that although the experiments had been in progress now for only two or three months, yet there was already an appreciable diminution in the numbers of the insects, and maintained that it is possible that even on the west coast of Africa, malaria may become a thing of the past.

Other papers presented to the Section were 'The Pelvic Cavity of the Porpoise as a Guide to the Determination of the Sacral Region in the Cetacea,' by Drs. Hepburn and Watson; 'The Relationship of the Premaxilla in Bears,' by Professor R. J. Anderson; 'A Method of Recording Local Faunas,' by Mr. E. J. Bles; 'The Fishes of the Coats Arctic Expedition,' and 'A Preliminary Notice of the Fauna of Franz Joseph Land,' by Mr. W. S. Bruce; 'The Behavior of Artifi-

cially Hatched Gulls,' and 'On Germinal Selection in Relation to Inheritance,' by Professor J. Arthur Thompson; 'The Tanganyika Problem,' by Mr. J. E. S. Moore; 'The Mechanism of the Frog's Tongue,' by Professor Marcus Hartog and Mr. Nevil Maskeleyne; 'Dimorphism in the Foraminifera,' by Mr. J. J. Lister; 'The Habits and Life Histories of some Sarawak Insects,' by Mr. R. Shelford; 'On a Large Nematode Parasite in the Sea-urchin,' by Dr. J. F. Gemmill; 'On the Youngest Known Larva of Polypterus,' by Mr. J. S. Budgett; on 'The Land Crabs of a Coral Island,' by Mr. L. A. Borradaile; and on 'The Fauna of an Atoll,' by Mr. C. F. Cooper.

A very pleasing incident of the meeting was the announcement of a generous gift, amounting to £3,500, from a donor who wished to remain anonymous, towards the equipment of the Scottish Marine Biological Station, now established at Millport on Cumbrae Island in the Firth of Clyde. The station, which was visited by a large number of the members of the Section, is admirably situated and is accomplishing most excellent work. The present gift will be devoted to an extension of the buildings so as to afford quarters for those who may be working at the station.

J. Playfair McMurrich.
University of Michigan.

ADDRESS OF THE PRESIDENT OF THE ANTHROPOLOGICAL SECTION OF THE BRITISH ASSOCIATION, II.

The insular district in the fetal brain is a depressed area of an elongated triangular form. The general surface of the cerebrum occupies, all round about it, a more elevated plane, and thus the insula comes to be bounded by distinct walls, like the sides of a shallow pit dug out in the ground. The upper wall is formed by the lower margins of the frontal and parietal lobes, the lower wall by the upper margin of the temporal lobe, and the front wall by the frontal lobe. From each of these bounding walls a separate portion of cerebral cortex grows, and these gradually creep over the surface of the insula so as to overlap it, and eventually completely cover it over and exclude it from the surface, in the same way that the lips overlap the teeth and gums. That which grows from above is called the *fronto-parietal operculum*, while that which grows from below is termed the *temporal opereulum*. These appear very early, and are responsible for closing over more than the hinder three-fourths of the insula. The lower or temporal operculum is in the first instance more rapid in its growth than the upper or fronto-parietal operculum, and thus it comes about that when their margins meet more of the insula is covered by the former than by the latter. So far the development is apparently precisely similar to what occurs in the ape. The slit or fissure formed by the approximation of the margins of these two opercula is called the Sylvian fissure, and it constitutes a natural lower boundary for the parietal and frontal lobes which lie above it. At first, from the more energetic growth of the lower temporal operculum, this fissure slants very obliquely upward and backward, and is very similar in direction to the corresponding fissure in the brain of the ape. But in the human brain this condition is only temporary. Now begins that downward movement of the parietal lobe and back part of the frontal lobe to which reference has been made. The upper or fronto-parietal operculum, in the later stages of fetal life and the earlier months of infancy, enters into a growth antagonism with the lower or temporal operculum, and in this it proves the victor. The margins of the two opercula are tightly pressed together, and, slowly but surely, the fronto-parietal operculum gains ground, pressing down the temporal operculum, and thus extending