

If we make $\epsilon = 23^\circ 27'$ we find that the heat received during the summer (equinox to equinox) of each hemisphere is '627 *E*, while the heat during the winter of each hemisphere is '373 *E*. More briefly still. If each hemisphere receives in the year a quantity of sun-heat represented by 365 units, then 229 of these are during summer, and 136 during winter. These figures are independent of the eccentricity of the earth's orbit.

The length of the summer is defined to be the interval when the sun's centre is above the equator. The length will of course vary with the eccentricity and with the position of the equinoxes on the orbit. We need only take the extreme case where the line of equinoxes is perpendicular to the major axis of the orbit. The maximum difference between the length of summer and of winter is thus

$$365 \text{ days} \times \text{eccentricity.}$$

I take the maximum eccentricity of the earth's orbit to be
0'0745,

this being the mean of the values by Leverrier, Lagrange, and Stockwell (see Croll, "Climate and Temp.," p. 531), and, therefore, the greatest difference between summer and winter will be about 33 days, *i.e.* one season is 199 days, and the other is 166 days.

The total quantity of heat received during the year on each hemisphere is practically independent of the eccentricity; but the mode in which that heat is received at the different seasons will vary, and thus give rise to the following extreme cases:—

GLACIAL			
(Summer)	229	heat units spread over	166 days.
(Winter)	136	" "	199 "
INTERGLACIAL			
(Summer)	229	heat units spread over	199 days.
(Winter)	136	" "	166 "

We hence deduce the following, where unity represents the mean daily heat for the whole year on one hemisphere:—

GLACIAL			
Mean daily sun-heat in summer (short)	...		1'38
" " winter (long)	"	"	'68
INTERGLACIAL			
Mean daily sun-heat in summer (long)	...		1'16
" " winter (short)	"	"	'81
PRESENT (NORTHERN HEMISPHERE)			
Mean daily sun-heat in summer (186 days)	...		1'24
" " winter (179 days)	"	"	0'75

These figures exhibit a thermal force of great intensity. The unit represents all the mean daily heat received from the sun by which the earth is warmed up from the temperature of space. The heat unit in fact maintains a temperature perhaps 300°, or even more, above what the earth would have without that heat. Each tenth of a unit may thus roughly be said to correspond to a rise or fall of mean temperature of 30° or more. The long winter of 199 days, when the average heat is only two-thirds of a unit, leads to the accumulation of ice and snow, which form the Glacial epoch. The short winter of 166 days, where the temperature is '06 of a unit above that of our present winter, presents the condition necessary for the mild interglacial epoch.

THE BRITISH ASSOCIATION

SECTION H—ANTHROPOLOGY

The Native Tribes of the Egyptian Súdán, by Sir Charles Wilson, K.C.B.—These may be divided into four distinct groups—the Hamitic, Semitic, Núba, and Negro; but the first three only were dealt with in this paper. The largest tribe in the Súdán is the Kabbabish. They extend from Dongola to the confines of Darfúr; they speak a pure Koranic Arabic, and have a tradition that they came from Tunis; they are possibly of Berber descent, but the Sheikhs are apparently of Arab origin. They are divided into two great branches and several minor clans. One clan, Kawahleh, appears to be of Arab origin.

The Celtic and Germanic Designs on Runic Crosses, by Prof. W. Boyd Dawkins.—The author said that although it is generally assumed by archæologists that the early Irish manuscripts, such as the illuminated Gospels of St. Cuthbert and St. Chad,

are of pure Irish art, and that consequently the interlacing "rope-" or "basket-work" pattern is distinctly Irish and Celtic, such an assumption is not warranted by experience. A consideration of the distribution of the designs on ornaments and monuments in the British Isles and in France, Scandinavia, and Germany, lead to the conclusion that the art was probably derived from the centres of civilisation in South Europe, principally Greek and Etruscan, and it has clearly been proved by Chantre to have been introduced into France from Italy. The square interlacing pattern does not occur in France or the British Isles in association with any remains of a date anterior to the movement of the Germanic tribes against the Roman Empire, and as it is only found in regions into which the German tribes penetrated, it may be concluded that it is distinctly Germanic, and not Celtic, still less "pure Irish."

The Scientific Prevention of Consumption, by G. W. Hambleton.—There are two distinct objects to be accomplished in the prevention of consumption. On the one hand we have to secure an adequate amount of breathing capacity in proportion to the rest of the body, and on the other to prevent either compression of the chest or injury to the lungs. This can be done by adopting those measures that tend to the development of the breathing capacity, and suppressing or obviating those conditions that compress or injure the lungs. By adopting measures is meant placing men, women, and children under conditions of habitation, clothing, education, and urging upon them habits that tend individually and collectively to develop the lungs.

Dragon Sacrifices at the Vernal Equinox, by George St. Clair, F.G.S.—The object of this paper was to show that human sacrifice, which prevailed extensively in early times, was a custom connected especially with the vernal equinox, and that the offerings were made to appease a mythical dragon which made its demand at that time. The dragon of mythology was identified and defined, and it was shown in what sense he opened his jaws at the spring season of the year. Human sacrifice was practised more especially at the spring of the year, or (in other instances) in honour of deities who once presided over equinox constellations. Artemis and Cronus, to whom this homage was chiefly shown, were both connected with the zodiacal sign Scorpio, and, according to M. Ernest de Bunsen, Scorpio was the starting-point of the primitive calendar. If the festival of Saturn did not get displaced or misplaced through the precession movement, it was still a festival in honour of the god of the under-world, and that meant death and the grave. Tradition says that human sacrifices were abolished by Hercules. As Scorpio rises with Hercules, and ceases to be a dark sign, the mythology is consistent with itself.

Evidence of Pre-Glacial Man in North Wales, by Dr. Henry Hicks, F.R.S.—The author in this paper described the conditions under which a number of flint instruments were discovered during the researches carried on by Mr. E. B. Luxmore and himself in the Ffynnon Beuno and Cae Gwyn Caves, in the Vale of Clwydd, in the years 1884-86. Last year a grant was made by the British Association for the purpose of carrying on the explorations, chiefly with the object of obtaining further evidence as to the age of the deposits in the caverns. The results obtained this year are highly confirmatory of the views which he (Dr. Hicks) had previously held, and have a very important bearing on the antiquity of man in Britain. It was found that the main entrance to the Cae Gwyn Cave had been blocked up by a considerable thickness of Glacial beds, which must have been deposited subsequently to the occupation of the cave by the Pleistocene mammals. A shaft was dug through these beds in front of the entrance to a depth of over 20 feet, and in the bone-earth, which extended outwards under the Glacial beds on the south side of the entrance, a small well-worked flint flake was discovered. Its position being about 18 inches beneath the lowest bed of sand, it seemed to be clear that the contents of the cavern must have been washed out by marine action during the great submergence in mid-Glacial times, and then covered by marine sand and an upper covering of boulder-clay. He believed that the flint implements, lance-heads, and scrapers found in the caverns were also of the same age as this flint flake, and hence that they must have been the work of pre-Glacial man.

The Recent Exploration of Gop Cairn and Cave, by Prof. Boyd Dawkins.—This was a paper on the exploration of Gop Cairn and Cave, near Gop Hall, New Market, St. Asaph, now being carried on by Mr. Pochin, Mr. P. G. Pochin,

and the author. The cairn commonly known as "Queen Boadicea's Tomb" was composed of blocks of limestone, about 40 feet high, 300 feet long, and 200 feet broad. A shaft was sunk near the centre of the cairn, but the only remains discovered were a few refuse heap bones of hog, sheep or goat, ox or horse, too fragmentary to be accurately determined. They were, however, of the character found almost universally in Britain in the burial-places of the Neolithic and Bronze Ages. The cairn itself was similar in character to one near Mold, in the same district, in which a skeleton was discovered in 1832 lying at full length, clad in a golden corselet, and adorned with 300 amber beads. An urn full of ashes and other remains was also met with. While the cairn was being attacked, a cave was discovered 141 feet to the south-west, and there were found bones and teeth of various animals which belonged to the Pleistocene age, and similar to those discovered in the caves of the Vale of Clwydd. Above these was found a deposit containing fragments of charcoal and large quantities of broken bones of wild and domestic animals. Slabs of limestone burned on their upper surface were also found, and pointed out the position of the fireplace. The date of this upper deposit was fixed by several fragments of pottery, which was in its characteristics similar to that of the Bronze Age. Besides these, a large number of human bones were found, increasing in number as the explorers dug their way to a square sepulchral chamber, 4 feet 10 inches by 3 feet 10 inches. This chamber was packed with human skulls and bones of all ages in the greatest confusion, and evidently interred from time to time. Among the bones were found two jet ornaments, a beautifully polished flint flake, with edges carefully bevelled, and some fragments of rude pottery of the kind commonly found in sepulchral urns of the Bronze Age. The chamber and the deposits showed that caves had probably been used for habitation and sepulture in North Wales in the Bronze Age, as they had already proved to have been used in the Neolithic Age. The human remains threw great light on the ethnology of the district in the Bronze Age, and proved that in the Neolithic Age the population of that part of Wales was of the oval-headed Iberic type, so widely spread throughout Europe. All the skulls were of this type save one, which possessed all the characteristics usually found in a round-headed Celt of the Bronze Age, and the presence of this skull in a sepulchre of the Iberic people appears to mark the beginning of the fusion of the two races, which has been going on ever since, and by which the Iberic type is at the present time being slowly obliterated.

On Bows' Barrow, near Heytesbury, in South Wilts, by W. Cunningham.—These researches, the writer stated, had been made at the east end of the barrow, where the original cist had been found empty, but with a skull near it. Several other skulls were also found in a more or less broken condition. Covering the floor of the barrow near where the skeletons were found was a black unctuous earth, which had been found to contain a large quantity of ammoniacal salts. Separated from the cist at the east end of the barrow several horns of oxen had been found, in addition to those that were found there some years ago. The skulls and other human remains which had been found were clearly primary burials, and were covered by large blocks of Sarsen stone, some of which weighed from 200 lb. to 300 lb.

The Crania and other Bones found in Bows' Barrow, by Dr. J. G. Garson.—The author said that the skulls are of large size, and long and narrow in form. In general outline they present two distinct forms, namely, the elongated oval, and what is called the coffin-shaped. They all conform in every respect to the long barrow type, and are all those of adult males.

Papuans and Polynesians, by the Rev. George Brown.—The object of this paper was to show that the two races had a common origin. Mr. Brown said he had worked for many years among the purest types of Polynesians and of Papuans, and in reducing the languages to writing he became convinced that, from the point of view of language and from their manners and customs, some of the difficulties in assigning to the two races a common origin were not so insuperable as they appeared. He considered that the basis of the Polynesian race was Papuan with an Asiatic admixture. The idea that cannibalism existed because of the love of animal food and the inability to gratify this appetite in any other way was all nonsense: in ninety-nine cases out of a hundred it was only practised as a means of revenge. The author gave a description of the etiquette and

general manners and customs of the two peoples, and, summing up his argument, said the points of similarity were so much more numerous and marked than the points of difference that as they inquired further they would find no insuperable difficulty in giving them one common origin.

What is an Aryan? by Sir George Campbell, K.C.S.I.—The great difficulty which we had in distinguishing the Aryan was that the Aryan race was seldom pure. Almost all the Aryans we met with were a very mixed race, but by their features and colour they were easily distinguished from the Turanian and Negro races. The difficulty in distinguishing between the Aryans and the Semites lay in their features, and if the rather high features, which we called Jewish, were the real types of the Semites, what were the types of the Aryans? There were two distinct branches of Aryans with which he had long been in contact—the dark branch found in India and Asia, and the fair branch, which included the whole of Europe and Asia Minor. Then in part of Western Asia, in the Hindu Kush, there was a whitey-brown variety of the race, which might be classed as the intermediates, and this he believed to have been the original habitat of the Aryan race. The question, of course, was what was the original Aryan—white, brown, or whitey-brown? and he was inclined to think that he was a whitey-brown, and that his primeval seats were in the higher recesses of the Hindu Kush, and that the branch which went into India had become darker by admixture with the aborigines, while those who went into Europe had become fairer or been completely blanched into whiteness by similar admixture with the fair races. As to features, he had come to the conclusion that the high prominent features which we were accustomed to speak of as distinctive of the Semite races were the real original features of the Aryan, and that the Jews had acquired them only by admixture with the Aryan races. The true type of Semite he believed was to be found in the Southern Arab.

On the Influence of the Canadian Climate on Europeans, by Prof. W. H. Hingston, M.D.—After describing the physical, geographical, and climatic characteristics of the country, the author proceeded to say that the heat of the summer in Canada was more easily endured than the moist humid summer weather often experienced in Europe. The skin was called into greater activity, and the heat of the summer weather acted very strongly on the liver, but if European residents adopted the indigenous customs of the country, lived moderately and temperately, and led active lives, their livers would give them no trouble. The cold weather in winter stimulated people to activity. The mortality in early life was large, because in no country in the world were there so many children, but the mortality in adult life was not large. With the exception of Malta, the Canadian stations used to be considered the healthiest posts of the British army, and there were really no diseases peculiar to the country, while many which prevailed in England and in Europe had no existence there.

The Life-History of a Savage, by the Rev. George Brown.—The author gave an account of the life-history of a native of New Britain, an island in the Polynesian group, about forty miles north-east of New Guinea. He commenced with the birth of the example child, and said that when a child was born to the Papuan people who occupied this land, a warm banana-leaf was wrapped round his body, and he was fed with the expressed juice of the cocoa-nut, and left ever afterwards to be "dressed in pure sunshine." He described the children's games of the people, and the initiation of the boy as he grew up into certain secret rites, and the ceremonies at the various feasts, especially on his marriage, and the feast when he was taught to curse his enemies. On the occasion of his marriage there was an interchange of goods and a distinct payment for the wife. Presents were also given by the women to the bride and by the men to the husband, and after a broom had been given to the former, and a spear to the latter, a stick was given to the man. The spear meant that the husband was to protect his wife, and the broom that with it the wife was to do her household work, and the stick was a symbol of his authority, or, in plain English, "Here's the stick with which to whack her if she does not." At the time of death the cries of the friends of the deceased were very piteous and touching. The dead person was cried to to come back, was expostulated with for having left his friends, was entreated to say how his friends had offended him, and so on, the mourners seeming to be speaking in the very presence of the spirit of the dead person. Many of the things which we should call good they also called good, but they had a definite

idea of a future state and also of punishment for one offender, the niggardly man. When an old man came near death he was placed upon a litter, and carried round to see the old scenes amid which he had passed his life—his canoe, the sea, and all the old familiar subjects, and then he was taken back to wait his time. After death he was placed in a sitting posture and taken into the public square, with his weapons by his side, and before him the people placed offerings of their valuable goods and money.

Notes on Photographs of Mummies of Ancient Egyptian Kings recently Unrolled, by Sir William Dawson, F.R.S.—The photographs representing the mummies of Seti I., Rameses II., and Rameses III. were communicated by Dr. Schweinfurth, of Cairo. They are of great interest as enabling us to see the actual features of these ancient Egyptian kings, and to compare them with their representations on the monuments and with modern Egyptians. It appears that the features of Seti are scarcely of Egyptian type, as represented either by the monuments of the older dynasties or by the present Egyptians; though, as Dr. Schweinfurth shows in a drawing accompanying the photographs, a similar style of countenance still exists among the Copts. It also appears that the features of Rameses II. strongly resemble those of his father, and are very like those of some of his statues. Both Seti and Rameses have narrow and somewhat retreating foreheads, and strongly developed jaws, indicating men of action rather than of thought; and both were men of great stature and bodily vigour, and seem to have lived to advanced ages.

Prehistoric Man in Manitoba, by Mr. C. N. Bell, F.R.G.S. (Winnipeg, Canada).—The author announced the existence in the Canadian North-West of sepulchral mounds, and pointed out the hitherto unknown fact that there is a continuous line of mounds from the mound-centres of the Mississippi River, down the Red River, to Lake Winnipeg. Human remains, much decayed, were found in the mounds, all buried by being placed on the surface under heaps of earth in which patches of charcoal and ashes frequently occurred, though no remains of funeral feasts, as bones, &c., were met with. Indian; when first met with, buried weapons with their warriors, but none were found in these mounds, though implements and ornaments of shell, bone, and stone were common, as well as pottery, which latter was unknown to the Indians of North-West Canada on the arrival of white emigrants. One mound had a floor of burnt clay and boulders, similar to the sacrificial mounds and altars of Ohio. Ornaments were found made of sea-shells, which must have been carried 1200 miles from their native waters. These mounds, from Lake Winnipeg to the Gulf of Mexico, were of the same character, and very likely were made by one race, though the whites found great diversity of mortuary customs prevailing among the Indian tribes inhabiting that great tract of country.

Notes on a Tau Cross on the Badge of a Medicine-Man of the Queen Charlotte Isles, by R. G. Haliburton.—Mr. Haliburton said this badge was noteworthy, as Queen Charlotte Isles form one of the most isolated groups of the Northern Pacific. They lie off the west coast of British Columbia. This symbol was used by the Indians on large sheets of copper, to which they assigned a high value, and each of which they called a *Tau*. The connection of that name with the symbol is world-wide. Our τ is simply the tau symbol, and is called *tee* or *tau*. The medicine-men represent the tau sometimes on the forehead. The ancients used to mark the captives who were to be saved with a tau or cross; Ezekiel refers to this, and the word he uses for "the sign" to be marked on the foreheads of them that are to be saved really is the "tau" or "cross." No one has divined why the *scarab* was so sacred. He was led to a solution by seeing an exaggerated *tau cross* on the back of a *scarab*. On looking into the Egyptian name for the *scarab* he found it to be *torz*, and that the sutures on the beetle form a tau cross. But the same name is applied to the same beetle by our peasantry—*tor-beetle* or *dor-beetle*. Wilkinson represents a god with a *scarab* for a head, one of the names of which was *Torz*. The use of the prehistoric or pre-Christian cross is world-wide.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE

OXFORD.—This term begins under a new official régime. Prof. Jowett, Master of Balliol, retires from the Vice-Chancellor-

ship, and Dr. Bellamy, the President of St. John's College, succeeds to his place. The Master of Balliol's four years of office have seen several important reforms in which he bore a prominent part. Among them we may mention the alteration in Honour Classical Moderations, the disestablishment of the Examination in the Rudiments of Faith and Religion, the establishment of a University course for medical students, and the abolition of Pass Classical Moderations in favour of Preliminary Examinations for students of law, natural science, and mathematics. The last reform, indeed, has not yet become law; but the necessary steps to complete the legislation are already taken, and the Statute will doubtless pass Convocation during the present term.

Scholarships in Natural Science are announced this term for competition at Balliol, Trinity, and Christ Church.

The following scheme of lectures in Natural Science is announced for the present term:—

Physics.—Prof. Clifton lectures on General Electricity, and Mr. Selby on Electrostatics treated Mathematically. Practical instruction in Physics is given in the Clarendon Laboratory by Prof. Clifton and Messrs. Walker and Selby.

At Christ Church, Mr. Baynes lectures on Fourier's Theorem. At Balliol, Mr. Dixon lectures on Elementary Light and Heat.

Chemistry.—Prof. Odling lectures at the Museum on the Benzoic Compounds. Mr. Fisher gives a course of Inorganic Chemistry, and Dr. Watts a course of Organic Chemistry. Practical instruction is given by the above, and by Messrs. Baker and Marsh.

At Christ Church, Mr. Vernon Harcourt gives a course of lectures on Inorganic Chemistry for the Preliminary Examination. Practical instruction is also given at the Christ Church and Balliol Laboratories.

Animal Morphology.—Prof. Westwood lectures on the Hexapod Arthropoda. Prof. Moseley lectures on Comparative Anatomy. Mr. Baldwin Spencer gives an elementary course on the same subject. Mr. Hatchett Jackson lectures on Comparative Embryology. Mr. Barclay Thompson lectures on the Osteology, Odontography, and Distribution of Mammals. Practical instruction is given by Prof. Moseley, Mr. Spencer, and Mr. Robertson.

Physiology.—Prof. Burdon-Sanderson lectures on Circulation, Respiration, and Bodily Motion. Mr. Dixey lectures on Histology; and Mr. Hatchett Jackson on Elementary Physiology. Practical classes are conducted by Messrs. Dixey and Gotch.

Human Anatomy.—Mr. A. Thomson lectures on the Central and Peripheral Nervous System, and Digestive System. He also gives demonstrations on Topographical Anatomy, and has a daily class for Dissection.

Medicine.—Dr. Darbishire gives demonstrations at the Radcliffe Infirmary, in Physical Diagnosis and Regional Anatomy, and Mr. Winkfield gives demonstrations in Surgical Diagnosis.

Botany.—Prof. Bayley Balfour lectures at the Botanic Garden on Vegetable Morphology and Physiology.

Mineralogy.—Prof. Story-Maskelyne lectures at the Museum on Minerals occurring in Lodes.

Geology.—Prof. Prestwich lectures at the Museum on the Principles of Geology.

Anthropology.—Dr. Tylor lectures on the Development of Culture, Sign Reading, &c.

Mr. A. L. Selby, B.A., Demonstrator of Physics in the Clarendon Laboratory, has been elected a Fellow of Merton College.

Mr. H. B. Dixon, M.A., of Trinity College, has been elected a Fellow of Balliol College.

SCIENTIFIC SERIALS

IN the *Journal of Botany* for August Mr. J. G. Baker concludes his notes on British Rubi, and Messrs. Roy and Bisset contribute the second and concluding part of their notes on Japanese Desmids (illustrated).—The number for September commences with an interesting and important paper by Mr. G. Masee, on the structure and functions of the subterranean parts of *Lathraea squamaria*, L. (also illustrated). He regards the plant as of saprophytic rather than parasitic habit, the disks or haustoria on which its parasitism depends being frequently entirely absent from old plants. In some instances, but not all, the roots are covered with the mycelium of a fungus similar to that described by Kamienski in the case of