

## Research Items.

**Smoking in Papua.**—Dr. A. C. Haddon, who is investigating tobacco smoking in Papua, communicates to *Man* for August an account by Capt. G. F. N. Zimmer of a method of smoking tobacco hitherto unrecorded, which is in use among bush natives on and to the west of the Fly River in an area including Shortland River and Lake Murray. The tobacco or a native cigarette is inserted in one end of a tube or cigarette holder—a narrow bamboo tube about nine inches long—and this end they place against a glowing log or fire-brand. When the tobacco is thoroughly alight, the end containing the tobacco is placed in the mouth and the other end inserted in the wider end of an arm guard or bracer which has been removed from the smoker's left arm, this end of the bracer being closed by the right hand, the tube going between the smoker's fingers. The narrower end is closed by the smoker's left hand. The bracer, *posiki*, is made of nine slats of wood, about 25 cm. long and tapering from 31 mm. to 25 mm. in width. The slats of wood are firmly lashed on both sides with rattan so as to make a very rigid object. The smoke is blown into the bracer through the tube. The tube is then removed and the smoke inhaled by slightly moving the left hand. This method of smoking is usually employed while hunting or when away from the village. It is in no way a freak, but has been observed on many occasions as a regular method in these circumstances.

**Agricultural Rites in Northern Nigeria.**—Mr. C. K. Meek describes in *Africa* for July (vol. 3, No. 3) the ceremonies observed by the Bachama of the Benue River in the cult of Nzeanzo, who is enshrined at Fare, a Bala village some seven miles east of Numan. Nzeanzo is believed to be the youngest of five sons of a woman named Venin, who herself receives divine honours in an annual mourning ceremony observed in April. The cult of Nzeanzo is the most honoured among the Bachama. It is in the hands of a kindred at Fare of which the head is called Kisami. He is assisted by a relative, who acts as spokesman on all occasions, and a man of another kindred who prepares the beer and food used in the rites. A woman known as Mbamto acts as intermediary between the god and the people. She is a perpetual virgin who has come from the district of Kona and is regarded as the bride of the god. She is not psychic and if she develops hysterical symptoms she is sent away. The principal festival of the cult is held at the end of April and lasts three days. The king, though not a priest, is regarded as president of all cults and is held responsible for the due performance of all rites. If he should fail in providing gifts at stated periods, any misfortune to the people would be regarded as due to his default. The Fare festival is primarily concerned with the opening of the agricultural year and precedes the sowing of the crops. It is even more important than the thanksgiving rites. Formerly one of the king's children was sacrificed annually during the fertility rites of 'Pilla' carried out at Lamurde. In comparatively recent times, the human victim was replaced by a cow. At Nafaran no one may sow his crops until the priest of the Nafaran cult has carried out certain rites and distributed the seed which he has had under his keeping, and is therefore believed to have magical qualities. Among the Jukum, Kona, and Mbum the seed-corn is distributed by the chief, and is the produce of the royal farm. This was apparently the custom of the old Bachama kings, and to this day the produce of the royal farm is considered the property of the community.

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**Fauna of South Africa.**—Report No. 7, for the year ending June 1929, of the Fisheries and Marine Biological Survey, Union of South Africa, contains, besides general matter relating to the fisheries, several papers in the "Special Reports", amongst which are two of special value. These are Dr. C. H. O'Donoghue's "Opisthobranchiate Mollusca" and Mr. M. Burton's "Description of South African Sponges" collected by the South African Marine Biological Survey. The first is a long, systematic paper on various forms chiefly belonging to the tectibranchs (sixteen species) together with a few nudibranchs (five species). Amongst these are five new species of tectibranchs and three new species of nudibranchs. The examination of such a collection is a thankless task, for all the specimens are preserved and have lost their original beauty, which in life may be marked, and the absence of coloration in most cases makes diagnosis difficult. Nevertheless, Dr. O'Donoghue has managed to extract a large amount of information out of the collection, the radulae, shells (when present), and jaws serving as valuable distinctive features, and these are fully figured in eight plates. *Euselenops luniceps* (Cuvier) is specially carefully and minutely described, with details of its anatomy, although only one specimen was present. This is identical with *Neda luniceps* described by Adams and Reeve in 1848. Mr. Burton in his critical survey of the desma-forming sponges abandons for ever the family Lithistidae, the heterogeneous collection of forms which have hitherto been placed together on account of the similarity of their skeletons being provisionally referred to several different families. Six species are recorded from South Africa, including one which is new. *Lithochela conica*, a new genus and species belonging to the Myxillae, is also described.

**Atlantic Foraminifera.**—Dr. Joseph Augustine Cushman continues his valuable series of memoirs on "The Foraminifera of the Atlantic Ocean", the present part (7) consisting of the Nonionidae, Camerinidae, Peneroplidae and Alveolinellidae (Smithsonian Institution, United States National Museum, *Bulletin* 104, 1930). As in former parts, the species are specially described which have occurred in the waters adjacent to the shores of the United States, including the whole of the Gulf of Mexico and the Caribbean Sea, which is the area chiefly worked by the vessels of the United States engaged in dredging. These families are all represented by simpler and usually smaller forms than in the Indo-Pacific, where some of the species reach to a very large size. The Nonionidae are most abundant in rather shallow water; three genera occur and numerous species. *Elphidium* is common, also *Nonion* and *Nonionella* in rather deeper water. The Camerinidae are almost wanting in the Atlantic, the Peneroplidae and Alveolinellidae being represented by simpler and more primitive species than in the Pacific. The new species *Peneropsis bradyi* is common in the West Indian region, occurring at numerous stations off the Tortugas and the Florida Keys, at Bermuda and Jamaica, probably replacing *Paneropsis planatus*, which apparently does not occur in the western Atlantic.

**Osteology of Pediculate Fishes.**—Mr. Albert Eide Parr, in his paper entitled "On the Osteology and Classification of the Pediculate Fishes of the genera *Aceratias*, *Rhynchoceratias*, *Haplophryne*, *Laevoceratias*, *Allector*, and *Lipactis*" (Occasional Papers of the Bingham Oceanographic Collection, Peabody Museum of Natural History, Yale University, No. 3,

1930), discusses the homology of the rostral bone of Rhynchoeratiæ and describes the new species *Rhynchoeratiæ longipinnis* with special reference to its osteology. He finds that the median, unpaired rostral bone of this genus which forms the anterior part of the upper border of the mouth, supplying through its denticles or spines the only functional dentition of the upper jaw apparatus, has nothing to do with the mesethmoidal bones of these fishes, but is homologous with the illicium of other ceratoids, representing an extreme phylogenetic modification of the most anterior dorsal fin ray (spine) of ordinary teleosts. The relationships of the other genera are discussed and the family Aceratiidæ divided into two sub-families, the Eurostrinæ, to which *Aceratiæ* and *Rhynchoeratiæ* belong, having the dorsal denticles inserted on a well developed rostral bone, and the Cryptorestrinæ, including *Haplophryne* and *Lævoeratiæ*, in which the rostral bone is reduced or absent.

**Iron in Humus.**—Some explanation of the beneficial influence of humus substances on the growth of green plants in water culture has been brought forward by C. Olsen (*Comptes-Rendus du Laboratoire Carlsberg*, vol. 18, 1930). The solution of the much-debated question as to whether or not humus is beneficial to plants grown under these conditions centres round the form in which the iron is presented, and the reaction of the nutrient solution. *Lemna* plants grow equally well in a culture solution of pH 6.0, whether humus was added or not, provided the iron was given in the form of ferric citrate, but if ferric chloride was substituted for the citrate the addition of humus greatly improved growth. The explanation given is that under neutral or alkaline conditions iron is not available to the plant unless it is in the form of an organic compound such as citrate. The watery extracts of peat contain such complex organic iron combinations, and are therefore useful to the plant for the available iron they provide. In support of this theory attention is directed to the fact that chlorosis is often noticeable in Nature among plants growing on calcareous soil poor in humus, whereas on soils of similar pH but containing humus, the symptoms of iron deficiency do not appear.

**Geophysics in the United States.**—The United States National Research Council has issued (June 1930) the *Transactions* of the American Geophysical Union for both the tenth and eleventh annual meetings (April 1929 and May 1930) in one volume (pp. 314, no price stated). The reports of previous annual meetings (up to that for 1928) appeared about a year after the date of the meetings. The remarkable promptitude of publication of the report of this year's meeting is due largely to the adoption of photolithographic reproduction from typescript for the whole of the material. The result is not quite so readable or pleasing to the eye as printed matter, but the advantage of early publication seems to outweigh this drawback, in view of the necessarily mainly ephemeral interest of the reports and papers, which deal largely with matter published more fully elsewhere. The Union meets as a whole and in seven sections; the reports and papers numbered 54 (at the 1930 meeting) and cover a wide range of important and interesting topics in geophysics.

**Magnetic Data from Mauritius.**—Miscellaneous Publications of the Royal Alfred Observatory, No. 8, is devoted to a summary and discussion by the director, Mr. R. A. Watson, of "The Disturbed and Quiet Day Variations of Magnetic Force at Mauritius, 1916-26". The inclusion of quiet and disturbed day inequalities in the monthly bulletin of the observatory is not

possible, and their collection and discussion for an 11-year period in this publication is therefore of special value and interest. The outstanding feature of the results is the manner in which disturbance is almost entirely confined to *H* (horizontal force). In *D* (declination) and *V* (vertical force) the inequalities are almost unmodified by disturbance, whereas in *H* both the type and the range of the inequality are entirely different on the two sets of days, quiet and disturbed. Even on international quiet days *H* usually shows some small disturbance, and though world-wide disturbances are in general considerably less intense at Mauritius than in latitudes 50° or more, small disturbances (in *H*) are more frequent at Mauritius, so much so that it is usually difficult to select one day in any given month as a typically undisturbed day.

**Turner Valley Oilfield, Alberta.**—Western Canadian oil possibilities have certainly derived stimulus from the developments on the Turner Valley oilfield, Alberta, of which Mr. E. H. Cunningham Craig gave some account to the Institution of Petroleum Technologists recently. In fact, it is not too much to state that if American interests in the oil potentialities of the Rocky Mountain region have flagged somewhat from the non-discovery of a second Salt Creek Oilfield, they have certainly been reanimated by the results of the last six years' work at Turner Valley, where geological conditions are closely allied to those in the relevant Rocky Mountain States. The Turner Valley anticline was first proved a producing structure by the drilling of the Royalite No. 4 oil-well some five years ago, and since then other producing wells have been completed. Significant interest attaches to this well, as it produced filtered oil and wet gas in considerable quantity; its present output is more than 500 barrels of light gasoline per day. It may be recalled that Alberta has in the past been specially noted for its enormous reserves of natural gas, chiefly of a dry character, with comparatively little oil; so that the Turner Valley developments are of more than usual importance. Some fifteen miles of the structure have been proved and other areas outside Turner Valley have been and are being prospected. The source of this oil and gas has revived the old controversy of upward or downward migrated oil. On one hand there is the possibility of derivation from Palæozoic (Devonian) horizons, and, on the other, from the Jurassic or lower Cretaceous. The author favours the latter source and inclines to the view that the parent oil rocks are of Kootenai age (base of Lower Cretaceous) with subsidiary possibilities in the overlying Dakota Sandstone. He dismisses the possibility of Palæozoic origin on the chief count of probable escape and loss of oil during the lengthy geological period intervening between the critical formations, during which considerable orogenic movement and accompanying erosion were accomplished. On the other hand, there is no doubt that the chief reservoir rock is a dolomitic limestone of pre-Jurassic age; so that, if the "stratigraphically downward migration" theory is proved, which we cannot easily admit on the basis of the facts so far presented, a most important principle, applicable to many other limestone fields in the world, is thus established.

**Ionised Regions of the Upper Atmosphere.**—Some fresh investigations of the upper air by wireless methods, which differ chiefly from earlier ones in the use of short waves and in the multiplication of the number of receiving stations, are described by Prof. E. V. Appleton, J. A. Ratcliffe, and A. L. Green in two papers in the July issue of the *Proceedings of the Royal Society*. These now show conclusively that

even relatively long waves (400 metres) occasionally pass through the lower ionised layer (the *E* region) at night when it is at a height of approximately 100 kilometres, and are then returned from the *F* region, which has a greater concentration of electrons, and is approximately two to three times as high. With shorter waves (100 metres) the penetration of the *E* layer occurs frequently, the waves being returned from it usually only in the middle of the day, when it is still at a height of approximately 100 kilometres. The equivalent height of the *E* layer for 400 metre waves varies very little with the angle at which they are incident upon it, and there is likewise little variation in the reflection coefficient, to explain which it is suggested that there is a zone below the *E* layer which causes considerable attenuation of the waves, without, however, deviating them. The receiving station at King's College, London, at which many of the interference records have been obtained, is distant only 18 kilometres from the transmitting station at Teddington.

#### Collisions Between $\alpha$ -Particles and Helium Atoms.—

The solution of the problem of collision between two particles which act upon each other with forces varying as the inverse square of the distance between them is the same in quantum mechanics and in classical mechanics, unless the particles are identical. In this case an important additional term appears in the quantum theory expression for the probability of scattering, and it is possible to decide between the old and the new theory by experiment. A test of this nature, in which the number of particles projected through  $45^\circ$  by slow  $\alpha$ -particles passing through helium is measured, is described by Dr. J. Chadwick in the *Proceedings of the Royal Society* for July. An annular type of scattering apparatus was used, with a strong polonium source, and a zinc sulphide detecting screen. The number of particles deviated was definitely greater than would be expected on classical theory, and for the slowest particles used, of range about 1.2 cm. in air under standard conditions, was close to the number predicted by quantum theory. A fundamental theoretical assumption which is verified by this result is that the helium nucleus has no spin or vector quantity associated with it, and that its field of force is spherical.

#### Measurement of Candle Power of Electric Lamps.—

The measurement of the candle power of lamps is one of the most difficult problems that physicists have to solve. The probable error of the routine tests of comparing the candle powers of incandescent lamps by visual methods in the factory are of the order of at least 2 per cent high or low. This is due not to carelessness but to the real difficulty which every observer has in judging when two surfaces have the same brightness or when two shadows have the same intensity. This is apart altogether from the difficulties arising in determining the mean intensity of the light emitted and from those arising from differences of colour. In a paper communicated to the May number of the *Journal of the Institution of Electrical Engineers*, Mr. Winch, of the G. E. C. Research Laboratories at Wembley, describes a photo-electric photometer for the commercial measurement of incandescent electric lamps. It seems to us that this instrument will go an appreciable way in meeting the commercial demand for higher accuracy combined with very rapid measurement. Whilst the eye must, of necessity, be the ultimate source of reference, there seems reason to believe that in the near future commercial photometry will, in general, be carried out photo-electrically. As an experiment, lamps were measured in the ordinary photometric way and the work done was equiva-

lent to having five observers working for four days, without taking into account the time taken in making calculations. The same series of tests when carried out photo-electrically by one observer took four hours. The method is capable of being developed so as to obtain higher accuracy and also so as to obtain spherical integration with one reading.

**Turbo-Vapour-Compressors for Refrigeration.**—Among the Selected Engineering Papers chosen to be published in pamphlet form by the Institution of Civil Engineers is one by Dr. H. Mawson on "Turbo-Vapour-Compressors and their Application to Refrigeration". While reciprocating compressors have been developed for refrigeration, turbo-compressors have not received serious consideration, and in the paper an attempt is made to consider the thermodynamic and practical possibilities of this type. Fundamental equations which are applicable to liquids, gases, and vapours are applied to the flow of fluids through a centrifugal compressor; the choice of a fluid for centrifugal compression between definite temperature limits is considered and the performance of a sulphur dioxide turbo-compressor for a given temperature range is examined by the aid of the  $p/I$  chart. Outlines of the design of a sulphur dioxide centrifugal compressor of definite duty for the same temperature range are given, together with a general arrangement of the compressor, and, finally, centrifugal and reciprocating compressors are contrasted, and the possible application of the former to central-station distribution of fluids under pressure for refrigeration is also considered.

**Metal Carbonyls.**—The *Journal of the Society of Chemical Industry* for June 13, 20, and 27 contains a most interesting article by Dr. Robert Mond on the metal carbonyls. The early experimental work which led to the discovery of the first known member of the group, nickel carbonyl, in 1890 by Ludwig Mond and C. Langer, and the subsequent investigations (in which Dr. Robert Mond played an active part) leading to the discovery of the other metal carbonyls, are described. The properties of the carbonyls and their actual and possible technical uses are next considered, and a full bibliography of the literature is given. The Mond Nickel process, which is a very important technical application of the properties of nickel carbonyl, is dealt with at some length. These three papers constitute an important and authoritative addition to chemical literature.

**Sorption of Gases by Charcoal.**—The June number of the *Journal of the American Chemical Society* contains a paper by McBain and Britton on the sorption of gases and vapours by charcoal under great pressure (up to 60 atm.) The experiments were completed in 1927 at the University of Bristol. The gases used were nitrogen, nitrous oxide, and ethylene, and the temperatures used were above and below the critical temperatures. It is claimed that the results enable a decision to be reached between rival views as to the nature of sorption by charcoal, that the Langmuir conception that only such molecules are sorbed as are in direct contact with the molecules holding them is correct, and that the Saussure-Polanyi conception of a compressed film is not supported by the experiments. In this connexion, however, it should be mentioned that the same issue of the journal contains a paper on the adsorption of water and benzene vapours on manganese dioxide, by Foote and Dixon, in which it is stated that Polanyi's theory is in agreement with the data, so that the question cannot be regarded as settled.