

taken with the end thrust bearing of this screw, so that no periodic error may occur when it is in the instrument. To ensure this, the end of the screw has a small flat surface optically ground and polished. This rests against a ruby plate to take the end thrust of the screw. The plate is capable of adjustment, and there will be no periodic error when the system of interference fringes which can be observed between the ruby plate and the end of the screw remain unchanged while the screw is revolved. The screw is said to be true to 1/100,000 mm.

Among other things seen were the testing of a camera lens for non-axial rays by the interference method recently perfected by Mr. Twyman, and fully

described by him in one of the catalogues and elsewhere,¹ and some extremely delicate thermo-junctions for spectro-bolometric work.

Mr. Twyman states that the large majority of those who come to inspect Hilger's showrooms, or apply to be shown over the works, are foreigners, and it is with the hope of bringing this exhibition to the knowledge of British men and women who are interested in optical design and spectrographic work in general, that the foregoing has been written.

C. C. L. GREGORY.

¹ "An Interferometer for testing Camera Lenses." Read before the Optical Society, April 14, 1921.

Biometry and Mathematical Statistics.

IN the new double number of *Biometrika* (vol. 14, Parts 3 and 4, Cambridge University Press. Price 30s. net) ample evidence is provided to show how groundless is the charge that the interest of modern statistical work is wholly mathematical. Of the ten memoirs published, only three require for their intelligent perusal more than a very moderate knowledge of algebra. The three mainly mathematical papers are Mr. Egon Pearson's evaluation of the probable error of a Class-index correlation, Prof. Pearson and Miss Elderton's paper on the Variate-difference method of determining correlation—a valuable contribution to the controversy which has arisen over the applicability of this method to various kinds of data—and Mr. E. C. Rhodes' paper on a particular type of Skew Correlation surface.

The most important of the biometric papers is Mr. Morant's careful study of the Tibetan skull. Mr. Morant concludes that there are in Tibet at least two distinct races—one closely allied to the Southern Chinese, Malaysians, and Burmese, the other not showing any close affinity to any other oriental race, but resembling most the Burmese B and C types. He conjectures that he may here be dealing with widely scattered fragments of a fundamental primitive human type, with a long-headed, broad-faced, rugous and massive cranium.

Dr. Lucy Cripps, Dr. Major Greenwood, and Miss E. M. Newbold contribute a study of the inter-relations of "vital capacity," stature, stem length, and weight, based upon data furnished by the medical department of the Royal Air Force. They conclude that, so far as these data are concerned, Prof. Dreyer's modifications of Hutchinson's methods, in particular the substitution of stem length for height, are not marked improvements. Miss Elderton's memoir on the present position with regard to the inheritance of intelligence concludes with the words: "To each of us a limit is set, a limit, as far as one can see at present, due to heredity rather than to opportunity, and to the intelligence of our parents and ancestors rather than to the educational system under which we were reared."

Dr. Percy Stocks describes—giving a pedigree—a facial spasm inherited through four generations. Two other papers—one a short addendum to a memoir on the sesamoids of the knee-joint, the other on a digital anomaly—are of medical interest. Dr. G. D. Maynard discusses the fertility statistics of the New Zealand census. The *miscellanea* contain two notes on points of method and reviews of two recent contributions to mathematical statistics.

There must be very few students of pure or applied statistics who will fail to find anything of interest to them in this issue of *Biometrika*.

Glacial Deposits and Palæolithic Cultures in East Anglia.

AT a meeting of the Royal Anthropological Institute held on June 19, Mr. H. J. E. Peake in the chair, Prof. P. G. H. Boswell and Mr. J. Reid Moir presented a paper on "Flint Implements at Foxhall Road, Ipswich." Prof. P. G. H. Boswell dealt with the geology of the deposits. The site lies in an oval hollow about 120 ft. above Ordnance datum, 1½ miles E.N.E. of Ipswich station. The surrounding plateau of glacial sand and gravel lies at about 130 to 140 ft. above Ordnance datum. The succession of general sequence of deposits from bottom to top down to a depth of 31 ft. 4 in. is as follows: Dark Chalky-Kimmeridgic Boulder Clay (bored to 2 ft. 6 in.), loamy sand and shingle (6 ft. 9 in.), sandy boulder clay and loam (3 ft.), gravelly and sandy brick-earths passing up into laminated brick-earths (15 ft. 3 in.), gravel and subsoils, etc. (3 ft. 10 in.). Mechanical analyses of the respective beds have been made, and as a result suggestions were offered regarding conditions of deposition. The mineralogical characters have also been worked out, the assemblage being of typically glacial character. Reasons for referring the lowermost deposits to the Chalky-Kimmeridgic Boulder Clay were given, and the evidence that the uppermost

gravel indicated a recrudescence of cold or even glacial conditions after a period of amelioration were discussed. Finally, tentative correlations with the glacial sequence in Lincolnshire and Yorkshire were attempted.

Mr. J. Reid Moir described the implements found in the excavations. The number of humanly-flaked flints totals 545: the latest artefacts in Beds Nos. 2 and 3 being referable to the Mousterian epoch; the unrolled hand-axes of Beds Nos. 4 to 6 are of late Acheulean date; while those recovered from Bed No. 7 appear to represent examples of early Acheulean workmanship. Associated with the well-finished implements in the beds mentioned were found a number of simply-made artefacts, such as scrapers, points, and borers. Burnt flints were also recovered from each implementiferous horizon; while quartzite hammer-stones occurred in Bed No. 7. With the exception of one small and unidentifiable piece of bone, no organic remains were found during the excavations. An examination of the artefacts recovered shows that the specimens were flaked differently at the different horizons mentioned, and that a large proportion of the flints are considerably striated; the pressure to which

the specimens have been subjected has not, so far as can be seen, resulted in the removal of flakes. Several rostro-carinates—representing partly finished hand-axes—were found in the Acheulean strata.

In the discussion which followed the paper, Prof. W. J. Sollas said that we now have convincing evidence that the greater part of the Mousterian was glacial, and late glacial—Würm—at that. It is possible that the earlier Mousterian implements of the type of La Micoque belong to the interglacial Riss-Würm. The Upper Acheulean implements found at the top of the lower loess must therefore be referred to the Riss glaciation. There are difficulties, however, and while it might be expected that something intervened between Acheulean and Mousterian, there is no evidence that anything did. Mr. Bury pointed out that while on this site there is a separation between Chelles and Acheulean types, such separation does not occur in the gravels south of the Thames. Curiously, the site also shows a gradual climatic change working up from Acheulean to Mousterian, while south of the Thames the implements occur at different levels—the Acheulean at 100 to 150 ft., and the Mousterian, if occurring in gravels at all, at lower levels. It was this apparently to which Prof. Sollas referred.

Mr. Peake said that this investigation appears to clear up the difference between monoglacialisists and polyglacialists. One point, however, has not been cleared up, and that is the relative position of the different industries. On the Continent it is generally held that the Mousterian equated with the Würm, but in America Prof. Osborne at least appears to have abandoned this position. The question arises, which of the four glaciations recognised on the Continent equate with the three glaciations for which there is evidence here? Prof. Boule has maintained that he is unable to find marked evidence for the Gunz glaciation in Western France. This suggests that the centre of glaciation was farther east, and that similar conditions prevailed in this country. In this case our three glaciations would equate with the three later of the Continental glaciations.

University and Educational Intelligence.

LEEDS.—One of the most important departments of the University is that which deals with agriculture, for, while the University is situated in a great industrial city, it is also the centre of the largest agricultural county in England. A new building for the department is about to be commenced. This has been made possible by the generous help received by the University from several sources. The late Mr. Walter Morrison gave a sum of 10,000*l.*, a donation which, by his wish, remained anonymous during his lifetime; a Treasury grant through the Ministry of Agriculture and Fisheries of 12,000*l.*, promised in 1914, has been increased to 15,000*l.*; the Yorkshire Council for Agricultural Education has contributed approximately 10,000*l.*; and there have been numerous other donations. The University is providing the site and the balance of the money required. The building will be located in University Road, west of the buildings of the Textile (Clothworkers) group, and will occupy a plot 190 feet long by 125 feet deep.

LONDON.—The following doctorates have been awarded, the subject of the thesis presented appearing after the name:

Ph.D. (Science):—H. E. M. Barlow (University College): "An Investigation of the Friction between Sliding Surfaces, with special reference to the Effects

produced by Electric Currents passing across such Surfaces"; Miss F. E. Barnett (Northern Polytechnic Institute): "Some Problems of the Endodermis—The Distribution of the Endodermis in Angiosperms, with some Observations on the Function of the Endodermis"; W. A. P. Challenor (Imperial College, Royal College of Science): "Conditions underlying Carbon Ring Formation"; B. W. Clack (Birkbeck College): "A Research on Diffusion in Liquids"; P. W. Cunliffe (King's College): "(a) Studies in Photo-Chemical Light Sources; (b) Studies on the Photolysis of Aqueous Solutions of Hypochlorous Acid and of Chlorine"; F. Dickens (Imperial College, Royal College of Science): "The Conditions of Formation of Four- and Five-membered Rings from Substituted and Unsubstituted Open Carbon Chains"; Miss C. H. Griffiths (Birkbeck College): "(1) Diffraction Patterns in the presence of Spherical Aberration; (2) Co-efficients of Diffusion of Potassium Chloride, Sodium Chloride, and Potassium Nitrate determined from the published experimental data of Mr. B. W. Clack by a method due to Dr. Albert Griffiths"; A. A. S. El Kirdany (Imperial College, Royal College of Science): "The Calculation of the Motion of an Inviscid Fluid round an Aerofoil when Cyclicity is assumed to be present"; Miss I. E. Knaggs (Imperial College, Royal College of Science): "The Relation between the Crystal Structure and Constitution of Carbon Compounds, with special reference to simple Substitution Products of Methane"; K. C. Pandya (Imperial College, Royal College of Science): "The Influence of Groups on Carbon Valency Direction"; H. A. Piggott (Imperial College, Royal College of Science): "A Study of the Conditions which determine the Mobility (or otherwise) of certain Potential Tautomeric Systems of the Glutaconic Acid Type in the Aromatic Series"; H. H. Potter (King's College): "Some Experiments on the Proportionality of Mass and Weight"; L. Rebekoff (King's College): "(a) Studies in the Photolyses of Formic and Oxalic Acids; (b) Studies in some Photochemical Light Sources"; D. O. Shiels (King's College): "The Adsorption of Water Vapour and other Vapours by Charcoal"; B. Singh (Imperial College, Royal College of Science): "Formation and Stability of Cyclic Compounds derived from B Substituted Glutaric Acid"; I. W. Wark (University College): "Some Copper Complexes with Hydroxy-Acids"; A. F. A. Young (King's College): "The Thermionic and Photo-Electric Properties of the Electro-positive Metals"; F. Arnall (Chelsea Polytechnic): "Studies in the Nitration of Phenol"; G. R. Clemo (Queen's College, Oxford): "The Introduction of the B-chloro-ethyl Group into Phenols, Thio-phenols, Aromatic Amines, etc."; J. W. Cook (Sir John Cass Technical Institute): "Some Derivatives of Anthracene"; B. S. Evans: "An Investigation into the Chemistry of the Reinsch Test for Arsenic and Antimony, and its Extension to Bismuth"; P. T. Freeman: "On the Binaural Location of a Source of Sound of Low Frequency, and its Application"; S. I. Levy: (1) "Studies on Cyclic Ketones, Parts II. and III."; (2) "An Attempt to resolve an Oxonium Salt"; (3) "The Action of Amino-Acid Esters on Ethyl Dicarboxyglutaconate"; (4) "(4'-Methoxy-1'-naphthyl)-2-chromon"; A. H. Stuart: "The Problem of securing Rigidity in an Aeroplane Wing"; and C. L. Withycombe (Imperial College, Royal College of Science): "Neuroptera, their Biology and Anatomy."

APPLICATIONS are invited for the Drapers' Company's research scholarship in dyeing at the Technical College, Huddersfield. The scholarship includes re-