as by the formal reading of papers; it should endeavor to make its findings plain to the man in the street.

There can be no question as to the need for such work to be undertaken. The present age is deafened by the cries of advertisers of nostrums of all kinds; and those of us who believe that, before all and above all, reason, and conviction by an appeal to reason, are the indispensable bases for any ordered, successful and permanent social advance, can not but be alarmed at the growing tendency to explosions of mass-hysteria. It is only when reason provides the outlook that the emotions may be trusted to control the direction. In a society such as is proposed it is of the first importance that its explorations should be conducted and its conclusions reached in a detached and cool spirit. Coolness does not mean coldbloodedness nor does it connote any hesitation in pursuing the right path once that path is known.

The main problem being one of the interaction of science and social relations, it is clear that, as Professor Ginsberg has put it, "the study of the effects of science on social relations requires not only a knowledge of science, but also of social relations." The problems are, in fact, sociological, and the society which undertakes the task of studying these repercussions must have a very wide field on which to draw. It may be that the ends in view will best be served by the formation of a new society charged with the special task of surveying and interpreting the social relations of science, but before actually constituting such a society, the British Association, itself a pioneer in the attack on some parts of the problem, might be invited to undertake the task.

As some correspondents have pointed out, the annual meeting of the association provides an admirable platform from which to announce progress, but that much more than this is needed: and much more is possible. Already the association is enlarging its activities to meet the changing needs of a changing era. It has initiated, in many of its sections, papers and discussions which touch upon these topics; it has taken part in the jubilee meeting of the Indian Science Congress Association, recently held in Calcutta, thereby establishing an important principle of overseas delegations. At the present moment its general officers are in consultation with their colleagues of the American Association for the Advancement of Science on a scheme for international cooperation such as that association has recently adumbrated. The association possesses sections the work of which touches closely that of a society for the study of social relations, and it is second to none in its experience of the manner of work of research committees. Is it too much to suggest that the association might very well consider the arranging of discussions of these problems to be held in London or elsewhere at regular intervals outside the annual meeting? For the organization of such meetings, and the undertaking of appropriate investigations by research committees, an entirely new department of the association might be constituted. It seems to us that this plan would be preferable to the addition of a new section, or subsection, to deal with the social relations of science.

A new society of the kind contemplated implies much more than an annual report; and if the British Association accepted responsibility for its functions, either by the formation of a new department or otherwise, the present annual report would have to be supplemented by a new periodical publication comparable to the proceedings or journals of other societies, and devoted mainly to the advancement of knowledge of the impact of science on society and of society on science.

It may be that the serious questions of finance and of policy involved will make it too difficult for the association to undertake this work. But in its constitution and outlook it is at least a possible body to undertake such duties, and its long and brilliant traditions are sufficient guarantee that the work, if undertaken, will be carried out in the true spirit of science and of public service. We suggest, therefore, that when a meeting is held to discuss proposals for constituting a body to organize inquiries into the social relations of science and publish the results, the possibility that the association might accept this responsibility should be considered. Even if the association fails to do so, for financial or other reasons, it might in many ways assist the work of any new society which may be formed.—*Nature*.

THE NATIONAL ACADEMY OF SCIENCES. II

ABSTRACTS OF PAPERS

The morphogenetic significance of the tonic-neck-reflex in the early patterning of human behavior: ARNOLD GESELL (introduced by W. R. Miles). The tonic-neck-reflex has been chiefly studied in quadrupeds, as a specific postural reaction in which aversion of the head induces (proprioceptively) an extension of one forelimb and a flexion of the other. Observations at the Yale Clinic of Child Development show that the counterpart of this postural attitude is a prominent and pervasive feature of infant behavior, particularly in the first four weeks of life. The data include (a) dictated observations of the spontaneous supine activity of 26 or more infants at 4, 6, 8, 12, 16 and 20 weeks of age; (b) cinema records of selected infants at these ages; (c) daily observations of one infant in the neonatal period; (d) cinema records and neuropathological findings in a case of double athetosis from basal birth injury of the brain. Cinema records were subjected to frame by frame analysis to determine the frequency and the serial components of the t-n-r phenomena. At four weeks of age the classic t-n-r attitude is almost invariably present in the waking infant. At sixteen weeks the head is no longer prevailingly averted, but maintains a mid-position, with increasing symmetry of arm posturing. This postural transformation involves far-reaching growth changes in eye-hand coordination, ocular fixation, prehension and, indirectly, locomotion. In the human species, the t-n-r is not a specific stereotyped reflex, but the framework and matrix for extensive developmental elaborations. Consistent individual differences in t-n-r manifestations denote differences in laterality, motor demeanor and psycho-motor constitution.

Influence of simple trial-and-error learning on the strength of the component habits: CLARK L. HULL. An albino rat is first trained to secure standard food units by pressing a vertical bar sidewise, and, second, is trained to a much stronger degree to secure the same food by pressing a horizontal bar downward. Simple trial-and-error learning results when the animal is presented with both bars, the apparatus so adjusted that only the functioning of the weak habit will yield food. The problem is to study independently the presumptive weakening of the strong habit and the presumptive strengthening of the weak habit as the latter gradually becomes dominant. This is done by measuring the strength of each habit just before the trial-and-error learning and again immediately afterwards. The criterion of habit strength is the number of times the animal will continue to press the bar without getting food reward. Distinct groups of comparable animals are employed for each of the four types of determination. Experimental results indicate that, in conformity with theoretical expectation, trial-and-error learning strengthens the weak habit. The effect on the strong habit is more complex and the outcome is still in doubt.

The camel-like ruminants of North America: WILLIAM B. SCOTT. At the present time the two divisions of the camel family, the true camels of Asia and the llamas of South America, are not represented in North America; but for ages the family was confined to the latter continent and here underwent a great diversification or development. Most branches of the stock have become extinct, leaving only the two just enumerated. The earliest members of the family that so far can be identified are found in the upper Eocene or Uinta stage. There at least four of the tribes of the family may be distinguished; and from then on camels and horses are always the most numerous and diversified mammals of each succeeding stage of the Tertiary period. In the latter part of the Tertiary, the Quaternary or Pleistocene, gigantic members of the family are common, ending in *Camelops*, so abundantly found in the tar pits of southern California, an animal which survived into Recent time, probably in times which in Europe are called "historic." It was in the Pliocene that the ancestors of modern true camels migrated to Asia, and the modern llamas and their allies to South America. In addition to this main line there were several branches; one the giraffe-like camels in which evidently, from the very long neck and long forelegs, the browsing habit of giraffes may be inferred. This line was characteristic of the Miocene and early Pliocene, and then died out. Then there were the gazelle-like camels, also Miocene and Pliocene, which have left no descendants, but which are remarkable for their slenderness of limb. These are animals of small size, not exceeding sheep in height. So far the single family Camelidae has been considered. There were other allied families which belonged to the same suborder Tylopoda, also exclusively American, but much more deer-like than the true camel. Some of these are extremely minute animals no larger than jack rabbits, and some even no larger than cotton-tails. Then a subdivision of this family developed grotesque outgrowths of the skull which were more or less horn-like in shape but probably not carrying horns. These reached their culmination in size and peculiar appearance in the lower Pliocene. Other families still further removed from the main line are of somewhat doubtful position; but the curious fact remains that for all of them North America was their only home until the Pliocene, when the migrations to Asia and South America already mentioned took place.

Palmer's instrumental observations in connection with the discovery of Antarctica: LAWRENCE MARTIN (introduced by W. C. Mendenhall). Magnetic declination and oceanography contribute to the evidence that Captain Nathaniel Brown Palmer, of Stonington, Conn., discovered the Antarctic continent in 1820. Two generalizations may be based upon a study of the log of the *Hero*, Palmer's sloop, now preserved in the Division of Maps at the Library of Congress. (1) Although no determination of longitude was recorded by Palmer at the point where he made his Antarctic landfall, his latitude is so dependable that the historic spot may be identified with precision. This is a coast trending northeasterly and southwesterly. *Given a reliable determination of latitude and a good map of a meridional or diagonal coast, no longitude is necessary for the identification of a precise position.* (2) At 63° 45′ south latitude Palmer recorded in his logbook that he "discovered a strait trending S S W and N N E." The northeastern end of Orleans Channel is situated at 60° 10′ west longitude and 63° 45′ south latitude. The axis of the strait, according to modern charts, is not north northeast and south southwest; but the trend recorded in 1820 was, of course, magnetic rather than true. Upon the application of a correction of some 25° of magnetic declination for the compass direction of the year 1820, however, Palmer's determination of the axis of Orleans Channel is found to be essentially correct. Dumont d'Urville saw only the northeast end of Orleans Channel in 1838; the French Service Hydrographique did not bring out until 1912 the chart of the South Shetland Islands showing the results of Charcot's explorations in 1904–5 and 1908–9. *Accordingly, as no one published a complete map of the Orleans Channel for 92 years after Palmer's* *visit, the Stonington sealer's reliable record of the axial trend of this strait in 1820 is a singularly attractive proof that he was there.*

The western interior region of North America in later Cretaceous time: JOHN B. REESIDE, JR. (introduced by W. C. Mendenhall). During earlier Cretaceous time the western interior region of North America was mostly a land area of low relief. Early in later Cretaceous time marine waters spread over a long strip extending from the Arctic to the Gulf of Mexico and persisted until nearly the end of the epoch. The sediments brought into this sea came in greater part from the west and constituted three general belts—a western belt of dominantly coarser material in great thickness; a middle belt of interfingering coarser and finer material, also of considerable thickness; and an eastern belt of dominantly finer material in small thickness. The position of the western margin of the marine waters may be inferred with considerable confidence for a number of epochs: that of the eastern margin is for most epochs no longer determinable. Volcanic activity at many times is indicated by beds of altered volcanic ash. Ten wide-spread zones of marine fossils have afforded correlations; an eleventh zone of non-marine fossils is also wide-spread, but a succeeding twelfth zone of marine fossils is much restricted. Dating the deposits by these faunal zones, the following inferences may be drawn: (1) The invading sea spread rapidly and in the time of the first zone (lower Benton) reached apparently its maximum extent. (2) The third zone (lower Carlile) is much less widely known, and its time may have been one of reduced sedimentation. (3) The fourth zone (upper Carlile) is composed of sands and muds, and its epoch was a time of shallower waters. (4) The fifth and sixth zones (Niobrara) represent an epoch of long duration or abundant sedimentation; the deposits are thick and wide-spread, reaching a second maximum. (5) The seventh, eighth and ninth zones (Pierre) show an oscillating but progressive advance from the west of coarser material, non-marine sediments eventually displacing marine. (6) The tenth zone (Fox Hills) continued and completed the withdrawal of marine waters and was succeeded everywhere by the eleventh zone (Lance-Laramie) of fluviatile material. (7) The twelfth zone (Cannonball) is of very restricted area and peculiar fauna; its significance is dubious. The next deposits are definitely of Tertiary age.

Normal micro- and macro-cephaly in aboriginal American crania: ALEŠ HRDLIČKA. The speaker presented a report on the great extent of what must be considered as normal variation in the crania of the American aborigines. Among the approximately 12,000 crania of the American Indian and Eskimo now preserved in the Division of Physical Anthropology, U. S. National Museum, there are over thirty the cranial capacity of which ranges from 1,050 to 910 cc; and there is approximately the same number of skulls the capacity of which ranges from 1,750 to 2,100 cc. All these skulls, both externally and internally, appear normal, and though at its extremes fall well within the curve of variation in size of the American skull. The largest of the crania here reported show materially more than twice the brain size (skull capacity) of the smallest. There is no indication of a tendency towards any segregation within the range of either the small or the large crania. The small skulls were apparently always accompanied by small stature; the large skulls, so far as known, belonged to individuals of good stature and development, but in no case excessive. The possessors of the smallest skulls could perhaps be called pigmies but not dwarfs; the owners of the large crania were in no instance giants. The here reported variation exceeds in both directions the normal variation in the size of the skull thus far recorded in the White people and other races, though that may be due to less ample records. Its causes are not yet understood, except so far that the smallest specimens are found predominately in groups in which the general average of skull size is sub-medium, while the larger specimens occur individually in groups where the mean cranial capacity tends to be high. The facial features correlate more or less with the size of the vault, and both the facial features as well as the teeth in all these specimens—so far as preserved—are entirely normal. (The specimens here dealt with were shown in a special case among the exhibits of the academy).

Biographical memoir of Albert Abraham Michelson: R. A. MILLIKAN. (Read by title.)

Biographical memoir of Nathaniel Lord Britton: E. D. MERRILL. (Read by title.)

Biographical memoir of William Morton Wheeler: G. H. PARKER. (Read by title.)

Biographical memoir of Othniel Charles Marsh: CHARLES SCHUCHERT. (Read by title.)

Biographical memoir of Marshall Avery Howe: W. A. SETCHELL. (Read by title.)

Biographical memoir of Henry Prentiss Armsby: FRANCIS G. BENEDICT. (Read by title.)

Biographical memoir of Harris Joseph Ryan: W. F. DURAND. (Read by title.)

Biographical memoir of Michael Idvorsky Pupin: BERGEN DAVIS. (Read by title.)

Biographical memoir of Walter Jones: W. MANSFIELD CLARK. (Read by title.)

Biographical memoir of Henry Mitchell: H. A. MARMER. (Read by title.)

Biographical memoir of George Owen Squier: ARTHUR E. KENNELLY. (Read by title.)

Biographical memoir of George Cary Comstock: JOEL STEBBINS. (Read by title.)

Biographical memoir of George Perkins Clinton: CHARLES THOM. (Read by title.)

Biographical memoir of Erwin Frink Smith: L. R. JONES. (Read by title.)