

able work of Ramsay and Shields and Aston, as well as that of Renard and Guye, to the standard herewith shown to be more trustworthy.

This paper is only a preliminary communication. A fuller report of the work will appear in the July number of the *Journal of the American Chemical Society*. Much more work upon the subject has already been finished, and yet more is in prospect. We hope that yet further accuracy may be attained in the future, bearing in mind the precautions to which attention has been called in this paper, and that the results may be capable of fruitful discussion.

In conclusion, we are glad to express our indebtedness to the Carnegie Institution of Washington for some of the apparatus we have employed.

Summary.—In the course of a series of determinations of capillary constants by measuring the capillary rise in fine tubes, the following precautions have been especially emphasized: (1) The detection and correction of inequalities in the glass tubes employed were effected by the use of a reversible apparatus. (2) Reference of the capillary rise was made to an unrestricted flat surface 38 mm. in diameter, the largest ever used. It was shown that much smaller surfaces are too small and that the insertion of a capillary in the middle of a larger tube causes appreciable error by increasing the capillary effect of the large tube. (3) Especial care was taken that the true bottom of the meniscus should be read. (4) The weight of the fine meniscus was in each case allowed for, and a new approximate formula was suggested for its calculation, depending upon the observed height of the meniscus.

Heeding these precautions, determinations of the capillary constants of several important liquids were determined at 20° as follows: water 14.861, benzene 6.721, toluene 6.736, methyl alcohol 5.832, ethyl alcohol 5.793, isobutyl alcohol 5.823, ethyl butyrate 5.704.

AN EXHIBIT IN PHYSICAL ANTHROPOLOGY

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In the April number of the PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES, I published a brief account of "Some recent anthropological explorations," which were carried out under my direction or by myself, for the Smithsonian Institution and the Panama-California Exposition at San Diego, in different parts of the world. I shall now point, in an equally brief way, to the material results of these expeditions in relation with the Exposition.

One of the main objects of the whole work was to bring together a comprehensive, instructive and harmonious exhibit relating to the natural history of man. Such exhibits have been attempted with more or less success at a number of former expositions, from that in Paris (1878) to those in Chicago (1892) and Dresden (1911); but all these efforts, while reaching creditable and useful results, suffered from the inclusion of archeological and other exhibits, as well as from defects due to heterogeneity or lack of material, and especially to the impossibility of carrying out a uniform and necessarily costly plan.

In undertaking the preparation of the exhibits for San Diego, the whole subject of Anthropology or Man's Natural History, was divided into four sections. These were (1) Man's Evolution (Phylogeny); (2) Man's Development and Growth (Ontogeny); (3) Man's Variation; and (4) Man's Decline and Elimination. To these it seemed necessary to add a subdivision dealing with the modern means by which anthropology works and including a comprehensive library. In accordance with this plan, a stipulation was made for five connected moderate sized halls, to accommodate in logical progression the five sections. The exhibits were to be, furthermore, as far as possible original and of permanent museum value, so that they could serve if circumstances permitted as a nucleus or an important part of a future permanent anthropological museum on the Pacific Coast.

As mentioned in the former paper, only three years were available for the carrying out of the above large program. Illness among the staff, the European war, and other conditions interfered. Not a few of the links or specimens needed were not to be found or purchased; and other difficulties developed. In consequence, the results are not as complete and perfect as they might be; yet it is safe to say that in richness, instructiveness, and harmony, they surpass considerably anything attempted before in this line. These facts seem to justify the present remarks which call attention not so much to the existence of the collection at San Diego as to the material progress accomplished in a branch of science in which exhibits are particularly scarce and difficult.

The five moderate sized halls which harbor the exhibits occupy a special building marked 'Science of Man.'

The first hall is devoted entirely to Man's Evolution. It contains one of the largest existing series of accurate, first-hand casts of the most important authentic skeletal remains of early man. Added to this are numerous attempted reconstructions of the generally defective early crania. On the walls above the specimens are illustrations showing, in good sized photographic enlargements or colored charts, the locali-

ties of discovery of the various originals represented by the casts. Besides this, there are large charts relating to geology and stratigraphy so far as these relate to man; and charts showing the probable lines of man's ascent after the foremost authorities. Another series of illustrations, covering more than one entire wall, is devoted to the pictorial representations of early man, by the early man himself (cave drawings and sculptures), and by noted scientists and artists of the present day. The whole center of this hall is occupied by the most striking and interesting series of busts—reconstructions of early man, made by the talented Mascré and under the direction of R. Rutot, one of the foremost European students of early man. Finally, there is a large series of original specimens showing in a progressive way the crania of existing primates, or more exactly those from the lemur to man. The anthropoid apes are each represented in this series by skulls of a full grown male and female and by one of a young animal of the same species.

The second hall, or that devoted to *Ontogeny*, contains six series of true-to-nature busts, made at the National Museum by one of the best modelers in this country, and showing, by different age stages, from birth onward and in both sexes, the three principal races of this country, namely the 'thorough-bred' white American (at least three generations American on each parental side), the Indian, and the full-blood American negro. These series form a unique, costly exhibit, nothing like which has ever been attempted before in this or any other country. Each set consists of fifteen busts and proceeds from infants at or within a few days after birth, to the oldest persons that could be found. The oldest American negro represented is 114. After the new-born, the stages are 9 months, 3 years, 6, 10, 15, 20, 28, 35, 45, 55, 65, and 75 years, and then the oldest person obtainable. Special care was exercised in ascertaining the age of the subjects, particularly among the Negroes and the Indians. No choice was made of the subject beyond that due to the requirements of pedigree, age, and good health. The whites and negroes were obtained with a few exceptions in the District of Columbia and vicinity, but their places of birth range over a large part of the eastern, southern, and middle states; for the Indian I chose the Sioux, a large, characteristic, and in a very large measure still pure blood tribe, and one in which the determination of the ages in the subjects was quite feasible.

On the walls of this room are eight original charts relating to the physical decline of man or normal senility, and a series of other charts, mostly in colors, relating to the development of the child in different races. In a case along the walls are series of brains, skulls and other

bones of the body, almost all in original specimens, showing the development of these parts from early fetal to adult life, or even towards old age.

The third hall is devoted to racial, sexual, and individual variations. The main exhibits consist of ten pairs of original busts, showing important groups of humanity; and over one hundred original bronzed masks, illustrating the individual variation in physiognomy among different races. The latter series includes the masks of 19 Bushmen, which are especially rare and valuable. The wall is covered with charts showing racial classification, distribution, and statistics. The middle of the hall is given to specially constructed steel fixtures, for over two hundred colored and plain portrait transparencies of racial types. These portraits include several special series, such as 'The Indian child in different parts of the continent,' 'Beauty among Indians' etc. In the wall case are numerous exhibits of original specimens relating to racial, sexual and individual variation in the skull and other parts of the skeleton.

The fourth hall is devoted to the illustration of the causes which, outside of strictly normal senility, contribute to the decline of the human organism, and in the vast majority of cases cause death. The geographical distribution of the principal diseases is represented in a series of small colored maps on the wall, and there are charts relating to causes and frequency of mortality. The main exhibit in this room, however, consists of a very large series of skeletal remains of the pre-historic American Indian, showing his entire, or almost entire pathology. This exhibit is unique and could scarcely be duplicated. It is supplemented by a large number of Indian crania which show wounds and by 60 original cases of pre-Columbian Indian trephining for such wounds.

The fifth hall is fitted out as a modern anthropological laboratory and is also used as a lecture room in which frequent demonstrations are given bearing on the collections in this section. There are, further, the library; two cases of modern anthropometric instruments; anthropometric charts on the walls, and a series of portraits of the most eminent deceased representatives of anthropology.

It will be seen from the above that the exhibits here briefly described, are quite different from the usual exhibits at an Exposition. They are of permanent value, have attracted from the first most encouraging attention, and are capable of forming the foundation of an anthropological center in a locality eminently fitted for such a purpose.