that attention is frequently directed to necessary modifications as regards older views. The deeper study of some of the questions considered therein will doubtless give rise to further necessary modifications. The unusually extensive lists of references which they present will be very useful to those who desire to enter more deeply into the study of certain historical questions. Hence it is to be hoped that these extensive works will serve not only as a source of information for those interested in the history of the development of elementary mathematics, but still more as a stepping-stone towards a deeper general insight into this history. The pursuit of such insight rather than the accumulation of historical facts should dominate the student of the history of science.

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SPECIAL ARTICLES

SEROLOGICAL OBSERVATIONS ON THE RELATIONSHIP OF THE BLOODS OF MAN AND THE ANTHROPOID APES[1]

MUCH attention has been paid to the work of Grünbaum[2] and of Nuttall[3] who studied the relationship between man and the anthropoid apes by means of the precipitin reaction. They found that the sera of man and chimpanzee were indistinguishable by this means. In Nuttall's tests with anti-human precipitin the intensity of the reaction decreased gradually in this order: chimpanzee and man, gorilla, orang, lower monkeys. As it has already been pointed out[4] that the antigens involved in the lytic and agglutinative reactions of red blood corpuscles differ essentially from the antigenic proteins concerned in the precipitin reaction, a comparative study of the serological behavior of the blood cells of the primates has been undertaken.

When immune agglutinins against human or chimpanzee erythrocytes (immune rabbit sera) were tested with several specimens of blood of both these species there was found often but not constantly a difference in the titers against the two kinds of blood. These results resemble those with the precipitin reaction. If, however, the method of absorption is employed, a striking difference between the two kinds of blood is brought out, so that there is no difficulty in differentiating the two species. We have been able to confirm this observation repeatedly. In the only absorption experiment performed with orang blood similar results were obtained. As had been expected[5] the reaction showed the differences: man—lower monkeys, and chimpanzee—lower monkeys, to be about equal among themselves and to be much greater than the difference: man—chimpanzee. This finding is in agreement with the view of zoologists that the anthropoids are not placed on a line leading from the lower monkeys to man, but that at a certain stage of evolution there separated one line which developed into the catarrhinae and another leading to the anthropoids and man.

The differences between the races of man were imperceptible by our technique in experiments made up to the present by the comparison of white and American negro bloods.

Of considerable interest was the search in anthropoid bloods for the occurrence of group specific substances similar to those in human blood, especially in view of the information accumulated in recent years by the work of H. and L. Hirschfeld[6] and their followers on the distribution of blood groups in human races. Owing to the complication arising from the presence in human serum of heteroagglutinins for anthropoid blood, the following technique was employed: Human red cells groups II and III[7] were agglutinated by human sera groups III and II, respectively. The cells were washed and the agglutinin separated from them by heating.[8] As a second method immune sera against human group II and group III blood cells were absorbed with human blood cells of group I. The resulting liquids agglutinated specifically group II and III cells, respectively, and served very well for typing the anthropoid bloods. Both methods gave reactions with anthropoid blood in every way identical with those of human blood, while the bloods of other animals behaved differently. These reactions give additional proof of the close relationship between man and the anthropoids.

Of twelve chimpanzees examined three belong to group I and nine to group II. By including the two sera and one blood of chimpanzee reported by v. Dungern and Hirschfeld,[9] apparently belonging to

[1] From the laboratories of The Rockefeller Institute for Medical Research, New York.

[2] Grünbaum, A. S. F., *Lancet* (1902, i), 143.

[3] Nuttall, G. H. F., "Blood Immunity and Blood Relationship," Cambridge, 1904.

[4] Landsteiner, K., and van der Scheer, J., *Jour. Exp. Med.*, xl (1924), 91. *Ibid*, xli (1925), 427.

[5] See H. T. Marshall's experiments on anti-human and anti-macacus hemolysins, *Jour. Exp. Med.*, vi (1901–1905), 347.

[6] Hirschfeld, L. and H., *Lancet* (1919, ii), 675.

[7] Nomenclature of the American Committee, *J. Am. Med. Assn.*, lxxvi (1921), 130.

[8] Landsteiner, K., *Münch. Med. Woch.*, xlix (1902), 1905.

[9] v. Dungern and Hirschfeld, *Z. Immunitsf.*, viii (1911), 526.

group II, a total of fifteen individuals have been examined of which three were group I and twelve group II.

Of five orangs, two were group II and three group III. The only gibbon blood examined belonged to group III.

In several cases the sera were tested on the blood cells of other individuals of the same species and found to contain isoagglutinins according to the rule for human blood.

It can be concluded from the foregoing that very probably the group specific factors characteristic for human blood appeared in the phylogeny of the primates prior to the genesis of man.

When tested with the absorbed immune sera, the bloods of thirteen species of lower monkeys (catarrhinae and platyrrhinae) all yielded negative results. Nor were distinct reactions obtained when they were tested with agglutinin solutions obtained from normal human serum group III. But agglutinin solutions from normal human serum group II agglutinated all eleven bloods of five species of platyrrhinae (new world monkeys) and one lemur and failed to react on all twenty-seven bloods of seven species of catarrhinae (old world monkeys). The reactive substances demonstrable in the bloods of the lower monkeys by these tests evidently differ from those of anthropoid and human bloods because of their failure to react with the absorbed immune sera. Similar reactions also occur in lower animals, *e.g.*, rabbits (see the absorption experiments of von Dungern and Hirschfeld.[9] The unexpected regularity, as exhibited by the tests on old and new world monkeys, suggests that a certain serological factor may be characteristic for a whole zoological family or group, or at least for the majority of its members.

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Catalytic reduction of cinnamic aldehyde to cinnamic alcohol by hydrogen and platinum black: W. F. TULEY with ROGER ADAMS. When cinnamic aldehyde is reduced with such reagents as sodium and alcohol, iron and hydrochloric acid, or even platinum black and hydrogen, there is invariably obtained as the chief product, phenylpropyl alcohol. Only traces of cinnamyl alcohol are ever produced, but certain amounts of phenyl propionaldehyde can usually be found. Small amounts of iron or zinc salts activate platinum black as a catalyst in aldehyde reductions. On the other hand they render the platinum less active for the reduction of olefines. By reducing cinnamic aldehyde in the presence of platinum black and a very small amount of a mixture of zinc and iron salts, it has been possible to cause the first molecule of hydrogen to react only with the aldehyde group with the formation of cinnamyl alcohol without the production of phenyl-propyl alcohol. The product as obtained directly from the reaction mixture melts only a few degrees lower than the pure substance.

The catalytic reduction of alpha-nitronaphthalene: ARTHUR N. PARRETT with ALEXANDER LOWY. A study has been made of the catalytic reduction of alpha-nitronaphthalene to the amine in the liquid phase under pressures of 50 and 100 pounds of hydrogen. A small laboratory autoclave fitted for rapid stirring was used. The nitro cpd. was reduced in glycol with palladium black as catalyst at temperatures from 50 to 100°. Maximum yield 98.4 per cent. Percentage reduction to amine increased with the temperature. Glycerol, water, and isopropyl alcohol were used in place of glycol. Palladium oxide, platinum oxide, and nickel were also used as catalysts. Temperature and time factors were studied with the different solvents. Molten alpha-nitronapthalene was reduced by hydrogen and PdO in 93.9 per cent. yield against a yield of 14.3 per cent. with nickel.

Catalytic dehydration of alcohols by aqueous hydrobromic acid: HENRY D. HIRSCH. Four secondary and two tertiary alcohols were heated in sealed tubes at 100° with about 2 per cent. by weight of 48 per cent. hydrobromic acid. The formation of unsaturated products was followed by titration with standard bromide-bromate solution. The dehydration reaction was found to be reversible. The reaction constants for the dehydration reactions are as follows: sec-Propyl .00073, sec-Butyl .00128, sec-Amyl .00082, sec-Hexyl .00034, tert-Butyl .0045, tert-Amyl .0070.

Ortho-cresaurin: M. GOMBERG and L. C. ANDERSON. o-Cresol can be condensed with carbon tetrachloride or oxalic acid with the formation of ortho-cresaurin (3, 3′, 3″-trimethyl aurin). The constitution of this dye has been definitely established. The free radical of the trimethyl ether derivative has been prepared in solution, and other derivatives have been synthesized. Ortho-cresaurin can be used in acidimetry, its color changing between pH 6.6 and pH 7.6. Its conversion to blue compounds analogous to aniline blue, hitherto unobtainable, has been realized.

Mercuration of aromatic sulfonic acids: LOUIS EHRENFELD. Aromatic sulfonic acids are mercurated with extreme ease on refluxing with aqueous mercuric acetate. Mercuric ions disappear in less than one hour. The following sulfonic acids have been mercurated: benzene-p-chlorobenzene-, p-bromobenzene-, p-iodobenzene-, o-toluene-, p-toluene-, 2,5-dichlorobenzene-, and 2-chlorotoluene-5-sulfonic acid. The products are usually complex mixtures soluble in bases but not reprecipitated by acid. In a few cases water soluble products may be obtained. The product from p-toluene sulfonic acid re-

[1] Baltimore meeting, April, 1925.