short great toe, short and raised heel, great obliquity of articulation in the leg, and absence of a long flexor tendon to the great toe, separating it far more widely from the foot of the Gorilla than the latter is separated from that of Man.

But, in some of the lower apes, the hand and foot diverge still more from those of the Gorilla, than they do in the Orang. The thumb ceases to be opposable in the American monkeys; is reduced to a mere rudiment covered by the skin in the Spider Monkey; and is directed forwards and armed with a curved claw like the other digits, in the Marmosets—so that, in all these cases, there can be no doubt but that the hand is more different from that of the Gorilla than the Gorilla's hand is from Man's.

And as to the foot, the great toe of the Marmoset is still more insignificant in proportion than that of the Orang—while in the Lemurs it is very large, and as completely thumb-like and opposable as in the Gorilla—but in these animals the second toe is often irregularly modified, and in some species the two principal bones of the tarsus, the *astragalus* and the *os calcis,* are so immensely elongated as to render the foot, so far, totally unlike that of any other mammal.

So with regard to the muscles. The short flexor of the toes of the Gorilla differs from that of Man by the circumstance that one slip of the muscle is attached, not to the heel bone, but to the tendons of the long flexors. The lower Apes depart from the Gorilla by an exaggeration of the same character, two, three, or more, slips becoming fixed to the long flexor tendons—or by a multiplication of the slips.—Again, the Gorilla differs slightly from Man in the mode of interlacing of the long flexor tendons: and the lower apes differ from the Gorilla in exhibiting yet other, sometimes very complex, arrangements of the same parts, and occasionally in the absence of the accessory fleshy bundle.

Throughout all these modifications it must be recollected that the foot loses no one of its essential characters. Every Monkey and Lemur exhibits the characteristic arrangement of tarsal bones, possesses a short flexor and short extensor muscle, and a *peronaeus longus.* Varied as the proportions and appearance of the organ may be, the terminal division of the hind limb remains, in plan and principle of construction, a foot, and never, in those respects, can be confounded with a hand.

Science News Letter, April 16, 1932

PHYSICS

Lonely Magnetic Poles May Change Ideas of Universe

THE IDEA that there can exist in nature a magnetic pole free from the clutches of a magnetic pole of opposite sign is receiving discussion in British scientific circles.

The possibility that one part of magnetism might be separated from the other was suggested by Dr. P. A. M. Dirac, the mathematical physicist of Cambridge University, who recently spent some months in America at Princeton University. He is recognized as one of the most brilliant of living physicists.

Might Separate Poles

Roughly expressed, it is conceived possible and consistent with the quantum theory of physics that a compass needle of the smallest size could be cut in two in the middle and the north pole separated from the south. No one has ever been able to separate the two poles of a magnet. Classical theory in physics considers magnetism as a manifestation of electricity, each molecule being an elementary magnet due to the orbital revolutions of the electrons inside.

In his theoretical calculations, Dr. Dirac was looking for the reason for the existence of the smallest electric charge, the electron. He found a connection between this smallest electric charge and the smallest magnetic pole since he obtained a wave equation in his development of the fruitful quantum mechanics of the new physics, whose "only physical interpretation is the motion of an electron in the field of a single pole."

In his further reasoning Dr. Dirac finds that the strength of these lonely magnetic poles is quantized, that is, magnetism occurs in definite amounts or "gobs" in just the same way that all electricity is built up of integral multiples of the smallest electric charge, that on the electron.

Important also is his discovery of a new connection between electricity and magnetism, that allows the calculation of the attraction between the two opposite elemental magnetic poles. It is found to be nearly 5,000 times the attractive force between the electron and the proton, the negative and positive particles of electricity that are the atomic building blocks.

Magnetic poles of opposite sign have never been separated in experiments and Dr. Dirac concluded that this very great attractive force is the reason.

This theoretical work may therefore have ushered into the world of science a new entity, the magnetic pole, which scientists can use in postulating how the universe is put together. The magnetic pole may come into its own as a fundamental unit alongside the electron and proton, which are the electricity units, and the photon, the unit of light.

Prof. O. W. Richardson of King's College, London, commenting on Dr. Dirac's technical paper that appeared in the Proceedings of the Royal Society last September, suggested that the isolated magnetic poles might be useful in explaining ultra-penetrating radiations, such as the cosmic rays. He feels that while it would seem difficult for such entities as the poles to be created, the possibility of their existence may have great influence on current views of how the universe is put together.

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MEDICINE

Blood Examination Urged To Prevent Poisoning

RADIUM, X-rays, benzene and its various compounds, such as arsphenamine, are all known to produce injuries to the blood-forming tissues, especially the bone marrow, in certain doses and with certain susceptible persons. On the other hand these agents are used in the treatment of blood diseases. In a report to the American College of Physicians, Dr. Edwin E. Osgood of the University of Oregon Medical School reviewed the effects of these agents and the conditions under which they exert an action upon the blood-forming tissues.

It was stated by Dr. Osgood that serious poisoning from these substances in the industries is not uncommon but might be prevented by periodic blood examinations, elimination of the more susceptible individuals, reduction of exposure by local ventilation in benzene cases and the use of less toxic substances.

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