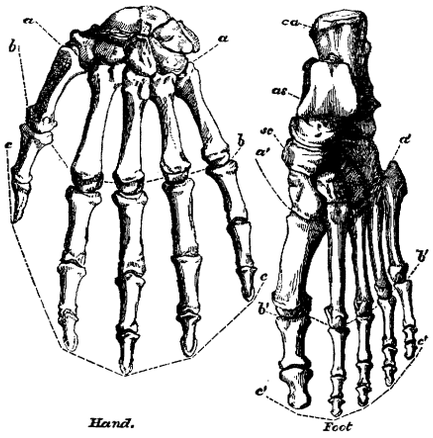

HAND AND FOOT

The skeleton of the hand and foot of man reduced from Dr. Carter's drawings in Gray's 'Anatomy.' The hand is drawn to a larger scale than the foot. The line a a in the hand indicates the boundary between the carpus and the metacarpus; b b that between the latter and the proximal phalanges; c c marks the ends of the distal phalanges. The line a' a' in the foot indicates the boundary between the tarsus and metatarsus; b' b' marks that between the metatarsus and the proximal phalanges; and c' c' bounds the ends of the distal phalanges: ca, the calcaneum; as, the astragalus; sc, the scaphoid bone in the tarsus. (Reproduced from "Evidence as to Man's Place in Nature.")

The four bones of the second row of the carpus bear the four long bones which support the palm of the hand. The fifth bone of the same character is articulated in a much more free and moveable manner than the others, with its carpal bone, and forms the base of the thumb. These are called *metacarpal* bones, and they carry the *phalanges,* or bones of the digits, of which there are two in the thumb, and three in each of the fingers.

The skeleton of the foot is very like that of the hand in some respects. Thus there are three phalanges in each of the lesser toes, and only two in the great toe, which answers to the thumb. There is a long bone, termed *metatarsal,* answering to the metacarpal, for each digit; and the *tarsus* which corresponds with the carpus, presents four short polygonal bones in a row, which correspond very closely with the four carpal bones of the second row of the hand. In other respects the foot differs very widely from the hand. Thus the great toe is the longest digit but one; and its metatarsal is far less moveably articulated with the tarsus, than the metacarpal of the thumb with the carpus. But a far more important distinction lies in the fact that, instead of four more tarsal bones there are only three; and that these three are not arranged side by side, or in one row. One of them, the *os calcis* or heel bone (*ca*), lies externally, and sends back the large projecting heel; another, the *astragalus* (*as*), rests on this by one face, and by another, forms, with the bones of the leg, the ankle joint; while a third face, directed forwards, is separated from the three inner tarsal bones of the row next the metatarsus by a bone called the *scaphoid* (*sc*).

Thus there is a fundamental difference in the structure of the foot and the hand, observable when the carpus and the tarsus are contrasted; and there are differences of degree noticeable when the proportions and the mobility of the metacarpals and metatarsals, with their respective digits, are compared together.

The same two classes of differences become obvious when the muscles of the hand are compared with those of the foot.

Three principal sets of muscles, called "flexors," bend the fingers and thumb, as in clenching the fist, and three sets, —the extensors—extend them, as in straightening the fingers. These muscles are all "long muscles"; that is to say, the fleshy part of each, lying in and being fixed to the bones of the arm, is, at the other end, continued into tendons, or rounded cords, which pass into the hand, and are ultimately fixed to the bones which are to be moved. Thus, when the fingers are bent, the fleshy parts of the flexors of the fingers, placed in the arm, contract, in virtue of their peculiar endowment as muscles; and pulling the tendinous cords, connected with their ends, cause them to pull down the bones of the fingers towards the palm.

Not only are the principal flexors of the fingers and of the thumb long muscles, but they remain quite distinct from one another throughout their whole length.

In the foot, there are also three principal flexor muscles of the digits or toes, and three principal extensors; but one extensor and one flexor are short muscles; that is to say, their fleshy parts are not situated in the leg (which corresponds with the arm), but in the back and in the sole of the foot—regions which correspond with the back and the palm of the hand.

Again, the tendons of the long flexor of the toes, and of the long flexor of the great toe, when they reach the sole of the foot, do not remain distinct from one another, as the flexors in the palm of the hand do, but they become united and commingled in a very curious manner—while their united tendons receive an accessory muscle connected with the heel-bone.

But perhaps the most absolutely distinctive character about the muscles of the foot is the existence of what is termed the *peronaeus longus,* a long muscle fixed to the outer bone of the leg, and sending its tendon to the outer ankle, behind and below which it passes, and then crosses the foot obliquely to be attached to the base of the great toe. No muscle in the hand exactly corresponds with this, which is eminently a foot muscle.

Science News Letter, April 9, 1932

CHEMISTRY

Vitamin A Concentrated In Halibut Liver Oil

A SOURCE of vitamin A, more than a hundred times as potent as cod liver oil, the present standard "bottled sunshine," has been found in oil from the liver of the food fish halibut. Halibut liver oil contains an unusually large concentration of vitamin D. These discoveries come from the joint research of scientists of two pharmaceutical laboratories. The workers are Dr. A. D. Emmett and Dr. O. D. Bird of Detroit and Dr. C. Nielson and Dr. H. J. Cannon of Chicago.

In spite of the great potency of the new therapeutic agent, overdoses do not appear to be dangerous. Laboratory test animals were given daily doses containing ten thousand times the amount of vitamin A and four hundred times the quantity of vitamin D called for in normal treatment. They became normal without showing bad effects.

Halibut liver oil was characterized as "superconcentrated sunshine." It was said to contain not less than fifty thousand vitamin A units per gram.

"Under strictly comparable conditions," the report of the four research chemists stated, "the growth produced in experimental animals by halibut liver oil compares favorably with that pro duced by doses of cod liver oil one hundred times greater. The halibut oil, as prepared by special methods of extraction, has as a rule from one hundred to one hundred and ten times the vitamin A potency of a five hundred unit per gram cod liver oil. The vitamin D content of halibut liver oil, which has never been previously investigated, was also found to be unusually high."

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