

ring finger. To the deep extensor set belong those muscles which, arising lower down upon the forearm, run somewhat obliquely across the others to be inserted into the index finger and the thumb. These are the three

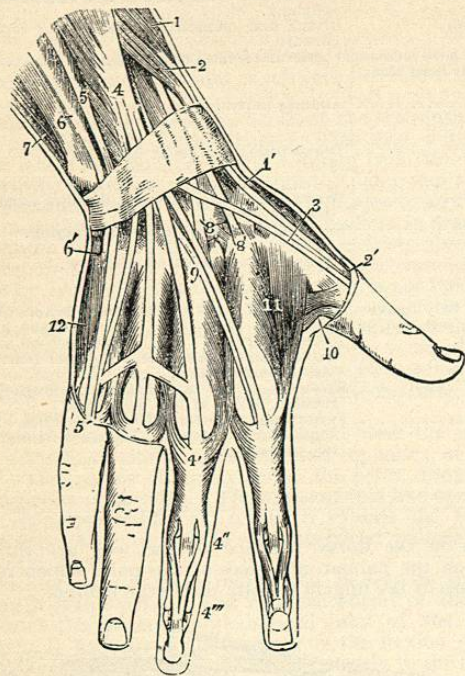


FIG. 2447.—Superficial Muscles and Tendons on the Back of the Wrist and Hand. (After Bourguery.) The posterior annular ligament of the wrist is represented. 1, Extensor ossis metacarpi pollicis; 1', its insertion; 2, extensor primi internodii pollicis; 2', its insertion; 3, tendon of extensor secundi internodii pollicis; 4, extensor communis digitorum; 4', tendon of the middle finger receiving the insertion of the second and third dorsal interosseous muscles; 4'', division of the tendon into three portions, of which the median is inserted into the second phalanx, the two lateral passing on to be inserted at 4''' into the terminal phalanx; 5, extensor minimi digiti; 5', its junction with the slip of the common extensor; 6, placed on the lower end of the ulna, points to the extensor carpi ulnaris; 6', insertion of this muscle into the base of the fifth metacarpal bone; 7, part of the flexor carpi ulnaris; 8, placed on the os magnum, points to the insertion of the extensor carpi radialis brevis; 8', placed on the base of the second metacarpal bone, points to the insertion of the extensor carpi radialis longior; 9, tendon of extensor indicis; 10, small part of the adductor pollicis, and inner head of the flexor brevis pollicis; 11, first dorsal interosseous or abductor indicis; in the other three interosseous spaces are seen in succession, from the radial side inward, the insertion of the first palmar, second dorsal, third dorsal, second palmar, fourth dorsal, and third palmar interosseous muscles; 12, abductor minimi digiti.

extensors of the thumb and the extensor indicis. Many varieties occur which confirm this view. In apes the extensor indicis also supplies the middle finger, and sometimes the ring finger as well. The extensor secundi internodii pollicis (which should be called extensor longus pollicis) also sends a tendon to the index, and sometimes to the medius. Similar variations occur in man. Koster<sup>14</sup> found the tendon of the indicis and the long extensor of the thumb united by a cross band like those which appear on the tendons of the common extensor.

The bones of the middle hand are the five metacarpals, each concave toward the palm, and having a somewhat prismatic shaft with two enlarged extremities. Closely applied at the bases they spread along the shaft so that they never

touch there, while again at the lower end they can be brought together. There is thus left room for the interossei muscles. The first metacarpal is an exception, as, in order to preserve the independence and opposability of the thumb, the base is set over and in front of the line of the others, and its distal end is not confined by ligaments. Since it is shaped more like a phalanx than like the others, anatomists have not failed to add this to other evidence which has been adduced to prove that the thumb has no true metacarpal. The joint by which it articulates with the trapezium is a saddle-joint, the movement being free in two planes, viz., that of flexion and extension, and that of adduction and abduction. It is not, however, limited to these, as circumduction can take place quite easily. There is no rotation. The capsule is thick and strong, and dislocation is very rare.

The situation of the joint is easily made out by running the finger upward along the shaft of the bone until it reaches the process at the base, immediately above which is the articulation. The process is made more prominent by strongly flexing and adducting the thumb, and the interarticular line can then be easily made out in most individuals. The other metacarpals are united to the wrist bones and to each other by articulations which are fixed by means of interosseous ligaments, which make their disarticulation very difficult. The fifth joint has the most movement.

The rounded lower ends of the metacarpals are of importance in forming an arch which strengthens the hand. For this reason they should be preserved in amputating the fingers, when it is possible to do so. The articular surfaces here are directed in such a manner as to have the planes of movement converge toward the middle of the hand. This greatly increases the power of grasp of the phalanges, as the tighter the fingers close the more strenuous becomes the lateral pressure. The convergence of the flexor tendons assists this. The extensor tendons pass over the most prominent part of the metacarpal heads behind. The third metacarpal, though not the longest, has its head more prominent, and is usually the one which receives injury from striking heavy blows.

THE FINGERS.—The anatomical names of the five digits or fingers are the pollex or thumb, indicis or index, medius or middle finger, annularis or ring finger, and auricularis or little finger, the latter presumably so called because of its use in cleaning the meatus auditorius. They are of notably different length, but somewhat nicely adjusted to the functions of grasping, as will be seen on holding a ball in the hand, as shown in Fig. 2449. The middle finger is the longest and has, therefore, the longest circumference to span, and the others are so adjusted, as to length, that they come very nearly to the same level at their tips. For this reason all tools which are to be grasped by the hand should have a swelling in the handle opposite the middle, so as to insure a good grip.

The usual arrangement as to length of the fingers is that in the extended hand the thumb does not quite reach the second phalanx of the index, the medius is longer than the annularis by half a nail, and the auricularis reaches only to the last phalanx. There is considerable variation in the length of the index. In about two-thirds of the cases (Mantegazza<sup>15</sup>) the index is shorter than the annularis, reaching only to the root of the nail of the medius. In others the two fingers are nearly of the same length, and rarely the index exceeds the annularis in length. Ecker<sup>16</sup> considers the shortness of the index to be a characteristic of apes, and thinks that when relatively longer it is an attribute of a higher form of hand. He

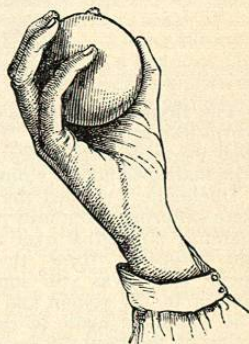


FIG. 2449.—The Length of the Fingers as Adapted in Grasping. (Humphry.)

finds it longer in women, who show in this, as in many anatomical features, signs of a purer morphological form. Carus<sup>17</sup> does not mention the length of the fingers, but figures what he calls, after d'Arpentigny,<sup>18</sup> the idealistic hand (seelische Hand, main psychique), which shows a long index. It is noticed by Hyrtl<sup>17</sup> that the apparent

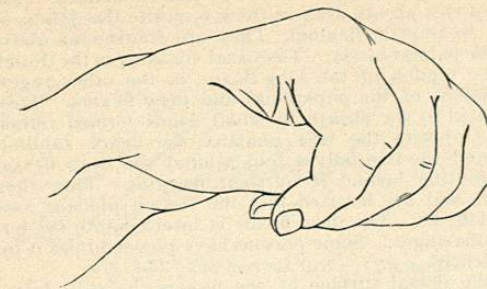


FIG. 2450.—The Convulsive Hand. (Warner.<sup>21</sup>)

length of the ring and index fingers may be influenced by the posture of the hand. If the hand is laid flat, so that the axis of the medius corresponds with that of the entire arm, the index usually appears a little shorter than the ring, but abduct the hand, and the ring finger will appear a whole nail's length longer. Grüning<sup>18</sup> has recently given the results of two hundred observations very carefully taken. He finds that the ring finger is usually the longer, yet the reverse is not uncommon, and more frequent in females. In the foot the second toe is usually the longest, but a greater length of the big toe is not rare, also more frequent in females. This lends some support to the theory that the foot has no digit homologous with the thumb.

The general relation of the middle finger to the rest of the hand is expressed by Langer<sup>19</sup> as follows: If a measurement be taken from the os magnum to the end of the finger, the various parts, as measured from the angles at the joints made by flexion, will be in the proportion of 8 : 5 : 3 : 2, that is to say, the middle hand is as long as the three other portions, and the basal phalanx is as long as the middle and ungual together. The length of the entire hand has been used by artists as a canon of proportion for the whole body, being set at one-ninth of the whole height. The Egyptian canon seems to have been based upon the length of the index, which was reckoned as one-nineteenth of the height. Many measures used as rough estimates are taken from the hand: the length of the middle finger from knuckle to point is reckoned as one-eighth of a yard, and from the tip of the thumb nail to the second joint as about half of that, and is called one nail. The breadth of the hand is used as a measure for horses, and is reckoned at four inches. The breadth of the thumb is the pouce or inch of the old French measures. Of course all these are liable to vary because of individual peculiarity.<sup>19</sup>

It should be noted that the proportions of the hand to the entire height are attained very early, at least by the fifth year (Quetelet<sup>20</sup>). The member appears to have the same early physical development that the brain has, and the hand of the new-born child is structurally that of the adult, differing only in size.

The thumb has from very early times held the place of honor among the digits, as the loss of it deprived the hand of much of its power. It is especially by the superiority of the thumb that man's hand is distinguished from that of the higher apes. There are no less than eight muscles attached to it, and this gives a freedom and variety of motion which is not possessed by any other digit. To cut off the thumb was an old method of disabling an enemy, by preventing him from properly using his weapons, and soldiers sometimes resorted to this mutilation to exempt themselves from military duty—as those of our own time have been known to amputate the terminal phalanx of the index to unfit themselves

for pulling the trigger of a gun. It is from this custom that the word poltroon is said to have arisen, being a corruption of *pollice truncus*. The palmists exalt the thumb far above the other digits. D'Arpentigny says: "*L'Animal supérieur est dans la main, l'homme est dans le pouce.*"

The Esquimaux tradition is that woman was originally formed from the thumb of man. The thumb was used by the spectators of Roman gladiatorial combats to indicate whether the conquered party should die or live. In La Vendée a large thumb indicates a predilection for the black art, and to bite the thumb is a grave insult in Scotland and Italy.\*

The unusual strength of the muscles which are attached to the thumb, making it an efficient portion of a pair of forceps when applied to the other fingers, leads also to its being affected by convulsive action. In almost all cases of this kind the thumb is firmly clenched and drawn into the palm (see Fig. 2450). This may be of service as a medico-legal sign, as it is almost always found in those who have died a violent death, and consequently suffered spasmodic contraction of the muscles during the last agony.

The index or pointing finger has been called the gynæcologist's eye. It is somewhat more sensitive to tactile impression than the others, and, being supplied with special muscles, it is particularly serviceable as the antag-

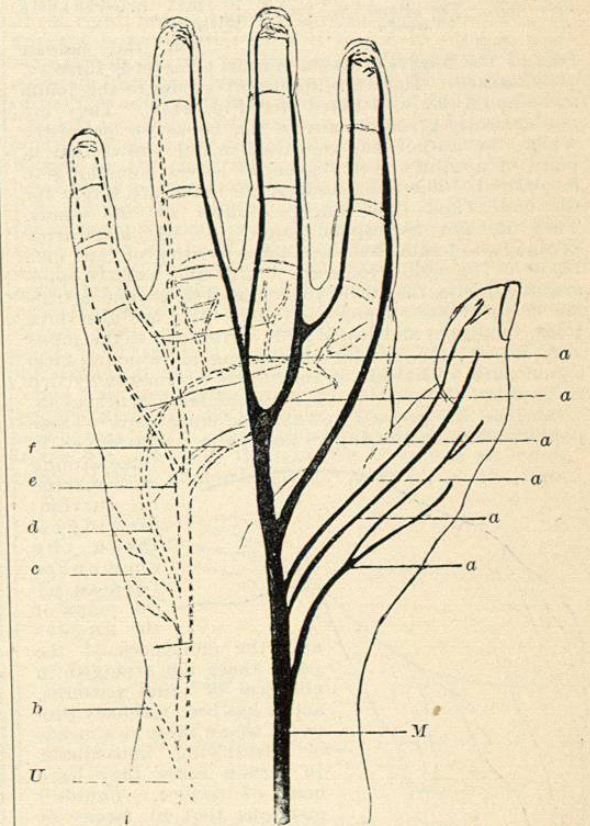


FIG. 2451.—Distribution of Nerves to the Palm of the Hand. (Tillaux.) M, Median nerve; U, ulnar nerve; a, a, a, a, a, a, collateral branches of the median nerve; b, dorsal branch of the ulnar nerve; c, muscular branches; d, superficial branch; e, deep branch; f, anastomotic branch.

onist of the thumb. It is always best to preserve this finger and the thumb, if possible, in injuries to the hand, as by themselves they make quite a serviceable organ.

\* Vide Romeo and Juliet, Act I, sc. 2. "I will bite my thumb at them, which is a disgrace if they bear it."



The ring finger, or annularis, is so called from the fact that it has been customary, since the time of the Romans, to carry rings upon it. This has been said to originate in the fact that they supposed it to be especially connected with the heart, either because it is supplied by two nerves (see Fig. 2451), or more probably because the vena salvatella runs prominently from it up the arm. Owing to the connection of the tendons this finger is somewhat protected by those beside it, and consequently is less liable than the others to injury, and this affords ample reason why it, as well as the left hand, should be chosen to wear the ring. The old anatomists called it the *digitus medicus*, because they were accustomed to mix medicines with it.

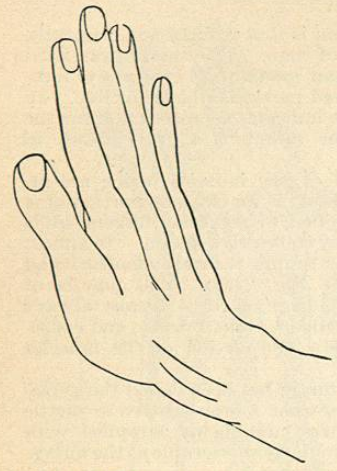


FIG. 2452.—The Hand in Fright. (Warner.)

Upon the palmar face of the fingers are seen certain transverse furrows, well marked. These are important guides to the joints and should be well noted (see Fig. 2444). They are not correctly given in any of the books on palmistry which the author has consulted, which shows that in point of accuracy their "science" leaves something to be desired. The folds nearest the palm are single for the index and little fingers, double for the others. They do not correspond exactly to the metacarpophalangeal joints, but are three-fourths of an inch below. The middle folds are double and exactly opposite the joints, the lower folds are all single and a trifle above the joints. Upon the thumb there are also three folds, the upper and lower folds correspond to the joints very nearly, the middle one having no topographical significance. The skin on the fingers is remarkably rich in papillae; the number of these containing nerves increases as we proceed toward the finger tips. These papillae, both on the fingers and palm, are arranged in

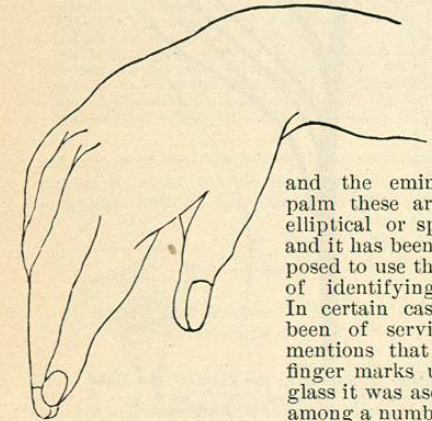


FIG. 2453.—The Feeble Hand. (Warner.)

lines forming characteristic curvilinear ridges. Upon the eminences formed by the pulps of the fingers and the eminences of the palm these are arranged in elliptical or spiral patterns, and it has been seriously proposed to use these as a means of identifying individuals. In certain cases they have been of service. Faulds<sup>22</sup> mentions that by means of finger marks upon a greasy glass it was ascertained who, among a number of servants, had been drinking some rectified spirit; and another case in which a criminal was detected by an impression of sooty finger marks on a white wall. He considers that the Mongolian races have a special and characteristic pattern. The city authorities of San Francisco recently considered the propriety of registering all the Chinese who arrived at the port by taking

an impression of the thumb. It is said that the legal expression "my hand and seal," arose from the custom of sealing papers with the thumb.

Beneath the skin the subcutaneous tissue is like that of the palm—a series of little cushions of fat. On the last phalanx this is called the pulp of the finger. Still deeper is found the canal for the flexor tendons. The fibres of this sheath are less thick opposite the joints, so as not to impede flexion. They are continuous above with the palmar fascia. The canal contains in the thumb only the tendon of the long flexor, in the other fingers the tendons of the superficial and deep flexors. They are united to the sheath by small bands termed *retinacula*. Opposite the first phalanx the flexor sublimis splits and the two halves fold around the deep flexor, again uniting behind it by their margins. They then separate and are inserted into the second phalanx (see Fig. 2446, B). The deep flexor is inserted into the terminal phalanges. Some persons have power to use it independently.

On the dorsal surface of the fingers the skin forms elliptical folds at the articulations of the first and second phalanges, and simply a few transverse folds at the articulations of the second and third. Under the skin the extensor tendons form a broad aponeurotic sheet into which the expanded tendons of the *lumbricales* and *interossei* are inserted. This sheet terminates with the insertion of the extensor into the last phalanx.

The nails which terminate the digits are, as is well known, really epidermal elements. They are found in the embryo at about the third month of pregnancy. Their growth is always from the root, and the rate at which they grow can frequently be noted by the spots which occur upon them, and thus a general notion may be obtained of the vigor of the processes of nutrition.

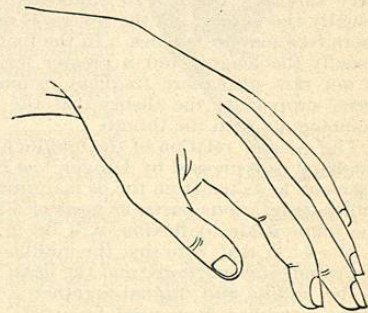


FIG. 2454.—The Tonic Hand. (Warner.)

The joints of the fingers have a general resemblance to each other, the metacarpophalangeal being merely a little broader. The ends of the phalanges broaden out somewhat at their extremities, and when the body becomes emaciated, as in a wasting disease, these ends become very prominent, and the disorder known as clubbed fingers results. At the metacarpophalangeal joint of the thumb there are two sesamoid bones, which are believed to be one of the causes of the difficulty of reducing a dislocation at that joint. Similar structures, usually cartilaginous, however, are found on the palmar surfaces of each of the phalangeal joints. In negroes, or in those laborers who use the hands much for heavy work, they may all be ossified, as they are in the forefoot of a bear. The articulations are all imperfect hinge joints, having lateral ligaments and a thickening of the capsule on the palmar surface. It should be remembered that the articular line is always found beyond the angle formed by the flexion of the phalanges.

The nerves of the hand are three in number. Their distribution to the palmar surface is shown in Fig. 2451, and the muscles they supply are mentioned in the table on page 485.

To those mentioned there should be added those which come down from above. Of these the flexors are supplied by the median and ulnar, the extensors by the radial. The ulnar supplies the flexor carpi ulnaris and the principal part of the deep flexor, leaving to the median that portion which goes to the index finger, which might, therefore, properly be classed as a separate muscle.

After section of the median nerve a considerable movement is left to the fingers, pronation being effected by the shoulder muscles acting on the arm, flexion of the wrist by the flexor carpi ulnaris, the first phalanges flexed by the *interossei*, the others by the deep flexor.

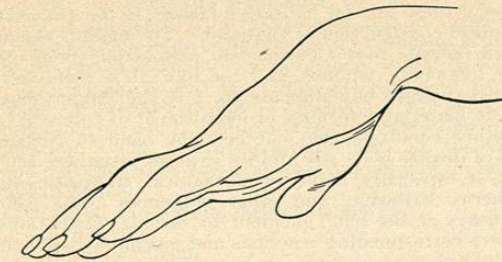


FIG. 2455.—The Nervous Hand. (Warner.)

The thumb suffers most, and we may, accordingly, say that the median nerve especially presides over the movements of that digit.

In the same way as motility is not entirely lost, so also is sensibility retained to some extent. The anaesthesia does not correspond with the distribution of the nerve. The reason for this is believed to be found in the collateral branches which run from the ulnar to anastomose with the median. There is no doubt that the anaesthesia after section continues to grow less, and it has been suggested that when certain parts are disabled, other nerves may send out filaments from the fine plexus into which the nerves break up before going to supply the papillae, in order to supply the need.

The correlative action of the muscles and nerves has a very marked result upon what may be called the physiognomy of the hand. Warner<sup>21</sup> has carefully studied this subject, and describes, among others, the following types, which relate to the expression of the emotions: The convulsive hand (Fig. 2450), in which the thumb is forcibly and violently adducted, the fingers are pressed closely together and semiflexed on the thumb, the hand assuming a conical shape. The opposite of this is the hand in fright (Fig. 2452), the phalanges and the wrist being extended. The whole attitude is that of repelling an abhorrent object. In pure horror, not accompanied by fear, the hands are thrown widely back, the arms uplifted, the fingers open. A passenger upon a train that ran over a man told me her first intimation of an accident was seeing through the window a person assume this attitude as the train shot past. The convulsive wringing of the hands is an expression of quite an opposite order, indicating intense and continued painful emotion, and instead of the hand-washing motion performed by tragic actors, is, when genuine, a passing of one hand down the other, with a convulsive twist at the ends of the fingers.

The feeble hand (Fig. 2453) is indicated by a dropping of the thumb and a bending of the phalanges.

The tonic hand in rest (Fig. 2454) is like this, but differs in the degree of the action. The nervous hand (Fig. 2455) has the wrist slightly bent, and the metacarpophalangeal joints hyperextended, and the first and third internodes slightly flexed.

The energetic hand (Fig. 2456) is the opposite of this, the wrist being extended and the small joints in flexion.

The vessels of the hand have recently been the subject of careful study by Bourceret,<sup>24</sup> and he has arrived at some conclusions which seem important and new. By a very ingenious process, and using a series of injections, he has been able not only to fill the entire arterial and capillary system, but the venous system as well, injecting from the heart outward, notwithstanding the valves.

The arrangement of the arteries has already been alluded to. The radial and ulnar form, as shown in Fig. 2444, two arterial arcades known as the superficial and deep palmar arches, the first of them being made by the radial

and the deep branch of the ulnar. To these may be added a third arch over the back of the wrist, formed by collateral branches of the two trunks. From these arches pass branches which supply the fingers, being of considerable size throughout their length, even to the last phalanges, and not accompanied by *venae comites*. The object of this excessive vascular supply is not only the nutrition of the fingers, but also to maintain the bodily warmth there. They communicate by two sets of capillaries, one small and intended for nutrition only, the other large and intended for increasing the heat. These capillaries are arranged in very complicated tortuosities, like little balls of tangled thread. They open immediately into the veins, which are also remarkable for their flexuosities. Any consideration of the hand would be incomplete without some remark concerning the separate use of the two hands. Right-handedness, or rather right-sidedness, for the matter is not by any means confined to the hand, is the rule among all races of men, and some traces of it may be seen in the animal creation. The elephant, for example, is said to use the right tusk more than the left, and this is accordingly called the servant tusk.<sup>25</sup> Left-handedness is the exception, occurring in about nine per cent. of individuals. Many attempts have been made to explain this, and Franklin's<sup>26</sup> plea for the left hand, and Charles Reade's essay<sup>27</sup> upon the injury mankind inflicts upon itself by the continuous use of the right, are well-known curiosities of literature. It appears, however, that there is reason to suppose that we have, in dextral preference, merely a further differentiation like that which has resulted in the development of the feet and hands from four originally similar organs. The left hemisphere of the brain appears to be assuming control of the more complicated motor functions performed by the right side of the body, while the right hemisphere attends more especially to the nutritive functions through the sympathetic system. It is noted that the senses of temperature and of weight are usually more acute in the left hand. Perhaps this is in some degree due to its less frequent use. Granting this, we have to search for the origination of the tendency. Hyrtl<sup>17</sup> supposes it to arise from the fact that the innominate artery carries more blood to the right side. Dwight and others<sup>28, 29, 30</sup> think it depends upon the situation of the left carotid at the top of the arch, surmising that it receives a swifter current of blood, which goes to the left brain, controlling the left side. Blumenbach supposed that it was due to a deviation of the innominate artery to the left. Breschet thought that there was an innate tendency to a predominance of nutrition on the right

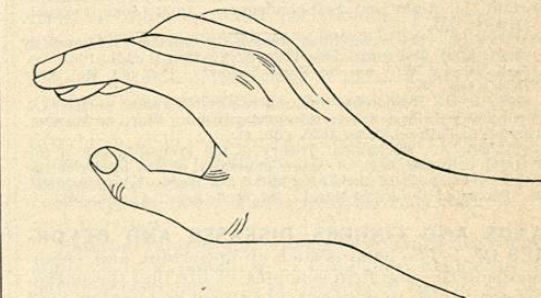


FIG. 2456.—The Energetic Hand. (Warner.)

side in foetal life. The right side of the spine develops first and so throws the heart to the left. Comte<sup>31</sup> suggests that it is due to the fact that the foetus in utero lies usually on the left side, owing to the obliquity of the pelvis, and that this occasions a precocity of development of the right side. The percentage of left-handed persons is about that of presentations where the foetus lies on its right side.

An ingenious explanation is offered by Buchanan,<sup>32</sup> who holds that the centre of gravity lies on the right side



owing to the weight of the liver, and that this causes a greater development of the muscles there. It is possible that several of these causes may have had an effect upon the matter. An efficient cause may be found in the situation of the heart upon the left side. A savage soon learns that his enemy is vulnerable there, and takes pains to protect himself by withdrawing the left side and using the weapon with the right. The constant persistence of this use of the right arm as the weapon-bearing member has probably resulted in organic dextral preference, and left-handedness may be considered an atavism.

Frank Baker.

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**HANDS AND FINGERS, DISEASES AND DEFORMITIES OF.**—The hand is such an important and essential factor in the practical economy of life that the pathological conditions to which it is subject and which tend to impair its usefulness form an important field of medical science and practice. It is a topographical region so well marked off, and is subject to such special pathologic and etiologic factors, that the morbid conditions which affect it make up quite a distinctive and well-marked group of diseases. The diseases to which the hands and fingers are subject comprise a considerable variety of conditions, diverse in their nature and cause, with the only element of unity resting in their common site. A comparative consideration of all these various conditions may prove of advantage in questions of differential diagnosis; and some of the rarer affections may be pointed

out which from not being often observed may prove puzzling when cases are met with.

**SPECIAL PATHOLOGICAL AND ETIOLOGICAL FACTORS.**—The hand exhibits a number of characteristics that exert special influences in determining and bringing about the morbid conditions to which it is subject.

Among these special causative factors is the peculiar anatomical construction of the hand. The hand is essentially a delicate motor mechanism and arrangement of joints, ligaments, tendons, and the like, all so nicely adjusted that slight impediments (as in trigger finger) may result in material deformity or impairment of function.

Another condition that subjects the hand to certain forms of disease is its use and its exposed situation, rendering it especially liable to mechanical, traumatic, atmospheric, irritative, and other influences. The constant usage of the hand incident to various occupations produces corresponding reactions and morphological and pathological consequences, as in writer's cramp and the stiffening and hardening effects of manual labor. The hand is much exposed to injuries, mechanical, chemical, thermic, while its being habitually uncovered by clothing and thus exposed to meteorological and other irritative influences makes it subject to certain skin affections.

The situation of the hand at a distance from the circulatory centres is another factor that gives rise to various pathological conditions. The great distance of the hand from the heart causes a relative weakness of the circulation in this member, which results in the occurrence of circulatory disturbances like stasis, clubbed fingers, oedema, and Raynaud's disease in this locality.

Its distant situation also renders the hand liable to suffer consequences of injuries or lesions primarily located at points between it and the trunk or the bodily centres. The motor mechanism of the hand is located chiefly in the forearm, while the vascular and nervous trunks that supply it course along the entire upper extremity, so that diseases or injuries of any of these structures in any part of their course may result in morbid conditions seated in the hand.

Other conditions there are which affect this region exclusively or peculiarly, for physiological reasons that, though obscure or unknown to us, are yet real and operative. These may be regarded as idiopathic pathological factors and diseases of the hand, exemplified by Dupuytren's contraction.

**CLASSIFICATION.**—The affections of the hand and fingers include those that are peculiar to or affect this region exclusively; those that may occur elsewhere, but show a predilection for, or exhibit special features or modifications in, this locality; those conditions affecting the hands equally and indifferently with other parts of the body; and the manifestations, exhibited by the hand, of general disease. The conditions of most pertinence to the present subject are those more or less peculiar to the hand or those that exhibit special features in this locality.

It is not easy to formulate a completely satisfactory and logical classification of all the affections of the hand and fingers on any uniform basis. There are several grounds on which classification may be based, but no one of them alone in the present state of our knowledge is sufficient to afford a practical and adequate classification.

From one standpoint a division can be made, with reference to the manner in which the etiological factors are brought to bear, into conditions arising: from local causes, either external or internal; from extension (by continuity or contiguity) from neighboring structures that are affected; from causes (nutritive, toxic, metastatic) brought to bear through the medium of the circulation; or from impressions derived from the nervous system. The difficulty with a strictly etiological classification consists in the fact that identical pathological conditions may result from very different causes.

Another basis of classification of diseases of the hand rests upon their pathological nature, as parasitic and infectious conditions, neoplasms, traumatism, senile con-

ditions, etc. The adequacy of such a classification is impaired by our ignorance of the essential pathological nature of many obscure affections. Another division is to be found in the different regions, tissues, and anatomical structures involved, as the affections of the nails, the fascias, the skin, the ligaments, the joints, etc. This division applies well in many cases, but in those conditions in which more than one set of tissues or structures is involved a satisfactory arrangement would be difficult.

The considerations mentioned enable us to mark off some well-defined groups of diseases of the hand, while other morbid conditions are not easily susceptible of classification. The following arrangement of the diseases and deformities of the hand and fingers will be followed in this article:

Congenital and developmental anomalies:

- Acheiria.
- Ectrodactylism.
- Hypophalangism.
- Polycheiria.
- Polydactylism.
- Polyphalangism.
- Syndactylism.
- Cleft hand.
- Congenital constrictions.
- Deflections of the hand and fingers.
  - Club-hand.
  - Congenital deflections of the fingers.
  - Lateral deflections of the fingers.
  - Backward deflections of the fingers.
- Microcheiria and microdactylism.
- Hypertrophy of hand and fingers—cheiromegaly and dactylomegaly.
- Neoplasms.
- Cysts.
- Traumatism and injuries.
- Inflammatory conditions.
- Infectious and parasitic conditions.
  - Suppurative and allied conditions.
  - Tuberculosis.
  - Syphilis.
- Other infections and parasites.
- Necrotic conditions.
- Ulcers.
- Cicatricial contractions.
- Acquired deformities.
- Effects of occupation on the hand.
- Affections of the nails.
- Affections of the skin.
- Affections of the burse.
- Affections of the bones.
- Affections of the joints.
- Affections of the tendons and tendon sheaths.
- Affections of connective-tissue structures:
  - Dupuytren's contraction of the palmar fascia.
  - Contraction of the digital fascia.
  - Hammer finger.
  - General palmar induration.
- Trigger finger.
- Circulatory disorders.
- Muscular affections.
- Nervous affections.
- Senile changes.
- Condition of the hand in general diseases.

**CONGENITAL AND DEVELOPMENTAL ANOMALIES.**

The class of developmental anomalies in general should include all aberrations or faults of development manifesting themselves at any time during the period of development, including not only conditions arising in the prenatal period (as polydactylism), but also those that make their appearance in childhood and up to the time of maturity and complete physical development (as certain forms of hammer finger). In this section it is proposed to consider only certain congenital abnormalities of the hand which develop during the intra-uterine period of existence.

The anomalies of development under consideration embrace the following conditions:

1. Conditions in which there is a deficient degree of development, either (a) a deficiency in the number of the structural parts affected, or (b) a deficiency in their size. The congenital numerical deficiencies pertaining to the hand are: *acheiria*, in which the hand is lacking altogether; *ectrodactylism*, in which one or more fingers are missing; and *hypophalangism*, in which the number of phalanges in a digit is below the normal. The congenital deficiencies in size of the hand and fingers will be considered in connection with microcheiria and microdactylism.

2. Conditions in which there is an excessive development; either (a) an excess in the number of structural parts, *polycheiria*, *polydactylism*, and *polyphalangism*, or supernumerary hand, fingers, or phalanges respectively; or (b) a congenital excess in size, or hypertrophy, which will be considered in connection with cheiromegaly and dactylomegaly.

3. Conditions of perverted development (qualitative or morphological rather than quantitative); as syndactylism, the union of fingers; cleft hand; congenital constrictions; deflections of the hand and fingers (club hand, etc.); congenital dislocations; congenital neoplasms; and various unclassifiable deformities and conditions.

In many cases anomalies of the types mentioned exist separate and distinct; in many other cases anomalous conditions of different types are associated together and coexist in the same member, as where a supernumerary finger is of rudimentary structure, or a club-hand is ectrodactylous.

Subjects exhibiting congenital anomalies of the region under consideration, especially numerical deficiencies, often exhibit other developmental faults or abnormalities in other parts of the body, as harelip or cleft palate, thus testifying to the existence of a deep-seated and general developmental vice. Such anomalies of the hand are especially associated with corresponding anomalies of the foot. In many cases hereditary transmission of the deformity is marked.

The causes of these congenital anomalies are obscure. They arise largely from deep-seated and innate tendencies to aberrant development, often hereditary. The aberrant tendency is sometimes very definite and fixed, precisely the same abnormality appearing in different generations. Some cases may perhaps be due to abnormalities of the early environment of the developing embryo.

Another class of causes that produce congenital deformities of the hand is to be found in intra-uterine traumatism or other prenatal pathological processes. Thus, intra-uterine amputation may cause loss of the entire hand or parts of it; prenatal ulcerations may be followed by abnormal union or adhesions of parts, as in some cases of syndactylism; deformities may perhaps arise from cicatrization or from adhesions to other parts of the fetus or afterbirth, or in other ways. Deformities caused by such prenatal morbid conditions are, of course, not real developmental aberrations; but as the results produced in the two ways are rarely distinguishable they may be considered together.

Maternal impressions during pregnancy are sometimes adduced in explanation of congenital anomalies of the hand (as elsewhere); as in the alleged case of an officer's wife, who after her husband lost his right hand gave birth to children exhibiting the same deformity. It is very doubtful if maternal impression really plays any part in the production of such deformities. Some alleged instances are coincidences; others are afterthoughts, a past incident being recalled after the birth of an affected child. Considering the difficulty that is found in demonstrating the hereditary transmission of acquired characters, it is obvious that to prove that a developing fetus can be influenced by maternal impressions is a matter of far greater difficulty.

The use of the x-rays now affords means of investigating and diagnosing the precise condition of the bony