

The Hand in SF Cinema

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Submitted for your approval

We all take our hands for granted. Stating the obvious, their primary function is to hold and manipulate things. And hands with opposable thumbs do indeed separate primates from all others, including all of you reading this scary magazine. However, should we break a finger bone or accidentally cut ourselves you can be sure that that particular digit is the one you always use and you suffer until it is properly healed. And depending if you are either right or left handed then the favored hand most likely will be the injured one. After all, this does make sense since we essentially use our hands for everything and therefore expose them to all sorts of harms and hazards. And since we typically take our hands for granted we neither worry about them nor care about the skin, bones, muscles, ligaments, tendons, blood vessels (arteries, veins, and lymphatics), and nerves that all work together to do what our hands do. Like all our body parts our hands work well when in synch and we only worry about them when they are hurt or injured.

To help understand our hands a little better and to better appreciate the films that featured hands (and arms) we need to know what our complex hands are really made of. It is amazing what is under that skin!

Our hands are made of many types of unique bones all with flexible joints. Loosely attached to the ends of our forearms, the hand performs all sorts of useful functions such as grasping and manipulating objects. Carpal bones form the wrist, metacarpal bones form the palm of the hand, and phalanges are the finger bones. The thumb is the most mobile of the five digits. This is due to its saddle joint at its base where the metacarpals meet the carpals (a saddle joint is very flexible with bone ends that fit together like two saddles, one on top of the other, and can move side to side and back and forth). The thumb has two phalanges and each of the other four fingers has three. The carpal bones form a plane joint where the bone surfaces are nearly flat and allow only limited movement. The condyloid joint (knuckle) is that connection between metacarpal bones and phalanx (finger bones) and these joints are similar to a ball and socket joint in that circular movements are allowed. Hinge joints are between two phalanges and allow the finger to bend or straighten. All in all there are 27 bones in each hand, 8 small carpals, held together by ligaments and form the wrist, the palm is formed from 5 long metacarpals, and 14 phalanges make up the fingers. There are 14 thumb and finger joints called knuckles. What this all means is the hand is obviously very complex with all those bones, ligaments, muscles, nerves,

blood vessels, tissues, etc. compacted into the shapes they have with all of the neuromuscular movements controlled by the brain. Whew, and perhaps you thought the hand was simple!

In addition to the bones, there are many muscles that control both hand and arm movement. Bone-shifting skeletal muscles make your limbs move by either shortening (pulling) or stretching (pushing). Many of the hand's movements are controlled by forearm muscles that help to pull and push. Most of the inner forearm muscles enable the wrist and fingers to bend (pull). Those muscles in the outer forearm allow wrist and fingers to straighten (push). These forearm muscles are attached to the hand bones by very long tendons and compose the extensor digitorum muscle. One muscle, the flexor carpi ulnaris, bends the hand downward at the wrist whereas another muscle, the extensor digitorum, straightens out the fingers. The extensor carpi ulnaris muscle straightens the wrist and the triceps brachii muscle straightens the arm at the elbow. All of these muscles are attached near the elbow. All in all, the muscles of the hand are divided into three groups consisting of the thumb, those of the little finger, and those of the middle of the palm between the metacarpal bones. As you now know our hands are quite remarkably complex. However, don't go away because we are not yet done.

The forearm is composed of two major sets of muscles, those known as the superficial group that are located just under the skin's surface and the deep group which are under the superficial group and touching the forearm bones, the radius and the ulna. The superficial muscles control hand movement, such as pronate movement in which the hand is turned so that the palm faces downward, whereas the deep group muscles by and large control finger movements. To push, pull, and flex, the arm muscles and tendons (all controlled by nerves) need to be anchored and the forearm bones, the radial and the ulna, serve this purpose. However, when these arm bones are severed (or broken) then there is no effective anchor, particularly as mentioned above, at the elbow, and the hand can no longer be totally controlled. (Think of your Achilles tendon and when that is severed the foot is useless so when arm bones are severed, say, at or near the elbow, then the hand is also essentially useless since the forearm muscles are no longer anchored to push or pull.)

To feed and control all of this action are the blood vessels and nerves. The flow of the main arteries extends down the length of the arm, through the wrist, and essentially fans out into all the fingers ending in capillaries that then form into veins that reverses the process. The two major nerves into the hand are the ulnar and median nerves. The tips of our fingers contain a myriad of nerve endings that are sensitive to many physical differences that can be readily distinguished. Each of these sensations is sent to our brains for interpretation and response through an extensive network of nerves from each finger, moving through the wrist, and down the arm. Yes, indeed, our hands are amazingly complex.

The Films

The majority of the “hand” films discussed here are based, some more loosely than others, on the classic story by French author Maurice Renard (1875-1939) titled, “Les Mains d’Orlac”, translated as “The Hands of Orlac”. This novel was first published in Paris by Nilsson in 1920 and published in English by Dutton in 1929. The basic plot involves a pianist whose hands are accidentally destroyed and replaced by those of a killer. Eventually, the hands have a will of their own, take over, and turn the pianist into a killer himself.

The surgeon portrayed in the Renard novel, a Dr. Cerral, was actually patterned on a real French surgeon, Dr Alexis Carrel, who won the 1912 Nobel Prize for biological transplants and grafting procedures. So, this means that Renard was aware of and interested in contemporary biomedical research and was able to foresee the time when indeed hand transplants are possible. This is another example of science fiction at the time that has now become science fact.

Renard was a man of many interests and one he was particularly passionate about was in how physiological modifications to the human body would provide a means to experience the “beyond”. For the 1920s this was quite forward looking and definitely outre. Grafting on a killer’s hands and having them resume their former “occupation” is an interesting concept in trying to understand the “beyond” (well, at least for the 1920s). Hollywood took notice of this interesting concept too and many films have been made based on the simple plot of hand grafting.

After transplanted hands the other hand option is the disembodied hand, some by themselves and others with some sort of a forearm attached. While the transplanted hand would more or less suffer from loss of coordination the disembodied hand primarily suffers from not only a lack of an energy supply (read: food) but also directional guidance (no body to take it around).

Though not meant to be an exhaustive list the following favorite fun films deal with hands either directly or (pardon the pun) in an off-hand manner.

The Hands of Orlac (1925) – silent. The first film made based on the then recently published (1920) novel by Renard, so even back then it did not take long for a book to make it to the silver screen. The plot involves a concert pianist whose hands are mutilated in an accident and he gets the transplanted hands of a killer. After a period of recovery the hands want to resume the killing. The protagonist of this film is well played by Conrad Veidt.

Mad Love (1935) – The plot of this film involves a “brilliant” surgeon who is in love with a pianist’s wife. When the pianist’s hands are accidentally destroyed the surgeon replaces them with those of a knife-wielding killer. The surgeon

makes the pianist think he is a killer to get him out of the way thereby clearing the path to the wife. Peter Lorre plays the surgeon and Colin Clive is the pianist.

The Beast With Five Fingers (1946) – In this film a recently deceased pianist's hand, severed by his personal secretary (Lorre), and no matter what the secretary did, the hand returned to complete its mission of seeking revenge and committing more murders. Peter Lorre and Robert Alda star in this film.

Invasion of the Saucer-Men (1957) – Though an alien hand a hand nevertheless. In this film a disembodied hand from one of the Martians moves about and terrorizes some teenagers in a car. Needles capable of injecting alcohol come out from the ends of the fingers (where is the alcohol stored in this disembodied hand?). On top of the hand is a moveable eye that appears to be aware of the surroundings and is capable of directing hand movement. It should be noted that Paul Blaisdell's hand was the hand seen in the film. Paul created the classic big-headed Martians of this film as well as the hand props.

The Witch's Mirror (1960; Mexican, *El Espejo de la Bruja*). With the film renaissance occurring south of the border a film based on hand grafting had to eventually make its appearance. Here we have a loose adaptation of the *Hands of Orlac*, Mexican style! In this film a woman's hands are burnt and her surgeon husband grafts on the hands of his former wife whom he poisoned to death earlier (plots of Mexican horror films are entertaining). The hands take over and cause the death of the husband getting their just revenge.

The Hands of Orlac (1960) – A concert pianist's hands are mutilated in an accident and a murderer's hands are grafted on (this plot should sound familiar by now). The pianist can no longer play the piano but wants to do violence. Though one of the lesser *Orlac* films, this movie stars Mel Ferrer and Christopher Lee.

Hands of a Stranger (1962) – In this film a pianist loses his hands in an accident and is given the transplanted hands of a murder victim. The hands want to take over and take vengeance on the murderer of the victim. Receiving the hands of a murder victim is an interesting plot twist on the basic *Hands of Orlac* theme. This film starred Paul Lukather and Sally Kellerman.

The Crawling Hand (1963) – An astronaut, exposed to cosmic radiation, returns to earth and the crash landing severs his hand and forearm. The hand/arm goes on a rampage (whatever happened to the rest of his body? Did that slither around too?) and causes much mayhem while infecting others with cosmic radiation. This film starred Rod Lauren, Peter Breck, and Alan Hale, Jr. (*Gilligan Island's* "Skipper").

The Hand (1981) – A cartoonist's right hand is severed in a car accident and went missing. The hand returns, has a mind of its own, and looks for victims. This film starred Michael Caine and was directed by Oliver Stone.

Re-Animator (1984) – In this entertaining film connected fingers more or less resembling a pseudo-hand skittle around due to being injected with Dr. West's reanimation reagent. The main protagonist is well played by Jeffery Coombs.

The Addams Family (1991) – Thing, a severed hand, goes about all his usual antics derived from the classic Charles Addams cartoons and the TV series of the 1960s. Obviously a fantasy, it is interesting to note that Thing can hear, respond, communicate, and have directed movement, all perhaps controlled by a nerve bundle located somewhere in its wrist.

Life imitates art

Though probably tried in ancient times the first modern recorded hand transplant was performed in Ecuador in 1964 but the transplant was rejected. The first short-term successful hand transplant was done in 1988 but, in an interesting 'hands of orlac moment' the recipient felt uncomfortable with someone else's hand and eventually had it removed at his request. The first prolonged successful hand transplant was done in 1999. Since then, though rare, hand transplants continue to be performed and immunosuppressive drug-related side effects continue to be a problem. A rare double hand transplant was done in August 2010 and the most recent, an 18 hour surgical procedure done by a surgical team, was performed at UCLA during early 2011. So, hand transplants are certainly not a trivial thing and not done by any individual but rather by a team of specialists. The skills of a "brilliant" Dr. Gogol (Lorre) who can do hand transplants all by himself (in the 1930s no less) are far in excess of what can realistically be done.

Surgically, hand transplantation is done in the following order: bone fixation, tendon repair, artery repair, and lastly nerve repair. The operation typically lasts 8-12 hours (in comparison, heart transplants typically take 6-8 hours so this should tell you how complicated hand transplants really are) and is done by a team, each with their own specialty, the bone specialists, the muscle and tendon specialists, and the nerve specialists. The hand transplant recipient needs to take immunosuppressive drugs since the body's natural immune system will try to reject the transplanted hand(s). Due to the immunosuppressive drugs the body is now susceptible to opportunistic infections. As such the hand recipient must lead a careful and germ-free life. This should all underscore the difficulty of doing effective hand transplants. In reality, a hand transplant is far more complicated and outcome uncertain than either a heart transplant or brain surgery. The difficult reality of hand transplants only makes the plots and actions of our favorite hand films that much more enjoyable simply because of the ludicrousness of it all. There is no way a disembodied hand and arm could really

choke someone to death. And the implausibility of this is what makes these films seem so plausible.

For a disembodied hand/arm to function, such as seen in IOTSM or TCH, then there must be some sort of nerve bundle that senses the surroundings and can provide directed movement. The fingers can grab the ground or other objects and slowly move forward. In this case, a functioning "brain" would not necessarily be critical because the hand/arm has limited needs and therefore has limited nerve requirements. Most likely, a small sensing nerve bundle would be quite adequate and this could easily fit into an arm or hand. And all of this movement will require energy and since there is no obvious food source then the arm must rely on what it naturally has (such as muscle protein) which will not last very long.

For transplanted hands the ability to use them in a normal fashion will mostly depend upon graft acceptance. Even so, coordinating the neuromuscular movements directed by the brain will require extensive rehabilitation and total dexterity may never be achieved. And thinking grafted hands could return to pounding those ivory keys on a piano as the "Hands of Orlac" most likely will not happen. Nevertheless, none of this diminishes our enjoyment of our favorite hand films. They continue to be fun to watch.

I hope you found this article, ahem...handy. Thanks for reading. It's back to the lab for me. Stay healthy and eat right.