The Hand: How Its Use Shapes the Brain, Language, and Human Culture Study Guide

The Hand: How Its Use Shapes the Brain, Language, and Human Culture by Frank R. Wilson

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Plot Summary

This non-fiction analytical description of "The Hand" subtitled "How its use shapes the brain, language, and human culture" was published in 1998 by Frank R. Wilson. Wilson presents a cultural and historical tale of the use and development of the human hand that supports human learning, physical characteristics and development before and since Homo sapiens appeared on earth. Earliest appearance of a man-like creature was the Australopithecine, which is the name of the first "southern apes" that walked upright in Africa. "Lucy" is a fossilized example who appeared on earth 3.9 million years ago.

Wilson's patients suffering symptoms of "musician's cramp" made him aware of difficulties sculptors, carvers and surgeons experience. His mission for this book is to expose the "hidden physical roots" of human capacity for passionate, creative work. He discusses the anthropological, evolutionary, biomechanical and physiological features as well as neurobehavioral and developmental perspectives. The author's underlying thesis is that people are innately resourceful, curious and willing to explore and learn over time and through experience to become skillful and thoughtful. Wilson claims the unique structure of the hand and its evolution in partnership with a brain makes modern man, Homo sapiens, the most intelligent animal on earth.

The author's voluminous research is supported by an appendix, endnotes, a bibliography and an index and is written objectively but offset ironically with subjective stories of his friends' experiences. For example, his friend Jack's hot-rod cars demonstrate the scientist Reynold's heterotechnic cooperation process. Other examples are Chef Reed's kitchen warrior skills and jeweler George's success at adapting to severed fingers. The wide breadth of Wilson's experience, knowledge and presentation may seem rambling for some casual readers.

Wilson's non-fiction study of "The Hand" is a casual, somewhat humorous, light-hearted read packed with academic research. For example, Chapter 14, "Hidden in the Hand" is an ironic euphemism for this chapter that compares the skillful fiberoptic tool cutting of a wrist by a microsurgeon to the sleight of hand used by magicians. Content of each chapter roams far and wide, like the Greenfield study titled in part "The Ontogeny and Phylogeny of Hierarchically Organized Sequential Behavior" that introduces the chapter on his friend Jack's hot-rod racing cars. The author's style of offsetting extensive academic references, such as 50 pages of endnotes, with simple stories about chefs, hot-rods and a jeweler that cut off his fingers keeps a casual reader wondering what may appear on the next page. An unknown tale of the hand and cultural humanity of man comes to life in Wilson's "The Hand."

Prologue and Dawn

Prologue and Dawn Summary and Analysis

This non-fiction analytical description of "The Hand" subtitled "How its use shapes the brain, language, and human culture" is published in 1998 by Frank R. Wilson. Wilson presents a cultural and historical tale of the use and development of the human hand that supports human learning, physical characteristics and development before and since Homo sapiens appears on earth.

Prologue

Hands and arms come to life even before waking to belie our total dependence on them as they are skillfully and silently involved in daily activities. The symptoms of "musician's cramp" are made known to the author, along with the pain sculptors, carvers, and surgeons experience. Wilson's mission is to expose the "hidden physical roots" of human capacity for passionate, creative work. He illustrates the anthropological and evolutionary views, biomechanical and physiological characteristics and neurobehavioral and developmental perspectives. Through the ages of human history he explores cultural transformation of human paths and posits the "permanent immaturity" of a human brain. Wilson's underlying thesis is that people are born resourceful. Over time and experience they adapt and evolve to become skillful and thoughtful.

Dawn

Australopithecines are the first "southern apes" to walk upright in Africa. "Lucy" is a well-known example from 3.2 million years ago. Her hand is not ape-like but her brain is chimpanzee-sized. Three characteristics distinguish this example of a "tool-using hominid" according to Sherwood Washburn's thesis on Darwinism. He claims the brain and musculoskeletal systems evolve by changing structure and function over time, the bipedal gait and upper limb changes are characteristic of the hominid line distinct from primates, and the driving force of hominid brain evolution is the brain and society as hominids expand their range beyond the jungle into other habitats. He claims a brain is the last organ to evolve after hominids became "handier" with tools.

From Lucy to the present passes over four anthropological reference dates. Lucy starts from 3.9 to 4.2 "million years ago" (mya), followed by Homo habilis from 2 mya, Homo erectus from 1 mya, and ends with Homo sapiens 100,000 years ago. Lucy's brain size of 400-500 cc grows to modern man's 1,350 cc brain and behavior evolves from primitive tool use, like rock-pounding and throwing, to manufacturing modern tools. Before Lucy, other primate changes occur dating back to 65 mya during Paleocene and later epochs to the Miocene epoch 24 mya. Monkeys and apes evolve from quadruped —walking on four legs—to biped, which enables movement on branches and treetops. The Pliocene epoch brings the hominids with a recognizable four-finger hand and thumb

exemplified by Lucy, lacking some flexibilities of a modern hand. For example Lucy can pound and throw stones accurately overhand, unlike chimps that throw only underhand. These biomechanical hand changes are accompanied by increased brain size, social structure, communication and cooperative tool making. Hand applications for hominid tool making and use require the development of "human cognition" as an elemental force in what is called the "mind," activated at birth.

The Hand-Thought-Language Nexus

The Hand-Thought-Language Nexus Summary and Analysis

The human brain accounts for intelligence or the ability to discover, weigh and relate facts to solve problems. Wilson claims there are two problem-solving strategies that stand out. They are the ability to design and manufacture a large, diverse, specialized inventory of tools and the use of words established by agreement among people as codes and symbols to stand for a real-world object or process. In other words, tools and language. In order for hominids to expand their range into habitats beyond the jungle, they required continuing brain evolution. The expansion of territory by hominids took group cooperation for survival. A professor of biology from the University of Liverpool named Robin Dunbar proposes a theory of brain growth, language and intelligence to correlate neocortex, brain size, with a stable group or tribe. His study indicates that larger tribe size implies larger neocortex size up to 150 individuals. Conversely, neocortex size is a reliable predictor of group size.

The Canadian professor of psychology Merlin Donald proposes his theory of cultural and cognitive evolution that claims the human brain developed in a three-stage process with a specific profile of motor and social behavior to account for differences between humans and other animals. For example, a goat eats both the candy and wrapper but a chimpanzee eats the candy and throws the wrapper away. However, a man who sees the candy says how much Jack hates Mars bars. Donald assumes speech is a primary enabler and the outcome of evolution in 1) cognitive capacity as representational or mimetic, 2) articulating speech, and 3) neural structure. Donald summarizes his ideas with the claim that humans did not simply grow larger brains, memories and speaking equipment but rather incorporated new ways to represent reality in their bigger brains.

Incorporating others' views, London psychobiology professor Henry Plotkin proposes his theory of intelligence as secondary heuristic. He claims that knowledge results in relation to the world. For example, a gored bullfighter has the words for bull in his mind as well as scars on his body that are a permanent memory reference to his encounter with a bull. The heuristic, or learning experience, leads to discovery and invention that is pragmatic, conservative and radical with new components. Language is inheritable with the capacity for vocal learning, which develops through a complex evolutionary process. Hindsight offers evidence of the heuristic "manual intelligence" or hand smarts that Homo sapiens acquired for manual skills along with the brain circuitry to relearn and redesign. Novelist Robertson Davies reinforces this idea with his observation, "the hand speaks to the brain as surely as the brain speaks to the hand."

The Arm We Brought Down From the Trees

The Arm We Brought Down From the Trees Summary and Analysis

Anatomically, ape and human hands have been, until recently, considered functionally equivalent by anthropologists. The prehuman arm, however, was considered functionally and anatomically different metaphorically by analysis to a construction crane and its operator. The operator must anticipate load weight and wind changes in addition to boom placement to avoid risks of tipping his crane over. The arm and shoulder may be viewed like a boom with the hand comparable to the bucket or lifting device. While the novice operator must make conscious adjustments until skilled to move his boom, the arm owner, whether quadruped or biped, moves through the unconscious control of a neuromuscular system that became "hardwired" over evolutionary time and inheritance.

The arm is suspended away from the body unlike the leg that is anchored to the body at the pelvis. The mechanism that deploys upper arm, forearm and hand into a "folding crane" is the scapula and muscular system, attached at the shoulder and waiting for silent instruction. The musculoskeletal system of shoulder, arm and hand is fully integrated to function simultaneously as one. Some movement exercises, like bending the elbow or rotation of the arm demonstrates the integration of movement.

The addition and transport of weight by the upper body changes the center of gravity and makes the body respond immediately to avoid losing balance and falling over. Ironically, when ancestors lived in the trees, the action of "falling" to a lower branch was a strategic method of movement through the treetops. Subsequently however, hominid musculature has adapted through evolution to enable repairing watches and throwing a discus and other items. When the forelimbs were relieved of the duty to walk on and support body weight, the brain enabled them to become functional in many other areas and skills. For example, shoulder and forearm development enabled throwing objects held by hand, which required the visual-motor control system to catch up with the evolving brain. The coordination of muscles, tendons, ligaments and bones orients the arm and hand to make adjusting and tension-setting movements that keep the body upright.

Puppet Lessons from Alexandria and Dusseldorf

Puppet Lessons from Alexandria and Dusseldorf Summary and Analysis

Marionettes exhibit similarities to the human muscle and tendon configuration in arms and legs. Etymologically, "neuron" is a Greek word for cord or fiber and marionettes are puppets moved by strings. The anatomist Herophilus discovers some neurons connect muscles to spinal cord whereas others connect muscles to bone, despite their similar appearance. Another anatomist Galen discovers pairs of muscles, agonist and antagonist, are required to pull against each other for action. Rene Descartes thinks fluid causes action in the eye, but not until Galvani in 1800 are electrical forces found to be the cause that initiates movement.

French physician-neurologist Duchenne determines in 1867 how to demonstrate the physiology of movement. He attaches strings to a model, like a marionette, from a paddle above them, to control movement. The paddle axis is designed to cause reciprocal action with limb movement that is simultaneous, equal and opposite. The critical significance of the paddle is that it sends simultaneous signals that result in the interplay of movement. Sherrington demonstrates that this action is caused by signals originated in the spinal cord to enable fluent movement.

The conscious dimension of action occurs with the thought of moving but is supported by unconscious interaction of the neuromuscular system to accomplish action automatically. Like a crane operator, a puppeteer develops the "feel" for his skill over years of practice. The neuron is not a string like the marionettes, but rather a lifeline that communicates instructions and results to accomplish coordinated movement. Duchenne further proposes the terms of "micrometric" and "macrometric" for the scale of movement required by two hands acting in partnership. Wilson restates the chapter title to say "the left hand knows what the right hand is planning, and the right hand knows what the left hand just did."

Hand, Eye and Sky

Hand, Eye and Sky Summary and Analysis

Juggling would be a pastime that accomplishes nothing, because it returns all items used back to their original state, except for the fact it involves the complementary processes of throwing and catching. Wilson proposes the juggling riddle that three balls are in motion at the same time while only one ball is held in either hand at the same time, in addition to the physical act of doing it. Juggling is not appreciated by children because they do not have the degree of hand-eye coordination from the necessary maturation of motor skills. Charles Bell asserts that practice enables the hand and eye to develop as sense organs so the brain teaches itself by making the hand and eye work together. Bell claims the brain focuses receptors in eye or hand on objects of interest that are moved precisely "during a process of exploration."

Another scientist Charles Sherrington claims the tip of the thumb and index finger are treated by the brain like the sensitive part of the retina. He claims the eye is drawn to the object automatically and the hand with its sensitive fingers grasps it. Both the retina and the fingertip are sensors to the target object. The process is learned with practice and not innate because a baby does not yet have the motor skills necessary to hold up its head to see and explore with its fingers. There is a natural progression in learning a motor skill that begins with a stable platform to see from. For example, the baby's head is supported by a crib or the arm and hand of another until strong enough to support its own head to see by itself.

Secondly a biologic clock develops to set an internal time reference relative to the time used in a sequence of motion—for example, the time it takes for a ball to fall. Practice improves the sense of timing but a teacher or coach can help to sequence the process and eliminate making the same mistakes. Belgian tennis player and juggler Serge Percelly was told he had the movements and "an eye for tennis" since he could see where the ball was going and meet it there. Practice after learning helps to maintain the skill and reorient it from the early visual and timing cues to a focus on goals of the activity. For example, the professional juggler of tennis racquets, Percelly focused on performing for audiences to determine what he enjoys doing and the audiences like watching him do. He discovered precision in what he did was not as important as the number of things he could do to perform better. Juggling as learned and performed by Percelly provides an entertaining dimension to understanding the mind-body dichotomy.

The Grip of the Past

The Grip of the Past Summary and Analysis

A puzzling consideration for the author is the hand's ability to be adept at rock-climbing and piano-playing. For example, the hand's optimal position over a keyboard is a gentle curve like that poised over the top of a basketball. On a rock face, however, the hand's optimal strength lies in its grip. Where touch of the pianist's hand on a piano key is less than three ounces, strength of the climber's grip on a rock face can be eighty pounds per square inch. Piano keystrokes can reach 20 per second in succession but one grip on a rock can last 40 seconds. Ironically, the human hand is a tool that functions at a wide variety and range of speed and strength.

Wilson's boyhood friend David is raised by a pioneering farmer father and academic mother who divorce when he is in high school. David is a high school and college wrestler who is not as strong as his competitors but compensates with his mental and psychological edge. He raises horses and learns to control them through the touch of his hand where unseen power lies ready for his use in hunting, hiking, backpacking and rock-climbing.

The hand function clinician John Napier identifies the terms "power grip" and "precision grip" by defining "prehensile" and "non-prehensile" movement. Prehensile movement is the grasp of an object partially or completely by hand or fingers, whereas non-prehensile is hand or finger manipulation but not grasp of an object. For example, combing hair is prehensile but playing piano is non-prehensile. Prehensile movement is defined as power grip, which is a hold position using the palm as buttress, whereas precision grip is a hold position using fingers and thumb in opposition. A Swedish scientist Forssberg studies development of the precision grip in children that is compensated for by excessive grip force. A form of power grip called hook grip is still used by rock climbers.

Wilson reflects on the notion that each of us evolve over time in our own lives by unifying body and spirit through personal growth and learning. For example, Percelly and David both cross paths of trouble and opportunity mixed with family and tribal routines to try new skills or combinations. These new-found abilities are part of their repertoire that becomes useful to them and can be passed on to others.

The Twenty-Four-Karat Thumb

The Twenty-Four-Karat Thumb Summary and Analysis

Not until Sir Charles Bell describes a human hand as the "consummation of all perfection as an instrument" do modern studies of its structure and function begin, to be followed a century later by Frederick Wood Jones noting that it is actually the brain in control. Until then it is the thumb that sets the human hand apart from the apes. Napier identifies the grip of the hand that supersedes the thumb. Mary Marzke follows up on Napier's initial work to classify three types of grip that are defined as pad-to-side, three-jawed chuck and five-jawed cradle. She identifies eight features of the human hand that includes a longer thumb, wider fingertip pads, thumb muscle modification and long flexor as well as metacarpal and wrist bone changes. Marzke incorporates expanded use of the palm in her identified grips relative to the comparative hands of apes and monkeys.

The thumb is not so important when it appears as it is now in retrospect. To be useful, the thumb has to grow long enough to reach the fingertips and the attaching musculature has to be modified enough to enable repositioning of the thumb to reach pad to pad contact with fingertips. The variety of object size for gripping must allow thumb movement combinations like flexion, extension and others, which is achieved with eight or nine thumb-attached muscles. The thumb is uniquely able to rotate, swivel and move independently of any other finger.

One of the author's associates, George unfortunately saws off four fingers from his right hand but retains his thumb. He practices rehabilitation exercises and is able to become adept enough with his left hand to become a freelance artist and teacher. He subsequently becomes a sculptor and successful jeweler. George's example provides evidence of how hands can learn to function in a complementary partnership, become an articulate organ with which to express oneself and associate complex motor linkages of hand and brain. George discovers his right hand can hold his tools and his left hand can manipulate them.

The Right Hand Knows What the Left Hand Just Did

The Right Hand Knows What the Left Hand Just Did Summary and Analysis

The hand has been used through its long history for both social interaction and attention. For example, handshakes, salutes, gestures are used for interaction and gloves, rings and nails attract attention. Right or left hands are used as symbols to signify issues like the hand and finger on which a wedding ring is worn. Social pressures often dictate which hand is dominant or most frequently used, such as right or left handedness, and attribute to it other irrelevant characteristics like intelligence or sex. For example, neurophysiologist William Calvin claims female apes are the main hunters and cradle babies in their left arm to sooth them by hearing their mother's heartbeat. Other scientists claim practicing a skill, like rock-throwing, using one hand more frequently than another makes them better at it with that hand.

Investigation of Stone Age rock flakes reveal that right-hand stone hammering to make stone tools, called "knapping," produces more flakes than left-hand hammering. Both of these activities, rock throwing and knapping require muscle contractions and relaxations to maximize their impact that is controlled and improves with practice. For example, the arm is "cocked" as chemical energy builds up in a muscle and releases at the precise time to accomplish the task. The question of what the non-dominant hand and arm do during dominant limb development is resolved with the current view that since both sides of a brain function complementarily then both hands may do so as well. A study by R.C. Oldfield describes a "laterality quotient" as a spectrum of handedness use ranging from strongly right to ambidextrous to strongly left, theoretically controlled by genes.

Several other studies follow Oldfield and conceptually arrive at three conclusions. They show that writing and drawing relate to many other skills using small tools by both right and left-handers. Secondly, throwing and throwing arm choice correlates with other whole body skills. The third conclusion is that right-handers both write and throw with that hand, whereas left-hand writers throw with right hands in one-half the cases and have stronger, larger right-hand thumbs and kick with a right foot. Hand performance theories range from "inferior-superior" to "just different" until French psychologist Yves Guiard proposes in 1987 that both hands perform in partnership to achieve a goal. For example, the non-dominant hand in writing repositions the paper and the non-dominant hand counterbalances the arm used in throwing darts.

Bad Boys, Polyliths, and the Heterotechnic Revolution

Bad Boys, Polyliths, and the Heterotechnic Revolution Summary and Analysis

UCLA psychology professor Patricia Greenfield studies human intelligence as it unfolds in child behavior twenty years earlier. She proposes a hierarchical rule generator in the human brain that overcomes naive childhood impulses. She claims to know how a child will solve her stick puzzle simply by knowing the child's age. The MIT Professor Jeanne Bamberger corroborates Greenfield's opinion referring to a "felt path" that she describes as "exactly how chimps would do it." Older children pass the "chimp stage" so that by eleven they are not orderly solvers but improvisers who behave with intelligence. Other scientists as well, like Haeckel, Reynolds and Dunbar confirm aspects of the evolutionary process perceived in Greenfield's theory.

Anthropologist Peter Reynolds spends years in direct observation of chimpanzees, New Guinea villagers and aborigines in Australia. He watches the humans perform socially organized, cooperative division of specialized labor to make and assemble crude stone tools that the chimps do not. Both humans and primates can make small, simple stone structures called "pods" and combine them in "polypods" held together by gravity. The term "polylith" refers to an object made of joined units or subassemblies, like a hammer that chimpanzees are unable to make without human direction or instruction. He calls this theory "complementation" that unites the polypod-polylith assembly process with the principle of "heterotechnic cooperation" into complex tool manufacturing.

Author Wilson's friend Jack Schaefer operates a frame shop and is a fan of car racing in Walnut Creek, California. Wilson wants to frame a favorite picture and Jack invites him to see a 1949 Mercury automobile he is restoring. Jack reminisces with Wilson about his youthful experiences with cars and his early teens learning to pinstripe so he can be around cars, where he learns to make them work better. Wilson uses Jack's story to demonstrate Reynolds' theory of complementation. Heterotechnic cooperation is learned and developed by Jack's father and with his uncle's guidance, combined with his own experiences hanging around and learning from the "bad boys" that like cars. Jack finds a lifetime of exploring, recapitulating and refining the talents, feelings and skills he has as a kid dealing with cars as an "exemplary polylithic creation of American industrial and pop culture" according to Wilson. Biological anthropologist Kathleen Gibson notes "human intelligence results from delayed development and a consequent permanent immaturity of the brain" that is assumed to mean an insatiable curiosity to discover something new.

The Articulate Hand

The Articulate Hand Summary and Analysis

The French physician Paul Broca identifies an area in the brain that controls speech by examining the brain of a stroke patient who is left speechless. Medical student Karl Wernicke identifies a second brain region that causes a language impairment he called aphasia. Although they both identify an area that disrupts speech, neither identifies these areas as originating or causing speech, according to author Steve Pinker. However, scientific belief identifies the left brain hemisphere as specialized for language and the consensus is that it has been preadapted for speech for over 100,000 years.

Further studies at the University of New Mexico in correlation with Gallaudet University propose a "continuum of communicative movements" that has four levels. They range from a primate display of aggression, iconic hand gestures like an "L-shape" to represent a gun, cultural gestures like getting a waiter's attention, and fourth-level gestures like the American Sign Language word/signs or code that meet requirements of a language. A second language requirement is a need for "discrete combinatorial system" or the ability to put words together in a chain or cluster, like tree branches. Words have hidden structure the linguist Noam Chomsky calls "innate syntax" that facilitates their rearrangement in different word order.

Chomsky identifies two brain tasks an individual must do to speak language, starting with sorting through "brain noise" to associate and label causal events and then ending by comparing those signals in a code it can read and play or say while retaining associated correspondence of internal and external events. For example, a shopper leaves home with an idea of what kind and color chair they want when they visit a store. The shopper compares chairs to see if an in-store chair matches or can replace the chair in mind while in the store or when back at home. All the inner thought considerations of the actual world occur inside one's head through a process called "mentalese" by Pinker. Wilson identifies the physical symbol system hypothesis for a brain's cognitive architecture that Alan Turing devises as "ChomTur" in honor of Chomsky and Turing.

According to Chomsky, young children readily acquire speech if they hear it early and begin to make sentences at the age of two. Consequently, he claims they must have innate ability for language. Another element of childhood learning speed is mobility to expand their territory, investigate and increase vocabulary and use of words. Mobility, gesture and verbalism provide the beginning of human consciousness. According to Vygotsky's "Thought and Language", the brain treats words like real objects by putting them in groups or clusters a child perceives as logical connections in his mind. As the child begins this thought-language nexus, his hand functions as an organ with fingers that move and manipulate objects. This process develops as extended hand-thought-language nexus by support of the brain. In this nexus the hand becomes an alternative to vocal expression and may develop "praxis" or skilled use. For example, Wilson

claims anyone can imitate piano playing, like in a game of charades or in a film. Expertise in playing piano, however, requires cognitive and emotional development beyond basic praxis.

In Tune and Evolving Prestissimo

In Tune and Evolving Prestissimo Summary and Analysis

The author's term ChomTur for specialized control mechanisms of language suggests the "behavioral antecedents of language" that is an inherited trait for communication skills may also have comparable features for music in the "musical brain." Wilson calls this facility "BachTur." He questions the source of manual dexterity to explain the gifted musical hand before there are musical instruments, for example strings and keys to use it on. How does Wilson's daughter make her fingers move so fast over the piano keyboard? Wilson defers to the heuristic work of Plotkin and Donald for answers.

Plotkin calls human language and music examples of secondary heuristics that exist everywhere in society, are useful to humans and affect psychomotor development. They both preserve and enhance life despite claims music is not biologically relevant. Wilson recognizes amateur music but claims only professional music relevant to intelligence, upper limb biomechanics and teaching. For example, the classic pianist Franz Liszt is remembered for his comment "I am the concert." Liszt and Darwin are both born and die within five years of each other in the 1800s. Darwin claims survival of the fittest and his contemporary Liszt survives as virtuoso classic pianist like many other pianists in other centuries, including Chopin, Schumann and Glenn Gould.

Wilson's notion of BachTur as a musical heuristic, learned, is based on the fact that great pianists do not precede invention of the piano. However, the piano's existence creates interest in discovery of pianist talent as well as increased virtuosity in solo piano performance. Despite the fact musical virtuosos have skill beyond other musicians, their talent is not genetic, but requires an ability to perceive, understand and interpret musical ideas among other abilities. Wilson concludes that a music talent or heuristic develops early in the brain and body of a child from cultural examples and opportunities. Human intelligence, talent and skill are developed through selective reinforcement and inhibition of the culture a child grows up in.

Lucy to Lulu to Rose

Lucy to Lulu to Rose Summary and Analysis

Changes in global climate 65 million years ago initiate an ecosystem full of flowering and fruit-bearing trees with blossoms and fruits that fill treetops with a mealtime feast. Ground mammals eat vegetarian life and capture or scavenge carnivores but are too heavy or ill-equipped to reach the primate picnic in the treetops. Lucy and her descendants get used to battling for food on the open savannah and today's warriors learn skills necessary to wield skillets, pots and pans after chopping and slicing in kitchens.

Chefs must combine the skills of a warrior with the aesthetics of a poet to create subtle aromas, tastes and textures in a kitchen. They labor in a combination of strong kitchen work that takes physical endurance and survives only by killer instinct in business with the ability to make a meal presentation with creative artistic skill and feeling. The lack of any one working ingredient can mark the end of a restaurant, even amidst abundant other food ingredients. The author's colleague and restaurateur Reed Hearon opens LuLu and many more restaurants after graduating with honors in math and philosophy.

Eating at LuLu teaches Wilson how cooking is a specific skill using hands to produce an immediate sense of achievement. Food is an emotional experience that brings memories and connections of childhood and motherhood. Hearon restaurants are designed to be places where people he might enjoy come in to share a meal and each others company. Reed proves his ability to achieve success using "ordinary physical skill" and a mix of other factors in his restaurant LuLu, Rose and others.

Touch, Tender and Tenacious

Touch, Tender and Tenacious Summary and Analysis

The author reminisces about his meeting with a high school language teacher whose work ends when her left side is paralyzed. She is hospitalized and rehabilitated but cannot return to class until she experiences Feldenkrais. Moshe Feldenkrais is an Israeli physicist who discovers certain movements can lead a person with practice to move more smoothly and efficiently. He perceives the brain as a sophisticated controller of movement. The awareness of its effect can restore feeling to one who has lost a sense of connection with their body and enable movement again. His goal was to return message flow from the brain as it was before paralysis rather than increasing muscle strength.

Feldenkrais' book "Awareness Through Movement" claims reduced bodily movement is caused by lack of attention, ignorance or laziness. Alternatively, some patients learn to move incorrectly and by eliminating forgotten or buried events and feelings, a patient can learn to improve movement again. Cured patients ask him how to "do Feldenkrais" so they can "cure" themselves. For example, an observer and early participant in practice named Anat becomes a practitioner to whom Wilson makes referrals. Anat works with a difficult case of torsion dystonia that disables a woman from any movement and causes her to be housebound. By the end of three Feldenkrais lessons she goes out dancing with her husband.

Feldenkrais claims parents can inhibit their child's abilities, even as positive protective directives distort their movement and growth. For example, the instruction to not touch something dangerous can inhibit action that subsequently needs correction. Feldenkrais facilitates "relearning" what is not learned. The method establishes positive feelings to restore or teach the link that is psychologically severed. Teaching is an omnipresent experience for children of any age but learning occurs independently and when there is connection with something that matters. Feldenkrais reinforces and establishes learning.

Hidden in the Hand

Hidden in the Hand Summary and Analysis

The use of hands in healing is a consistent practice common to Feldenkrais and others. "Hands-on" therapy is used in many cultures and hearkens back to primate grooming and supports the notion that humans need to be touched. Generally, modern doctors use some type of tool to touch and heal their patient. Ironically, use of hands or manual dexterity does not distinguish proficient from mediocre surgical performance as well as analysis and perceptual organization does. Most critical facility is use of the brain, "not the hands."

Magic and its connection with charismatic persuasion is one of medicine's oldest links. The magician, whether of white or black magic, knows his success depends on belief of his subjects and his ability to distract subjects from what he is doing to create an illusion. Similarly, physicians encourage or charm their patients to follow instructions and take their medicine to be cured. Early medicine relies for healing on faith in the healer or medicine man, bedside manner of a doctor and bed rest since there was little else science could do. A French word for "quick fingers" is "prestidigitation" and a magician needs quick fingers, along with hand-eye coordination, to succee—as does a surgeon.

Medicine and magic both depend on the willingness of one individual to suspend their disbelief and surrender their autonomy to another. For example, the patient must do what the doctor recommends and the audience member must believe the magician can do what he appears to do. The doctor uses his hands and vision to determine what is in the best interest of the patient. The combination of how things look and how they feel in his hands provide visuomotor perception of the health of the patient he is about to cure.

Head for the Hands and Epilogue

Head for the Hands and Epilogue Summary and Analysis

Wilson's premise is that the hand and brain equally are at the core of human life. One of his colleagues Kieran Egan writes in "The Educated Mind" a history of three educational goals. These are: teach the young current norms and conventions of adult society; ensure their thinking conforms to the real and true in the world; and encourage development of student potential. Despite viability of these goals, their accomplishment is incompatible with institutional education. Yale psychologist Seymour Sarason claims education can succeed when it recognizes every individual is potentially creative and artistic. Human learning can proceed in the presence of fundamental and comparatively simple conditions, like an interest in the subject or skill and the encouragement and support of others.

Egan proposes that children can learn according to the template established through human evolutionary and cultural history. Specifically, every society has tools that include somatic, mythic, romantic, philosophic and ironic understanding, from lowest to highest level. For example, children enter school at somatic or physical body level understanding and grow in primary grades to understanding stories or mythic knowledge, and gradually progress to higher levels of romantic, philosophic and higher understanding. The theories of other commentators like Dunbar, Donald and Plotkin introduce environmental and evolutionary changes that incorporate heuristic or learning levels of understanding. The underlying issue is continuing use of intelligence for uniting mind and body. Later commentators like Charles Bell, John Napier, Mary Marzke and many others contribute to the growing body of knowledge and science that the curiosity and hands of a child are the most influential tactic available to learning.

Epilogue

The author Frank R. Wilson summarizes his understanding of human history with the conclusion that humans have become who they are because of their rationality as well as their ability to control their irrationality. Despite the scientific name Homo sapiens, Wilson suggests the experience of our "wise or discerning man" identification ought to be mixed with actual occurrences of mankind over time that have fed our rationality with unconscious and playful curiosity. Wilson proposes we might be better identified as "Homo habilis rabens ludens sapiens" to capture our essence.

Characters

Frank R. Wilson

Frank R. Wilson is the name of the author of "The Hand." He wonders at the fact hands and arms come to life before waking to belie our total dependence on them in daily activities. Patients with symptoms of "musician's cramp" make Wilson aware of the difficulties sculptors, carvers, and surgeons experience. Wilson chooses as his mission exposing "hidden physical roots" of human capacity for passionate, creative work. He discusses anthropological, evolutionary, biomechanical and physiological features, as well as neurobehavioral and developmental perspectives of the human hand.

Through the ages of human history he explores cultural transformation of human beings and proposes "permanent immaturity" of the human brain. The author's underlying thesis is that people are innately resourceful, curious and willing to explore and learn over time and experience to become skillful and thoughtful. He claims the unique structure of the hand and its evolution in partnership with the brain makes modern man, Homo sapiens, the most intelligent animal on earth.

Frank R. Wilson is a graduate of New York City's Columbia College and the University of California School Of Medicine in San Francisco. He lives with his wife Patricia in Danville, California and is a neurologist. Wilson is the medical director of the Peter F. Ostwald Health Program for Performing Artists at the University of California, School of Medicine. He begins this book while on sabbatical for a year at University of Düsseldorf, West Germany, in a neurology department.

Lucy

Lucy is the name of an Australopithecine who is among the first "southern apes" to walk upright in Africa. "Lucy" is the name of a well-known example whose fossilized remains are believed to have come from 3.2 million years ago. She is notable anthropologically because her hand is not apelike, her brain is chimpanzee-sized and she is the first example of a "tool-using hominid." Lucy is significant to this work because she sets the range of analysis Wilson considers. The present evolves over four anthropological reference dates starting with Lucy from 3.9 to 4.2 million years ago. She is followed 2 mya by Homo habilis, who is followed by Homo erectus 1 mya to modern man as Homo sapiens 100,000 years ago. Her brain size of 400-500 cc evolves to modern man's 1,350 cc size.

Lucy can pound and throw stones overhand which differentiates her from chimpanzees that can only throw underhand. This Pliocene epoch hominid has a recognizable four-finger hand and thumb but lacks flexibilities of a modern hand. Hominid tool making and use require "human cognition" as an elemental force in what is called the "mind,"

activated at birth. Biomechanical hand changes areupported by increased brain size, social structure, communication and cooperative tool making.

Sherwood Washburn

Sherwood Washburn is the name of an anthropologist whose thesis on Darwinism demonstrates significant work on brain and musculoskeletal systems. He claims they evolve in structure and function over time. Three characteristics distinguish this first example of a "tool-using hominid," according to his thesis. Those characteristics are that the brain and musculoskeletal systems change structure and function, a bipedal gait and upper limb changes differentiate the hominid line from primates, and the driving force of their brain evolution is the brain and society when hominids expand their range beyond the jungle into other habitats.

Robin Dunbar

Robin Dunbar is the name of a professor of biology from the University of Liverpool. Dunbar develops a study that relates neocortex size to brain growth, language and intelligence. He studies brain growth, language and intelligence to correlate neocortex, brain size, with a stable group. He indicates that larger tribe size implies larger neocortex size and neocortex size predicts group size.

Merlin Donald

Merlin Donald is the name of a Canadian professor of psychology who proposes a theory of cultural and cognitive evolution that demonstrates that the human brain developes in a three-stage process. Donald assumes speech is a primary enabler and outcome of evolution in 1) cognitive capacity as representational or mimetic, 2) articulation of speech, and 3) evolving neural structure. He claims humans do not just grow larger brains, memories and speaking equipment but also find new ways to represent reality.

Henry Plotkin

Henry Plotkin is the name of a London professor of psychobiology who proposes a theory of intelligence as secondary heuristic. He claims that knowledge refers to conditions in relation to the world. The heuristic, or learning experience, leads to discovery and invention that is pragmatic, conservative and radical with new components. Language is inheritable, but chimpanzees lack capacity for vocal learning because it results from a complex evolutionary process.

Robertson Davies

Robertson Davies is the name of a distinguished Canadian novelist who claims "the hand speaks to the brain as surely as the brain speaks to the hand." Hindsight evidences the heuristic "manual intelligence" or hand smarts that Homo sapiens acquires for manual skills and brain circuitry to relearn and/or redesign.

Duchenne

Duchenne is the name of a French physician-neurologist who determines in 1867 how to demonstrate the physiology of movement. He attaches a paddle, via strings, to a model. The paddle axis is designed to cause reciprocal action with limb movement that is simultaneous, equal and opposite to cause interplay.

Charles Sherrington

Charles Sherrington is the name of a scientist who claims the thumb tip and index finger are treated by the brain like sensitive parts of the retina. The eye is drawn to the object automatically and the hands' sensitive fingers grasp it. Both retina and fingertip are sensors to the target object. The process is learned with practice after the baby can hold up its head to see and explore with its fingers.

Sir Charles Bell

Sir Charles Bell is the name of a Scottish surgeon who asserts that practice enables the hand and eye to develop as sense organs so the brain teaches itself by making the hand and eye work together. Bell claims the brain focuses receptors in the eye or hand on the object of interest that move precisely "during a process of exploration." Sir Charles Bell describes human hands as the "consummation of all perfection as an instrument."

John Napier

John Napier is the name of an anthropologist-physician and a founder of modern primatology. The preeminent hand function clinician identifies the terms "power grip" and "precision grip" to define "prehensile" and "non-prehensile" movement. Prehensile movement is the grasp of an object partially or completely by hand or fingers but non-prehensile is hand or finger manipulation, not grasp of an object. For example, combing hair is prehensile but playing piano is non-prehensile. Prehensile movement is a power grip or hold position using the palm as buttress but precision grip is a hold position using fingers and thumb in opposition.

Mary Marzke

Mary Marzke is the name of an anthropologist who follows up Napier's initial work to classify three types of grip that are pad-to-side, three-jawed chuck and five-jawed cradle. She identifies eight features of the human hand that includes a longer thumb, wider fingertip pads, thumb muscle modification and long flexor as well as metacarpal and wrist bone changes.

Yves Guiard

Yves Guiard is the name of a French psychologist who proposes in 1987 that both hands perform in partnership to reach a goal. For example, a non-dominant hand repositions the paper in writing or counterbalances the arm when throwing darts.

Peter Reynolds

Peter Reynolds is the name of an Australian anthropologist who spends years in direct observation of chimpanzees, New Guinea villagers and aborigines. He watches humans perform socially organized cooperative division of specialized labor to make and assemble crude stone tools the chimps cannot. Both humans and primates make small, simple stone structures called "pods" to combine into "polypods" held together by gravity. The term "polylith" refers to an object made of joined units or subassemblies, for example, a hammer that chimpanzees cannot make without human direction. Reynolds calls this "complementation," which unites polypod-polylith assembly and "heterotechnic cooperation" in manufacturing.

Noam Chomsky

Noam Chomsky is the name of a linguist who identifies a structure that he calls an "innate syntax" to enable word rearrangement in different orders. Chomsky identifies two brain tasks that an individual must do to speak language. One is sorting through "brain noise" to associate and label causal events and the second compares signals in code it can read, play or say without losing correspondence of internal and external events.

Lev Vygotsky

Lev Vygotsky is the name of the author of "Thought and Language" who claims a brain treats words like real objects by putting them in groups or clusters that a child sees as logical connection in his mind. As a child begins thought-language nexus, his hand functions like an organ with fingers to move and manipulate objects as it develops an extended hand-thought-language nexus by support of the brain. In this nexus the hand becomes an alternative to vocal expression and develops "praxis" or skilled use.

Moshe Feldenkrais

Moshe Feldenkrais is the name of an Israeli physicist who discovers certain movements can lead a person who practices them to move more smoothly and efficiently. He sees the brain as a sophisticated controller of movement. The awareness of its effect can restore feeling to one who has lost a sense of connection with their body and enable movement again. His goal is to return message flow from the brain as it is before paralysis, rather than increasing muscle strength. His name become attached to his method and is referred to as "Feldenkrais."

Kieran Egan

Kieran Egan is the name of a Canadian educator who writes in "The Educated Mind" a history of three educational goals. Those goals include 1) teaching the young current norms and conventions of adult society, 2) ensuring their thinking conforms to real and true in the world and 3) encouraging development of student potential. Egan claims accomplishment of these goals is incompatible with institutional education. He proposes children can learn according to the template established through human evolution and cultural history. For example, children enter school at somatic or physical body level understanding and grow in primary grades to understanding stories or mythic knowledge, gradually progressing to higher levels of romantic, philosophic and higher understanding.

Seymour Sarason

Seymour Sarason is the name of a Yale psychologist who claims education can succeed when it recognizes every individual is potentially creative and artistic. Human learning can proceed in the presence of fundamental and comparatively simple conditions like interest in the subject or skill and the encouragement and support of others.

Objects/Places

Permanent immaturity

"Permanent immaturity" is a term used by the author Wilson for the human brain; it underlies his thesis that people are born resourceful. Over time and experience they become skillful and thoughtful because their brain remains in a state of permanent curiosity, learning and growth.

Australopithecine

Australopithecine is the name of the first "southern apes" that walk upright in Africa, exemplified by "Lucy" from 3.2 million years ago. Her hand is not ape-like and her brain is chimpanzee-sized. Sherwood Washburn's thesis on Darwinism claims three characteristics distinguish this first "tool-using hominid."

Anthropological reference date

Anthropological reference date is the term used by Wilson to denote human development periods that start with Lucy, 3.9 to 4.2 million years ago (mya), Homo habilis 2 mya, Homo erectus 1 mya and Homo sapiens 100,000 years ago.

Pliocene epoch

Pliocene epoch is a term that denotes an anthropological period when hominids appear with a recognizable four-finger hand and thumb, exemplified by Lucy.

Theory of brain growth, language and intelligence

Theory of brain growth, language and intelligence is a theory devised by Robin Dunbar to correlate neocortex or brain size with a stable group or tribe size. For example, his study results indicate larger tribe size implies larger neocortex size up to 150 individuals. Conversely, neocortex size can reliably predict group size.

Theory of cultural and cognitive evolution

Theory of cultural and cognitive evolution is a theory devised by Merlin Donald that claims the human brain developed in a three-stage process with a specific profile of motor and social behavior to account for differences between humans and other animals.

Theory of intelligence

Theory of intelligence as secondary heuristic is proposed by Henry Plotkin. He claims that knowledge refers to a state in relation to the world. The heuristic, or learning experience, leads to discovery and invention as pragmatic, conservative and radical with new components.

Manual intelligence

"Manual intelligence" or hand smarts is the term that refers to Homo sapiens' ability to acquire the manual skills and brain circuitry to relearn and/or redesign defined by Robertson Davies. He says "the hand speaks to the brain as surely as the brain speaks to the hand."

Scapula and muscular system

Scapula and muscular system is the term used for a body mechanism that deploys upper arm, forearm and hand into a "folding crane" that is attached at the shoulder and awaits silent instruction. The musculoskeletal system of shoulder, arm and hand is fully integrated to function simultaneously as one, as with bending the elbow.

Marionette

Marionette is the term for a type of puppet that exhibits similarities demonstrated by the human muscle and tendon configuration in arms and legs. Etymologically, "neuron" is a Greek word for cord or fiber and marionettes are puppets moved by strings. The anatomist Galen finds pairs of muscles, agonist and antagonist, are required to pull against each other for action, like marionette strings.

Juggling

Juggling is the term for an activity or pastime that accomplishes nothing since it returns all items used back to their original state except for the complementary processes of throwing and catching. Wilson asks the juggling riddle how three balls are in motion at the same time while only one ball is held in either hand.

Power grip and precision grip

"Power grip" and "precision grip" are the terms used by clinician John Napier to identify hand function that defines "prehensile" and "non-prehensile" movement. Prehensile movement is the grasp of an object partially or completely by hand or fingers, whereas non-prehensile is hand or finger manipulation but not grasp of an object. Prehensile movement is a power grip or hold position using the palm as buttress, whereas

precision grip is a hold position using fingers and thumb in opposition. A form of power grip called hook grip is still used by rock climbers.

Laterality quotient

"Laterality quotient" is a term defined by R.C. Oldfield to describe a spectrum of handedness ranging from strongly right, through ambidextrous to strongly left.

Pod, polypod and polylith

"Pod", "polypod" and "polylith" are terms defined by anthropologist Peter Reynolds that refer to one or more simple or complex objects made of individual units, joined units or subassemblies. He uses these terms to explain his theory of "complementation" that unites polypod-polylith assembly process with principles of "heterotechnic cooperation" into complex tool manufacturing.

Continuum of communicative movements

"Continuum of communicative movements" is a term that refers to four levels of communication from the primate display of aggression, iconic hand gestures like an "L-shape" to represent a gun, cultural gestures like getting a waiter's attention, and fourth-level gestures like American Sign Language word/signs or code that meet one requirement of language.

ChomTur

ChomTur is a term used by Wilson to define specialized control mechanisms of language or "behavioral antecedents of language" that become an inherited trait for communication skills. Turing derives the physical symbol system hypothesis for a brain's cognitive architecture. Wilson combines Turing's work with that of Noam Chomsky to create the term ChomTur. Wilson uses comparable features named after Bach for music in a "musical brain" called "BachTur."

Chef

Chef is the term used by Wilson to identify the kitchen worker's combined skills of warrior with the aesthetics of a poet to create subtle aromas, tastes and textures in a kitchen. According to Wilson, chefs labor in a combination of strong kitchen work that takes physical endurance and skill. They survive only by killer instinct in business with the ability to make a meal presentation that demonstrates creative artistic skill and feeling. This reality is exemplified by his friend restaurateur Reed Hearon.

Feldenkrais

Feldenkrais is the term for a therapeutic method described in a book "Awareness Through Movement" by Moshe Feldenkrais. He claims that reduced bodily movement is caused by lack of attention, ignorance or laziness. Alternatively, some patients learn to move incorrectly. By eliminating forgotten events and feelings through his therapy, a patient can relearn improved movement. Cured patients often ask him how to "do Feldenkrais" so they can "cure" themselves.

Hands-on therapy

"Hands-on" therapy is a term used in many cultures that recalls primate grooming and supports the notion that humans need to be touched. Generally, modern doctors use some type of tool to touch. Ironically, hands-on dexterity does not distinguish proficient from mediocre surgical performance.

Magic

Magic is a term used in connection with charismatic persuasion—one of medicine's oldest links. The magician depends on belief of his subject and his ability to distract a subject to create an illusion. Similarly, physicians encourage, or charm patients to follow instructions and take their medicine to be cured. Early medicine relies for healing on faith in the healer or shaman, bedside manner of the doctor and bed rest, since there is little else science could do.

Themes

Ages of Man

The author writes in this book about the role of the human hand in supporting human learning, physical characteristics and development before and since Homo sapiens appears on the earth. The earliest appearance of a manlike creature in ages of man is with the Australopithecine, which is the name of the first "southern apes" that walked upright in Africa. "Lucy" is a fossilized example who appears on earth from 3.9 million years ago. Although her hand is not apelike, as shown on pages 22-23, her brain is the size of a chimpanzee brain. Three features distinguish this first example of a "tool-using hominid" according to Sherwood Washburn, but he claims the brain is the last organ to evolve after hominids become "handier" with tools.

The schematic on page 17 graphically illustrates the anthropological reference dates used by Wilson in this work to denote human development periods. The family of hominids or Hominidae includes Australopithecus and Homo. For example, Lucy (A. afarensis on the chart) appears from 3.9 to 4.2 mya. Homo habilis appears on the chart from 2 mya following a line of descent from A. africanus. The Homo segment of hominids descends forward with Homo erectus from 1 mya and ends with Homo sapiens at 100,000 years ago. This schematic describes the Pliocene and Pleistocene epochs from 5 mya to 100,000 years ago at the appearance of Homo sapiens but does not include latter Pleistocene to 10,000 years ago nor the Holocene epoch from 10,000 years ago to the present. These are the anthropological periods when hominids appear with a recognizable four-finger hand and thumb exemplified by Lucy, who is significant to this work because she sets the farthest range of analysis Wilson considers.

Three characteristics that distinguish Lucy's evolution according to Washburn's thesis on Darwinism are: 1) brain and musculoskeletal systems evolved by changing structure and function, 2) the bipedal gait and upper limb changes that characterize the hominid line distinct from the primate line, and 3) the fact that the driving force of hominid brain evolution is the brain itself and society as hominids expand their range beyond the jungle into other habitats. He claims the brain is the last organ to evolve after hominids become "handier" with tools. A. afarensis's brain size grew from 400-500 cc to the Homo sapiens brain size of 1350cc. This Pliocene hominid has a four-finger hand and thumb but not the flexibility of a modern hand. Hominid tool making and use requires "human cognition" or learning as an elemental force active at birth. Biomechanical hand changes are enabled by increased brain size, social structure, communication and cooperative tool making.

Get a Grip

Wilson is appreciative of two authors who write about the hand before him and two other scientists who also make a significant contribution to this work. Sir Charles Bell is

a Scottish surgeon who claims that practice makes the hand and eye develop together. They work as sense organs so the brain teaches itself by making hand and eye work together precisely "during a process of exploration." Bell describes human hands as "consummation of all perfection as an instrument." John Napier is an anthropologist-physician and preeminent hand function clinician who defines "power grip" and "precision grip." These terms describe "prehensile" and "non-prehensile" movement. Mary Marzke is an anthropologist who follows up Napier's initial work to classify three types of grip and identify eight features of the human hand. Finally, Yves Guiard is a French psychologist who determines in 1987 that both hands work together rather than a person using either the right or left-hand. For example, the non-dominant hand repositions paper in writing or counterbalances the arm when throwing darts.

John Napier identifies the power grip as a hold position using the palm as buttress and "prehensile" is the grasp of an object partially or completely by hand or fingers. The hook grip is a form of power grip still used by rock climbers. The precision grip, in contrast, is a hold position with fingers and thumb in opposition, and is "non-prehensile" since it is manipulation but not grasp of an object. Mary Marzke classifies three types of grip as pad-to-side, three-jawed chuck and five-jawed cradle. She identifies eight features of a human hand. Marzke calls for expanded use of a palm in identified grips relative to hands of apes and monkeys. The thumb is not thought so important initially as it is now in retrospect. Features of the hand she identifies include a longer thumb, wider fingertip pads, thumb muscle modification and long flexor, and metacarpal and wrist bone changes. Pages 130-138 of the text provide graphic illustrations and photos of Marzke's analysis. The variety of object size for gripping must allow for thumb movement combinations like flexion, extension and others, achieved with eight or nine thumb-attached muscles that are necessary to get a firm grip on the desired object.

Building on theories

Man evolves over millions of years to reach the point of Homo sapiens about 100,000 years ago. Wilson identifies several aspects of evolutionary change that are based on specific characteristics scientists have interpreted to be theories of evolution. These theories are results or observable output of studies that build upon one another to reach man's current condition. Specifically, the cumulative effect of these evolutionary learning blocks has become integrated into the current existence of modern man. Wilson identifies several evolutionary theories as specific, effective and representative of learning and communication.

Wilson's first identified theory of evolutionary change is Robin Dunbar's theory of brain growth, language and intelligence. This theory accounts for increased brain size from Lucy's 400-500 cc to Homo sapiens 1300 cc. Dunbar correlates neocortex or brain size with group size and finds that tribes up to 150 individuals have members with larger brains. Presumably a larger brain is required for more complex activities and Merlin Donald's theory of cultural and cognitive evolution confirms that. Donald claims the human brain develops in a three-stage process of behavioral differences between human and other animals. Donald's theory claims humans do not just grow larger

brains, memories and speech but need the larger size to represent reality in a new way. Henry Plotkin proposes a theory of intelligence as secondary heuristic that claims knowledge refers to a state in relation to the world. The heuristic or learning experience leads to discovery that is practical, conservative and radical from integrating new components.

Another group of evolutionary theories that Wilson identifies is the Gallaudet University proposed "continuum of communicative movements" with four levels from the primate display of aggression, iconic hand gestures like an "L-shape" to represent a gun, cultural gestures like getting a waiter's attention, and fourth-level gestures like American Sign Language signs or code as language and "discrete combinatorial system" or ability to put words together in a chain or cluster, like tree branches. Chomsky identifies two brain tasks an individual must do to speak language: sorting through "brain noise" to associate, label and compare signals in a code without losing correspondence of internal and external events. For example, a shopper has an idea of what they want and compares what is available in-store to match or replace what is in mind while in the store or when back at home through a process called "mentalese." Vygotsky claims a brain treats words like real objects by putting them in groups or clusters to show logical connections in the mind. This thought-language nexus develops into hand-thought-language nexus when the hand becomes an alternative to vocal expression and develops "praxis" or skilled use. Plotkin calls human language and music examples of secondary heuristics that exist everywhere in society and are useful to humans and affect psychomotor development to preserve and enhance life. Robertson Davies claims "the hand speaks to the brain as surely as the brain speaks to the hand."

Style

Perspective

Frank R. Wilson is a graduate of New York City's Columbia College and the University of California School of Medicine in San Francisco. He is a neurologist and medical director of the Peter F. Ostwald Health Program for Performing Artists at the University of California, School of Medicine. He begins this book during a sabbatical year in the department of neurology at the University of Düsseldorf, West Germany. Wilson's exposure to patients with symptoms of "musician's cramp" makes him aware of the difficulties sculptors, carvers, and surgeons experience.

Wilson's mission for this book is to expose the "hidden physical roots" of human capacity for passionate, creative work. He discusses anthropological, evolutionary, biomechanical and physiological features as well as neurobehavioral and developmental perspectives. The author's underlying thesis is that people are innately resourceful, curious and willing to explore and learn over time and experience to become skillful and thoughtful.His purpose with this book is to make a valuable contribution to that effort. He claims the unique structure of the hand and its evolution in partnership with the brain makes modern man, Homo sapiens, the most intelligent animal on earth.

Tone

Wilson's "The Hand" is a thoroughly researched, referenced, footnoted and well-written expose of the hand's development over millions of years. The author's voluminous research is supported by an appendix, endnotes, bibliography and index and is written in an objective tone but offset ironically with subjective stories of friends' experiences. For example, he tells the story of friend Jack's hot cars to illustrate elements of Reynold's heterotechnic cooperation process. Other examples are chef Reed's kitchen warrior skills and jeweler George's success at adapting to severed fingers. The wide breadth of Wilson's experience, knowledge and writing presentation is a bit rambling for casual readers. Some areas of discussion are pertinent and clearly presented, but others seem to stretch a point. For example, his example of the crane operator and configuration contribute to understanding hand-arm-shoulder structure, as does his marionette strings example, but Hearon's chef experience and a primate buffet in treetops seems far-fetched and distracting from Wilson's stated mission and tone of the work. Distracting examples may be interesting but are confusing and make reading a book of 400 pages laborious.

Structure

This 400 page book with a 1998 copyright is comprised of Acknowledgements, Contents, Prologue, fifteen titled and numbered Chapters, Epilogue, Appendix, Notes,

Bibliography, Permissions Acknowledgements and Index. Interspersed throughout the pages of text are photographs, sketches, cartoons and sayings that depict concepts and notions found in Wilson's writing. Chapters are numbered from 1 through 15 and range in length from 11 to 28 pages. Each chapter is titled with a descriptive, euphemistic or metaphoric saying. For example, the first chapter is "Dawn" and the sixth is "The Grip of the Past" followed by "The Twenty-Four-Karat Thumb." There is a four page Appendix giving tribute to Sir Charles Bell and John Russell Napier, both of whom have previously written books with the same thesis: "the hand figures critically in human cognitive, physical, and emotional development." The 50 page Notes section has extensive endnote source detail by chapter and page, followed by 10 pages Bibliography and 17 pages Index by subject or person.

The format of Wilson's non-fiction study of "The Hand" provides for a casual, somewhat humorous and light-hearted read that is nonetheless chockfull of academic research. For example, Chapter 14, "Hidden in the Hand" is an ironic euphemism for a chapter that compares the skillful fiberoptic tool cutting of a wrist by a microsurgeon to the sleight of hand used by magicians. Content of each chapter roams far and wide, like Wilson's notes about Greenfield's study titled in part "The Ontogeny and Phylogeny of Hierarchically Organized Sequential Behavior" that he uses to introduce the chapter on his friend Jack's hot rod racing cars. The author's style of offsetting extensive academic references with simple stories about chefs, hot-rods and a jeweler that cuts off his fingers keeps a casual reader wondering what may appear on the next page. An unknown tale of the hand and cultural humanity of man comes to life in this format of "The Hand."

Quotes

"The word 'passion' describes attachments that are this strong. As I came to learn how such attachments are generated, it became the mission of this book to expose the hidden physical roots of the unique human capacity for passionate and creative work. It is now abundantly clear to me that these roots are more than deep and more than merely ancient. They reach down, and backward in time, past the dawn of human history to the beginning of primate life on this planet," p. 6.

"Washburn quite specifically insisted that the modern human brain came into being after the hominid hand became 'handier' with tools, maintaining that the brain was the last organ to evolve. It is a daring idea, one which requires us to look very closely at the evolutionary background of this hand, and at the changes that brought it its present anatomic configuration and functional capabilities," p. 18.

"This change by itself was nothing but a mutation until its utility gave it the status of an adaptation. Absent what preceded it, surrounded it, and was still to come, it would have been neither burr nor spur. But with the advantage of hindsight, we can guess that events following this anatomic change conspired to produce a second iteration of Plotkin's secondary heuristic: 'manual intelligence,' or just plain 'hand smarts,'" p. 59.

"The muscles that move the scapula, and those that run from the scapula to the humerus and the elbow, orient the shoulder and upper arm in advance of active movement, maintain whatever orientation is necessary to support the acting hand, and contribute to subsequent active movements of the hand by rotating or deflecting the humerus," p. 73.

"Thanks to the genius of scientists like Herophilus and Bell and Sherrington, we now know that the neuron is not just a string but a lifeline to and from the spinal cord and brain. It neither pulls on muscles nor inflates them but, rather, sends the instructions and receives the reports required to balance the contractions and relaxations on which coordinated movement depends. Thus, thought becomes action, and action becomes thought," p. 94.

"That's the kind of thing nobody can tell you. You have to learn to be a performer by working with audiences. You can be very good when you're young, but you're not necessarily a performer then. I could have done all this ten years ago, but I would never have enjoyed performing the way I do now. I know people want to see something, but first of all they want to see somebody who is having fun, who makes it interesting as well," p. 109.

"When you work with a horse, your hand is what controls the whole horse. Horsemen talk about people who have 'light hands.' You can guide a horse and communicate with a horse through a very delicate hand. You can build trust with your hand and your touch more than you can with any amount of whipping or yelling or anything else. There is tremendous power there," p. 117 .

"Articulated hand control is a recent accomplishment of the entire evolutionary experience of the primate upper limb and as clear an example of functional revision through the distilling process of selection as one could hope to find," p. 129.

"The last of these specialized area of investigation, kinesiology, yields the central question about handedness: how much do we know about the specific movements associated with tasks assigned to, or performed best by, the left and the right hand on one-handed and bimanual tasks? The answer is: almost nothing," p. 157.

"Aborigines are not simply 'jacks-of-all-trades with crude stone tools.' In deceptively primitive working conditions they actually demonstrate all of the basic principles of modern manufacturing: 'task specialization, symbolic coordination, social cooperation, role complementarity, collective goals, the logical sequencing of operations, and the assembly of separately manufactured parts,'" p. 171.

"Language is built more like a tree, with limbs whose branching patterns support clusters, or subassemblies, of words. Words, therefore, are logically related to one another not on the basis of their order or proximity to one another in a chain, but on the basis of their association with specific branches. Think of a real tree," p. 187.

"Whatever you can do with your hands gives you a small world that you can actually cope with, as opposed to the big world, where perhaps you can't. I think this interest in small things explains my habit of observing people in a certain way. I am sure my sensitivity to outcomes has to do with being very insecure and easily intimated as a kid. That feeling leads you to watch other people's faces carefully as you speak to them," p. 219.

"Chefs in the modern world have to be both strong and imaginative: kitchen work requires herculean physical endurance and absolute psychological indomitability; second, survival demands a killer instinct in the business world (the ability to get more than turnip juice out of a turnip, in other words); third—and this is the only attribute the public consistently pays for—a winning presentation demands a keen eye and a solid feeling for theater and ritual," p. 233.

"The gist was that Feldenkrais had discovered that certain movements, done gently and in particular sequences, would lead the person doing them to a heightened sense of what the body was doing, the mechanics of getting from one place to another. Eventually, with practice (by doing movement 'lessons'), the person could learn to move more smoothly, efficiently. and, indeed, pleasurably," p. 243.

"Prestidigitation is from a French word meaning 'quick fingers.' A prestidigitateur was a person who performed magic. The person who coined the word did so because he did not like the connotations of the word 'magic,'" p. 267.

"In ascending order, the tools found in every society are somatic, mythic, romantic, philosophic, and ironic understanding. These different kinds of understanding imply a progression of human capacity for thought," p. 285.

Topics for Discussion

Identify, list and describe characteristics associated with the four anthropological reference dates up to and including Homo sapiens.

Explain and discuss the significance of Robin Dunbar's proposed theory of brain growth, language and intelligence. Explain how it might affect tribe size.

Identify elements and describe Wilson's crane operator metaphor. How does the crane help to understand movements of the arm?

Identify and describe how marionettes can be a useful tool to describe human muscle movement. What are the significant parts and how are they connected?

Identify and describe characteristics of juggling that made it fit Serge Percelly's career experience as a tennis player. How do they fit a mind-body dichotomy?

List, describe and discuss the distinguishing capabilities of a pianist's hand and that of a rock climber. What have you done to show the capability of your hand?

Describe and discuss three types of grip defined by Mary Marzke. How have you used any of these grips?

Identify, list and describe at least five uses of the hand for social interaction and attention. Which ones have you used for what purpose?

Identify, list and describe how pods, polypods and polyliths are different. How do they fit "heterotechnic cooperation" and complex tool manufacturing?

Explain, describe and discuss the "continuum of communicative movements." How does ALS fit on this continuum?

Describe and differentiate ChomTur and BachTur. How are they significant?

Identify and describe Wilson's characterization of the chef as kitchen warrior.

Identify and describe the healing characteristics of Feldenkrais. Describe and discuss whether you think the method works and give reasons why or why not.

Describe and discuss three characteristics that magic and medicine share.

Describe and discuss the three educational goals that Kieran Egan writes about in "The Educated Mind." How have you seen these goals active in your life?