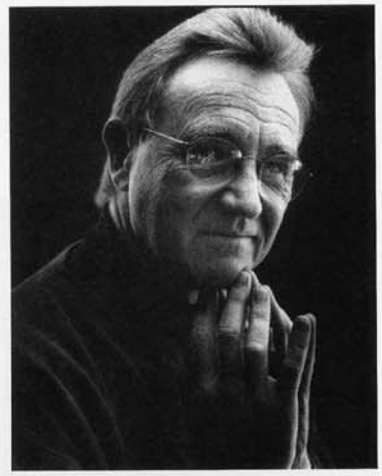
INTERVIEW

Frank R. Wilson

by Dana Standish



Frank R. Wilson, 1999
Photo: David Powers

Frank R. Wilson, M.D., is former medical director of the Peter F. Ostwald Health Program for Performing Arts at the University of California School of Medicine, San Francisco, and an associate clinical professor in the university's graduate program in physical therapy. He is the author of *Tone Deaf and All Thumbs?* (Viking-Penguin,1986) and *The Hand* (Random House,1998).

Dr. Wilson's research has focused on the neurologic and anthropologic foundations of manual skill, an interest that grew out of his clinical work seeing musicians with musculo-sketetal problems His book, *The Hand*, explores the relationship between the hand and the development of the human brain, culture, and language. It is Dr. Wilson's claim that the unique structure of the hand contributed to the development of the brain of Homo sapiens, which allowed them to evolve into the dominant animal on earth. Dr. Wilson and his wife, Pat, recently retired to Portland, Oregon. *Metalsmith* caught up with him after a lecture at the Northwest Jewelry and Metals Symposium in Seattle.

Dana Standish: When you decided to study neurology, did you have an interest in the hand, or did that interest develop later?

Frank R. Wilson: I didn't know whether to go into neurology or psychiatry. Then I decided that I was really interested in language, about how ideas take shape. Whether in sign language or writing skills, the hand is tied up with communication. But my interest in the hand as a functioning object started in the late 1970s. Our daughter was around 12 years old and she was taking piano lessons. At one point when I was watching her play, I realized she was doing things with her hands that were simply incomprehensible to me and I thought that as a neurologist I really ought to know how that happens. That realization framed itself in this question: how does she make her fingers go so fast?

DS: And that led you to work with musicians and artists?

FW: That interest evolved over a period of a couple of years, when I started seeing musicians as patients. And it took me about 10 years before I realized that there was something happening in front of me that I had profoundly misunderstood. I was seeing people who said, 'Look, Doc, I've got a hand that hurts and I have a concert on Friday night, nobody else can fix it, can you help me?' I took that at face value, that it was my job to fix the hand and get the person back on stage.

DS: What was really happening?

FW: After lots of frustration I came to understand that in many cases it appeared that the body had initiated some resistance to the career. I began to discover that many of the people I was seeing were fundamentally unhappy. I saw that many of the musicians who were very good had started when they were quite young and they had been unconsciously propelled by the people around them who didn't understand that just because you can make your fingers go fast doesn't mean that that's what you want to do for the rest of your life.

DS: If metalsmiths want to keep working on a small scale for the duration of their careers, are there any ergonomic concerns they should be paying attention to so you don't see them later on with hand injuries?

FW: You shouldn't use tools that make your hand feel uncomfortable. This is generally true of anything, whether it's typing on the keyboard or shoeing horses or cutting somebody's hair. You can't continue to learn, to improve, you can't soldier on if what you're doing as part of your routine causes your body to hurt.

There are other considerations as well: in addition to the point of contact between the hand and the tool, there's also the fact that there's a lot going on in the arm and the shoulder and the neck, so sitting posture, general health, muscle balance, levels of hydration, and a big thing—anxiety—those are all things that have to be looked at.

DS: Can you describe the earliest tool-using hominids?

FW: A lot of our knowledge is based on the evidence from the skeletal structure of the fossil, Lucy, who lived about 3.25 million years ago. Lucy was an australopithecine. She was probably the only existing hominid in Africa for as many as a million years.

DS: What could Lucy do that the others couldn't do before her?

FW: Mary Marzke is the anthropologist who has done most of the work on Lucy's hand. What she found was that there were several major changes. First of all, the thumb was longer in relation to the rest of the hand than it had been earlier in any nonhominid member of the ape family. Marzke was able to determine that the index and middle fingers were capable of rotating slightly around the long axis so that you could make a tripod, or what she called the "three-jawed chuck."

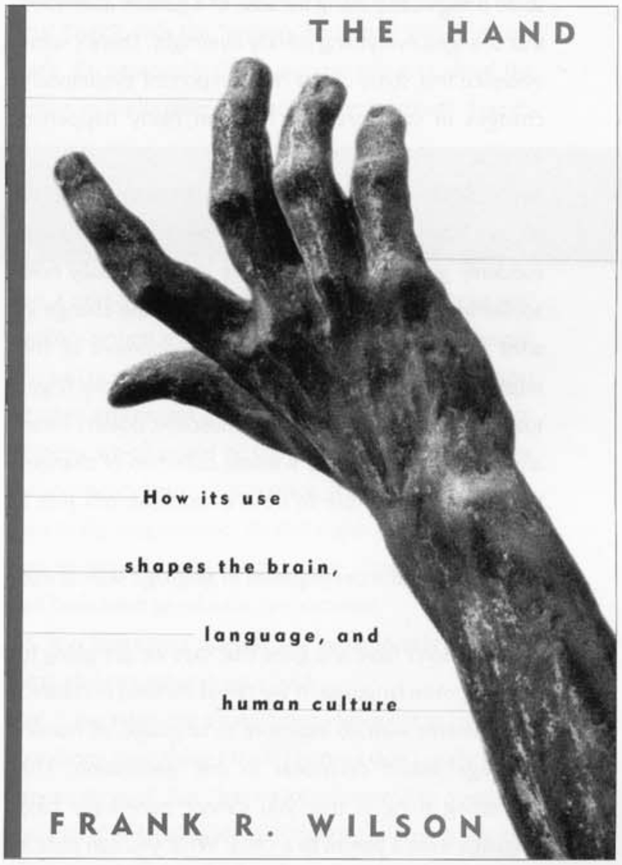
DS: Could Lucy have held a hammer?

FW: Lucy could have held a hammer, but she would have held it in a different way. Lucy did not have the movement in the hand that would allow her to have what we call a power squeeze grip. That's the tennis racket, hammer, and golf club grip of the hand.

Some time after that, probably within about a million years, the first *homo* species, called *homo habilis* or the "handy man," was holding the stone in one hand while knocking at the edge of it with another stone. The first stone tools were made that way. The ability to manipulate the stone in the hand probably was present in the hand by about two million years ago.

DS: Was this a gradual occurrence, when hominids discovered they could use tools, or was it some sort of a defining moment?

FW: There are lots of little moments that lead you toward a branching point where beyond that branching point everything is different. The branching moment came when everything was in place in the hand, tools were being made, stones were being thrown, probably sticks and other shaft-like objects were being used for the purpose of clubbing. So there was now a practice that was widely disseminated through this whole species that boiled down to: we defend ourselves with our hands. Implicit in that statement is that the movements of the hand and the strategies with which you employ the hand really are dependent on a nervous system that collaborates with the hand, that's wedded to it and that grows up with it. That's a critical issue that people need to understand—that it's a system, and the system grows up over time and continues with experience.



DS: Is the thumb an example of form follows function, or is it the opposite?

FW: I'm not sure it's fair to take a question from the Bauhaus movement and turn it into a question about how evolution works. It's a chicken and egg question, and I think that with enough time and with tiny incremental changes, form and function interact, and it turns out that combination A is more successful than combination C. It's like when you work in art. You assemble something, and you try this version of it, and it really doesn't work. That's how the Eames studio worked. If a design was lousy, they tried something else, and they literally set up experiments to think of how many different ways they could do something. That's how evolution works, that's what evolution really is. You try this idea in the real world, and either it works or it doesn't.

DS: But did our thumb develop so that we could hold tools or could we hold tools because our thumb developed?

FW: There's always been a big argument about this in evolution and the person whose name is associated with this is Stephen Jay Gould, who wrote about what is called "punctuated equilibrium." That is, in fact, things can happen quite abruptly. Most Darwinians say that everything happens by little tiny bits and pieces and over a long enough period of time you can come gradually to a fork in the road. Gould would say that it is perfectly possible that just bang out of nowhere, out of the blue, some design came along because of a genetic aberration that changed everything literally overnight. There's some evidence that some of the really important evolutionary changes in structure and function really happened like that.

So the answer to your question about the thumb could be, we were able to make tools because the thumb suddenly got longer and we were able to actually hold something, but we also know it involved the change in wrist bone structure, it was the development of the muscle that makes it possible to rotate the pinky finger toward the thumb. Without that muscle, it doesn't mean anything. There's actually a whole collection of changes that make it possible to hold a hammer, not just a single change.

DS: How does the development of language skills fit into all this?

FW: We don't have any gene that says we are going to have a spoken language. If we raised children in isolated environments with no exposure to language, all human language would disappear in one generation. The interesting thing is that you cannot genetically pass language from a parent to a child. What you can pass is the capacity to hear, the capacity to articulate, the capacity to join the perceptual and motor system together in a way that's so compelling that kids learn language beginning at the age of about one at an unbelievable pace. And it's laid down so profoundly that you can always tell where somebody was born, because they carry the accent, the dialect, of the people who taught them in the first place.

DS: Is this true of sign language as well?

FW: It turns out the same is true of sign language. Sign language has dialects, it has accents, and when people have brain damage, like a stroke, they demonstrate exactly the same deficits in speech output that speaking people do. So the language capacity of human beings has nothing to do with the input or output. It can come in the visual channel, it can come in the auditory channel. It turns out that with people who don't see or hear, such as Helen Keller, it can come in through the hands.

DS: What is the relationship between visual ability and the use of the hand?

FW: It is thought now that in our normal ongoing adult visual behavior we are using multiple visual systems at the same time and each one of them attracts our attention under very different kinds of circumstances. The people who put stuff on television and video games have already figured this out. They take the most primitive circuitry that exists in the human visual system and they drive information into that system by producing stimuli that come in via the periphery. It's very close to what happens to any animal that is living in the branches and swinging between trees where you have to be able to know exactly how to maneuver through a very complex environment in which things are coming at you from the side and from above.

DS: How does this affect children's ability to learn?

FW: No one really knows what effect it has on children to be exposed to images that are coming in ways that they have no control over. If you were to pick up a ball, for example, and turn it in your hand to look at it, you're actually controlling the way information is acquired and presented to you. That's not the case in video games. So the result is that we've now got younger and younger children whose brains are being bombarded with a visual world that for all practical purposes is like the visual world that existed for our ancestors 10 or 15 million years ago. It's a world full of emergencies.

DS: In your book you talk about the importance of manipulating tools and objects, and of learning how to put things together. What repercussions does it have for the development of intelligence if one does not have these manual experiences?

FW: One of the questions that I've been asking the psychologists and people working with this is, "What is the effect when children are not encouraged to sit quietly with objects and move them around, or to look at a book and go back and forth between the picture and look for the word that goes with that picture?" It may turn out to be totally irrelevant, but it's worth asking the question: if children lack language training and exposure and the chance to experiment—reading stories, telling stories, etc.—if a child's mouth were taped shut and you just played cacophonous sounds in music and heavy metal into a child's ears, what would happen to their brain? How would they develop? We don't know.

If you take a musician and send her off to some island where she only plays music and then bring her back at the age of 30, how good is she going to be at making her way around New York City? Young musicians are often trained in highly sheltered environments rather than fully educated, and end up having to have someone hold their hand and walk them around, take them to the concert hall and do things for them because they just can't manage all that on their own. You can't do that experiment with children. You'd never get the approval of an ethics committee. But this is being done on a massive scale every day around the world by people who are recruiting psychologists and software engineers to develop programs and visual entertainment that so captivate children that they have no ability to pull themselves away from them.

DS: Many people spend a lot of time looking at the computer screen instead of working with their hands. I gather from your book that the part of our brain that forms ideas and anticipates cause and effect relationships and that imagines an object in its finished state (in other words, imagination) is not being developed when we stare at a screen.

It has taken me a long time to learn not to try to tell everybody everything I think I know.

FW: I have some reservations about saying the "part of the brain that." There are some things about specialization of function that we know about from Stephen Pinker, a very distinguished neuroscientist at M.I.T. He's written an important book called *The Language Instinct*. In the book he tells about people who have developed language loss, where they can't say anything except the names of vegetables, and so he asked the question: is there a part of the brain that's specialized for vegetables, is there a greengrocer section of the brain? The answer is no. We don't really understand exactly why that happens. But we do know that there are certain very complex functions of the brain like language that are critically dependent upon the normal functioning of very restricted areas of the brain. So in that sense we can say that there are specializations. But, to use the example of a racecar, if you cut the gas line, the damned thing will shut down. It also will shut down if you disconnect the carburetor. So there are many systems within this very complex system upon which its normal function is dependent immediately.

DS: One of the most simple and fascinating things in your book is the phrase that "brain is hand and hand is brain." Could you explain that for people who haven't read the book?

FW: There's a Robertson Davies quote from *What's Bred in the Bone*, "The hand speaks to the brain as surely as the brain speaks to the hand." And because these communications are literally instantaneous and because they change over time, it really becomes a system as though it had been programmed genetically to function that way. That's what Henry Plotkin writes about, in his book called *Darwin, Machines and the Nature of Knowledge*. He talks about what he calls "heuristics." These are learning devices. The primary heuristic is not only the physical structure you're born with, but the time sequence plan. It says there are things that are going to happen at a certain time. At age one, the child is programmed to reach out and extend its legs and stand up. Once they do that, they've learned something. That's what Plotkin calls the "primary heuristic." Which means that's it's genetically there and it's going to drive the system in predictable ways to do certain things. There's also a primary heuristic that says that your tongue and auditory system and your eyes are going to follow people and you're going to pick up speech. But it doesn't tell you whether you're going to pick up French or Spanish or Chinese, which would be the secondary heuristic. Once the secondary heuristic is in place, it behaves as if it were genetically programmed. It's that stable. You don't forget how to ride a bicycle. Once you've done it, it might as well have been genetically programmed.

DS: It is interesting the way you've been able to pull all these ideas together in your book.

FW: It has taken me a long time to learn not to try to tell everybody everything I think I know. I don't really know very much at all. But I have a lot of interesting questions and a lot of interesting ideas. What I try to do is to ask, out of all this stuff, what's the thing that interests me the most? And then I just home in on that.

DS: Could you sum up how working with your hands leads to the development of intelligence?

FW: Let's just say that working with your hands leads you to ask many questions. It's like [industrial designer] Ralph Caplan said in his book *By Design*: "design is a problem solving process that begins with being a human being." ⌧

Dana Standish is a writer living in Seattle, Washington.