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This interview transcript has been edited by BW for clarity and concision. It has been approved by the interviewee.

Bernard Wood (BW) and Ralph Holloway (RH)

BW: Ralph, for the record could you please tell us your name? I know you are retired, but what was your affiliation before you retired?

RH: My name is Ralph Holloway. I am an Emeritus Professor at Columbia University in New York.

BW: Where did you spend your childhood? And tell us about your parents and family?

RH: I spent my childhood in Philadelphia. My mother was a secretary, and my father was very skilled at drafting; he drafted designs for major companies. My dad graduated from the Wharton School at The University of Pennsylvania in 1931, when the Great Depression was at its worst. He was never able to use his degree in insurance. There were no jobs. People were jumping out of windows, not buying insurance.

BW: Did you have any brothers and sisters?

RH: No. I was their only child, but I had a half-brother from my mother's first marriage.

BW: Where did you go to high school?

RH: I went to a public high school in southwest Philadelphia, named after the botanist John Bartram.

BW: Were you a good student?

RH: Fabulous!

BW: Well, that goes without saying! What did you want to be when you grew up? If I took you back to the age of 10 and asked you that question, what would you have said?

RH: Some kind of scientist. I liked metals, and I wanted to be a metallurgical engineer. By that age I had memorized the periodic table. I really enjoyed that sort of thing. Much later I was offered a summer position, so I was able to go to Baltimore and work with the American Stainless Steel Corporation. They let me loose and said you can do anything you want to. I told them I was interested in how low temperatures effect the structure of stainless steel. They let me play around with liquid nitrogen and so forth. It was just a wonderful experience, and I even wrote a report for them about the effects of low temperature on stainless steel.

BW: Where did you go to college?

RH: I went to Drexel Institute of Technology, where I majored in metallurgical engineering. But my family moved to New Mexico, so I transferred to the University of New Mexico.

BW: What did you do after graduation?

RH: I graduated in 1959, when the oil business was really hurting. So I worked as a roughneck in the oil fields because even with a degree in geology I couldn't get a job. I had an aunt in Los Angeles, so I just drove out there and I enrolled in Los Angeles University. I took a course in engineering and one in human evolution. I really fell in love with anthropology and I dropped the engineering! At the time I was struggling with religion and everything else, but after being exposed to anthropology I had this sudden epiphany. I'm free, I don't have to worry about religion anymore, and I can do whatever I want, I wanted to do science of some kind.

BW: What came next?

RH: After I finished at the University of New Mexico, I had a job or two that took me out to Los Angeles, and for a time I worked as a metallurgical engineer for Lockheed Aircraft. And then I somehow got to the Bay area, to Berkeley, where I once again became enamored with physical anthropology, and with neuroanatomy.

BW: You applied to go to graduate school at the University of California at Berkeley, and you were admitted to work in the anthropology department. How did you come to have Sherry (Sherwood) Washburn as your advisor? Who else was working with Washburn? Russ Tuttle?

RH: Yes. I think so. Washburn wanted me to become a primatologist and study baboon behavior, but I didn't want to do that at all. I forget the exact semester, but we were going through the courses I wanted to take, and I said I wanted to take a course in neuroanatomy by Marian Diamond, he said "no, no, no, you can't do that." I said "I'm sorry, I'm going to take that course!" and his response was "if you do, I will no longer be your advisor." So that's how I came to have Ted McCown as my advisor!

BW: McCown was more accommodating?

RH: Oh yes. Very. He didn't know anything about the evolution of the brain, but he was open to anything. It was just a wonderful contrast to Sherry Washburn, if I could put it that way.

BW: I've heard that Ted McCown was a good man who was willing to help. When did you finish your thesis, and what was the title?

RH: End of 1963, early 1964? 'Quantitative Relations in the Primate Brain.'

BW: So, you had a PhD from the University of California at Berkeley. What did you do next? Or what did you *want* to do next? Were you looking for a job, or were you looking for a post-doc?

RH: I wanted a teaching position. I applied to various places, and Columbia University offered me a job. At that time there was a four-field approach in anthropology at Columbia. I had met Robert Murphy at Berkeley, we had fun together, and he told his colleagues that he knew a person who would be a great addition to the faculty. I ended up with an offer and I took it!

BW: So, you went straight from being a PhD student at Berkeley to being an Assistant Professor at Columbia. Who was in the anthropology department at Columbia then?

RH: In addition to Bob Murphy, there was Marvin Harris and Morton Freed. I've forgotten the name of the archeologist.

BW: You were *the* biological anthropologist! How and when did your interest in paleoneurology begin?

RH: I think it really began when I was awarded a Guggenheim Fellowship, and I used it to go to Africa, to Kenya and then to South Africa. When I was in South Africa, I met Tobias and the people in his department. After looking at the impressive comparative collections in the Anatomy Department at the University of the Witwatersrand, I became very interested in the problem of symmetry. I studied the collections looking for petalias and other evidence of asymmetry. When I saw the original Taung endocast I was intrigued by it. Arthur Keith had questioned whether the skull was as advanced as Dart had claimed, but when I looked at the original I thought, by golly, I think Dart was right, and concluded that the lunate sulcus is posterior because of expansion of the parietal. Before I wrote my thesis, I thought paleoneurology was impossible because endocasts could only tell you about volume, but going to South Africa changed my mind. That's how I got interested in paleoneurology.

BW: There are not many people who can claim they started and enabled a sub-discipline, but you did. People like Dart were commenting on endocranial morphology, but you made it your focus. How did the notion that you could pour a small amount of liquid latex into the cranial cavity, swirl it around, wait for it to cure, pull it out, and then use it to make a positive endocranial cast, come to you?

RH: I didn't invent that technique, but I forget who did. It appealed to me, so I tried it out first on some of the monkey crania we had in the Columbia anthropology department. Then I tried it out on individual bonobo, chimpanzee and gorilla crania, then on the bonobos in Tervuren in Belgium.

BW: You seem to view science as a very broad church that includes metallurgy and neuroscience. What are the qualities of Ralph Holloway that make him a good scientist?

RH: You have to be open to ideas. You also need to recognize that you probably have biases and you need to test those biases. I have also come to appreciate the value of repetition. You also need to reinvigorate yourself with new ideas. All these qualities apply to any topic. I'm enormously interested in astronomy. I keep wanting to get to the edge of the universe, peel it back and see what the hell was under there.

BW: You say you are open, but I get the impression you are also stubborn! How do you combine openness and stubbornness to make for a successful scientific career?

RH: Good Lord, man, I don't know!

BW: The people I know who have been your students speak very highly of your teaching, and how you have inspired them. Where does that come from? Did *you* enjoy teaching, or did you resent the time you spent away from research?

RH: I enjoyed teaching. In terms of large lecture classes that are over a hundred or so, I did those and could do it well. But what I really liked was sitting down with students, talking about research problems, and then encouraging and helping them do what they want to do. My experience with Washburn left a deep impression on me about the importance of freedom and letting a student do what they want to do, with guidance as necessary. But by and large, let them go and get into it. You can always advise them afterwards. I didn't like saying, you *have* to do this, or you *have* to do that. As it turned out, I think it was in 1985, when the department was going through hell with regards to the four-field approach, and it was questioned whether physical/biological anthropology would be a part of the curriculum at all. I remember walking out of the meeting resolving that after teaching the current biological anthropology course, I was not going to teach a large class again. So, I offered a class with only eight or 10 students, and never lectured the large class again.

BW: You joined Columbia, and you have stayed at Columbia. That road was a little rocky at times, but you never thought of abandoning Columbia? Did you not think that you could go and get a job somewhere else? People would've been happy to have you!

RH: Yes, I did think about that, but I had relationships here, our children were getting educated in private schools, and it would have been much too much to drop everything and go somewhere else and reestablish a whole life and so forth. I grew up in southwest Philadelphia and I'm very attached to it, and I wanted to stay fairly close to my roots. Another major piece was my first wife's people were in New York, and that was one of the reasons I took the job at Columbia.

BW: Do you have affection for Columbia?

RH: Yes.

BW: So, you stayed and just carried on doing your own thing. I'm not sure everybody could have done that. I guess this gets back to my question about determination, which some people may

call stubbornness. Do you think that was also important in your science? If you want to investigate something, you have to do it properly, and that means doing it the way you think it should be done, as opposed to the way other people think it should be done. You have your standards. Where did that determination come from? Did it come from your parents?

RH: Chromosome nine? I don't know.

BW: Your parents must have recognized this was an important part of Ralph Holloway's personality. What did they think of your career? I started as a medical student and my parents ran a grocery store, so they understood that to have an only son who was a doctor was a good thing. When I moved into paleoanthropology, my parents never understood what I was doing. Later in life, when my father introduced me to his friends, he would say "My son used to be a doctor. Now he doesn't have a proper job!" Did your parents appreciate you had a proper job?

RH: I think my dad was quite proud. My mother passed just after I got my graduate degree when I was writing my first papers in *Nature*. I think she was proud of me. And when I decided to major in anthropology, my dad asked me where I was going to get a job. He didn't really understand. He was the first person in our family to ever go to college.

BW: Thanks to my parents' support, I was effectively educated away from their world. Did you ever get that sense with your father, or do you feel he shared and appreciated your world?

RH: I think they were very pleased that I was going into engineering at Drexel Institute of Technology, and when I started going into the anthropology world, my father was a little shaken by it.

BW: What are you most proud? Is it the papers? Or the students you have mentored?

RH: Well, it is really broadening the field of paleoneurology and utilizing the fossil record to get information from the inside of the cranial cavity to say something. What does the surface of the brain tell you about the frontal lobe and Broca's area in terms of language? Those are the kinds of questions that have fascinated me, and I really enjoyed working on. I only had a couple of students who were interested in following my interests.

BW: Have your ideas about the importance of brain size changed over the course of your career?

RH: Early on I was skeptical about the importance of brain size, and more into the organization of the brain being more important than size. I was always struck by the range of variation in modern human brain size (900 to 2200 cm³; Jonathan Swift etc.), and that brain size by itself was not important. Yes, I was interested in terms of the change in brain size in the fossil record, and I was particularly interested in the possibilities that we really had to look at parental care as a major factor in the evolution of the human brain. As the brain got larger, it took longer to mature.

And if it took longer to mature, the help required meant there was a much closer social bond between the mother and father. It sort of spurred me on. I'm particularly interested in sexual dimorphism and how sexual dimorphism differed in species as we get closer to *Homo sapiens*. I really think social behavioral changes were very important, and I am not so sure brain size was, other than being a measure of the amount of social cohesion.

BW: I often think I'd like to put myself inside the brain of *Homo habilis* to see how it saw the world? You are much too good a scientist to do something like that! What other researchers do you admire?

RH: David Reich, at Harvard, who has been finding out about modern human genetic variation in populations across the world. I have a major interest in modern human variation, and I admire his book. And I admire John Tooby's work.

BW: If you were going to give career advice to a young person who was interested in paleoneuroscience, what would your advice be?

RH: I would say find a university where work is being done on comparative neuroscience, like Brian Hare is doing at Duke working on dogs. The relationship of variation within and among breeds to their behavior is one of the more fascinating topics out there.

BW: Do you have any regrets about your scientific career?

RH: I think I spent too much time on the debate with Dean Falk about the lunate sulcus!

BW: Ralph, how do you relax?

RH: I play trumpet and trombone, but I am missing a few teeth so I struggle to play more than an octave! I relax by reading thrillers; Robert Ludlum is a favorite. And I am interested in genealogy.

BW: What advice would you give young people?

RH: Follow your heart and what interests you, even if it means financial sacrifices.

BW: Have you changed as you have grown older?

RH: I am more tolerant of some things, and more intolerant of others!

BW: Ralph, thank you for finding time to do this interview, and thank you to your Tom for his help setting it up. All the very best.