

- Arjun: [00:24](#) Welcome to episode seven of Anthropological Airwaves. My name is Arjun Shankar, postdoctoral fellow at the University of Pennsylvania, and in this episode we'll hear from Ralph Holloway, Professor at Columbia University, and Shara Bailey, Professor at NYU, who help us dive into the current debates and dilemmas facing physical anthropologists. How do we study, for example, the evolution of the human brain? What is the nature of intelligence and how do we connect physical changes in human beings to social and environmental factors? What kinds of political questions come into focus under the methods deployed by physical anthropologists? For me, I think one thing that seems clear and especially useful is that by examining the extent to which humans manifest biological variability, or not, physical anthropologists engage with a number of debates regarding race, sexuality, and problems of othering. I think with that I'll pass it over to Volney Friedrich, graduate student at the University of Pennsylvania. Please enjoy.
- Volney: [01:22](#) Kind of jumping right into the first question, how do you study brain evolution?
- Ralph: [01:27](#) Well, I try and combine a number of approaches. My main focus is what is called paleo-neurology, and what this studies are the fossil remains and if the skulls are relatively intact, I can make cast of the inside of them and get some idea of what the brain is like or was like, just at least on the surface, but what I have to do then is combined that with studies of comparative neurology and neuroanatomy to find out how brains differ morphologically and what the differences in behavior might be that might be related to it. I also have to study archeology and know what the fossils who were living at that time we're trying to do or doing and so forth, and what I really do is basically try and synthesize the information from one set of that approach to the others so I can come up with some some better idea of how possibly the human brain evolved.
- Ralph: [02:25](#) There were probably a lot of important selective events that took place for brain size, but brain size. The whole issue is also how the brain is organized. I mean, yes, we're four times larger than a chimpanzee, but also the amount of gray matter, white matter distributions are different between the two species and so forth. How the different lobes of the brain might have been enlarged or made smaller during the course of at least primate evolution in certainly human evolution. So that's where this is famous luminant sulcus thing that I've been all these fits in because it's a marker for what is called a sensory cortex. Visuals, sensory cortex. If that cortex gets a little bit smaller, that means that the anterior parietal lobe gets a little bit larger. And now

we know that that has an awful lot to do with complex behavior patterns including social behavior, facial recognition, all sorts of things that fit into the aspect of, of what human sociality and human psychobiology are really all about. And then, you know, you look at stone tools and you begin to find that there may just standardized patterns. Well, you know, clearly it's surely not a genetic thing that's happening. You know, there's not a gene for the Ache-lean hand axe. And, so when you see that, that sort of suggests that there social consensus, which then leads you to speculate about language,

Volney: [03:54](#) I mean, I guess that leads straight into the next question, which is that human intelligence and language unites us as humans and separates us from other animals. What does the evolution of the human brain reveal about the story of becoming human?

Ralph: [04:10](#) First of all, intelligence is a, is a tough nut to crack on this. I mean, I tend to think of different animals having species specific attributes of intelligence. I would wonder if Bonobos, you know, understand flirting behavior more than do chimpanzees, for example. So what I'm, what I think more about what I've tried to think of human evolution. I tended to think, you know, maybe two and a half, 3 million years ago. These "hominins," well this can't be on your show

Volney: [04:42](#) Yeah, it's a radio show, but "air-quotes" [on hominins].

Ralph: [04:47](#) Yeah, they had to, if the brain was supposed to get larger, it meant that there had to be a time for which the brain could grow larger. It didn't start out larger. So that meant the lane, not infancy, but maybe childhood, maybe delaying the onset of adolescence. And what this means to me is that what natural selection really favor was a different social order, the different kind of social nurturance, nutritional and nurturance as well for offspring. Network going to remain helpless for a longer period of time so that the brain could grow. So now what I'm thinking of, you know, I had been for so many years is selection pressures on things. Things like grandparenting with the improved, better taking care of things. I'm thinking of task specialization.

Volney: [05:39](#) Right, because children require so much more time and effort.

Ralph: [05:44](#) Exactly.

Volney: [05:44](#) So maybe more than one person other than just the mother.

- Ralph: [05:48](#) There's that. So I mean the whole social element of associations is that a very different level, I think, than what you would find in a chimpanzee group or a baboon group. So intelligence is a part of this and certainly there must be some relationship between the size of the brain and what we call grossly intelligence, but it's a broad type of thing. To me, the brain size, while that's the most evident thing that you see in the fossil record, it increase. I think there's underlying that whole realm of social behavior, but we're just really beginning to get into and explore. I'm just trying to say, you also have to approach this, this area with some humility. The hope that I see for the future, however is in your realm and that is the neuro-genomics might be possible if the fossil record can be extended a little bit further back in terms of the genetics markers trying to be found. There's a good possibility that eventually we might find a lot more about a thing called strong signature. You know what I'm talking about?
- Volney: [06:55](#) The signatures that you can see reading things backwards, various deletions, insertions and repetitions that come up again and again.
- Ralph: [07:05](#) I mean, we're learning so much more from neurogenomics now. I mean, we're not learning how many genes it takes to be intelligent or anything like that. Okay, but genes associated with anxiety, genes associated with resistance, to stress and so forth are beginning to be elaborated as possibilities and so forthcoming with new studies.
- Volney: [07:29](#) Right. It's really also so dependent on our increased knowledge of the present population.
- Ralph: [07:35](#) Right.
- Volney: [07:36](#) When you say genomics is not just the DNA, but the epigenetics and which genes are turned on and turned off and then...
- Ralph: [07:44](#) Imprinting.
- Volney: [07:45](#) Imprinting and what's the effect of environment on biology and biology on environment.
- Ralph: [07:49](#) Right.
- Volney: [07:50](#) It becomes very complicated very quickly.
- Ralph: [07:52](#) So one of the of the arguments I've always tried to make is, if we want to know how the human brain evolved, we better

know how it varies. Right? Because that tells you what things you might look for,

Volney: [08:04](#)

Right? You can't look for what you don't know.

Ralph: [08:06](#)

No.

Volney: [08:07](#)

I mean we're kind of constrained by our own knowledge. I think the other question it also brings up is how much involvement you want to have with your studies beyond data generation, right? So you can generate data and you can say that there's statistical differences, but then everybody wants the story, like what's the story behind that that and how involved does one want to become in the path of that story because it can go from just, I can see a statistical differences to value judgments about what's better. Is faster maturation, better or worse? Like technically at the moment we're not seeing any such thing but. And it just, it depends, I guess how you would...

Ralph: [08:49](#)

Would you say something you have something like that then it's sort of mentioned, well, let me just back off for just a minute. I mean, one of the things I have never understood is why they don't teach statistics in grammar school... so that they get the idea of what a curve looks like, a distribution curve of some phenotypic manifestation or behavioral manifestation so that you see the damn thing and once you will find whether you do it for males and females or whether you do it for blacks or you do it for whites, you know you have this enormous area of overlap. Right? And now, all right, depending on the piece that you regard as important and you make a significant difference or not, but what it tells should tell you immediately is there is no way of looking at a person and knowing where they are in that distribution,

Volney: [09:39](#)

Right. About variability, it seems to be something that's obviously not controlled by any one thing, which is why we're talking about it in terms of curves and I think this is such a good example of how society and politics and culture kind of interact with the practice of research and science and that we're greatly impacted by it.

Ralph: [10:00](#)

So just look at what's happening with 23 and Me and Ancestry.com.

Ancestry Ad: [10:05](#)

Growing up, we were German. We danced in a German dance group. Lederhosen, when I first got on ancestry, I was really surprised that I wasn't finding all of these Germans in my tree. I

decided to have my DNA tested through ancestry DNA. The big surprise was we were not German at all.

- Ralph: [10:23](#) People are saying, you know, I don't know what I am anymore. I don't know what to put down on the census form.
- Volney: [10:28](#) Right, and like we were talking about identity, it's so important to people to identify with things that they practice in some way or perform. So in ways that you perform Irish American, which you know, turns out you're not very Irish American. What does that mean to you and
- Ralph: [10:47](#) It captures... so one ad shows you this woman who learns that she's from Nigeria. I was seeing this on TV. It goes out and buys the Nigerian headgear and so forth.
- Volney: [10:58](#) She looks very happy. I'm sure other people have been very upset.
- Ralph: [11:01](#) Some people are getting very upset.
- Volney: [11:04](#) I know that there've been white supremacists who have found that they have African ancestry and [ironically] that's when they become scientists, and start talking about statistics and about how I [the scientist] can't be right. Yeah. Talking about things happening now about how much identity plays a role in people's individual lives as well as social and political lives. How do you think anthropology plays a part in identity?
- Ralph: [11:26](#) Well, that's a really important part and still has an important part to play which is anthropology, is basically the study of cultural and biological variability and how that variability interfaces with actual environments, how changes of environment, and I'm not just talking about the weather, I'm talking about things like colonialism and you know what effects they might have had. An anthropology has always had possibility of being open minded and ready to observe that there has been biases well, that's part of human nature as well.
- Michio Kaku: [12:02](#) In the old days when we lived in the forest, there were enormous selection pressures placed on us to develop a large brain to understand how to use tools to run, to be able to navigate to survive in the forest. Enormous pressures on us because if you were not fit to live in the forest, you died and so your genes are not here today.

- Volney: [12:34](#) How are teeth and fossilized teeth used to study human evolution?
- Shara: [12:39](#) The question really should be what don't teeth tell us about human evolution? Because there's so much that we can figure out about the behavior of early humans at the Diet of early humans, about the biological relationships of early humans, all of those things, actually, all the questions that a paleo-anthropologist might ask, you can ask and answer or at least get data from the dentition. So some of the most recent work that's been done is actually extracting DNA from the calculus, which is the tartar, of course, the buildup that the dentist scrapes off your teeth every six months. I'm getting DNA from the plants and animals that fossil hominids ate, I mean, and that's really amazing stuff.
- Volney: [13:26](#) Great and wonderful because teeth are one of the things that survive the longest.
- Shara: [13:31](#) Yeah. They are about 97 percent mineral in content and so they preserve even better than bone. And in fact, most of, most of the fossils that we have more fossils are teeth, than they are bone. So we have more teeth than anything else.
- Volney: [13:44](#) Kind of a little bit of a transition, but there's been articles on fossil discovery is published in the Atlantic, New York Times, Newsweek, BBC, all over. Why do you think this kind of biological anthropology is compelling to the public?
- Shara: [13:59](#) Well, I think that humans innately want to know their history, right? And so for example, the research that I've been recently, part of the earliest modern humans from [Jebel] Irhoud.
- Volney: [14:13](#) Yes, I was definitely going to mention that because it's so exciting.
- Shara: [14:17](#) Yeah, that's really exciting because people want to know: when did we become us? Right? And so when did modern humans become modern humans?
- Shara: [14:25](#) And so this discovery pushed that back 100,000 years. So that's exciting for people and the Homo Naledi material that I've also been working on, although it's not homo sapiens, it's probably something that evolved in parallel to us. It's kind of interesting to think about, you know, that there are other humans around the same time. Essentially we were okay. And I, I presumed that we'll probably find things that are older, given that you find

well, given that you find, clear evidence of neanderthal ancestors from [indistinct] going back 400, 400 plus thousand years, right? Neanderthals and modern humans diverge 700,000 years ago genetically, you know, the morphology could have diverged even earlier than that. I think that were just innately interested in, in, you know, when we became us in and also where we alone or were there other human species at that time.

- Volney: [15:17](#) Right. And how we could have interacted or seen other species?
- Shara: [15:22](#) Right. If homo sapiens ever encountered them, did they see them as human or not right?
- Volney: [15:28](#) What is humanness versus anything else?
- Shara: [15:31](#) Yeah. Yeah, exactly.
- Volney: [15:33](#) Um, and with regards to that, how do you think that finding the earlier anatomically modern human changes or substantiate the story of human evolution?
- Shara: [15:43](#) We've always known that modern humans came from Africa. So these new fossils push it back another 100,000 years, but maybe more compelling or more interesting is the fact that they're not found in east Africa, right? So it suggests that the origin of modern humans in Africa was a pan-African event rather than just happening in one specific spot. So you can imagine, you know, the modern human chin evolving somewhere and the modern humans rounded braincase, evolving perhaps somewhere else so that these quote modern human features, they could evolve in different areas and evolved through a process of gene flow right and come together as we interacted with.
- Shara: [16:25](#) There's a lot of diversity in Africa, in the earliest modern humans. Philip Gunz and colleagues have shown that with the cranial remains, and I find that with the dental morphology to and morphology basically just means shape, but the kinds of things that you can study on teeth are the bumps and the grooves and the relationships between these bumps and bruises and how many you have and what they look like. And. And so for example, there are different human groups even recently, humans who have different patterns, different combinations of features. For example, people who have their ancestry in Northeast Asia, which includes native Americans, have a high frequency of ridges on the tongue side of their

tooth. Sometimes they have ridges on the lip side of their incisors. They also have higher frequencies of five cusps on their lower molars and things like that, but so you can find other groups with shovel shaped incisors, but that's usually combined with some other features. So it's the combination of features that distinguish human groups, and so we calculate frequencies of traits and we calculate patterns of traits and we can put them into statistical packages that tell us how closely living humans and also fossil humans are to each other based on the differences in their bumps and grooves on their teeth.

Volney: [17:43](#) People tend to take these especially like origin stories out of Africa or to talk about how there's a certain amount of unity, but then there's also a lot of human variation and people also use that to fuel or whatever agendas they might have. And how do biological anthropologists interact with that?

Shara: [18:01](#) I mean, it depends on what kind of anthropologists you are. If you're a forensic anthropologist, you're kind of required by law enforcement to tell them the "race" of an individual. Even though the American Association of Physical Anthropology has stated in their public statement that we believe that there's no such thing as discrete races among modern humans. So that's the tough one because the fact of the matter is, is there are extremes and variation and when you look at those extremes, you can get very good separation of geographic groups.

Shara: [18:38](#) You will never confuse a native person from Australia with a native person, whatever native European is, you know, but there's always been a gene flow between human groups and so there's never been discrete categories when I do my work, so I might refer to my European group or my, you know, Australasian group or my Subsaharan African group, because in let's say teeth, there are distinctive dental patterns from those groups. But again, as I mentioned, those are in combination of traits, not in presence or absence of traits. And it's the same way with every part of the body, you know. So you have to at least recognize that the humans are variable around the world. But probably half the time it's kind of, eh, it's hard and you have to say, I can't really tell. Yeah, that's, you know. Does that make sense?

Volney: [19:35](#) Yeah, I mean it makes absolute sense. So there's, there's just a ton of human variation. But again, there's all this overlap and yeah, I guess that's sort of reflected in, all throughout human evolution. It looks like when we're looking back at early humans

were there, you know, all of these different traits are coming together and, and it's looking just as variable then.

- Shara: [19:54](#) Yeah. I mean there's so much diversity within Africa. It's actually more than what you see outside of Africa when you compare groups, that's hard for people to get a grasp on.
- Volney: [20:04](#) Yes. I feel like even on evolutionary terms, and this is not very technical, that nature seems to preserve diversity for survival. Yeah, absolutely. Got to have different skills, different features. If anything changes, some organisms have to survive, so the ideal...
- Shara: [20:23](#) Well, they don't have to!
- Volney: [20:28](#) Oh right, yeah, we could go extinct like many hominins...
- Lauren Sallan: [20:28](#) By being here, listening, alive, a member of a growing species, you are one of history's greatest winners. The culmination of a success story 4 billion years in the making. You are here because of golden opportunities made possible by mass extinction. [laughter]
- Volney: [20:51](#) But in order to survive, there's got to be an organism that can deal with whatever new thing is happening.
- Shara: [20:59](#) Yeah. You know, we tend to think of at the level of the physical level, meaning our phenotype or what we look like, but a lot of that variation is something we can't even see. Right. You know, in my intro classes often people are interested in what is the diet we've been evolved to eat. They want to know like, well what were we evolved to eat meat or we've all the vegetables.
- Volney: [21:24](#) What's natural?
- Shara: [21:26](#) And, and it depends because for my ancestors, right, I have northern European ancestors, I have, I've evolved to drink milk, but most of the population in the world has not evolved to drink milk. Right? So for me milk is good, milk is right, but for other people, milk is bad.
- Shara: [21:47](#) So I can't say what you're evolved to eat, you know, I can say that probably what led to our survival as a species is our diversity and is our ability to adapt and eat whatever we have, you know, and the, and lactose tolerance, the ability to break down milk sugar has evolved independently around the world. So it's not just one mutation, it's occurred several times. She

had red hair, the red hair mutation in that we know there are neanderthals from Spain who had red hair and it's a different mutation than the red hair mutation in modern humans,

- Volney: [22:20](#) Although I'm not sure what advantage you get from having red hair, it could just be a random mutation. Not every mutation is advantageous.
- Shara: [22:26](#) Red Haired people are awesome. Everyone wants to mate with them. [laughter]
- Shara: [22:32](#) But the thing is, like, just because we can't imagine or can't think of it being an advantageous [trait] doesn't mean it wasn't.
- Volney: [22:39](#) Evolution is often like a double-edged sword where you get one advantage in one situation and then if it's a different situation, it's not.
- Shara: [22:47](#) Absolutely. But I think a lot of the evolution that goes on is, is, like I said, not at the phenotypic level, but at the genetic level and that's probably going on, certainly is, going on all the time. So we continue to evolve. You might not be able to see it necessarily on the outside.
- Volney: [23:02](#) Right. When people do the intro classes and they come from high school where they're kind of taught that evolution is progress... and, like there's some sort of point out there where we're going to be perfect and you have to go over that and be like, actually that's, that's not how evolution works.
- Shara: [23:19](#) Yeah. Yeah. On my darkest days I'm like, we're just, we're not even gonna be around that long because seriously,
- Volney: [23:25](#) Yeah.
- Shara: [23:27](#) You know, it's like a thousand years from now, probably not. Gone.
- Volney: [23:31](#) Well, I mean, what, nuclear weapons were invented 60 years ago? Like how long is our span for not pulling the trigger as it were.
- Shara: [23:42](#) So on my better days and like, well probably not everybody will die off, but maybe some people will survive. And then, we have no way to predict what their descendants will look like.

Arjun:

[24:02](#)

Thank you all so much for listening again, and I hope you'll listen into our final episode of the season, which is going to be a retrospective on the upcoming AAA meeting. Should be a really good episode. Until then, goodbye.