An Interview with Kenneth Aizawa

:: Hykel Hosni

Abstract

Hykel Hosni interviews Kenneth Aizawa, Professor of Philosophy of Science at Rutgers University, Newark.

The interview opens with Aizawa's reflections on the challenges currently confronting US universities under the second Trump administration. It then turns to a discussion of his forthcoming book, *Compositional Abduction and Scientific Interpretation: A Granular Approach*. Following a retrospective on Aizawa's academic trajectory, the conversation concludes with his advice for early-career researchers.

Keywords

Scientific reasoning, abduction, confirmation, philosophy of science, scientific inquiry, scientific practice, US academia.

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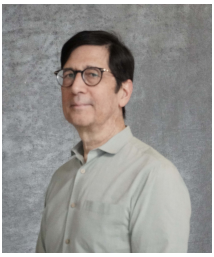
HYKEL HOSNI: You are currently Professor of Philosophy at Rutgers Newark. Staggering news arrives from the US on an almost daily basis. The attack on Harvard by the Trump administration is the most spectacular and recent episode, but it is just one in a very long list. Columbia was stripped of 400 million in federal funding on allegations of antisemitism. Many NIH grants have been terminated. Those are unprecedented political measures against US universities. How does it feel to work in such a climate?

KENNETH AIZAWA: It's a level of disbelief, I guess. Part of it is just, *can this be the United States where freedom of speech is under attack*? The rule of law is under attack. One of the engines of our economy – our science, our education– is under attack. And you know, our openness to people from other countries. Harvard might resist all these illegal things, but the message is getting out there that the United States is not a safe country. It's just not.



HH: It's a message Canada is hearing loud and clear

KA: I live in New Jersey, not far from Canada. It's just hard to believe that we could be at a place where we would not be welcome in Canada. In Canada! So, there is a level of disbelief that this is happening. Some things maybe we could resist. On the illegal things, maybe they will be stopped. Maybe they will be stopped by their incompetence. But there are certain things that you can't just put back in the bottle.

HH: Like the anti-immigrant sentiment?

KA: You just can't. It is here and it's not going to go away for

decades. And it's a really big deal. At Rutgers Newark we have lots and lots of international students. In my introductory classes, students will speak ten different languages. We have lots and lots of bilinguals. And you can just see that they might not come. And I can understand that. It isn't to fight anti-Semitism. It's just to harm universities.

HH: It's incredible that the US government is taking action that might not even be legal.

KA: They just *do* things, and then see if it's legal. They do all sorts of things just to drag their feet. The illegal deportations without habeas corpus are just astonishing. You might have seen the picture of the woman in Massachusetts who was just snatched off the street. It looks like that can't be the United States, right?

HH: I read that clinical trials involving non-US institutions are losing funding due to national security concerns, stemming from the idea that COVID originated in a foreign lab. Putting the rather questionable motivation aside, this will have a tangible effect soon on the US public health.

KA: Oh, yes. It's having an impact right now. There were people in these studies with medical implants which you now can't take out. You got someone with a medical implant that needs to be removed. It's just staggering.

HH: Presumably this will also have a long-term impact on how society perceives academics in the US, with more people questioning their relevance, importance, and integrity.

KA: This has been brewing for a decade. Sociologists have measured an uptick in Republican resistance to universities in the US. It was about 2015, 2016 where Republicans began to believe that universities were more of a force for the worse, than for the better.

HH: And the pandemic certainly didn't help.

KA: COVID was politicized and so people decided they didn't want to wear masks and the masking was associated with universities, so that probably contributed. Every now and then when someone finds out I'm a professor, they begin to ask, so do you have a lot of indoctrination there? You know that they're getting this message. And I live in a blue state!

HH: But why tearing down universities?

KA: Maybe they realise that there aren't enough conservative academics to replace all the others. So they're just going to blow it up. You might have heard of this New College in Florida. They fired all the liberal professors who didn't have tenure to make it a very conservative liberal arts college. They introduced sports and changed the curriculum so you know it's an America first kind of curriculum where you're supposed to learn about how great the United States is and things like this. So, they just did that.

HH: But they can't do that for everywhere, right?

KA: So, they're just going to blow up the rest of us.

HH: How far will this Administration go?

KA: As far as they can. They can hurt the universities, but they probably can't destroy us just by cutting off federal funding. In fact most state universities are run by tuition. That's why they're targeting research powerhouses like Harvard.

HH: And Harvard is fighting back.

KA: Harvard is on the ball. After they had this the international students block, within 24 hours or so, they had an extensive 72-page response. I mean, Harvard academics are educated, they've got a lot of money at stake, they've got a lot of resources at stake,

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so they can fight back. And it's good that they will.

HH: For US academia, but I guess, it's good for all of us. And on this note of optimism, let's switch to research now. Your latest book *Compositional Abduction and Scientific Interpretation: A Granular Approach* is to be published soon by Cambridge University Press. The readers of The Reasoner will find a very enticing sentence in the opening pages: "My project is to provide a descriptively adequate account of published scientific reasoning."

KA: Some people say science really happens in the lab, and of course it does. But my focus is on published research because science also happens in the publication record. There, you can find experimental work, opinion pieces, review articles, and textbooks. But I think the journal article is a central fixture in scientific research. It plays a distinct role.

HH: You mean the introduction, methods, results and discussion format.

KA: Yes, and that part where you explain your results. That's where you find *abduction*. The part where you say why you have these results, and you explain what's going on. That provides confirmation. I believe that abduction is confirmation, and the engine of confirmation is the interpretation of experimental results That's why I'm focusing in on that and why I look at that.

HH: Is this an idea of trying to understand why scientists believe that the data they have give them a finding?

KA: That is the idea. Why do they take away from their experiments what they take away? That's a core bit of understanding how science works. It may not be all of science, but it's a big part of it.

HH: After all scientists do experiments to form beliefs rather than

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knock them down.

KA: To me it is scandalous that for the last say 20 years, there hasn't been a theory that replaces hypothetical deductivism (HD). Almost every philosopher of science has heard of HD methodology. And they also heard that it doesn't work. But they don't have an account of what is going on.

HH: It's not uncommon for philosophers to theorise independently of how science works. What's puzzling is that scientists often buy into a 'textbook story' that differs significantly from what they actually do in practice.

KA: You have to separate out what scientists are doing from what they say they are doing. They may sometimes go together, but sometimes they come apart. But here's part of my story that occurs in chapter four. What scientists do *looks like* hypothetical deductivism. It really does. They have this hypothesis and they figure out some consequences and then they see if the consequences are really there. But in chapter four of my book I describe why I think is not what is going on.

HH: So, what you think it is going on?

KA: They're not deriving some sentences and then checking whether the sentences are true or not. What they're doing is that they have these hypotheses, and they're tracing out the physical consequences, not the logical consequences of those hypotheses in the world. Then they see if the physical consequences have taken place.

HH: So what scientists do looks like HD if one fails to distinguish logical and physical consequences of hypotheses. You recently published a paper on The Reasoner, pointing out that Disconfirmation is not modus tollens.

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KA: I show in it that material conditional is not fit for disconfirmation because what scientists are really thinking about is not logical consequences. They are thinking about *physical consequences*.

A week or so ago, I hosted a conference at Rutgers with a lot of neuroscientists. When I described this to them, they said, “Yeah, that’s what we are doing!" I think philosophers of science haven’t given scientists a way of thinking about it. They’ve given them just a bad characterization of what they do.

HH: So your book puts forward a better one.

KA: That’s what I’m trying to do. That’s why I look closely at what scientists are doing. I don’t just take what *they say* they’re doing, because they’re just maybe borrowing that from philosophers.

HH: I can understand that. They’re busy enough with the science, and certainly we can expect them to do philosophy too! You argue that the practical effect of abduction is confirmation. This differs radically from the (rather mysterious) textbook definition of abduction. How do Peirceans react to your view?

KA: Oh, they’re scandalized by it. No one has this view as far as I know. And the Peirce scholars just will not touch it. They just won’t tolerate it at all. I get the most indignant responses from them about this, “just need to read more Peirce", they typically say.

HH: It is quite typical of epigones to be very territorial about the meaning of words.

KA: Exactly. Peirceans say abduction is inferring a hypothesis because it’s explanatory. And then they build other things on top. Like the thing to be explained has to be surprising.

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HH: And what about the epistemologists who work on Inference to the Best Explanation (IBE)?

KA: They just think my account makes no sense. For them, abduction is just defined as IBE. So they're just outraged by seeing abduction as confirmation.

HH: Do you see abductive confirmation quantitatively?

KA: It's qualitative support. And I guess that's why the IBE people don't like. It's not a guarantor of truth. It's just a reason. A scientist says, "Here's an explanation of the data." But then another scientist comes along and says, "Well, wait a second. Here's an alternative explanation." And then they have a "fight" to decide which, if any, is the correct explanation.

HH: This descriptive focus departs from traditional questions in the epistemology of science.

KA: Epistemology of science is concerned with the question of when do you know. I'm not asking that question. I'm interested in understanding the inquiry part of science. I do an experiment, I interpret the results, and then maybe I'll be convinced by that one experiment, but probably not. I'm going to continue to do many experiments, and each little experiment is to generate a little bit more evidence, a little bit more confirmation. But then someone else might come along and say, "No, no, that's not the correct explanation of any of these, the correct explanation is this." That's what I want to try to capture. I want an account of a single experiment because it is the building block.

HH: But what you are saying relates to the epistemology of science.

KA: Of course. To be able to tell when you have enough evidence for knowledge, you must have an account of what a piece

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of evidence is.

HH: That's very clear. The core concept in your book is singular compositional abduction. You told us what you think abduction is (not). What about "singular" and "compositional"?

KA: Let's start from 'singular'. It picks up on the idea of a data point. In the book I often talk about what happened: "A current in axon number 15 that took place on one day in the summer of 1949". It's one single thing.

HH: A measurement.

KA: A measurement, exactly. You have this oscilloscope over here and then it's measuring what's going on in the axon over here. And so what you want is that particular action potential say, or that particular action current. And then you want to say what happened in that particular action current. That's the 'singular' aspect.

The answer is that there were some ion movements, let's say. So the ion movements down here explain that individual action current at that time, on that day. That's the *compositional* explanation. And it's compositional because the current in the axon is explained by these lower level movements of ions. So it presupposes that things are in levels, and that things that happen at a lower level determine something at a higher level.

HH: And then you get abduction when you say "this explanation gives me a reason to believe". You emphasize a science-first approach, and you go into the fine detail of experimental results. The examples you discuss in the book however, fall in the camp of traditional, or "theory-driven" science. How about model-based, data-intensive or AI-driven science? There is a lot of interest and promise in it, especially in the biosciences.

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KA: One of the things that is growing in neuroscience is artificial neural networks. There's a lot of modeling there. Now, none of the examples I use are models. There's a big difference between Hodgkin-Huxley's fifth paper, which is modeling, and their earlier papers which are experimental. There is just a very different story there. When you're working with artificial models, it's often unclear what connection, if any, they have to the physical world, or even whether they're intended to have one. All of a sudden you just don't get the physical consequences of the story any more. If you're just running a mathematical simulation, you're doing a mathematical thought experiment, and it looks like it's a completely different kind of thing. Maybe you can explain something. But then that sense of explanation is very different.

So I think it would be a mistake to try to carry over my picture to the data-driven sort of science. I wouldn't know how to apply it there. But I'm OK with that.

HH: Science is complicated, it moves on fast, and scientists do many things in many different ways. I guess it would be suspicious if one approach claimed to account for all of science.

KA: I view my book as offering an abductive approach, but I don't have all the answers. The whole book is predicated on there being gaps. That's true for the neural network stuff and big data, but probably more. It is set up not to be the final word, but to be the next thing to try.

HH: Can you tell us about your academic trajectory? What got you interested in philosophy and then in cognitive science?

KA: I guess I got interested in philosophy in high school. Actually from taking a Spanish class. I took the fourth year Spanish and we were reading the Generation of '98. It all seemed very

philosophical to me, and it stimulated my interest and curiosity. I knew when I went off to college that I wanted to major in philosophy

HH: Which you did.

KA: Not immediately. My parents wanted me to be pre-med, so I said, "Okay, I'll do that." I gave it a shot, but then I liked philosophy too much, I wanted to go into philosophy. In pre-med I learned a fair amount of science and so then I decided to go into history and philosophy of science.

HH: The title of your 1989 PhD thesis was *The Promise of Parallel Distributed Processing*. It took some time, and some unexpected events, like everyone on the planet holding a smartphone in their hands 18 hours a day, but a lot of that promise did eventually deliver. How much of it would you change in hindsight?

KA: So, here is the picture at the time I was writing my thesis. Once I passed the qualifying exam, I didn't have any idea what I wanted to do for a thesis. I didn't tailor my coursework to prepare me for a dissertation. And that was a big mistake. But , I was teaching at Carnegie Mellon as a graduate student and Hinton was there. The *Parallel Distributed Processing* books were coming out and I bought a Xerox copy from James L. McClelland. One of my colleagues at Carnegie Mellon told me "You should try this." And so I just I threw in on that. In the same year John Bickle, Tim van Gelder and Bill Ramsey, also came out working on connectionism. All of us saw that it was happening. If it was a bad call, three other people made it too. But if I were to do things differently, I'd probably try to look further ahead.

HH: Speaking about bets, your best-known work (with Fred Adams) closes with a forecast: "Insofar as we aspire to create a

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cognitive science, it seems reasonable to suppose that the science of cognition will resemble the science of physical, chemical, and biological processes. Such, at least, is our bet." Twenty-five years have passed, so it's perhaps time to assess that bet.

KA: I think we won! I guess I was struck in the original Clark and Chalmers paper. They said, "Inga and Otto are exactly the same." And then Adams and I said, "Well, no, by the lights of cognitive science, they're very different". Inga doesn't have the memory effects that Otto does, or Inga has memory effects that Otto doesn't. So cognitive psychologists will see that they are different. There are important differences. And as far as I know, everyone interested in the debate accepts that now. The move ever since has been to say that Inga and Otto are "in some respects they are the same". Well, game over, right? Of course they're the same *in some respect*!

HH: Is the controversy still ongoing?

KA: I stopped fighting with them. I've stopped fighting the extended cognition people. They have not decided they're going to go after cognitivism. They just said they're going to make up new words for cognition and say *okay that's extended.* Okay, so what?

HH: So you don't buy into the idea that machine learning-driven wearables break the bounds of cognition you identified in the skull?

KA: No. The whole reason you like these wearables is because they do something your brain does not. That's why they are useful. The reason you use pencil and paper to add is because it lightens the memory load. You just put everything in columns, do the first column, and then you forget about it. Then you do the second column, then you forget about it. The reason this is so great is it's not

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the way you normally do it in your head. To me this is completely obvious, and I wonder how they ever thought otherwise.

HH: So why did you work on it?

KA: The first time I read the Clark and Chalmers paper, I wasn't going to do anything about it. I thought it was just so absurd. But then I saw Dan Dennett getting interested in that, and then John Haugeland, Merlin Donald, and others getting interested in that. Something was happening there. And I decided to write on it. I guess that was a good call, but I never dreamed it would be this big.

HH: Do you have any advice for postdocs on how to secure tenure?

KA: Find your niche. Do find your niche. Try and see what is coming down the pipe. See what's going to become hot.

HH: You are telling them to become *the* expert on something, rather than to become knowledgeable about many things.

KA: Just be very serious about one thing. Be the world's leading expert on something that is going to catch a wave.

HH: That's necessary but not sufficient, I guess.

KA: I guess I did catch a wave on connectionism, but that was not enough. One of the things that is happening now in the United States, is memory research. It is taking off. So that would be a good area. But where in memory are you going to, how are you going to distinguish yourself? Those are the questions I would advise postdocs to focus on.

HH: Any rule of thumb to spot the coming wave?

KA: If you are a philosopher of science, look for new science. Look for the latest thing that is happening in science, so you can

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get in early, and then identify what's important about it. Do it from a philosophy of science angle.

HH: For instance?

KA: Optogenetics. It is a new technique neuroscientists are very excited about, because they think it's going to do things for them that they couldn't have done otherwise. So here is a theoretical question: what exactly is that thing they couldn't do otherwise? Why do they care about it?

HH: Techniques typically provide answers before a theoretical question has been asked.

KA: I guess 30 years ago fMRI was like this. A lot of people wanted to write about the limitations and promises of fMRI. Several people published on that, it was something to be an expert on. So those are the kinds of techniques to look at.

HH: Last question: Five books everyone serious about the philosophy of science should read.

KA: First, my book.

HH: Fair enough.

KA: Normally I am not a self-promoter, but I do believe in this book.

HH: Then?

KA: *Making Things Happen*. It's a challenging read, but I think it's going to stand the test of time.

HH: Number three.

KA: *Explaining the Brain* was an important book. Still is. I guess I see see my book as a successor to that.

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HH: Number four.

KA: Mazviita Chirimuuta's *The Brain Abstracted*. That's getting a lot of attention. And then Ned Block's *The Border between Seeing and Thinking*.

HH: Do you want to make it six then?

KA: Maybe I would add *Knowing Science* by Alexander Bird. I think a counterpoint to what I'm doing. Bird does epistemology of science.

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