

Storey Interview of Zachary Pirtle, Ph.D., performed May 10, 2018

**Wisdom at Work podcast by David Storey (Boston College).** [Audio link](#). Released July 27, 2020.

Note from Zach Pirtle (interviewee): I had a transcript made of this chat, as I often share career advice that I articulated in in this podcast. Transcript below, with bracketed notes indicating times on the audio link above.

Key timestamps that some readers may care about:

- 7:57: start of the interview
- 15:50: Arizona and my ASU education in engineering and philosophy
- 34:30 Discussion of my Fulbright experience in Mexico
- 35:50: Discussion of the Presidential Management Fellowship program, as the way I got hired into US government
- 39:15 Why did I transition away from academia?
- 43:50: How academics perceive me as a government employee
- 47:00 My advice on going into government service
- 48:40. Discussion about how to push for more humility and knowledge in government.
- 49:40. bad habits that I had to unlearn on getting into government
- 52:05. Zach's advice to undergrads to dual-major in humanities and science/engineering
- 53:45. My experience on getting into government.
- 55:30 Philosophy Book recommendations:.
- 56:00 Science policy book recommendations;.
- 58:15 Discussion of Zach's work in philosophy of engineering:.
- 1:01:40 My work in ethics/public deliberation, including a NASA ECAST citizen deliberation that I helped to implement
- 1:02:30 Discussion of the 2018 conference Zach organized, the Forum on Philosophy, Engineering and Technology (fPET)
- 1:03:50. Public deliberation conversation: discussion of a NASA ECAST citizen forum
- 1:29:45 Recommendation on scifi author Malka Older's Infomocracy book

INTERVIEW:

David Storey: [00:01:00] Welcome to the latest episode of Wisdom at Work Philosophy Beyond the Ivory Tower, where I interview people who translate philosophy into successful careers outside the academy to tell their stories, how they found their way through the wilderness and reinvented themselves and distill the insights, the decisions, the [00:01:30] strategies, the tips, and the secrets to their success.

If you're new to the podcast, I would recommend checking out the trailer and episode zero where I go into the background, the rationale and the goals of the podcast. If you're interested in what I like to call people's Batman begins stories, how they became who they are professionally, how they got their big break, how they found their success?

If you are an undergrad considering declaring a philosophy major or a graduating senior with a [00:02:00] philosophy major wondering what the hell

you're going to do, if you're a master's student in philosophy, if you are a PhD in philosophy, if you are an academic, maybe even a full professor and/or looking for some outside the box unconventional ways to apply your career, whether that is as a hobby, as a side gig, or maybe even as a career transition, then I think you're going to find a lot of value in these interviews.

According to conventional wisdom, the STEM disciplines, science, technology, engineering, and mathematics [00:02:30] are diametrically opposed to the humanities, in general, and philosophy in particular and beyond that, they're often regarded as practical, while philosophy and humanities are regarded as useless. But my guest today is Zachary Pirtle is living proof that the conventional wisdom is wrongheaded.

Zach studied philosophy and engineering, double majoring as an undergraduate at Arizona State, and in this episode he tells us why his study of philosophy and in [00:03:00] particular the philosophy of science actually helped him stick with engineering and helped him see really the social importance and just how intellectually fascinating it was as a subject.

Zach went on to study civil and environmental engineering at Arizona State where he came out of the same program that a number of my upcoming guests have come out of, which is highly interdisciplinary and pairs the study of engineering with the study of science policy, science and technology studies [00:03:30] and philosophy of science.

From there, Zach took a route that a number of my guests have taken through the Presidential Management Fellowship or PMF program. During his time in Washington DC ended up landing a job in a federal government agency where he works to this day. Beyond this, he continued his studies completing a PhD in systems engineering from George Washington University.

Zach and I recorded this episode actually almost about two years ago. So in [00:04:00] the interim, he has completed his PhD, so he is officially a doctor. Likewise with his master's and undergraduate study, his PhD was not just in engineering, but also had a heavy philosophical component. He had the well-known philosopher of science, Jay Odenbaugh, on his committee.

Zach's work involves what you might call drawing on the ethics and the epistemology of engineering, thinking both about [00:04:30] some of the conceptual challenges in engineering theory and practice, particularly around concepts like uncertainty and the ethical component having to do with how do public decision about, say funding gets allocated for certain projects, how do those kinds of decisions get made?

And in this episode he talks a little bit about some work he's done on helping to organize and convene citizen forums on topics such as asteroid use [00:05:00] and space flight. So I think this is a really helpful set of topics to be thinking

about at a time when public confidence in the federal government and in quote-unquote experts is at an all time low arguably.

And we cover a lot of topics here, including what engineering is and how we might think about the obligations that engineers have in a democratic society and to a democratic citizenry. Another thing that's [00:05:30] been happening in the last few years is the so-called tech lash of a lot of the public becoming very skeptical toward big tech and the sort of unforeseen social and psychological consequences that this profusion of technological innovations has had on our culture.

I think Zach pushes us to think more intelligently about some of the deeper value questions at play in science and engineering policy. And as kind of more [00:06:00] on the fun side, we also talk about science fiction and some of the science fiction novels and TV shows and movies that were kind of influential for Zach early on. And that continue to help him use both his imagination and his intellect to think about future scenarios of how the decisions that we might make today at the level of government and planning and policy could lead [00:06:30] to better and worse outcomes, especially around the role that science and technology can potentially play for good or ill in helping build a healthier and safer and more humane democratic society of the future.

[...]Without further ado, please enjoy my discussion with Zachary Pirtle.

Zach, welcome to the podcast.

Zachary Pirtle: Hi, David.

David Storey: Where is home? We're speaking to you from Washington DC, is that right?

Zachary Pirtle: Yeah. I live in Southwest Washington DC. [00:08:00] It is quite lovely right now and in the middle of springtime.

David Storey: Well, I guess I could say that for Boston. We're kind of spring challenged here, unfortunately, but the weather at least is no longer unpleasant. Put it that way. You actually came up in conversation with my previous guest who was Cameron Keys. I'm guessing you guys know each other.

Zachary Pirtle: Oh, Cameron is a great guy. I look forward to hearing that podcast.

David Storey: And I [00:08:30] guess we'll get into at some point, the program that you and Cameron both went through as well as the path that you both followed into the federal government, the presidential management fellowship that we'll get to in a little bit. But I'd actually like to start off by giving listeners a window into my guests as a person before we get into their professional history and interests. Feel free to answer this question in any way [00:09:00] you would like. But what do you do for play?

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Zachary Pirtle: So one thing I get a lot of enjoyment out of is I used to live in Mexico and trying to find really good Mexican food, and in particular good tacos. And so, I try to explore around the Washington DC area. There's been, and I'm trying to figure it out, but there's been a boomlet of more and more tacos in the area, just the right sort of authentic Mexican size, just meat, cilantro, onion, and [00:09:30] it's been a wonderful last few years.

It used to be a bit of a food desert when I moved here in 2010. Yeah. So it's fun going to a new neighborhood just because I know that they have a new taco shops setting up and it's a great excuse to walk around all over the city, which I really love the DC area.

David Storey: My wife's actually half Mexican and she's from DC. Her parents live in Springfield, so if you're really, really into tacos, I'm sure they... And they actually used [00:10:00] to work for the federal government as well. They were in the State Department.

Zachary Pirtle: Oh, that's exciting.

David Storey: And her dad, makes incredible, not just tacos but the whole thing. So sometime I'm sure they'd love to have you. What brought you to Mexico? I'm curious.

Zachary Pirtle: I was fortunate enough in 2008, I received a Fulbright Scholarship. I was actually in the category of philosophy and I had a research project to study nanotechnology as it was being pushed by the Mexican government at the time. And I got to [00:10:30] interview a number of scientists about how they were trying to connect their work to Mexico's development goals, which was a lot of fun.

David Storey: And what role did nanotechnology development play in their development goals?

Zachary Pirtle: So they were trying to, in some ways jumpstart to the next industrial evolution. They were starting to make big investments in nanotechnology. The interest was there in order to try to guide science to have some really strong and positive effect on society. It was a little... [00:11:00] Still, even now, 10 years later, it's too early to see the fruits of it.

I think that they have a lot of the same challenges that we in the US have, which is that it's difficult to measure the benefit of science funding that we do from the government and the amount of effort that they were putting into thinking about it though I think it was inspiring, and I think there's actually stuff that we should still be learning from that here in the US.

David Storey: And I'm curious in terms of nanotech, I think probably most of us hear that and we have some [00:11:30] vague idea of what it would actually entail in terms of

a concrete application or technology, but can you give us some examples of applications of nanotech that would be of great social import?

Zachary Pirtle: Yeah. The branding of nanotechnology there's been a lot of instances where like 40-year-old work in chemistry, because it's dealing with molecules is suddenly being called nanotech. But within the Mexican context, they were interested in new materials research, getting stronger materials, carbon nanotubes. [00:12:00] They were interested in environmental remediation [inaudible 00:12:03] particles that could latch onto particulates and remove threats from the environment. It was a lot, a broad variety of projects like that.

David Storey: Okay. So I imagine we'll come back to some of this at some point later in the conversation, but when people ask you what do you do, how do you typically respond?

Zachary Pirtle: I will be honest. I almost always respond to say that I'm an engineer by title and by training, [00:12:30] and I do work in a government agency that deals with human space flight and almost always introducing yourself that way. That's a immediate people get what background you're coming from. However, I have been lucky enough that I've had some colleagues label me as a engineer/philosopher.

I do have an engineering degree as well as a philosophy degree, and I've continued to publish and do work in philosophy of science, philosophy of engineering. And so, I actually have two business cards. I have my engineer [00:13:00] business card, and then I have one for a conference that I'll describe later the forum on philosophy, engineering and technology.

I'm fortunate enough to be the co-chair of, and so I've tried to keep hands in both the philosophy world as well as the engineering world.

David Storey: I'm interested to hear how you balance, and to what extent you integrate these two hats that you wear. Do you find challenges? Do you encounter challenges when you are in the so-called [00:13:30] philosophy world, presenting yourself as an engineer and vice versa? Do you find yourself downplaying your philosophical background or credentials when you are in a more technically engineering type environment?

And I ask in part because one thing I've noticed with folks that I interview who have a background in philosophy, but work outside of the traditional academic context is they find the less they wear their philosophy credentials on their sleeve, and the less [00:14:00] they drop names of Aristotle and other thinkers, the better things tend to go. So I'm curious what your experience is like interfacing these two identities.

Zachary Pirtle: I think I am another data point that adds to the trend that you observed. I try to avoid saying the P word, philosophy. There's some people who get it and there

are people who are naturally reflective. A lot of when I talk to other people about we need to think about if we're doing this work in human space flight, what's the ultimate purpose [00:14:30] of it for? Why are we doing it?

How do we really understand when we're making projections about how safe we're going to be or how much we're going to cost? How do we understand and describe the uncertainties there, and to try to get people to be more reflective there?

I found a lot of my engineer colleagues, they get the need for reflection and they get... I think a lot of the skill sets that a philosophy background helps prepare you to ask. But a lot of that work can be done, it should be done within the engineering community as well. And I sometimes don't even [00:15:00] mention to colleagues that I have a philosophy background, that I still engage in philosophy until I've known them for several years.

Usually it's a positive surprise. I've never had anyone, by the time I tell someone that I've got basically a secret identity, I find that I've been working with them for enough time and they've seen that I'm able to contribute to the mission and to do big things such that it's an interesting character attribute they value.

David Storey: So it's sort of the Trojan horse strategy. We'll get into a lot of this later and I definitely want to hear [00:15:30] about this conference that you've been working on. But I'd like to actually to go back to your growing up and your intellectual development to get a sense for how you got into this, how you adopted this I think very unique intellectual approach. So where did you grow up?

Zachary Pirtle: Yeah. So I'm a third generation native from Arizona, specifically from Phoenix, Arizona. And I loved growing up in the desert. My dad had me do a lot of the same things that he did growing up, which is to go [00:16:00] camping through the Superstition Mountains. I'm really lucky to have had a good family that supported me with a lot of diverse intellectual interests growing up.

I got introduced to science fiction through my dad. Some of the initial things that started forming who I am were in high school. I did speech and debate competitively on the high school circuit. I really loved Lincoln Douglas debate, it became sort of the focal point of my high school education. At the same time, [00:16:30] my dad is an engineer. My brother ended up also becoming an engineer.

And when it finally came time to go to college, I ended up going to Arizona State University. So very local. My father and grandfather had also been there before me. And the choice of what major to do just seemed automatic that I would study what my dad did, which was mechanical engineering. But I think I'd been exposed to speech and debate, which involved some discussion about philosophical greats, Locke, Hobbes, Plato's [00:17:00] Republic.

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I was plugged into and I was a member of the ASU Barrett Honors College, which required great books reading, required additional work in the humanities alongside of whatever your degree was. I ended up going into my college career trying to do both, and I actually ended up succeeding and I ended up getting both a philosophy degree and an engineering degree. But there's a couple steps in there that are important.

David Storey: I want to go back to science fiction. What authors or books were the ones [00:17:30] that really grabbed you and really kind of sparked your imagination? And did they lead directly or indirectly to the path that you eventually took?

Zachary Pirtle: I deeply enjoy Star Trek, Star Wars. I inherited that from my dad. And intellectually, the spark took on a much stronger form when I read stuff like Frank Herbert's Dune. I think that's a book that's set 10,000 years into the future. It's incredibly ambitious and it's also, it's got a lot of self-sacrifice in there about how do you help humanity, not just [00:18:00] with your family today, but how do you think about helping humanity survive for the ultimate course of time throughout all history.

And there's a lot of implications in that book about the value of hard work and also a lot of reflections about technology and the need for humans to be able to have some sort of democratic control over technology. They just blew my mind as a kid, and that I keep thinking about to this day.

David Storey: Yeah. Well, I can already see some of the connections to your research [00:18:30] interests that you mentioned to me previously that we'll be getting to. It's funny, Cameron Keys mentioned Dune as well as a book that really made a huge impression on him and that he keeps coming back to. And I'm actually looking at it right now on my bookshelf, and it's not just because of that conversation, but a lot of people I've heard recommending that over the last year that I've finally decided it's time for me to get around to it.

So that was some influential [00:19:00] authors and books. Did you have any heroes growing up that looking back you can see sort of nudged you along the course that you eventually ended up taking?

Zachary Pirtle: Yeah. I have some heroes from science fiction. In terms of real life heroes, I was following politics avidly in high school, but I never had someone who was deeply inspiring in that way. I think the person that I tried the most to mimic my behavior off of was my father, he's an engineer [00:19:30] that he really is good at solving problems and he can get his mindset in just such a way that he's able to start going through it. And I feel that a lot of that shaped how I interacted with other people.

David Storey: Well, I'm curious, what area of engineering did he specialize in?

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Zachary Pirtle: He's a reliability engineer. A lot of it's about making accurate predictions about how long an airplane valve is going to last based upon historical data. And it's dealing with a lot of uncertainties about when you've got things that are operating in the field and conditions that no one's [00:20:00] ever quite sure about, how do you give some sort of guarantee that's going to end up mattering contractually about how something will last?

David Storey: So you mentioned a great books program as well. I'm wondering... I mean I know this was definitely my entree to philosophy program that I went through here and actually that I still teach in here at Boston College. What texts, in particular, I know you mentioned Locke and Hobbs and Plato's Republic. Was it more your experience with the debate program or was it a particular philosophical author [00:20:30] or text that really made you decide, "Okay, I want to double major?"

Zachary Pirtle: Yeah. So my sophomore year was key for me. I was actually struggling in my engineering classes. I was good at math, I was good at being able to ingest the material, but for the life of me, I struggled with wanting to do homework set after homework set and it... At the beginning of an engineering education most of what you do is focused on largely Newtonian mechanics, statics, dynamics, a lot of problems that are disconnected from real [00:21:00] world usage.

And I almost dropped out of engineering at that point actually. The key thing that actually saved me, I took a philosophy of science class with a professor who had a huge influence on me, Professor Richard Creath from ASU, and that class finally led me to understand why it is that you do so many homework sets, like I became exposed to Thomas Kuhn's *The Structure of Scientific Revolutions*. And that part of how you learn a paradigm is you have to do sort of mindless [00:21:30] repetition to figure out how to apply problem solving techniques and tools.

And basically, you learn the paradigm, and then you sort of kick the ladder away. And that helped me understand why I was doing what I was doing. I also ended up doing an engineering internship at Honeywell Aerospace independent of my father and began to see a lot of the real world application for it. But while I continued with my mechanical engineering degree, I was still intrigued...

Initially, I wanted to do a minor in philosophy, focusing [00:22:00] on philosophy of science. I ended up getting a history and philosophy of science certificate. And then, there came a certain point around the beginning of my fourth year of undergrad where I realized that I was so close to getting a philosophy major that if I just expanded out to go from four years to an undergrad to five, I could do both the mechanical engineering degree and the philosophy degree, which was...

It's a lot easier to say than to do. It was a big challenge, but still to this day having done both degrees, it's something that I'm very proud of.



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David Storey: It's funny, I was interviewing [00:22:30] someone else yesterday and he's a philosopher named Robert Frodeman. He works a lot on interdisciplinarity and what he calls field philosophy and his whole thing is we need more philosophers embedded in government agencies. Exactly the kind of work you're doing.

And I asked him what advice he would have for undergrads who majored in philosophy and he said, "Double major. Aristotle has aligned somewhere that the mark of an intelligent man or intelligent [00:23:00] person is someone who can see connections between the most disparate things." It's a paraphrase. And he said, "Somebody who double majored in philosophy and engineering." And I said, "I'm actually interviewing somebody who did that tomorrow." And I've actually never met someone who double majored in those two subjects.

It strikes me listening to your previous answer that STEM often gets opposed to the humanities and philosophy gets lumped in with the humanities. But what I'm hearing you say is that studying philosophy [00:23:30] parallel to studying engineering actually motivated you and made you see more why the way in which you were studying engineering made sense.

So I mean do you think that pairing philosophy with STEM training would be a sensible move for more and more academic programs?

Zachary Pirtle: Yeah. I think Frodeman's advice, and I've really benefited from reading his interdisciplinarity work, by the way. His advice to do a STEM degree and something else, I think it's so critical. [00:24:00] To me, I focused... My philosophy training was very focused on philosophy of science-

PART 1 OF 4 ENDS [00:24:04]

Zachary Pirtle: To me, my philosophy training was very focused on philosophy of science, so there was perhaps synergy there. When I talk to someone that's in undergrad or considering undergrad, I think just doing some sort of humanities degree or social science degree in addition to something like engineering, I think is a great combo. It matters less to me the exact things that you learn than it is just the broad, critical humanistic reflection that you get from a humanities degree.

David Storey: I think this is a good segue to, one of my favorite questions [00:24:30] that I like to hear guests weigh in on is what do you think are the most common misconceptions about philosophy? To what extent is that bound up with the conventional opposition of STEM and the humanities or even your own experience feeling like you should keep secret your philosophical credentials and background?

Zachary Pirtle: I think that some of the misconceptions about philosophy [00:25:00] that are commonly raised, which is that philosophy is not very practical, it's hard to use. There are kernels of truth in that.

I go to some philosophy conferences or I talk to some people and people are very strongly motivated that they have to get a certain type of publication in order to get tenure. The type of work that they get rewarded for is often not the work that would benefit people who are in the field.

And while I might agree in the conception that philosophy [00:25:30] can sometimes be impractical is sometimes true, the need for it though is imperative. And the misconception that philosophy may not be necessary to me, there's so many areas in life and I see this just by observing different parts of the federal government where things can become ossified, things can become stuck in place, we sort of move blindly forward because people have too many things to do, not enough time or enough funding to do it. And to find some way to have the critical, reflective spirit from philosophy to [00:26:00] force you to think more deeply, I think it's vital in many areas.

When I meet people who are philosophers who have this sort of special resonance, I really love work that's done and I know Frodeman's gone to this as well, the Society for the Philosophy of Science and Practice, there's a lot more engagement in that realm with people who are actually doing real science, who are doing real problems.

There are enclaves within the philosophy community that I think [00:26:30] are different than the rest, but there's of course not everything has to be relevant and useful in a very practical sense. The beauty of studying philosophy is often worth it for itself, but there just needs to be more of this sort of sweet spot applied and relevant philosophy, I believe.

David Storey: Yeah. Yeah, sweet spot is a nice way to put it. And in my experience, one of the crucial ingredients of hitting that is [00:27:00] conferences where you have non philosophers there. Frodeman actually helped organize a conference for the Public Philosophy Network, and we had folks from all sorts of disciplines. We had people from the media just outside the traditional academic purview. And actually one of my colleagues regularly attends that conference you just mentioned, and she said that that's one of the really refreshing things. It's not just philosophers talking to each other.

And I imagine [00:27:30] the conference that you're helping to organize is a perfect example of that, that we'll get to in a little bit.

Zachary Pirtle: Yes.

David Storey: I want to give listeners maybe a more granular view of the field of engineering or probably incorrect to even say that, it's probably multiple fields. But I think when most of us think about engineering, we think of infrastructure, bridges, buildings and so on. How would you define engineering, and can you help us broaden and deepen [00:28:00] the vague popular understanding of the term?

Zachary Pirtle: Definitely. So my favorite definition of engineering, I owe to Glen Miller who's a philosopher at Texas A&M University, and he adopted an old maxim from the 1800s by Thomas Tredgold, say the following. He defines engineering as the art of harnessing energy and matter, when appropriate, to contribute to human flourishing today and in the future.

And it's the sweet spot interaction across many disciplines from nuclear engineering, chemical engineering, [00:28:30] mechanical aerospace, biomedical engineering, of trying to transform the world around us by using energy that's there and then by using matter to put things in the right sorts of motions that's useful for human beings.

Now, I think I would agree that every type of engineering, much of it can vary quite broadly. Some of the work that's done in the [inaudible 00:28:51] engineering community that I'm part of helps to flesh that out. My main bugaboo that bothers me when people talk about engineering is when [00:29:00] peoples view it as merely applied science, that there must be some sort of physical theory that you've got say, Newtonian mechanics or other types of theories and the engineers just figure out how to apply it.

The real world of engineering in terms of the problems that engineers have to solve, you can be building a system or doing some sort of weld on a material that's well known and it turns out that it's just not working the way you thought it would. And there's nothing in any physics textbook that's out there, but yet you still [00:29:30] need to figure out how to repair this weld and make the design continue.

There's lots of instances where engineers have to develop and apply knowledge that is unique and separate from what you find in physics. The best articulation of this, the sort of engineer, philosopher Walter Vincenti had a great book in 1990 that I wish there were just a dozen more like it, but it was called What Engineers Know and How They Know It. And it's a series of case studies basically of how engineers have to develop ideas, heuristics [00:30:00] and just sometimes raw empirical knowledge of how something works that has, in many cases, no tie to physics.

So I think beyond just infrastructure, engineers could be working in many things, the work that an engineer does, it's very knowledge intensive. They have to figure out if they're going to design something to occur and work in some real world context. They have to understand what that context is. They have to understand how people will interact with it. There could be a lot of emergent properties. You could have a bridge [00:30:30] that looks fine, but it could have potentially some sort of harmonic frequency where if there's the wrong sort of vibration, the vibration can propagate in an unstable and lead to the bridge's destruction in a way that would not be obvious just from looking at the high level design.

And again, there's lots of instances where engineers are doing something where all the physics would imply that it should work, but it just doesn't. If you look back at the history from steam engines to the discovery of [00:31:00] how we need to design airplanes to what's called a jerk, which is basically it's the first derivative acceleration. There are all these design constraints where there's often not a good scientific explanation for how they get implemented, how they work in the world, but yet engineers have figured out that there's good reason to do that, and they have knowledge that supports their effort in that.

David Storey: So instead of applied science, would be more appropriate to say that in some ways [00:31:30] in practice engineers have to employ the kind of reasoning that goes on in pure science, so to speak, and thus develop a kind of scientific body of knowledge within the practice of engineering. So it's not like we first do our science and then just apply it is. Would that be accurate to say?

Zachary Pirtle: Yeah, I think that's a fair characterization. I don't think that different scientific disciplines... Sometimes different specialists can be talking [00:32:00] widely disparate. Some might say in commensurable languages, but I think often there's sort of lingua franca across different disciplines where they can speak and apply some of the same terms.

There probably are some real, significant differences in reasoning. A lot of what [inaudible 00:32:15] of science focused on in, say the first 50 years of the Philosophy of Science Association, they focus on physics. And there's a broad interest in how do you find the laws of physics and then try to make deductions from those laws for lower level theories.

[00:32:30] And I'm not sure that engineering works in a sort of deductive way from high level laws down. I think that the thought process can be a little bit more bottoms up or just more holistic and organic. I don't think I would disagree with your broad point that engineers share a lot of the same lingua franca as a lot of other scientists do.

David Storey: You double major and then you go on for a master's in, was it civil and environmental engineering?

Zachary Pirtle: Yeah. So I finished undergrad in 2007, and at that point I was [00:33:00] already set. I wanted to actually be a philosopher focused on engineering.

David Storey: And by that do you mean wasn't going into academia?

Zachary Pirtle: Going into academia, I didn't even dream of going into government at all, which makes my current life very surreal sometimes. In preparation for that, there was a good opportunity to do some graduate work. There was a crazy professor in the engineering school, Brad Allenby, who's visionary and thoughtful and who ended up being one of my co-advisors. [00:33:30] And I'd also been working

with a philosopher, Andrew Hamilton, who was a student of Nancy Cartwright, and he became my co-advisor for my master's thesis.

I had a great year of graduate study. I was in such a cool environment at Arizona State. Separate from philosophy, I was part of Dan Sarewitz's Consortium for Science Policy and Outcomes, which in the mid 2000s had a great collection of just thoughtful people who wanted to think [00:34:00] and reflect on how science affects society across the board. And I'd been able to engage with them as an undergrad, as an intern.

So I'd been taking graduate level classes in both philosophy of science and in this area for a few years by the time I decided to do the master's. And I ended up focusing on a certain type of analysis focused on when you have multiple models, the degree, and thinking through how independent the different models are. This is sometimes called robustness analysis in the philosophy of science literature.

[00:34:30] So my master's degree was fantastic. During that time there someone had encouraged me to apply for a Fulbright scholarship, which I ended up getting and I did while I was still completing my master's degree. And I was able to go to Mexico to study nanotechnology as I discussed before. And that was just, it was a lovely... I sometimes try to advise people, do whatever's going to weird you out or extend you the most from what you're most comfortable with. And living in Mexico for a year was, it [00:35:00] was fantastic. I still benefit and go back to Mexico to this day. Mexico City, I love the city there.

David Storey: So that's where you were, was in Mexico City?

Zachary Pirtle: There, and I also split time in a colonial town called Zacatecas. I loved it. It was good.

David Storey: When does the turn happen? When do you decide that you're not going to go into academia, in philosophy?

Zachary Pirtle: [00:35:30] It was the spring of 2010. I had, after Fulbright, I applied for a policy fellowship called the Mirzayan Fellowship that's at the National Academy of Sciences. That's also a fellowship that's open to anyone from any graduate degree program that philosophers could go for. But the Mirzayan program was a way to spend time at the National Academy of Sciences here in DC.

When I was there, I was told by someone that I should apply for the Presidential Management Fellowship. It was actually, it was an alum [00:36:00] who had done it before. And I was frankly not interested in PMF, the Presidential Management Fellowship. I thought the word management, I wouldn't want to do that. I want to understand how real engineering works. I care more about policy management, doesn't seem interesting. But I applied for it regardless at

the same time when I was applying to PhD programs, and I ended up getting admitted.

Carnegie Mellon has an engineering and public policy PhD program where I was hoping to interact with a lot of the philosophers that were there. And then I also was admitted [00:36:30] to University of Colorado Boulder's environmental studies program where I basically pitched collaborating with a lot of the philosophers that were there.

I got accepted to both, and I was actually out visiting I recall at CU Boulder and I got a call that basically said I was one of the finalists for the Presidential Management Fellowship. And I was like, "Whoa, maybe it's time to actually take this seriously." PMF and I suspect that most listeners may have heard Cameron Keys described this already, but [00:37:00] PMF, it can be a great equalizer for people when they're applying into government.

Normally, it's a two-year fellowship, but almost every hiring agency when they're trying to hire someone, they're trying to hire one for a career. They want someone to be there for life. And I had misconceptions about how it worked, but I went for it. This is a bit embarrassing to mention publicly, but PMF has a big job fair, and I ended up getting nine interviews at the job fair, but I had told most of them that-

David Storey: And that would be considered a lot, I would imagine.

Zachary Pirtle: Yes.

David Storey: Yeah.

Zachary Pirtle: It's [00:37:30] still a surreal experience that I think upon today.

David Storey: What do you think that was, that you were in such high demand?

Zachary Pirtle: The federal government struggles with hiring. The USAJOBS website, I think there's a lot of people in government that would openly say that it's not ideal for hiring someone in.

The Presidential Management Fellowship, when someone's been declared a finalist for that, and there's around 400 finalists every year, they can then be hired very easily by any agency without having to go through the USAJOBS process. So a lot of agencies will go to the job fair for it, searching for people. And [00:38:00] if you're a finalist and you go to the job fair, there are more jobs and there are people.

So I was not necessarily because of my background or skills, but I was just one of the PMFs that was there, and there were a lot of interviews to be had. I did luck out... So this is the embarrassing part. When I spoke to everyone in these

interviews, I was like, "Oh yes, I want to do the PMF term for two years, and then I want to leave and go do a PhD," which I learned later was the exact opposite of what they thought the program was. And [00:38:30] there was one agency that does human space flight that took pity on me.

David Storey: I just want to come back to the transition point. So you're in Boulder when you get this call. Now, the program in environmental studies, would the path there have been to go into academia and become a professor?

Zachary Pirtle: Yeah.

David Storey: Okay. Boulder's actually one of my favorite places, and it's a great place to be, great environment, both in terms of the natural beauty [00:39:00] as well as the intellectual scene there at CU. So would you say that your desire to go into academia was not that strong? Or what was the deciding factor?

Zachary Pirtle: So from 2005, probably until maybe 2013, in my heart I wanted to do academic philosophy of science, and I wanted to do research that would actually be useful for policy. This is owing to the CSPO tradition that I got from Dan Sarewitz back at ASU.

[00:39:30] Took me years to give up on the dream of wanting to be an academic to realize that being inside the government actually could have its own good and actually arguably a higher good. Looking back in terms of in 2010, when I decided to take the PMF, I did defer admission at Carnegie Mellon for two years to their engineering and public policy program. I ended up just never even looking back is how it ended up working out, but I didn't think I was quite giving up on academia at that point.

I thought I was still [00:40:00] keeping a foot in both doors, but it just became clearer and clearer working in a government agency where no one in there, they all have more work to do than time and budget allows, and none of them read any of the academic literature about science policy. Very, very few of them do.

And to realize that all these ideas that some of the academics that I've been collaborating with for years, they've been trying to figure out how could science agencies do a better job at getting return on investment for science and ensuring that there's a public good and a public benefit to [00:40:30] it, but all the work that my colleagues were doing, it's not getting anywhere unless there's someone inside of an agency that's able to ingest that knowledge, bring it in, and try to advocate for it within an agency.

I had no idea the complexities that go on inside of a federal agency. It's been a mission of mine to try to help colleagues who are on the outside to see within, to help them basically understand these problems and to guide their own work so they can be relevant to the sorts of issues that the federal civil service is able to actually influence at times.

Storey Interview of Zachary Pirtle, Ph.D., performed May 10, 2018

David Storey: There [00:41:00] are two things here that I think are really important for listeners about this transition that you made. The first is actually something that Frodeman and his colleague Adam Briggie discuss in their book, *Socrates Tenured*, which I don't... Have you heard of this text?

Zachary Pirtle: Oh, that's a great book. And I'm a fan and friend of Adam.

David Storey: They talk about in the book, well, as you know, but for listeners, this sort of model that it sounds like you had [00:41:30] believed in of throwing it over the wall, that sort of philosophers do their work in philosophy of science or philosophy of engineering or philosophy and public policy or applied ethics, and publish it. And then somewhere down the line, those ideas sort of trickle into government agencies or into the policy community. They sort of throw our research over the wall assuming that it's going to actually have an impact.

And they actually did research suggesting that this is not [00:42:00] the case. And it sounds like your own experience confirms that idea. So I think that's helpful because it dispels an assumption that many people might be guided into academia with.

And the second one is, you said it took years for you to get over or let go of the dream of getting into academia. Would you say you had this assumption that there was this, I don't know how I would put it, [00:42:30] sometimes people think of the pure life of the mind versus the, I don't know, lesser station of work outside of academia. I think that a lot of people stay in or try to get in because they think that it is serving some higher good, often in ignorance of what it's actually like in sectors outside the academy.

I'm just interested in your own psychological transition in that respect. So feel free to comment on any of that, but it's just [00:43:00] two points I wanted to highlight that I think are useful for listeners to think about.

Zachary Pirtle: Yeah, I really wish podcasts like yours would've been around when I was an undergrad. I think for me, the idea of working in an agency, sometimes it seemed really scary. Like, "Oh, if you work there, you won't have any time to do something, to think critically. That if you want to do real work, you need to be in academia."

I've been able to still keep publishing, and I've actually been working on finishing my PhD since 2012. I've been able to keep publishing. I got tapped to lead the [00:43:30] forum on Philosophy Engineering and Technology Conference that I'll talk about more later. I feel like I've been with the group of peers in the philosophy world that had already been working with or before my agency, I've still been able to be seen as a active and valuable member of that community. That is possible to do that from outside of academia.



I do meet some people that if I approach them at a conference and they hear that I'm not in academia, they might lose interest quickly or they might not think that I've got the rigor to be part of [00:44:00] the discussion, and that's their prerogative. That's fine.

David Storey: Yeah. Well, that's their problem I would say. So your PhD is on systems engineering. Can you tell us a little bit about what this involves and the nature and extent of your collaboration with philosophers on the project?

Zachary Pirtle: Yeah, definitely. So, at a high level, systems of engineering can be the art of how to navigate the rest of the engineering disciplines together on a given project. It's how do you navigate balancing the needs of different subsystems [00:44:30] on a project against one another as a design goes from being a PowerPoint idea conception to being something that's fully materialized?

My work is actually, it's much closer to history and philosophy of science than it is to traditional system engineering analysis. The PhD program that I'm in at George Washington University, there's been a large number of qualitative social science researchers added to the faculty, and they do a lot of deep interviews trying to really understand how decisions [00:45:00] and knowledge is brought to bear and engineering organizations.

And the main case study that I've been focusing on, which is to compare two engineering scientist teams, one at the Goddard Space Flight Center in the US and then another in the Netherlands that were beginning in the year 1995, trying to build the same type of x-ray sensor and comparing the different decisions that they made over time and what role knowledge and different design constraints played in constraining their decisions and how they were able to operate.

I've [00:45:30] been very fortunate in that I've got on my dissertation committee, a philosopher, Jay Odenbaugh from Lewis & Clark. I'd actually been a fan of his work during my master's thesis because he's written a lot on robustness analysis. And when you are working with multiple independent models that are trying to study the same phenomenon, how do you see the added benefit or the added likelihood of agreed upon claims being true?

I've been able to port some of that philosophy of science literature on robustness into the engineering [00:46:00] space, comparing in my case study how there's two different groups that are trying to design that same thing, but they're doing it in slightly different ways. I ended up making some similar design decisions, but also some importantly different ones.

I feel working with Jay I've been able to keep a bit of a philosophy of science pedigree, but I also hope with a couple of papers that are coming out this summer that some of this comparative work on understanding independence and agreement across both multiple models and multiple engineering

developments, I hope it'll be [00:46:30] of interest to the broader scholarly community.

David Storey: That's a major contribution of the work is advancing this approach from the philosophy of science into some particular engineering case studies.

Zachary Pirtle: And in turn, learning from those engineering case studies about good strategies for using independent approaches to try to solve a problem. Yep.

David Storey: Okay. So I'd like to shift gears now to talk about your transition into working in the [00:47:00] government. You mentioned that many people might regard working in a government agency as scary. So could you tell us about some of the most difficult challenges transitioning into government work, be they psychological, be they logistical, be they skills or competency-based, new skills you had to learn and so on?

Zachary Pirtle: Yeah, in terms of skills, it's something that when I'm doing it, when I'm working on [00:47:30] a team and we have to get a deliverable done or we're preparing for a new design review, I often don't think backup on skills.

I would say that for a lot of my first two years working in the government, I did focus a lot on learning. I was less ambitious. I didn't talk about, say, some of my interests in ethics or some of the epistemology literature, although I think I did contribute in important ways in those areas during those early years. But [00:48:00] for the first two years, I did just cast myself as someone who was there to help out.

PART 2 OF 4 ENDS [00:48:04]

Zachary Pirtle: For the first two years, I did just cast myself as someone who was there to help out and to meet the needs of the office. I think that ended up paying dividends later. People see me that I've been a long member of this team that I'm working on. I'm actually one of the longest served members on the team now. It's been about eight years. And I've been more and more able to introduce ideas from sort of philosophy of science and ethics into the conversation. So for example, [00:48:30] in the area of systemology and model analysis, there's a lot of models that we use to think about cost commitments and how long is it going to take to finish building a given rocket or a spacecraft.

And some people have this naive impression that the more stuff you put into a model, the better. There's a type of analysis called JCL modeling, joint confidence level modeling, and I've been able to do a few presentations to this programmatic analysis, cost and schedule analysis community trying to push for a little [00:49:00] bit more sophistication about how models relate to the world. And I think that's happened. And I've been able to give advice to management that tries to be more sophisticated in talking about uncertainty. I've also been

able to introduce more ethics work through, there was a citizen forum that I was able to help participate in, which we can talk about now or later.

David Storey: Yeah, we can come. Yeah, let's come back to that in a little bit. We can focus on the content of the things you've worked on. In terms of are there habits that you had to unlearn during your transition? Habits [00:49:30] of thinking or working? You developed working in an academic context that were maladaptive working in government?

Zachary Pirtle: I did have some bad habits that I had to unlearn. I'm not sure to what extent they were just bad habits that I had or if they might be common. Very simple, but email etiquette, very, very, very short emails are almost always preferred. And if you talk about something complex, then just set up an in-person meeting. I think coming out of a graduate program where part of what professors want is to see you actively engaging and questioning and thinking. [00:50:00] Sometimes you just need to go with the flow and you learn and you understand it as it comes along. And it took me, to be able to fully learn from my colleagues as much as possible. A lot of the knowledge that, say, colleagues or engineers have, they can't really describe it very well or they've got good instincts because they've been through similar problems before. To learn to really appreciate that took a while.

David Storey: Are there important new skills you learned in your endeavor or was it just this sort of absorbing [00:50:30] of more specialized knowledge in the areas that you were working and how did you go about learning them?

Zachary Pirtle: I think knowing just the right amount of information to give to a particular audience and writing a response to a question from a member from Congress, trying to give the right amount of information to directly answer the question and not to keep going. There's also, there can be situations where there's a lot of uncertainties and unknowns and you can point to that and you try to make sure verbally and through conversation that [00:51:00] the high level management gets that. But sometimes it's difficult to get that sort of deep dialogue into a written paper. And I do think that's okay. There's so many competing demands on attention. So it's figuring out, I feel for me, trying to put the right amount of time into different tasks and activities, being aware that there's only so many things that I can do in a day and that to also be very conscious of the impact that I have on my colleagues.

David Storey: Yeah, that's [00:51:30] another common pattern that I've heard from guests. When they moved out of the academic context, they realized that they had a tendency to over explain things and the necessity for more concise communication became clear, that we don't need to always be providing all the references and all the footnotes. So this might be a question that you [00:52:00] are well poised to answer because it sounds like your program prepared you well for the kind of work that you went into. But how do you think that philosophy programs could be redesigned to better prepare you for where you are today or for people who might want to pursue the track that you did?

Zachary Pirtle: I haven't thought enough about how to refine philosophy curricula. I've been more passionate about the idea that you suggested earlier about how to make it easier for engineers potentially to double major and to do [00:52:30] that degree. It's, actually, it's particularly difficult for engineering students because they have almost the high, I believe they have the highest number of required courses out of almost any degree on a given campus. 128 credit hours was required in the ASU system.

Many engineers end up having to do five years just to get through their regular degree. Finding a sweet spot of maybe fewer sort of fundamental physics classes, maybe fewer specialist classes. There's been some proposals of a bachelor of arts in engineering, which [00:53:00] I'm not necessarily sure that's the right answer, but trying to find some way to change an engineering degree to make it more accessible so that you can have philosophy study alongside of it. There could be a lot of additional thoughts about how to reform a philosophy degree. I just haven't thought about it as deeply, but I feel that doing that in conjunction with another degree either in engineering or in a science would be powerful.

David Storey: I guess that's one answer to my next question, which is what advice would you give to someone who is transitioning [00:53:30] out of academia, whether they were a philosophy, whether they are a philosophy major or were a philosophy major or got a master's in philosophy, and as well as advice you would give for breaking into your industry or field.

Zachary Pirtle: Breaking into government is easier to talk about. The presidential management fellowship, PMF, is one route. There are other routes. If you get a PhD, you are eligible to apply for the AAAS American Association for the Advancement of [00:54:00] Science, Science and Technology Policy Fellowship. There are also, and for every government agency, it can be hard to get hired onto the civil service directly. In the civil service, you have to swear on the constitution that you will always uphold it.

The job securities for civil servants and some of the most sensitive and most important jobs have to be done by civil servants. But because of hiring restrictions and other things, every [00:54:30] agency will augment their civil service support with support contractors. And if someone's looking to get into government, I would figure out for whatever area, if you're interested in help, if you're interested in international affairs, try to figure out at what agency you might want to work at, what support contracting companies are involved in that and maybe just toss your resume in. See if you can do a summer internship with them and get experience there. Or try to do a summer internship at an agency. If you work hard enough at it, I think the federal government, it can [00:55:00] be gotten into, but sometimes it might take a couple of years.

David Storey: For a couple of years is better than five years, which is unfortunately a common experience with folks who are trying to get into academia. And I think your previous point about your assumptions about what it would be like working in

the government were somewhat mistaken that there was both fulfilling and work and a so-called higher good. So that's really helpful. What books would you recommend for [00:55:30] people who are interested in philosophy of engineering or philosophy of technology along the lines that you've pursued?

Zachary Pirtle: Yeah, I think to get a taste of it, reading through some of Walter Vincenti's *What Engineers Know and How They Know It* book is a great start. If you are interested in something of a more continental flair, Carl Mitcham's 1994 book *Thinking Through Technology* overviews of broad history. There's been an interesting set of work [00:56:00] published through the conference series, the FPEC Philosophy of Engineering Conference series, but there's not that many, there are some great books. Actually Shannon Vallor has a book on virtue ethics and applying that to technology.

Separately, just in terms of things that might be useful for working on the federal government, I think Roger Pielke Jr's book, *The Honest Broker*.

David Storey: Yeah.

Zachary Pirtle: It's fantastic for that. I think the philosopher Heather Douglas's book *Science* [00:56:30] and the *Value Free Ideal*. I've actually written a paper that tries to port her concept and to really apply it more strongly to engineering. But there's a great set of literature there that is also worth going into.

David Storey: Yeah. So that concept of the value free ideal, that is, I think so, I mean my knowledge is limited, but what little I do know is that seems so important. One of the things I work on is climate ethics [00:57:00] and policy. And Andrew Light, do you know Andrew Light?

Zachary Pirtle: I have met him briefly, but I do not know him well.

David Storey: He was with the State Department in the Obama administration and helped to, essentially helped to negotiate the Paris Agreement. Philosophy professor at George Mason University. But he was giving a talk at this conference that Bob Frodeman had recently organized, I mentioned earlier. And he said one thing to keep [00:57:30] in mind is that economists have an absolute lock in the policy world on values questions. But their values commitments or positions are not always or often explicitly stated as value commitments, as value judgments or decisions over alternatives.

So he was saying that there, there's really a lot of potential in the policy world for philosophers to contribute along those lines. And I would imagine the same thing [00:58:00] is the case with respect to engineering and innovation policy. So that's probably a good place to segue to the current work that you are focused on, your research and the conference you're organizing.

So in terms of your research, to the extent that philosophers are aware of philosophy of engineering, I think most of us would probably think of engineering ethics as a subset of applied ethics. But even there, it usually takes a backseat to environmental [00:58:30] ethics or biomedical ethics. But your research on philosophy of engineering seems to span a number of fields, philosophy of science, technology, ethics, as well as politics. So can you tell us about your major research projects?

Zachary Pirtle:

Yeah, definitely. So I feel I've had separate but interrelated programs in both epistemology or the study of knowledge as well as in the area of ethics written broadly. And I really loved your description of Andrew Light's point and I strongly agree with that. In terms of [00:59:00] the epistemology work that I've done, trying to tease out the unique nature of engineering knowledge, there's a paper where I draw from some of Walter Vincenti's work to think through whether and how models in engineer are different than in science. I've tried with some of this robustness analysis or using independent models to provide more instructive feedback that if engineers are modeling a given project, what sorts of independent should they try to design into their models there? My paper that will be at this upcoming FPEC conference [00:59:30] is actually going to be focusing a little bit on engineering innovation.

So in order to innovate or to do something new, oftentimes you do have to create new knowledge. But as I was trying to allude to earlier, the knowledge doesn't necessarily flow from some textbook. It's very hard to study this historically. And one of my papers is actually, it's looking at a 1960s case study, which is still to this day, one of the most comprehensive ever done by the federal government. It was done by the Department of Defense and called [01:00:00] Project Hindsight where they took 23 different weapon systems and they looked at about 10 different block vehicle upgrades. So going from say a Miniman one to a Miniman two launch vehicle, and they tried to track down what were the key sort of insights or research exploration developments that were required in order to get from the prior version of a vehicle to a new one. Basically what new knowledge was needed.

The project hindsight data, there's been a lot of debate and controversy over the years. I try to argue that a lot of it sort of didn't actually [01:00:30] read the report. There's still some insights to be gained there, but it becomes a little bit interesting about where does these new engineering insights come from? And there's a lot of the project hindsight data that argues fairly strongly that it's not coming from basic research or from some sort of applied physics research. So epistemology, so this area of both uncertainty and modeling, but also about where does new knowledge and engineering needed for a new technical system come from is one track of my work.

The other track of my work is focused on engineering and democracy, and this is [01:01:00] how I see ethics construed broadly. I've got a paper called On Ideals for Engineering and Democratic Societies that I co-authored. It takes several pieces of work in the philosophy of science world, including Heather Douglas's

and Roger Pielke Jr's. It applies them to how should engineers think about their obligations to a democratic society. Now, one of the things, and this was actually the highlight of my undergraduate research, and it's a philosopher that I keep coming back to time and time again. [01:01:30] It's Philip Kitcher's book Science Truth and Democracy. Have you read that one?

David Storey: I have not.

Zachary Pirtle: So that was the first book that I saw that tried to take from a philosophy perspective and to try to tie it all together for policy. There'd been other people who'd been doing that before Kitcher such as Helen [inaudible 01:01:48], but it was the first book that I read in that vein. And he sort of takes a John Rawls approach to justice that if one is trying to decide on what the good science you should be funding.

So [01:02:00] if you're, say, the Congress and you're trying to think through what good should you be supporting and funding for scientific research. So imagine sort of an ideal thought experiment where people are sort of stripped away of their everyday biases and they try to think through the collective good that would come from different spheres of research. And there's a lot of problems with Kitcher's approach and strategy, but it's a beautiful piece on how you could have a better democratic deliberation and to use that in his view as a thought experiment to inform [01:02:30] what our goal should be for engineering. And he focuses more squarely on science.

What I've been able to do, and I was able to work on this inside the government agency that I work on, is to, instead of just having thought experiments of philosophers sitting around and discussing what good or what justice is or what good should we support, I was able to have us participate in a set of citizen forums about how should humans engage with asteroids.

David Storey: Wow.

Zachary Pirtle: Yeah. [01:03:00] And what should the goals be for humans engaging with asteroids? How should we think about asteroid threats? And to actually implement a lot of the thought experiment that Kitcher had written about. And we've got a couple of papers on that. I think there's a beauty in that. And then some of what I've tried to talk about is that there's philosophers who've been talking about how should you decide what a democratic society should engineer. For a lot of this stuff, instead of just having philosophers get around and talk about it, just actually ask people, bring a broader democratic conversation into it.

David Storey: Yeah. [01:03:30] So that it's actually a real conversation if maybe we could put it that way.

Zachary Pirtle: Yeah.

Storey Interview of Zachary Pirtle, Ph.D., performed May 10, 2018

David Storey: So I'm curious, this forum, could you tell us more about the contours of it? How were the citizens who participated selected? How many were there? What was the format? What were some specific questions at play with regard to asteroid engagement?

Zachary Pirtle: Yeah, we were fortunate to partner through a cooperative agreement with a group called [01:04:00] the ECAST Network, and ECAST stands for Expert in Citizen Assessment of Science and Technology. And they've done some work like this and actually building on the effort that we collaborated with them on, they've done a lot more. But to bring in members of the public, they get hundreds of applications for 90 slots on each citizen forum, and then they screen out people who are already engaged and are working on that issue directly. People who might have some sort of preexisting bias based upon the application that they send in. They work to try to get the people who actually [01:04:30] attend the forums to be demographically representative of the broader public.

David Storey: Okay.

Zachary Pirtle: Now, there's been a lot of work in Europe and there's many different ways in which you can involve citizens, some of which can take months, some of which can take just a few hours and involve only a handful of people. What this did is it brought in two forms, one in Arizona and one in Boston. People were put in, 90 people total at each site were put into groups of six to eight people and deliberated on a set [01:05:00] of questions that they were presented with background material that they'd been given in advance about what level of threat asteroids posed to the human race, different options for funding, work to detect more asteroids and to ways in which we could respond to asteroid threats.

And a lot of it was similar information that people who were managers inside my agency had been deliberating on. And the question for them was to think through what should the priorities be [01:05:30] here? What amount of opportunity, cost and trade off is acceptable in terms of if you spend more money on asteroid detection, it might mean less money spent on science. And just to get their thoughts on the issue. We partnered, some of the ECAST members had some really good social science backgrounds that did some very fascinating analysis of the conversations at the different tables. There were different observers. And it gave a broad set of insights about how they viewed the opportunity costs as well as just their thoughts on [01:06:00] dealing with asteroid threats in general.

There was also some discussion at the forum about human space flights and different options for missions there that would take a bit of time to get into. The papers I think capture it, I think fairly well. In my mind, part of what we were able to accomplish... Kitcher makes this argument that if you had a set of peers that they were behind this John Rawls veil of ignorance [01:06:30] and were given accurate information about what the priorities for society should be, that



the only way to decide on what good society should do is to imagine for Kitcher and Rawls what an ideal deliberation would look like. I think a lot of what we accomplish, there's imperfections with it. We learned a lot. But this type of deliberation of getting unbiased, fairly representative citizens to deliberate on something, there's a lot of ways in which it meets [01:07:00] parts of Kitcher's ideal.

And I think in a very practical way, I think a lot of the engineering managers that saw some of these results were very interested because they hear from special interests all the time, but they don't hear from everyday people. And I think there was a special interest in hearing this sort of results. I think you could actually make this type of citizen form deliberation. Our ECAST partners called it participatory technology assessment. You could make this as common as jury duty. You could have every agency that is [01:07:30] frequently engaged in this.

There was actually a tremendous amount of work on our end in order to translate the results and to make them sort of resonate or to try to bucket the inputs into categories that some of it would not necessarily be favorable of what the agency's plans were. But to put it into categories that managers could digest it because they themselves only have a limited amount of time to consume that information. And it seems to me, I argue [01:08:00] this in one of my papers with David Tomlin from the ECAST group, that this is an area that's right for philosophers to help come in to provide conceptual clarity. It's something that I think that if this does scale up to having this being so common throughout government that it could have a broad impact, I think it'd be really good for democracy as a whole, even beyond just engineering and science.

David Storey: Yeah, that's exactly where my mind was going, just listening to you [01:08:30] speak, it sounds too like philosophers may be able to help as facilitators for these kinds of public discussions. And on this point of this being healthy for democracy as a whole, one thing I'm thinking of is could this help more of the broader public develop more trust in government and in experts? I had mentioned to you earlier in our exchange, [01:09:00] it strikes me that this it experiment with the Citizens Forum, it touches on a broader cultural and political phenomenon. We've been seeing what Tom Nichols has called the Death of Expertise. He just published a book about this. This waning faith among the public that experts, that the term experts often has a pejorative connotation for much of the public that they're not competent, they're not worthy of trust. So I'm wondering, did this issue come up at all in the [01:09:30] deliberations and have you dealt with this issue at all in your work? And how do you think we might counteract that strong tendency we're seeing?

Zachary Pirtle: Yeah, I've got a lot of thoughts about that. Specifically within our forum, this questioning of the experts didn't come out too strongly. There was a little bit of suspicion that maybe some of the cost numbers that the agency was putting out there, they didn't quite believe them. There was, and to be honest, this is a very fair point. There was [01:10:00] some comments in the post-surveys where we

were asking the citizens if they thought the agency was actually going to use these results in a serious way. And a lot of people were skeptical of that.

David Storey: Right.

Zachary Pirtle: I think there are some key ways that I can't quite talk about it in which these results did influence decisions, but it's also, it's the right thing to do to have this type of dialogue regardless of whether you can do a direct A to B causal chain in terms of how the results change something. [01:10:30] In terms of expertise more broadly, I'm very sympathetic. There's so many political and cultural debates surrounding several issues such as climate change, vaccines. I try not to engage in those areas too much, but I feel that the people who came and showed up at this event, they were excited to offer their views. And they wanted to learn about things.

I think that you can almost sidestep some of these much more politicized issues [01:11:00] by just bringing in everyday people and having a conversation about what the goals should be. I don't think that expanding the citizen forums too broadly, I don't think it would necessarily fall into these politicized traps as much. And I think if you build out people's sort of muscle memory about how to talk to people who are from a different political party, about how to talk to people who are from a different economic income, of which we tried to have at these forums, both economic incomes and diverse representative [01:11:30] political affiliations, I think you can get people talking and training them up to have tougher and tougher conversations.

I am a little bit critical of this death of expertise notion, largely from my scholarship on Philip Kitcher's work. There's been a lot of philosophers that I've tried to say that maybe you could have experts that just decide what the right scientific questions are. And Kitcher actually was part of the old guard that his 1990s book, the Advancement of Science, was trying to still carve out a way in which [01:12:00] you could have some independent conception about what scientific value was.

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Zachary Pirtle: You could have some independent conception about what scientific value was, that you could use to decide what scientists should do. And he finally realized with the Science, Truth, and Democracy book in 2001, some of the other philosophers like Helen Longino had already realized before. It's just that there's no way to have an expert-based answer to some of these questions. These questions that are ultimately about values can't be answered by expertise.

David Storey: Mm-hmm.

Zachary Pirtle: I do speculate, and I'm drawing off of Dan Horowitz's argument here, that perhaps some of why [01:12:30] expertise and the death of expertise is being

focused on so much, is that there's scientists who are, their work is in an area that's tied to some of these big value debates, and that's...

I think instead of trying to just politicize it, maybe just having a democratic conversation on what to do. And the politicized examples I talked about before, there are big exceptions, or people who are very thoughtful about this. But sometimes there are scientists who try to double down on [01:13:00] expertise as a way to resolve the value debate.

David Storey: Right.

Zachary Pirtle: I feel like that...

David Storey: And that's worthy of criticism.

Zachary Pirtle: Yes.

David Storey: Yeah.

Zachary Pirtle: Now there's great work and Andrew Light's a great example of it, that's very thoughtful in this way, but I do worry that people are trying to resolve political values disputes too often through expertise. It's been dragging and making it seem as though the value of expertise is being lost. But really I think the people who are frustrated here, they're just misapplying it. [01:13:30] Some of these conversations I think we should just get back down to more fundamental points about how... Just getting us to talk as a democracy.

David Storey: Mm-hmm. So in some ways we might see the pushback against expertise as a healthy development, in the sense that people are questioning authority. In that many times experts might be just invoking their authority and just basically appealing to authority to ram through their own [01:14:00] agenda.

Zachary Pirtle: Yeah. I think philosophers can have a role to play in helping to translate and broker this discussion, especially Heather Douglas's work on how values can actually be part of science and try to make it clear that there are areas within, politicized scientific areas where values are playing a role, I think could be important. Just as it fosters, I think could also contribute to additional public dialogues that are forming scientific technology [01:14:30] issues.

David Storey: I want to share something that you wrote to me earlier when I was asking you to describe your research, and you've touched on this already to some extent, but I just wanted listeners to hear it, because I thought it was a really nice articulation of what you are interested in and care about.

You wrote, these two themes relate closely, the two research tracks of engineering and epistemology and democracy and engineering. Greater humility on knowledge can improve democratic conversations about what we should

engineer. And [01:15:00] deeper awareness of values from democratic conversation can help us to make more accurate models of the world.

I just think that's a really nice encapsulation of why the kind of work that you're doing is important. Feel free to offer any examples or anecdotes of particular technological problems for which you think this is relevant. I know you mentioned some of the more controversial ones like climate change and so on. Anything that really stands out as an important issue on the horizon.

Zachary Pirtle:

[01:15:30] Yeah. I think just to show how these two tracks of engineering epistemology on the one hand and then ethics and democracy on the other, sometimes I feel people, there can be a political debate about say, infrastructure. And people only have limited amount of money to spend on infrastructures. There's limited amount of money to spend on anything. And there's a hope that they go, oh, let's just build this. We want it to last for 30 years and we don't want to spend any maintenance money on it except for a cursory amount.

But oftentimes there can be so much uncertainty say in infrastructure, about [01:16:00] just how much maintenance costs will be required, about how people will use that. Sometimes it's hard for engineers to give an easy answer to, it's going to last for 30 years or maybe only 10, and it's only going to cost \$20 million, but it could be 40 or 50.

Teasing out these uncertainties that are inherent within a lot of engineering systems, I could point to estimates in human space flight for how safe a spacecraft is going to be, where the outer bounds of uncertainty can get very broad, [01:16:30] and then sometimes you're getting some information out of a model, but it's not quite clear how you can trust the boundaries of the box, so to say.

But yet someone has to make a decision that's going to affect someone's livelihood and if someone lives or dies. And then if something bad does happen, then it becomes an issue that's discussed in Congress, just among families at the dinner table about just how safe is safe enough.

I think for people just to realize that the work that engineers do, just the limits in terms of if people are using models or bringing them to bear on something like safety or about [01:17:00] people are spending public funds when there's multiple competing funds, just the uncertainties there. I think that helps bely and it helps provide context to when things sometimes don't go wrong, and public policy or when an engineering thing doesn't quite meet its promise. And also it helps, it points people to the right sorts of dialogues that they should be having about how to help something.

On the other hand, in terms of how democratic deliberations and these sorts of things can help engineers do a better job of providing benefits to society, there's

a lot of decisions that engineers make as they're designing a new system, that [01:17:30] maybe some economist comes in and does a value return on investment analysis or something.

But if you look at the ways in which iPads are shaping, how parents are interacting with their children, having them rely on it, there's lots of decisions that were made by engineers years and years ago about how kids can engage with those devices that shape how the family dynamic works.

David Storey: Yeah.

Zachary Pirtle: Engineers, there's some people like Sheila Jasanoff who sometimes talk about science and technology as this extra constitution that has got this power over our lives that's shaping [01:18:00] and influencing things.

The more democratic debate that you have around engineering systems, the more that engineers can bring that into the early stages of the design and change something so that you can potentially avoid negative consequences. But perhaps more importantly so that you can get new benefits or to help you do things that will provide more good for society.

I think that these are both high-level examples. I think it's possible to go a bit deeper, but I think in almost any issue, I think democratic discussion can be helped by a clearer sense [01:18:30] of what knowledge is involved and the limits of that knowledge, which there are always important ones. But then I think just by having more democratic deliberation, you help democracy for democracy's sake, but I think you can provide a way in which engineers, just in the course of the work that they do, can start to steer the ship in ways that might lead to more benefit for society.

David Storey: I love that you raised the example of iPads and technology and its effects on the family. I think it's fair to say we're in the middle of the tech lash, this new concern around, I guess you could say [01:19:00] software engineering and the political consequences of Facebook as well as the psychological effects of smartphones and so on.

So it seems, in terms of the general public's attitudes and relationships to emerging technologies, digital technologies, it sounds like this is something that is in the water, in the air, there's increased appreciation for.

So why don't we turn to this conference that you are co-organizing. So this is the conference on philosophy, engineering and technology. [01:19:30] So you sent me a link to the program and the website, which I can post the website in the show notes for anybody who wants to check it out. First of all, I really want to attend. This looks so fascinating. Most of this stuff is very much out of my wheelhouse, but it just looks intrinsically interesting.

Second, I want to read a quote that is included on the website for the conference that really struck me. In his essay, the True Grand Challenge for Engineering Self-Knowledge, Carl [01:20:00] Mitcham you mentioned earlier, wrote, and I quote, in the words of the great Spanish philosopher José Ortega y Gasset, "in the first philosophical meditation on technology, to be an engineer and only an engineer is to be potentially everything and actually nothing. Our increasing engineering prowess calls upon us all, engineers and non-engineers alike to reflect more deeply about who we are and what we really want to become."

And lastly, I want to read [01:20:30] some of the paper titles to give listeners a sense for the range of topics that'll be discussed at the conference. Is an engineered life worth living for humans, engineering at what cost to what purpose? The US Federal budget process as a site for responsible innovation and engineering ethics work, software and metaphors, the hermeneutical dimensions of software development, ethics in citizen science, lessons from the Flint, Michigan, water crisis. And building trust in AI system design and operation, [01:21:00] a perspective from automated driving system. So can you tell us about the origins of this conference and what void do you see it filling?

Zachary Pirtle:

Thanks. And so the fPET, Form on Philosophy, Engineering and Technology, it's more tangible forms began around 2007 through the work of David Goldberg, Alva Vanderbilt, Diane Michelfelder and several others.

When I've [01:21:30] talked about my history and a lot of my background in philosophy, it's very much an analytic philosophy, science bent. There's been a broader community of philosophers that I've been part of what's called the Society for Philosophy and Technology. They've actually been meeting since the '70s.

Carl Mitcham is one of this crowd. There's been some interesting work there. Langdon Winner was part of that crowd and his work on Do Artifacts have Politics is quite famous. There was a sense that, one, first of all the philosophy and technology [01:22:00] work was relatively smaller than a lot of the work done in philosophy of science, although it's continued to grow and become more prominent as time goes on.

But there was also a sense that that group wasn't engaging with practitioners of engineering. It was not just as much on engineering itself. And so Dave Goldberg, Diane Michelfelder and others in 2007 had an initial meeting. It was a different name before fPET, but it eventually became the fPET conference series, where they started [01:22:30] bringing engineers and philosophers together.

Now, there's still more philosophers than engineers, but it's been a good, and I think healthy dialogue. I believe this will be the 7th meeting of fPET, if I've counted correctly. The first meeting was in Delfzijl, the Netherlands. There's been a meeting at the Chinese Academy of Sciences, in Nuremberg and

Colorado, and now we're hosting the fPET meeting actually at the University of Maryland College Park, which is nearby to DC.

I'm able [01:23:00] to do it, thanks to my colleague from the ECAS work, David Tomlin, who's at University of Maryland College Park is the local host, and then I'm the conference coach here. I do think it fills a gap both in just focusing on engineering, but also I try to make it very important for this meeting, and it's been important in the past about bringing in practitioners.

David Storey: Right.

Zachary Pirtle: And I think there's still a type of learning that can go on when you do both there.

David Storey: And so these are, [01:23:30] including not just academics, but scientists, engineers, government officials and so on, I would imagine?

Zachary Pirtle: It's probably... It is majority academics. Some of the engineers who attend are engineering professors. We do have some NGOs that are attending this year, groups that focus on emerging technologies. There's been a number of practicing engineers as well.

I think at the last fPET there was one from Orbital Sciences. There are a few from different engineering firms that are going to be at [01:24:00] this one. There's not as many... I'm one of the few government employees that's there. There's actually going to be more at this one. There's going to be at least a handful at this one, which I'm excited about.

And it's very different schools of philosophy, but I think most of them are brought together by this idea that engaging with engineering practitioners is important. I talked earlier about my work largely reflecting work in epistemology and then work in ethics. There's a lot of both at the fPET meeting, as I think is indicated by the titles that you quoted earlier.

David Storey: [01:24:30] Mm-hmm. Yeah. And would this fall roughly within the bounds of science and technology studies? Is that an overlapping field you would say?

Zachary Pirtle: I love STS. A lot of STS work I find to be very challenging and insightful. I don't care too much about what disciplinary titles you put onto things. I do think that the philosophy of engineering work that we have at our meeting, probably there's a little bit more [01:25:00] focus on epistemology, then you might get at an STS meeting.

And there's a little bit more focus on ethics as a topic of itself, than there might be at an STS meeting. But I think that in terms of some high-level overlap, there's plenty. And there will be some STS scholars at the meeting and it's a good involvement.

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David Storey: Well, I wish you the best with the conference and someday I would hope to attend. I'm not sure how I would end up there, but I'll definitely keep it on my radar, let folks know about it through the website.

Zachary Pirtle: [01:25:30] I'm really excited about it. There's one thing that's interesting about comparing philosophy of engineering to philosophy of science, there's been a lot more work in philosophy of science. It's been about physics, which was the classic archetype for philosophy of science for many decades. There's been more work on biology.

Engineers have not been as reflective philosophically about their work in the past. A lot of them, they just like to build stuff. They like to just go off and do things. Whereas as perhaps academic scientists, Einstein or Richard Levins or Ernst Mayr, they wanted to reflect more on the fundamentals [01:26:00] into applying about the knowledge of their... I do think that a lot of the engineers that we do engage and we do talk to about just this, as philosophy of engineering is an opportunity to reflect more deeply. Of the best engineers that I know, all of them find that argument fairly compelling.

And I do hope that this fPET philosophy of engineering work continues to strengthen others. It can plug in, there's work going on all over the place about changing engineering curriculum. There's engineering societies that care a lot about technology and society. I really appreciate the [01:26:30] chance to talk about it. And fPET does happen every two years. So the next will probably be in 2020.

But on the off years, there's still the Society for Philosophy and Technology meeting, the SPT meeting. I've also talked to other engineering societies about trying to have more fPET or putting more philosophy into conversation with some of the conferences that they already have going on. There's a lot of people who are interested in the topic, but it's hard, given that there's not that many engineers or philosophers working on philosophy of engineering. It's hard to get a lot of them plugged into stuff.

[01:27:00] I'm actually really excited, with this fPET conference I think it's significantly larger than the last one. It might be one of the largest fPET conferences ever. We've got about 70 items on the agenda. So I do hope that this work can keep growing. I also hope that it achieves some of the stuff that you and I were talking about earlier, about philosophers engaging with the world and in the world.

David Storey: So a couple of things. One is that, unfortunately when I look at the job postings in academic philosophy, there's maybe a couple of engineering [01:27:30] ethics jobs every year. It's not in demand, at least in terms of academic appointments.

What that means is it's not incentivizing anybody to study those kinds of topics. So that seems like definitely a gap, but the demand, it just seems so clear given



the overall trends of where our society is going. We touched on the tech lash before, and it also strikes me that there's a lot of folks in Silicon Valley who are now [01:28:00] being forced to reflect on the design decisions that go into so many of the products and services that they create.

Are you familiar with Jaron Lanier at all? So he's somebody that I think you would be really interested in reading. He came up in my discussion with Bob Frodeman. So he was essentially one of the creators of virtual reality, and he's currently chief scientist or some big title at Microsoft. But he's written a couple of books that I think [01:28:30] you could describe as works in the philosophy of technology over the last couple of years. One is called, You Are Not a Gadget, the other is, Who Owns the Future?

And he's come out as a really prominent critic of the blind faith in Silicon Valley, almost religious faith in technology as improving society. And if it can be done, it should be done, bracketing any value questions or philosophical questions, conceptual questions at the heart of what kind of work goes on there. So just [01:29:00] strikes me it would be a really good connection for the kind of work you're doing at the conference.

Zachary Pirtle: Sounds exciting.

David Storey: Just a few wrap up random questions and then we can finish up. So you mentioned Dune as a favorite and influential book. Are there books that you reread every year or that you keep coming back to?

Zachary Pirtle: Not a book, but The Battlestar Galactica remake keeps drawing me in, and I did a re-watch of some of the Star Trek. Well, the Next Generation, Deep Space Nine. Deep Space Nine blew me away, that I didn't realize [01:29:30] when I was a kid just how deep it made the social universe of Star Trek. Yeah, I do a lot of that. I have a hard time reading novels these days, while

David Storey: Join the club.

Zachary Pirtle: [inaudible 01:29:40] dissertation. Yeah.

David Storey: Are you reading anything right now?

Zachary Pirtle: Actually, I just finished a book, which this is a minor miracle that I finished something. Malka Older is a fantastic author, I've liked her stuff so much that I made her one of the keynote speakers for the fPET Conference.

She's a science fiction writer, and her first book was called Infomocracy, [01:30:00] and I just finished reading the sequel, but it's a world where people decided to give up on nation states and they decided to make everything focused on a democratic system where everyone is part of a 100,000 person city state. So the entire world.

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And the book is actually, it's about people who make the information system this Facebook on steroids that provides news to inform elections and daily opinions. And it's this beautiful interweaving between how people have these political [01:30:30] values and how those get manifested in this information system, and then how the system itself starts shaping the democratic elections. And it's a great sort of philosophy of engineering vignette case study.

David Storey: Is it utopian or dystopian?

Zachary Pirtle: So, Malka has gotten that question a lot. And the infomocracy came out in 20... Just after the election.

David Storey: Proceeded to sell millions of copies, I hope.

Zachary Pirtle: [01:31:00] Yeah. It's gotten some good accolades. Washington Post, I think put it as a best of 2016. It came out just before the election. A lot of people have found it to be prophetic. She actually thinks it's not necessarily all that dystopic. I think I'm inclined to agree with her.

I don't care so much about the utopian dystopian one. I just think it's a beautiful metaphor for how we could think about doing democracy differently and then how that democracy is shaped by engineering systems. So whether that's a good thing or a bad thing, I don't care.

David Storey: Sounds maybe [01:31:30] like a Rousseauian dream, small-scale democracies with very informed citizens. Maybe that's the answer. Do you know your Meyers-Briggs?

Zachary Pirtle: I believe it is INTP, but I'd have to look back on it.

David Storey: The dominant profile seems to be INTJ for philosophers that I've interviewed, so interesting.

Zachary Pirtle: Interesting.

David Storey: Do you have any creativity rituals?

Zachary Pirtle: I need more. So I'm excited to listen to the rest of your podcast to find them. My only current [01:32:00] one is I've been waking up significantly earlier than my wife lately, and I've been sitting with the windows open and trying to write while listening to the birds.

David Storey: I try to practice that one. But I'm still working on not being a morning person. Still working on trying to become a morning person. Do you have a favorite superhero?

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Zachary Pirtle: I'm embarrassed that I sometimes get emotional during superhero movies, but anytime a superhero is willing to just sacrifice it all, that pulls on my heartstrings. And that [01:32:30] category probably ends up touching on most superheroes at some point.

David Storey: So you mentioned the conference, we discussed that, that's probably the major thing on your horizon, but what is next? What is something big in the next year or maybe couple of years, that you're really excited about, you're really looking forward to working on?

Zachary Pirtle: Yeah. So I'm hoping that we'll get either a book or a special issue out of the fPET conference. But otherwise, really, I'm trying to just double down where I'm at to within the agency that I work in to encourage more reflection, [01:33:00] both on epistemology, on ethics. And honestly, I hope I'm doing now in 10 years, in 20 years the same thing and just doing more of the same. But there's always a chance that some screwball will pop up and I'll go a different way. So we'll see.

David Storey: Well, Zach, I want to thank you so much for your time. This has been a really great conversation and I think especially because it gives listeners some really practical ideas for what they might do with philosophy outside the box. [01:33:30] So thanks for being on.

Zachary Pirtle: Thank you so much, David, and best of luck with the podcast. This is great.

David Storey: So thanks for checking out my conversation with Zach. Tune in next week for another person who went through [01:34:00] the PMF program, the Presidential Management Fellowship, and likewise transitioned into working for the Federal Government. In this case, the United States Department of Agriculture.

In the meantime, if you are enjoying the podcast and you want to support it, please recommend it to five friends and write a short review on iTunes. And as always, if you have recommendations for guests, if you'd like to be a guest, if you'd like to see topics covered, you can drop me a line on my website, [01:34:30] [www.davidstorey.com](http://www.davidstorey.com).

Music for today's episode from Xperia, thanks to the APA for their support for this project. And thanks to you for tuning in and checking it out, and hope to see you back here next week.

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