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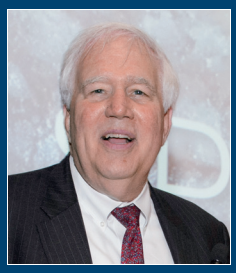
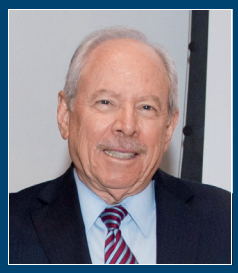
On Free Speech and Academic Freedom

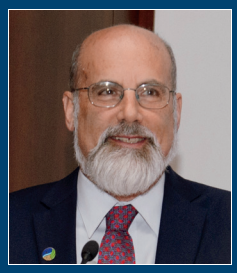
Joan W. Scott

A Reading and Discussion of the Play *Paradise*

Rebecca Saxe, Paula T. Hammond, and Saba Valadkhan







Communicating Science in an Age of Disbelief in Experts

Richard A. Meserve, Mary Sue Coleman, Alan I. Leshner, Joe Palca, and Matthew P. Scott

ALSO:

A Reading and Discussion of *Paradise*, a play by Laura Maria Censabella

On February 15, 2017, members of the Catalyst Collaborative@MIT performed a staged reading of *Paradise*, a play by Laura Maria Censabella. The program, which served as the Academy's 2050th Stated Meeting, included a panel discussion featuring **Paula T. Hammond** (David H. Koch Chair Professor in Engineering and Head of the Department of Chemical Engineering at MIT), **Rebecca Saxe** (Professor of Cognitive Neuroscience in the Department of Brain and Cognitive Sciences at MIT), and **Saba Valadkhan** (Assistant Professor in the Department of Biochemistry at Case Western Reserve University). The conversation was moderated by **Carey Goldberg** (Editor of the CommonHealth blog at WBUR) and featured introductory remarks by **Debra Wise** (Codirector of the Catalyst Collaborative@MIT and Artistic Director of the Underground Railway Theater) and **Jonathan F. Fanton** (President of the American Academy of Arts and Sciences). The following is an edited transcript of that discussion.

Paula T. Hammond

Paula T. Hammond is the David H. Koch Chair Professor in Engineering and Head of the Department of Chemical Engineering at MIT. She was elected a Fellow of the American Academy in 2013.

Sometimes you experience inner conflict when aspects of your new scientific environment clash with your upbringing, your culture, your family, or your faith. You might feel that you have to take sides.

I would like to talk a little bit about my own experiences and what really got me about the play *Paradise*. I grew up in Detroit, Michigan – which is Motown – in the 1960s and 70s. I had very well-educated parents and lived in a middle-class neighborhood. My parents had a lot of high expectations of me when I was growing up, and they told me that I could – and should – do whatever I wanted. So I was very enabled.

My culture, my African-American culture, is a little different in that, especially at that time, there was a bit of duality. I received a lot of encouragement to achieve at the highest levels but, at the same time, I was the oddball and the loner in the classroom and at school. Being different meant not minding that being smart was not cool and that loving learning was something that wasn't going to get you a lot of friends. I had one friend from grades one through eight. It was one of those experiences where you realize you're different.

When I got to MIT as an undergraduate student, I thought that I had come into my own. I discovered people who were just like me, and yet I was still different from most of my classmates. So I can really relate to the theme of differentness that the character Yasmeen experiences in the play.

As I got older, I came to understand that my differentness was a tool, rather than a burden. Like Yasmeen, I'm a very surprising person, and I came to embrace that. When I walk into a room, someone might assume that I'm not the person in charge, and I end up defying those expectations. And to embrace that is something that you have to be able to do to continue in a career in science and technology. Because no one is expecting you.

Another theme I connected with in the play was how faith, culture, and family experience make you who you are, whereas the culture of science, the ability to get in there and do what you need to do to perform at the topmost levels, does not. But I have found that, throughout my life, I always felt that I carried several identities with me. The whole Detroit thing. The whole African-American thing. The fact that I'm Christian and a person of faith, but I'm also a scientist. I'm a liberal, somebody who believes that we should live in a fact-based world, and I can say hallelujah to that at the same time. That is something that is unique to who I am.

But part of being able to embrace that is recognizing that sometimes you will experience inner conflict when aspects of your

new scientific environment clash with your upbringing, your culture, your family, or your faith. You might feel that you have to take sides. And those feelings are very real; they're conflicts that can tear you apart.

As I've gone through life, I've wondered: are those choices real, or are they only conflicts I feel? In reality, we don't have such clear choices. We have to be ourselves, and we carry ourselves with us. When I walk into a classroom, I'm taking the African-American kid who didn't have a lot of friends. I'm taking the Christian part. I'm taking all of those parts with me. And at some point, I have to feel comfortable with that. But that means confrontations, and sometimes it means losing groups of friends.

When I was growing up, I was told that I acted white. When I then began to enter the scientific world, I was asked about my life in the ghetto growing up. So there are times when you realize that there's not any one particular place for you; you have to find that place or create it. You have to find your allies and your friends. Find the cohorts who will be with you for that journey. And allow yourself to bring all those elements in, recognizing that sometimes there will be a fight, but that the fight will be worth it.

Rebecca Saxe

Rebecca Saxe is Professor of Cognitive Neuroscience in the Department of Brain and Cognitive Sciences at MIT.

I want to first thank the actors. I had read the play and it was so much more interesting and more meaningful to see it performed. It brought a lot of it to life in a really powerful way. So thank you for that beautiful performance.

The play also spoke to me very personally. It's almost uncanny the various ways in which the play speaks to themes that I feel like I have experienced or lived. Yasmeen's motivation for being a scientist is essentially my motivation for being a scientist, and for being the specific kind of scientist I am. In fact, it's a little bit unnerving how much her research program actually looks like mine.

Yasmeen tries to articulate an idea of wanting to be a neuroscientist in order to help people. And then she says, "Not with disease. But with how to live." This is the core question of my professional life: is it possible to approach the human brain scientifically and do so with the intent of understanding better how to live? What would that look like?

She grapples with that puzzle throughout the play. One question that she faces is about what a life of value is. What does it mean as an individual to choose how to live? And she feels that she is being asked to choose between two kinds of value. The value in which she is a part of a whole she's inherited: she is valuable insofar as she carries on and honors the traditions of her family and her culture. Or the value that she creates by earning it through science: by creating new knowledge or new experiments.

And I felt like I had that choice. I was also religious as a child. I'm Jewish and, like Yasmeen, I also dressed distinctively, in ways that marked me as a religious woman. For me that meant wearing long skirts. And when I was her age, and then for years afterward, I felt there was a choice of value in either living according to the ideas of what a Jewish woman is or living according to the idea of what a scientist is. It's an odd position that, retrospectively, can be hard to understand.

For example, one of the strange positions Judaism can put you in is that there's an explicit way of counting people in which women are not counted. And, as a young woman, I argued, with all of the intellectual capacity Yasmeen brings, for not being counted as a person, which is a little hard for me to remember or admit. But Yasmeen says something that reminds me of who I was then: she says she dresses the way she does and uses her call to prayer to remind her of who she is. She says, "That's who I am." And I resonate with that sense that you do have to decide who you are, which is almost the opposite of what Paula just said.

Another way the play spoke to me is through Royston, who said that there's always a personal reason behind what you choose to study. And I have wondered whether that was true for me and have fought with

Is it possible to approach the human brain scientifically and do so with the intent of understanding better how to live? What would that look like?

it. Is science always personal? Are the questions we're asking always personal?

My dad used to tease me that I studied theory of mind because my mother didn't have one. I hope she's not listening. But I thought for a long time that my science wasn't personal. And I thought that actually, that was a flaw of mine as a scientist – assuming that my questions were purely intellectual. Then, coincidentally, I started studying human brain development and had a baby, and I spent my maternity leave in an MRI machine with my newborn son. There was suddenly this creature that mattered more to me than anything else, and I got to know him as much as anywhere while scanning his brain on an MRI machine. Suddenly science got very personal.

And then it got more personal. I was studying his brain partly because babies' brains are very resilient to injury. And then my dad had a stroke. Suddenly science can come back and bite you in the most personal ways you least expected.

The last thing that I wanted to reflect on is the play as science communication. Like I mentioned, the experiment Yasmeen is designing is an experiment that could be at home in my lab, but when I first read the play, the conversation between the two of them didn't sound real to me; it didn't sound like the way scientists talk to their students. And I didn't know whether to be bothered by that or not. Should a play be veridical in that way? Should it sound like what it would sound like to have that conversation in my lab?

I'll share one last thought on the play's merits. The play articulates a scientific view of adolescents: that they are reckless, have problems with impulse control; that they are passionate, but make poor choices. That's what Yasmeen says is their earth-shattering theory of adolescents. But in reality, I think Yasmeen herself is a much better portrait of what science suggests about adolescents, which is that they are not simply governed by impulse, but that they are extremely black-and-white in their motivations, driven by needs for authenticity, for resisting adult control, and for serving the ultimate greater good in all-or-none terms. That's actually what science currently suggests about adolescents, and it's what Yasmeen is, even though she doesn't describe herself that way when thinking scientifically. And somewhere in there is the interface between art and science.

Saba Valadkhan

Saba Valadkhan is Assistant Professor in the Department of Biochemistry at Case Western Reserve University.

I also feel very connected to the play. I wonder if it's because the experience of being a minority, no matter what kind of minority you are, is one and the same. The sense of disempowerment, of being an impostor is a shared experience of minority groups. So the need for empowerment, for receiving positive outside messages, is really paramount for a minority person to flourish.

But there are a lot of factors that continue to disempower minorities: a lack of mentorship, a lack of role models, cultural restrictions, and, often in scientific society, a lack of facilities. For example, not a long time ago, women were a minority in science. Things are becoming a lot better, but we are still falling behind. At one time, women weren't allowed to study at male colleges. Slowly women made progress and gained access to study side by side with men. Slowly, they started to go into higher education and earn their PhDs. Right now, at least in some subjects, for example in biology, we see that they are gaining a lot of ground. And so among biology PhD graduates, the proportion of women is now not that much lower than men. So that's fantastic ground that we have covered.

Improving the culture by reducing prejudice against women, or maybe even just improving the situation of women in terms of having childcare, being allowed to have a family at the same time as their careers, can help mend the existing leaky pipeline.

But it seems that after that, the pipeline becomes leaky. In the transition from a graduate student to a postdoc, we seem to lose a lot of women. And there's an even bigger gap when women transition from postdoc status to a professorship. After that, going up the academic ladder, the pipeline becomes more and more leaky.

Viewing progress from when women were not allowed to be in the same schools as men, clearly the situation is a lot better; but there is still a lot to be done. Improving the culture by reducing prejudice against women, or maybe even just improving the situation of women in terms of having childcare, being allowed to have a family at the same time as their careers, can help mend the existing leaky pipeline. And other minority groups, for example people of different ethnicities and religions, are experiencing the same problems. And it's very likely that the same interventions that brought women to this point would work for other groups, like Muslim women or women of color, as well.

So just to share some interesting statistics. In the United States, women are graduating from colleges at a reasonable rate, but they're still underrepresented in a number of subjects, like engineering. It's the same thing in Muslim countries, except much worse. There, women are actually graduating at a higher rate, believe it or not, compared to men: 50 to 60 percent of college students are women. But they are all in arts and humanities; there are very few women in STEM. So that reflects what we had here before, just three decades behind.

My hope is that the interventions that helped here – better mentorship, better empowerment, the presence of role models – may be the same type of interventions that would help down the road elsewhere. And, hopefully, we would be able to see this gap bridged in coming decades.

I'm not an expert on this, but experts always seem to emphasize that high school, where Yasmeen is, and middle school are extremely important in creating an image of empowerment for going into STEM subjects. And I think all of us have had a similar experience of empowerment during this critical period of our life. So how can we make this happen for future generations?

A lot of people think it comes down to science policy or educational policy, but that isn't enough. There is an enormous amount of talent here in this room. People in real positions of power are here. So, I ask you: how much does it take, for example, to ask all the active scientists to spend two hours a year going into high schools with minority students and try to empower them? This is not going to kill your career, but it could make a life-or-death difference in terms of their careers. I don't know how difficult this would be to implement, but I think waiting for the government – especially this administration – to do something about this is just wasting our time. We have to be the ones to

do something if we care about it. It doesn't take an arm and a leg, just a little effort from each and every one of us.

Discussion

Audience Question

I was raised in the Muslim faith and my whole family is Muslim. I have both experienced and witnessed how sometimes faith has to be left behind to pursue professional goals. And you have all said that you are religious or were religious in some way. So I'm curious to hear about your experience transitioning from your family life to your professional life with your religion.

Paula T. Hammond

I work with nanotechnology and chemical engineering, which sounds very technical and impersonal. But there is the idea that you can bring molecules together and create something new, and to me, that is an inspiration. And at the same time it is a celebration. From my perspective, my faith, going into the lab and creating is a gift. I always thought that all of the scientific theories in the world, including evolution, are just beautiful transcripts from how god created the world. But it's also true that many people of my faith wouldn't see it that way. For me, though, these things don't have to be separated. It can certainly be challenging, but I don't mind being challenged.

Audience Question

I think it's important to understand and communicate to your students the cultural context in which they're caught. Can you comment on that?

Rebecca Saxe

One thing we didn't explicitly talk about in our discussion, which the play is centered on, is about the relationship between a student and a mentor, which is a profound and defining relationship in everyone's scientific career. Each student often has multiple mentors, and then, if they're lucky, will have multiple students they will mentor. It can sometimes feel like marriage after a short blind date: I meet somebody for half an hour, check their CV, and make a lifelong commitment to them. Which is insane. And we put so much at stake in one another when we make that commitment. My grad students' careers depend on me in a profoundly feudal and kind of creepy way. And my life satisfaction, never mind my success, every aspect of my day-to-day life is now contingent on them because I don't do science anymore. I mentor people who do science. Any aspect of science I get to do, I do through other people. There's no question that being a professional scientist, in my experience, has defined me through relationships more than any other part of my life except my children. I think about how to handle mentorship relationships much more than I think about how the brain works. Much more.

Our lives are built around the nurturing of young scientists who are trying to branch their careers. What we experience every day is people; we're not surrounded by walls and test tubes, but by people and their relationships with us.

Paula T. Hammond

Rebecca's comments resonate with me as well. Our lives are built around the nurturing of young scientists who are trying to branch their careers. What we experience every day is people; we're not surrounded by walls and test tubes, but by people and their relationships with us. Our relationships with them are the defining characteristic of what we do.

Rebecca Saxe

Some people might experience science as a lonely endeavor, but for most of us, it's profoundly social. In complicated ways, in good ways, in bad ways, but nevertheless, nonstop social.

Saba Valadkhan

This goes to show that the reality of being a scientist doesn't always match the external image that we project. People think that scientists are these crazy people who are hiding themselves in labs and offices. But that's not the case. Like it or not, we have to interact with people all the time.

Audience Question

Something we've all wondered as a mentee or a mentor is, what's the right way to do it? And how personal do you get? We have not seen the whole play here, but this teacher is an odd person. And he's getting, in my opinion, close to being inappropriate in his

assumptions about the young woman and where she's coming from. And yet I'm sure we've all experienced degrees of that in our mentor-mentee relationships. And sometimes even with that inappropriate behavior, you can still benefit, as Yasmeen seems to be doing. So I'm just wondering if you guys can each pick an example from your own lives of both the challenge but then the benefit.

Saba Valadkhan

It's tough. I realize that when I have mentors that expect me to perform extremely well I do perform extremely well. The problem is when mentors start to see the otherness in me and treat me as different from themselves. Maybe less of a capable person. So this otherness problem is very detrimental. Many of the women in my institution – especially junior women – feel they are being treated as slightly different. For example, there was this really nice, well-meaning, very senior gentleman, a very good scientist. Every time he saw me, he felt the need to talk to me about being pregnant, but in a supportive way. He would say he supported me, assuming I was going to get pregnant and that it would hurt my career. That's weird, and inappropriate to say, especially in front of my graduate students. Just don't do it!

Paula T. Hammond

I've had some great mentors that didn't look anything like me. And I feel very lucky for that. But the ones who were most effective for me were the faculty members who said, "Why aren't you thinking about doing that? Why aren't you putting yourself up for that? Why didn't you?" They looked at me and said, "I see what you can do. Why aren't you doing it?" But I've also encountered others who had low expectations of me. And you can tell. We're all very smart; young people are very smart. They can tell when you anticipate that they're just going to make it through, or be somewhere in the middle. That doesn't leave you with a feeling of capability. And while sometimes that can drive you to want to achieve more just to show them you can, I think we need to be aware of our unconscious assumptions about people. And I think it's about learning: dropping the guise of what you think this person is and where they come from and realizing that they're just another brilliant person.

How do we make science culture one that embraces everybody and hears everybody and allows you to stumble and rise back up without a huge retaliation?

Rebecca Saxe

I was extremely lucky with the mentors that I had. And I've never known whether I was just lucky that I got three fabulous mentors or if it's the fact that they were all women. My undergraduate research, my graduate research, and my postdoc research were all in the labs of women. And I can't remember a time at any point in my education when anybody had low expectations of me because I was a woman. In regards to how personal to get, I think there are tons of gray areas and complexities. And, for me, that comes up as a mentor all the time. It can be hard to know how personal to be in caring for my students when I know something is going on in their lives; I want to be supportive but not invasive. If you're going through a difficult breakup, for example, it could be weird for your boss to ask you about that. Or it could be nice. And so I'm trying to figure out how to express that I'm open to them telling me what's going on, but I don't need them to tell me what's going on. That is part of the complexity of being an appropriate mentor. And, on the other side, one thing that I struggled with in particular was how personal to be about my own unhappiness. If I'm unhappy or if I'm struggling, if personal issues in my life or my ability to be enthusiastic about science are affecting me day to day, how much should I talk about that or be open about that with my lab? My feelings of failure. Or my impostor syndrome. How open should I be?

And I see two sides to that. On the one hand, I felt like being open with it normalizes it. So if everybody knows that I also experience impostor syndrome, I also get depressed, I also have days when my personal life prevents me from working, perhaps that destigmatizes it. On the other hand, I feel like a key role that I play for my students is in helping them to stay enthusiastic and to shore up their energy for the next assault. And certainly a key role my mentor played in my life was that every time I lost faith in science, she reminded me why I was doing it. And so about a year ago at a lab meeting, I asked, "What would you guys like me to do? Do you want me to tell you when I'm feeling depressed and distracted and can't get the will to live and don't remember why we're doing these experiments? Or do you want me not to tell you?" And there was much discussion; it was a very intense lab meeting. And the end consensus was to talk about past feelings of impostor syndrome and depression, but not present ones. I thought that was really insightful. ■