



To Live Your Best Life, Do Mathematics

The ancient Greeks argued that the best life was filled with beauty, truth, justice, play and love. The mathematician Francis Su knows just where to find them.

By Kevin Hartnett

Math conferences don't usually feature standing ovations, but Francis Su received one last month in Atlanta. Su, a mathematician at Harvey Mudd College in California and the outgoing president of the Mathematical Association of America (MAA), delivered [an emotional farewell address](#) at the Joint Mathematics Meetings of the MAA and the American Mathematical Society in which he challenged the mathematical community to be more inclusive.

Su opened his talk with the story of Christopher, an inmate serving a long sentence for armed robbery who had begun to teach himself math from textbooks he had ordered. After seven years in prison, during which he studied algebra, trigonometry, geometry and calculus, he wrote to Su asking for advice on how to continue his work. After Su told this story, he asked the packed ballroom at the Marriott Marquis, his voice breaking: "When you think of who does mathematics, do you think of Christopher?"

Su grew up in Texas, the son of Chinese parents, in a town that was predominantly white and Latino. He spoke of trying hard to "act white" as a kid. He went to college at the University of Texas, Austin, then to graduate school at Harvard University. In 2015 he became the first person of color to lead the MAA. In his talk he framed mathematics as a pursuit uniquely suited to the achievement of human flourishing, a concept the ancient Greeks called *eudaimonia*, or a life composed of all the highest goods. Su talked of five basic human desires that are met through the pursuit of mathematics: play, beauty, truth, justice and love.

If mathematics is a medium for human flourishing, it stands to reason that everyone should have a chance to participate in it. But in his talk Su identified what he views as structural barriers in the mathematical community that dictate who gets the opportunity to succeed in the field — from the requirements attached to graduate school admissions to implicit assumptions about who looks the part of a budding mathematician.

When Su finished his talk, the audience rose to its feet and applauded, and many of his fellow mathematicians came up to him afterward to say he had made them cry. A few hours later [Quanta Magazine](#) sat down with Su in a quiet room on a lower level of the hotel and asked him why he feels so moved by the experiences of people who find themselves pushed away from math. An edited and condensed version of that conversation and a follow-up conversation follows.

QUANTA MAGAZINE: The title of your talk was “Mathematics for Human Flourishing.” Flourishing is a big idea — what do you have in mind by it?

FRANCIS SU: When I think of human flourishing, I’m thinking of something close to Aristotle’s definition, which is activity in accordance with virtue. For instance, each of the basic desires that I mentioned in my talk is a mark of flourishing. If you have a playful mind or a playful spirit, or you’re seeking truth, or pursuing beauty, or fighting for justice, or loving another human being — these are activities that line up with certain virtues. Maybe a more modern way of thinking about it is living up to your potential, in some sense, though I wouldn’t just limit it to that. If I am loving somebody well, that’s living up to a certain potential that I have to be able to love somebody well.



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And how does mathematics promote human flourishing?

It builds skills that allow people to do things they might otherwise not have been able to do or experience. If I learn mathematics and I become a better thinker, I develop perseverance, because I know what it’s like to wrestle with a hard problem, and I develop hopefulness that I will actually solve these problems. And some people experience a kind of transcendent wonder that they’re seeing something true about the universe. That’s a source of joy and flourishing.

Math helps us do these things. And when we talk about teaching mathematics, sometimes we forget these larger virtues that we are seeking to cultivate in our students. Teaching mathematics shouldn’t be about sending everybody to a Ph.D. program. That’s a very narrow view of what it means to do mathematics. It shouldn’t mean just teaching people a bunch of facts. That’s also a very narrow view of what mathematics is. What we’re really doing is training habits of mind, and those habits of mind allow people to flourish no matter what profession they go into.

Several times in your talk you quoted Simone Weil, the French philosopher (and sibling of the famed mathematician André Weil), who wrote, “Every being cries out silently to be read differently.” Why did you choose that quote?

I chose it because it says in a very succinct way what the problem is, what causes injustice — we judge, and we don’t judge correctly. So “read” means “judged,” of course. We read people differently than they actually are.

And how does that apply to the math community?

We do this in lots of different ways. I think part of it is that we have a picture of who actually can succeed in math. Some of that picture has been developed because the only examples we’ve seen so far are people who come from particular backgrounds. We’re not used to, for instance, seeing African-Americans at a math conference, although it’s become more and more common.

We’re not used to seeing kids from lower socioeconomic backgrounds in college or grad school. So what I was trying to say is: If we’re looking for talent, why are we choosing for background? If we really want to have a more diverse set of people in mathematical sciences, we have to take into account the structural barriers that make it hard for people from disadvantaged backgrounds to succeed in math.

We’ve been hearing more about how these kinds of [educational barriers arise in primary and secondary school](#). Do you argue that they arise in undergraduate and graduate programs as well?

That’s right. At every stage we’re losing people. So if you look at some of the studies people are doing now about people who take Calculus 1, and how many of them go on to take Calculus 2, you’ll find basically that we’re losing women and minorities at these critical junctures. This happens for reasons that we can only speculate about. But I’m sure some of it has to do with people in these groups not seeing themselves as belonging in math, possibly because of a negative culture and an unwelcome climate, or because of things that professors or other students are doing to discourage people from continuing.

The obvious problem with this attrition is that when mathematics draws from a smaller pool, we end up with fewer talented mathematicians. But you emphasized in your speech that denying people math is actually denying them an opportunity to flourish.

Math can contribute in a broad way to every person’s life whether that person actually becomes a mathematician or not. The goal of broadly getting people to appreciate math is not at odds with bringing more people into deep mathematics. Connect with people in a deep way and you’re going to draw more people into mathematics. Some of them, more of them, are going to go to graduate school, and that will necessarily happen if you address some of these deep desires — for love, truth, beauty, justice, play. If you address some of these deep themes you’re going to get more people and a more diverse set of people in deep mathematics.

Some of those desires are easier to relate to math than others. I think people

have a somewhat intuitive sense of how a desire for truth or beauty might be realized through math. But you spent a lot of your talk on justice. How does that relate to mathematics?

Justice is a desire that people have, and so it leads to a certain virtue which is to become a just person, somebody who cares about fighting for things that defend basic human dignity. I spent the most time discussing justice in my talk mainly because I feel that our mathematics community can do better; we can become more just. I see a lot of ways in which we can do better and become more virtuous as a community.

Being a mathematician in some ways allows us to see things more for what they are. When people learn not to overgeneralize their arguments, they're going to be very careful not to think that if you're poor you're necessarily uneducated or vice versa. Having a mathematical background certainly helps people to be less governed by their biases.

You've been a successful research mathematician, yet you teach at a small college, Harvey Mudd, that doesn't have a graduate school. That's kind of unusual. Was there a point where you decided you'd prefer to work at a liberal arts college rather than a big research university?

When I was in graduate school at Harvard I realized I loved teaching, and I remember one of my professors from college telling me that the teaching was better at small liberal arts colleges. So when I was on the job market I started looking at those colleges. I was interested in the research track and willing to do that, but I was also very attracted to the liberal arts environment. I chose to go and I love it; I couldn't see myself being anywhere else.

And how do you think working at a liberal arts college shapes the way you look at the mathematics community today?

I think one of the things I didn't address in the talk, but almost did, is the divide in the community between research universities and liberal arts colleges. There is a cultural divide, and the research universities are in some sense the dominant culture because all of us with Ph.D.s come through research universities. And there's the whole pattern of the dominant culture being completely unaware of what's going on at the liberal arts colleges. So people come up to me and say: "So, you're at Harvey Mudd; are you happy there?" It's almost like assuming I wouldn't be. That happens all the time, so I find it a bit frustrating to feel like I have to say: "No, this is actually my dream job."

What are the consequences of this cultural imbalance?

Well, the downsides are, for instance, that many of the people at research universities would never consider taking students from an undergraduate college. That's the downside; they're missing a lot of talent. So in many ways the issues are analogous to some of the racial issues that are going on.

I think professors at research universities often don't realize that there are a lot of bright kids coming through the liberal arts colleges. What I'm addressing is the very common practice right now in certain graduate schools of only admitting people who've already had a full slate of graduate courses. In other words, they're expecting undergraduates to have taken graduate courses before they even get considered. If you have that kind of structural situation, you are necessarily going to exclude a bunch of people who otherwise might be successful.

One barrier you mentioned in your talk arises when senior professors don't teach introductory classes. Tell me about that.

I'm being a little provocative here as well. I think what that communicates is: "This is not an important enough segment of people for me to put my attention to." I'm certainly not saying everybody who only teaches senior-level courses has this attitude, but I am saying there are a lot of people who think the math major is basically there for the benefit of students who are going to get a Ph.D. That's a problem.

At the Joint Mathematics Meetings there were a number of prizes specifically for women, and a number of women gave invited talks. Has the math community made more progress on gender equality than on racial inclusiveness?

Definitely, racial inclusiveness has not come as far or as fast as gender inclusiveness. Currently about 27 percent of people with Ph.D.s, faculty members, are women, and about 30 percent of the ones who won awards in teaching and service are women. So we're actually doing pretty well on that front. With our writing awards, which are awards for research and exposition — the fraction of women winning those awards is lower.

Can you look at the process by which gender equality has improved and draw any lessons from that about how to improve racial equality in math?

Many of the practices that work to encourage women in math also work for minorities. Part of the issue here is that there just aren't that many minorities who come into college interested in doing STEM majors. So there's something that happened at the secondary and primary school level, and it would help a lot if we could figure out what's going on there.

You used the metaphor of a "secret menu" in Chinese restaurants. What did you mean by that?

If you go to an authentic restaurant in a big city in New York or California, if you are not Chinese they will give you a standard menu that has things in English and Chinese. But if you're Chinese, they'll give you a different menu. Often it's a menu that is written completely in Chinese and has some additional options that aren't on the standard menu. And I think that happens in the math community. If you talk to women and minorities they will often tell you they've had experiences where people discouraged them from going on, either because they don't think a woman should be in math, or for other reasons. So I used the metaphor "secret menu" to mean: Do we have a secret menu? And who gets to look at it?

You told a story about a student who was counseled by a professor to choose a different major on the grounds that the student wasn't good enough to stick with math. Is that common?

I think it's common. Of course we don't have any data, but I've certainly talked to enough people who've had those kinds of experiences to know that it's very frequent and most of those people are women and minorities.

It's been almost a month since you gave your speech, and it's generated a lot of attention on the internet and among mathematicians. What kinds of responses have you received?

Most of the comments have come from people who are grateful to me for mentioning things that haven't necessarily been discussed, but also for identifying some of the deep, underlying things that cause us to do what we do. I think a lot of people, especially women and minorities, have expressed to me how important it was for somebody to say that. We've been having discussions like this in smaller conversations, and a lot of time it's preaching to the choir, and so having somebody say that in a big address at the national meeting I think felt important and helpful to them.

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