

A decade ago she created lectin microarrays, a complex lab tool that allows researchers to view these molecules in a whole new way. The technology revolutionized the study of glycomics. For the first time, scientists could parse the distinct structures and related enzymes that make certain sugars and carbohydrates significant to our bodies and, more importantly, significant to the ways our bodies create diseases like cancer or respond to viruses and illnesses such as the flu.

In other words, Mahal created a method for other researchers to view problems like never before—to allow them to see what she was seeing. It's not the kind of invention we typically think of: this was an idea that opened new doors instead of definitely and triumphantly closing them. At times, Mahal has struggled to get other scientists to recognize the huge potential of unlocking the glycome and the technology she invented to do that. Sometimes it has been a struggle even to be recognized as the inventor.

"The hardest part has been advocating for myself and my technology. I mean, I'm good at it. But I hate it. That part is much harder than the science. The science is lovely—it's fun," she says.

"I love the science and I love my students. I want both to be successful. And they can't be successful if no one knows who I am."

She's cognizant, too, of the specific challenge of advocating for a challenging idea as a woman. You can't come across as "too preachy," she says, but you can't shrink, either. Not advocating for yourself is not an option: success as an academic (not to mention funding) depends on what you can show for your work. Plus, people can't use the theories and technologies that you've spent decades developing if they've never heard of them.

Over the course of her career, Mahal has found a community of collaborators, first in the United States and more recently at the U of A. In 2019, she was recruited to the university as Canada Excellence Research Chair in Glycomics and joined GlycoNet, a network hosted at the university that brings together glycomics experts from across Canada.

She and her collaborators are working to unpack the glycome's role in disease. Her lab has already teased out sugar's role in causing some people to die from the flu and how

THINK LIKE A DESIGNER

Unlock the innovator within you with these steps

By Lisa Szabo, '16 BA

There are problems, and then there are *wicked* problems. The former can often be tackled with elbow grease, good advice or help from Google. The latter are more complex.

Wicked problems, like how to live sustainably or raise a child in today's world, are difficult or next to impossible to solve because they have no single right-or-wrong answer—only a sea of good and bad options. So, how do we find the best ones?

Design thinking has emerged as a way to unlock innovative thinking and help people come up with new solutions to complicated problems. It's usually a five- or six-step approach to make the creative process more deliberate and bust people out of ingrained thought patterns that can hold back creativity.

"When you ask someone to innovate and they don't have an initial solution, that's a tall order—especially when there are multiple paths to multiple solutions," says **Justin Pritchard**, '13 BDes, '15 MDes, sessional instructor in the Faculty of Arts and co-creator of the Design Thinking workshop offered by the Faculty of Graduate Studies & Research.

"Having a framework or process makes the messiness less messy and eliminates that initial barrier of being overwhelmed."

Artists, entrepreneurs and business people often use the design method to dream up new products or services. But it has a place in daily work and personal lives, too. Design thinking can help you write your dissertation, decide between two jobs or plan your retirement.

Pritchard outlines the framework to help tackle tough problems in your own life.

1 DEFINE

Before you can brainstorm solutions, you need to be clear about the problem. What are you trying to solve? For whom are you trying to solve it? What are the roadblocks that might

get in your way? It seems as though it should be simple to define the issue and move on to the next step. But Pritchard says complex problems have layers: sometimes solving one problem exposes others. You also want to define some of the constraints. Things like budget and time restrictions are common barriers—but so are your own thought

patterns. "If I'm not aware of deliberately acknowledging who I'm designing for, I could slip into the habit of just using my preconceived ideas," he says. Be prepared to trade in habitual thinking for openness and curiosity about the task and the people involved.

2 RESEARCH

Research will help you understand the needs of the people or person for whom you're problem-solving. Sometimes that person is you. If you're a young grad trying to figure out your career path, part of your research will likely be scoping out different career options within a field of interest. But it might also be digging into the details of your daily life and thinking about your strengths and interests and what you're willing to give up. Are you OK with shift work? Do you like working with people or do you prefer to work alone? Instead of letting your own inherent thoughts about the problem drive your solution, research tells you about the environment you're working in and what your audience really cares about.

3 IDEATE

"Ideation is where the juicy stuff is," Pritchard says. This is the phase where you generate a ton of ideas and hope some unexpected ideas emerge. There are entire books devoted to this topic, but you've likely used simple versions without realizing it—such as mind-mapping, where you begin with a central theme or idea and map out a spray of associations around it. Pritchard says that close to the centre the associations will be fairly obvious, but as you get farther out the links become more unusual—and interesting. When you start to see connections between

things that might not have seemed related, you unlock a world of new solutions. "That is really where creativity lies." You can brainstorm on your own but Pritchard suggests brainstorming as a group so you can bounce ideas off one another. But beware of evaluating ideas prematurely; you never know what might spark a better one later in the process.

4 PROTOTYPE

"Prototype" might conjure images of 3D-printed gadgets but it's also a verb. "Prototyping is about testing your ideas with intention," Pritchard says. After you've done your research and chosen your best couple of ideas, you'll need to find out if they work. For prospective homeowners, for example, this step might be renting a home in a given neighbourhood for a few months to see if it's a lifestyle "fit." As with any test, you might not get the answer you expected and, chances are, new problems will crop up. The learnings from the prototype phase will help you tweak your idea or decide on another one altogether.

5 IMPLEMENT

Once you're satisfied with the idea, it's time to put it into action. Maybe you've decided on a design for your fitness app or have finally figured out the plot for that novel you've been wanting to write. The design thinking process culminates when you implement the best solution to the problem you started with. Keep in mind that you can continue to learn about your audience, evaluate your ideas and test changes even after the "final" stage. By nature, wicked problems ebb and flow as circumstances change, and new solutions will always be needed. There's no end to innovation.



ILLUSTRATION BY DAVID VAGIN