



INTERVIEW WITH MALA RADHAKRISHNAN

Mala Radhakrishnan is a scientist-poet and a professor of chemistry at Wellesley College, US. She writes and performs chemistry-themed poetry, and has published two poetry books. In this interview, she shares insights into how chemistry and poetry can be integrated into education.

Q1. Mala, could you tell us a little more about what you do at present?

Mala: As a computational biophysical chemist, my students and I like to say that we play the role of 'matchmakers' for molecules—we use models based on physics to predict how strongly molecules will interact with each other. These predictions can be used to analyse and design drug molecules or other molecules of biological importance. I'm also working with my research team to develop molecular modelling activities to engage high school students in interdisciplinary science.

I teach a wide array of courses, from introductory chemistry to physical and computational chemistry. I also teach a seminar that engages students with models across disciplines—looking at what models are from philosophical, psychological, and scientific perspectives. This course highlights the power of

connecting the humanities, social sciences, and natural sciences to understand the world and our connection to it.

My science-related poetry is also rooted in my interest in combining creativity and science. Currently, I'm also interested in collaborative projects to engage science students in writing poetry to reflect on their scientific journeys.

Q2. When and how did your interest in chemistry begin?

Mala: My high school chemistry teacher was one of the most enthusiastic teachers I have had. It was so clear that he was excited about the discipline and wanted us to see how exciting it can be. I think it is important to embrace and honestly own your passion for whatever it is that you like, and he taught me that it is okay to do so (in addition to teaching me a lot of chemistry)!



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Q3. What inspired you to write poems, particularly ones on chemistry?

Mala: My journey started from the world of spoken-word poetry. My inspiration came from attending poetry open mics and poetry slams, where I listened to what others wrote about and performed. Before this, I had known 'in theory' that poetry could be written about 'anything', but I had never explicitly appreciated the diversity of topics that one could engage with via poetry. The first time I read a poem I had written at an open mic, it was not about chemistry.

The inspiration to write poems about chemistry came from some amazing students I had taught at a high school in California, U.S. I would often talk about chemistry as a soap opera on the molecular level (atoms come together, break up, etc.). When the students painted a mural that narrated the story of ions within such a soap opera, it inspired me to think about other creative ways to communicate chemistry.

So I wrote a poem that narrated a molecular-level soap opera and read it at a poetry venue's open mic. The (non-chemistry) audience loved it! So I wrote another, and another, and I kept coming back each week. The audience would always react (pun?) favourably and would sometimes comment on how they learned a little bit about chemistry through the poems.

I realized that such poems could have educational value, so I started to write with an eye toward communicating specific chemical concepts, while still keeping the storylines compelling and entertaining. Eventually, I started doing poetry features, and was even part of a spoken-word poetry troupe. It was an amazing experience, and I found the other poets very inspiring.

Q4. For readers who may want to try their hand at poetry, could you tell us something about the process you use to compose poems?

Mala: The answer to this question really varies. If I have a good storyline for a poem, it sometimes almost writes itself. The poems that require more effort are the ones written for a particular purpose (like to teach a specific concept) because the storyline has to be created around this goal as opposed to just arising "organically". For example, in some poems, I try to focus on developing one skill, like rhythm. Or I think up a good rhyme and craft a poem all around that. For example, a poem in my book 'Atomic Romances, Molecular Dances' was inspired by an effort to rhyme as many things as possible with

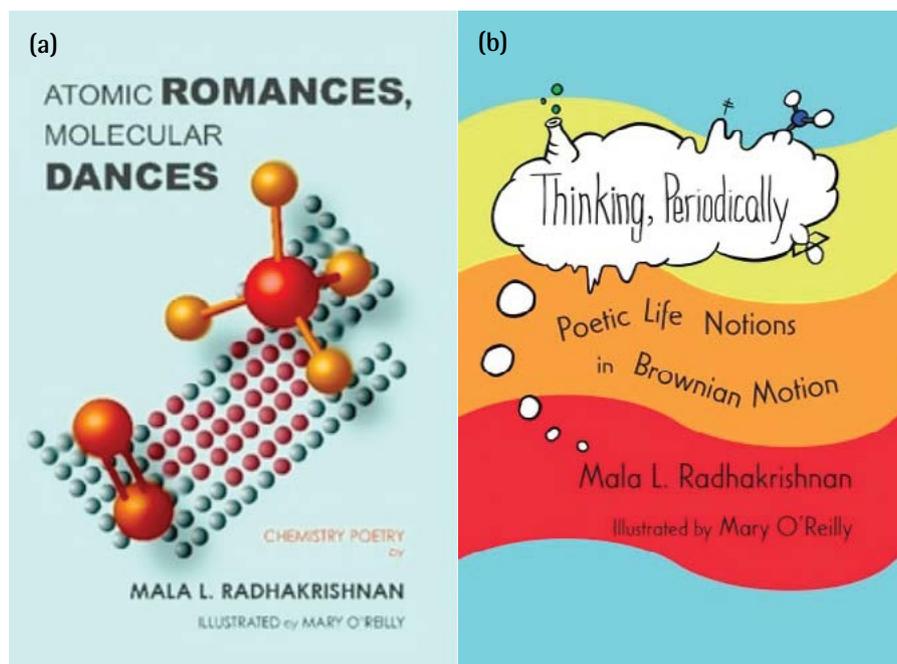
the word 'anonymous'. In my opinion, rhyming verse can help reinforce concepts, and make the content feel more 'approachable'. This is because we associate rhyming verse with songs and stories from our youth.

Longer poems can take anywhere from just a couple of hours to days to draft, but I always go back, edit, and reword them multiple times. In contrast, couplets (two-line poems) are often rather spontaneous. Part of the point with couplets is to show that anyone can be a poet. In fact, I moved to mainly writing short couplets in part because my life has been so busy recently that I rarely have time to sit down and write a longer poem. This is my way of still engaging that side of my brain with whatever time I have.

Q5. Could you tell us a little bit about your two poetry collections?

Mala: The two collections (each dedicated to one of my children, incidentally), complement each other.

The first one (Atomic Romances, Molecular Dances) is more pedagogical in the sense that I specifically crafted many of the poems to teach



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particular concepts in chemistry (the common ion effect, the second law of thermodynamics, etc.). It consists of narrative poems that use personification to describe chemical concepts and processes from the perspective of the atoms and molecules experiencing them first-hand. In other words, it uses everyday language to describe chemistry.

In contrast, the second collection (Thinking, Periodically) is meant to be more whimsical, representing 'spontaneous' thoughts I had in my daily life (as a working mother of young children) that were articulated through chemical language. In other words, it uses the language of chemistry to describe everyday life. This collection consists of individual rhyming couplets that can make great 'exclamation points' at the end of a class period, and are also valuable resources for teachers.

In this way, both books bridge the everyday world with the chemical world, but they do this by moving in opposite directions.

Q6. That you humanize chemicals and give them personalities makes your poems both relatable and interesting. Does this approach present any challenges or limitations?

Mala: Personification can help people relate the 'unfamiliar' molecular world to their own familiar, everyday lives. It also can remove the barrier of unfamiliar lingo. One challenge is that I obviously take some poetic license—clearly, molecules don't 'talk' or have the emotions the poems ascribe to them. But one can think of a narrative poem as yet another type of model. Just like a Lewis structure or a balanced chemical equation, it has limitations in how and what it can represent. It is, therefore, important to discuss the limitations of models, analogies, and other constructions used to convey information. But these different representations complement each other, and when used in conjunction can help

a student get a better, more holistic understanding of chemistry.

Another challenge is that whenever one uses personification, pop culture, or other human-oriented strategies to communicate, it will not work for everyone and can even make some people feel uncomfortable. For example, in my first collection, there are some poems that touch on themes that may be more appropriate for older audiences (as indicated in the Table of Contents). There are others that make references to, for example, a television show that people at only one point in time or in one part of the world may be familiar with. It can be difficult to find analogies and narratives that can appeal to and be pedagogically effective for a broad audience. Realizing that, I think it is important to continue evolving one's poetry, keeping inclusivity and the audience in mind.

Q7. How do you see the intersection of art and science? For example, do facts, wonder, passion, beauty, and metaphor take on different meanings in science and poetry?

Mala: I think the arts and sciences are more similar than people recognize. Both use ideas that have been generated by people to help us understand the world and our connection to it. Such constructions are called models in science, but in the philosophical sense, they are not all that different from, say, realistic fiction (or even science fiction). Both are meant to make us think differently about, say, how humans respond to a mass epidemic.

Obviously, there are differences in approach. In the arts, more focus is put on the process, the intention of the artist, and the artist's connection to the work. Science, sadly, has become dehumanized to the point where publications are often written in passive voice and the process is distilled to only the 'minimum necessary path' to get from the hypothesis to the results. The 'reproducible' path, results, and

end-products are obviously important in both the arts and science. But, I think, focusing more on subjective processes and interpretations can help us remember, for example, that it is possible that you and I could look at the same data and still arrive at different conclusions. And these conclusions could both be reasonable in different contexts. There is a lot more subjectivity in science than people recognize. Seeing it as just facts and a reproducible process rather than an ongoing dialogue and an evolving, subjective process can make it less exciting—and less impactful—for people who want to make a difference and contribute creatively. And science needs creative people to maximize impact! For example, wonder, passion, beauty, and metaphor are just as much a part of science as they are in any other discipline, but they do not appear to be celebrated as much in science. This is one of the reasons why many people view science as dull.

Q8. Are there some considerations that the scientist-poet needs to keep in mind to balance the rigour of science with the creativity of poetry?

Mala: It depends on one's goals. For poems aimed to teach chemical concepts in the classroom, I think it is very important to be as accurate as possible within the constraints of poetic license (like atoms and molecules talking, etc.). But if one's goal is to be thought-provoking in other ways, or to convey emotions (as it sometimes is), then I might just use imagery in ways that might not be 100% accurate but still generates the intended effect.

I think different poets fall on different parts of the continuum, and I don't think that creativity and accuracy are mutually exclusive. On the contrary, sometimes you need to be creative to accurately convey something (quantum mechanics, for example).

Q9. In one of your writings, you share: “I ask that all scientists take time to write poetically about their personal scientific stories and share widely with each other, so we are regularly reminded that science is a human endeavour”. Could you elaborate on this?

Mala: Poetry is special because it is inherently personal. If asked to write a poem about how a chemical reaction progresses, for example, your poem will not look like mine, whereas our prose descriptions will likely be much more similar.

Poetry gives each person a way to connect to science in a way that they feel comfortable with, that draws from their own experiences in a non-judgmental way, because there is no one 'right' poem about something. It can give each person a unique voice, and complement the standardized scientific writing that we're all familiar with.

Q10. Most of our readers are school science teachers, who we hope will use your poems in teaching chemistry. Would you have any suggestions for them?

Mala: There are many ways to incorporate poems, and to use them as a catalyst for students to create their own. I use my poetry in nearly all my classes, and students almost universally find them helpful as another way to engage with concepts. When I assign creative assignments, students often write impressive poems. Similarly, I know of teachers who either simply read a poem, have students illustrate or create a poster depicting the story in a poem, or have students work through a numerical or conceptual problem based on a poem.

My suggestion to teachers would be to encourage their students to write poems about a chemical concept or process. They are likely to be amazed at

what their students can come up with. Students' poems may provide interesting windows into their understanding, while also being a fun way for them to engage with science. Sometimes, they may also help teachers get insights into student misunderstandings that may not have been apparent in traditional assessments.

Q11. Any thoughts that you'd like to leave our readers with?

Mala: We often think about science as a bunch of 'facts' that live outside of us. But the models that shape how we think about the world were developed by people, and would probably be different if different people had participated. What this means is that YOUR perspective will make you a unique contributor to science. So be creative as a scientist. And in addition to the more 'traditional' ways of communicating science, find ways that work for you—in doing so, you might inspire others to understand the world in a new way!



Notes:

1. Excerpts from some of Mala Radhakrishnan's poems can be found here: <https://oreillyscienceart.com/chemistry-poetry>.
2. Teachers interested in connecting with Mala Radhakrishnan can reach her at: mradhakr@wellesley.edu.
3. The questions for the interview were prepared by Radha Gopalan & Chitra Ravi (Editors, i wonder...).
4. Source of the image used in the background of the article title: Chemistry Lab.
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