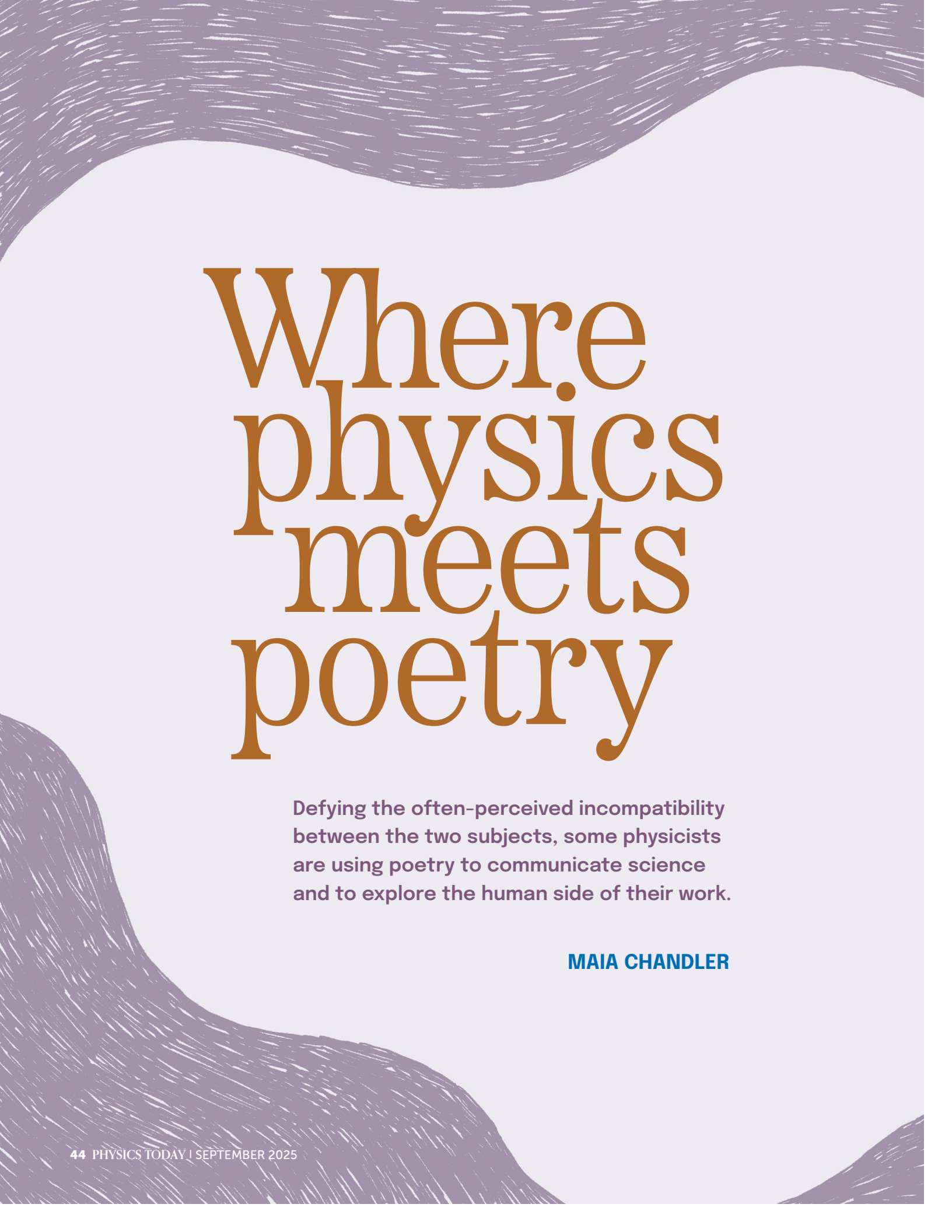




Where physics meets poetry

Defying the often-perceived incompatibility between the two subjects, some physicists are using poetry to communicate science and to explore the human side of their work.

MAIA CHANDLER



Maia Chandler is a recent graduate of Swarthmore College, where they majored in biophysics and minored in educational studies. They interned at PHYSICS TODAY this summer.



The path between physics and poetry is often painted as a one-way street. Myriad poets have turned to the physical sciences for inspiration. Jane Hirshfield, for example, illustrates a fundamental concept of quantum mechanics in the poem “Entanglement”; Walt Whitman’s “When I Heard the Learn’d Astronomer” celebrates stars; and Tracy K. Smith muses about outer space in “My God, It’s Full of Stars.” Physicists, however, are commonly perceived as analytical, unwilling to be clouded by the romanticism of a pursuit such as poetry.

Despite that perception, poetry and physics are not disparate subjects. They are both mechanisms for knowing the world more intimately. They both humanize the ineffable and savor everyday phenomena, and their practitioners grapple to articulate what we know about the world around us. When I ask physics students what makes physics special, they tell me how it provides elegant structures for finding logic and meaning in a seemingly meaningless, illogical universe. They share how physics combines rigorous scientific thought with a wonder and humility for our place in the cosmos and how it gives us a reason for why things are the way they are.

In the space where poetry and physics overlap, science is personal. The physicists and poets who exist at that intersection are motivated by curiosity, wonder, and the spirit of exploration. They use poetry as a mode of science communication, and they write it for pleasure, using observation and imagination to clarify their experience and celebrate what they describe.

To begin to navigate that creative landscape, PHYSICS TODAY spoke with Sam Illingworth, a physicist-poet who started both a peer-reviewed journal and an annual competition dedicated to science and poetry. Accompanying the interview is a selection of physicist-written poetry. Some of the poems are sourced from Illingworth’s endeavors. All of them remind us that science is human.

Drying the Spine

SAM ILLINGWORTH

What slipped
was not a flood –
no clean edge
or single rupture –
but a drawn-down
thread,
sucked from the grip
of root-treads and
clay-cradle.
A thirst took
the curve of years
and held it,
tightening
until the skin cracked.
Not drought,
but the absence
of return.



(ILLUSTRATION BY THREE RING STUDIO.)

Q&A: Sam Illingworth unites poetry and science

After finishing his atmospheric physics PhD program, Sam Illingworth took a sharp turn away from his research, which involved using satellites and aircraft to measure greenhouse gases. In 2010, he moved to Japan, where he spent two years exploring the relationship between science and theater. That experience, he says, helped him realize he “loved communicating science and was probably better at communicating science than doing science.” Now that’s his job.

As a professor of creative pedagogies at Edinburgh Napier University in the UK, Illingworth researches how poetry and games can be used to facilitate dialogue between scientists and society. He runs science poetry workshops with students, asylum seekers, and mental health organizations.

Illingworth has built on his interest in poetry and background in developing undergraduate curricula that use theatrical techniques for effective communication. He has a weekly blog, *The Poetry of Science*, where he writes poems based on recent scientific publications. Rather than trying to explain quantum entanglement or dark matter, he tries to write from a place of curiosity. Five years ago, he founded the first science and poetry peer-reviewed journal, *Consilience*, which has a yearly readership of 100 000. Illingworth also started an international poetry competition, Brilliant Poetry, that explores scientific wonder and discovery. This year’s competition invites poems inspired by the International Year of Quantum Science and Technology.

A Rubric for Heat

SUNAYANA BHARGAVA

Staring aimlessly out of a crowded train,
I begin to wonder about the heat death of the Universe

That runaway descent into disorder,
like thread unspooling.
All work eventually undone

What is more romantic than labour
that fights the prophecy of its extinction?

Earlier I watched people assemble
like particles, charged
against a death less inevitable than heat

To read the Riot Act
to those who are already dispersed
is perhaps another kind of entropy

After we said goodbye,
I reimagined the city as a heat map

The train tracks molten,
spilling under slick blue buildings,
The residual warmth you left in my hands
given away by an infrared eye

What if heat, like language,
is not the firmness of ground
but the cracks that bloom under it?

There is a way to rescue order;
rake in the wasteland of energy and
bring it to rest: absolute zero

The wilderness of space is too warm.
The coldest place we have is here on Earth.

I question laws that speak of bodies
without first surviving in one
or stopping one from feeling illegal

On the cusp of equilibrium;
I can feel the incapacity of my hands
as you slip through them. The gentle stasis
of unrest under a darkening sky

An entire history of transfer, lost,
the moment two properties become equal.

Sunayana Bhargava is a postdoctoral fellow at the Côte d'Azur Observatory site in Nice, France, where she searches for galaxy clusters. She is an editor for *Consilience*. This poem was inspired by the four laws of thermodynamics and was originally commissioned by IF Oxford.

On First Looking Into Dirac's Quantum Mechanics

JOSEPH CONLON

No show; no poetry, no eloquence.
Lines of austere unpolished truth unroll
On logic-chiselled tracks. A sneaking sense
Of felt emotion flits then fades. The whole

Of human culture is reduced to this:
Evolving quantum states of ϕ and ψ
Churning unceasingly down the abyss
Where Greek and Roman classics come to die.

From death comes life; these cold equations change
To living fire, as algebra unfolds
To understanding. Symbols rearrange
And make the Megas Basileus that holds
Our universe in thrall. Its chthonic roar
Razes the squeaks of Homer's village war.

Joseph Conlon, a professor of theoretical physics at the University of Oxford in the UK, has enjoyed (and memorized) poetry since childhood. He was captivated by the direct, unadorned style of Paul Dirac's book *The Principles of Quantum Mechanics*. This poem was short-listed in the 2024 Brilliant Poetry competition.

PT: Describe your work.

ILLINGWORTH: My research involves three different strands: poetry, games, and generative AI. How can I help to democratize and diversify science? I found a way through poetry. This involves using poetry to disseminate knowledge and to more effectively establish a dialogue between scientists and nonscientists so that the nonscientists can contribute their expertise, tacit knowledge, and lived experience to frontier research and future research directions. I also explore how we can use poetry as a pedagogic tool within higher education.

PT: What is the process of transforming a research article into a poem?

ILLINGWORTH: The idea behind *The Poetry of Science* is that science is societally important, interesting, weird, scary, and fun but often written in language that nonscientists can't engage with. So can I take the science and write a poem about it to bring people in?

I look through press releases to see what I think is going to be interesting. I've written about wildfire suppressants, merging galaxies, crow sight, and quantum biology. I then write a lay summary and write the poem about it. That sounds like a huge leap. I used to write poetry that followed a very particular form, like a villanelle, a sonnet, or a sestina. I don't do that as much anymore, but because I did that for so long, it helped me find my poetic voice. So the poem just kind of comes a lot of the time.

I used to feel like the poem had to tell the exact science story, whereas it now has this nonspecialist summary that offers a new lens through which to view the science. If a poem opens a question or gives someone pause to consider something differently, then it has already done more than a didactic summary ever could.

I always email a copy of the poem to the scientists whose work I have featured, and almost without exception, they

reply. Many express thanks and often note how interesting it is to see their research reframed through poetry. Several have mentioned that it prompted them to think differently about how they communicate their work—which for me, is a quiet but meaningful outcome.

PT: You do a lot of work on climate change and poetry. Why?

ILLINGWORTH: I think the climate crisis lends itself to poetry. The way that we've communicated the climate crisis has failed. Poetry is a way of reminding people of the human centeredness of the crisis—that this is caused by humans, affecting humans, and ultimately is only going to be solved by humans.

PT: Why poetry? Could another art form serve a similar purpose?

ILLINGWORTH: People can feel intimidated by scientists. Poetry creates this set base of “Oh, there's a professor. And they might be good at science, but they're not very good at poetry.”

Doing science, you're taught to be very objective about it. That's fine when conducting science, but when talking about it, it's okay to display pathos. Scientists find that hard because they're not really trained to do it. Writing a poem about those experiences gives the scientists permission to display this level of emotion that they're not normally “allowed” to display.

Of course, there are elements of physics that are complex and detailed. When using poetry to explore physics, I think the most important thing is to communicate a sense of wonder and uncertainty—that science is a process, not just a set of results.

PT: You mentioned the importance of establishing a dialogue between scientists and nonscientists. What does using poetry as dialogue mean?

One Hundred One Thousand Meters

IRIS VAN ZELST

At the surface
of the Earth,
rocks are
strong
A little
lower,
a little
less
Then strong again
and then
they
get
w
e
a
k

Iris van Zelst is a Patience Cowie Research Fellow at the University of Edinburgh in the UK. She studies the geodynamics and seismology of Venus. She thinks poetry is playful and is a creative outlet, and she encourages people to look at science in an unexpected way. The shape of this poem mirrors the structure of its subject matter: the strength of Earth's crust and upper mantle.

Physics for the unwary student

PIPPA GOLDSCHMIDT

1. Imagine that you are trying to balance on the surface of an expanding balloon. List all the different ways in which this resembles reality.
2. Thousands of sub-atomic particles stream through you night and day. Does this account for those peculiar flashes of light you sometimes see?
3. You are trapped in a lift which is plummeting to the ground. Describe what you feel.
4. You are in a spaceship travelling towards a black hole. As you pass the event horizon and become cut off from the rest of the Universe, what do you observe?
5. What happens if you stop believing in gravity? Will you slide off the Earth?
6. What happens if you stop believing?

Pippa Goldschmidt has a PhD in astronomy and a master of letters in creative writing. She is an honorary fellow in the Science, Technology and Innovation Studies unit at the University of Edinburgh in the UK. This poem was inspired by thought experiments in physics that ask us to consider what happens in various extreme situations.

ILLINGWORTH: What people share in poetry dialogues varies widely depending on the group and context. In a session with asylum seekers, participants wrote poems reflecting on visibility and air—not just as pollution, but as something that can't be escaped, that is inhaled regardless of choice or status. Their needs, expressed through poetry, often center on being heard and being safe. These are not easily summarized in a policy report but are deeply felt and politically charged.

Poetry creates a space where these needs can be articulated without having to conform to institutional or scientific language. We use that as the starting point for conversations with experts in that area of physics or research. It's about making those relationships.

People first need to feel encouraged to write poetry and realize that it really is for everybody. It's a very accessible art form when discussed and introduced in the right way.

PT: What parallels do you see between poetry and physics?

ILLINGWORTH: I think at their core, they're both trying to make sense of the world in which we live. They're just doing it in different ways. Certainly, since the turn of the 19th century, when science became a proper discipline and moved away from being an amateur field, it feels to some extent that science has had a monopoly on what original thought is. But science doesn't have all the answers. Poetry and physics have complementary pieces of the same jigsaw.

PT: How do you approach doing poetry versus doing physics?

ILLINGWORTH: When I'm doing poetry or physics, I feel as though I'm engaging the same part of my brain. It's problem-solving, just using a different set of tools. There's precedent to this. Physicist- or scientist-poets write about the fact that it's scratching the same itch and that a lot of the time, society forces them to pick whether they're a scientist or poet. Most of the time, they've felt as though they've had to pick the scientist part to be taken seriously. But the overlap is why I think it's important to involve creatives in scientific work.

I think that for me, thinking physically or thinking scientifically is about the facility to ask questions. A lot of the work I do in terms of developing people's science literacy isn't necessarily about feeding them facts. It's about empowering them to ask questions. **PT**