

ALICE MAJOR

Scansion and Science

So many different poets have given the Anne Szumigalski lecture over the years, since the series was started after her death. I'm honoured to be asked to contribute another thread in this ongoing conversation about poetry.

TO TALK ABOUT POETRY AND SCIENCE, I'd like start by telling you a story that sums up much of what I think about the relationship between the two.

A couple of months back, I went down to Calgary to introduce my new book, *Welcome to the Anthropocene*. For the event at Shelf Life Books, I had invited Weyman Chan to read and take part in a conversation about poetry and science. Weyman is an excellent poet who draws on his science background—he's a lab technician by day—though our poetries go in different directions from this base. After our readings, our host Julie Sedivy, who is also a writer and scientist, asked a significant question: Does it matter as an artist whether you get the science right? (She added that she personally finds it irritating if we don't.)

Well, that question rocketed me back to a moment, two weeks earlier, the afternoon of the official launch of my book in Edmonton. I've got that cat-on-hot-bricks feeling. I'm choosing the selections that I'll share that evening, practising them over for timing, and I read these lines aloud:

Life has done this before — tipped the balance
when microbes poured a poisonous chalice
of oxygen into their air. Dumb actors

in their own demise, *Cyanobacter*
out of control, replicating round the globe.
Their own waste product choked those anaerobes
until they couldn't take it any more
and died...

I stopped. "Oh, shit!" I thought. "That's wrong!"

Cyanobacter are blue-green algae—they didn't kill themselves off. They took over, they're doing fine. In fact, they're the basis of our whole food chain today. What they did do was pour oxygen into the atmosphere and choke off a previously dominant life form, the anaerobic bacteria that can't tolerate oxygen.

I do basically understand the Great Oxygenation Event. How did my poem go off the rails?

It happened while I was doing the last round of edits on the manuscript. The lines in the earlier version weren't working the way I wanted them to—the scansion felt lumpy. One line in particular went something like "their waste product choked the anaerobes." As poetry, it was a complete clunker. In a moment of misguided inspiration, I added a word and changed another, so that it read "their own waste product choked those anaerobes" and I felt okay about it. I now had four long 'o' sounds in the line. And the iambic beat felt better. I tweaked a couple of other words the same way and signed off on the manuscript.

And only now, holding the printed book in my hand, did I notice that the change had completely reversed the meaning of the line! Scansion had trumped science.

I felt genuinely sick, that whacked-in-the-solar-plexus sensation. For a mad half-hour, I wanted to phone the University of Alberta Press and plead with them to call back the entire print run. I thought of sending out a notice on social media as a kind of *mea culpa*—"forgive me, Facebook, for I have sinned." I didn't carry out flamboyant acts of expiation—though I guess that's what I'm doing here. I still feel sick.

Now, a poetry book isn't an exam you can flunk because you gave the wrong answers. Why did I want to call off the launch and hide in a dark closet with a bucket to throw up in? Is it just me? Am I overly sensitive to criticism?

But I'm not *that* sensitive. Yes, we poets are fussy; we care about the details of our work and, as Oscar Wilde said, can spend a morning deciding whether a line needs a comma or not. However, I accept with

equanimity that there will be misprints and mistakes. You always find them, no matter how scrupulous the editing, and sometimes you don't even notice them for years afterwards.

When I find something like this, I don't normally want to sequester myself in a dark space. For instance, when I realized, in the case of this same long poem, that the last two lines had switched from iambic pentameter to alexandrines—six beats instead of five—I shrugged and said, "I'll pretend that's what I meant to do all along."

As for getting facts out of whack, well, isn't there something called poetic licence? John Keats could have Cortez stand "silent on a peak in Darien"¹ as the first European explorer to see the Pacific Ocean, even though it was a completely different conquistador, Balboa, who did so. We don't haul Keats over the coals for the historical inaccuracy—it doesn't seem essential to the truth of the poem, which is about the wonderful feeling of exploration he got from starting to read a translation of Homer.

At that event in Calgary, Weyman Chan could say that he isn't so very concerned about accuracy—that the concepts and language of science are his starting point, not a narrow-gauge railroad. But, for me, getting things "right" somehow goes to the heart of what I feel I'm doing as a poet. It has something to do with the idea of poetry and truth. And that's what I'd like to unpack here.

Truth and ...

Truth is one of those amorphous concepts we've been trying to throw our arms around for a very long time. We feel that poetry is somehow supposed to be "truthful" in some deep way. There's that other famous line by Keats: "Beauty is truth, truth beauty," which is a line of great poetry but seriously fuzzy philosophy.

Of course, since Keats's time, we've all become self-conscious about the word: it's so absolute and imperial. We've learned to say things like "your truth is not my truth"—and yes, that is "true." Your narrative, your experience of facts, can be very different from mine. However, this position can take us dangerously close to saying that truth is always relative, a position that I think has become perilous in this age of fake news; it seems to say that even the pursuit of accuracy doesn't matter.

The word "truth" comes from a Proto-Indo-European root that means to be firm, solid, steadfast. It's a root that also gives us the word "trust." I refuse to accept that we must live in post-truth times—which

would be a time without the possibility of trust. And I refuse to accept that we shouldn't aspire to some universal understanding that we feel we can share, a place that transcends our individual experiences.

Though philosophers can argue this position heatedly, I maintain there is a physical bedrock to the universe that isn't subject to our subjectivity. Maybe bedrock is the wrong metaphor—it's too solid, too tangible. However, there *is* an underlying coherence to the world's many phenomena that we can explore.

We often equate truth with identifying the facts: inarguable, definite, hard. But facts are *not* small, irreducible granules. They are always embedded in a context, linked, inextricable. Facts are, above all, relationships. Often, they are relationships we might not have noticed before (like the ones that link waves with particles, or human activity with the planet's climate) that we have to discover through exploration, using the tools of science.

This becomes my working definition of truth. It's the fabric of consistent relationships that make up the cosmos, the planet, our human world. It doesn't reduce to some single equation, some theory of everything, some God particle or a set of commandments. Instead, it's an ecology that ties together physics, genetics, biology, neurons and narratives. In the words of physicist Richard Feynman, "If our small minds, for some convenience, divide this glass of wine, this universe into parts—physics, biology, geology, astronomy, psychology and so forth—remember that nature does not know it."²

We can trust facts when they are consistent with the other strands in the fabric; in other words, when they are related. This is the web that scientists try to explore, and that we can all try to understand.

I have had a lifelong interest in that exploration. I feel it's vital for us to understand the dialogue, to bring science into our public discourse in a meaningful way. How do the discoveries—of physics, of evolution, of genetics, of cognitive science—map onto our daily lives? Because there are consequences to understanding (or misunderstanding or misrepresenting or ignoring) science. Maybe we don't have to understand all the details of the relationships, but if we are to understand their significance we need some general picture that is reasonably accurate.

Truth and maps

When I try to link my poetry with science, I feel as though I'm part of a huge mapping project, to map science onto significance. So let's think about that word, "mapping."

A map is an abstraction, of course. We say “the map is not the territory.”³ We wag our forefingers and say, “Don’t get this model confused with reality.” One of the very useful, and cautionary, books on my shelf opens with the sentence, “Not only is it easy to lie with maps, it’s essential.”⁴

However, a trustworthy map can give you an overview of the territory, a sense of where you might go in it. It can be accurate (a word that originally meant “done with care”) even if it’s not complete.

Even mathematicians—who like accuracy very much—use the concept of mapping all the time. They call it “projection,” a process that preserves meaningful relationships. Physicist Frank Wilzcek describes a projection as “...a mapping from one shape to another, by which information about the first shape is presented in a new form. Often (but not always) some of the information is lost.” This does not invalidate the mapping.

I think that “map” is a good metaphor for what we are trying to build, as scientists, as poets, as human beings. To be useful, a map has to have meaningful connection to the world we are trying to negotiate. Call that connection truth, if you will—a truth that has been woven over time, a shared project.

Think how our map of this planet we live on has evolved throughout our human history from those sketches showing a flat plate with the ocean circling its edge. Even those early maps preserved meaningful relationships about the position of the Mediterranean, the Nile, Greece, Libya. Since then, explorers have come back from voyages with new sketches and voids. Over time, the maps get filled in with increasing accuracy. We push the *terra incognita* further out in space and further back and forward in time.

And the great thing about maps is that they exist usefully at different scales. There’s the globe mounted on its armature that sits near my desk, which I can spin to see the shapes of continent and ocean. There’s the Google map program that I can use to zoom in on details of the park in my own city when I want to figure out what turn-off I need to take for the dog park. The essential thing is that these scales interlock—they are consistent, that the universe is consistent. So that when we explore our one small part of it, we can explore all of it.

It’s like that wonderful mathematical object, the border of the Mandelbrot set. It’s a pattern that continues to be as complex as ever, no matter how closely you zoom in on it or how far you pull back.

Let us not draw our maps the way the Flat Earth Society does, maps that don’t evolve with time. (By the way, that society will be holding

a conference in Edmonton this summer. They're meeting at the Fantasyland Hotel. You couldn't make that up!) No, there *is* a truthful map that is faithful to the real terrain. The globe is not "fake news." It is a reality that can be explored, and where we can draw a series of interlocking maps faithful to all the threads of evidence we pull together from different sources.

Who draws the maps and how?

What are the respective roles of poet and scientist in this endeavour? Scientists and mathematicians can get seriously grumpy about how the general public distorts their findings. They often feel that only the mathematical equations can make for accuracy; anything else will oversimplify *their* truth. Sometimes they say things like "Metaphors deny distinctions between things: problems often arise from taking structural metaphors too literally."

Well, it's a point. However, any attempt to communicate a science-inspired concept to a broader audience will have to depend on analogies and examples and the ordinary language that human beings use.

Math is certainly NOT a language I speak. Sometimes I feel I glimpse shapes in its mist, have a sense of the beauty of the relationships that mathematics can encode. But I can't bring a critical eye to the accuracy of the equations themselves. Like the vast majority of us, I have to depend on others to translate those equations into language, images, narratives that I can get my brain around. So I depend on widening circles of translation—the popularizers, the other writers. But the circles generally start with those scientists who are directly involved in the work and are willing to try to make it comprehensible.

So where can a poet come in? I think there are three places in the landscape where we tend to locate ourselves.

First, poetry is a repository of knowledge, and an attempt to attach that knowledge to meaning. Often poets do this simply by encoding our times. Our work becomes a record of what our generation has been thinking about, what knowledge base we've been using.

I like to think of how Shakespeare was among the first generation of students to learn the new system of Arabic numerals from a school textbook called *The Ground of Arts*, published in 1543. This taught him about the use of zero and how that symbol could hold a place open

in a number—something that was there and yet not there. So, the Fool says to King Lear, “Thou art an O without a figure...Thou art nothing.” It’s a metaphor Shakespeare would not have come up with if he hadn’t learned this new system of using the “cypher.”

This is the kind of informal integration of science that we almost can’t help but use. For instance, think of the pictures we’ve gathered in recent decades of our globe seen from space—images that have inspired many poems by creating a new framework for seeing the planet. We don’t need a physics degree to write or understand something like P.K. Page’s glosa, *Planet Earth*. “It has to be loved as if it were embroidered / with flowers and birds and two joined hearts upon it.”⁵ The limitless ocean at the feet of Keats’s conquistador has become a tablecloth on an ironing board.

The second place that a number of poets go is a bit more deliberate. We can mine science for fresh imagery. This is what I have personally used science for throughout my writing life: to “replenish my store of metaphor,” in the words of Percy Bysshe Shelley. I remember how fascinating I found the idea of a black hole when I first read about it back in the 1980s, how magical a phrase like “event horizon” seemed to me. It was the way words from my everyday language could be recombined into such strange concepts, which could in turn become new metaphors.

When I do this, I do want to get the science right. I can get annoyed when someone tosses a word like “fractal” into a poem because it sounds good or uses “black hole” to describe the junk drawer, without understanding what kind of map they are making between the concept and their poem. But that’s just me, really. I feel that, by not understanding the idea, the writer isn’t using its full metaphoric potential. However, I’m not going to dismiss an otherwise interesting poem because the writer hasn’t been reading the latest issue of *Quanta*.

But there is a third place in the science-poetry landscape: poem intended as instruction. There’s a long tradition of poets trying to integrate a body of knowledge from their time into a system of thought and present it to readers. In the first century BCE, the Roman poet Lucretius wrote his long poem *De Rerum Natura* (“On the Nature of the Universe”) because he wanted to put the complex teachings of the Greek philosopher Epicurus into a compelling form. Two centuries earlier, Epicurus had taught that the world is made up of countless atoms and their motion is what makes things happen in the world—not the actions of gods. Lucretius turned these ideas into

his great long poem because he wanted to counter the superstitious behaviour of his fellow Romans in their turbulent times.

Then there was Alexander Pope, centuries later, writing another long poem that tries to make sense of the science of his day. Just think! Pope belonged to the first generation ever to look through a microscope and see the tiny, living material there: bacteria, protozoa, cells, the complexity of human muscle tissue. And towards the end of his life, he wrote *An Essay on Man* in which he was trying to work out the implications of this new knowledge, garnered from both microscope and telescope, in poetic form. How might these facts fit with the medieval philosophy that underlay the doctrines of the Catholic Church in which he grew up?

More recently, I found myself embarked on a similar effort to pull together all the reading and thinking I've done about different fields of science into a long poem that tries to put together a picture of where we fit into the cosmos. It became the title poem of that new book—the one I was about to launch.

Talk about a grandiloquent task. God help me, I have entered the realm of didactic poetry. "Didactic." It's such a pejorative term. *Did. Ack. Tic.* Like you only want to stick things on a table with thumb tacks. We poets can protest, witness, describe, deconstruct. But we're not generally supposed to "tell," like a teacher looking grimly over her glasses from the front of the classroom.

However, the word "didactic" originally meant "skilful teaching," a praiseworthy effort to make learning interesting and memorable. When I'm taking up this voice in poetry, I like to think of it as sharing, rather than a forcible download of information.

However, to share anything in the world of ideas, we do need to start with some common map conventions. This necessity affects my poetic decisions. I choose to use full sentences and ordinary punctuation. I even put footnotes at the back of books. I care about whether you get the connections I'm trying to make. I don't want to mislead you. From this position in the poetry-science landscape, I feel I have to get things as "right" as I can.

I recognize this is a somewhat unfashionable poetic voice. I mean, Alexander Pope, for heaven's sake. How regressive can you get? That Augustan satire, its problematic voice that says, "From up here, I know best." Perhaps it was even more worrying to find myself adopting his heroic-couplet form, that eighteenth-century slam-down of rhyme.

But I had such *fun* writing this poem. I enjoy the challenge of writing about science, trying to express something that is “true”, faithful to the scientific thought, yet keeping it in the realm of poetry with all the pleasures that our form of communication offers. I realized the usefulness of rhyme—contemporary rhyme, rather than Pope’s eighteenth-century masculine matches—in making information interesting. The form became this big engine pulling me along. It felt like I was driving this huge bulldozer... *To hell with “tell it slant.” To hell with post-structuralist critical theory. I’m coming through!*

Still, the question recurs, how *truthful* am I being? As teacher, how do you ever know you’ve got it exactly right? Obviously, I *can* screw up! There are probably times when I’ve made mistakes I don’t even know about. And time will put me in my place—the science of today will become inadequate.

Aspirations to truth do require humility.

Truth and us

Science, whatever its faults and flaws, is driven by the human desire shared by poets to understand how things hang together. Scientists may focus on details of population growth or subatomic particles. But poets are also driven by the desire to acquire knowledge and to incorporate it into what we have gained already. We want to pull a broader understanding into our orbit. What does it mean for human beings? For society? For spirit? For our place in the cosmos? (Sometimes poets are better than scientists at doing this.)

We also like to share that understanding—to map from one area of experience to another, using metaphors that are not small, neat bulls-eyes on a target, nor fuzzy generalities that observe no constraints of accuracy, but metaphors that preserve the meaningful relationships of this world. (And poets are definitely more comfortable with metaphor than the mathematicians are.)

In the end, what is it that I’m trying to say about poetry and truth and me? Every poet reaches after truth in some way through some portal. Mine is science. First, because of the sense of wonder that it gives me, the sense that the universe is far more fabulous and interconnected than we might have thought. Science takes me out of myself, my little life. It’s not reductive or determined—that’s a stereotype from a century ago.

But I also reach for truth this way because it feels like an understanding we are all building in common: a shared understanding

that is facilitated by technology but ultimately has to rest in the individual heart. It's an enterprise that weaves together the individual and the whole.

This understanding isn't a static structure but a map we are continuously exploring from our place in it. It is a map of the *range* of things that humans are: not a single thing called "human nature," but a landscape within a landscape. It is a map of where we live, and how we are threaded into that home. It is a map of where we are in the narrative of time. We are insignificant and yet we matter "in a cosmos where / everything is common, and everything is rare."

We have a stereotype about science, that it is the pursuit of the relentlessly new. But it's really a journey to fill in a map that we've been sketching throughout human history. There are things we've known about ourselves forever. But we do need to figure out more detail, to answer questions like "Why are we like this?"—and to answer them accurately, with care, not ideology.

We sometimes try to impose the same stereotype of invention on poetry. However, as a poet, my task is not to think—or write—things that have never been thought or written before, displaying some strange quality called "originality." No, I want to absorb what has been thought, discovered, by others and to share that back out again, to be part of the widening circles of understanding. Which means trying to be as truthful as I can.

After all this, does it matter that Keats confused his conquistadors?

Wikipedia has a story that his friend Charles Clark had pointed out the error, but that Keats decided to keep it because he thought the line sounded better as "stout Cortez" rather than "Balboa." I present this "fact" with caution, since I haven't been able to confirm it.

Maybe it's not that big a deal, two centuries after Keats wrote his sonnet and five centuries after *some* conquistador stood on the far side of Panama and thought he was the first person to look at the Pacific. However, IF I had been there with young John Keats, and IF he stuck with the error because he just thought the line sounded better that way, then I might have put my hand on his shoulder and said, "Look, John, screw the scansion. Let's strive to get it right."

So to conclude, and for the record, I'd like to read you that section of *Welcome to the Anthropocene* with the science corrected...

5.

*Atoms or systems into ruins hurl'd,
And now a bubble burst, and now a world.*
—Alexander Pope, *An Essay on Man*

To all you entries in the global database of life: welcome. Welcome to this hyperspace during which humanity has hacked into the planet's history. In this tract of ad hoc coding, we're running trials like half-assed systems analysts whose files have never been backed up, reckless geeks who don't know when we've pressed 'delete' once too often.

Still, we might be content on a planet with no great auks or elephants, polar bears or pandas. How often do we meet Sumatran tigers on our city streets (or want to)? We could simply look at legendary beasts in picture books or videos. They're nice-to-haves, not musts for daily life. As for rhinoceros, white shark or Orinoco crocodile, who'd care for living with one, cheek by jowl?

We don't mourn the passing of the mammoth every morning, nor the vanished giant sloth, even if our weaponry inventions helped to push them off extinction's sharp-edged shelf. In fact, we've benefitted from the cull of evolution. We'd not be here at all if dinosaurs had not turned up clawed toes and left. Yes, it's too bad about the dodos, but there are many other lineages of pigeon. The earth still manages to maintain its total biomass. That bulk may shift from balanced muscle to a pulp of sagging flab around the waist; it matters not the least. There are as many creatures

living on the planet as have ever been
— even if a lot them are hens.

But fear is growing in us (like a gas
after too rich a meal) that we have passed
some threshold — that we may be rendering
earth derelict, a disaster ending
not just giant pandas but ourselves.
A fear we're blocking earth's escape valves
and bio-sinks. Many will dismiss the question —
they say it's just a touch of indigestion,
we'll be fine. Besides, they say, it isn't us —
one good fart of forest-fire exhaust
dwarfs all the output of our vehicles.
Still, doubt's sour odour lingers in our nostrils
like effluvia wafting from our garbage dunes.
Our conurbations spread their plumes
of carbon far beyond the city limits,
and our roaring engineering mimics
volcanic-level belches every day.
Sober citizens consider ways
to plan for rising tides and surging storms
as polar ice caps melt and our world warms.
We design deployable walls, but feel
as if we were the child in some old tale
of dikes and imminent disaster,
sensing that the cracks are spreading faster
than adults (waking finally) can mend
with chips of silicon and bags of sand.

Life has done this before — tipped the balance,
when microbes poured a poisonous chalice
of oxygen into their air. Dumb actors
in climatic havoc, *Cyanobacter*
out of control, replicating round the globe.
Their O₂ off-gas choked off anaerobes,
turned the entire planet's atmosphere
to hostile smog, thereby launching our career
of carelessness to others.

Many folk dismiss
this history, insisting *We can fix
anything, we're smarter than bacteria.*
There isn't any reason for hysteria.
We'll plant some trees. But do we really want
to take the risk? We don't seem intelligent
enough to work together, work through
our rifts and schisms. More likely we will do
little more than flap our techno-wings.

Will it be our place in the scheme of things
— with all the virtual flim-flam we've installed —
to burst the blown-glass bubble of our world?

Footnotes

1. John Keats, "On First Looking into Chapman's Homer."
2. Richard Feynman, *The Feynman Lectures on Physics*, chapter 3.
3. Alfred Korzybski, "A Non-Aristotelian System and its Necessity for Rigour in Mathematics and Physics," a paper presented at a meeting of the American Association for the Advancement of Science in 1931.
4. Mark Monmonier, *How to Lie with Maps* (University of Chicago Press, 1991).
5. P.K. Page, "Planet Earth," from *Hologram* (Brick Books, 1994).[‡]