

FANCY & FACTS IN POETRY  
An Argument for Scientific Research in Poetry

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## Fancy & Facts in Poetry: An Argument for Scientific Research in Poetry

There is no science without fancy, and no art without facts.  
— Vladimir Nabokov

Put a group of scientists and some poets in a dimly lit café with a few bottles of wine or beer. Now let's give them a subject. Let's talk about sex. It's a common subject that arouses conversation and that's just what we want. Now we listen.

Listen to the scientists delve into the mechanics, biology, chemistry, and anatomy of sex. Or maybe they will discuss the entomological world's approach. Or maybe the scientists will take sex to an outcome: virology or genetics or embryology. The poets begin to discuss experiences: first times, last times, worst times, best times, places, times. They talk about eros and sensuality. Or perhaps they reach into the poetic past for fodder, perhaps Yeats's "Leda and the Swan" or Sappho. But what would happen if these worlds collided, merged, mated? What if the neurochemistry of sexual intimacy made it into a poem of desire? What happens when poets borrow from science?

Poets and scientists share an attitude of wonder and curiosity for the world and the human mind's ability to process it. Poets and scientists strive to place order, or some semblance of it, on what they encounter. Neither profession claims to lay bare the secrets of the universe, but instead aims to point out the wonders for everyone to see as we all work to understand humanity and our world better. Poets A. Van Jordan, Bruce Beasley, and Katherine Larson all approach the merging of science and poetry differently, but in inspirational and exciting ways. We will examine poetry by these three poets to explore the following questions: What happens when scientific knowledge becomes part of a

poem? What does poetry gain from the introduction of science? What influence does it have on readers? What is the poet's responsibility, if there is any?

### **Poetry + Science: What Does Poetry Gain?**

To explore what happens when a poet brings science into a poem, we need to first understand why a poet chooses to use science. In *Cross-Pollinations: The Marriage of Science and Poetry*, scientist and poet Gary Paul Nabhan examines the space where poetry and science meet and begins his book with this quote by photographer Paul Strand:

The true artist, like the true scientist, is a researcher using materials and techniques to dig into the truth and meaning of the world in which he himself lives, and what he creates, or better perhaps, what he brings back are the objective results of his explorations. (3)

When a poet uses science in a poem she is using a “technique to dig into the truth and meaning of the world.” What does poetry gain from this?

First, science allows for a poet to get at a more precise truth by developing stronger and richer metaphors, introducing specialized language, and using more specific facts. Second, maybe not intentionally but surely, the use of science allows a poet to teach readers as well as poets and scientists.

Whether a poet has an innate knowledge of science that bears forth into a poem or researches heavily to bolster her work, science can add to the poet's consciousness, create a more precise exploration or representation of truth, and therefore enhance the reader's experience. In the linking of subjects, a poet can craft a closer look at her subject.

Perhaps by a turning of the head to look at her subject from a different angle or a lens through which the subject is magnified or colored, much like a scientist, the poet is always looking for new and better ways of approaching her subject, and the use of science is one of those ways. In *Cross-Pollinations*, Nabhan quotes H. Poincare:

To create consists precisely in not making useless combinations and in making those which are useful and which are only a small minority. Invention is discernment, choice .... [Creative ideas] are those which reveal to us unsuspected kinship between other facts, long known, but wrongly believed to be strangers to one another. (45)

When poetry and science meet, the web of creation grows more complex and stronger.

*Poetry + Science: Toward a More Precise Truth*

What are those poets and scientists trying to get at in their café conversation? They are alike, working toward truth, aiming at something that explains more about our world.

Poetry has a long history of incorporating research to get closer to the truth of the subject at hand. In the late 1700s/early 1800s, William Wordsworth and Samuel Taylor Coleridge wrote in the preface to their *Lyrical Ballads*:

If the labours of Men of science should ever create any material revolution, direct or indirect, in our condition, and in the impressions which we habitually receive, the Poet will sleep no more than at present; he will be ready to follow the steps of the Man of science, not only in those general indirect effects, but he will be at his side, carrying sensation into the midst of the objects of science itself. The remotest discoveries of

the Chemist, the Botanist, or Mineralogist, will be as proper objects of the Poet's art as any upon which it can be employed. (606–07)

Poets held science in high esteem, and they often attended the lectures of important scientists of the day to inspire their poetry. In his article “Scientists Fallen Among Poets,” Algis Valiunas points us to Keats’s poem “Watcher of the Skies” as an example of the use of scientific research to get closer to his subject:

The ancient bard, the astronomer [William Herschel], and the explorer Cortez (whom the poet confuses with Balboa) flame in Keats’s mind as heroes for the ages, and he believes that to commemorate their genius in a Romantic poem of genius gives them some slight portion of the glory they deserve:

Then felt I like some watcher of the skies  
 When a new planet swims into his ken;  
 Or like stout Cortez when with wond’ring eyes  
 He stared at the Pacific—and all his men  
 Looked at each other with a wild surmise —  
 Silent upon a peak in Darien.

Thus Herschel is to be remembered along with Homer. (55–56)

There are quite a few poets writing today who follow in the tradition of melding science and poetry. To better understand how science can work toward a more precise truth in poetry, we will look at three poets and their collections in the next three sections: A. Van Jordan’s *Quantum Lyrics*, Bruce Beasley’s *Lord Brain*, and Katherine Larson’s

*Radial Symmetry*. Each of these poets uses science to access emotion in different and powerful ways: A. Van Jordan uses scientific fact to build deep and rich metaphors, Bruce Beasley uses scientific language to expand the reader's view of the world, and Katherine Larson reimagines science as personal. Among the many recent collections that make use of science in some way, I selected these three for the directness of their use of science as the central force and the clarity of emotion that the science allows for.

### **Metaphors in A. Van Jordan's *Quantum Lyrics***

In *Cross-Pollinations*, Nabhan asks, "Does some capacity in metaphorical thinking actually help me generate novel hypotheses to test, or freshly interpret, field conditions and experiments in ways I might not otherwise entertain?" (44). He answers that question throughout his book as he shares stories of how his science has influenced his poetry and vice versa. By using science as a fresh lens through which to view human relationships, A. Van Jordan is able to create rich metaphors in his collection of poetry *Quantum Lyrics*.

The poems in *Quantum Lyrics* vibrate and tremble like atoms. There is a constant sense of motion and movement through the poems provided by new and exciting metaphors. It is not always a forward movement, but it is always important. Each of the four sections in this collection deals with the two-sidedness of relationships, and each depends on metaphors built of math and science to provide movement. Jordan uses the conceit of math to draw a string through the entire, trembling collection. Both the language and concepts of math are drawn into the everyday lives of characters throughout this collection.

The language of math and science plays an important role in evaluating how people relate to one another. In the poem “Richard P. Feynman Lecture: Intro to Symmetry,” Jordan addresses the two-sidedness of relationships with the metaphor of math:

You cannot solve for the use of one side of the body over the other, so there is no single voice that emits from it. You cannot solve for the harmonics of a dual body, facing each other, both inquisitive. You cannot solve for the marriage of opposites, their fit, their match, their endlessness.

(15)

Jordan writes, using facts from lectures by the popular physicist Richard P. Feynman, about the endless flip-flopping between sides in a relationship. Math comes to stand in for the human and, in turn, the human illustrates the mathematic. He uses the phrase “You cannot solve” to show that the two sides of a relationship may never be “solved,” but earlier in the poem, he writes: “What do we pray for but the equation that helps us make sense of what happens in our daily lives?” (15), showing that we will continue to try to make sense of it all in some way.

In the second section, “Quantum Lyrics Montage,” Jordan looks at relationships through a series of poems about and from the perspective of Einstein and those involved with him. In the letter poems between Einstein and his first wife, Mileva, which deal with a romantic relationship, Jordan chooses to use science to express the complications. In the first poem in this series, he writes from the interior of Albert Einstein’s head: “two lovers kiss and someone gets hurt, / the action of love and the reaction / of disappointment are equal forces” (37). He dives into the complications of a relationship

by incorporating Newton's Laws of Motions. He goes on to incorporate gravity, light speed, potential energy, and other scientific and mathematical concepts throughout these poems. Each of these scientific references comes to stand in for an aspect of relationships. The use of science as the driving force allows Jordan to dive deeper into metaphor, which creates a richer sense of meaning in his poems.

It is through the concepts of science and math that Jordan reflects on the complexities of relationships. He analyzes his own relationship with his recently dead father and with other people from his past, and even the relationships between races, by placing them in the context of mathematics and science. Often we view math and science as facts that have already been sorted out, equations that have already been solved. But we tend to forget the millions of questions that have yet to be solved, or even asked. It is in these unsolved areas that Jordan finds movement by adding science as metaphor in order to write toward a deeper and more specific truth.

### **Specialized Language in Bruce Beasley's *Lord Brain***

In *Lord Brain*, Bruce Beasley does not shy away from the technical vocabulary of neurology, and it only works to strengthen this collection of poems. He takes on the immense worlds of the brain and faith (as well as a variety of other fields) with the precision of a surgeon. The poems in this book act as an argument for specialized vocabulary because Beasley is able to extend the ways a reader can look at the world.

The use of scientific language can change the tone of the poem and shift the way a reader sees the poem and the world it inhabits. Specialized vocabulary is often rich in sound not found in typical everyday language or even in most poems. In the title poem,



“Lord Brain,” Beasley writes: “& I watched a slugtail shimmer down the brick, / felt the dulling of my nerve-impulse, amygdala to cortex” (21). While the image is a fairly typical one (especially where I live in Washington State), the final words hold meaning in their sound. The open sound of *ah* creates the sense of a beginning, and the closing sound *ex* creates a feeling of finality. The sense of sound moves the reader from a beginning to an end, just as the amygdala is the center of the brain and the cortex is the outermost part of the brain. Even without knowledge of the vocabulary, the sound conveys meaning and shifts the tone of the poem, which gives the reader a fresh way of looking at the world.

Because the language of a particular field has meaning on a different level than we normally encounter, it is full of potential for deeper meaning and truth for the reader—particularly new, unusual, and exciting meaning. The use of specialized vocabulary expands the reader’s sense of the world by creating a new lens through which to look at it. In his poem “Particle Accelerator,” Beasley breaks down Latin words that are characteristic of science and religion, body and soul. The way Beasley breaks the words down to their roots and repeats them stands in for the overlap between the brain and religion/faith. Sound and meaning come at the reader in a great rush in this poem, like particles from an accelerator. The two realms are smashed together in the poem “Particle Accelerator,” and specialized language is the conduit: “(*Quantum* / which means: *How great* –)” (79)—terms from both Lord and Brain. It is because he chose to use the language he did that this poem is even possible.

In “Counterearth & Lux,” Beasley uses the language of science and math to connect with the reader in this love poem. Not only do sound and language come into play in these poems, but also surprise occurs at every turn. The idea of a Pythagorean-

inspired love poem is surprising in itself (and thrilling!), but then the poem moves from “cosmic harmony” to the “skull-locked hemispheres of the brain” (28) in one surprising breath. Because of his focus on love through the lens of science and math, he is able to make this surprising image work:

Always 2 points imply a linkage, & thus  
 the cosmography of form. Odd & odd are always even.  
 —If I speak of us in metaphor, Suzanne,  
*as* metaphor, in the slippage of vehicle into tenor, in the implied  
 line between 2 points that have *no dimension, no property but location...*

(30)

He makes partners of science and deep love. Surprising, indeed.

Alison Hawthorne points out that “one can take some heart that specialized vocabularies within the large languages are burgeoning, and in no field are they doing so with more gusto than in science, providing fresh instruments for seeing the world” (24). While Jordan masterfully creates rich metaphors with scientific concepts, Beasley uses the specialized language of science to give the reader a new, expanded way to see the world. He takes advantage of this exploding, explosive language and handles the immense topics of the brain and faith with the gentle and curious mind of a poetic surgeon, peeling back the layers and telling us, in beautifully specific terms, what we are looking at. He is able to point to a more specific truth by using the precise language of neurology. And by using precise language, Beasley is able to extend the ways in which a reader may see the world.

### Facts in Katherine Larson's *Radial Symmetry*

In their preface to *Lyrical Ballads*, Wordsworth and Keats imagined what would happen to poets if science became flesh and blood:

If the time should ever come when what is now called Science, thus familiarized to men, shall be ready to put on, as it were, a form of flesh and blood, the Poet will lend his divine spirit to aid the transfiguration, and will welcome the Being thus produced, as a dear and genuine inmate of the household of man. (607)

Science becomes a warm and pulsing being in Katherine Larson's *Radial Symmetry*. She has taken what is cold and hard and made it, through poetry, something that is close to "flesh and blood." By reimagining the specific facts of biology in the warmth of her image-driven poetry, she has brought new life to both science and poetry.

The long, sectioned poem "Ghost Nets" explores extinction, the fragility of life, and the "soul and meat" of being" (41), but not in any typical way. Larson uses the specific facts from her life as a research scientist and field ecologist to sharpen her poems toward the truth she is working to discover. In section IX, the speaker and her presumed lover wake to death: "We wake to sun stars / stretching in the tide pools / and the stench / of the rotting sea lion carcass with the plastic Coke bottle / lodged inside its throat" (45). The speaker then moves on to the deaths of the lovers past: "The day you sawed off the head of the dead dolphin / with your mother, / you were trying to get past the abstraction of death" (45). Both of these moments show specific facts from a life in marine biology, but also create a sense of intimacy between the speaker and the lover in the here and now. Larson merges the scientific and the human by giving face and story to facts. The section

ends with a look at the fleeting brightness and temporality of life Larson has shown throughout the entirety of “Ghost Nets”:

Because there are times when you swim at night, your arms leave  
trails in the water. So many dinoflagellates switching on,  
for a moment the darkness after your body is a trail of green light.  
Then it vanishes. (45)

The dinoflagellates are known for bioluminescence, and Larson closes this section with the brevity of such bright moments in the darkness as she relates it to the speaker’s previously mentioned experiences of death. This one little fact creates a more intimate feel to a theme that could easily feel generalized, and, by orchestrating that intimacy, Larson has invited the reader into a smaller sphere where the grandiose becomes detailed. Larson has told the reader life is short and death is everywhere without being clichéd; she has brought the reader’s eye to the microscope and given us a clear lens through which to look at the facts.

In “Love at Thirty-Two Degrees,” there is no question of where the speaker has been, and the poem begins with a claim of certain knowledge: squid, acacia, lab bench. There is no question because the speaker begins in specifics:

Today I dissected a squid,  
the late acacia tossing its pollen  
across the black of the lab bench. (14)

The dissection then leads to the speaker’s sharing with the reader of “Amazing, hearts. / This branchial heart” (14), which sets up the next three sections of the poem. Because Larson has begun her poem with specifics, she has established a tone of expertise, so the

reader is able to follow her through the Arizona desert, into the life of the astronomer and his wife, and then to Science and its relation to making love. In the first section, Larson has given the reader a platform to stand on while the speaker moves outward, from lab bench to personal life to astronomer's life to the science of life. If Larson had jumped right into the final section, the poem would be abstract and without context, and her powerful closing lines would lose much of their power. But since the poet has merged science and the personal by showing us the dissected squid that led her to examine her own relationship ("considering the cold, and the fact that you / weren't there to warm me" (15)) and then the relationship of an astronomer and his wife ("So he walks to the house / inflamed by moonlight, and slips / into the bed with his wife" (16)), the final lines become powerful in light of her personal discoveries throughout the poem:

Science—

beyond pheromones, hormones, aesthetics of bone,

every time I make love for love's sake alone,

I betray you. (14–16)

Larson is able to write, "Science...I betray you," only because she has established expertise and intimacy with the facts of science. If she had not begun by working at a lab bench, there would be no reason for her betrayal of science to mean anything to a reader.

*Radial Symmetry* merges the facts of science and relationship with the tenderness and cruelty of a dissection. While Jordan creates rich metaphors with science and Beasley uses specialized language to extend the way the reader might view the world, Larson merges the scientific with the personal in a way that creates mystery and therefore expands the reader's experience of the world. Larson is able to bring the reader into the

worlds of marine biology and poetry by masterfully crafting each poem toward the truth she set out to explore. She never says, “This is a fact, you must believe me.” Instead, she weaves small facts into her exploration of the unknown to guide the reader through the complexity, offering the stable ground of the known for respite from the spinning chaos. In her poem “Crypsis and Mimicry,” she addresses the complexity and mystery of science, truth, and language:

I used to believe that science was only concerned  
with certainty. Later, I recognized its mystery.  
There isn’t language for it—  
The way I can see you when you are shining.  
Our roots crypsis, our wings mimicry. (12)

### **Poetry + Science: To Teach**

There is much to be learned from both poetry and science, and when they are combined, the potential for learning grows. In his book *Walking the High Ridge: Life as Field Trip*, scientist and writer Robert Michael Pyle states:

Some questions can be closed in on through experimentation and close, attentive observation. Others yield to the imagination, in concert with colors, the smells, the cold crush of the stones and the soft lift of the high alpine air itself. (6)

Poetry offers the perfect form for both “close, attentive observation” and the imagination. Readers, poets, and scientists can learn much from the merging of subjects. By creating

and sharing the metaphors, specialized language, and specific facts mentioned earlier, poets are able to act inadvertently as teacher in subjects outside of poetry.

*Teaching Readers: Empathy*

Writing poetry, and reading poetry, largely teaches empathy. In his article “Narrative Empathy,” Keith Oatley examines how reading fiction can teach empathy:

[W]e set aside our own plans and concerns for a while as we take up our book; we then take on the plans and concerns of a fictional character, and empathetically imagine what that character might feel. We are not just book-reading, we are mind-reading. ... we experience emotions—our own emotions—in the circumstances of a character’s concerns, plans and actions.

I would argue that this holds true especially in poetry. Replace the word “character” with “speaker” and you have what I consider to be the most important thing poetry can do. Poetry moves into the interior of an experience and/or mind so that we often feel it on a deeper level. Poetry allows us, as both poet and reader, to get so close to the speaker that we are inside her skin, living her life, watching her mind work. Science can teach empathy by creating common ground, by finding things that are true for everyone. While a poem that contains science may teach hard facts and concepts, it can also teach empathy, which is a crucial way to understand the human experience.

In *Quantum Lyrics*, Jordan couples the relationship of Albert and Mileva Einstein with the language of science and math to create a world, in poems, that the reader can access. In the poem series “Quantum Lyrics Montage,” Jordan uses not only the lives of

two people crucial to the history of science, but science itself to construct an intricate world for the reader. By using the language of science (presumably the Einsteins' language) to explain the Einsteins' relationship, Jordan links these two things in the reader's mind, allowing the reader to inhabit his poems and the relationship they present. By linking science and love, he also gives the reader new ways to explore human relationships, as can be seen in these three examples:

Our love, despite the evidence, experiments  
with the physics of simply being together. (42)

You find time to test ideas, travel without me and to read;  
the unsolved problem is love. We are the experiment. (42)

Trust me, my love, if I understand  
the photoelectric effects of ultraviolet light on metal, I can read  
a man. (43)

Jordan gives the reader an access point by providing a relationship to examine and then strengthens his poems with supporting language, metaphors, and facts from science. The reader of Jordan's poems may be able to more fully inhabit the relationships of others through an empathy that comes from the intimate voice and universality of science.

Beasley's poem "The Little Gland Which the Spirits Surround" examines the relationship between the pineal gland and the soul. Had he written a poem about his ideas on the soul, it would have been abstract and inaccessible, but he uses science as a common ground for readers to access his ideas about the abstract idea of "soul." By



explaining the function of the pineal gland and the history of its discovery, he has allowed the reader to track his reasons for coming to this conclusion:

Therefore that's where the soul  
*exercises its functions:*  
 darkness-summoned, serotonin-  
 gluttoned, nonluminous

& preying on what radiance is ushered in. . . . (13)

Without providing information about the pineal gland, this elegant metaphor would make little sense for a reader, and she would not be able find use for this poem in her own life; but because Beasley conveys how the pineal gland works, the reader can see the image he created and how it relates to the idea of the soul. The feeling of understanding is the beginning of empathy. Beasley teaches the reader to see the human experience through a new lens and thereby expand her empathy.

*Radial Symmetry* awakens the senses both scientifically and poetically, merging the two worlds into one beating heart that is both technical and passionate—and thus fully inhabitable by the reader. In “A Lime Tree for San Cristóbal,” Larson melds the attentive observation of a scientist and the imagination of a poet to make the reader feel the thrill of living so close to death:

Today's specimen: *Eel dark*  
*reddish purplish brown with pale or whitish*  
*brown spots.*

I know I'm still alive because I love

to eat. On the table's a gift  
 from fisherman: pink gills embroidered  
 blood, the eyes—two mirrors snapped over  
 with iron. This shark that I will cut and soak  
 in lime has a mouth made for eating darkness—  
 an architecture built without a need for dawn. (13)

Her attention to the details of the shark stem from her work as a scientist, but the careful crafting of the lines is the art of a poet. The details create a concrete, sensual world for the reader, while the line breaks (particularly the one in “I know I’m still alive because I love / to eat” (13)) are beautifully crafted to add a sense of suspense and then surprise. Larson compels the reader to take a second, careful look at the simple things, like what we eat, and see them as a connection to life as a whole. Larson gives a well-rounded view of the world she sees by utilizing more than just the “poetic” part of her life.

These poems of Jordan, Beasley, and Larson demonstrate how poetry and science can teach empathy by creating a world the reader can inhabit and understand as she reads. But what about the poets and scientists—what can they learn?

*Teaching Poets & Scientists: Expanding Boundaries*

Poets and scientists can gain a lot by merging their subjects. Scientist and poet Gary Paul Nabhan knows this well and compares the merging to the cross-pollination necessary to hundreds of thousands of plants in insects: “Artists and scientists also need cross-fertilization or else their isolated endeavors will atrophy, wither, or fall short of their

aspirations” (13). The beauty of both science and poetry is that they are open-ended: just as you discover an answer, you discover hundreds of questions. Neither science nor poetry claims to have figured it all out; instead, each devotes itself to question-asking, theories, exploration, and love for the mystery of it all.

Writing poetry is often an exercise in making connections. The leaps poems take are where the surprise lies, and surprise is the pulse of poetry. When a poet introduces research from subjects outside of literature, she opens up worlds of possibility in her poetry. Jordan, Beasley, and Larson all provide excellent examples of where science can take a poet, with no compromise to the poetry. Poems become rich with exterior context when research is added to the poem-making process. Nabhan points out that “what a great many artists do is investigate. For that matter, art can be thought of as aesthetic investigation. Where would science be without research? The same question can be said about art” (41). Just as poets pave new avenues for learning and exploring by incorporating scientific research, scientists can benefit from studying poetry.

Because poetry is experienced through the senses, both physically (sound) and intellectually (imagery, meaning), it makes a perfect teaching tool for scientists at all stages. Both science and poetry are a constant learning process. Both scientists and poets require new modes of learning for growth. Poetry can teach scientists new ways of looking at their own work.

In Pyle’s *Walking the High Ridge*, Nabhan’s *Cross-Pollinations*, and Vladimir Nabokov’s *Strong Opinions*, these scientist-poet authors discuss how their poetry helped them make new discoveries and connections in their science life. All three found their creative writing to be critical to their scientific research. Nabhan writes: “[A]s Bill

Stafford once suggested, that we benefit from ‘stories that could be true’ —that we recognize new possibilities in the world through our imaginations, and then we see that they become manifest in other ways” (63). It is in the act of not only researching but reimagining that discoveries are made, just as physicist Leo Kadanoff points out: “It is an experience like no other experience I can describe, the best thing that can happen to a scientist, realizing that something that’s happening in his or her mind exactly corresponds to something that happens in nature” (Deming, 18). Poetry offers a space for imaginative exploration, and when that exploration is guided by scientific fact, it can lead to new and exciting discoveries. Unfortunately, “[a]s John Horgan describes so well in *The End of Science*, bright, well-equipped scientists are meeting the limits of what they can accomplish *as long as they stay within the paradigms of their own disciplines*” (Nabhan, 49).

While I advocate the joining of science and poetry in the form of a poem, poetry can complement science in other ways. In his essay “The Earth Whirls Everywhere,” Dava Sobel writes:

Although I don’t write poetry myself, I do try to employ what I’ve learned from reading poetry in my science-oriented prose. I try to be concise, to heed the rhythm of the sentences (by reading them aloud), to choose words for their sound as well as their sense, and to prize the emotion attached to each discovery or invention.

There is great power in borrowing the best of other subjects to enhance your own. Alison Hawthorne Deming points out that

if science today needs anything, it needs to move out of its insular objectivity, its pretense that it deals only with facts, not with ethical implications or free-market motives. What science creates is not only fact but metaphysics—it tells us what we believe about the nature of our existence, and it fosters ever new relationships with the unknown, thereby stirring the deepest waters of our subjectivity. (25)

At its best, the marriage of poetry and science enhances both subjects by encouraging and helping both poets and scientists think outside of their rote modes of working. At its best, it expands boundaries, changes maps, and becomes a two-way street. And, at its best, the marriage of science to poetry influences the readers of those such-informed poems.

### **Poetry + Science: Influence on Readers**

Those poets in the café have now written poems that take full advantage of scientific research. They have written poems with deepened metaphors, specialized language, and specific facts that meld the science of sex with their own poetic leanings. They have taught readers some science and hopefully a lot of empathy, and maybe along the way, they have expanded a scientist's horizon. A reader's sense of a poem, her reaction to the poem, and her trust in a poem are all hugely important, or should be, to a poet. But how does any of what we have explored to this point influence a reader when what she has brought to the poem merges with what the poem brings to her?

Every time a reader approaches a poem, she brings her own experiences and way of reading. When a reader feels a sense of direction in a poem, she is put at ease.

Scientific fact in a poem can guide the reader through the poem when used skillfully, but can be a stumbling block if inserted randomly or used in a way that works against the poem. For instance, in her poem “Metamorphosis,” Larson writes about gathering dragonflies from a stream:

We dredge up the stream with soup strainers  
and separate dragonfly and damselfly nymphs –  
their eyes like inky bulbs, jaws snapping  
at the light as if the world was full of  
tiny traps, each hairpin mechanism  
tripped for transformation. (57)

Gathering dragonflies from a stream for research is not a scene most of us have encountered, but Larson uses language that makes it feel daily and comfortable, and her images are easy to imagine. Because she has expert knowledge of this scene, she could have easily created a completely different tone to the poem: she could have used the order name *Odonata* for the dragonflies or added that each of their compound eyes is composed of nearly 28,000 individual units. Such language or other facts would have guided the reader in a different direction because Larson would have set a tone implying that science was the focus of the poem. But throughout her collection, neither science nor her personal life is the focus; instead, the merging of the two is. Larson has created a tone that is at once educated without becoming lecture-like and calm without becoming hazy, and this invites the reader into her intimate sphere of knowledge.

Science gives the poet the opportunity for new and exciting surprises that may not be found in other, tired places. Science can bring new life to a clichéd image or subject

(the moon or cranes, for example). A collection like *Lord Brain*, full of new language and ideas, holds many surprises for most readers. Beasley is aware that his specialized language and very scientific facts can become burdensome for a reader, so he works to secure the reader's investment in the poem, to keep her reading without becoming exhausted, by giving her respite from the science. In his poem "Soul Atoms," Beasley begins with the historically known image of the sparrow and the physical world:

The fall of every sparrow—it is written  
that He watches, in cattails & salt marsh,  
  
black streaks in the flank, wing-coverts & burnt  
umber plumes. & He watches, too, the electron-  
  
cloud of each disintegrant atom  
  
& all the assembled syllables (70)

This is surprising for the reader! When a poem begins with a Biblical sparrow, you do not expect it to turn to a cloud of atoms, but Beasley has masterfully created a space for the reader's reaction. He builds from the Biblical and physical off and on in the poem, but also skips to nerve cells, carbonized stars, and even the very scientific  $C_{17}H_{27}NO_2HCl$ . Beasley creates a balance between the physical, known world to the mysterious (for most) world of science.

Science cannot only surprise the reader and give her a sense of direction, but can be used by the poet to gain trust. If a poet carefully crafts facts, precise images, specialized language, and metaphor, the readers will believe she knows what she is

writing about and that everything included has a reason. If the incorporated science does not feel integral to the whole but merely stuck in the poem, the reader will distrust the poet and therefore the poem.

Jordan uses facts, which are clearly well researched, throughout the entirety of *Quantum Lyrics*, and this builds trust with the reader because she has a whole collection of poems to examine. Even stand-alone, his poems demonstrate enough scientific research to build the reader's trust. For example, the title of "Richard P. Feynman Lecture: Intro to Symmetry" immediately scores the reader's trust, which Jordan deepens by using language typical of science throughout the poem, but with a poetic slant: "Love begins in the streets with vibration," "equations elegant enough to figure on our fingers," "Try to use math to calculate what the eye does every second of any given moment," and "You cannot solve for the harmonics of a dual body" (15). Jordan gives hints to the reader about his research, knowledge, and aim to use science in his poems. The poems in *Quantum Lyrics* are prime examples of creating trust in the reader. There is an easy feeling to the incorporation of his scientific research that is at once both natural and intentional. When a poet blends science and poetry seamlessly, the reader can read at ease.

Alternately, if a poet misuses science in a poem, the reader can become confused, frustrated, and distrustful of the poem and its speaker—and ultimately the poet. It is up to the poet to use science in a way that builds a poem, to use science in a way that maintains scientific integrity while creating beautiful poetry. The poet has a responsibility to the reader, poetry, and science. Careful use of scientific facts allows readers to suspend disbelief and follow the speaker, wherein lies the poet's responsibility.



### **Poetry + Science: The Poet's Responsibility**

In his book of interviews, *Strong Opinions*, Vladimir Nabokov posits: “In high art and pure science, detail is everything” (168). A poet who chooses to use science must go about it the way a scientist would, true and responsible to the facts, including as much detail as is allowed by the poem so as not to misinform, mislead, or misuse the reader. A poet must not only consider the reader, but poetry and science as well.

If a poet is going to use scientific vocabulary or facts outside of what is considered basic public knowledge, it is her responsibility to offer education outside of the poem as well. *Lord Brain* is heavy with specialized language and fact, but in the midst of it all, Beasley doesn't leave the reader without context. He includes “Phantom Limbs of the Poems” to provide context without making the reader feel stupid (which is no small feat). He gives important background and history to some poems and defines scientific terms that may not be familiar. In essence, he provides proof of research and jumping-off points for the reader who wants to know more. Poets do not write in a vacuum, and that is especially clear when research is introduced. The poet's responsibility to the reader, then, is to make clear the facts and then make at least a gentle nod toward the research to not only prove its existence, but to give the reader a feeling of confidence in the poet as truth-teller, much like a scientist does.

A scientist holds responsibility for sharing information in order to further the conversations happening in the scientific world; and if she cannot or will not share her research or sources, she will lose funding, publication, and credibility. The scientific method implies a code of ethics. But what about when science crosses into the sphere of

poetry? Much of the science that enters into poetry is publicly accessible common knowledge: references to Newton's Laws, the laws of planets, or the way atoms work. But when a poet finds research that is groundbreaking or obscure, does she owe the scientists a reference? I believe that she does. If a scientist was to reference a poem, she would also be required to reference the poet. When a poet uses another poet's work or a painter's painting, she references it in either the title, an epigraph, a footnote, or notes. Often poets fall back on the saying "Good artists borrow, great artists steal." But most poets would not look kindly on having their work stolen without reference. Referencing is a matter of respect and reverence for the work of science. Art of all kinds is a conversation, and when an artist invites science into the conversation, she should clue the reader into the voices heard and also open up a forum for dialogue between the disciplines. Not only would that be the respectful path, but it would also allow for the possibility of new discoveries. Deming notes in her essay "Science and Poetry" that

W.I.B. Beveridge, a British animal pathologist, has written several useful books about the mental procedures that lead to new ideas, whether in science, art, or any other imaginative enterprise. "Most discoveries that break new ground," he asserts, "are by their very nature unforeseeable." The process is not purely rational, but dependent upon chance, intuition, and imagination. (19)

By referencing scientific research, poets are opening the door for cross-disciplinary exploration that could lead to the new ideas Beveridge talks about.

While a poet has a responsibility to the reader and to science, her first responsibility is to the art of poetry. Language is the poet's medium, and it must be held

in the highest regard. If a poet takes seriously her responsibility to language while incorporating science, a good poem is more likely to follow. Deming writes:

[S]cience and poetry, when each discipline is practiced with integrity, use language in a fundamentally different manner. Both disciplines share the attempt to find a language for the unknown, to develop an orderly syntax to represent accurately some carefully seen aspect of the world. Both employ language in a manner more distilled than ordinary conversation. ... But, as Czech immunologist and poet Miroslav Holub points out, “for the sciences, words are an auxiliary tool.” ... Poetry uses language itself as the object. ... (18–19)

Like Jordan, Beasley, and Larson, poets can take language seriously while also doing justice to the world of science. All three of these poets use language to call attention to the work of science and to create a better understanding of the human condition. Throughout each of the three collections explored here, the reader can trust the poet while delighting in the poems, science is exalted, and poetry is held in the highest esteem. The poems of Jordan, Beasley, and Larson prove that the worlds of science and poetry can live on one page in great beauty.

### **Conclusion**

Those poor poets and scientists from the café are now sleeping off the alcohol and resting after the thrill of discovery, but the work they produced has begun to take on a new life. They have worked hard, together, to discover for readers, poets, and scientists alike. Via their poems, the poets have entered into conversations with science that were not possible

until they considered the science behind their subjects. The poets have learned that science holds, for them and the reader, more precise truth through deeper metaphors, specialized language, and pure fact. They have learned that they can meaningfully influence readers, poets, and scientists by introducing conversations across disciplinary borders, and that how they wield research greatly influences a reader's sense of, reaction to, and trust in the poetry created. And, hopefully, they have learned to give the respect and reverence of reference when utilizing research.

Poetry owes much of its delight to the surprise of uncovering new ideas and clarifying truths, and science can go a long way in aiding that process. Neither the poet nor the scientist claims to lay bare the secrets of the universe; instead, each works to point to the world in wonder and reveal some new way of looking at our humanity. Deming beautifully sums up the work of poetry as “a means to create order and form in a field unified only by chaos; it is an act of resistance against the second law of thermodynamics that says, essentially, that everything in the universe is running out of steam” (21). The beauty of science is that poets can use it to work against the laws it professes by marrying scientific knowledge with the mystery and beauty of language.

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