Songs That Science Gives us

Connie Barlow

I know so little about an oyster's logic,
or why slugs mate acrobatically
from slime gallows.
Earth isn't small enough for me
to exhaust. Why covet mind-teasers
lightyears away?

I chose this poem by Diane Ackerman[1] to begin my new science anthology *(Evolution Extended: Biological Debates on the Meaning of Life)* because the sentiment she expresses was the impetus for my book. Physics may be the reigning king of the sciences for philosophical questers, but biology most certainly is queen. And only she can speak to deep questions about the meaning of life.

Sadly, within the past several decades biology's proponents have been rather guarded in their pronouncements, in their extensions of the science of biology into the realm of meaning. So I have gathered up the threads, past and present, and hope that, in concert, the rich and diverse voices will foster wider recognition of the utility and beauty this queen of the sciences has to offer. And lo, because of the diversity, a survey of the best extensions of the science becomes a kind of smorgasbord, offering a plenitude of ingredients from which each of us can create a personal agar for culturing or perhaps just confirming beliefs, hopes, and fears.

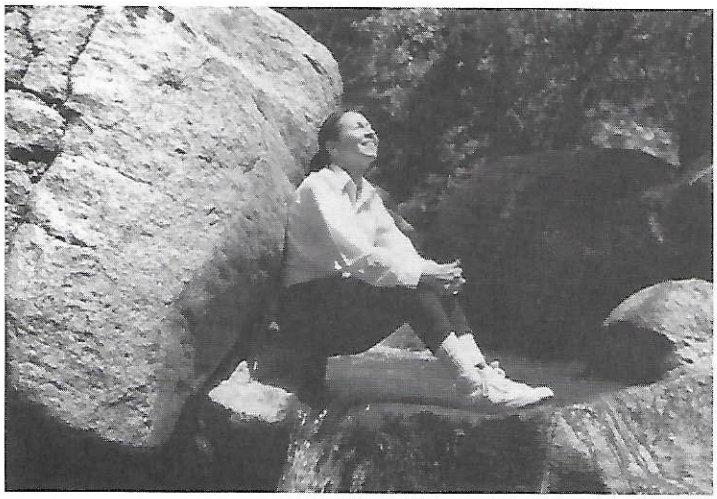
When I began selecting the poetry for this anthology, I assumed that it would serve a function similar to that of the graphics — an invitation for readers to engage the right brain as well as the left. But now, with manuscript complete, I find that the poetry holds a special magic for me. Indeed, my way of savoring one of the greatest of life experiences — the act of creation fulfilled — is not to pull out a chapter for bedtime reading, but to nestle down with a separate printout I have made of the poetry alone. I close my eyes and recite the poems I know; for others, I may pause to commit another few lines to memory. Along the way, I grasp new subtleties and feel more deeply the connections between the poem and the text it embellishes.

What a privilege it has been to bring my science and literary heroes into conversation and then reintroduce them for others to share! Annie Dillard, for example, polishes the extracts I used from Charles Darwin's *Origin of Species*. I was entranced when I first read Darwin's great work a half dozen years ago, and I was entranced when I first read Dillard's *Pilgrim at Tinker Creek*, years earlier. In fact, I even then added several of her finest paragraphs into my little notebook of favorite poetry. And for those paragraphs, I created line ends because, for me, they were poetry. A decade and a half later I found myself writing to Annie Dillard and securing her permission not only to draw from her work but to use the line ends I had created. Here is what came of it:[2]

> I am a frayed and nibbled survivor
> In a fallen world, and I am getting along.
> I am aging and eaten and have done my share
> Of eating too. I am not washed and beautiful,
> In control of a shining world in which everything fits,
> But instead am wandering awed about on a splintered wreck
> I've come to care for, whose gnawed trees breathe
> A delicate air, whose bloodied and scarred creatures
> Are my dearest companions, and whose beauty beats and shines
> Not *in* its imperfections but overwhelmingly in spite of them.

Charles Darwin created the science underpinning Dillard's poem, and he surely shared the sentiment. Darwin's world of "survival of the fittest" may have been bloody ("red in tooth and claw" as Tennyson[3] put it before him), but his insight that we are all kin made it utterly dear to him. Then too, it was in the imperfections of organisms that Darwin found one of his best arguments against the ruling paradigm: "He who believes that each being has been created as we now see it, must occasionally have felt surprise when he has met with an animal having habits and structure not in agreement. What can be plainer than that the webbed feet of ducks and geese are formed for swimming? Yet there are upland geese with webbed feet which rarely go near the water. On the other hand, grebes and coots are eminently aquatic, although their toes are only bordered with membrane."[4]

Darwin had no awareness, however, that forces outside our planet play an important part in determining which species nature selects for extinction. We can now be almost sure that a collision with a meteor or comet of extraordinary proportions (far bigger than the usual pinpricks of cosmic dust that give us shooting stars) brought the reign of the dinosaurs to an



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end. Paleontologist David Raup amplified on the meaning of this discovery in his 1991 book, *Extinction: Bad Genes or Bad Luck?* I plucked extracts from that book and tied them off with a stanza from one of Diane Ackerman's poems:[5]

All around me:
planet, moon, sun, riverbed, marsh:
grew out of cataclysms galore;
nothing ever sprang whole, stays put.
I feel the earth beneath my feet
suddenly shale away;
everywhere I look there's a new disaster,
and what splintered the mountains
made gape the pine.

But it is not just strife and catastrophe that fashioned the eye of an octopus or the human hand out of the first bacterial cell. Cooperation — call it an urge to merge — has also been constructive. Lynn Margulis has finally succeeded in convincing her colleagues that the complex cells of which we and all animals and plants are made were achieved by mergers of bacterial ancestors. Tiny bacteria that had evolved a capacity to use oxygen established symbiotic relationships inside and with larger bacterial cells that knew only how to metabolize nutrients anaerobically. And blue-green algae that knew how to use the energy of sunlight to weave complex molecules out of simpler ones moved in with hosts that could supply them with the needed materials — for a fee (a share of the product). The "motives" underlying these mergers may have been less than admirable (aerobic bacteria may have

been attempting to parasitize their anaerobic hosts; blue-green algae may have been welcomed into another cell as a potential food source, which happened to resist digestion), but today the evolved relationships appear as paragons of goodwill.

Synergy is the word for this kind of cooperative activity, a coming together that yields more than the sum of the parts. Synergy, as well as strife, has thus been a powerful tool of evolution. But so too has been initiative.

Alister Hardy (a noted biologist, who in the last decade of his life wrote with an unabashedly spiritual bent) and Karl Popper (our century's best-known philosopher of science) have both drawn attention to the importance of initiative in evolution. In Hardy's words, "It is adaptations which are due to the animal's behaviour, to its restless exploration of its surroundings, to its initiative in seeking new sources of food when its normal supply fails or becomes scarce through competition, that distinguish the main diverging lines of evolution."[6] One cannot, for example, expect mutation alone to make a woodpecker of a fly-catcher. A stouter bill produced by chance would have failed to enhance the fitness of a fly-catcher unless the bird had first developed the habit of poking into the bark of trees. And there is no doubt that behavioral initiative plays a powerful role in those species for which a wholly new form of evolution is now at play: cultural evolution.

Robinson Jeffers[7] gave poetic voice to this worldview a decade before Hardy and Popper became its scientific exponents:

> **I believe the first living cell**
> **Had echoes of the future in it, and felt**
> **Direction and the great animals, the deep green forest**
> **And whale's-track sea; I believe this globed earth**
> **Not all by chance and fortune brings forth her broods,**
> **But feels and chooses. And the Galaxy, the firewheel**
> **On which we are pinned, the whirlwind of stars in which our sun**
> **Is one dust-grain, one electron, this giant atom of the universe**
> **Is not blind force, but fulfills its life and intends its course.**

Strife, catastrophe, synergy, initiative: these are all forces at work in evolution. But what of the wider picture? How have the facts of evolutionary biology been extended beyond the science and into the realm of meaning? What, at base, is the meaning of life? And how should we, *Homo sapiens*, view ourselves within the living community and within the universe?

Scientists who agree pretty much down the line on the facts have vastly differing outlooks on what meaning can and should be drawn out of them. Evolutionary biologists have extended their expertise into speculative philosophies that differ as night from day. And what this gives the rest of us is choice: an opportunity to delight in the best factual knowledge that science can offer without restricting our freedom to choose how we color the world that emerges.

In the 1940s and 50s, for example, two of the most prominent evolutionary biologists engaged in a debate about meaning that is to this day unsurpassed. Is evolution going anywhere? Is there evidence of progress in the organic world? Julian Huxley answered yes; George Gaylord Simpson said no. Both offer compelling arguments, and both have impeccable credentials.

Julian Huxley, grandson of Darwin's ally Thomas Henry Huxley, believed that the history of life showed evidence of "an increase in the control exerted by organisms over their environment, and in their independence with regard to it." He also discerned an increase in "the harmony of the parts of organisms" and in "the psychical powers of organisms, an increase of willing, of feeling, and of knowing." Not all lineages, of course, followed this pattern, and some even regressed, but Huxley found evidence of an overall progress in that "the upper level of these properties of living matter has been continually raised."[8]

George Gaylord Simpson was foil to Julian Huxley on the question of evolutionary progress: "The fossil record shows very clearly that there is no central line leading steadily, in a goal-directed way, from a protozoan to man. Instead there has been continual and extremely intricate branching, and whatever course we follow through the branches there are repeated changes both in the rate and in the direction of evolution. Man is the end of one ultimate twig. The housefly, the dog flea, the apple tree, and millions of other kinds of organisms are similarly the ends of others."[9]

But Julian Huxley was unmoved by Simpson's critique, and he went on to extend his progressive vision into a grand worldview that partook of the colonial spirit of his native England. "The scientific doctrine of progress is destined to replace not only the myth of progress, but all other myths of human earthly destiny. It will inevitably become one of the cornerstones of man's theology, or whatever may be the future substitute for theology."[10]

Walt Whitman gave expression to Huxley's exultant humanism a hundred years earlier:[11]

Before I was born out of my mother, generations guided me;
My embryo has never been torpid — nothing could overlay it.

For it the nebula cohered to an orb,
The long slow strata piled to rest it on,
Vast vegetables gave it sustenance,
Monstrous sauroids transported it in their mouths, and deposited it with care.

All forces have been steadily employ'd to complete and delight me;
Now on this spot I stand with my robust Soul.

Today Annie Dillard[12] echoes the Simpsonian worldview:

Follow the rivers, look for a pass,
or follow the ridges, rise.
There are no eyes on you.
You were kindled from a clot
and washed on the beach like a conch
from one more witless wave.

On the heels of Simpson and Huxley, Jacques Monod (an existentialist molecular biologist) and Pierre Teilhard de Chardin (a Jesuit paleontologist) published books that brought the emotion and grandeur of this debate to a peak. Monod built his *Chance and Necessity* around a conviction that "The ancient covenant is in pieces; man knows at last that he is alone in the universe's unfeeling immensity, out of which he emerged only by chance."[13] Teilhard agreed with Monod on the cause of humanity's malaise, but he believed it unfounded. Teilhard's *Phenomenon of Man* is a call for the spiritually inclined to ground their beliefs in an evolutionary worldview that is as optimistic as it is impassioned: humankind is bringing mind to the planet, giving it a "noosphere," and our further efforts will one day bring about a grand "Omega Point."

William Wordsworth[14] long ago provided a poetic rendering of the malaise perceived by both Monod and Teilhard:

There was a time when meadow, grove, and stream,
The earth, and every common sight,
To me did seem
Apparelled in celestial light,
The glory and the freshness of a dream.

It is not now as it hath been of yore; —
Turn wheresoe'er I may,
By night or day,
The things which I have seen I now can see no more.

Whither is fled the visionary gleam?
Where is it now, the glory and the dream?

For Teilhard's cosmic vision of progress, Walt Whitman[15] is an immortal soul-mate:

The sun and stars that float in the open air;
The apple-shaped earth, and we upon it — surely the drift of them is something grand!
I do not know what it is, except that it is grand, and that it is happiness,
And that the enclosing purport of us here is not a speculation, or bon-mot, or reconnoisance,
And that it is not something which by luck may turn out well for us, and without luck must be a failure for us,
And not something which may yet be retracted in a certain contingency.

Today, Edward O. Wilson ("the great E. O." as he is known by his students) argues that evolution has built into humankind not only a capacity but a need for religion — the so-called mythopoeic drive. We humans demand to know where we fit in the cosmos, and those societies that can provide answers that motivate their members will enhance their fitness. In Wilson's view the "evolutionary epic" is not only the best science of our own day; it is "probably the best myth we will ever have." In his newfound role as champion of biodiversity, he beckons us to find our cosmic ties through our kindred species. Lord Tennyson[16] is my choice for Wilson's personal bard:

The world is too much with us; late and soon,
Getting and spending, we lay waste our powers.
Little we see in Nature that is ours;
We have given our hearts away, a sordid boon!

This Sea that bares her bosom to the moon;
The winds that will be howling all hours
And are up-gathered now like sleeping flowers;
For this, for everything, we are out of tune;
It moves us not.— Great God! I'd rather be
A pagan suckled in a creed outworn;
So might I, standing on this pleasant lea,
Have glimpses that would make one less forlorn;
Have sight of Proteus rising from the sea;
Or hear old Triton blow his wreathed horn.

John C. Greene, a historian of biology, meanwhile urges his colleagues to clip their philosophical wings. Science is science and religion is religion. And one does not inform the other. A passage from George Bernard Shaw's 1921 play, *Back to Methuselah: A Metabiological Pentateuch*, is a witty accompaniment for Greene's worldview:

They tell me there are leucocytes
In my blood and sodium and carbon in my flesh.
I thank them for the information and tell them
There are black beetles in my kitchen,
Washing soda in the laundry and coal in my cellar.
I do not deny their existence
But I keep them in their proper place.

Greene (and Bernard Shaw) have a point, but there is something immensely attractive, immensely inspiring in the writings of synthesizers like Teilhard de Chardin and Julian Huxley. Oh yes, as Thomas Berry warns us today, we must temper those views with a newfound allegiance to the biosphere and a growing ecological egalitarianism, but who among the scientists today dares to call forth Spirit the way those two did in decades past? Who in science, today or tomorrow, will give us the dream and the will to act in difficult times? And what songs will they be singing?

I am the credulous man of qualities, ages, races;
I advance from the people in their own spirit;
Here is what sings unrestricted faith.

I, too, following many, and follow'd by many, inaugurate a
Religion — I descend into the arena.

Each is not for its sake,
I say the whole earth, and all the stars in the sky,
are for Religion's sake.

I say no man has ever yet been half devout enough;
None has ever yet adored or worship'd half enough;
None has begun to think how divine he himself is,
and how certain the future is.

O strain, musical, flowing through the ages — now reaching hither!
I take to your reckless and composite chords — I add to them,
and cheerfully pass them forward.

Whitman sings his song[17] with a force that still empowers. But can scientists be expected to sing their own songs, no matter how eloquently they may speak? Brian Swimme, coauthor with Thomas Berry of *The Universe Story* thinks not. Scientists give us the storyline, but they cannot be expected to be the "cosmic storytellers" of the future. Moreover, we need not *a* storyteller, but many storytellers. The story will emerge only through the voices of many singers, in many contexts and in many nations. Swimme speculates, "I think we will only have a common story for the human community when poets tell us the story. For until artists, poets, mystics, nature lovers tell the story — or until the poetic and mystical dimensions of humans are drawn forth in every person who sets out to tell us our story — we have only facts and theories."[18] But Swimme is hopeful: "We are in the midst of a revelatory experience of the universe that must be compared in its magnitude with those of the great religious revelations. And we need only wander about telling this new story to ignite a transformation of humanity."[19]

I will close here with one song of one such singer: the New Mexican poet Joy Harjo.[20]

I can hear the sizzle of newborn stars,
and know that anything of meaning, of fierce
magic is emerging here. I am witness
to flexible eternity, the evolving past,
and I know we will live forever,
as dust or breath in the face of stars,
in the shifting pattern of winds.

Notes

1. From "Lady Faustus" in *Jaguar of Sweet Laughter: New and Selected Poems* by Diane Ackerman, 1991 (Random House).

2. *Pilgrim at Tinker Creek* by Annie Dillard, 1974 (Harper's Magazine Press), page 242.

3. From "In Memoriam" by Alfred, Lord Tennyson, 1833.

4. From the first section of chapter 6 of *The Origin of Species* by Charles Darwin (sixth edition), originally published in 1859.

5. From "Mars" in *Jaguar of Sweet Laughter: New and Selected Poems* by Diane Ackerman, 1991 (Random House).

6. Page 192 of Alister Hardy's first series of Gifford lectures, published in 1965 as *The Living Stream: Evolution and Man* (Collins).

7. From "De Rerum Virtute" in *Selected Poems* by Robinson Jeffers, 1954 (Random House).

8. *Essays of a Biologist* by Julian Huxley, 1923 (Knopf), page 30.

9. "The Nonprevalence of Humanoids," *Science* 143 (1964): 773.

10. *New Bottles for New Wine* by Julian Huxley, 1957 (Harper and Row), page 21.

11. From "Walt Whitman" in *Leaves of Grass* by Walt Whitman, 1855.

12. From "Bivouac" in *Tickets for a Prayer Wheel* by Annie Dillard, 1974 (Harper & Row).

13. *Chance and Necessity* by Jacques Monod, translated by Austryn Wainhouse, 1971 (Knopf), page 180.

14. From "Ode: Intimations of Immortality" by William Wordsworth, 1804.

15. From "Carol of Occupations" in *Leaves of Grass* by Walt Whitman, 1855.

16. From "The World Is Too Much With Us" by Alfred, Lord Tennyson, 1804.

17. From "Starting from Paumanok" in *Leaves of Grass* by Walt Whitman, 1855.

18. "The Cosmic Creation Story" by Brian Swimme in *The Reenchantment of Science*, edited by David Ray Griffin, 1988 (SUNY Press), page 52.

19. *The Universe Story* by Brian Swimme and Thomas Berry, 1992 (Harper San Francisco), page 229.

20. *Secrets from the Center of the World* by Joy Harjo [poetry] and Stephen Strom [photography], vol. 17 of Sun Tracks: An American Indian Literary Series), 1989 (University of Arizona Press), page 56.