

# Current Comments®

EUGENE GARFIELD  
INSTITUTE FOR SCIENTIFIC INFORMATION®  
3501 MARKET ST., PHILADELPHIA, PA 19104

## Further Reflections on the Poetry-Science Connection

Number 7

February 17, 1986

Most *Current Contents*® (CC®) readers are absorbed in their own particular areas of research. I suspect that many of them, despite their willing immersion in their work, wish they had more time to consider and enjoy the philosophical and aesthetic aspects of science. In light of this, I am not surprised to learn that my essays on the connections between science and art are appreciated. When I discussed poetry and science,<sup>1</sup> mentioning such poets as Virgil, Shakespeare, and Walt Whitman, the response was remarkable. Readers also found it exciting to learn that many living scientists are accomplished poets. Indeed, after the essay was published, many readers wrote to me, sharing further examples of the poetry-science connection. I vowed that a follow-up discussion was definitely in order.

My immediate purpose, therefore, is simply to look at other samples of verse inspired by the scientific world and to pay homage to additional poets and scientists who have attempted to bridge the gap between the "two cultures" of science and art. In the future we'll take up the issue of creativity.

In the past few years, two excellent sources on science and poetry have been published. *Poems of Science*,<sup>2</sup> edited by John Heath-Stubbs, a poet and critic, and Phillips Salman, Department of English, Cleveland State University, Ohio, features verse on scientific themes from many well-known poets, including Chaucer, Milton, Shakespeare, and oth-

ers mentioned in my original discussion.<sup>1</sup> Another appropriate anthology is *Songs from Unsung Worlds*,<sup>3</sup> edited by Bonnie Bilyeu Gordon, an editor at *Science 86*. This book contains a collection of contemporary verse on scientific topics, including poetry from J. Robert Oppenheimer, the physicist who led the effort to develop the atomic bomb in World War II.

Science and poetry have at times been in conflict. Scientific inquiry, with its objective, rational scrutiny of humankind and nature, has been a source of irritation to poets, who seek to celebrate, rather than dissect, the natural world. In his book *Poetries and Sciences*, I.A. Richards, Department of English, Harvard University, refers to the advent of scientific knowledge as the "neutralization of nature."<sup>4</sup> (p. 50) This neutralization replaced what Richards calls the "magical view" of the world—a conception of a world dominated by spirits and powers that could be evoked, but not controlled, by humans. Richards points out that this magical view, which afforded humankind an emotional involvement in the surrounding world, may have contributed to the development of various art forms, including poetry.<sup>4</sup> (p. 51) Although the magical view has given way to more precise scientific investigation of the natural world, the same potential for emotional involvement, for discovery, still exists. "Thus," writes Richards, "a number of [those] who might in other times have been po-

ets may today be in biochemical laboratories...."4 (p. 52)

My point is a simple truism—there *are* poets in the world of science and medicine. One such poet is Carl Djerassi, the highly prolific chemist and scientific entrepreneur who is perhaps best known to the public for his contribution to the development of the birth-control pill. I've discussed his scientific contributions in an earlier piece.<sup>5</sup> What I've since discovered is that Carl has been, as he put it, "leading a literary life on the side."<sup>6</sup> In addition to a novel, he has been writing verse. A selection that he sent me included "Amour d'Arthropode," a series of playful, humorous poems on the mating habits of insects. In each poem, a straightforward excerpt from an entomological text detailing some facet of insect reproduction is followed by his own treatment of the subject.<sup>6</sup>

For example, the male *Heliconius* butterfly passes what is believed to be an anti-aphrodisiac odor to the female during mating. This scent apparently keeps other males away and serves to enforce monogamy among females. Djerassi ponders what might happen if such scents were marketed for human females, in contrast to the alluringly titled perfumes now jamming cosmetic counters:

Arthropod promiscuity  
Has taught us well;  
His jealousy we overlooked.

Sexual perfumes of arthropods—  
Pheromones—  
Are the vogue  
In VOGUE, in GLAMOUR,  
All over MADEMOISELLE.

*Tabu, Tigress,*  
*Even Pheromone,*  
*Heaven Sent* to some,  
Are Satan's scents  
To Hutterites, Mennonites, Shi'ites.

*Heliconius'* taboo could be  
Their vogue.  
One dab marks you for life.

Attar made to order  
For jealous lovers,  
Chauvinist wolves,  
Assorted macho males.

The sale is on;  
The line forms on the left;  
The choices are:  
*Reserved!*  
*Away!*  
*Stop!*  
*No!*

Another poet-scientist is entomologist D. Keith McE. Kevan, Lyman Entomological Museum and Research Laboratory, Macdonald Campus, McGill University, Ste.-Anne-de-Belleveue, Quebec, Canada. Kevan has been writing humorous verse about insects since his student days. He has also collected and translated poetry, from throughout history, in which allusions are made to grasshoppers, locusts, katydids, crickets, and their relatives. Two extensive compilations, *The Land of the Grasshoppers*<sup>7</sup> and *The Land of the Locusts*,<sup>8</sup> contain a variety of poetry on these insects. Some of the verse, from China and elsewhere, is more than 3,000 years old. Kevan also contributed his own poetry to the collections.

Entomology also happens to be the specialty of John M. Burns, curator of entomology, National Museum of Natural History, Smithsonian Institution, Washington, DC. While teaching biology at Harvard, Burns ran a weekly seminar on natural history. This involved concocting an introduction for each week's guest speaker, a task that Burns did not relish. Having written poetry off and on since his boyhood, Burns decided one week to use a pair of original limericks to introduce a speaker. The response was very positive, and thereafter the use of light verse to introduce speakers became something of a tradition with Burns. Some years later, a publisher's agent suggested that Burns write a book of poems about biology. The result is *BioGraffiti: A Natural Se-*

lection,<sup>9</sup> which contains poems on a variety of topics. The following example, "Evolution of Auditory Ossicles," (p. 21) demonstrates Burns's sense of humor, including an obvious taste for puns:

With malleus  
Aforethought  
Mammals  
Got an earful  
Of their ancestors'  
Jaw.

Other humorous verse can be found in *The Biochemists' Songbook*,<sup>10</sup> by Harold Baum, professor of biochemistry, Chelsea College, University of London. The songs, which Baum wrote for his department's annual Christmas party, consist of actual chemical processes set to popular melodies. In the preface Baum denies that his songs deserve to be called "poetry." But he does demonstrate considerable verbal skill in fitting complex chemistry into the proper rhyme and meter for each song. (Or *almost* proper; he does point out that certain lines require somewhat unorthodox emphasis by the singer in order to fit the melody.) Here's one stanza of "Protein Biosynthesis" (p. 54-6) (sung to the tune of "My Bonnie Lies over the Ocean"):

The primary sequence of proteins  
Is coded within DNA  
On sense strand of the double helix  
Coiled antiparallel way.  
(Introns and exons, changes post-  
transcriptional, and all  
Glycosylations, don't alter such basics  
at all).

Baum's songbook also includes "Photosynthesis," "Blood Sugar," and "The Battle Hymn of the Aerobes." Incidentally, the foreword to *The Biochemists' Songbook* was written by the late Sir Hans Krebs, winner of the 1953 Nobel Prize in chemistry and the subject of an earlier essay.<sup>11</sup>

An after-dinner speech at a 1958 symposium on lipids was the occasion for "Hiawatha's Lipid,"<sup>12</sup> composed (with no apology to Henry Wadsworth Longfellow) by Hugh Sinclair, Magdalen College, Oxford, UK. Instead of an American Indian brave, Sinclair's protagonist is a scientist about to deliver a paper on serum cholesterol to an expectant crowd at a symposium. Like Baum, Sinclair manages to work in a good deal of technical material, all in a satiric vein. He also pokes some fun at symposium audiences. After Hiawatha's presentation, the people in the audience:

Praised his industry, his brilliance,  
And applauded his statistics,  
For they had not understood him  
Nor could read his logarithms.

Sinclair recently published a fascinating *Citation Classic*<sup>®</sup> commentary in *CC* about his work on essential fatty acids.<sup>13</sup>

Theoretical chemist Roald Hoffmann, Cornell University, Ithaca, New York, who shared the 1981 Nobel Prize in chemistry with Kenichi Fukui, Kyoto Imperial University, Japan,<sup>14</sup> is also a published poet. Two of his poems, in fact, appear in *Songs from Unsung Worlds*.<sup>3</sup> Hoffmann was awarded the Nobel Prize for his principles of orbital symmetry conservation, which he developed with the late Robert B. Woodward, Harvard University. These "Woodward-Hoffmann rules," as they are now called, deal with the characteristics of molecules in chemical reactions. Hoffmann contemplates molecules in a slightly different context in the poem "Men and Molecules":<sup>15</sup>

Cantilevered methyl groups,  
battered in endless anharmonic motion.  
A molecule swims,  
dispersing its functionality,  
scattering its reactive centers.  
Not every collision,  
not every punctilious trajectory  
by which billiard-ball complexes

arrive at their calculable meeting places  
leads to reaction.

Most encounters end in  
a harmless sideways swipe.  
An exchange of momentum,  
a mere deflection.

And so it is for us.  
The hard knock must be just right.  
The eyes need lock, and  
glimmers of intent penetrate.

The setting counts.  
A soft brush of mohair  
or touch of hand.

A perfumed breeze  
Men (and women) are not  
as different from molecules  
as they think.

Hoffmann, incidentally, appeared in our study of the 1,000 most-cited contemporary scientists, 1965-1978.<sup>16</sup> He was also featured in our recent analysis of the 1982 chemistry articles most cited in 1982-1984.<sup>17</sup>

Not surprisingly, the field of mathematics has also produced its share of poets. Among them is Clarence R. Wylie, Furman University, Greenville, South Carolina, a retired professor of mathematics who still lectures at the university. Wylie published several poems during the 1940s in the now-defunct *Scientific Monthly*. He has also written two books of poems and limericks.<sup>18,19</sup> He compares the process of writing a poem to the polishing of a mathematical theorem. Both the poet and the mathematician are interested in the form and meaning of an idea, he says, and both have a longing for order. A poem, like the solution to a math problem, must be carefully thought out and meticulously structured.<sup>20</sup>

Wylie's poem "Paradox"<sup>21</sup> considers the nature of mathematics—an abstract, somewhat fragile discipline that, when correctly applied, has the power to hold a bridge over a great span:

*Not truth, nor certainty. These I  
forsook  
In my novitiate, as young men called  
To holy orders must abjure the world.*

*'If..., then....' this only I assert:  
And my successes are but pretty chains  
Linking twin doubts, for it is vain to ask  
If what I postulate be justified,  
Or what I prove possess the stamp  
of fact.*

*Yet bridges stand, and men no longer  
crawl  
In two dimensions. And such triumphs  
stem  
In no small measure from the power this  
game,  
Played with the thrice-attenuated shades  
Of things, has over their originals.  
How frail the wand, but how profound  
the spell!*

More poetry based on mathematics can be found in *A History of  $\pi$  (pi)*,<sup>22</sup> by Peter Beckmann, Department of Electrical Engineering, University of Colorado, Boulder. Beckmann includes French and German poems that have been written as mnemonic representations of the value of pi. In these poems, the number of letters in each word represents the successive digits in pi, up to as many as 29 decimal places.

The drive to write poetry is also found in the medical world, including dentistry. James F. Gardiner, Louisiana State University School of Dentistry, New Orleans, writes of Solyman Brown (1790-1876), a charter member of the American Society of Dental Surgeons and a founder of the first national dental journal, the *American Journal of Dental Science*. In 1833 Brown, who had also studied literature, wrote "Dentologia, a Poem on the Diseases of the Teeth and Their Proper Remedies."<sup>23</sup> This epic includes sections on dental materials, the effects of tooth loss, and the repair of cavities. The lines below warn of the consequences of failing to brush:

*In dark disguise insidious tartar comes  
Incrusts the teeth and irritates the gums,  
Till vile deformity usurps the seat  
Where smiles should play and winning  
graces meet...*

This passage reminds me of the "silent affliction" of halitosis, which I discussed several years ago.<sup>24</sup>

William Carlos Williams, mentioned in my original discussion,<sup>1</sup> was a physician who also achieved renown as a poet. The Pulitzer Prize for poetry in 1963 was awarded to him posthumously. While not all medical poets can hope to equal Williams's literary fame, there are those who are equally devoted to creating poetry. For example, Sheila Moriber Katz, Hahnemann University School of Medicine, Philadelphia, has been writing poems since childhood. In the fall of 1976 Katz was one of many pathologists attempting to isolate the cause of Legionnaire's disease, which had taken 29 lives in Philadelphia that summer. She was featured on the front page of the *New York Times*, having been stricken with a viral pneumonia similar to legionellosis following laboratory exposure to lung tissue from a Legionnaire's patient.<sup>25</sup> Fortunately, she recovered. Her experiences undoubtedly figured in her poem "Legionella (The Shark-Like Microbe)."<sup>26</sup> Katz asserts that her work as a scientist enhances her work as a poet. Her poetry reflects her compassionate nature and sensitivity as a physician.<sup>27</sup> Katz was recently appointed executive director of the American Physicians Poetry Association, a group of over 150 physician-poets. Incidentally, we recently published a *Citation Classic* commentary by David W. Fraser, now president, Swarthmore College, Pennsylvania. He discussed the first efforts to investigate the Philadelphia Legionnaire's epidemic while he was at the Centers for Disease Control in Atlanta, Georgia.<sup>28</sup>

Katz is also an officer in a new organization founded to explore the common ground between medicine and art: the International Arts-Medicine Association (IAMA). IAMA's president, Richard A. Lippin, a medical director for Atlantic Richfield Company, Philadelphia, has noted the growing number of physi-

cians and other health-care providers who are either professionally or avocationally involved in the arts. He has proposed the creation of a new medical specialty known as "arts medicine."<sup>29</sup> This emerging field is in some ways similar to sports medicine, as it includes doctors who specialize in preventing and treating illnesses and injuries associated with artistic activities, such as singing or playing a musical instrument.<sup>30</sup> Arts medicine, however, as envisioned by Lippin and other IAMA members, promises to be a broad, all-embracing discipline that seeks to explore the myriad relationships between medicine and the arts. Lippin hopes to see more research into the nature of creativity and the value of art in medical therapy. The IAMA also provides a creative outlet for medical professionals who are themselves involved in the arts, including poetry. Anyone interested in more information can write to the International Arts-Medicine Association, 19 South 22nd Street, Philadelphia, PA 19103.

Another pertinent organization is the International Society for the Arts, Sciences, and Technology, formerly the International Society of Scientist-Artists. The society publishes the quarterly journal *Leonardo*. Interested readers can write to the International Society for the Arts, Sciences, and Technology, P.O. Box 421704, San Francisco, CA 94142-1704. Readers can also contact a new organization, the Society for Literature and Science (SLS), which recently retained a poetry editor for its newsletter. For more information about the SLS newsletter, write to its main editor: Stuart Peterfreund, Department of English, Northeastern University, 360 Huntington Avenue, Boston, MA 02115.

Further examples of poetry in the medical world can be found in the *Journal of the American Medical Association (JAMA)*. The column called "A Piece of My Mind" at the end of each issue, consisting of reader contributions,

often includes poetry. *JAMA* also published poems from the 1984 William Carlos Williams Poetry Competition for Medical Students. The contest was sponsored by the Human Values in Medicine program of the Northeastern Ohio Universities College of Medicine, Rootstown, Ohio. The winning poem appeared in *JAMA* in June,<sup>31</sup> and the other prizewinning and honorable-mention poems were featured later in 1985.

Occasional articles in medical journals have also dealt with poetry and medicine. John H. Dirckx, Gosiger Health Center, University of Dayton, Ohio, has written in *JAMA* about medical themes in Virgil's *Aeneid*.<sup>32</sup> In another article, Ian Cameron, Dalhousie University, Halifax, Nova Scotia, and Gordon L. Dickie, University of Western Ontario, London, Canada, performed an informal experiment in diagnosis with the William Carlos Williams poem "To an Old Jaundiced Woman." Fourth-year medical students read the poem and, by carefully examining the symptoms described or implied in the text, attempted to diagnose the woman's various afflictions.<sup>33</sup>

To gauge research interest in poetry and science, we checked a new ISI® online database, *Arts & Humanities Search*™. This database, available through Bibliographic Retrieval Services (BRS), corresponds to the printed *Arts & Humanities Citation Index*™ (*A&HCI*™) and covers 1,300 journals in the arts and humanities from 1980 to the present. The *A&HCI*, it should be noted, covers the years 1976 to the present. A check of the keywords "poetry" and "science" revealed about 70 publications, many of them book reviews, with these two words in the title. Six were from 1985.

Hoffmann has noted that poetry often appears in smaller journals that do not have enormous readerships.<sup>34</sup> His poem "Men and Molecules,"<sup>15</sup> for example, appeared originally in *Synthesis*, published at Harvard University. Hoffmann

is intrigued by the problem of locating complete bibliographic information on poetry that appears in obscure journals. He suggested an experiment for us to perform at ISI.<sup>34</sup> He proposed that we select two or three poets, obtain their publication lists, and run a search to see how much of their poetry is covered in our databases. Space and time prevent me from reporting on such an experiment here. But it would make a fascinating addition to a future essay.

Needless to say, I am not the first author to discuss the poetry-science connection. Science writer and editor Bernard Dixon has also considered this topic. Writing in *World Medicine*,<sup>35</sup> he singled out an anthology of science poetry called *Songs of Science*, originally compiled by Virginia Shortridge in Boston in 1930.<sup>36</sup> Dixon also drew my attention to a 1961 anthology, *A Book of Science Verse*, selected by W. Eastwood.<sup>37</sup> Incidentally, anyone interested in further reading can turn also to *Imagination's Other Place*,<sup>38</sup> a 1955 collection of poems on science and mathematics edited by Helen Plotz.

Another relevant author is Desmond G. King-Hele, Royal Aircraft Establishment, Hampshire, UK. A poet himself, King-Hele has written on the similarities and differences between scientists and poets.<sup>39</sup> The work of both, he says, advances by a series of "imaginative leaps," and both seek to explore humanity and nature. While the methods may be different, the aims of science and poetry are complementary, not opposed.<sup>39</sup> Too often, says King-Hele, poets and scientists tend to ignore one another's territory, perpetuating the imagined gulf between the two disciplines. The scientist-poets I've discussed demonstrate that the realms of art and science need not be separate.

I'll close with some verse written by my old friend Maurice Goldsmith, Science Policy Foundation (SPF), London. In December of 1985 Maurice was in Houston, Texas, participating in a dis-

discussion on the interpretation of quantum theory.<sup>40</sup> The discussion inspired him to compose the following poem:

How odd of Reality  
to trap me in a magic snare  
so that my Love is absent  
when I'm not there.

But when my absence becomes presence  
then is my Love by Reality restored.

\* \* \* \* \*

*My thanks to Linda Cooper and  
Christopher King for their help in the  
preparation of this essay.*

© 1986 ISI

#### REFERENCES

1. **Garfield E.** The poetry-science connection. *Essays of an information scientist*. Philadelphia: ISI Press, 1984. Vol. 6. p. 223-8.
2. **Heath-Stubbs J & Salman P**, eds. *Poems of science*. New York: Penguin, 1984. 328 p.
3. **Gordon B B**, ed. *Songs from unsung worlds*. Boston, MA: Birkhauser, 1985. 230 p.
4. **Richards I A.** *Poetries and sciences*. New York: W.W. Norton, 1970. 121 p.
5. **Garfield E.** A tribute to Carl Djerassi: reflections on a remarkable scientific entrepreneur. *Essays of an information scientist*. Philadelphia: ISI Press, 1983. Vol. 5. p. 721-30.
6. **Djerassi C.** Personal communication. 30 November 1984.
7. **Kevan D K M**, ed. *The land of the grasshoppers*. Ste.-Anne-de-Bellevue, Canada: Lyman Entomological Museum and Research Laboratory, 1974. 326 p. (Memoir No. 2.)
8. ...., *The land of the locusts*. Ste.-Anne-de-Bellevue, Canada: Lyman Entomological Museum and Research Laboratory, 1978, 1983, 1985. Parts I-III. (Memoirs No. 6, 10, 16.)
9. **Burns J M.** *BioGraffiti: a natural selection*. New York: W.W. Norton, 1975. 112 p.
10. **Baum H.** *The biochemists' songbook*. New York: Pergamon Press, 1982. 62 p.
11. **Garfield E.** To remember Sir Hans Krebs: Nobelist, friend, and adviser. *Essays of an information scientist*. Philadelphia: ISI Press, 1983. Vol. 5. p. 627-33.
12. **Sinclair H.** Hiawatha's lipid. *Perspect. Biol. Med.* 4:72-6, 1960.
13. ...., Citation Classic. Commentary on *Lancet* 1:381-3, 1956.  
*Current Contents/Clinical Practice* 13(39):20, 30 September 1985.
14. **Garfield E.** Were the 1981 Nobel prizewinners in science, economics, and literature anticipated by citation analysis? *Essays of an information scientist*. Philadelphia: ISI Press, 1983. Vol. 5. p. 551-61.
15. **Hoffmann R.** Men and molecules. *Synthesis* (Cambridge, MA) 7(1):43, 1984.
16. **Garfield E.** The 1,000 contemporary scientists most-cited 1965-1978. Part I. The basic list and introduction. *Essays of an information scientist*. Philadelphia: ISI Press, 1983. Vol. 5. p. 269-78.
17. ...., The 1982 chemistry articles most cited, 1982-1984. *Current Contents* (51-52):3-17, 23-30 December 1985.
18. **Wylie C R.** *Strange havoc*. New York: Exposition Press, 1956. 63 p.
19. ...., *The wisdom of Eric Lim*. New York: Vantage Press, 1974. 87 p.
20. ...., Telephone communication. 18 October 1985.
21. ...., Paradox. *Sci. Monthly* 67:63, 1948.
22. **Beckmann P.** *A history of n (pi)*. New York: St. Martin's Press, 1971. 200 p.
23. **Gardiner J F.** Solyman Brown and his epic poem "Dentologia." *Bull. Hist. Dent.* 32:44-51, 1984.
24. **Garfield E.** Halitosis, the silent affliction: a profile of bad-breath research. *Essays of an information scientist*. Philadelphia: ISI Press, 1983. Vol. 5. p. 742-8.
25. **Altman L K.** Pathologist studying the 'legion' disease caught a like illness. *NY Times* 15 November 1976. p. 1: 18.
26. **Katz S M.** Legionella. (Katz S M. ed.) *Legionellosis*. Boca Raton, FL: CRC Press, 1985. Vol. 1.
27. ...., Personal communication. 28 October 1985.
28. **Fraser D W.** Citation Classic. Commentary on *N. Engl. J. Med.* 297:1189-97, 1977.  
*Current Contents/Clinical Practice* 13(15):20, 15 April 1985.
29. **Lippin R A.** Arts medicine—a call for a new medical specialty. *Phila. Med.* 81(1):14-5, 1985.
30. **International Arts-Medicine Association.** *Newsletter* 1(1), 1985.
31. **Ver Ellen P A.** The china. *JAMA—J. Am. Med. Assn.* 253:3595, 1985.
32. **Dirckx J H.** Virgil and medicine. *JAMA—J. Am. Med. Assn.* 246:1326-9, 1981.
33. **Cameron I & Dickie G L.** The patient in poetry: an exercise in clinical problem solving.  
*Can. Fam. Phys.* 31:615-8, 1985.
34. **Hoffmann R.** Telephone communication. 16 December 1985.
35. **Dixon B.** Talking science. *World Med.* p. 25, 18 October 1978.
36. **Shortridge V**, ed. *Songs of science*. Boston, MA: Marshall Jones, 1930. 245 p.
37. **Eastwood W**, ed. *A book of science verse*. London: Macmillan, 1961. 279 p.
38. **Plotz H**, ed. *Imagination's other place*. New York: Thomas Y. Crowell, 1955. 200 p.
39. **King-Hele D G.** Science and poetry. *New Sci.* 14:352-4, 1962.
40. **Goldsmith M.** Personal communication. 16 December 1985.