TRUTH IN LITERATURE AND TRUTH IN SCIENCE

by

Marvin Green

There appears to be a boundary between physical science and literature.[1] On the physical science side human beings systematically investigate things that exist in nature. On the literature side human beings bring new things into existence by means of writing.

Aristotle stakes out both sides. In *Physics,* his treatise on physical science, he says, "Of things that exist, some exist by nature, some from other causes."[2]

Since science deals with reality——and literature with imagination——let*s consider whether truth is the boundary.

It appears to be, according to Ms. Julie Mattern, a scientist in training. At age 17 she scored 34 points out of 36 on the American College Testing examination and thereby won a scholarship to Illinois Institute of Technology. She contrasts English and math. She says, "I prefer math to English because it*s problem solving. You get an answer and it*s right or wrong . . .[3]

By "English" no doubt Ms. Mattern means literature. No doubt she also means that in literature you*re free to disregard natural truth and physical and mathematical exactitude. You can say whatever you want, and, voila! whatever you say is "English."

With truth as a boundary, she could fence out poetic license.

No less a person than Marilyn vos Savant agrees 100% with Ms. Mattern. Ms. Vos Savant is listed in the *Guinness Book of World Records* for her IQ of 228.[4] In her weekly "Ask Marilyn" column, in the Sunday newspaper supplement *Parade,* she gives her opinion in answer to a reader*s question about English versus math. The reader says that two professors claim it takes "the same mental powers to succeed in either." Are they right? She replies,

> I think they*re wrong. Can you imagine our best engineers writing our most important novels? Or our top playwrights resolving significant issues in physics?
>
> In school, I think it*s tougher to succeed in math: Answers are either right or wrong; there*s no room for subjectivity. But after graduation, I think it*s much

> harder to succeed in most writing careers, and for that very reason: There are no guidelines.[5]

Edward FitzGerald was not a mathematician or an engineer or a physicist. He was an English country gentleman, a poet, a friend of the writers Thackeray, Tennyson and Carlyle. In *The Rubáiyât of Omar Khayyám* he rather wistfully agrees with Ms. Mattern and Ms. vos Savant that human imagination may create things that are not true, that are not reality, that simply don*t have any guidelines. He says,

> Ah, Love! could you and I with Him conspire
> To grasp this sorry Scheme of Things entire,
> Would not we shatter it to bits - and then
> Remold it nearer to the Heart*s Desire![6]

Truth, in the form of independent verifiability, is a hallmark requirement of the scientific method. Whereas writers take poetic license, scientists do not. Scientists dare not remold "this sorry Scheme of Things," because it*s not professional and because someone will always find them out.

Albert Einstein came up with his astonishing General Theory of Relativity in 1916 and explicitly invited verification. He identified three natural phenomena——check them out, he says. See for yourself whether relativity explains them or accurately predicts them.[7] If it does, relativity would seem true and hence would belong on the truth side of the boundary.

Although fiction writers may very well be mindful of reality, they blithely deviate from it. Their purpose is not to tell the

truth. Their purpose is to create an effect. Mark Twain depicts Huckleberry Finn as a person who*s trying to create an effect in a ticklish situation. In debating with himself whether to resort to fact or to fiction, Huck cautions us that telling the truth is "like setting down on a kag [sic] of powder and touching it off just to see where you*ll go to."[8]

So nature and reality constrain scientists whereas writers meander around scot-free. A dictionary defines their freedom, their poetic license, as "The liberty taken by an artist or writer in deviating from conventional form or fact to achieve an effect."[9]

OK, on the basis of this introduction, let*s plunge ahead. Let*s hypothesize that truth is the boundary between science and literature, but, as Einstein says, let*s check it out.

Literature As False Truth

The scientist/writer Carl Sagan takes Huck Finn*s warning seriously. The truth can hurt you. We have Hiroshima and Nagasaki as living proof, so to speak, because, more or less as Huck anticipated, Einstein*s famous $E=mc^2$ has eventuated in atom bombs—— and now hydrogen bombs and neutron bombs, too. Like Huck we have to wonder, What "kag" have we touched off, and where will we go to? Sagan in particular wonders whether somewhere in the universe "there are advanced civilizations [that have developed] methods of avoiding the self-destruction that seems so real a danger of our present technological adolescence."[10]

During the Cold War in the 1950s, when the United States was properly frightened about the possibility of Soviet-American mutual destruction, our government selected literature as one test of national loyalty. The FBI hunted down "security risks," supposing rightly or wrongly that you might tell whether a particular citizen is loyal or disloyal by identifying the publications he reads.

In 1954, for instance, we accused an aeronautical engineer, a man named William L. Greene, of having some sort of connection with communist literature during the years 1942—1947. Eventually Mr. Greene lost his security clearance and his job. The United States Supreme Court more or less vindicated him in 1959, reversing a lower court*s judgment against him. In the full record of his case, the following were some of the accusations made against him:

> 1. During 1942 [he] was a member of the Washington Book Shop Association, an organization that has been officially cited by the Attorney General of the United States as Communist and subversive.
>
> * * *
>
> 3. During the period of [his] first marriage he and his wife had many Communist publications in their home, including the "Daily Worker"; "Soviet Russia Today"; "In Fact"; and Karl Marx*s "Das Kapita1."[11]

The rationale for the FBI*s use of literature could be the belief that there's such a thing as "false truth." If *Das Kapital* is a work of false truth, perhaps it*s capable of seducing William Greene and the first Mrs. Greene into becoming agents for the Soviet Union, or perhaps it enables them to seduce other persons.

Not even skilled scientists——not even those who every day grapple successfully with scientific truth——are deemed immune from false truth.

Galileo is the leading example. In 1637 the poet John Milton went to Florence and later in his prose work *Areopagitica* reported, "I found and visited the famous *Galileo* grown old, a prisner [sic] of the Inquisition for thinking in Astronomy otherwise then the Franciscan and Dominican licensers thought."[12] Galileo went blind and died in January, 1642. It was posterity that vindicated him.

More recently, in 1954, our own country held an "Inquisition," or, as a government lawyer involved in the proceedings put it, a "lynching."[13] We stripped the physicist Robert Oppenheimer of his security clearance. During World War II he was the midwife of the atom bomb. He spoke seven languages. In the original Sanskrit he read the transcendental philosophical work, the *Bhagavad Gita.* We don*t know everything else he read, but at the height of the Cold War, we discovered that false truth had infected him. Specifically, he did not want us to produce the "Super"——the hydrogen bomb——whereas Let*s-Make-the-Super was our official government policy at the time.

Oppenheimer died of throat cancer in 1967. We didn*t wait around for posterity to vindicate him but changed our mind about his loyalty to truth and to the United States. In 1963 President

Lyndon Johnson presented him the Atomic Energy Commission*s Enrico Fermi Award, its gold medal and its prize of $50,000, tax free.

John Milton is among those who are not worried about false truth. Truth, he says, always prevails. His *Areopagitica* pertains not only to Galileo*s heretical scientific findings but to Star Chamber censorship in England and to Inquisitions. In his own words and spelling, here's what Milton says:

> And though all the windes of doctrin were let loose to play upon the earth, so Truth be in the field, we do injuriously by licensing and prohibiting to misdoubt her strength. Let her and Falshood grapple; who ever knew Truth put to the wors, in a free and open encounter.[14]

Professional journalists and publishers believe in John Milton and definitely champion truth in its battle against "Falshood."

In July, 2000, a columnist for the *Boston Globe,* received an E-mail letter about the fates of signers of the Declaration of Independence. He checked it out to some degree, revised it and ran it ostensibly as his own. It perhaps included some inaccuracies. The *Globe* suspended him without pay for four months.

In May, 1998, *The New Republic* fired a 25-year old associate editor. The magazine had published his realistic article about a computer hacker but then discovered that the article was a hoax. Moreover it determined that the young man had fabricated 6 other articles and some parts of 25 articles.

In the *"New Yorker"* magazine the journalist/writer Christopher Dickey, son of James Dickey, America*s prize winning poet and

novelist, dealt on a personal level with the same problem of deliberate lies. He tells of one of his last encounters with his dying father:

> And now, as we sat together on the landing, six months before his death, I asked him about his brother and the string.
>
> "I made that up," he said.
>
> "Yeah?"
>
> We were back to the creative possibilities of the lie. One of the great lessons he*d learned in poetry, he said, was from Monroe Spears, who taught him at Vanderbilt in the nineteen-forties. Spears had been telling him what he needed to do to improve a particular poem——"What should happen here is"——when my father said, or so he said he had said, "It didn*t happen that way." And Spears had told him, "No artist is bound by the truth." A great lesson, my father thought.
>
> We sat there on the landing for a while longer, not talking, waiting for breath from the machine.
>
> "But you*re a journalist," my father said. "So the truth is important."
>
> "In journalism, it is."
>
> He considered that proposition for a time, as if waiting for more or better air.[15]

If we go along with John Milton, or if we subscribe to the standards of professional journalism, we have to admit that maybe some literature can be true.

Let*s check out now whether even fiction can be true.

Literature As Actual Truth

Walter Goodman, a television critic for the *New York Times*, seems to be spearheading a movement to require dramatic literature to be true. He speaks of "a strange occurrence in the New Mexico desert in 1947," by which he is referring to a visit by extra-

terrestrial beings to Earth. He's reviewing the 2—hour television program *Roswell.* Though he speaks of "the inherent improbability of the story," he doesn*t mean the aliens* supposed presence in New Mexico. He means something altogether different——namely, that, according to *Roswell,* there was a deliberate cover-up of this visit. He concludes with the following:

> What prevents this professionally fashioned hokum from being a high flier is the annoying question of how a cover-up that involved hundreds or thousands of people could have been maintained for 30 years or even 30 seconds in this exposé-prone society.[16]

The historian John Toland joins Goodman in arguing that creative literature can be true. In 1971 Toland won the Pulitzer Prize for *The Rising Sun: The Decline and Fall of the Japanese Empire, 1936—1945.*[17] In 1985 he published a novel, *Gods of War,* a piece of fiction about Japan and the United States at the same period. In a foreword to the novel he argues that literature is even more truthful than professional history. He says,

> Over the past years I have devoted much of my professional life to studying and writing the history of the relationship between the United States and Japan before and during World War II. But even the most scrupulously researched history can be only an approximation of the truth. And that is why I have turned to fiction, the fittest stage for humanity. You will meet invented people, you will read conversations I did not hear and scenes that I did not witness. Despite that, I believe that the story you are about to read is as real as, if not more real than, formal history.[18]

Toland is identifying different but related aspects of professional history. First, scrupulous research develops

authoritative facts. Second, human imagination gives the facts flesh and blood. The distinguished British historian and philosopher R.G. Collingwood agrees. He says, "The historian*s picture of his subject . . . appears as a web of imaginative construction stretched between [authoritative facts]."[19]

Two recent history-like books published a year apart——one fiction, one biography——claim to rely on authoritative facts but then proceed to stretch the web of imaginative construction pretty much to the outer limits of false truth.

In 2000 Gore Vidal came out with his novel *The Golden Age,*[20] which revises 20th Century American history. In just the first two chapters he depicts fictional characters as conversing with the following real persons: Melvyn and Helen Gahagan Douglas, Orson Welles, Senators Arthur Vandenberg and Robert Taft, President Franklin Roosevelt and Eleanor Roosevelt, Harry Hopkins, Governor Harold Stassen and Wendell Willkie. In an afterword Vidal reveals that as a writer he's a ventriloquist for his characters. He says,

> The lives of such invented characters as Caroline and Blaise and Peter Sanford intersect with those of "real people" like Roosevelt and Hopkins. What the real people say and do is essentially what they have been recorded as saying and doing, while [my] invented characters are then able to speculate upon motivation, dangerous territory for the historian.[21]

In 1999 Edmund Morris came out with his *Dutch: A Memoir of Ronald Reagan.*[22] While Vidal is not a historian but a novelist and as such has poetic license, Morris as a biographer has no license.

Even so, Morris chose——for some reason——to introduce fictitious persons——including himself——as characters in *Dutch.* His earlier biography of Theodore Roosevelt was more conventional. It won a Pulitzer Prize, and now he was officially engaged to write about Ronald Reagan. Spending 14 years on the project, he had ready access to Reagan and to the White House. Because of his fictitious persons, however, Random House placed the following "Publisher*s Note" on the copyright page:

> This is an authorized biography and a work of extensive scholarship. All of the words (written or spoken) of Ronald Reagan, all his recounted thoughts and acts, and indeed those of every historical character in the text, are matters of fact and record. Full documentation is available in the Notes, and the contributions of other writers or interlocuters indicated under "acknowledgments."[23]

In the magazine *U.S. News & World Reports* the very hard-nosed columnist Gloria Borger disputed Random House's claim for the authenticity of *Dutch.* She says,

> Allow me to set the scene: Ronald Reagan biographer Edmund Morris, posing as an imaginary old Reagan acquaintance in his book, tracks down the president*s first fiancée to ask a question. "Who dumped whom?" he wants to know. It is a question, the imaginary Morris writes, that was suggested by his friend Paul. Paul, the astute reader eventually discerns, is also fake. The ex—fiancée, Margaret Cleaver Gordon, who is a real person, apparently declines to answer the question posed to her by this imaginary fellow, who really is Morris. But she does tell him that he "had an inability to distinguish between fact and fancy."
>
> She was talking about Reagan; she could have been talking about Morris.[24]

Maybe those who claim that literature is true will have to settle for the proposition that literature may be true, or that it may be false, or that it may be partly true or partly false.

Because this proposition is too indefinite to be of real help, let*s sharpen our understanding by focusing on truth as a possible boundary between a definite kind of science——astrophysics——and a definite kind of literature——poetry.

Truth as the Boundary Between Astrophysics and Poetry

We can concentrate on the Mattern/vos Savant doctrine that on one side of the truth boundary answers are "right or wrong" and that on the other side "there are no guidelines." We can use the following definition: Truth is "ideal or fundamental reality apart from and transcending perceived experience."[25]

Astrophysics would be on the truth side of this possible boundary, because it*s physically apart from us and certainly transcends our everyday perceived experience. It is "the branch of astronomy that deals with the physical properties of celestial bodies, and with the interaction between matter and radiation in the interior of celestial bodies and in interstellar space."[26]

Persons such as Ms. Mattern and Ms. vos Savant undoubtedly would be satisfied with the protection that truth as a boundary would afford them. On their side, they could exclude "English" and could use the heavens as a guideline to determine whether astrophysical statements are right or wrong. For example, they

could readily assure themselves that Einstein*s relativity is right and that Newton*s classical mechanics is wrong when it comes to the orbital period of the planet Mercury.

Way over across the boundary, poetry is something else. It's "the art of rhythmical composition, written or spoken, for exciting pleasure by beautiful, imaginative, or elevated thoughts."[27]

Employing such a definition of poetry, we have to acknowledge that the truth boundary looks quite real. The poet John Keats says, "Beauty is truth, truth beauty——that is all / Ye know on earth, and all ye need to know."[28] Other than that mysterious assertion, however, we are left with the problem of guidelines. How can Ms. Mattern or how can Ms. vos Savant possibly say that any person*s poem is right or that it*s wrong? How can anyone?

Now the magazine *Scientific American* comes along.[29] In the course of profiling a certain husband and wife, it directly challenges the Mattern/vos Savant guideline doctrine. The profiled husband is Jeremiah P. Ostriker, an astrophysicist and cosmologist. The wife is Alicia Suskind Ostriker, a professor of English literature and a poet and essayist.

In 1974 Mr. Ostriker published a "landmark" paper on the dynamics of rotating galaxies, and his theory has become the "conventional view."

As for Mrs. Ostriker, it*s she who offers a striking concept of guidelines in literature. She says that "new ideas in

literature are much like new ideas in astrophysics." She adds, "You test them against reality as you perceive it, and your work is a quest for the truth."

Focusing on poetry as a kind of literature, Mrs. Ostriker comes close to asserting that you can "prove" a poem. She*s speaking, however, of a poem that doesn*t even exist. She*s speaking of a poem that you*re just now in the process of creating. *Scientific American* says,

> Alicia [notes] the similar ways that ideas are created and tested [in astrophysics and poetry]. "First you know something intuitively and then you try to prove it," she says. "If it turns out you can*t prove it, then it*s wrong. Writing a poem is much the same; you try to find the right words, and if you can*t, you didn*t really know the poem."

In what sense can you "really know" a non—existent poem? Saint Thomas Aquinas explains that the non-existent poem is actually a likeness under construction. He says,

> and thus the likeness of a house pre—exists in the mind of the builder. And this may be called the idea of the house, since the builder intends to build his house like to the form conceived in his mind.[30]

If there are guidelines for the poet, evidently they*re ideas in his or her own head. Let*s consider whether to give credence to such mental guidelines.

Reality and the Ideas in Your Head

You yourself can conjure an image of Albert Einstein buttonholing friends at the patent office and in the Zurich coffee

houses in 1905, totally mystifying them as he attempts to explain his Special Theory of Relativity. Or you yourself can even conjure some sort of image of the article that he published 11 years later in 1916 expounding his General Theory of Relativity.

Such images would exist solely in your head.

On the other hand, what Einstein actually said to his coffee house cronies would emanate not from your head but from his—— likewise what he actually wrote in the article that he published in 1916.

We are noticing here that there is a difference between what you conjure and what actually is.

Aristotle advanced the following statement that links the symbols of writing and speech with actual reality and with a person*s mental experiences, including his or her conjured images:

> Spoken words are the symbols of mental experience and written words are the symbols of spoken words. Just as all men have not the same writing, so all men have not the same speech sounds, but the mental experiences, which these directly symbolize, are the same for all, as also are those things of which our experiences are the images. [31]

When you experience any natural phenomenon, you form an image of it in your mind——Aristotle would say that Newton formed a mental image of an apple falling from a tree. If you also conjure an explanation of the image——the Law of Gravity, for example——that explanation, too, is a mental experience, and you can express it in spoken or written symbols.

Some say that Einstein was not a good mathematician and that he relied on "thought experiments" in developing his discoveries. Maybe so. In any case, he did indeed have mental experiences, and in 1916 he conjured the symbols $E=mc^2$ to represent in writing his explanation of certain images that had formed in his mind. Thereby his $E=mc^2$ became literature. Thereby a human being, Einstein, placed the literary artifact $E=mc^2$ alongside the stock of those things that, as Aristotle says in his *Physics,* "exist by nature."

The knighted epistemologist/astrophysicist/scientist/writer Sir Arthur Eddington agrees with Aristotle that such scientific literature consists of mental-experience symbols that are not nature itself but that supplement nature. He says,

> The theory of relativity has passed in review the whole subject matter of physics. It has unified the great laws, which by the precision of their formulation and the exactness of their application have won the proud place in human knowledge which physical science holds today. And yet, in regard to the nature of things, this knowledge is only an empty shell——a form of symbols. . . . Here is a hint of aspects deep within the world of physics, and yet unattainable by the methods of physics. And, moreover, we have found that where science has progressed the farthest, the mind has but regained from nature that which the mind has put into nature.
>
> We have found a strange foot-print on the shores of the unknown. We have devised profound theories, one after another, to account for its origin. At last, we have succeeded in reconstructing the creature that made the foot-print. And Lo! It is our own.[32]

Whenever scientists seriously investigate "this sorry Scheme of Things entire"——which is just another name for what Eddington is

is calling "the shores of the unknown"——we know they encounter Einstein*s $E=mc^2$ symbols as part of "the strange foot-print." We also know that Einstein himself placed those symbols there.

What exactly is this $E=mc^2$? It is the result of a thought experiment conjured in a man*s head. It is his opinion about nature, expressed in symbols. As the people in Hiroshima found out on August 6, 1945, and the people in Nagasaki on August 9, the opinion strongly corresponds with reality.

Similarly, for almost three centuries Newton*s physical science discoveries——we call them "laws," his Law of Gravity and his Laws of Motion——persuasively seemed to correspond with reality. They were in fact amazingly successful in explaining and predicting natural phenomena. Alexander Pope put it this way in his intended epitaph for Newton: "Nature and Nature*s laws lay hid in Night: / God said, *Let* Newton *be!* and all was Light![33]

Yet Newton*s Laws were opinions, too.

Scientific opinions abound. All of them consist of symbols, some of them far more obscure than $E=mc^2$. Mr. Ostriker in his landmark paper says that rotating "galaxies remained stable only if they were surrounded by a spherical halo of unseen material, commonly known as dark matter."[34] That's his opinion. Obscure or not, serious astrophysicists must deal with it.

Quantum theory, too, is an opinion that must be dealt with. In mathematics so is Euclid*s controversial fifth postulate, that parallel lines never meet. So is Stephen Hawking*s theory of black holes. So is the physiologists* theory that stress is the principal cause of stomach ulcers.

In Galileo*s day the Franciscans and Dominicans of the Inquisition rejected Galileo*s heretical heliocentric opinion as false truth because they believed their own opinion that the Earth is the center of the solar system. That opinion——like Let*s-Make-the-Super in 1954——was the official policy of the times.

Well, things change. In our day we see that Einstein*s relativity opinion is more credible than Newton*s Laws. Therefore we realize now that for almost three centuries Newton*s opinions were not Laws at all——they were false truth.

Concerning the Mattern/vos Savant problem of guidelines, there's no scientific or mathematical truth that's always right or wrong. The guidelines are opinions in our head.

What Then Is the Difference Between Science and Literature?

About 2500 years ago a man named Empedocles was a poet, a statesman, a physician, a biologist and a philosopher. He wrote a 5,000-line poem, *Physis*, about nature, but only about 400 lines survive. He proclaimed his opinion that all matter is made of

combinations of four "roots," the primary substances——fire, air, water and earth.[35]

Aristotle compares Empedocles and Homer. Both, he said, are called poets, because both wrote in meter; but "poet" is a misnomer for one of them. Aristotle says,

> [When] a theory of medicine or physical philosophy [is] put forth in metrical form, it is usual to describe the writer [as a poet]; Homer and Empedocles, however, have nothing in common apart from their metre; so that, if one is to be called a poet, the other should be termed a physicist rather than a poet.[36]

Mortimer Adler pinpoints the Aristotelian difference between physicist and poet as the difference between two kinds of truth. He says,

> Aristotle [distinguishes] between poetical and logical truths. . . . Logical truth is defined as the correspondence between the judgments made by the mind and the facts that exist outside the mind and are independent of it.
>
> In contrast, poetical narratives have a quite different kind of truth, one that is based not on actual realities but on the realm of possibilities. If the story that a novel or play tells us about human actions has the ring of possibility or probability——if, in short, it has verisimilitude——it has, in Aristotle*s view, poetical truth.[37]

Professional journalists and professional historians and biographers have a vocational imperative to respect the kind of truth that Adler is calling "logical truth." They must write only that which corresponds with reality. Hence we can readily

understand why the *New Republic* axed the young man who had written realistically but falsely about a computer hacker.

Using the two kinds of truth, we can go a step further. We can reconcile Random House's version of *Dutch* with Gloria Borger*s hard-nosed version. Indeed it*s quite simple——*Dutch* is a mixture of the logical and the poetical, and Edmund Morris believed he had an appropriate reason for inserting the poetical. Doreen Carvajal says so in the *New York Times,* citing Morris*s explanation: Ronald Reagan "could only be described in terms of an audience, a witness, a camera;" he*s a born "thespian;" his "personality defies a conventional approach because his magic was in performance;" he "went from production to production to production;" and in "each case his character changed."[38]

Here*s what Aristotle says in his *Poetics,* and perhaps it suggests the role of human imagination and human guidelines in fiction and also in science, history, biography and journalism.

> From what has been said it will be seen that the poet*s function is to describe, not the thing that has happened, but a kind of thing that might happen, i.e., what is possible as being probable or necessary. The distinction between historian and poet is not in the one writing prose and the other verse——you might put the work of Herodotus into verse, and it would still be a species of history; it consists really in this, that the one describes the thing that has been, and the other a kind of thing that might be. Hence poetry is something more philosophical and of greater import than history, since its statements are of the nature of universals, whereas those of history are singulars. [39]

Is Truth a Boundary?

So our investigation is finished, and the results are quite simple.

Physical science is an imaginative human art applied in making discoveries about the things that exist in physical nature.

Literature is an imaginative human art applied in creating intangible artifacts, such as stories and opinions, that are added as supplements to the things that exist in physical nature.

Whenever scientists express their findings in writing, they are poets. They're describing what might be. Dr. Sigmund Freud was just such a scientist/poet. Their writings are literature, or, as Ms. Mattern and Ms. vos Savant would say, English——or German or whatever.

The human mind arrives at opinions. Opinions are guidelines, judgments that compare mental experience with reality.

We say that science and scientific literature——the works of Sigmund Freud and the works of professional scientists, historians, biographers and journalists——are logically true if they seem to correspond with reality.

We say that fiction——a poem, a *Star Trek* television program, a historical novel——is poetically true if its plausible.

Yes, you can distinguish science from literature, but, no, truth is not a boundary between them.

NOTES

1. Hard-nosed readers are strongly forewarned that this essay takes poetic license and relies on imprecision. For example, there's no definition of "literature;" ultimately there's an implication that literature is anything that's written or perhaps spoken. There's no definition of "science" and no distinction between science as a discipline and science as a body of knowledge; there's no differentiation between physical and social science, no differentiation between science and mathematics or between science and engineering. The essay commingles journalism, history and biography. It doesn't acknowledge the role of imagination in science and doesn't define the relationship, if any, between reality and truth. It doesn't distinguish "opinion" from "hypothesis," "conjecture" and "postulate;" ultimately there's an implication that opinion is anything a human being thinks.

To warrant all of that license the essayist presumes that literature popularly seems different from science and that systematic imagination about reality popularly seems different from fanciful imagination.

The essayist believes that these differences are very common perceptions (and oversimplifications) about science and literature and that they're strong enough to permit even the hard-nosed reader to swallow the licensed imprecision and to follow the essayist's argument.

2. Aristotle, *Physics,* in *The Basic Works of Aristotle,* trans. R.P. Hardie and R.K. Gaye, ed. Richard McKeon, Random House (New York:1941), Bk. II, Ch. 1, p.236.

3. *Chicago Sun-Times,* Wednesday, August 24, 1994, p.6.

4. *Guinness Book of World Records,* 1989 Edition, p.26.

5. Marilyn vos Savant, "Ask Marilyn," *Parade,* September 10, 2000, p.20.

6. Edward FitzGerald, "The Rubáiyát of Omar Khayyâm," Quatrain 99, as quoted in Meyer Howard Abrams, ed., *The Norton Anthology of English Literature* (Third Edition), Vol. 2, p.1509 at 1520, W.W. Norton & Company, Inc. (New York: 1974)

7. See Albert Einstein, *Relativity,* Crown Publishers (New York:1931), Appendix III, pp. 148-59; Carl Sagan, *The Dragons of*

Eden, Ballantine Books (New York:1977), p.193.

8. Mark Twain, *Adventures of Huckleberry Finn,* Doubleday & Company, Inc. (Garden City, NY:1985), p.209.

9. *The American Heritage Dictionary of the English Language*, 3d Ed., Houghton Mifflin Company (Boston, MA:1992), p.1397.

10. Carl Sagan, op. cit. n.6, supra, at p.244.

11. *Greene v. McElroy,* 360 U.S. 474, 79 S. Ct. 1400 (1959), at 360 U.S. 484, 79 S. Ct. 1407.

12. John Milton, *Areopagitica*, in *Complete Poetry and Selected Prose of John Milton,* The Modern Library (New York:1950), p.706.

13. Harold Green, quoted in David Halberstam, *The Fifties,* Villard Books (New York:1993), p.352.

14. Op. cit., n.l2, supra, p.719.

15. Christopher Dickey, "Summer of Deliverance," in *The New Yorker,* July 13, 1998, p.51.

16. Walter Goodman, "Serving a 30-Year Hitch On the Trail of a U.F.O.," TV Weekend, *The New York Times,* Saturday, July 30, 1994,p.11.

17. John Toland, *The Rising Sun: The Decline and Fall of the Japanese Empire, 1936-1945,* Random House, (New York:1970).

18. John Toland, *Gods of War,* Doubleday and Company, Inc. (Garden City, New York:1985), Foreword, p.9.

19. R.G. Collingwood, "The Historical Imagination," reprinted in *The Philosophy of History in Our Time: An Anthology Selected, and with an Introduction and Commentary by Hans Meyerhoff,* Doubleday Anchor Books, Doubleday & Company, Inc. (Garden City, NY:1959), pp.77—78.

20. Gore Vidal, *The Golden Age,* Doubleday (New York:2000).

21. Ibid., pp.455—56.

22. Edmund Morris, *Dutch: A Memoir of Ronald Reagan,* Random House (New York:1999)

23. Ibid., copyright page.

24. Gloria Borger, "Where*s the Rest of Me?," in *U.S. News & World Reports,* October 11, 1999, p.32.

25. *Webster*s Unabridged Dictionary of the English Language,* Portland House (New York:1989), p.1521.

26. Ibid., p.92.

27. Ibid., p.1110.

28. John Keats, "Ode on a Grecian Urn," in *The Complete Poetical Works of Keats,* Cambridge Edition, Houghton Mifflin Company (Boston:1899), p.135.

29. All references in the text, including direct and indirect quotations from Mrs. Ostriker, are to Corey S. Powell, Personal Profile of Jeremiah P. Ostriker and Alicia Suskind, *Scientific American,* Vol. 271, Issue 3, September, 1994, pp.28—31.

30. Saint Thomas Aquinas, the *Summa Theologica,* trans. Fathers of the English Dominican Province, Benzinger Bros. Edition (1947), First Part, Question 15, "Of Ideas," Article 1, "Whether There Are Ideas."

31. Aristotle, *On Interpretation,* trans. E.M. Edghill, in op. cit. n.2, supra, Ch.1, p.40.

32. Sir Arthur Eddington, *Space, Time and Gravitation,* At the University Press (Cambridge:1953), pp.200-201.

33. Alexander Pope, "Intended for Sir Isaac Newton (in Westminster Abbey)," in *The Complete Poetical Works of Pope,* Cambridge Edition, Houghton Mifflin Company (Boston:1931), p.135.

34. Op. cit., n.29, supra.

35. "Empedocles," *Encyclopedia Britannica,* (1969), Vol.8, p.342.

36. Aristotle, *Poetics,* trans. Ingram Bywater, in op. cit. n.2, supra, Random House (New York:1941), Ch.1, pp.1455-56.

37. Mortimer J. Adler, *Art, the Arts, and the Great Ideas,* Macmillan Publishing Company (New York:1994), p.13.

38. Doreen Carvajal, in *The New York Times*, October 5, 1999, p.A1, continued to p.A23.

39. Op. cit. n.37, supra, Ch.9, pp.1463—64.