
From Two Cultures to One

On the Relation between Science and Art

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This article is in part adapted from a talk given by Vladislav Rozentuller at The Nature Institute on September 10, 2004. The talk was entitled, "The Nature of Drama and the Drama of Nature."

All science is rooted in experience. We have nowhere to begin except with whatever we are aware of — and nowhere else to end either. If, as scientists, we discipline and extend the range of our experience, we do so in order to gain new understandings describable in terms of this widened experiential horizon. How could we understand or describe anything that lies entirely outside our experience?

The link to experience can be easy to forget amid what physicist Arthur Zajonc has called the "mess of formulas" constituting the hard sciences — and all the more so when our philosophical heritage inclines us to believe that objective truth consists precisely of whatever is not contaminated by human subjectivity. Since our experience is always the experience of a human subject, this distrust of the subject puts the experiential basis of science at continual risk.

We can sense the risk when we note how experiment in science has more and more become the province of computer simulation and of elaborate equipment that disconnects the researcher from the crucial events being investigated. At the same time, we see how the fascination with rigorous mathematical deduction and with the neat, step-by-step, logical determinism of algorithms threatens to carry us away from an observation-based science and back to a kind of medieval attempt to seize the world's truth through the necessities of pure, abstract cerebration.¹

Subjectivity and Objectivity

But a science removed from experience is no longer science. It becomes something different, and is likely to degenerate into the dogma of mere belief. The philosopher Kurt Riezler was targeting this confusion over the experiential basis of science when, at mid-twentieth century, he admonished physicists this way:

[M]ost of your notions change color in a twilight. You use the word "force" and, when queried, you define it by law, field, and vector; but what you really have in mind is the force you feel in commanding your muscles. Do not imagine, however, that you are uniting these two: you mix up unconnected notions, surreptitiously exchanging one for the other. All your thinking goes on in such ambiguity. (Riezler 1940, p. 11-12)

There is no quarreling with the fact that the fundamental concepts of science — those that might tell us what sort of reality our wonderfully precise equations are *about* — remain strangely unapproachable and mysterious. Physicist Richard Feynman felt compelled to admit that "in physics today, we have no knowledge of what energy *is*" (1963, p. 4-1). Other theorists can be heard asking whether time can flow backward, and whether we all exist in multiple, parallel universes. And who can tell us with great confidence about such basic aspects of our world as the nature of space or the character of matter?

Such mystery is hardly surprising when you consider how remote from human experience physics has become today. Things might be different if we were to explore the roots of science within ourselves. Can we gain an adequate scientific understanding of gravity except by referring to the willful use of our muscles? A little reflection will convince us that the answer is no. True, many scientists will react initially to the question by citing the purely objective relationships of moving masses — relationships given in strictly mathematical terms. But the word *relationship* here turns out to be more than "just a little" pregnant. It conceals — so long as we are willing to avert our gaze — what *sort* of connection between things we really have in mind.

Objects changing their positions in space may give us a certain mathematically describable lawfulness, but so, too, can points on a piece of graph paper. No one takes those points to be exerting a physical force upon each other. Neither could we think of planets as exerting a force upon each other *unless we had an independent concept of force*. As the graph paper illustrates, the mathematical relationships alone do not give us knowledge of a force. Think about it all you

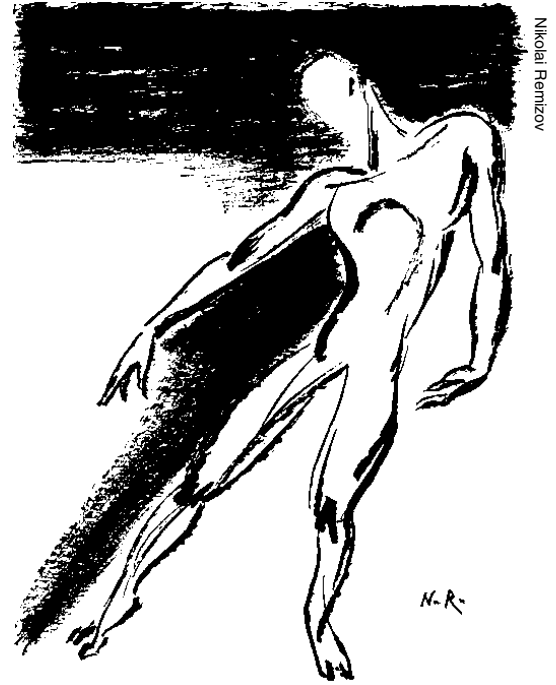
wish, but you will never find a source for this concept except in the inner experience of your own body.

This truth may be obvious to those who are willing to consider the matter. But if our experience gives us an essential part of our science of gravity — if it gives us the actual physical *meaning* of our equations, telling us what they are about — then the implications for science are radical. In particular, we come to see that science has validity as an attempt to understand physical reality only because our experience provides a language of revelation for this reality.

Actually, the question how our world of inner experience relates to the outer or objective world is raised even by the mathematics that is so central to our scientific formulations. Is this mathematics “in our heads” or in the world? Eminent scientists and mathematicians have lined up on one side of the question or the other. But the obvious fact of the matter is that both contentions are true. What prevents acceptance of this is the reigning Cartesian dualism: if mathematics is conceptual in nature and therefore part of our mentality, as it so clearly is, how can it also be out there in the world? Yet all scientists assume that, in characterizing the mathematics of gravity, they are telling us something objective about how the world really is. Somehow the thoughts we so easily assume to be in our heads also belong to the world.

Once we reckon with Riezler’s point about muscles and forces, we realize that the objective-subjective question goes far beyond mental formalisms such as mathematics and logic. It is our entire realm of inner experience that seems to refer to the world outside — or is it that the world outside refers to our inner experience? This reciprocal relationship will be far easier to grasp once we have overcome the Cartesian cleavage — as nearly all thinkers today *say* they want to do.

But it can be desperately painful to let go of centuries-old habits of thought. When we do manage to transcend the great Cartesian divide, we will recognize how natural it is that our interior should give us the key to understanding the outer world. Consciousness is not something that merely goes on inside our own skulls; it is the inner aspect of the world. Just as our mathematical concepts belong not only to us, but to the world as well, so also more generally: our own interior is at the same time the world’s interior. We are, after all, part of the world, not aliens from elsewhere. Is it really a surprise that where, in us, the world wakes up to self-consciousness, this consciousness should find itself participating in, and capable of knowing, the world? Only a long history of artificially isolating the subject as knower from the world known could have made us think otherwise.



Nikolai Remizov

The Work of the Artist

We discover the world through experience — *all* experience, and not just the abstract and formal (that is, logical and quantitative) thoughts we like to picture as taking place in our heads. This means that we participate in the world’s being through all our senses, experiencing its various qualities with our entire selves. When we consciously live in these qualities (not something we moderns are readily inclined to do), we lay the foundation for understanding. And so imagination and feeling, movement and will, all play a role in scientific discovery. The attempt to ignore this truth is what leads to the confusion in scientific terminology that Riezler noted. The problem is that, despite unavoidably relying upon the qualities of human experience in order to give meaning to their concepts, scientists are discouraged from paying attention to how they do so — or even the fact that they do so.

This ambiguity of attitude is perhaps understandable when you consider the startling cost of removing it and facing an experience-based science squarely. One person who tried to do this was Goethe, and his conclusion would hardly appeal to many scientists today. “Art,” he said, “is nature’s worthiest interpreter.”

Goethe found a close kinship between the creative processes in nature and our own artistic activities. As Tolkien would later put it, “we create by the law in which we’re made.” The highest art therefore has the truth and power of nature — which is why it can be a revelation of nature. The

same imaginative power that grows a flower on the ground of the earth also grows the poem in the soul of the great poet.

It is hardly strange to say that the forces at work in nature are also at work in us. How could it be otherwise? But in us these forces gain a voice; they become a language. Goethe believed that nature pursues its own work further through the human soul in order to reach a higher level of perfection.

When Goethe says that art is nature's worthiest interpreter, he has in mind not only the way we feel and enjoy nature through poetry, painting, and the rest, but also how we *understand* nature with the help of art. In fashioning a true work of art, we feel nature's creative and objective laws speaking through us. We learn to work with those laws, and thereby come to understand them. The outer form of an artistic creation, insofar as it is successful, bears an inner meaning true to nature. It captures something of nature's way of being.

The use of outer form to convey inner content, or meaning, is characteristic of all artistic technique, as we can see very well with drama. The dramatic production employs elements of the other arts — words, sounds, music, colors, physical form, and movement — and these elements always point inward. The actor's task is to make his outer actions — movement, pause, gesture, vocal intonation — a revelation of his inner world. The inner reality may be that he is looking for something, protecting somebody, proving something, asking or sacrificing or doubting or despairing. In all these cases the inner attitude and inner movement can be suggested through the qualities suffusing his bodily movement and speech. The body becomes a language of soul.

Not only the actors but even the elements of staging enter into the conversation between outer appearance and inner meaning. A detail such as a dry leaf may suggest a certain dying process in the soul. A blue sky may have to do with hope. And if a character is dressed in black, it may convey pain or existential anguish. Of course, such associations may become conventional and trivial. But that is because of lazy habit and dullness of perception. (When was the last time you let yourself deeply imbibe a blue sky?) The metaphors nevertheless originate in a true perception of the qualities of things. In staging a drama, the aim is to bring perception alive again, so that every detail of appearance begins to speak out of one or another aspect of its inner nature.

But actors also use images of nature in a more immediate way. For example, a director may tell an actor, "Enter the room like a snake." Without literally reproducing a snake's movement, the actor takes its qualities into his behavior and mien. He may thereby project a cunningly evasive indirection, or an unblinking, penetrating focus, or the lurking

danger of a sudden, venomous thrust — all depending on which qualities of the snake he finds relevant to the inner transactions on the stage.

It would, of course, be an egregious mistake to read human cunning into the snake. But the objective movements of a snake express certain qualities of a cunning person in a way that other movements do not. To anyone who actually works with the language of form, this is just an obvious fact. Every outer form has its own inner qualities. This truth, however is one whose revelatory and scientific significance we have long trained ourselves to overlook.

Likewise, the director may instruct an actor to enter the room like a cold wind — or a blustery wind, or a sodden, rain-soaked wind, or a summer breeze. Each conveys its own distinctive character. Whether superficially or profoundly, we draw on images of nature to suggest inner character all the time: "This man is a wolf." "She has a heart of stone." "His brain is made of oak." "Her smile is like the sunshine." "She is beautiful, but her eyes are like a whirlpool." Just as there are attractive, dark-green, whirlpool-like eyes suggesting a danger within, so, too, all the other metaphors suggest a link between the phenomena of nature and the inner states of human beings. We find in nature powers that work also within us.

As actors know so well, every posture and every movement carries its own inner significance, contributing to a language of form, or gesture, in which outer appearance and inner meaning converse intimately with each other. Stand with your head inclined slightly downward, and you will add a meaning to the scene that differs drastically from inclining your head upward. To move your hand toward an object in a certain hesitating and faltering way is (for the actor whose



powers of perception and attention have been trained) to experience in the quality of the movement a feeling of distracted worry or anxiety. The feeling is objective in the sense that it belongs to the physical movement itself; the actor need not recall or imagine any purely personal anxiety. But, at the same time, the feeling does become *his* feeling. We could say that the experience has a subjective-objective character: the actor makes of his personal consciousness a stage onto which he invites this or that feeling from the objective world.

The Language of Gesture

This dialogue between inner and outer is no mere peculiarity of the arts. We find the same dialogue in all human language. Owen Barfield, a philologist, reminds us that “language appears at first sight to consist of what has been well called ‘a tissue of faded metaphors.’” Thus, to *express* means to “squeeze out,” and when we *focus* our minds we invoke the gathering and centering of light by a magnifying glass — and the Latin word *focus* applied to such a glass originally referred to a hearth and the fire burning there. In this way our immaterial meanings arise from the content of world processes.

The inner-outer dialogue implicit in many words is still obvious to us, as with *conceive*, *apprehend*, and *understand*. But it is no less present as a historical fact even where it has long been forgotten. For example, *right* is thought to derive from a word meaning “stretched” and therefore “straight,” while *wrong* descends from “wringing” or “sour” (Barfield 1981, p. 35). And, Barfield adds, not even such respectable scientific terms as *cause*, *reference*, *organism*, and *stimulus* are exempt from the general rule. Our innermost, and also our most abstract, meanings arose by grace of external appearances.

Moreover (as Barfield also shows) the same holds true in reverse: our most external and material meanings once bore inner significance as well. In fact, *material* itself is related to the Latin *mater*, which means “mother,” with connotations of motherly love and nurture. In general, both our most material and our most immaterial meanings are late arrivals in human history. They emerge through subtraction from the material-immaterial unity our ancestors so naturally experienced (Barfield 1973, p. 134).

An analysis of human language and the role of figurative speech in our meanings, scientific and otherwise, leads Barfield to conclude that if our language has any meaning at all, then objective nature has an inside that is somehow akin to our own interior (1977, p. 15). The claim of objectivity for this interior may be difficult for many modern scientists to



stomach, but, as we have seen, the problem already presents itself in the case of our mathematical thought. And it becomes even more acute when we look at the work of whole-organism biologists. For example, Craig Holdrege, after sketching the physiology, morphology, and behavior of the three-toed sloth, writes: “Every detail speaks ‘sloth’” (1997). If every physical detail of an organism speaks with one voice, it can only be because inner, unifying qualities express themselves through these details. No external structure or individual detail of behavior can provide the unity evident throughout all the parts of a discernible whole.

If not only the organism but also nearly every word of our language testifies to the world’s expressive qualities, and if the artist has become conscious and discerning of the gestural language of nature at work in these qualities, then this knowledge is essential to the scientist. The scientist and artist are engaged in the same larger enterprise. Where the artist tries to transform matter in the image of truth, creating outer forms that reveal an inner meaning and significance as clearly as possible, the scientist contemplates the given forms of nature and seeks to discover their inner and lawful coherence. The emphasis for the artist is on creation, and for the scientist on discovery. But the two activities relate to the same reality; the language is one language.

We can call it wisdom when understanding and creative power, knowledge and art, are joined in a higher unity.

The Unity of Art and Science

In his commentary upon Goethe’s worldview, Rudolf Steiner remarks that the scientist looks upon the world in

order to apprehend natural laws in the form of thoughts or ideas. The artist, by contrast, experiences the lawfulness of a natural process in a more pictorial, and therefore a more deeply felt, way; the creative aim is for a purer, more complete picture of the lawfulness than the world itself normally makes available. Everything contingent, everything incidental to the revelation gripping the artist, is stripped away from the sculpture or painting or dramatic presentation in order to lay bare a particular expressive aspect of the world (Steiner 2000, p. 210; Brady 2002).

Putting it a little differently: where the scientist tries to apprehend the idea of a natural phenomenon, the artist tries to encounter the soul of nature herself. Where the scientist pursues a method of *research*, systematically demonstrating an idea, the artist strives to create an image that is a *revelation* of nature. Faced with the beauty of a sunset, the scientist wants to understand it as deeply as possible, and the artist wants to feel it as deeply as possible.

The two approaches are closely related. The deep feeling sought by the artist is a true feeling, a cognitive feeling — a feeling that can be raised to a conscious, imaginative level where it reveals the inner character of the phenomenon. In the other direction, the scientist's ideas — when they become more full-fleshed than our usual abstractions — can be warmed with feeling and made more pictorial. It was Goethe's genius, as both artist and scientist, to unite these two movements in one person, raising feeling to cognition and enlivening ideas with feeling. In doing so he pointed the way to what has been called Goethean science. Steiner summarizes his achievement this way:

[When nature's laws] come to expression in the mind of a true artist not only as perfect pictures of things, but also as thoughts, then the creative source common to both [science] and art appears with special clarity before our eyes. Goethe is such an artist. (Steiner 2000, p. 210)

Of course, Steiner could just as well have said, "When nature's laws come to expression in the mind of the scientist, not only as thoughts, but also as pictures...." In any case, Goethe himself expressed the result of bringing the artistic and scientific impulses together:

When healthy human nature works as a whole; when we feel ourselves within the world as in a beautiful, worthy, and precious whole; when harmonious satisfaction grants us pure and free delight, then the universe, if it were self-aware, would rejoice at having attained its goal, and it would marvel at the pinnacle of its own becoming and being. (Quoted in Steiner 2000, pp. 211-12)

There is no underestimating how uncomfortably Goethe's

thought sits within the current scientific ethos. But there is also no underestimating the painful wrench required of us if science is to escape its ever more oppressive and dangerous dualistic inheritance. It is, after all, no wonder that Goethe's sentiment seems strange within a culture where abstract, computerlike head-thoughts run on in isolation from our beating hearts and muscular activity. Losing contact with the real being of nature, we create a kind of senseless, unfeeling, technological counter-reality of dumb but terrifying power, until finally we provoke nature beyond her patience to endure, and ecological catastrophe ensues.

Overcoming Alienation

If we are to transcend dumb power in our quest for wisdom, we will have to overcome the mutual alienation of mind, heart, and limbs. A mind cut off from the feeling heart becomes abstract and dead; limbs isolated from the heart become instruments of mere technical effectiveness.

The alienation of mind from body works in both directions. On the one hand, our thin and abstract thoughts do not naturally inhabit our bodies or find their appropriate, outward, gestural form. On the other hand, the inner, expressive aspect of the body's gestures and feelings does not easily light up in imagination and thought. Our bodies, in other words, are not plastic or responsive or expressive in relation to our thoughts and feelings. The conversation between inner and outer becomes stilted or non-existent. We do not learn the language of gesture that unites outer appearance and inner significance, and therefore we cannot think in images. We cannot think imaginatively.

And yet, our bodies are that part of the physical world with which we are surely most intimate! If we cannot make our own bodies the image and outer revelation of our thoughts, and if we cannot discover in thought the inner, expressive content of our outer, bodily gestures, then how can we expect the gestures of external nature to light up within us as understanding? Only through an artistically informed scientific training can the researcher intensify the imaginal and pictorial richness of her thoughts and thereby bring them into much more vivid relationship with the world's phenomena.

It may be difficult for many scientists to see the relevance of such training to their own work. So, too, it was difficult for many of Galileo's contemporaries to see the relevance of the telescope and of experiments with inclined planes to what they already knew about celestial and terrestrial bodies. The world's actual expression of itself loses its importance when one retreats into received metaphysical doctrine or the comforting certainties of mathematics.

Galileo achieved his revolutionary insights by uniting the human being as perceiver and artisan with the human being as thinker. Our task today is in some regards similar. We can further scientific understanding only by recovering the unity of our own being, which is also to recover our connections with the external world — that is, to recover the world as a world of full-bodied *experience*. The mutual alienation of science and art in our time provides a good measure of the scale of the task before us.

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NOTES

1. We should be open to the possibility that many of the great thinkers of the medieval era, while dealing with concepts

divorced from any systematic, perceptual engagement with the world’s phenomena, nevertheless thought much more deeply and incisively than we do today, and experienced a reality in their thoughts that has progressively been lost to us.

BIBLIOGRAPHY

- Barfield, Owen (1973). *Poetic Diction: A Study in Meaning*. Middletown, CT: Wesleyan University Press. Originally published in 1928.
- Barfield, Owen (1977). *The Rediscovery of Meaning, and Other Essays*. Middletown CT: Wesleyan University Press.
- Barfield, Owen (1981). “The Nature of Meaning.” *Seven* 2: 32-43.
- Brady, R. H. (2002). “Perception: Connections Between Art and Science.” Available at <http://natureinstitute.org/txt/rb/art/perception.htm>
- Feynman, Richard P., Robert B. Leighton, and Matthew Sands (1963). *The Feynman Lectures on Physics*. Reading MA: Addison-Wesley.
- Holdrege, Craig (1999). “What Does It Mean To Be a Sloth?” *NetFuture* #97. Available at http://netfuture.org/1999/Nov0399_97.html#2.
- Riezler, Kurt (1940). *Physics and Reality: Lectures of Aristotle on Modern Physics*. New Haven CT: Yale University Press.
- Steiner, Rudolf (2000). *Nature’s Open Secret: Introductions to Goethe’s Scientific Writings*, translated by John Barnes and Mado Spiegler. Great Barrington MA: Anthroposophic Press.