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The Case of the Proliferating Paradigms

Jack Coulehan¹

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Consider the following articles from recent medical literature: “Three Times Weekly Tacrolimus Ointment Reduces Relapse in Stabilized Atopic Dermatitis: A New Paradigm for Use” (Paller et al., 2008); “Patellofemoral Syndrome: A Paradigm for Current Surgical Strategies” (Teitge, 2008); and “Neuroplasticity After Spinal Cord Injury and Training: An Emerging Paradigm Shift in Rehabilitation and Walking Recovery” (Behrman, Bowden, & Nair, 2006). What do they all have in common? You guessed it: paradigms! If you’re conversant with the latest literature in biology or medicine, you’re probably aware that these days paradigms are a dime a dozen. Each year, hundreds of investigators announce that they have consigned antiquated theories, models, and paradigms to the trash bin of history and replaced them with radically new versions. The paradigm is dead, long live the paradigm!

It seems strange, then, that so much of biological science remains stable from year to year. When historian of science Thomas Kuhn introduced the term *paradigm* in his 1967 book, *The Structure of Scientific Revolutions*, he used the term to represent revolutionary developments in science that had occurred over a period of 2,400 years (Kuhn, 1996). He illustrated sequential paradigms in physics, tracing a progression from Aristotle to Newton to Einstein. He provided the reader with similar sequences in astronomy, chemistry, and medicine. For example, Harvey’s demonstration that the heart pumps blood in continuous circulation was a radical shift from the earlier Galenic belief, held for nearly 1,500 years, that the heart’s primary function was to infuse “animal spirits” into the blood, which did not recirculate. Kuhn had something very important in mind when he coined this usage of paradigm, although critics have subsequently argued that even then the concept was not entirely clear.

However, it is clear that contemporary researchers must have a much different concept in mind when they use the term. Over the years the word has become progressively more popular in biomedical research, and has been applied to developments of progressively less significance. I recently did a Medline search for articles that include “paradigm” in their titles. Prior to 1969, there were 10. The numbers nudged upward in the subsequent decade (24 citations), and thereafter began to increase geometrically: 1979–1988, 164 titles; 1989–1998, 932 titles; and 1999–2008, 2,496 titles. According to Kuhn, it

took 2,400 years for physics to progress through 3 paradigms, but today’s biological scientists knock them off at the rate of 250 per annum!

Language evolves. Thus, it is perfectly reasonable that a word should acquire new connotations over several decades of use. In today’s practice, the original Kuhnian definition has expanded, and paradigm is now sometimes used as a synonym for several less dramatic words, among which are proposal, hypothesis, scheme, idea, method, heuristic, approach, and treatment. For example, the article entitled “Cardioprotection: A New Paradigm in the Management of Heart Failure” proposes a different approach to treating heart failure (Maytin & Colucci, 2005). “Oxidative Stress—A Unifying Paradigm in Obstructive Sleep Apnea and Comorbidities” presents the hypothesis that a number of medical conditions associated with sleep apnea are related because they all result from oxidative stress (Lavie, 2009). A third example, “The Clinician–Patient Partnership Paradigm: Outcomes Associated With Physician Communication Behavior,” makes the unobjectionable point that good communication between client and clinician promotes better health care outcomes (Clark et al., 2008).

To argue that these examples demonstrate evolution of language, in this case producing a “big tent” paradigm that takes in a number of other well-established technical terms, is interesting, but merely descriptive. It doesn’t explain why the word has become so popular. I’m going to stick my neck out here and suggest a reason for this: Today’s culture of science—reflecting popular culture as a whole—puts great stock in appearance. Often, the medium is the message, and the message is frequently much larger than reality. Celebrity may have nothing to do with talent or accomplishment; assertiveness has replaced prudence as a life-orienting virtue; and humility has almost disappeared from the cultural radar. For example, can you imagine a hospital advertising that its doctors

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score #1 in humility? Or that they excel in being aware of their limitations? Likewise, precision in language is disvalued, especially in the direction of reinterpreting words to have meanings bigger, better, or more important than their received meanings. In a world in which the smallest soft drink you can buy is a “large,” it’s understandable that an investigator might want to label a “normal” scientific finding as a paradigm shift.

Thus, I believe that, over the last few decades, the connotation of “paradigm shift” in the health sciences has been stretched and distorted beyond all recognition as a result of creeping grandiosity, vanishing humility, and word inflation. In fact, I was an early perpetrator of paradigm shift myself.

In 1977, George Engel, a psychiatrically trained internist at the University of Rochester, published an article in the prestigious journal *Science*, titled “The Need for a New Medical Model.” In it, Engel argued that contemporary medicine was stuck in a reductionistic frame of reference that admitted only biological and biochemical aspects of illness (Engel, 1977). This biomedical model, as Engel called it, ignored, or at least minimized, the influence of experiential factors on illness. “The dominant model of disease today is biomedical,” he wrote, “and it leaves no room within this framework for the social, psychological, and behavioral dimensions of illness” (p. 129). Engel proposed replacing the biomedical framework with a new biopsychosocial model, based on general systems theory. In essence, the biopsychosocial model affirms that phenomena observed at a higher level of organization cannot be fully understood by reducing them to lower levels of organization. Illness, for example, which involves the person as a whole, cannot be satisfactorily explained by biochemical and genetic factors. In other words, the whole is greater than the sum of its parts.

In 1980, fresh from my first readings of George Engel and Thomas Kuhn, I published an article entitled “Human Illness: Cases, Models, and Paradigms,” based on my experience as a general internist in an urban, low-income community (Coulehan, 1980). The article began with three composite patient narratives, each of which involved a 48-year-old married woman with type 2 diabetes and degenerative joint disease. Although their biochemical and pathological findings were identical, Mrs. A was disabled by her illness, Mrs. B had mild and “appropriate” symptoms, and Mrs. C was entirely asymptomatic and, thus, unaware of her biomedical disorders. I argued that the three women manifested far different illnesses—in fact, patient C had no illness at all—even though their diseases were indistinguishable. Their illnesses depended more on personal history and social context than on so-called “hard” findings. A physician could neither understand nor effectively treat their conditions solely by reference to the Western biomedical model.

Rather, a new holistic-systems model was needed. I used the expression “holistic-systems” rather than Engel’s biopsychosocial because, being an ambitious young academic, I wanted to coin my own term, related more explicitly to the general systems theory that George Engel had also cited (von Bertalanffy, 1968). To characterize this breakthrough, I played the paradigm card: “Data from patients such as Mrs. A and Mrs. C will suggest the laws underlying a new paradigm, elegant in its simplicity, robust in its inclusion of known data, and powerful in its potential for healing” (p. 6; see Table 1).

I find it embarrassing to read this article today, nearly 30 years later. The tone is didactic, stuffy, even ponderous. I make breathtakingly global assertions. I take my relatively uninformed statements about history and philosophy of science very seriously. Nowadays, whenever I read this and some other early papers, I can’t help but hear Bob Dylan’s raspy voice, repeating over and over in my head, “I was so much older then, I’m younger than that now.”

The most important aspect of my misusing the word paradigm, and I think also the subsequent pattern of misuse among investigators, relates to Kuhn’s (1996) criterion that the conceptual framework of a new paradigm cannot be accommodated within the old. In other words, the so-called new paradigm is not just an innovative discovery or an unexpected breakthrough; it’s not just a solution to a major problem; and it’s not just a fresh new emphasis on an aspect of the field that has previously been neglected. Rather, the new paradigm replaces (and subsumes) the entirety of the “normal science” of the field in question. The newcomers speak a different language and create a new culture. The paradigm shift is precisely not a development or advance; it’s an earthquake.

However, in the dichotomy of biomedical vs. biopsychosocial models, nothing so dramatic is at stake. The original paradigm simply predicates a consistent application of the scientific method to biological (in this case, illness and health-related) phenomena. In this context the complexity and multifactorial nature of illness poses no conceptual problem. In fact, the psychological and social dimensions of illness were known and studied long before Engel without any need to demolish the conceptual system of biomedicine, or develop radically new, and more basic, ways of understanding the world. For example, when Engel wrote his paper, the field of psychosomatic medicine had been thriving for decades, and the study of psychological and social determinants of health and illness was already a burgeoning field of research. None of this required a paradigm shift.

Furthermore, when it came along in 1977, the biopsychosocial model added nothing substantive to existing normal science. The model merely consisted of a set of assertions that focused attention on areas that Engel rightfully believed were underappreciated in medical practice

Table 1. Two Basic Models of Human Illness

Western Biomedical Model	Holistic-Systems Models ^a
Disease can be understood by investigating isolated causal chains.	Cause is a complex function—multiple factors related in a higher-order system.
The biochemical lesion is the most important or only significant factor in pathogenesis of disease.	The biochemical lesion is one of many factors, a substrate, which may or may not contribute to manifest illness.
Dualism: Disease can be separated in a fundamental sense into (a) physical or somatic, and (b) mental or functional categories.	Monism: Illness is unitary, in the sense that all illness has behavioral, psychological, and physical components.
Ontologic: Disease can be studied adequately as a thing, an entity that attacks the person.	Physiologic: Illness is a physiological imbalance, a failure of homeostasis.
Disease presence demands active intervention.	Intervention is based on assisting the natural healing processes.

Note: Adapted from Coulehan, 1980, p. 6.

^aBiopsychosocial model (Engel, 1977); general systems model (von Bertalanfy, 1968).

and less generously funded by research dollars. The new term, and the dichotomy it created, provided a convenient heuristic, i.e., a tool to help physicians and biological scientists better understand the importance of psychological and social factors in illness. Likewise, when I introduced my “holistic-systems” paradigm in 1980 and contrasted it with the “Western-biomedical” paradigm, I attempted to follow in Engel’s footsteps, but there was nothing new in what I wrote. The so-called paradigm shift was just another dichotomy created to highlight certain aspects of illness. In addition, my paradigm-language, like Engel’s model language, was a rhetorical device intended, hopefully, to influence the politics of medical education and research.

Thomas Aquinas defined humility as “keeping oneself within one’s own bounds, not reaching out to things above one” (Aquinas, 1989). A more contemporary source states, “Humility is the state of being humble. A humble person is generally thought to be unpretentious and modest: someone who does not think that he or she is better or more important than others” (Wikipedia, n.d.). These definitions adequately capture traditional usages: modesty, unpretentiousness, and realistic assessment of one’s own qualities and abilities. Since true humility (as opposed, for example, to neurotic self-debasement) is based on self-knowledge, it requires thoughtful reflection, i.e., applying the Socratic (or Delphic) dictum, “know thyself.”

Health care researchers have a lot to be humble about. First, there is the intrinsic uncertainty of medicine, its probabilistic nature, and the wide gaps in its knowledge base. In an essay published in *Mayo Clinic Proceedings*, Li characterized the humble physician as being “able to appreciate the mysteries of disease and the marvels of healing” (Li, 1999). Humility acknowledges ambiguities, mysteries, and surprises. It’s an interior response to the insight that human biology, behavior, and medicine are “totally awesome,” as my children used to say. Second, individual researchers

have personal limitations in their knowledge, technical skill, emotional resilience, and endurance. In this context, humility reflects the capacity to work within one’s limitations, to acknowledge mistakes, and to continue learning. Finally, a third factor that ought to promote humility in research is the struggle to achieve balance. This is a version of Aristotle’s claim that virtue strives for a “golden mean.” In research, as in clinical practice, competing interests (or motivations) are at stake: altruism, in the desire to help one’s patients, or create new knowledge that will help others, or advance science; and self-interest, the desire to gain recognition, money, power, and so forth. Humility recognizes these conflicting forces, steering a course between bravado, cynicism, and self-gratification on one hand; and meekness, gullibility, and utter self-effacement on the other.

As Patrick Duff observes, “Humility should be at the top of the list of desirable professional attributes . . . [however,] medical students and physicians are very accomplished and highly successful individuals. At times, their sustained pattern of success can lead to an inappropriate sense of entitlement and arrogance. From the perspective of patients and coworkers, nothing is more immediately recognizable, more unsettling, and more offensive than hubris . . .” (Duff, 2004). The same risk of entitlement and arrogance applies to students, teachers, and researchers in the other health sciences as well.

Since this reflection on paradigms is a cautionary tale, I’m obligated to conclude with a moral to the story, or at least some advice for those tempted to engage publicly in paradigm-shifting behavior. As far as I know, Paradigm Shifters Anonymous has yet to be instituted, so these are just the opinions of one man. Here they are: Be cautious about taking yourself too seriously. An ounce of reflection is worth a pound of embarrassment. Modesty is the jewel in the crown of contentment. And, remember, if exciting new paradigms are a dime a dozen, then yours is worth less than a penny.

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