

Doing the Creative Frontier: A Scientist and a Humanist Learn to Teach Humanities Together

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Abstract

This paper relates the story of two professors that have made a bridge between the two cultures, science and humanities. They teach a humanities course together.

Main Description

This paper relates the story of two professors that have made a bridge between the two cultures, science and humanities. They teach a humanities course together in which they explore the nature of the two cultures, their differences and their commonalities. The processes of team-building and planning produced five heuristic questions for the course around which the paper is organized:

1. Have science and the humanities always been separate cultures?
2. What are the respective worldviews out of which scientists and humanists work?
3. Can the two cultures be bridged?
4. What sort of dialogue can bring about that connection?
5. Can students understand and become participants in that dialogue?

The paper describes this team teaching experience from its conceptual beginnings through the actualization of those concepts. In it, we will talk about “doing” the course, what we have learned from teaching it and how we have changed from the experience.

In 1959, C.P. Snow was invited to deliver a Rede Lecture at Cambridge University. On May 7, he delivered a speech that he titled “The Two Cultures and the Scientific Revolution” and that caused a furor in the academic world. In it he articulated, the first person to do so publicly, the schism between science and the humanities, and he spoke forcefully about the dangers that schism presented. It is now 2004, 45 years after that historic lecture. The dangers that C.P. Snow enumerated have mostly been realized, and the schism is as deep as or even deeper than ever.

Snow begins by delineating between the “industrial” and the “scientific” revolutions. He characterizes his “literary intellectual” culture as “natural Luddites” who, despite their despising industry, did very well out of it. He observes that the Industrial Revolution looked very different depending on the point from which one viewed it. The Industrial Revolution spread medical care, literacy and prosperity where there had been poverty, illiteracy, and ill health. It supported the blurring of lines between social classes and it began to work at blurring the lines between high culture and low. It caused change, and change is always discomfiting.

Snow separates, however, the Industrial Revolution from the scientific one, dating the scientific revolution from the time when “atomic particles were first made industrial use of”. Snow saw and said then that the scientific revolution “is, in cardinal respects, different in kind from any that has gone before, and will change the world much more” (Snow, 1959). This statement is certainly borne out by the mechanisms through which The Second International Conference on New Directions in the Humanities was organized and implemented. The world has changed around us “natural Luddites”; we can deliver our papers virtually, if we wish, in Prato, Italy, while sitting in our offices in Buffalo, New York. Recently, Dr. Leist did a bit of consulting on electronic portfolios for the Oracle Company. The consulting took place via conference call supported by concurrent material on a website. She sat in her favorite chair in her living room for the two-hour calls, her cell phone to her ear, her laptop on her lap. Along with the other four voices present, she participated in a stimulating discussion of the subject at hand, a discussion that produced a working document concomitantly as the conversation proceeded.

In his 1993 introduction to the Canto edition of *The Two Cultures*, Stefan Collini examines and analyzes both Snow’s lecture and the responses it garnered. Collini claims that Snow was doing more than asking what the relation should be between the two cultures he believed had identified (the ‘literary intellectuals’ and the natural scientists), and doing more than asking that the curricula of schools and universities should be arranged to give people an adequate education in both branches of knowledge...he was asking how (not whether but how) the rich countries should help the poor, he was asking how the planet would be fed and what hopes the future held for mankind. (Collini, 1993).

Snow felt that literary intellectuals or humanists looked down on science as being “meanly utilitarian and grubby” (Snow, 1959). Collini points out that even though that view may have ameliorated, humanists now tend to display high anxiety about the harmful consequences of scientific discovery and progress. He advocates what he calls “the intellectual equivalent of bilingualism, a capacity not only to exercise the language of our respective specialism, but also to attend to, learn from, and eventually contribute to, wider cultural conversations.” (Collini, 1993).

Stanley Kardonsky, Ph.D. Nuclear Physics, Vice President for Finance and Management and Susan Leist, EDD, Composition and Literature Pedagogy, Professor, English Department are currently teaching a course entitled “The Two Cultures”. In it we explore the nature of the two cultures, their differences and their commonalties. Our heuristic questions for the course are:

1. Have science and the humanities always been separate cultures?
2. What are the respective worldviews out of which scientists and humanists work?
3. Can the two cultures be bridged?
4. What sort of dialogue can bring about that connection?
5. Can students understand and become participants in that dialogue?

This paper will relate our story. It will describe this team teaching experience from its conceptual beginnings through the actualization of those concepts. In it, we will talk about “doing” the course, what we have learned from teaching it and how we have changed from the experience.

The whole undertaking started, as many important things do, at a party held by our college president, Dr. Muriel Howard. Dr. Leist had been trying to get Dr. Gary Marotta, who was the college provost at the time, to teach a humanities course with her. Although that never happened, Dr. Marotta figured in this present undertaking in two ways. During that party conversation, Dr. Kardonsky was standing near enough to hear and to volunteer that he was interested in teaching a humanities course, so the occasion got us started. Then later, it was Marotta who suggested using the Snow essay and the title, “The Two Cultures”. Marotta provided the concept that would allow the course to take shape. Our heuristic questions are articulations rising out of that concept.

Question 1: *Have science and the humanities always been separate cultures?*

Both Kardonsky and Leist were interested in this question, and exploring it was quite revealing for both. The answer is, of course, that science and humanities have not always been separate cultures. Science was once called natural philosophy and was a branch of that discipline whose overarching aim is to understand the world and how humans live in it. Aristotle is generally considered to be the first scientist of record, but he was also a rhetorician and a drama critic whose influence is felt today. Through the centuries, “scientists” thought of themselves as philosophers trying to understand the natural world, as humans perceived it. Enlightenment “scientists” presented their papers to philosophical societies.

While Snow (1959) traces the origins of the cultural divide to the industrial revolution, Kardonsky and Leist believe that it is useful to look back several centuries to the life of Galileo. Galileo, whose childhood and education were typical of all male Italians of his class, would never have regarded himself as somehow of a different “culture” than his peers (although he did consider himself to be smarter). His education at the University of Pisa was in the Faculty of Arts which included the sciences of both medicine and mathematics. He lived his entire life as a devout Catholic and, but for his interest in understanding the world around him, was entirely mainstream.

We recognize Galileo as the father of experimental science and as one of the first to reject the Aristotelian method. As Nobel Laureate physicist Steven Weinberg (2001) comments in his essay *The Heritage of Galileo*, “Galileo was the first to regard matters of dynamics, like the law of motion of falling bodies, as open questions that must be settled not by pure thought but by quantitative measurements.” (Weinberg, 2001) Galileo himself wrote, “I cannot but be astonished that [someone] should persist in trying to prove by means of witnesses something that I may see for myself at any time by means of experiment...” (Galilei, 1623).

It was the position in which Galileo found himself with respect to the Catholic Church that we can point to as the root of the separation that would grow into the chasm that Snow describes. To think and teach as Galileo did was to tempt sanctions from the court of the inquisition or worse. Dominican friar Giordano Bruno had been burned alive in 1600 for espousing, among other things, support for the Copernican model. In much of Europe, therefore, the pursuit of science became one that was to be conducted pretty much out of sight or it was at least important to make that pursuit appear to be something else. Indeed, Galileo published his seminal work on the motion of the planets, *Dialogue on the Two Chief World Systems: Ptolemaic and Copernican* (1632), as a series of debates rather than a scientific treatise. His supporters would smuggle his writings out of Italy to countries where they could be published out of reach of the Vatican. Real science, then, started out as something that needed to be shipped in a “brown paper wrapper.”

Question 2: *What are the respective worldviews out of which scientists and humanists work?*

Kardonsky is a scientist. He trusts observation, replicated experiment, and numbers. Leist is a humanist. She trusts intuition, language, and conversation.

In Kardonsky’s view, there are such things as “objective truths.” Truths are value free and absolute. The role of the scientist is to learn those truths, to understand them and their role in the larger scheme of physical law.

For Leist, nothing is ever quite that black or white. Scientific “truth”, for her, is no more than another of the various ways of describing the world – neither better nor worse than any other. For her, truth is relative, situational, a construct of language, culture and expediency. She is much more aware of “ways of knowing”, is much influenced by the post-positivist paradigm.

For the scientist, the “secrets” of the universe are ultimately knowable, logical and unique. For the humanist, these secrets are also knowable, but they are explainable in many ways. She tends to give poets credit for truth-telling as often as she does scientists. Kardonsky appreciates poetry, [His favorite poem is Keats’ *Ode on a Grecian Urn* (1819)], but he looks at poetry as revealing emotional or psychological insight as opposed to replicable truth. In the uniqueness of the poem lies its inability to deliver truth, by Kardonsky’s definition. Nothing that is unable to be replicated and produce the same result can deliver lasting truth.

Question 3: Can the two cultures be bridged?

After a year or so, Kardonsky and Leist had the answer to this question. Yes and no. Leist found that Kardonsky has a much easier time swimming in her ocean than she does in his. He is certainly able to understand anything she has so far given him. He often rejects such things as deconstruction and postmodernism as cultural theory because he sees no trace of scientific objectivity in them, but he apprehends what they are and what their use is. She, on the other hand, can only follow him so far into the arcane notions of Einstein’s special relativity theory. She has not spent her life acquiring the epistemology of physics as has he. She is at best an attentive but rather slow student of science, but she understands the cultural significance of special relativity and the difference it has made in her world. She appreciates science in a way that was not possible for her before this interdisciplinary experience.

Kardonsky views Leist’s lack of facility in science as a direct result of what he perceives to be a cultural bias against scientific and quantitative experience. He notes that from grade school through university, one is exposed, in and out of both the classroom, to a great deal more art, poetry, music, novels, journalism and other traditionally “humanistic” disciplines than to science. “We grow up”, he says, “immersed in the humanities. You’ve got to make a conscious decision to go to science.” He rejects the conventional wisdom, for example, that women are mostly math phobic and argues that they never really had a chance to explore and embrace math since they are indoctrinated into the humanities (suitable pursuits) almost from infancy, much more so than men are. As Snow himself put it “It is the traditional culture, to an extent remarkably little diminished by the emergence of the scientific one, which manages the western world”. (Snow, 1959) His comment is still true. Little has changed since Snow said that. Leist comments, “Giving me a computer and a cell phone does not acculturate me to science. It simply gives me a fancy abacus with which to calculate grades, an unlimited library in which to research, and a way to revise without recopying.”

So yes, as we have demonstrated, the two cultures can be bridged, and no, because the bridge sometimes does not quite reach across the river. Kardonsky and Leist have learned about each other’s cultures. They have each gained an educated respect for both cultures. Each has gained vocabulary; each has gained conceptual agility. The interdisciplinary exposure, the talk, has given a new set of dimensions to each range of knowledge. The discoveries that they continuously make about common conceptualizations underlying bilateral working systems are a source of invariable excitement. In one of the teaching texts they use, for example, they came across a phrase applied to both Einstein and Picasso:

Instead of referring to an interplay between art and science, we must begin to speak of ideas that were developed in common by artists and scientists. The age-old quest of both art and science has been to seek new representations of phenomena beyond appearances. This effort becomes focused at the nascent moment of creativity when boundaries dissolve between disciplines and *NOTIONS OF AESTHETICS* (emphasis added) become paramount. (Miller, 2001).

Leist was caught by the concept of aesthetics applied to science, not an application that seemed usual to her. With student input, she and Kardonsky articulated a quick criteria set for “scientific aesthetics”. Kardonsky could immediately posit a list of qualities that constitute beauty for a scientist:

1. coherence
2. logic
3. “flow”
4. simplicity (elegance)
5. “Gestalt” (completeness)
6. clarity (as opposed to ambiguity)

What emerged from this exercise and the ensuing discussion was fascinating. Kardonsky is quite accustomed to practicing an aesthetic process in the course of pursuing his field. He has a cogent idea of what is more or less beautiful in science, and he uses “scientific aesthetics” as a tool just as much as does the artist or art critic.

This entire discovery has been a bit of work for each, though work they were willing to do out of commitment to their project and to their interdisciplinary relationship. Unfortunately, it is work that they do not see their colleagues doing or being willing to do.

Question 4: *What sort of dialogue can bring about that connection?*

After that first contact, Kardonsky and Leist spent the next year talking to each other. They met once a week or so in the Barnes and Noble College Bookstore for many cups of coffee. Leist had done interdisciplinary teaming before, and she understood that the first effective step in team building is connection. An effective interdisciplinary team has an understanding of the range of knowledge possessed by each member. As well, there is a relationship between the members based on mutual regard. If both these things are not actualized, the team never works to capacity.

Leist, however, had never actually team taught with a scientist, and Kardonsky had never team taught at all. In the course of the initial conversations, that second heuristic question became the overwhelmingly important one. The two found that their perceptions of reality, what each thought important about a subject, and the ways in which they thought about things were different. Kardonsky found an article by Mark Bauerlein (2001) called *The Two Cultures Again: Tilting Against Objectivity* that portrays a humanist brother trying to understand a scientist sister’s defense of scientific operational objectivity, and from reading it, Leist gained understanding of the importance of replication in verification of scientific experiment. Leist gave Kardonsky a book comparing positivism with post positivism. He was “almost persuaded”, but not quite. When she gave him materials on deconstruction, he was not impressed. Jacques Derrida sends him into fits of laughter. The two grew to enjoy ragging each other.

As the two talked on, though, they built understanding of each other, and they built regard for each other. He read things she gave him, and she read things he gave her. They often disagreed about those texts, but the important thing was the continuing commitment that made each expend the effort. They paid attention, each to the other, and eventually they began arriving at commonalities. Such phrases as “essential characteristic” and “*gedanken* experiment” from Kardonsky connected with “essential trait” and “metaphorical thinking” from Leist. They began to find some things that were the same among all those differences. Both scientists and humanists, for example, use conceptualization and construct to drive their thinking; conceptualization for the one is in the language of math and physics and for the other is in the language of rhetoric and poetics.

They each grew in understanding of the perceptions and the modes of operation of the other. They knew that there were things they would never agree on, and they began to enjoy those disagreements. It became easier and easier to communicate. The next question was whether students could, or would be willing to, enter into the communication.

Question 5: *Can students understand and become participants in that dialogue?*

After a year or so of talking, the time came for Kardonsky and Leist to plan a course that would enable students to become participants in that dialogue and that proved to encompass another set of concerns. Kardonsky had taught information-laden courses to undergraduates in which he lectured and demonstrated the principles of chemistry and physics. Leist had taught literature, writing, and methods of teaching those. For him, teaching had been about the dissemination of information and fostering an appreciation for the underlying scientific principles. For her, teaching began that way as well, but it had changed over the course of her career. Information had become a means to foster students' ability to operate as scholars, readers and writers. She had learned to use literature as a way of achieving her goals. It seemed logical to her that a way of getting students to be able participants in the dialogue would be to use literature about science and scientists, literature that would begin to demand scientific literacy from students in order for them to understand it.

Kardonsky has an open mind, and so he was willing to try teaching with materials he had certainly never considered using as pedagogical tools—novels and biographies and memoirs. Both knew that the starting point would be *The Two Cultures*, but then Kardonsky got the inspiration that sets the tone of the course. He suggested showing Stanley Kubrik's *2001: A Space Odyssey*, (1968). This icon of cinematic science fiction incorporates much of what the two see as necessary to begin the dialogue. So many things that are pictured in the film did not exist at the time it was made but DO exist now. Credit cards, voiceprint identification, Velcro, videophones, credit card telephone calls—the list is endless and the things on the list all came out of scientific invention. More importantly, the film introduces many of the questions that vex both the scientist and the humanist and yet polarize them: Where did we come from? Where are we going? What does it mean to be “human”? Students have a hard time with the film because it is so slow, but they wonder about it and begin asking the kinds of questions that Leist and Kardonsky like to hear, for they are questions with more than one answer, questions that start conversations.

The edition that Leist and Kardonsky use of *The Two Cultures* (1993) with its Collini introduction provides students with an unparalleled background for discussion of science and the humanities. Snow's perception of the growing divide between the two, especially in terms of applied science as technology, inspires students to consider how much they know or do not know about the epistemologies of both sides. When their reading continues to James Watson's memoir, *The Double Helix*, (1968) the focus shifts to the human quality of science and scientists. The book is the story of young men who possess all the foibles of their kind including chauvinism. That quality particularly affected the woman scientist, Rosalind Franklin, whose work was so important to the mapping of DNA and who remained largely uncredited in her lifetime. Students are led to consider feminist issues as well as other kinds of political issues germane to science. The realization that the mapping of DNA, one of the twentieth century's great accomplishments, was carried out by people near their own age is also a source of discussion.

As the students read these texts, they do in-class writing about the ideas and issues involved, for one of the objectives of the course is to make them better readers and writers. They work in groups as well with these issues, making group presentations to the larger class. Always Kardonsky and Leist are working to foster students as independent scholars. The class is certainly about the students more than it is about the instructors. Students learn a large body of information, but their progress as critical thinkers, readers, and writers is an overarching goal.

The other two texts that students read concern people who are very far apart in time. Dava Sobel's *Galileo's Daughter* (1999) continues the involvement with scientists as human beings. Galileo's story is a compelling one and his daughter's letters, the basis of the book, allow it to be portrayed as the

story of a very complicated man whose religious and scientific lives brought him to irreconcilable conflict. The book allows new dimensions to be brought to the concept of the two cultures. Understanding it demands exploration of the history of science, culture, and religion. Kardonsky and Leist take students to the physics department where a colleague performs Galileo's motion experiments for them. Kardonsky shows students more of the principles of physics focusing on the kinds of thinking that are involved, and Leist teaches more about literary forms. The work and life of Copernicus must be explored, and the vast differences between the prevailing paradigms of Galileo's time and those of the twenty-first century provide fuel for closer examination of both science and humanities.

The last text that students read in the course is Arthur Miller's dual biography of Picasso and Einstein, *Picasso and Einstein: Space, Time, and the Beauty That Causes Havoc*, (2001). This rather dense text demands stretching on the part of students as readers. It also provides a wealth of material to be learned about twentieth century science as well as twentieth century art. Miller's purpose in the book is to conduct an interdisciplinary examination of the common influences on Picasso and Einstein during their early lives, influences that figured in the enormous changes that each brought to his discipline. The book is a wonderful example of bridging between the two cultures since it demonstrates beyond doubt the ways in which they are inseparable.

Students end the semester with a group project presentation rather than an examination. What follows here is excerpted from the guidelines for that project.

The projects will:

1. Be worked on and accomplished in groups of 4 or 5.
2. Each member of the group will have a clear role chosen by the group.
3. Each member of the group will present to the class and then will hand in a hard copy of their product for the project grade.
4. The project's culminating presentation and products may include a wide range of venues:
 - A. Original art work.
 - B. Slides of existing artwork.
 - C. Video compilations.
 - D. Original videos.
 - E. Written texts – fiction or non-fiction.
 - F. Play scripts to be acted for the large group.
 - G. Scene productions from existing plays.
 - H. Audio compilations.
 - I. Student choice approved by the instructors.

The project demands a high level of independence from students since they are urged to conceptualize and execute it for themselves. Any resources of the college that Leist and Kardonsky can arrange for are made available to students. The products of the final project assignment have been notable. Students have written stage scripts and produced them on film. They have carried on e-mail correspondence with women scientists and incorporated that into elaborate power point presentations. They have staged and filmed a debate, which they underscored with Andy Warhol images. Always they have conducted in-depth research, manipulated their data, and produced written reports to accompany their presentations. Their sense of accomplishment is always just about commensurate with that of Leist and Kardonsky.

The experience of doing the creative frontier has been life changing for both Leist and Kardonsky. It certainly has convinced them that the abyss between the two cultures can be leveled out to

even ground. Their own ranges of knowledge have been widened and deepened. Their ideas about teaching have been tested and refined. It has been exertive for both, but the experience has been a source of professional renewal that neither would want to have missed.

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Notes