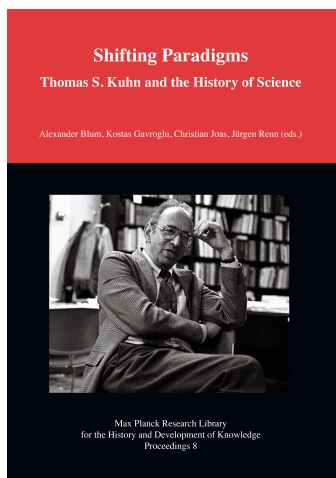


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Kostas Gavroglu:

An Episode from the History of History and Philosophy of Science: The Phenomenal Publishing Success of Kuhn's *Structure*



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Chapter 4

An Episode from the History of History and Philosophy of Science: The Phenomenal Publishing Success of Kuhn's *Structure*

Kostas Gavroglu

Introduction

One of the most intriguing issues in the history of history and philosophy of science would be to examine how and why some historians and philosophers of science and their work have been able to become (well) known outside the relatively narrow circle of historians and philosophers of science, and of some scientists. Karl Popper and, especially, his views about falsification is such a case. Another case is Thomas Kuhn, his *Structure of Scientific Revolutions* and the notion of paradigm. That Kuhn has become a household name among many communities of scholars, and importantly, among large numbers of people who do not necessarily invoke a professional reason for their interest in Kuhn, is something that many of us have repeatedly witnessed. How did a book which, at the time of its appearance was torn apart by its critics as being philosophically sloppy and historically naive, become one of the most quoted and sold books of the twentieth century? How can we go about examining such an issue? What would be the criteria in articulating a *plausibility argument* for understanding such a success outside the confines of relatively well-defined disciplinary boundaries? I would argue that to understand the phenomenal success of the book, one would have to identify the characteristics of the overall social and political context *after* the book was published, explore *how* the book was publicly perceived and what it was in *Structure* that resonated with the agendas of those seeking alternative practices and approaches in many social domains in the 1960s and 1970s.

There have been many works that attempt to situate Kuhn in the context of the period he worked in and to understand how *Structure* was formed. Perhaps, the strongest thesis is that of Steve Fuller, who argues that *Structure* is an “exemplary document of the Cold War era [...] [and Kuhn] a normal scientist in the Cold War political paradigm constructed by James Conant” (Fuller 2001, 5). Fuller examined the ways the Cold War conditions, especially those that were so prevalent

at Harvard and initiated by Harvard President James Conant, to whom Kuhn dedicated *Structure*, formed its basic tenets. George Reisch in his book *How the Cold War Transformed Philosophy of Science*, acknowledges that he “owes much to Fuller” (Reisch 2005, 229), but also diverges from him, especially in the ways he contrasts the physicist Philipp Frank’s and Kuhn’s views about physics, physicists and philosophy of science. He argues that *Structure* spoke persuasively to intellectuals and scientists because “professionalization tended to come with not only epistemic legitimacy but job security” (2005, 233). For Reisch, *Structure* appealed to scientists of different disciplines because it showed the way to intellectual success and that the “path to job security and freedom from political attack were one and the same” (2005, 233).

Another work, perhaps one that bears the most direct relevance to what I shall try to argue in this paper, is Jon Agar’s *Science in the 20th Century and Beyond* (2012). According to Agar, in the long 1960s (starting in the mid-1950s and ending in the mid-1970s) science and scientists featured in social movements in three kinds of relationships.

First, certain scientists and sciences were objects of criticism because they were seen within social movements as tools of their opponents. Second, places where science was done became theaters for social movement demonstration. Third, scientists as activists were contributors to social movements. This third relationship took two forms: their science could be incidental to their involvement in a movement or, most significantly, it could be the cause, the tool, the object and subject of activism. (Agar 2012, 404–405)

The work provides an admirable overview of what the title promises, but, also, it analyses many episodes that had been rather decisive in questioning the prestige of science and its authority. It was through these episodes that a critical discourse against the dominant scientific practices had been articulated. According to the author, this period, among other things, was characterized by conflicting expert testimony in the public sphere which brought forth all the ideological, political as well as the methodological difficulties concerning the discussions about knowledge claims. Furthermore, Agar argues convincingly, for the generation growing up in the 1960s, the images of science and technology were ‘contradictory.’ This “generation were free to enjoy benefits (domestic technologies, ‘high-tech music’, synthetic drugs) while consuming critical texts (Kuhn, Feyerabend, Carson, Ehrlich, Commoner, Illich, Schumacher) and recognizing the ‘loss of innocence’ of science made vivid by anti-nuclear and anti-Vietnam movements” (2012, 429).

What will be attempted in this essay is more akin to the exploration of the career of the book itself. Almost axiomatically, the impressive publishing record of *Structure* (which, having sold almost two million copies, constitutes a unique case in the history of history or philosophy of science) cannot be understood solely with respect to the appeal the book may have had among professors and instructors in the humanities and social sciences, or its inclusion in the reading lists of undergraduate and graduate classes. Neither the ambivalence of some philosophers (and to a much lesser degree historians) of science, who stressed some merits of the book, nor of course the references in the early works on social constructivism, can explain its huge success. Thus, my argument will not be based on those who liked and who strongly criticized the book.

Such a phenomenon needs to be understood in terms of the *public perception* of *Structure*. In what follows, I shall attempt to explore the possibilities of correlating the book's phenomenal success with various events that took place especially in the USA, but also in Britain and, to a lesser extent, continental Europe during the period 1962 to 1969, which is the period between the two editions of the book. Though the Cold War created an all-encompassing ideology and mentality, it may be instructive to note that during the same period there were serious deviations from this hegemonic ideology. During the Cold War era, there were a lot of events and initiatives whose theoretical articulation and practical repercussions clashed with the Cold War mentalities, seriously questioned the status-quo and attempted to propose different alternatives for many aspects of everyday life, be it in industrial production, scientific research, education, the role of women, the emancipation of black people, etc. During the 1960s and 1970s, a large number of scientists became seriously disillusioned with the ways in which science was practiced; they aired their varied criticisms and sought to formulate different alternatives. At the same time, many social and political events brought to the surface the deep grievances of the black community, as well as women and young people who were demanding these issues take center stage. A number of books, which I shall be discussing later on, argued persuasively for radical reorientations in a wide spectrum of academic disciplines, as well as in mainstream social and economic practices and, a few years after they appeared, became standard reading. It may not be unreasonable to argue that a book with such a suggestive title as *Structure*, and publicly perceived as a scathing criticism of the received view about philosophical issues associated with science and its history, could have become a reference point for many of those dissatisfied with the practices of the time.

In this paper I shall attempt to put forward such a plausibility argument (and it is, at best, a plausibility argument). *Structure* is a book that has been discussed and bought by many more people than its originally intended audience and in the

process became a kind of cultural icon and a “must-read” for people with a wide range of interests. The book is one of the bestsellers of the twentieth century, as well as the most cited book in the humanities. Though the book appeared in the reading lists of courses on a wide variety of subjects, what happened exclusively within academia cannot be the only explanation for such a success.¹

But what kind of book is *Structure*? There are, surely, arguments to classify it as a book on the philosophy of science, yet some prefer it as a book on historiography, while others consider it a precursor of the new sociological approaches to the history of science. Strictly speaking, the book does not “belong” to any of these categories. In this paper, the book will be regarded as a long essay about science, as a book perceived as having all the elements of philosophy, history and sociology of science, yet not written with the heavy terminology of these disciplines. It can surely be regarded, even by professionals, as a book that discusses what science “was all about.” For many, it was a book that was easy to understand; it emphasized the significance of collective work for the development of the sciences and, importantly, it discussed the grand scheme of things.

It may thus be worthwhile to distance oneself from dilemmas about the “true” nature of the book, and instead examine how the book has been perceived by the wide audience of people whose experiences as citizens made them realize, if only dimly, that perhaps the scientific enterprise was not as “innocent” and “straightforward” as generations of teachers have insisted. Thus, by distancing ourselves from the theoretical issues dealt with in the book and the subsequent reactions by philosophers and historians of science, and seeking to understand the social and ideological context within which such a book made its presence felt, we may gain additional insight into the success of the book. It may also help us to understand the social history of the book itself: not its influence within a rather narrow group of philosophers (and to some extent historians) of science, but the conditions within which the book became what it became.

My inclination is to think of the book as emerging twice: in 1962 (date of first publication) and in 1969 (date of second edition which included the epilogue/postscript).² The book's presence was felt among philosophers of science some-

¹From Kaiser (2012). Concerning the book's citations, see Garfield (1987) and Owen Gingerich, email to the author, November 6, 2009 (on the book's dominance across Harvard's curriculum).

²In 1964, two years after the publication of *Structure*, Kuhn left Berkeley to take up the position of M. Taylor Pyne, Professor of Philosophy and History of Science at Princeton University. In 1965, an International Colloquium in the Philosophy of Science was held at Bedford College, London. One of the key events of the colloquium was to be a debate between Kuhn and Feyerabend, who, however, could not attend because of illness. John Watkins replaced Feyerabend, the session being chaired by Popper. In the discussion, after the papers were delivered, Popper, Margaret Masterman and Stephen Toulmin severely criticized the book. Papers from these discussants along with contributions from Feyerabend and Lakatos were published several years later in *Criticism and the Growth of Knowledge*, edited by Imre Lakatos and Alan Musgrave (1970). A few months earlier in 1969, the second edition of

time between its first and second edition when the spokesman *par excellence* of the established order in philosophy launched an attack against Kuhn. Karl Popper, whose *Conjectures and Refutations* was published a year after *Structure*, ever so confident that his own views were exempt from the criterion of falsificationism, in the 1965 conference found nothing right with Kuhn's views. But by the time the *Proceedings* of the conference appeared in 1970, Kuhn had already incorporated his responses to these criticisms in an epilogue/postscript to the second edition of the *Structure*. It was as if the second edition came to complete what the first edition had started. "Something happened" to the first edition and what happened was reflected in the second edition. Notwithstanding the pronouncement in the 1964 *Scientific American* review of *Structure*, that the book was "much ado about very little" (Anonymous 1964). *Structure* was there to stay, having received an uncanny and certainly unusual blessing by the old school: the strong criticism the book received, especially by the politically conservative Karl Popper, "turned" the book into one of the reference points in the trade, providing it with an "anti-conventional" aura. Kuhn's new ideas could not have been ignored, since they undermined—even in a philosophically naive way—the very fabric of the received view. The strong criticism the book received had an additional, yet peculiar, side effect: this long essay about science was also perceived by many within academia as a diatribe against logical empiricism—something that experts knew was not true—and such a perception reinforced its popular expositions that stressed its revolutionary character.

The Public Perception of *Structure*

When discussing such widely circulated books (and not only scholarly ones), one should always be aware of the difference between the character of the consensus among the specialists and experts about the merits of the book, and the social perception of the book. The two are not necessarily identical, and may not even be consistent with each other. The social perception of *Structure* has resulted from the complex mechanisms that shaped the circulation of knowledge about the book: the serious, and less serious, popularizations of the book led to an amazingly large number of people apparently knowing "something" about the book and having an "idea" of what the book was about, without having necessarily read the whole or even parts of the book. Scientific popularization is neither impervious to what is happening in the wider social context nor is it a process where every aspect of what is being popularized is carefully scrutinized by those who popularize it. The social perception of such books is the result of eclectic

Structure was published with an important postscript. It was in this postscript that Kuhn incorporated his answers and clarifications (especially about the notion of paradigm) in response to his critics.

presentations and the ensuing discussions of what is projected in these books as being the “relevant” aspects of the subject matter. Hence, the public perception of such books appears to be tandem with various social and political prerogatives of the time, rather than exclusively academic or disciplinary ones. Indeed, in the period between the two editions of *Structure*, we do witness a number of such social and political and social prerogatives.

One of the best ways to get a feeling about the public perception of *Structure* is by looking at Kuhn himself. In his interview with John Horgan in 1991 for *Scientific American*,³ he reminds the interviewer that as he had often said he was “much fonder of my critics than my fans.” Kuhn recalled a student thanking him for telling “us about paradigms. Now that we know about them, we can get rid of them.” In one seminar, he experienced both students and the professor discussing “how [his] book denied truth and falsity.” And when Kuhn tried to explain that within the framework of a paradigm such concepts were, in fact, necessary for the scientists’ work, the professor intervened and told him “you do not know how radical this book is.” There were instances when things got out of control: “I get a lot of letters saying, ‘I’ve just read your book, and it’s transformed my life. I’m trying to start a revolution. Please help me,’ and accompanied by a book-length manuscript” (Horgan 2012).

In fact, it has been often noted by anyone who talked to Kuhn that he was greatly distressed by all those who opposed science, and especially in the 1960s, thought they had found an ally for “pure experience” in *Structure*. Kuhn himself had acknowledged that many people thought that science is nothing more than power politics, triggering strong reactions on his part. In addition to all the “misunderstandings” the public perception of his book brought about, another aspect of it made it particularly welcome to many who were becoming uneasy and critical with what had been going on around them, be it in science or politics. Though the notion of progress in the sciences was not free of problems, Kuhn had given it a rather intriguing twist. Science was surely progressing—it was changing—but it was not evolving toward *the Truth*. Hacking expressed it rather succinctly: “he just thought that progress wasn’t ‘to’ something. It was progress away from what didn’t work very well, but that there isn’t any kind of permanent goal.”⁴ Such a viewpoint was indeed a radical alternative to the unidirectional notion of progress that was such an integral part of the hegemonic ideology and against which there were, at the time, such strong reactions among many segments of American society.

Concerning the public perception of *Structure*, Kuhn himself was even more forthcoming in one of his interviews:

³Interview of Thomas Kuhn with John Horgan, (1991).

⁴Interview with Ian Hacking by Gary Stix, (2012).

I mean, a lot of the early audience [for SSR] was social scientists ... I gradually realized that a lot of the response was coming from social scientists. I thought of the book as directed to philosophers. And I think not a lot of them read it, I think it was picked up much more widely than that [...] The sixties were the years of the student rebellions. And I was told at one point that, Kuhn and Marcuse are the heroes at San Francisco State University. Here was the man who had written two books about revolutions, and students used to come to me: it's "thank you for telling us about paradigms, now that we know what they are we can get along without them." All seen as examples of oppression. And that wasn't my point at all! I remember being invited to attend and talk to a seminar at Princeton organized by undergraduates during the times of troubles. And I kept saying, "But I didn't say that! But I didn't say that! But I didn't say that!" And finally, a student of mine, or a student in the programme who would sort of help get me into this and had come along to listen said to the students, "You have to realize that in terms of what you are thinking of, this is a profoundly conservative book." And it is, I mean, it was in the sense that I was trying to explain how it could be that the most rigid disciplines and the most authoritarian could also be the most creative. [...] So, it's hard to say how I felt. I thought I was being, I want to say badly treated, badly misunderstood. And I didn't like what most people were getting from the book [...].⁵

Throughout the 1970s and to a certain extent 1980s, the book met the fate of what Copernicus, the hero of Kuhn's first book, wrote at the beginning of *De revolutionibus* in his letter of dedication to the Pope. In order to convey the arbitrariness of the hypotheses astronomers of the Ptolemaic tradition used for their calculations, Copernicus likened them to someone who would

[C]ollect hands, feet, a head, and other members from various places, all very fine in themselves, but not proportionate to one body, and no single one corresponding in its turn to the others, so that a monster rather than a man would be formed from them.⁶

The public perception of *Structure* and the way the catchword paradigm has been (ab)used may have had monstrous overtones for professional philosophers of sci-

⁵Interview with Thomas Kuhn by Aristides Baltas, Kostas Gavroglu and Vaso Kindi, Kuhn (2000, 255–323).

⁶From the Letter of Dedication to Pope Paul II, Rosen (1992, ix-xii).

ence and for Kuhn himself.⁷ Nevertheless, the perception of the book by an impressively large audience as a book proposing alternative ways for science gained a dynamic of its own.

The Title

The book had the catchiest of titles. Every word triggered all kinds of connotations in the new realities being formed in the 1960s when science and revolutions were strongly present in the public discourse of, at least, the English-speaking world. *Structure* was less conspicuous in the public domain, yet its meanings and repercussions were strongly contested in the academic environments, at least in the French-speaking world.

The notion of “structure” or its more formal expression “structuralism” had a rather insistent presence in academia and had been a source of major re-orientations in various fields: linguistics, psychology, sociology, economics, literary criticism, architecture and, of course, anthropology have all had a rich history of discussions concerning the possibilities opened up by a structuralist approach to each discipline. Given the difficulties involved in defining such approaches, Simon Blackburn’s suggestion succinctly captures most of the characteristics of structuralism as a viewpoint and as a research program: “the belief that phenomena of human life are not intelligible except through their interrelations. These relations constitute a structure, and behind local variations in the surface phenomena there are constant laws of abstract culture” (Blackburn 2008, 322).

Though structuralism was originally put forward in linguistics by Ferdinand de Saussure at the beginning of the twentieth century, it was the work of Claude Lévi-Strauss that from the early 1950s and throughout the 1960s rekindled interest in structuralism. 1962, the year *Structure* first appeared was also a “very good” year for structuralism. It was the year Lévi-Strauss published his seminal work *La Pensée Sauvage*.⁸ Though of a different orientation, 1962 was also the year Jürgen Habermas completed his *Strukturwandel der Öffentlichkeit. Untersuchungen zu einer Kategorie der bürgerlichen Gesellschaft*, where the notion of structure featured prominently and where he articulated the concepts that have been so central to political theory ever since (Habermas 1991).

⁷“Today, you can purchase audio and video equipment from Paradigm Electronics in Ontario, Canada; you can buy bonds and stocks from Paradigm Financial Partners in the UK; you can obtain solutions to your human resource problems from Paradigm Shift Consulting Service, Ltd. In India; or—best of all—you can read a provocative Paul Krugman op-ed piece in The New York Times entitled ‘The Ponzi Paradigm’,” Goldstein (2012, iii).

⁸French edition 1962, English edition 1966.

During the period between the two editions of *Structure*, Noam Chomsky would strongly criticize the structuralist approach in linguistics. His classic books in linguistics were published in the 1960s, all borrowing from the findings and arguments of his first book *Syntactic Structures*, published in 1957. Kuhn joined the MIT in 1979 where Noam Chomsky was already working. Not only did they share the WWII bunker, where their offices were long situated, but also a particular notion, appearing in the titles of their hugely successful works, although they differed on the emphasis of paradigm shift. Jean Piaget, however, had a different view. In his *Structuralism* of 1968, he found a parallelism between Kuhn's notion of paradigm and the notion of episteme proposed by Foucault in his *Order of Things*, which saw seven editions between 1966 and 1967. By the late 1960s, about a decade after Lévi-Strauss was appointed as Chair of Social Anthropology at the Collège de France, a group of French scholars would initiate a systematic criticism of structuralism, building a well-argued conceptual framework while vying for a rather strong presence in the debates about the social sciences and fighting for a hegemonic presence in their academic settings. The arguments of M. Foucault, J. Derrida, R. Barthes and L. Althusser articulating the post-structuralist framework were commanding ever larger audiences and these discussions were also echoed in the USA where, in 1966, a conference was organized at Johns Hopkins University with Derrida, Barthes and J. Lacan among the main speakers.⁹

Science was surely a structured set of beliefs, and logical positivism, so dear to the hearts of most practicing scientists, was a program to unfold the logical structure(s) of science. In 1961, a year before the appearance of *Structure*, Ernest Nagel's *The Structure of Science* was published. It was a book squarely within the tradition of logical positivism. Both books appeared when the set of ideas around structures were starting to be intensely discussed in academic circles. The two *Structure(s)* symbolized, in a way, the end of one era and the beginning of a new one, at least in the ways many philosophers, but not only philosophers, viewed science. If Nagel's *Structure of Science* was rather static and dealt with science ahistorically, Kuhn's *Structure* was forward looking and signified that change (in the form of revolutions) had a structure as well.

In the period between the two editions, the *problematique* concerning structuralism underwent a deep metamorphosis yet, at least in the USA, most of the repercussions of these discussions were basically confined to academia. It was what "happened" to the other two words in the title—science and revolution—that proved absolutely decisive for the book's success.

⁹See Macksey and Donato (2007).

Science

The manifesto of *Undercurrents: the magazine for radical science and the people's technology*, founded in 1972 and published in London, captured rather succinctly the climate of the times:

Science, we feel, has largely abandoned its original “quest for truth”—if the phrase today sounds naive, it is a measure of that abandonment. *Undercurrents* believes it is possible to evolve a ‘sadder but a wiser’ science, a science that is aware of its limitations as well as its strengths which will search the hitherto ignored areas of human experience for clues to more meaningful and relative synthesis than is dreamt of in our present philosophies.¹⁰

One can speculate that if such a manifesto had been written ten years earlier, it would have had almost no audience. The 1960s, however, witnessed serious cracks in the perception of science as a process of a continuous accumulation of new and useful knowledge to be exploited for the benefit of humanity. Many social phenomena appeared to be undermining such an image of science, with serious repercussions. The shocking effects of pesticides, the involvement of scientists in planning the atrocities of the Vietnam War, the renewed discussion (and in many cases application) of lobotomies as a means of containing violence, the energy crisis and the realization that there may be non-reversible environmental damage caused by humans slowly started to mar the image of science.

The first edition of *Structure* in 1962 coincided with the publication of Rachel Carson's *Silent Spring*, another eye-opening book that concerned the environment, whose self-sustainability until then had hardly been questioned (much like the characteristics of science which, before *Structure*, were almost universally thought of as self-evident). *Silent Spring* exposed the amazingly harmful effects of pesticides and in effect gave a great boost to all the feeble discussions about environmental issues. It was also the year that London fog—despite its catastrophic effects ten years earlier and the clean-air act that followed it—caused the deaths of hundreds of people. Starting in 1961 the US Air Force used Agent Orange extensively; its development was the result of work in many laboratories and its effects on the environment and humans, as it was soon realized, were disastrous. Between the first (1962) and second edition (1969) of *Structure*, a strong and very vocal movement criticizing many aspects of scientific practices emerged among scientists and commanded an ever larger audience. This movement culminated with the publication a few years later in

¹⁰See <http://undercurrents1972.wordpress.com/2013/02/06/uc-manifesto/>, p. 2.

1972 of the immensely influential booklet titled *Science Against the People* by a group of well-known scientists who exposed the activities of the prestigious JASON committee. This advisory group, comprised of “star” scientists in the USA, were generously financed by the Department of Defense and became deeply involved in developing the anti-guerrilla techniques used by the US Army in Latin America and during the Vietnam War.¹¹

Interestingly, such “cracks” in the image of science appeared within a context where success stories of science and technology continued. The reaction to Sputnik resulted in an appeal for more advances in science and technology, and in the 1960s, once TV sets had also invaded households, this flooded the public discourse. The hugely successful Apollo Program, which culminated with three astronauts landing on the moon in 1969, made not only the Americans re-live the triumph of the Manhattan Project. Though not as lethal in its connotations this triumph was equally forceful in the message it conveyed to the Soviet Union. The term “personal computer” seems to have been coined for the first time in 1962.¹² The period between the two editions of *Structure* was the period of human organ transplants: it was the time when liver, lung, kidney and later, in 1967, heart transplants were successfully carried out on humans. In a different direction, William Masters and Virginia Johnson did most of their ground-breaking work on the nature of human sexuality, which helped dispel all kinds of myths about women’s sexuality, in the Reproductive Biology Research Foundation founded in 1964. They jointly wrote two classic texts in the field, *Human Sexual Response* and *Human Sexual Inadequacy*, published in 1966 and 1970, respectively. Both of these books were bestsellers and were translated into more than thirty languages. Thus, alongside the strong criticism against the various uses of science and technology, the success stories continued unabated. These and many other developments during the period between the two editions of *Structure* kept the notions of science and technology continually “in the news.” The combination of success stories and the problematic (or scandalous, according to some) aspects of science and technology induced many people to rethink both the limits and the repercussions of what science can do and what it “should” do.

But, as we noted, all was not well. It was in 1962 that an article in the *Washington Post* by Morton Mintz exposed a horrifying story: The tranquilizer pill thalidomide was the cause of thousands of children being born without limbs.

¹¹ See <http://socrates.berkeley.edu/~schwartz/SfIP/JASON/Jason.html>.

¹² November 3—The earliest recorded use of the term features in *The New York Times* in a story about John Mauchly’s lecture the day before at the American Institute of Industrial Engineers. Mauchly, “inventor of some of the original room-size computers,” says that “in a decade or so” everyone would have their own computer with “exchangeable wafer-thin data storage files to provide inexhaustible memories and answer most problems.” He is quoted as saying “There is no reason to suppose the average boy or girl cannot be master of a personal computer” Mauchly (1962).

The outcry that followed the article led to the banning of this sedative and to laws being passed for stronger regulation of drugs; its manufacture, however, was far from being terminated.¹³ In addition, Mintz in a long report exposed the side effects of “The Pill,” the contraceptive that was hailed in 1960 as having redefined the role of women. His accusation was that by approving the pill, the US Food and Drug Administration had launched the “greatest uncontrolled medical experiment”¹⁴ in human history since the tests and evidence concerning side effects were hugely inadequate.

The case of the XYY chromosome and its connection to violent behavior was a particularly instructive case. After the unprecedented Watts Riots in Los Angeles in 1965, two publications in prestigious scientific journals—in *Nature* (December 1965) and in *The Lancet* (March 1966)—reported that in a study of 315 male patients in one of the special security hospitals for the developmentally disabled, nine of them were found to have the 47th chromosome.¹⁵ It was reported that these patients were taller than the average height of the other patients and the authors characterized them as being “aggressive and violent criminals.” In 1968, *The Lancet* and *Science* published the findings of Mary Telfer, a biochemist at the Elwyn Institute, formerly known as “The Pennsylvania Training School for the Feeble Minded,” in which she claimed that acne was the distinguishing characteristic of XYY males, since in her study in the hospitals and penal institutions of Pennsylvania, she had found five tall boys and men who had facial acne.¹⁶ And since the convicted murderer Richard Speck, who had tortured, raped and murdered eight student nurses from South Chicago Community Hospital on July 14, 1966, was acne scarred, it was suggested that the XYY syndrome was associated with aggression and criminality—even though Speck was not a XYY male, although it was reported that he was! In April 1968, the *New York Times* ran a three-part story about these findings, starting with a long first-page article in the Sunday edition, introducing this research the public. *Time* and *Newsweek* were quick to follow. Telfer was the exclusive source for all these articles.

The first comprehensive review article about the XYY syndrome was published by the end of 1968 in the *Journal of Medical Genetics*. The author was Michael Court Brown, director of the Medical Research Center Human Genetics

¹³For an amazing story involving thalidomide, politics and financial dealings, see <http://www.theguardian.com/society/2014/nov/14/-sp-thalidomide-pill-how-evaded-justice>.

¹⁴This was originally claimed in the Washington Post in 1962, to be emphatically repeated by Mintz in his review of Maurice Perutz's book, *The Fifth Freedom*, Mintz (1993).

¹⁵In 1961 the first report of a man possessing a 47th chromosome was published. See Anonymous (1966); Jacobs, Brunton, et al. (1965); Prince et al. (1966); Sandberg et al (1961).

¹⁶Telfer (1968); Telfer, Baker, Clark, et al. (1968); Telfer, Baker, and Longtin (1968).

Unit.¹⁷ The article reported no statistical differences when the chromosome surveys in prisons and hospitals for the developmentally disabled were compared to those of the population at large. Telfer's results were considered to be seriously flawed, showing selection bias. In May 1969, at the annual meeting of the American Psychiatric Association, Telfer and her colleagues reported that their recent studies did indeed find that there were no differences.

Perhaps no other incident in the 1960s showed in such a dramatic manner how "scientific findings," social events, the hegemonic ideology and the mass media comprised such an integral whole. Though from the very beginning, the methodological flaws in this line of research were pretty clear, the amazing publicity it received from the "serious" scientific journals, newspapers and magazines showed that this kind of interrelationship was indicative of the less-than-objective nature of some scientific work. It can, of course, be claimed that all was well, since in the end the "bad science" of Telfer was exposed. But this was hardly the case. In 1974, psychologist John Money at Johns Hopkins Hospital experimented on thirteen XYY boys and men (ages 15 to 37) in an unsuccessful attempt to treat their history of behavioral problems with chemical castration using high-dose Depo-Provera. The side-effects were weight gain (avg. 26 lbs.) and suicide. This was not a case of science "going wrong." This was a line of research where people were actively involved in attempts to create a paradigm shift: an attempt to find "the seat" of violent behavior in biological entities.

Science—or, at least the scientific enterprise—did not *by definition* appear to be an undertaking pursued by virtuous individuals seeking objective results for the benefit of humanity. One needed many qualifications to reach such a conclusion. And though there had been similar worries in some scientific circles in the early 1950s concerning the build-up of nuclear weapons, the 1960s brought about a deeper sense of disappointment in the role of science to many more people. Increasingly, more and more scientists, students from a wide range of disciplines, intellectuals and of course, philosophers and historians of science were becoming very uneasy with the received view of science.

In less than ten years, Stanley Kubrick made three films containing some of the strongest statements about science and technology "going wrong." For many people, among his three roles in the 1964 film *How I Learned to Stop Worrying and Love the Bomb*, Peter Seller's eccentric scientist "Dr. Strangelove" seemed most realistic. In his 1968 film, *2001: A Space Odyssey*, the protagonist was, in effect, "Hall 9000," a computer capable of speech, speech recognition, facial recognition, natural language processing, lip reading and interpreting. It could also reproduce emotional behaviors, automated reasoning and even play chess!

¹⁷Brown, Price and Jacobs (1968a, 1968b); Green (1985); Harper (2006, 77–96); Jacobs (1982); Jacobs, Price, et al. (1968).

Whereas, *Clockwork Orange*, released in 1971, depicted the mediation of drugs in containing violence through behavior modification and the role of the state in this, it was actually an adaptation of Anthony Burgess's 1962 novella of the same name, a critical study of psychophysical and psychochemical methods used to "cure" violent behavior. The roles of scientists and government officials were presented as being complementary to projecting a view of science that was at the service of "law and order," with almost no concern for the ethical status of the methods used, their side effects or even their effectiveness. It was a film that examined the kind of science produced as a result of the close relationship between scientists and those holding political power. The "success" of science became its own dead end. What the novella and the film depicted was not so far removed from the situation relating to the XYY syndrome. A combination of bad methodology, conservative politics and the pressure to find "solutions" after the ghetto uprisings gave this discovery impressive coverage. The XYY incident is particularly characteristic of this period since it shows both the vulnerability of science to social forces as well as its self-correcting processes. It was an incident that convinced many people that scientific practice was far from being immune to what was happening in society at large, and often succumbed to the views and policies of the dominant social groups.

In an altogether different framework, between 1965 and 1975, Berkeley physicist Geoffrey Chew challenged the dominant paradigm in physics with his particularly interesting approach to elementary particle theoretical physics. Particle physics was previously dominated by a strict division between elementary and composite particles. Chew initiated a method whereby all particles—elementary and composite—were treated on an equal footing and called his approach "nuclear democracy." "My standpoint here [...] is that every nuclear particle should receive equal treatment under the law," he wrote in 1964. Chew, who was active in the reform activities concerning the changes in graduate physics courses, time and again explained their "unequivocal adoption of nuclear democracy as a guiding principle." He began by contrasting, at some length, "the aristocratic structure of atomic physics as governed by quantum electrodynamics" with the "revolutionary character of nuclear particle democracy." Chew—who had played an active role in the Berkeley Free Speech movement during the 1964–1965 academic year—and his collaborators published many papers in the standard journals and, in fact, claimed moderate success in dealing with the mainstream problems in elementary particle physics, before his method waned, basically because of serious difficulties involved in the calculations.

As Chew's program ran into difficulties, another group became active at Berkeley. In his provocative book *How the Hippies Saved Physics* (Kaiser 2012), David Kaiser told the intriguing story of the Fundamental Physics Group: a group

of physicists, largely from the West Coast of the USA, who insisted that physics as it was practiced in the 1960s had broken away from the culture of modern physics as established by its founders. They argued that to think about physics in a philosophically sophisticated manner, and to deal with all technical aspects without neglecting the conceptual dimensions, was part of the legacy of physics. They felt that the way physics was taught and practiced, the pragmatic culture of doing physics that was particularly prevalent in the US, was heading towards a dead end. Though the group was formed in 1975 and had been preceded by the “Consciousness Theory Group” and the “Physics/Consciousness Research Group,” what had triggered these initiatives was Bell’s theorem, published in 1964, which demonstrated the possibility of testing the non-locality of quantum mechanics. This was in fact verified in experiments by Aspect and others in 1981. The prospect of the Einstein Podolsky Rosen paradox being accommodated within quantum mechanics led some people to investigate the limits of what quantum mechanics could tell us about our consciousness, something that appeared to be of interest to the Central Intelligence Agency, which funded some of the groups’ activities!

“Unhappiness” with the present state of science was also expressed from other quarters in rather extreme forms. After Timothy Leary founded the International Foundation of Internal Freedom in 1962, “experimenting” with LSD became rampant. Public discussions and articles in almost every newspaper and magazine about states of new or higher consciousness became very frequent, putting questions about ethics, limits and freedom of the scientific pursuits on the public agenda. Leary, “America’s most dangerous man” according to Richard Nixon, was fired from Harvard the following year and his *Psychedelic Experience*, published in 1964, played an important role in his collaboration with John Lennon of the Beatles for the coming years.

Apart from individual critical reactions to prevalent mainstream scientific practices in the late 1960s and early 1970s, three collective initiatives provided the medium for articulating a systematic criticism of many facets of scientific activities—especially those related to the war in Vietnam. Three journals, accompanied by three collectives, appeared at the beginning of 1970s. *Radical Science Journal* was based in the UK. *Undercurrents*, ‘the magazine of alternative science and technology’ was also published in England between 1972 and 1984, when it was merged into *Resurgence: Science for the People* which was based mainly in the USA. In the 1969 meeting of the American Physical Society, two well-known physicists Charlie Schwartz and Martin Perl led an initiative to get a resolution passed against the Vietnam War. Though this did not materialize, a group of physicists established a group called “Scientists and Engineers for Social and Political Action” (SESPA), which participated in the 1970 annual meeting of the American Association for the Advancement of Science. The subsequent col-

lective *Science for the People* became rather vocal in similar meetings and began to publish the journal.

It is interesting to note that the British Society for Social Responsibility in Science was founded in 1969 by a large number of well-known academics, including over 40 fellows of the Royal Society with the Nobel Laureate Maurice Wilkins as its first President. Its explicit aim was to explore the individual and collective responsibilities of scientists, to demonstrate political, social and economic factors affecting science and technology, and to draw attention to the implications and consequences of scientific development. The intention was to generate an informed public.

The creation of these three journals and the activities of the members of the collectives resulted in a sharpening of the critique of science, of its practices and, most notably, of the political implications of scientific research in some subject areas. Science and technocracy could not continue their march unscathed. The problems appeared more serious than “bad” applications of otherwise “good” science. The whole fabric of scientific activity, whether in the production of new knowledge or its applications, was perceived as needing serious readjustment. The postwar image of science and the ethos of those associated with its practices undermined the questionable status of the health and safety regulations of government or companies: the effects of pesticides, the laxity of government agencies in granting patents, the strong presence of pharmaceutical companies in research in university laboratories, the involvement of scientists in the war machine, the forum provided by prestigious journals for methodologically questionable scientific work, the dead end of “expensive” physics and even the attempts to escape the restraints dictated by dominant scientific practices. If left to their own devices, neither the scientists nor the government agencies and companies seemed able to achieve the virtuous effect going hand in hand with textbook narratives of what science and scientists should do for society. While in the long run it appeared that a democratic society had the means and the people to bring about at least a partial catharsis, by the end of the 1960s and the beginning of the 1970s the image of science had been severely tarnished.

Revolution

If a number of events played a catalytic role for society at large to reflect on and re-appraise the development, practice, research and applications of science between the two editions of *Structure*, the same period witnessed a rather strong re-orientation concerning another word appearing in the title of the book. No one could ignore the references to revolutions in what was happening among students, hippies and the black community as well as in the colonies in Africa, the

movements in Latin America, China and, of course, Vietnam. Neither citizens in general nor the intellectuals in particular were indifferent to this. Whether friend or foe of these actual or potential political and social upheavals, no one could afford to dismiss them as fleeting, transient and ephemeral situations. The word “revolution” was no longer associated solely with the threat from the Soviet Union, and society at large became used to hearing the term and discussing its implications. Much like “science,” “revolution” also became the talk of the town—admittedly a very large (global) town.

The completion of what was long considered as the paradigmatic revolution was heralded in 1962: the protracted uprising of the Algerians against the French, culminating in the declaration of their independence. In 1963, Hannah Arendt published her influential book *On Revolution*. Interestingly the most popular phase of the “revolutionary” Beatles coincides with the period between the editions of *Structure*: Their first hit *Love me Do* was released in 1962 and the band broke up in 1970, having recorded the song *Revolution* in 1968. Three years earlier, in 1965, Bob Dylan recorded *Mr. Tambourine Man* and his “revolutionary” album *Highway 61 Revisited*.

Another event with momentous repercussions was the Cultural Revolution in China, initiated by Mao Zedong himself in 1966 and lasting until 1976. Many scientists and scholars both in the USA and (Western) Europe were very sympathetic to the Cultural Revolution because, among other things, one of its aims was to create alternative sciences in agriculture and medicine.

In 1968, the expression “Green Revolution” was inaugurated for the first time, associating the word revolution with something whose beneficial repercussions were almost identical to utopian pronouncements. In the same year, the director of the United States Agency for International Development, William Gaud, who later received the Nobel Peace Prize for Peace, in a speech before the Society for International Development talked about the vast possibilities the new technologies could provide for agriculture. He was convinced that the technical developments contained the “makings of a new revolution. It is not a violent Red Revolution like that of the Soviets, nor is it a White Revolution like that of the Shah of Iran. I call it the Green Revolution.”¹⁸ Sadly the fate of this revolution led to serious catastrophes of established agricultural patterns and practices, and led to increased poverty among the poor in various nations.

1962 was also the year when a declaration known as the Port Huron Statement spelled out the principles and aims of the Students for a Democratic Society (SDS), which would play an absolutely decisive role in many of the developments

¹⁸“The Green Revolution: Accomplishments and Apprehensions” Address by William S. Gaud (administrator at Agency for International Development, Department of State, USA) to the Society for International Development, March 8, 1968.

among American students and youth during the coming decade. The manifesto condemned the role of large corporations, blamed the government for poverty, reproached racism and called for a participatory democracy.

Last but not least, the years between the two editions witnessed one of the most tempestuous events in American history: the uprisings in black neighborhoods, especially those in Watts and Detroit. The Civil Rights Movement following Martin Luther King Jr.'s "I Have a Dream" speech in 1963 and his declaration of the Program Alabama was followed by the Selma to Montgomery marches. The rest is history: the establishment of the Black Panther Party in 1966, the formation of the Weather Underground Organization in 1969 and the countless assassinations of emblematic figures signified the deep and radical changes, whether abhorrent or welcome, that would affect everyday life. Revolution was no longer something foreign to American society nor was it an abstract concept. It was there, menacing or liberating, depending on who you were, but surely not something to be indifferent about.

The Watts riots (or rebellion) references what occurred in one of the most impoverished neighborhoods in Los Angeles in 1965. The arrest of a black motorist by a highway policeman sparked riots that lasted for six days and could not be contained, even after troops of the National Guard moved in. After a curfew was imposed and the riots subsided, there were thirty-four dead, a thousand injured and four thousand arrested. The investigation that followed found that the reasons for the riots were the abominable living conditions of the people living in the Watts neighborhood. The Watts riots and the following events in Detroit in 1967, which were brought about by essentially the same reasons as the Watts riots, resulted in even more casualties. These events became emblematic symbols for the most radical aspects of the Civil Rights Movement. The urban riots were at the beginning conveniently regarded as the expression of violent behavior by innately violent individuals. Yet, soon they came to symbolize the plight of the black community in the USA.

In fact, this was the same period when the Revolution(ary) became visible. The murder of Che Guevara in Bolivia in 1967 caused his image to be shown almost everywhere, also portraits in the famous iconoclast, Andy Warhol's, pantheon. Graffiti, blouses, t-shirts and posters helped the image of revolution invade private spaces and become part of people's appearances. For better or for worse, fewer and fewer people could afford to be indifferent about "The Revolution(ary)." Thus spurred by momentous world events in the period between the two editions of *Structure*, the word "revolution" became deeply entrenched in the public discourse.

The public discussions about Kuhn's book outside the narrow circle of philosophers of science (since historians of science hardly participated in the

discussions), its popularizations and the references to it, all took part in the context surrounding these events. Science was no longer something to be unconditionally worshipped. Between those who were uncritically talking about science and those who were inaugurating the anti-science movements, many people began to seek a third approach whose faint yet definite path was now becoming feasible. The same thing happened to revolution. Revolution was no longer a reference to characterize the birth of two "nations": one in 1776, which personified everything that was (absolutely) good, and one in 1917, which personified everything that was (absolutely) bad. An alternative approach, with its excesses and contradictions, was also being articulated. Within such a framework, a book with such a title as *Structure* could hardly have gone unnoticed in the 1960s and 1970s. This does not go to say that all who were attracted to its title read it closely, nor do I imply that the title in itself is responsible for the book's success. Surely, however, in the specific conditions of the period, such a title greatly helped the propagation of the book and increased the number of people who became acquainted with its contents through its many and varied popular expositions.

Kuhn's book appeared in a period when, on one level, there were concerted efforts to normalize educational programs in accordance with the hegemonic Cold War mentality, and "prove" that the USA could do better things in space, in technology (as the famous Kitchen Debate between Nixon and Khrushchev showed during the opening of the American National Exhibition in Moscow in 1959), in cinema, in economy and in education. On another level, there was the formation of a multiplicity of viewpoints which, by the mid-1960s and throughout the 1970s, would strongly challenge established and long-cherished values and ideals, mainly in the USA and, then, in many European countries. The book appeared and slowly took off during a period of intense criticism of the ways in which science was produced, practiced and applied. The 1960s and 1970s became a period of both radical criticism of the sciences *and* of a search for alternative models concerning the production, practices and applications of science. Such discussions and controversies were not part of the anti-science trends of the 1960s. Quite the opposite: painstaking efforts were made to articulate a new paradigm, in education, in the ways that science was practiced and applied, in energy consumption and even in personal relationships. There was an overall feeling that American society was in search of a paradigm shift. A paradigm shift appeared to be the common aim of those who were critical of many aspects of the sciences and technology. Kuhn's book, surely without its author's blessings, became a kind of reference point for many people who were unsatisfied with the *status quo*.

It was a book with a specific title, which according to its popular accounts argued that there could be changes in the sciences, and not necessarily through

only well-defined methods and rational undertakings. It insisted the new paradigm could be incommensurable with the old; it had no difficulty catching the imagination of many people who were discontented and even disgruntled with both the way in which science was pursued and the ways that society was run.

It was not unreasonable for people who were frustrated with the social function of science to have thought that *Structure* could provide clues for an alternative approach, or that it would help them understand the reasons why so many things, at least in the sciences, went wrong. Since more and more people began to associate the book with the notion of paradigm change, it may have appeared that *Structure*—which in the minds of many was about science and scientists and not a strictly philosophical book—had the answers. Scientists could relate to the book in their everyday lives; students could find a critique of education. People participating in social movements (whether for civil rights, the running of the universities, pro-peace, “science for the people,” and so on) found justification to diverge from rational ways to change the status quo. Self-proclaimed revolutionaries considered the possibility of erasing old memories and starting a clean slate, regardless of whether these “readings” could hold when the contents of the book were analyzed in accordance with the rules of academic discussion. Society at large and its various sub-cultures do not always obey the rules of academia when perceiving and appropriating ideas expressed in books. It is these processes that “made” the book into a cultural artifact.

Books in Search of New “Paradigms”

I knew someone at Princeton, who congratulated me on avoiding being a guru. And she said I could so easily have been the Marshal McLuhan of science.¹⁹

The Gutenberg Galaxy: The Making of the Typographic Man by Marshall McLuhan was published in 1962. The author argued about the deep interconnections between communication technology (even from ancient times) and cognitive organization, bringing about dramatic repercussions in the ways societies are organized. This pioneering work in cultural and media studies was followed in 1964 by a work that provided a further solid basis for media studies. *Understanding Media: The Extensions of Man* opened new vistas for discussions about the new artifact that was invading every household in Western societies, and the author codified his views with a phrase that would become a catchphrase of our times: “the medium is the message” (McLuhan 1964, 7). The book was catalytic

¹⁹Interview with Thomas Kuhn, see footnote 5.

in initiating a discussion about the non-neutrality of technology and that when assessing the “wonders” of science, regarding technology as simply the application of scientific innovations may not be a particularly fruitful way of understanding technology.

But the period between the two editions of *Structure* saw the publication of a number of books that have, since their publication, played a rather decisive role in raising public awareness by questioning some of the long held “untouchable” beliefs of Western societies.

Silent Spring by Rachel Carson was also published in 1962. It revealed the catastrophic effects of pesticides, especially on birds, as well as the neglect of industries, particularly the chemical companies, and government officials to impose safety measures. It became the first book to help make the American public aware of environmental issues and led to the ban of the widely used DDT in agricultural practices. Interestingly, many of the synthetic pesticides used were being developed through military funded research. A strong boost to her own research were reports relating pesticides to carcinogenesis. Although her book was based on a mass of technical data, Carson's message was not technical: it emphasized the effects humans have on nature and the hitherto unimagined repercussions of such effects. Years later, while assessing the effects of the book, Mark Hamilton Lytle would write that Carson “quite self-consciously decided to write a book calling into question the paradigm of scientific progress that defined postwar American culture” (Lytle 2007, 166–167).

Two other influential books were published in 1962. Given the context within which Milton Friedman's *Capitalism and Freedom* was written, it advanced a critique of US government big spending and argued that economic freedom was a prerequisite for political freedom. Though such views became dominant after the late 1970s, at the time they vied for a change of paradigm. The other book was *The Other America: Poverty in the United States* by Michael Harrington. The author, a former Catholic disillusioned and “shocked by the faithlessness of the believers” declared himself an atheist and became involved in left-wing politics. In his book, he argued that almost 25% of Americans lived in poverty and, since the data upon which his thesis was based was freely available, he spoke of how the poor were made invisible by the Americans themselves. Policies that were first initiated by President Kennedy and subsequently named by the Johnson Administration “War on Poverty” were traceable in Harrington's ideas about social welfare.

The *Feminine Mystique* by Betty Friedan, published in 1963, made the dissatisfaction of middle-class women public, in a time where many thought they were a segment of the population who seemingly “who had it all”—husbands with good jobs, houses in good neighborhoods, children going to good schools.

The issues raised were initially intended to be published as an article, but when no journal would willing publish it, Friedan instead decided to write a book, researching the lives of middle-class women, the discussion of the role of education, women's magazines and advertisements targeting housewives. "The problem that has no name" turned out to be hugely successful, sparked the second-wave feminist movement and contributed to radical changes in American society, not least of which was the establishment of the National Organization of Women in 1966. Her book was preceded by an article of similar content by another champion of American feminism, Gloria Steinem.

The Making of the English Working Class by E. P. Thompson was published in 1963 (and revised in 1968) and brought to the fore the culture and practices of the working class, especially of the artisans and workers, attempting to "rescue the poor stockinger, the Luddite cropper, the "obsolete" hand-loom weaver, the "utopian" artisan [...] from the enormous condescension of posterity" (Thompson 1963, 2). Thompson forcefully argued for a different kind of social history, where he would rescue the working class from being treated solely in terms of statistics, thus bringing in a humanist element to the writing of history. In 2013, in an article celebrating the 50th anniversary of its publication, Robert Colls, a cultural historian noted that "in its day his book was the biggest paradigm-shifter of the lot" (Colls 2013, 7).

One-Dimensional Man: Studies in the Ideology of Advanced Industrial Society by Herbert Marcuse was published in 1964 and became an emblematic book for another social phenomenon of the period: the formation of the "New Left." The book presented a forceful criticism of both capitalism and socialism as applied in the Soviet Union, and discussed the new forms of social repression in both societies, analyzing the repercussions of consumerism in the undermining of the revolutionary potential in Western societies.

Unsafe at Any Speed Ralph Nader was published in 1965 and was highly critical of the automotive industry. The book revealed the indifference of the auto industries to safety, and the fact that they did not utilize reliable test results in order to incorporate the necessary changes in the design of cars. If Carson's book provided the rationale for a comprehensive environmental movement, Nader's book gave the same impetus to the consumers' movement and made its author the unquestionable "leader" of consumers' interests. Nader's subsequent lobbying led to the establishment of the US Environmental Protection Agency in 1970.

Science and Survival by Barry Commoner was published in 1966 (and his *The Closing Circle* in 1971). He argued for a change in the whole structure of the industrial basis of capitalism to conform with the laws of ecology that he had first formulated. He forcefully argued for the notion of sustainability, and very large audiences became acquainted with the notion and its implications. His was

a different paradigm, proposing the “eco-socialist” model to replace the “limits of growth” thesis, by arguing that it was the capitalist industries, rather than over-population, that were responsible for the ecological problems.

These books had a large circulation and almost all of them have since remained in various “100 most important books” lists, most notably that of *Time* magazine with its huge readership—independent of what the validity of such lists may be. Nevertheless, such lists are indicative of the public perception of these books and it is surely the case that these books have challenged dominant values, practices, policies and viewpoints, resonating with the demands expressed through many social issues of the period.

Interestingly Nader's book, along with Friedan's and Carson's, together with the works of Keynes, Dewey, Marx, Hitler, Mao, Compton, the Kinsey Report, Lenin and Darwin appeared on the list of most harmful books in the nineteenth and twentieth centuries of the *Human Events*, the site of “powerful conservative voices.”²⁰

What I have discussed above is, of course, not an exhaustive list. Many other books of similar character, which were widely discussed yet perhaps not as catalytic as the ones mentioned, were published in the period between the two editions of *Structure*. The *Age of Revolutions*, the first book of a planned trilogy by Eric Hobsbawm, was published in 1962. Between 1964 and 1966, Richard Feynman's lectures in physics, were published, bringing a totally new approach to undergraduate physics teaching. In 1963, the *Letter from the Birmingham Jail* by Martin Luther King and the authorized version of Che Guevara's *Reminiscences* were both published. Two iconoclastic books appeared in the next two years and found a very large readership. In 1964, Timothy Leary's the *Psychedelic Experience: A Manual Based on the Tibetan Book of the Dead* appeared, and a year later the “comedian” Lenny Bruce published his *How to Talk Dirty and Influence People*. Paul Freire's well-thought strategy for a *Pedagogy of the Oppressed* appeared in 1967 and as did David Cooper's *Psychiatry and Anti-Psychiatry*, which would be decisive in the debates that reconsidered psychiatric practices. In 1968, Eldridge Cleaver, a founding member of the Black Panther Party founded in 1966, published his *Soul on Ice*, which became hugely popular. In 1969, Hilary Rose and Steven Rose published *Science and Society*, which severely criticized British science policy and became one of the first books ever written on science policy. In 1973 Levy Leblond, a well-known French physicist from Orsay, published *Autocritique des sciences*. The work was the result of discussions and popular publications around the themes of “eco-socialism” initiated by the collective Open Science (Science Ouverte), which was established in 1966 by the biologist Max de Ceccatty, the philosopher François Dagognet and the mathematician André

²⁰See <http://www.humanevents.com>.

Warusfel. In that same year, *Small Is Beautiful: Economics As If People Mattered* by E. F. Schumacher was also published. The author of the essays collected in the book presented an incisive critique of economic development at a time when the energy crisis came to question the model of development in Western societies. The author traced much of what was wrong in postwar capitalism to its strong adherence to what he called “gigantism.” Peopled-centered economics, he argued, would make an environmentally sustainable progress possible.

For many people, *Structure* became part of this constellation of books that through their incisive criticism of various aspects of dominant values and practices were, in effect, putting the demand for a change of paradigm on the social and political agenda, whether in the role of women in society, economic development, technology, ideology or the writing of history.

Concluding Remarks

During the period between the two editions of *Structure*, a number of social issues were publicly negotiated through books that, eventually, commanded large readerships and came to symbolize the new social movements and a new public consciousness. There was a deep metamorphosis in the public perception of the status of the black community, women, university students, America's military might, the environment, industrial production, historiography and other aspects of social and academic life. The scathing criticism of the status quo and the search for new paradigms went hand in hand. These books became emblematic of the new era, and so did *Structure*. It described the past of the sciences and the *structure* of its revolutionary changes in ways that were perceived as homologous with whatever was happening “out there.”

More specifically, within such a framework an increasing number of scientists were becoming dissatisfied with the dominant trends in the social function of science, seeking alternative ways of organizing and applying science. *Structure*—independent of its philosophical problems—became some kind of reference point. To many it signified a critique of the traditional way science was viewed. Paradigm change implied that changes were indeed possible. Incommensurability meant that the “old” state of affairs would not linger on in the “new.” The importance of consensus around a paradigm that *Structure* claimed raised hopes about different practices if consensus could be achieved with respect to different values. The questioning of progress in science helped the discussion about the possibilities for other modes of social development. Though such a “neat” codification was surely unacceptable to professional philosophers, it did form a framework that provided some kind of theoretical justification to many of

those who were frustrated with what was going on in both society at large and within the field of science.

Discussions among philosophers of science did not seem to deter a large number of people from considering the book as addressing many of the issues that were bothering them. Fuller has perceptively noted that

The appeal of SSR is founded on its ability to compel readers without demanding too much engagement in return. It is [a] narrative that is indefinitely adaptable to user's wishes [...] certainly the book does not encourage deep reading [...] [it has a] non threatening prose style, which contains relatively little technical language invites the reader to participate in correcting its flaws and completing its argument. But this invitation is less to interpret than apply the text [...] a common thread that runs through the formal and informal comments people make about the book is that it is quite thin in their own field of expertise, but truly enlightening in some other field. (Fuller 2001, 31–32); (Reingold 1991, 389–409)

Indeed, *Structure* was many things to many people or (slightly) different things to different people. And such a characteristic was particularly “convenient” in the 1960s and 1970s for the success of the book.

The period between the two editions of *Structure* embraced many events that forced a reconceptualization of both revolution and science in the minds of an amazingly large number of people. The civil rights, student and anti-war movements brought the realities of uprisings very close to home, to which American society had seemed immune to more than a generation before. What was understood as happening in lands far from the US, in the mid-1960s became part of the everyday experience of American society. No one could afford indifference. Independent of whether Kuhn's views were formed during the period when American educational exigencies were adapting to the Cold War, one cannot ignore the fact that at the same time, at the height of the Cold War, all kinds of new critical approaches to the ways the sciences were practiced started to play an increasingly important role. These events brought about deep divides and lasting changes within the scientific community. The sales figures of the book imply that eventually, Kuhn's book was appropriated by an increasing number of people who wanted to bring forth changes in many aspects of American society.

It was during this very same period that the social perception of science and scientists, and the assessment of what these scientists were doing, became rather critical. If the sentiment in American society in the post war years was “in scientists we trust,” then this long-cherished unconditional trust in what the scientists were engaged in started to wane. It was not a question of scientists'

ethics; it was the crisis within the strong ties between science and democracy that many thought was irrevocably broken. A whole generation that was raised to believe that science and democracy were strongly correlated was realizing that neither science nor democracy was faring well.

This uneasy and confusing social context made Kuhn's book a respectable choice for all those who had become disillusioned by the occurrences of the era, and despite its success stories, even in the sciences. *Structure* became a point of reference for those who wanted to understand what was happening in the chaotic developments which, in one way or another, touched them. For those with some scientific background and who felt that the old ways were over, Kuhn's book, with its comprehensible philosophy and its history, which gave a sense of relevance, was, at least, a good starting point.

So we see that in the period when Kuhn's book began its career, there was a deep political, social, institutional and ideological realignment among various groups of scientists. This brought all kinds of reactions, criticisms and, most importantly, a search for alternatives; a search of alternative ways of how to do science, what kind of science to do and how to apply it. Paradigm shift, though it used in a totally different way than Kuhn used it, became the "term" that unified the disgruntled. This is not to say that Kuhn and his book had a leftist or even a radical agenda. Nevertheless, how books and their ideas are appropriated in societies often has little to do with what the authors believe, or with what the expressed aims of the book actually are.

As I stressed at the beginning, the point of this essay is to give credence neither to the hypothesis that the phenomenal success of the book was not primarily due to the philosophical discussions it initiated, nor to the sympathetic views that some scientists expressed towards it, but rather because of the general social climate in the USA. In order to substantiate such a hypothesis, a number of events—especially those that directly or indirectly questioned the dominant views and practices of science—have been discussed to show how the demands or trends among many social groups in the USA appeared to *resonate* with the social perception of Kuhn's book.

It is not inconceivable that the public reception of *Structure* was tinged with an aura of radicalism, since it was a book with such a "radical" title and it was, at the same time, criticized severely by the established philosophers of science. Thus, misreading this work in the 1960s and early 1970s should not be taken as a sign of collective inability to understand the details of the arguments in *Structure*, but rather as a way to appropriate a cluster of ideas which appeared to be in alliance with the ideas of all those who had become disillusioned with science and its practitioners.

I have tried to bring together a number of events whose beginnings can be traced in the period between the two editions of *Structure*—whether publishing enterprises or large-scale social and political movements—that strongly criticized many of the constitutive pillars of modern Western societies: the role of women, the status of black people, science, economic development, industrial production—and persuasively put forth alternatives. Neither the books nor the social movements were marginal events. The books and the discussions around social events generated ideas, proposals and practices that for sometime caught the imagination of a large number of citizens. The problem for discussion was the phenomenal success of the book or rather, the phenomenal sales figures of the book, which made it a unique—and only—success story on such a scale in the history of the history, and/or philosophy and/or sociology of science.

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