Abstract

Dr. Patrick Suppes, Lucie Stern Emeritus Professor of Philosophy at Stanford, is a remarkable gentleman of many interests, truly a philosopher-scientist. He is a Fellow of the American Association for the Advancement of Science (1962); the American Psychological Association (1964); and the American Academy of Arts and Sciences (1968). Dr. Suppes is also a member of the National Academy of Education (1965), and the National Academy of Sciences (1978), as well as a member of the American Philosophical Society (1991).

Dr. Suppes has received the American Psychological Association’s Distinguished Scientific Contribution Award, Columbia University Teachers College Medal for Distinguished Service (1978) and was awarded the National Medal of Science (1990) by President George H. W. Bush. In 2003, Dr. Suppes was laureate of the Lakatos Award for his contributions to the philosophy of science.

He has published extensively in philosophy and the social sciences, in particular, psychology as well as education. He is a past president of the Pacific Division, American Philosophical Association (1972-73); the American Educational Research Association (1973-74); the National Academy of Education (1973-77), and International Union of History and Philosophy of Science (1975, 1978).

Patrick Suppes has made significant contributions to the philosophy of science, the theory of measurement, foundations of quantum mechanics, psychology, decision theory, and educational technology. He went to Stanford in 1952 where he continues to work today.
• First of all, may I ask you how you pronounce your last name?

Yes, I am frequently asked this! Soup-ez, with stress on the first syllable: Soup, and pronounce ez as ease. So I could spell it for you as: Soupease!

• You have written of some of the important influences of your academic life, such as McKinsey and Tarski, Estes, as well as others; Who were your early mentors, and how did they impact you?

I have already written about the importance of my participation as a secondary school student, Grades 7-12, in the Tulsa Oklahoma public schools. This school system participated in the Eight-year Study, organized nationwide by Ralph Tyler and others. Students were selected in the 6th grade (spring of 1933 for me) to participate on the basis of aptitude and achievement tests given in elementary school. As I record in my autobiography from 1922 to 1978, I received an intense and competitive secondary education. The classes were as good, in many ways, as those I was in at the University of Chicago later.

• Could you discuss your use of the set-theoretical methods as introduced to you by J.C.C. McKinsey back in your early post-doctoral days at Stanford? How they have changed over the years?

In 1957 I published in the last chapter of my Introduction to Logic a detailed formulation, but at a not-too-difficult level for students. This book was reprinted by Dover Publications in 1999, and is still in circulation. I have not radically changed my approach. In 2002 I published a much longer and much more technical book, entitled Representation and Invariance of Scientific Structures, CSLI Publications, Stanford, CA. This book applies such set-theoretical methods to a variety of foundational questions in a number of scientific disciplines. Moreover, as another extended application of such methods, I co-authored a three-volume work entitled Foundations of Measurement (Vol. 1, 1971; Vol. II, 1989; Vol. III, 1990), and these three volumes have just been reprinted by Dover Publications also. My co-authors in this work are three well-known mathematical psychologists, David Krantz, Duncan Luce, and Amos Tversky (now deceased).

On the other hand, I have changed in two important respects. First, I now consider it just as important philosophically to analyze the nature of experimental practices in science. How to describe and think about what goes on in practice before the experimental data are collected, cleaned up and analyzed. I have written about both physics and psychology in this respect. Second, I now have a new competing view of foundations running around in my head. This has been generated by my focus on brain research. Since 1996, I have been much involved in the fundamental problem of how the brain represents language, including all of its constituents—phonemes, syllables, words, phrases, sentences, discourse. Fundamentally this is a new problem, for me, of structural isomorphism. Unless there is a fairly tight isomorphic representation of these constituents in the brain it is difficult to conceive of how the brain can compute so quickly and easily whatever is heard or read (comprehension) or generate new spoken or written utterances (production). I and my younger associates have begun having some success in studies of these matters using EEG recordings of electrical fields generated on the scalp by brain activity. I do emphasize that structural isomorphism does not mean that brain representations of phonemes or
words, for example, look just like their occurrences outside the brain. The isomorphism here is the kind that justifies all kinds of fundamental measurement in science, i.e., isomorphism between empirical structures concerning the results of empirical procedures of measurement and the numerical structures encoding these results in terms of numbers, vectors or other quantities. But the isomorphism of the relevant relations and operations is necessary to justify endless numerical computations providing new analyses and predictions. The brain almost surely needs something similar going on.

At a more general philosophical level, I see that there is psychologically something unsatisfactory about thinking that identifying the appropriate set-theoretical structures can be a final foundational answer to the nature of physics, psychology or any other science, even at the purely theoretical level. This kind of set-theoretical answer does not provide methods for explaining, for example, in any satisfactory way how the brain does in fact represent language or compute the truth or falsity of a new sentence. More generally, how the brain represents the world and continually computes on such representations is, in its own way, as fundamental a question as the formal axiomatic questions that motivate the rigorous application of set-theoretical methods to scientific theories. One does not exclude the other from its legitimacy. But I did not earlier recognize how fundamental brain representations are. Their description must ultimately be physical at bottom, and only secondarily, set-theoretical.

- What do you think about the fast-growing trend in education of online instruction; online degrees. What do you see as the pros and cons?

My first experiments with online education began in a lab at Stanford in 1962. The important next step was to move student access from the lab to the school (this was long before personal computers were on the scene). In 1964, we placed a single teletype, connected by phone line to our computer on the Stanford campus, in a school about five miles away. So for more than forty years I have been involved in online education, at Stanford and, for twenty-three years (1967-1990) at Computer Curriculum Corporation, which I founded with Dick Atkinson. As an emeritus professor at Stanford, since 1992 I have directed Stanford's Education Program for Gifted Youth (EPGY). All the instruction, which is mainly mathematics, English and physics, is online. No students appear on campus for regular courses, although we do run resident programs for several weeks in the summer on the Stanford campus. We recently got a grant to set up an accredited online high school, and we expect definite growth in this area. Overall, we have more than 4,000 students taking courses from EPGY each year. The age range is from 4 to 18 years, for we are entirely pre-college and we have bright four-year olds taking the K-7 Math course. Not unexpectedly, I think the future of online education is very positive. It provides a way of meeting educational needs of many diverse kinds of students who otherwise may find access to what they need difficult. Generally this is certainly true of gifted students, who are often bored and restless at the pace of group learning in mathematics and language arts in elementary school. Individualized online instruction provides an approach that adjusts itself to whatever pace the student is able and wants to set. (This same approach
of individualization, by the way, is very useful for students below the mean who are struggling to keep up in regular classrooms.)

A fair criticism is that such online instruction is not currently well suited to take on the complete task of instruction for many types of students. There is no serious constituency that believes K-12 schools should be eliminated in favor of just online instruction. Parents who are home schooling their own children seldom have such a radical agenda for the entire school.

Looking farther in the future is another matter. As ever more sophisticated methods of video conferencing or even points-to-point videos are developed, the entire workplace may change in ways we cannot predict in detail. The Defense Department, large corporations and related entities now have, by current computer and television standards, exotic video conferencing rooms with near high-definition images and high-quality audio being the new standard. At EPGY we run a number of online classes, but not with such currently exotic and expensive equipment. Intel said, in announcing its new 80-core microchip, that it had the computing capacity of its 1996 supercomputer that occupied a large physical space. The continuing revolution in computing and telecommunicating will surely make the exotic equipment of today the commercial product of tomorrow. As this happens, the work week will surely continue to change. Working mother and fathers, for example, can trade off work days at home, so that at least one parent is usually there. As things get ever better both visually and auditorily, the need to go to an office will decline, and as this happens, online education will flourish all the more. A favorite example of mine is the possibility of giving very specialized seminars that ordinarily attract only a few people in a given university, but if given online in this future fashion could gather up from all over the world an order of magnitude more persons seriously interested. The opposite direction will also almost certainly develop as well. Famous lecturers in introductory courses will lecture online to thousands of students, and, most likely, the lectures will be videos made earlier and repeated for some years. Such lectures will probably be followed by online discussion groups of small numbers, but online and consisting of students from many parts of the globe. We have small-scale examples of this already in EPGY's new online high school.

- What do you think of the current state of public education and what would you do to change it, if given the power to do so?

The great and most important educational success of the last century was finishing the 19th century beginning of mass education. By the end of the 20th century, most children of school age were, in this country, in school, and a surprisingly large percentage of the world's population of children was also. The American comprehensive high school was a great achievement as an institution.

Now it is time to change again. John Dewey sounded the theme at the end of the 19th century with his emphasis on individual differences and accompanying instruction adapted to the particular abilities and past achievements of each student. Computer technology used in ever deeper ways makes possible a much richer realization of this goal than was possible in the past, not that we don't still have a long way to go. For me, the existence of individual choice, and instruction individualized for each student, is a much more important and feasible goal than broad purely institutional and administrative
changes, such as can be provided by vouchers or charter schools, for example. If public schools, as we know them, cease to exist in the future, it will be because they were unable to adapt to the future needs of the population. Admittedly, school administrators and teachers can be very resistant to change, but not all are. Moreover, even those, who in their hearts like things just as they are, can come to see that change is necessary for survival. This instinct, once really aroused, will make adaptation to new technological and social arrangements for schooling feasible. Teachers raising children of their own may find teaching from home online, but under the sponsorship of the new form of public education, much more attractive than they ever thought possible.

- Given the increasing diversity of our student populations, the seemingly increasing lack of preparedness of our students in general; how do you see these things affecting the role of our public schools?

I am skeptical of the given premises of this question. I don't think there is a massive difference in the preparedness of students now, compared to the past. For example, using Table 215, p. 147, of the current Statistical Abstract of the United States, in 1960, counting all races together, 39.5% of the males and 42.5% of the females graduated from high school. These numbers increase through the decades with no declines for females, reaching a rate of graduation of 85.4% in 2004, and only very small declines for the males in 2001 and 2002, to reach a 2004 rate of 84.8%. Both sexes more than doubled the rate of graduation between 1960 and 2004. This is hardly a sign of decline. The signs of unpreparedness, so much lamented, are probably due to the very much larger percent of the age-related population now in high school. Second, I am skeptical that values are eroding. Certainly they are changing, and most certainly often for the good. Women and minorities are surely treated more equitably than fifty years ago, just to give one example. How I think public schools will change in the future was sketched in the previous answer.

- Who would you include on your list of the 10 greatest philosophers of all time?

I list that number chronologically omitting any now living: Plato, Aristotle, Aquinas, Descartes, Hobbes, Hume, Kant, Mill, William James, and Bertrand Russell.

- How do you see philosophy fitting into the big scheme of things? Why study it? Why should college and graduate students be exposed to it?

Philosophy should be the discipline that studies foundational questions important to all other disciplines, whether it be physics, music, poetry or something else. Of course, different philosophers are needed for different disciplines. A philosopher of physics must know some physics, and a philosopher concerned with the aesthetics of music must know something about music. But philosophers of different disciplines can come together in their interest in general concepts and principles, and what methods should be used for thinking about foundations.

- In your opinion, what should be mandated reading on our high school students' reading lists?

To have read something of at least two or three of the great philosophers I listed above would be very desirable, even though formal courses in philosophy are not customarily taught in American high schools. We do have such readings in our core courses in
EPGY’s online high school, for example, in the core course “Democracy, Freedom and the Rule of Law”.

- You wrote some years ago that you are a philosopher scientist at this point in your life, would you modify that in any way? How and why?

No, I would not. My scientific interests are now totally concentrated on the brain. Even though I am now writing about quantum mechanics and the brain, the main work is experimental and the detailed construction of mathematical, physical and statistical models to fit the brain data from our experiments. Concurrently, my active interest in philosophy of science continues, including my interest in the foundations of economics, on which I would like to bring some neuroeconomic experiments to bear.

- Working with your curriculum software, now called SuccessMaker (Pearson) I am continually amazed at how well it assists students’ academic growth in Reading and Math; it is well-entrenched in my school district, in its 9th year. Could you describe your development of this software, back in the days of CCC Computer Curriculum Corporation?

The details are now hazy, but the chronology is not. It began at Stanford in the 1960s in the way I have already described. In the 1970s my interest in the elementary-mathematics curriculum moved to CCC and over the period roughly between 1972 and 1990 math and reading computer-based courses for elementary and middle schools were the most important focus. The general idea of individualization, associated with individual motion, stochastic in nature, had already been developed at Stanford, but then at CCC for a much larger curriculum and student population. At Stanford during this period my online education interests shifted to university-level courses. In 1972, I began teaching Introduction to Logic each term purely by computer, but with good teaching assistants to answer questions, and in 1974, I followed with a second course, Axiomatic Set Theory, based on my 1960 book with the same title. I taught both these courses every term, i.e., three times a year, until I retired at age 70 in 1992. During these last 16 years I carried on the books the largest teaching load of courses of anyone at Stanford, for in addition to these six courses, I taught at least two seminars every year.

- Looking back on your life, what would you like to do that you have not done?

The list is long, but I will mention only three items on it. First, start scientific study of the brain a decade earlier at least (remember, I only began in 1996 at the age of 74). Second, move instructional technology at a much faster pace. I am dissatisfied at what I and others have been able to accomplish in using speech and dialogue in a natural way. One hundred years from now the primitive condition of our interaction by talking and listening to our computers will seem pitiful. Third, I have been an avid tennis player since my twenties. In retrospect I wish I had had when young some serious formal instruction in what is my best sport.

- You have done some research work with Amos Tversky of Tversky and Kahnemann fame. How important do you see the role of measurement, and more specifically about the role of thinking about precise measurement in the social sciences?

The role is fundamental, as it has been in the physical sciences. The widespread effect of the development of scientific measurement
methods in the social sciences is evident from the large literature and the many new experiments using such methods. The final pages of references in our three-volume treatise Foundations of Measurement mentioned earlier alone contain hundreds of entries.

- I think that Clark Hull commented that his life had been fun. What comment would you make?

I have enjoyed my long academic career, with many pleasant memories, and few regrets. I have been lucky to have been at Stanford all these years, and to have had so many smart collaborators from whom I have learned much of what I know.

- Taking a line from your autobiography I think we are all faced with the dilemma of the “precision and perfection of the physical sciences and the vagueness and imprecision of the social sciences.” How can you and I as scientists, philosophers and scholars reconcile this dichotomy?

I don’t think the dichotomy is as large as many others think. The greatest early triumph of modern science was Newton’s Principia, published in 1687. The part that was the centerpiece of the book was the dynamical theory of the motion of the planets and the moon based on the universal force of gravitation. But the observational success of the theory was entirely dependent on many centuries of astronomical observations reaching back 1500 years to Ptolemy, and even earlier. No such long tradition exists in any of the social sciences. Still, much good quantitative work already exists in economics and psychology. I am optimistic about the future.