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Current Comments®

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The 1983 Nobel Prizes. Part 3. Economics and Literature Awards Go to Gerard Debreu and William Golding

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Last week, we examined the work of Barbara McClintock, who won the Nobel Prize in physiology or medicine.[1] We also recently discussed the prize-winning work of Subrahmanyan Chandrasekhar and William A. Fowler, the 1983 laureates in physics, and that of chemistry prizewinner Henry Taube.[2] This last portion of the essay will focus on the 1983 winners in economics and literature.

Incidentally, the 1984 Nobel Prizes have been announced. The award in economics went to Sir Richard Stone for his work involving an accounting system for evaluating the performance of national economies.[3] Stone retired from Cambridge University, England, in 1980. The 1984 literature prize was awarded to Czech poet Jaroslav Seifert.[4] We will discuss the work of these laureates later this year.

Economics

The 1983 Nobel Prize in economics was awarded to Gerard Debreu, University of California, Berkeley, "...for having incorporated new analytical methods into economic theory and for his rigorous reformulation of the theory of general equilibrium."[5] The award honors three decades of study on how the prices of commodities work to balance supply and demand.[6]

Born on July 4, 1921, in Calais, France, Debreu attended the École Normale Supérieure in Paris from 1941 until 1944, when he joined the French army and served in North Africa and Germany during World War II. After the war, he studied mathematics at the Agrégé de l'Université in Paris. He received his first appointment as a research associate at the Centre National de la Recherche Scientifique, also in Paris. During this time, Debreu turned his attention from mathematics to economics. In his Nobel lecture, he said that the Centre "...showed an impressive tolerance for the absence of tangible results associated with the change from one field to another distant field."[7]

In 1950, Debreu became associated with the famous Cowles Commission for Research in Economics at the University of Chicago, Illinois. Later known as the Cowles Foundation and relocated to Yale University, New Haven, Connecticut, the Cowles group was founded by a wealthy investor interested in applying science to the study of finance. After the early 1930s, it was the hub of many important developments in the field of mathematical economics.[7] In fact, at least six Nobel Prize winners have been associated with the Cowles group: Debreu; James Tobin (1981), Yale; Lawrence R. Klein (1980), University of Pennsylvania, Philadelphia; Herbert A. Simon (1978), Carnegie-Mellon University, Pittsburgh; Tjalling C. Koopmans (1975), Yale; and Kenneth J. Arrow (1972), Stanford University, California.

The stimulation of a new environment following the Cowles group's move to Yale in 1955 led Debreu to study several problems in the theory of cardinal utility,[7] or a measure of the usefulness of a product to the consumer who purchased it. In fact, the cardinal utility metric is the subject of one of Debreu's most-cited works, a methods paper outlining topological techniques for "mapping" various probabilities concerning the uses to which a product might be put.[8] We found at least 60 cites to the 1960 paper in the *Science Citation Index®* (*SCI®*) between 1960 and 1984, and at least 125 cites to it from 1966 through 1984 in the *Social Sciences Citation Index®* (*SSCI®*).

In 1962, Debreu joined the faculty at the University of California, Berkeley, where he has remained ever since. Once at Berkeley, he collaborated on another highly cited paper with Herbert Scarf, then at Stanford, but currently head of the Cowles group at Yale. Entitled "A limit theorem on the core of an economy,"[9] the paper was published in 1963 and has been cited at least 145 times through 1984.

In an article in the *New York Times*,[10] economist Robert Dorfman, Harvard University, claims that the body of work for which Debreu was awarded the Nobel Prize addresses a legacy of *The Wealth of Nations*,[11] by Scottish philosopher Adam Smith. Since 1776, Smith's famous passage about the economy being guided "by an invisible hand" has been the unifying principle of economics.[10] Smith theorized that the conflicting desires of producers and consumers of goods were brought into an efficient balance by competitive prices that create equilibrium in supply and demand.

Smith's assertion was suggestive on an intuitive level. In fact, as Dorfman states, it provided the justification for antitrust regulation and underlies policies that rest on faith in the operation of a free market. But Smith's exposition on the invisible hand occupies barely a page in his landmark work, which actually was intended to attack the regulations and restrictions then burdening the English economy.[10] Smith's propositions are vague and ambiguous, and did not even constitute a proof that there exists a competitive market equilibrium.

The first big step toward such an explanation was taken nearly a century later by the French mathematical economist Lēon Walras (1834-1910),[12] who, according to Dorfman, was the first to describe the economy in terms of supply and demand equations.[10] Walras showed that producers would strive to maximize their profits while consumers would seek the greatest possible satisfaction from their incomes. Both would adjust their goals until all arrived at a price equilibrium, the point at which the amounts produced were precisely the amounts consumed, and the markets cleared.

Unfortunately, Dorfman writes, although Walras's equations were a great advance, he never showed that his results would always be sensible.[10] His pioneering equations might require negative prices for some commodities or might have solutions involving such high prices that negative amounts of goods and services would have to be purchased. By the 1930s, a few literary economists began to realize that, when prices fell to zero—but before they became negative—Walras's equality of supply and demand needed to be treated as an inequality. It took the mathematician Abraham Wald (1902-1950) to devise a proof of the existence of an equilibrium free of negative pricing or production;[13] his pioneering model, however, was intricate and, involving as it did some rather strong sufficiency con-

ditions, was based on a number of restrictive assumptions that might not apply under realistic conditions.

A breakthrough in the problem came at about the time that Leonid V. Kantorovich,[14] Institute of Mathematics, Novosibirsk, USSR (who shared the 1975 Nobel economics prize with Koopmans), and George B. Dantzig,[15] Stanford, independently developed linear programming. Koopmans[16] and, independently, Lionel McKenzie,[17] Duke University, Durham, North Carolina, used one aspect of the technique—the fixed-point theorem of Luitzen E.J. Brouwer[18] (1881-1966) and Shizuo Kakutani,[19] Yale—to introduce a new way of looking at the existence-of-equilibrium problem. And in 1954, Debreu and Arrow coauthored a brief paper,[20] cited 88 times through 1984, that was based on these insights. Dispensing with the shortcomings of the Walras formulation, the paper also established realistic conditions under which equilibrium could be achieved. These assumptions were less restrictive and more transparent than those in the Wald analysis.

Debreu and Arrow's paper formed the basis of Debreu's 1959 monograph, *Theory of Value: An Axiomatic Analysis of Economic Equilibrium*.[21] Cited over 800 times through 1984, this work is the culmination, thus far, of the long process of justifying Smith's brilliant conjecture. In the words of the Swedish Academy of Sciences, as quoted in an article in *Newsweek* by staff writers Harry Anderson, Nadine Joseph, and Kristine Mortensen, Debreu "...confirmed the internal logical consistency..." of the classical view of markets.[22]

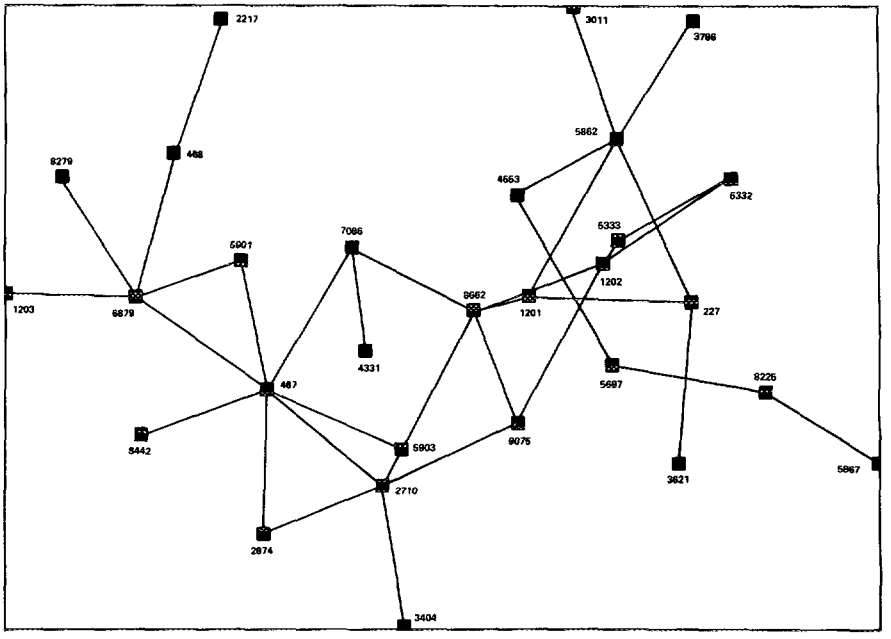
Dorfman claims, however, that at least two critical differences between Debreu's theory and economic reality limit the application of the Debreu formulation in economic planning.[10] In Debreu's theoretical economy, although supply balances demand in every market, a producer's size is irrelevant. Specifically, no advantage accrues to large corporations, so that a small, local business can produce goods as cheaply as a multinational conglomerate. Moreover, in the Debreu economy, the future holds no uncertainties—either all productive investments are completely safe, or there exist a fantastic number of different markets in which prices equilibrate supply and demand at *all* future times and for every different state of the world that chance can bring. Thus, although Debreu's work is the most advanced yet in this area, Dorfman claims that it falls short of proving that reliance on the invisible hand suffices for sound economic policy.

Citation Information and Research Front Data

Even so, Debreu's work is highly cited. His books and papers have been cited over 2,065 times for the years and journals covered by ISI®'s indexes. (The impact on textbook writers is a separate issue.)

Debreu's *Theory of Value*[21] is one of three core works for the 1983 research front #83-1203, "Economic theories of equilibrium and the competitive firm, financial market and macroeconomic structure and efficiency." The other two are both by Arrow. One discusses the role of securities in taking financial risks;[23] the other, a book coauthored with F.H. Hahn, London School of Economics, is on general competitive analysis.[24] Rather than the usual cocitation map of the research front itself, as an interesting sidelight we have presented in Figure 1 a "higher level" multidimensional scaling map. This map encompasses research front #83-1203 within the larger framework of a cluster entitled "Financial analysis and market structure." The key that accompanies

Figure 1: Multidimensional scaling map of "Financial analysis and market structure," showing links between research fronts. See accompanying key for research front titles and numbers. A = 1983 research front number. B = research front title.



A B

227 Costs, competition, utilization and disenrollment issues of health maintenance organizations and other prepaid medical care plans
467 Market theory of corporate control and analysis of financial effects of related management moves
468 Evolutionary theory of economic change
1201 Individual insurance decisions and health insurance medical fees, agreements and trust between patient and physician
1202 Theory and impact of price uncertainty, risk aversion and utility function on firm and farm production and on insurance purchasing
1203 Economic theories of equilibrium and the competitive firm, financial market and macroeconomic structure and efficiency
2217 Methodology in macroeconomics; approaches and paradigms from Keynes, Friedman, supply-side adherents and others
2710 Capital planning, market structure, risk assessment and other aspects of corporate financial analysis
2874 *Financial valuation, pricing and risk assessment of bonds, leasing contracts and commodity options on futures*
3011 Adenotonsillectomy; appraisal of indications and treatment strategies in developing countries
3404 Financial analysis, cost of capital and strategic planning
3621 Role of competition in health care organizations
3786 Studies of surgical utilization and the efficiency of health services
4331 Rice harvesting, China's tenure system and theories of common property and collective action in peasant agriculture
4553 Evaluation of private and public health care services
5332 Uncertainty, competitive equilibria and decision-making theory in stock market economies
5333 Decisions for risk aversion under conditions of uncertainty in investment theory; applications of risk analysis
5687 Cultural role and anthropological aspects of health care in various societies
5862 Importance of physician-induced demand and other facets in health care service
5867 Family, kinship and other ethnographic, religious and historical studies of time, Nuer society, and other African, European and Australian cultures
5901 Forward pricing, hedging and market efficiency in the futures market
5903 Accounting regulation, taxes and the value of capital holdings
6879 *Financial accounting and corporate disclosure of information*
7086 Theory of contracts and agency, and the optimal organization of the firm
8225 Anthropological analyses of naming and classification practice in a structuralist sociology of primitive culture
8279 Quality, price, advertising and gains from search; market equilibrium and the effects of decisions based on imperfect information
8442 *Modern financial theory; portfolio review, capital assets and corporate policy*
8662 Pricing and analysis of optimal insurance in competitive markets
9075 Limited information and adverse selection in insurance markets, industry and taxation

the figure lists the numbers and titles of the 29 research fronts involved.

The 1963 paper by Debreu and Scarf,[9] mentioned earlier, is among the four publications forming the core of the 1983 research front #83-1396 on "Core equilibria in replica games and the general economy." The other three include a model of markets with "perfect competition,"[25] by Robert J. Aumann, Hebrew University, Jerusalem, Israel; a book on the core and equilibria of a large economy,[26] by Werner Hildenbrand, University of Bonn, Federal Republic of Germany; and a paper by L.S. Shapley, University of California, Los Angeles, and M. Shubik, Yale, discussing a model of a pure exchange economy.[27]

A paper by Debreu[28] on the properties of utility theory as advanced by Francis Y. Edgeworth (1845-1926),[29] John von Neumann (1903-1957),[30] and Vilfredo Pareto (1848-1923),[31] along with three other publications, forms the core of the 1983 research front #83-5149, "Interval orders and the numerical representation of preferences." The other works forming the core of this front are a paper on indifference levels by Peter C. Fishburn,[32] Research Analysis Corporation, McLean, Virginia; a book on utility theory in decision-making,[33] also by Fishburn; and an article on utility theory,[34] by R. Duncan Luce, Stanford.

Debreu's work and the work of others in this area provide a deeper understanding of the way a market-guided economy works, helping to show which problems a free market can overcome on its own and which should be dealt with through other means.[10] And indeed, as Karl-Goran Maler, a member of the Royal Academy, was quoted in *Newsweek*, both the World Bank and the International Monetary Fund use models based on Debreu's work.[22] To a great extent, Maler said, "...the economic and political planning of many nations is...built directly on Debreu's efforts."[22]

Literature

William Golding, the well-known English novelist, won the 1983 Nobel Prize in literature. The Swedish Academy awarded him the prize for "...his novels which, with the perspicuity of realistic narrative art, and the diversity and universality of myth, illuminate the human condition in the world today."[5]

As in previous years, the literature award is somewhat controversial. According to an article in the *Philadelphia Inquirer* by staff writer Stephan Salisbury,[35] there was vast surprise among literary circles at the Swedish Academy's choice; apparently, it was expected that this was at last the year in which the award would be given to British novelist Graham Greene or to Argentine writer Jorge Luis Borges. Unfortunately, there are never enough awards for all those who clearly deserve them. As sociologist Harriet Zuckerman, Columbia University, puts it, "Who shall occupy the forty-first chair?"[36]

But as Lars Gyllensten, head of the Nobel committee, was quoted in a wire story appearing in the *Los Angeles Times*, "Golding has, like many other candidates, been considered for many years.... The impact of his work has consistently increased after every novel was published."[37] Whether or not Gyllensten's use of the word "impact" included citation impact is not clear; but certainly Golding's "impact" on the public is very different from his impact on scholars and other writers.

Golding was born on September 19, 1911, in St. Columb Minor, Cornwall, England. He began his literary career at an early age and published his first book, *Poems*,[38] in 1934. The book was not very successful, and he did not publish again

until he was 43 years old. Golding received his BA degree from Oxford University along with a diploma in education in 1935. At his parents' prompting, he initially studied science, but later turned to English literature. After graduation, Golding taught in an all-boys' school, the Bishop Wordsworth's School, Salisbury, Wiltshire, and he often used the all-male experience throughout his novels as a thematic backdrop.[39]

Golding's teaching career was interrupted by World War II, which he called the turning point in his life. As a lieutenant in the Royal Navy, he spent most of the war at sea. He took part in the Normandy invasion and witnessed many other battles, including the sinking of the *Bismarck*. As a result of his war experiences, the common themes of humanity's loss of innocence and its inherent evilness run throughout his works, reflecting his pessimistic view of the human race.

Golding, author of at least a dozen novels, novellas, essays, and a volume of poetry, probably is best known for his book *Lord of the Flies*.[40] Published in England in 1954, the book is typical of Golding's vision of humanity, namely, that human beings are capable of great evil. In an interview with *Time* staff writer Paul Gray, Golding explained that the theme of *Lord of the Flies* is "...an attempt to trace the defects of society to the defects of human nature."[41]

On one level, *Lord of the Flies* is the story of a group of plane-wrecked English schoolboys. The tale describes the breakdown of social order and the colossal evil that the characters enact upon each other. But in a critical study of Golding's work, professor of English literature Bernard F. Dick, Iona College, New York, states that the book is also considered an allegory, filled with symbolism and quasi-religious themes.[42] Golding enjoyed immense success with *Lord of the Flies* when the paperback version was published in the US in 1959. He became very popular with students in the 1960s, and just about every US college English course curriculum included a Golding novel. The film version of *Lord of the Flies*, originally released in 1963, appears occasionally on TV.

Citation Information

In addition to its coverage of the social and natural sciences, ISI also produces the *Arts and Humanities Citation Index* ™ (*A&HCI* ™).[43] While there are significant differences between the literatures of the arts and sciences, the existence of the *A&HCI* permits us to include relevant citation impact data for artists and literary scholars, as I discussed in a recent essay on how to use the *A&HCI*.[44] Although we never attempt to predict Nobel Prizes, it is particularly interesting to note that in our last analysis of the 100 most-cited authors of twentieth century literature, 24 already are Nobelists.[45]

Whereas most scientists are well-cited long before they receive the award, literary laureates who were not heavily cited may become well-cited in the future. And a more thorough analysis of their impact would not only take into account the direct citation of their literary creations, but also the scholarly works about them. While the *A&HCI* will tell you directly who is "citing" the work of Shakespeare, Shelley, or Shaw, for example, the citation of the scholars who interpret their work for us is even more essential grist for the citation mill.

Golding was already a highly cited author when he received the Nobel Prize. His work was explicitly cited in almost 350 review articles, book reviews, chronologies, and other types of

publications between 1966 and 1984. Of these, about 95 were from the *SSCI* and about 250 from the *A&HCI*, which covers the years 1976 to the present only. A 10-year cumulation for 1975-1984 is now planned.

These citation numbers are very high for an author of fiction. Most novelists are never explicitly cited at all. His most-cited, or reviewed, work, *Lord of the Flies*, was cited explicitly nearly 110 times. Among the citations to it is a commentary by Anthony Weaver, senior lecturer in art education, University of London, Goldsmith College. Published in the *Journal of Moral Education*,[46] Weaver's contribution discusses an article by poet and novelist David Holbrook that appeared in the same issue. Holbrook's article focused on his experience as a tutor at an isolated, stone house in a remote, rural setting in Yorkshire, where he taught courses on writing to small groups of adolescent students.[47] Holbrook dwelt on the implications for society of the students' at-times unruly behavior; Weaver came up with the comparison to the behavior of the plane-wrecked boys in *Lord of the Flies* for which Holbrook had been searching.

Another article that cites *Lord of the Flies*, by John Berry, editor-in-chief of the *Library Journal*, in which the article was published, discusses the determinants of popularity in literature and the factors that influence whether or not a library will purchase a given book.[48] Berry listed Golding's book, *Lord of the Flies*, as a perennial favorite among faculty members.

Another Golding book, *Darkness Visible*[49] (1979), has been cited over 30 times. *The Inheritors*[50] (1955), *The Spire*[51] (1964), and *Pincher Martin*[52] (1956) were all cited approximately 25 times each. It is interesting to note that *The Inheritors*, which tells the story of the extermination of the last of the Neanderthals by *Homo sapiens sapiens*, was cited by John Pfeiffer, professor of anthropology, Rutgers University, Livingston College, Piscataway, New Jersey, in his commentary[53] on an article by Randall White, New York University, in *Current Anthropology*.[54]

White's paper deals with the transition between the Upper and Middle Paleolithic Ages in Western Europe. Among his conclusions, White discounts the notion that the replacement of *Homo sapiens neanderthalensis* by supposedly intellectually superior *Homo sapiens sapiens* played a major role in the transition. Pfeiffer applauds White's conclusion, stating that "...there is no reason to believe that our robust relatives were a bit weak in the head." Pfeiffer cites Golding's portrayal of Neanderthals in *The Inheritors* as individuals incapable of abstract reasoning as part of the basis for the common conception—or misconception—of the Neanderthal as a brute.

Golding, who has published another novel, *The Paper Men*[55] (1984), since he received the Nobel, will undoubtedly become more highly cited in the future. The Nobel is not Golding's first literary distinction. He won the Booker McDonnell award for *Rites of Passage*[56] in 1980, and has been a fellow of the Royal Society of Literature since 1955. Cited explicitly more than 20 times, *Rites of Passage* has been the subject of considerable literary scrutiny. Among the articles citing it are a review by Jay L. Halio, professor of English, University of Delaware, Newark, in the *Southern Review*[57] and a critical opinion by Michael Waterhouse, New College, Oxford, England, comparing *Rites of Passage* with the rest of Golding's works.[58]

In his acceptance speech, Golding reminds us of the inseparable connections between the cultures of science and art. Commenting on the Nobel Prize

categories, he declared, "The truth is that, though each of the subjects for which the prizes are awarded has its own and unique importance, none can exist wholly to itself. Even the novel, if it climbs into an ivory tower, will find no audience except those with ivory towers of their own. Put simply, the novel stands between us and the hardening concept of statistical man."[59] And finally, Golding calls himself an optimist "...when I consider the spiritual dimension which the scientist's disciplines forces him to ignore."[59]

This completes our review of the 1983 Nobel Prize winners.

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