

in institutions should recognize it as such. A passing familiarity with the structure of legal systems reveals these facts: institutions persist where technologies and endowments change, and vary where endowments and technologies are similar. For instance, as we approach the twenty-first century, the range of legal diversity across the 50 American states remains quite remarkable, and pales in an international context. Institutions, once established, have persisting consequences.

Students of institutions should neither reject game theory as without interest nor embrace it with such enthusiasm that its limitations are overlooked. There are many types of strategic interaction for which an understanding of the technique can be helpful; these range considerably beyond those for which the Prisoner's Dilemma may be a useful metaphor. Other examples include games of coordination, useful for interpreting the emergence of standards such as railway gauges or video cassette standards.

Game theory can be a powerful tool for studying human interaction within rule-constrained circumstances. It can also be useful prescriptively, as a guide to individual behaviour. And, because of its power to illuminate the consequences of different institutional arrangements, it can be helpful from the standpoint of public policy in designing and/or advocating new institutional arrangements. But in any specific attempt to explain economic, political or social behaviour, knowledge of analytical technique must be complemented by descriptive/historical data on institutions and norms. Without such data, it is impossible to describe or define the strategy space. Without rules (which may or may not be governmentally enforced) there is no game, as Morgenstern makes clear.

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See also:

Cooperation, The Evolution of; Cost-Benefit Analysis; Evolution and Optimality; Formalism in Economics; Habits; Institutions; Lock-in and Chreodic Development; Natural Selection, Economic Evolution and; Routines; Rules; Trust; Uncertainty.

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Georgescu-Roegen, Nicholas

One of the pioneers in mathematical economics in Harvard in the 1930s, Georgescu-Roegen later developed a new epistemology of the social sciences and economics, one which is for the most part critical of 'standard' (that is, neoclassical mainstream) economics, and became the father of a new paradigm, called 'bioeconomics'. In 1976, he retired as Distinguished Professor of Economics at Vanderbilt University, where he has lived since 1948.

Georgescu-Roegen's career encompasses three important turning-points in his life. Beginning as a pure mathematician, he became a statistician, then a mathematical economist and, finally, one of the most profound and prominent dissenters in economics. While he is no outsider, no sincere economist has been willing to publicly challenge his work; instead, it is completely ignored by standard economists. However, the founding of the European Association for Bioeconomic Studies (EABS) in 1990, devoted to promoting the bioeconomic paradigm, is evidence of the steadily rising interest in his work.

Georgescu-Roegen was born on 4 February 1906 in Constanza, Romania. His father, an army captain, died when he was eight. His mother, coming from a humble family, taught needlework and dreamed of seeing him as an engineer, free of material worries. But when he won a scholarship to a military lycee at Bucharest, his mathematical aptitudes were discovered and encouraged. In 1923, he entered the mathematical department of Bucharest University, receiving his first academic degree three years later.

In November 1929, he left for Paris and registered at the Sorbonne's Institut de Statistique. Although not knowing English then, Georgescu-Roegen went to England on a small scholarship in late 1930 to continue his studies with the famous Karl Pearson in the Galton Laboratories at the University College of London. In late 1934, he went to Harvard on a Rockefeller post-doctoral fellowship. There he met Joseph A. Schumpeter, who was immediately interested in the way in which the young man's mathematical-statistical methods could be used for his planned *Business Cycles*.

This was, by pure accident, the start of the economist Georgescu-Roegen. Within a year and a half, he published four papers in economics. One of them, 'Marginal Utility of Money and Elasticities of Demand' (1936) was a verdict against Milton Friedman in his controversy with A.C. Pigou, written at the invitation of editor Frank W. Taussig, who asked Georgescu-Roegen to act as a 'broker'. Another essay, on 'The Pure Theory of Consumer's Behavior' (1936), covered several entirely new aspects of that subject, and was considered by Georgescu-Roegen one of his salient contributions to economic theory; and, according to Paul Samuelson, it was a pathbreaking development of the theory of choice.

Thus, at the age of 30, Georgescu-Roegen was a promising and sought-after scholar. Both Harvard and Schumpeter wanted to keep him on, the latter wanting to write an economic analysis with him. Arrangements were even made for his possible return to the USA after he had looked at conditions in Romania. But without quite understanding today why, he declined and sailed for Bucharest in the summer of 1936.

He learned two invaluable economic lessons during the subsequent 12 years from his own underdeveloped backyard which undermined his then 'religious confidence in mathematical economics'. The first would undoubtedly strike a standard economist as a ridiculous product of some economic ignoramus: the fact that only in the land of plenty does the marginal principle maximize a complex of product proper and chosen leisure; whereas in the land of scarcity (underdevelopment) people must work as long as they can, to the point of zero marginal productivity of labour (as illustrated, for example, by the doormen outside the offices of very high functionaries, public or private, who produce nothing to justify their pay). But even in advanced countries – despite pure neoclassical claims – consumers are not only guided by a quantitative set of commodities; individual behaviour is also affected by the way of perceiving wants, for example, affiliated, not with a quantitative scale, but with the qualitative social matrix.

The second lesson came from Romanian peasants, who, even under inflation, still sold goods for money, no matter how devalued, because money has always been *summum bonum* for them. These lessons, drawn from personal experience and not from textbooks, led him not only to dissent from the Keynesian thesis that government spending ('planned inflation') should be the unique prescription for universal growth, but also to depart from the popular tenet that the take-off, especially of an underdeveloped country, can be achieved only by inflation (because it is a means by which virtually all economic growth benefits the privileged classes (Georgescu-Roegen, 1976b, ch.7)). Conventional economic wisdom later gave him several other reasons to dissent, especially from the standard production function, which ignores the important role of natural resources – as had first become clear to the public during the oil embargo of 1973–4, some years after Georgescu-Roegen first presented his new epistemology and the bioeconomic approach (Georgescu-Roegen, 1966, 1971).

In February 1949, fearing arrest, Georgescu-Roegen fled with his wife on a freighter from Constanza harbour; he arrived at Harvard in early July. There W. Leontief and E.S. Mason reinstated him in the economics department as a lecturer and research associate. He then moved to Vanderbilt University as professor of economics until 1969, thereafter Distinguished Professor until his retirement in 1976.

Shortly after his return to Harvard (where he saw Schumpeter again before the latter's death in early January 1950), and to 'truly great avenues [that] had been opened in economics during my long "exile"' (Georgescu-Roegen (1992c) in Szenberg, p. 133), Georgescu-Roegen completed several papers of lasting value, among them the 1954 classic, on 'Choice, Expectations and Measurability'. In 1951, with T.C. Koopmans, he co-edited *Activity Analysis of Production and Allocation* (with his later flow-fund representation he claimed to offer a radical alternative to both the activity analysis and the production function model). With his 1960 work, 'Economic Theory and Agrarian Economics', which was soon translated into several languages, he made his decisive break with standard neoclassical economics.

He thus established himself as an outstanding mathematical economist and original scholar, especially in consumer theory, input-output analysis, and production theory in the widest sense. In the famous methodological introductory essay to the first English edition of *Analytical Economics* (1966), Georgescu-Roegen blamed standard economics for having reduced economics to a mechanical analogue. At the same time he offered in a nutshell his own paradigmatic approach to a new alliance between economics and environment which, after 1975, was labelled simply 'bioeconomics'.

In a 1970 pamphlet, 'The Entropy Law and the Economic Problem', he outlined for the first time the issues in what remains the most comprehensive version of his vision in *The Entropy Law and the Economic Process* (1971), that is, the important role of the entropy law for the existence of our species. Since then, he has developed several aspects of this approach (see 'The Entropy Law and the Economic Process in Retrospect', 1986, and 'Thermodynamics and We the Humans', in Seifert and Alier, 1992b); the ethical and political implications are summarized in 'A Minimal Bioeconomic Program' (1976b, pp. 33–5). Georgescu-Roegen's new epistemology is important, but even more ignored than his 'bioeconomics'. This epistemology focuses on the distinction between 'arithmomorphic' and 'dialectic' concepts (the Hegelian term is adopted to characterize a way of thinking, not to imply a force which legislates nature and society, as Hegel and Marx – in an inverted way – claimed). Arithmomorphic concepts, essentially mathematical ones, are not suitable for portraying qualitative phenomena proper, which have no real distinct, but 'overlapping' characteristics; in all these qualitative cases (primarily social and economic change, as Georgescu-Roegen knows from his teacher Schumpeter), only dialectical concepts, also distinct, but not discretely distinct, fit the properties of such processes.

Knowing the possible legitimate role of mathematics, taking into account this fundamental epistemological difference and reflecting the current practice of the economic establishment grinding out papers with the mathematical engine, Georgescu-Roegen heavily criticizes the abuse of mathematics,

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Giddens, Anthony

Anthony Giddens was born in 1938 and studied at the University of Hull and the London School of Economics. He has taught sociology at the universities of Leicester and, since 1969, Cambridge. His first book, *Capitalism and Modern Social Theory* (1971), introduced generations of students to Marx, Weber and Durkheim at a time when there were few up-to-date studies in English of the classics of sociology. In the 1970s, as well as producing major studies on class structure and elites, Giddens developed his own theory of 'structuration', culminating in his main theoretical work, *The Constitution of Society* (1984). He has applied this model in his wide-ranging substantive works, *A Contemporary Critique of Historical Materialism* (1981), *The Nation State and Violence* (1985), *The Consequence of Modernity* (1990) and *Modernity and Self-Identity* (1991). His *Sociology: a Brief but Critical Introduction* (1982) and his comprehensive textbook, *Sociology* (1989), are exemplary introductions to sociology in the broad and interdisciplinary sense in which Giddens conceives it.

While he rejects methodological individualism, Giddens's theory of structuration gives a central place to the 'knowledgeability' of human beings and their active role in the reproduction and transformation of social structures. He thus aims to go beyond the traditional oppositions in social theory between voluntaristic theories of individual or collective action, which neglect structural constraints, and structuralist or system theories, which ignore the creative activity of human beings, and between a microsociology focusing on individual actions or small-scale interactions and a macro-sociological focus on systems and structures. Giddens shows how the structural properties of large-scale social systems stretching across time and space, such as the great empires of world history, are grounded in individual action and interaction (1984, p. 25).

Economic processes are central to Giddens's theory of society, though he rejects both economic determinism, in Marxist and other forms, and substantivist conceptions of economic institutions (1984, pp. 33ff.). For Giddens, the analysis of economic relations requires us to examine the overall role in a given society of what he calls material or 'allocative', as opposed to 'authoritative' resources grounded in systems of domination.

attack after a conference on Eco-Development at the Inter-University in Dubrovnik, Yugoslavia, and died on 9 April 1976.

Kapp's contribution to the integration of social science and the foundations of institutional and evolutionary economics

Against the stream, Kapp was convinced that a new paradigm in economics was universally acceptable only if it was able to formulate relationships to nature and society in harmony with the findings of modern sciences. His point of departure in *Towards a Science of Man in Society* (1961) is an open systems approach, based on an evolutionary perspective that distinguishes clearly between three levels of organization: inanimate matter, living organisms and human society. They are both intrinsically linked (in that they represent different degrees of complexity) and unique kinds of structures (owing to the fact that, with the changing degree of complexity, qualitative new features arise, forbidding conclusive analogies between the different levels of organization).

In order to comprehend Kapp's understanding of the open systems approach, it is necessary to distinguish clearly between the meaning of openness proper to all living organisms and the meaning of man's *unique* open biological structure, a distinction central to his integrative framework. (A different classification of closed and open systems in thermodynamics, one taking account of dissipative structures, is obviously possible.) As early as 1960, Kapp followed the insights of Schrödinger and Bertalanffy in regard to the first meaning of openness: living organisms are capable of maintaining themselves in a steady state, temporarily avoiding the increase of entropy, and even develop towards states of increased order as the result of an influx of nutrients and an efflux of waste materials. This puts living organisms in a double-bind relationship within the ecological system: life is not possible without modifying nature and these modifications influence every living organism according to the evolutionary principles of self-organization in nature. This early understanding of the meaning of the entropy law for life, and his knowledge of ecological principles elaborated for this theory of social costs, allowed Kapp to agree with Georgescu-Roegen on the fundamental significance of the irreversible entropic character of the economic process as a basic principle for ecological economics.

The relationship between the meaning of openness characteristic of all living structures and the particular meaning of openness in social structure is given by *man's unique* openness as a biological structure. Following Portman and Gehlen, Kapp insisted on the quasi-embryonic state at birth and the period of another year of 'extra-uterine existence' before the infant acquires the ability to use his or her sensory and motor organs, assumes the human erect position and develops the ability to speak. It is that uniqueness of

man's biological structure that accounts for both the extreme vulnerability of man's existence and the openness of his potentials. Since the actualization of man's potentials depends universally on cooperation and communication, self-affirmation and individuation and some safety, order and security, all of which are social, the relationship between the individual and society is also of the nature of a double-bind: human potential can only be actualized in a process of enculturation, yet in going through that process individuals are conditioned in a culturally specific way and cannot confront reality otherwise than through their acquired linguistic and symbolic system and the corresponding mind-set.

The origin, meaning and function of institutions (in the sense of habitual modes of thought, feeling and action) and rules defining transactions are best understood as adaptive tools to stabilize the unstable structure of human drives and needs, open to being channelled into the most diverse directions including extremely destructive ones. Yet, not only is any enculturation process selective in favouring the actualization of some potentials at the cost of others, the conditioning process provides at the same time the axiomatic values which serve to explain, rationalize and justify the same conditioning process. This closing-down mechanism of circular causation is value-laden, emotionally charged and to a large extent unconscious. This is why 'freedom' in the sense of autonomous thought and feeling and deliberate action is possible only on the basis of a laborious process of consciousness raising on both the intellectual and the emotional level, a proposition valid in ordinary life as much as in economic affairs and scientific activity.

This recognition of the double-bind relationship between man's unique openness (as a biological organism) and culture (as a complex set of structured institutions) allows not only the integration of the complementary aspects of facts and values, of reason and feeling, of unconscious and conscious motivations as integral elements of social conditions; it provides also a framework to distinguish clearly between the universal and the culturally specific. Kapp rejected the projection of culturally specific ways of satisfying need onto other cultural contexts – such as the acquisition of money, income and wealth that are culturally specific ways of satisfying the universal need for self-affirmation – rejecting also purely formal considerations and cultural relativism. Double-binds call for an approach from both sides: the universal biological, psychological and social needs already mentioned provide the basis for a critical evaluation of those institutional arrangements that in any given culture inhibit the self-actualization process of groups or even the majority of a population, or prevent the actualization of *new* potentials as an evolutionary step to overcome 'locked-in' situations of vicious circles and involution. From the other side of the same double-bind, it is the study of the social and ecological consequences of individual and group action