dependente do passado - é path dependent.
A história é caracterizada por particularidades
Logo, as teorias gerais têm limites. A dependência do passado
dificulta a fascinação pela teoria geral.

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THE LIMITATIONS OF GENERAL THEORY

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Science must begin with myths, and with the criticism of myths.
(Sir Karl Popper, 'The Philosophy of Science' (1957))

History is important, partly because every complex organism, every human being and every society carries the baggage of its past. Evolution builds on past survivals that encumber actions in the present. Choices made by our ancestors can be difficult to undo. For example, the standard railway gauge used by modern high-speed trains has its origins in the axle dimensions of horse-drawn carts of over two thousand years ago. We travel on railways that were designed with some dimensions inherited from an ancient and inappropriate means of transport. Other examples of lock-in and path dependence in the evolution of technology and conventions are well known in the social sciences.[1]

If history matters – at least in the sense of social development being path dependent – then our analyses must explore the particularities of the past. While we may retain general principles or guidelines, detailed analyses of particular events, structures and circumstances are required. If history matters in this sense, then general theories have their limits. That is one reason why some of the quoted examples of technological lock-in have been controversial: path dependence dulls the lure of a general theory.[2]

In contrast, if we were to possess an adequate general theory of socio-economic structure and change, then we would use it to understand every kind of circumstance within its broad domain of application. Specific circumstances would enter the theory merely as data. Particular theories would no longer be required. The achievement of a general theory of economic behaviour would make the construction of a historically delimited theory redundant. A single theoretical framework would encompass all possibilities. That is the lure of a general theory.[3]

1 See, for example, David (1985, 1994), Dosi *et al.* (1988), Arthur (1989, 1994), North (1990), Hodgson (1993a), H. P. Young (1996).

2 Note the discussion of network externalities, and the controversy over whether the QWERTY keyboard and the VHS video system were in some sense optimal or not (David, 1985; Katz and Shapiro, 1985, 1986, 1994; Liebowitz and Margolis, 1990, 1994).

3 There is a slight difference of meaning between the terms 'general theory' and 'universal theory' in that the latter connotes a wider domain of applicability than the former. Both terms are used in this book. Different possible levels of generality emerge after the introduction of different levels of abstraction. See chapter 21 below.

A fascinação pela teoria geral é responsável parcial pela negligência dos cientistas sociais em relação à história.

Nevertheless, it is argued here that such a goal is impossible, at least in the social sciences. The desire for a general theory obliges scientists to simplify and to overturn the very generality for which they strive. The lure of a general theory is in part responsible for a degree of neglect of history in contemporary economics and sociology. This chapter considers the basis of this lure. It argues that general theories can be only of limited use in social science. A place for historically specific theories must remain.

For centuries, however, scientists have admired general theories. The Ancient Greeks sought common patterns and symmetries in nature. Pythagoras observed a blacksmith at work and noticed that iron bars of different lengths gave out sounds of different pitch under the strokes of the hammer. Conceptions of sound and length, of music and measure, were amalgamated. Centuries later, at the beginning of the modern world, Isaac Newton formulated his general laws of motion, explaining both the motion of earthly projectiles and the movements of the planets. In 1820 Hans Christian Oersted saw that an electric current flowing through a wire deflected a nearby compass. He thus discovered the hitherto unrecognised link between magnetism and electricity and inspired the development of the electric motor. Michael Faraday set himself the problem of finding the connections between light, heat, magnetism and electricity, and developed a unified theory of electromagnetic radiation. Energy and matter became later unified in Albert Einstein's theory of relativity. Physics still struggles to capture diverse phenomena within a common explanatory framework. Science tries to unify: it strives for general theories. The goal of unification has endured in the history of science and has inspired many of its achievements.

Much innovation in science comes from combining different phenomena in a more general scientific framework. Philosophers of science have rightly identified the power and value of explanatory unification. For example, Paul Thagard (1978) and Philip Kitcher (1981, 1989) have correctly pointed out that explanatory unification has played a significant role in the development of the natural sciences. Likewise, Clark Glymour (1980, p. 31) has argued that successful explanations in science have the feature that they 'eliminate contingency and they unify'. The importance and possible value of explanatory unifications should not be underestimated.

However, the quest for explanatory unification should not be pushed to the point where the nature and value of the particular explanation adopted are given weak scrutiny. Some explanations may unify, but be of little worth. A theory that every event is caused by the gods is an explanatory unification, but it is of little scientific significance. Likewise, as discussed in chapter 16 below, a non-falsifiable general theory such as 'everyone is a utility maximiser' is also of little explanatory value. This book addresses the limits of explanatory unification in the social sciences.

Some claims of explanatory unification are defective in their failure to consider their ontological presuppositions. Others fail, similarly, to question what is meant by 'explanation', being merely satisfied to point to a theory that seemingly 'fits' every eventuality. The ideas that everyone maximises their utility, or that every event is caused by gods, come into this category. However, once we attempt to build more careful and meaningful explanations, then we are faced with the problem that economic reality changes in a way that physical reality does not. Yet the lure of a general theory has often overcome such critical reflections.

The lure of a general theory pervades the social as well as the natural sciences. Again it is believed that a general theory is always better than one with a narrower domain of analysis. Consequently, it is upheld that to become respectable, economics, sociology and anthropology must also uncover general principles or laws – much in the manner of the natural sciences. The aim is for one theory that fits all circumstances.[4]

This notion emerged in the heyday of classical economics. While Adam Smith attempted judiciously to blend induction with deduction, at the same time he sought general principles and laws. However, his classical successors such as David Ricardo and especially Nassau Senior went much further. They pursued more and more an axiomatic and deductivist method, attempting to derive universal conclusions from a few professedly general and fundamental propositions. Ranged against this Ricardian tendency was Thomas Robert Malthus. Malthus criticised the over-emphasis on deduction and generalisation. He wrote in 1819: 'The principal cause of error, and of the differences which prevail at present among the scientific writers on political economy, appears to me to be a precipitate attempt to simplify and generalize' (Malthus, 1836, p. 4).

Significantly, John Maynard Keynes (1972, pp. 100–1) wrote in his 1933 essay on Malthus: 'If only Malthus, instead of Ricardo, had been the parent stem from which nineteenth-century economics proceeded, what a much wiser and richer place the world would be today!' However, Keynes himself made two crucial mistakes. Both helped the Ricardian rather than the Malthusian stem to triumph and spread across the world. One error was to neglect the German historical school and its alternative to Ricardian deductivism. The other mistake was to recommend a 'general theory' of his own. *The General Theory of Employment, Interest and Money* (1936) is one of the most famous cases of an attempted general theory in economics. Keynes's perceptions in his Malthus essay were right, but – as argued in chapter 15 of this work – he did not do enough to prevent a strain of deductivist general theorising that dominated economics for forty years after his death. The case of Keynes is an object lesson. The search for a general theory is not confined to mainstream or neoclassical economics. All sorts of economists have revered a 'general theory'.[5]

For much of the postwar period, 'general equilibrium analysis' has been in vogue in economics. It has attempted to elaborate the general conditions for the existence and stability of market equilibria (Debreu, 1959; Arrow and Hahn, 1971). This work was at the cutting edge of theoretical economics until it ran into analytical difficulties in the 1970s. It was eclipsed by the rising interest in game theory in the 1980s.

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4 The classic account of the growth of 'physics envy' in economics is Mirowski (1989). However, some reservations concerning Mirowski's thesis are expressed below and in Hodgson (1999b). Overall, economics suffers perhaps more from mathematics envy rather than physics envy (McCloskey, 1991; Blaug, 1999).

5 For example, a 'general theory' is proclaimed in the titles of Roemer (1982), Nell (1998) and Ormerod (1998).

Na ciência econômica, entre os 1930s e os 1980s, a teoria do equilíbrio geral foi a tentativa mais prestigiosa de construir uma teoria geral.

Likewise, in sociology, there has been a similar reverence for general theory of social action, interaction and structure. Twentieth-century milestones in sociological theory – such as Talcott Parsons (1937a), Robert Merton (1949), George Homans (1961), Peter Blau (1964), Jeffrey Alexander (1982–3), Anthony Giddens (1984), James Coleman (1990), Harrison White (1992) and Niklas Luhmann (1995) – are all general attempts to understand 'society', largely unconfined to any historically specific epoch or type of social structure.[6]

Overall, general theories have pervaded economics and sociology for the second half of the twentieth century. General principles are assumed and their logical consequences are explored. In this respect, at least, the social sciences look to physics and other natural sciences as their role models. The more general and inclusive the theory, the greater its prestige. Universalisations take the accolade.

Def. teoria geral

What characterises a general theory in the social sciences? Here we shall take the term 'general theory' to mean the following: It is any substantial explanation or model of the principal characteristics and behaviour of human economies or societies, *largely or wholly in terms of features that are assumed to be common to most conceivable social or economic systems.*

It is true that modern mainstream economists attempt to tailor their theories to specific situations. There are theories of perfect competition, theories of monopoly, theories of oligopoly, theories of labour markets and so on. Such theories may claim to apply to a specific set of circumstances. In some of their assumptions, these theories differ from one another. Nevertheless, some of their features are like those of a general theory. First, some presumptions – such as rationality, scarcity and fixed preferences – are common to all these theories. These core assumptions are held to apply to all socio-economic systems. Second, it is rarely claimed that the theory involved applies to a specific type of socio-economic system or a limited historical period. In these two senses, ahistorical and acultural generalities pervade even specific modes of theorising in modern mainstream economics.

The goal of a general theory has been pursued to the greatest extent in the type of general equilibrium theory developed by Léon Walras, Kenneth Arrow, Gerard Debreu and others. Significantly, from the 1930s to the 1980s, general equilibrium was one of the most prestigious areas of research in economic theory. Of course, the word 'general' in 'general equilibrium theory' applies to the word 'equilibrium' rather than 'theory'. General equilibrium is thereby distinguished from partial equilibrium. Nevertheless, general equilibrium theorists have used the rhetoric and appeal of general theorising as well, often using the term 'general theory of economic equilibrium'. Attempts have been made to apply this general equilibrium approach to feudalism and socialism, as well as to capitalism (Lange and Taylor, 1938; Rader, 1971). In particular, both Oskar Lange and Joseph

6 For overviews and discussions of the character of these general theories in sociology, see, for example, Fararo (1989), Holmwood (1996) and Mouzelis (1995). Notably, several of names of sociological general theorists mentioned here were strongly influenced by Parsons, including Merton and Luhmann (who were his students) and Homans (who was a colleague of Parsons at Harvard).

Os sociólogos não escaparam à tentação da teoria geral.

Schumpeter lauded Walras as the architect of a 'truly general theory' in economics.[7]

Abstraction and simplification are necessary for any theory. General theorists, however, build upon features that are taken as common or universal, rather than historically or culturally specific. Their guiding examples in this respect are the successful explanatory unifications and general theories that are found in the natural sciences. For example, in economics, general equilibrium theorists have made ostensibly general assumptions concerning human agents, their endowments and their interactions. With these they attempt to deduce some general results concerning economic equilibria. Likewise, in social theory, general assumptions are made about social agents, their 'exchanges' and the social structures that they inhabit.

GENERAL THEORISTS, NIHILISTS AND EMPIRICISTS

Nevertheless, general theorising is not universally popular. Ranged against the proponents of general theory, in both economics and sociology, are those that are critical of its operational usefulness, explanatory adequacy and universal claims.

For instance, 'post-modernism' is a major assault on general theorising in the social sciences. Post-modernists emphatically reject grand narratives and totalising theory (Lyotard, 1984). The problem is that they can do this only by means of a totalising, meta-narrative of their own. There is no means by which to dispense with a grand narrative other than by an even grander, universal story. Hence the post-modernists fall into a paradox of their own making. As Andrew Sayer (1995, p. 223) puts it: 'Those who are sceptical of meta-narratives should turn their suspicions on "modernism" and "postmodernism" first.' There is no way of avoiding this paradox: grand theory cannot be dismissed by yet another grand, general discourse, whatever its rhetorical appeal. Post-modernism is further weakened by its abandonment of the search for truth. Post-modernism is a symptomatic but nihilistic reaction against the excessive claims for general theorising in social science.

Logically, any argument against general theories must involve general statements or narratives. Although these statements are not necessarily general theories, in the sense defined above, they are nevertheless general in their scope. The rejection of general theories must itself involve generalities. There is no escape.

Post-modernism rightly detects some of the limits of general theorising but veers off in a largely unwarranted and unacceptable direction. These mistakes might have been avoided if post-modernists had some awareness of past debates concerning the limits of general theory in the social sciences. We shall briefly

7 See Lange (1938), Schumpeter (1954, p. 1082).

Outros críticos das teorias gerais refugiaram-se no empirismo, a convicção que o conhecimento é baseado principalmente na experiência e não em um sistema teórico.

Porém, todo empirismo tem escondida uma teoria geral própria.

discuss post-modernism again in the next chapter, after the problem of historical specificity has been introduced in more detail.

Other critics of general theories take refuge in empirical work. Empiricism is defined as the broad notion that knowledge is based primarily on experience rather than on any body of theory.[8] Empiricists hold that reality can be understood only by detailed, empirical engagement. It is believed that the search for truth is an empirical matter; it involves the gathering of data rather than the unsupported erection of theoretical postulates. If any theoretical generalisation is possible, empiricists believe that it must emerge on the basis of extensive empirical enquiry.

Today, we find both empiricists and general theorists in university social science departments. For centuries, a version of empiricism has been a haven for critics of general theorising. This type of empiricism is antithetical to all theory. We also find empiricist hybrids, who accept some universal propositions, but also believe that further truths are established on the basis of data alone. These hybrids accept the desirability of universal assumptions and then immerse themselves in empirical work, believing that universal truths can eventually be established by induction.[9]

Over time, the balance of debate has shifted back and forth between these various positions. Intellectual fashions come and go. As both economics and sociology go through periods of theoretical crisis, empiricism is seen as the salvation. Even further, the inadequacies of general theorising sometimes create a reaction against all theory. Theory is abandoned in search of the facts. The anti-theoretical empiricists march forth with their clipboards and computers. But as some cohorts of these empiricists get lost in the analytical swamplands of questionnaires and statistics, new groups of general theorists emerge, promising order and deliverance. And so it goes on, each group ascending then descending.

The truth is that both empiricism and general theorising have their intellectual limitations, as does any hybrid combination of the two. Both empiricists and general theorists place their conceptual weight on universal assumptions, placing less emphasis on concepts and theories that are more appropriate to the specific situation at hand. Although empiricists may sometimes fail to champion an explicit general theory, empiricism always has a hidden general theory of its own. This is because, in attempting to measure any quantity, or trying to establish any empirical regularity, acts of classification or taxonomy are unavoidable. For empirical enquiry, entities are placed into groups. The most important properties

8 This is a standard definition of the term. Inductivism and positivism are particular versions of empiricism. Positivism is a version of empiricism that emphasises empirical confirmation – rather than falsification – by observation or experiment. Empiricism has a long history and exists in several different forms. Nevertheless, they all have in common the notion that knowledge is based primarily on experience.

9 Induction refers to the method of generalising from a finite sample. If we observe a large number of white swans we may presume, by induction, that all swans are white. However, it is difficult to be sure that we have observed all existing swans, no matter how many we have seen. Indeed, in this case it turns out that in Australia there are black swans, and the presumption of universality is false.

and relations are identified. Connections are made. Accordingly, all empirical investigation involves prior judgements of sameness and difference. For example, we cannot examine transaction costs in firms without first having a notion of what is, and what is not, a transaction cost and a firm. Classification, by bringing together entities in discrete groups, must refer to common qualities. These qualities themselves have generality: they must be assumed to endure through space and time.

All empirical work thus relies on the principle known as 'the uniformity of nature'. For some types, entities or qualities, it has to be assumed that the type, entity or quality in one place in space and time remains the same type, entity or quality at another place in space and time. Otherwise we are faced with an immense collection of disconnected entities and qualities, and no meaningful empirical or other scientific investigation is possible. This supposition of the uniformity of nature is a highly general theoretical principle. Although empirical work depends upon it, the principle cannot be proven or disproven by the data. It must be assumed at the outset.

The idea that empirical data are sufficient for all knowledge thus founders. The empirical researcher must classify, and classification depends on the metaphysical principle of the uniformity of nature. Any empirical investigation depends on the assumptions of identity, continuity and measurability. These assumptions cannot themselves be derived from empirical data. Pure empiricism is thus incoherent.

In addition, a principal goal of any science is explanation. Explanation involves the suggestion of relationships of cause and effect. Without a presumption of causality, there can be no convincing scientific explanation of any phenomenon. However, no empirical enquiry can itself establish a causal relation. No cause can be perceived. Data cannot show us cause and effect. Correlations between sets of events are not necessarily indications of cause and effect. Correlation is not causation. Since David Hume's discussion of this problem, it has been widely accepted by philosophers that causal relations cannot be discerned in the data themselves. Accordingly, any scientific explanation involves the assumption of causal relationships that are themselves absent in the empirical data: they must be assumed. Empirical data cannot on their own provide causal explanations.[10]

Theory has primacy over facts, because concepts and theories are required to formulate any factual statement. However, this does not mean that science always works by first formulating a theoretical explanation and then testing it. There are many cases in the history of science where facts have first emerged without a theory that explains them. Science may subsequently triumph by supplying a theoretical explanation. In this manner, facts may inform or impel the formation of theories. But this does not negate the proposition that all facts depend upon some theoretical grounding.

Consider, for example, the professedly anomalous fact, noted by Wassily Leontief (1953), that the more developed countries have imported relatively more

10 The assumption that every event has a cause is a special postulate concerning the uniformity of nature. Hence the problems of causality and uniformity of nature are closely related.

capital-intensive products than they have exported. Recognition of this 'fact' requires prior theoretical concepts such as 'developed', 'capital-intensity' and 'import'. Second, any explanation of this phenomenon requires a theory that cannot spring from the facts alone. For these reasons an empiricist epistemology is flawed. However, this does not deny the possibility, as in the case of the so-called Leontief paradox, that facts may stimulate the search for new theories.[11]

THE LIMITS TO EXPLANATORY UNIFICATION

By its nature, a general theory achieves some explanatory unification. However, as Uskali Mäki (1990a, 1990b, forthcoming) has shown, there are explanatory unifications of different types. First, logical or derivational unification means that 'more and more statements within a discipline become derivable from the same set of axioms, or when the same set of statements becomes derivable from a smaller set of axioms' (Mäki 1990b, p. 331). This notion of unification involves purely deductive connections between axioms and derived statements. Many of the claims of explanatory unification within economics are of this derivational type. They are deductive accomplishments without ontological grounding.

While derivational unification is based on the inferential capabilities of theories, the contrasting idea of ontological unification is based on their referential and representational capabilities. If an ontological explanatory unification is possible, then it must be based on some underlying, ontological unity among a set of phenomena; they must share some substantial ontic foundations. Any explanatory unity among phenomena must result from investigation and discovery, rather than the mere imposition of assumptions. Priority is given to entities rather than propositions (Mäki, forthcoming).

Accordingly, the nature and location of the limits of general theorising vary in each case. The limits of general theorising by derivational unification result from the lack of ontological grounding to its claims. These limits concern neither the boundaries of unification, nor the number of items that can be unified, but the adequacy of the explanation. A derivational unification may be achieved, but on its own it cannot constitute a causal explanation of real phenomena.

On the other hand, the limits of ontological explanatory unification depend upon existence or otherwise of underlying unities among the phenomena under investigation. While the search for underlying unities behind the diverse appearances of real phenomena is rightly a central aim of science, any absence of recurring elements or similarities poses limits to ontological unification. Ontological explanatory unification requires the identification of similar structures or causal mechanisms. The capacity of a theory to unify in this ontological sense depends not on its axioms or propositions, but on the degree of real, underlying unity or similarity in its domain of application. It is primarily these

11 A good critique of positivism and empiricism in the social sciences is Hindess (1977). Bunge (1959) provided an excellent discussion of causality.

possible limits to ontological explanatory unification that concern us in the present work.[12]

We can conceive of reality as consisting of different ontological levels. There may be a level relating to matter addressed by physics, a level relating to molecules addressed by chemistry, a level relating to living organisms addressed by biology, and so on. These levels may themselves be subdivided. Within physics, for example, quantum physics and mechanics address different levels. Accordingly, different scientific theories may relate to different levels of reality.

Although universal laws have both scientific appeal and some explanatory power, they are often of limited use when it comes to the detail of specific contexts and situations, operating at a different ontological level. Einstein's theory of relativity may rule the universe, and its domain of application applies to all physical phenomena, but it tells us little of tomorrow's weather or of the carrying capacity of the Golden Gate suspension bridge. In achieving unification, general theories have an awesome appeal. But neither unification nor generality mean that the theory is sufficient for particular, contingent circumstances at a different ontological level.

Arguably, within the social sciences, there are differences among the real items to be explained that place limits on the scope for any general theory. Long ago, Max Weber reached a similar conclusion. In 1904, Weber (1949, pp. 72–80) wrote that 'the most general laws' are 'the least valuable' because 'the more comprehensive their scope' the more they 'lead away' from the task of explaining the particular phenomenon in question. This argument is similar to Ernest Nagel's (1961, p. 575) 'principle of the inverse variation of extension with intension'. This principle alleges that there is a trade-off between the generality and the informative content of a theory. This argument, developed further by Lars Udéhn (1992), has some force against the claimed universality of some of the assumptions of modern mainstream economics.[13]

It has been suggested that a similar problem may apply to the natural sciences. Physicists are now in hot pursuit of the TOE (Theory of Everything) or the GUT (Grand Unified Theory) that will marry quantum theory with the general theory of relativity. Superstring theory is part of this project. But as Jack Cohen and Ian Stewart (1994, p. 365) put it: 'A Theory of Everything would have the whole universe wrapped up. And that's precisely what would make it useless.'[14]

12 Although T. Lawson (1997) provides no extensive discussion of the place, types and limits of explanatory unification, his stress on the need for open-minded investigation into underlying causal mechanisms and structures is also valuable in this context.

13 However, while I concur with much of Udéhn's argument, he credits neoclassical economics with some relative success in explaining market, as opposed to non-market, phenomena. While the genuine achievements of neoclassical economics should not be denied, as Clower (1994, 1999) and others have noted, it concedes too much to suggest that it has an adequate definition and analysis of market institutions.

14 See Cartwright (1994) for a stimulating discussion of the role of allegedly general theories in physics and elsewhere. She argued that physical laws (such as Newton's) would hold only insofar as nothing (such as a wind) interferes with the motion of a body in space (p. 282). However, the wind itself could be regarded as a mass of separate particles, each subject to the same (Newtonian)

Ao contrário das teorias de Newton ou de Einstein, a teoria que o comportamento humano resulta de maximização individual da utilidade é não-falsificável

 (cap. 16)

Another set of problems arise with some types of general theory that arise in the social sciences. Some of these problems are discussed in more detail in chapter 16 and elsewhere. The general theory that individual behaviour results from the maximisation of individual utility is a case in point. It is argued in chapter 16 that this theory is non-falsifiable and it can apply, in principle, to any behaviour, including the behaviour of non-human organisms. If this argument is valid then there is a crucial difference between theories like Newton's or Einstein's, on the one hand, and the theory of utility maximisation, on the other. The difference is that the laws of physics impose restrictions on the type of supplementary theory that can be accommodated. This is not the case with utility maximisation: *any* behaviour is compatible with it. The reckless pursuit of generality in the social sciences has created theories that are compatible with *any* possible behaviour by *any* possible organism. The same cannot be said for prominent theories in the natural sciences.

Accordingly, much explanatory unification in the social sciences is achieved without a search for recurring elements or similarities in reality. The theory of utility maximisation is a case in point. Instead of the successful identification of similar, underlying causal mechanisms and structures, its proponents simply manipulate this theory to fit any phenomenon. Hence, this theory achieves derivational unification but not ontological unification. In contrast, the Newtonian and Einsteinian theories achieved a high degree of ontological unification.

All sciences have to deal with both sameness and difference. As biologists Richard Levins and Richard Lewontin (1985, p. 141) have put it: 'Things are similar: this makes science possible. Things are different: this makes science necessary.' General theorists sometimes over-emphasise the similarities, neglecting the differences. These problems are particularly acute in the social sciences. A general theory can clumsily obscure all historical and geographical differences between different socio-economic systems.

Nevertheless, there are some important examples of successful general theories concerning complex systems. Charles Darwin's theory of evolution is the most important. However, without diminishing the importance of this great achievement, biology does not confine itself to such generalities. Evolutionary biology has a few laws or general principles by which origin and development can be explained. Analysis of the evolution of a specific organism requires detailed data concerning the organism and its environment, and also specific explanations relevant to the species under consideration. Evolutionary biology requires theories that have both specific and general domains. As Lewontin (1991, pp. 142–3) has argued, the notion that 'science consists of universal claims as opposed to mere historical statements is rubbish' and 'a great deal of the body

laws. Contrary to Cartwright, the laws would then remain universal. The problem is that this universal formulation is for practical purposes intractable. To deal with wind friction, we have to focus not on the multitude of wafting particles but on the emergent properties and different laws of wind itself. Only in this way is a tractable solution possible. Universal laws may exist in physics (and even in economics) but if we found them they may for this reason be of limited use.

of biological research and knowledge consists of narrative statements'. Likewise, in economics and the other social sciences, there is a place for both.

Similarly, complex systems theory has established a few general principles. W. Ross Ashby's (1952) 'law of requisite variety' is an example. However, once again, systems theory is unable to deliver very much more than this kind of thing at the general level. It 'works' only when it is augmented by much more specific assumptions. The limited but potentially positive role of such general principles and theories is discussed further in chapter 18 of this work. In chapter 21 an attempt is made to show how a limited general theory can supplement more specific theories and explanations. To this end, some ideas from evolutionary biology and systems theory are applied in chapter 22. But it is recognised these principles are far from sufficient on their own.

GENERAL THEORY AND COMPLEXITY

There are strong reasons why the quest for a substantial, richly textured, general theory of complex systems will always be elusive. Simplification has to be radical, stripping any general theory of its comprehensive, explanatory ambitions. Even with a limited number of assumptions, the chain of deductive reasoning cannot take us very far. Kurt Gödel is famous for his demonstration that the axiomatic method has inherent limitations (Nagel and Newman, 1959). He proved that it is impossible to establish the internal logical consistency of a very large class of deductive systems. It is widely believed that this impossibility result is even more pervasive than Gödel was able to reveal. Proofs may be computationally out of reach. Hence Jack Cohen and Ian Stewart (1994, p. 439) argue:

> sufficiently rich formal systems do obey Gödel's theorem, so they must contain true statements whose proofs are a thousand times as long, or a billion times as long, as the statements are. That is, such systems necessarily possess properties that are far simpler than any route by which you could establish them.

Christopher Cherniak (1986, pp. 79–80) has noted the limits of computation in logical systems. It has been shown that all the possible calculation resources of the entire universe, computing for all of the time that the universe has existed, would be insufficient to determine the logical consistency of more than 138 well-defined propositions. Clearly, the computational capacities of a human agent are much more limited than this. The number of propositions that we can process logically must be much less than 138.

Claude Shannon (1950) pointed out that there are about 30 chess moves that can be made from each position on the chess board. In a typical game each play makes an average of 40 moves. Accordingly, there are about $(30^2)^{40}$ or 10^{120} possible chess moves in a single game. This number is greater than the number of particles in the universe, professedly 10^{80}. Any attempt at a general analysis of chess strategy is thwarted by this problem of combinatorial explosion, despite the fact that the rules of chess are relatively simple.

Gödel demonstrou que é impossível estabelecer a coerência lógica de sistemas dedutivos muito grandes. Além disso é preciso considerar que esses sistemas ultrapassam os limites da computação.

Consider an attempt to develop a general theory of network structures. A general theory of n points in space would have to embrace the possibility of $n(n-1)/2$ connections between any two points in that space. If n is 1000, then the number of possible connections is close to half a million. If a connection is either present or absent, then each may be represented – as a simple first step – by a binary value. Accordingly, the number of possible structures in this simple model is:

$$2^{n(n-1)/2}$$

If n is 1000, then the value of this expression is greater than 10^{150000}. The philosopher Willard van Orman Quine (1987) has coined the word 'hyperastronomic' to describe numbers greater than the number of particles in the universe. The number we are concerned with is *much* greater: a simple general model of a network, with binary-valued connections and 1000 nodes, has to cover an indescribable scale of mega-hyperastronomic variety.[15]

Combinatorial explosions such as these paralyse attempts to place complex phenomena within a richly textured general theory. Adding new dimensions to the space of possibilities, or new branches to a decision tree, increases the scope of the theory. But the computational mass explodes with devastating effect. To deal with complexity even on this relatively modest scale, simplifying assumptions have to be made. Either we are confined to broad principles governing all such structures, or the theory has to confine itself to a manageable and relatively tiny subset of all possible structures. Indeed, such a small subset may represent the most important or relevant phenomena in the real world. In this case the theory has to cease to be general. Otherwise, the analysis is confined to broad statements that do not explain very much.

GENERAL THEORISING IN ECONOMICS

A central problem with all models in the social sciences is that they have to consider not only the structured relations between agents, but also the computations of the agents themselves, as they react to their changing circumstances. Both the system and the agents must be modelled, where the model of the agent includes its perception of the system. This is a level of tangled complexity that is difficult to put in a general model, at least without the imposition of severe simplifying assumptions.

For example, how does the individual agent deal with multiple markets in a general equilibrium model? Roy Radner (1968) has considered the computational problems involved. The general equilibrium models of the type of Kenneth Arrow and Gerard Debreu assumed that a 'market' existed for the exchange

15 Accordingly, general theories of graphs or networks have to concentrate on structural or system level properties rather than detailed comparisons of specific network structures.

O problema central de todos os modelos nas ciências sociais está no fato de que não só eles devem considerar as relações estruturais entre os agentes, mas tb. os cálculos de cada agente (sendo que os modelos of every possible commodity, on every possible date, in every possible state of nature. Hence if there are a thousand types of commodity, a thousand possible 'dates' and a thousand possible 'states' then there will be a billion different markets. Assuming all possibilities and connections, the number of markets explodes beyond the calculating engagement of any human agent. Radner (1968, p. 32) concluded that 'there is a basic difficulty in incorporating computational limitations in . . . equilibrium theory based on optimizing behaviour.'

Overall, general equilibrium theorists have had great difficulty deriving general explanatory principles. As Arrow (1986, p. S388) declared: 'In the aggregate, the hypothesis of rational behaviour has in general no implications.' Within general equilibrium theory, the aggregated excess demand functions can take almost any form (Sonnenschein, 1972, 1973a, 1973b; Debreu, 1974; Mantel, 1974).[16] As S. Abu Turab Rizvi pointed out, the conclusions of Sonnenschein, Debreu, and Mantel are general and devastating. The main result

> is that the hypothesis of individual rationality, and other assumptions made at the micro level, gives no guidance to an analysis of macro-level phenomena: the assumption of rationality or utility maximisation is not enough to talk about social regularities.
>
> (Rizvi, 1994a, p. 363)

Facing such problems, Alan Kirman (1992, p. 118) wrote that 'there is no plausible formal justification for the assumption that the aggregate of individuals, even maximizers, acts itself like an individual maximizer.' Research into the problems of the uniqueness and stability of general equilibria has shown that they may be indeterminate and unstable unless very strong assumptions are made, such as the supposition that society as a whole behaves as if it were a single individual (Arrow, 1986; Coricelli and Dosi, 1988). Not only is it assumed that preference functions are exogenously given, it is also assumed that all these preference functions are exactly the same.

Because general theories become overwhelmed by explosive complexity, all attempts at general theorising have ultimately to abandon many generalities. They simplify, declaring that 'more work remains to be done' to generalise the model. The principal theoretical results of general equilibrium theory have depended on such restrictive assumptions. Truly general theorising has proved to be difficult, if not impossible. It is widely accepted that the only truly general explanatory principle that has been derived from general equilibrium theory is 'everything depends on everything else'. The weakness of the theory derives in part from its wanton pursuit of universality, as well as from the limitations of its basic axioms.[17]

16 See also Lavoie (1992, pp. 36–41), Rizvi (1994a), Screpanti and Zamagni (1993, pp. 344–53).

17 Mirowski (1989) and Potts (2000) have characterised general equilibrium analysis as a mathematical 'field theory' where every point in space is connected with every other. Potts argued that, on the contrary, economic reality is characterised by limited interconnectedness, as in a lattice or network. Following the precedents of Kirman (1983, 1987), Bush (1983), Ellerman (1984) and Mirowski (1991), Potts saw mathematical techniques such as graph theory as an appropriate formalisation of the limited interconnectedness of this reality.

Os principais teóricos do equilíbrio geral reconheceram mais tarde as limitações do seu projeto.

In practice, all attempts to erect an all-embracing general theory in economics have been highly limited or have led to failure. Leading general equilibrium theorists have latterly accepted the limitations of their project. For example, Frank Hahn (1980, p. 132) has candidly admitted that the typical Walrasian type of theory excludes time, because it collapses the future into the present. It also excludes money, which is essentially a means of dealing with an uncertain future (Hahn, 1988, p. 972). Robert Clower (1994, 1999) passed a similarly negative verdict. He argued, on similar lines, that the Walrasian theory actually excludes production, markets, competition and real trade. Crucially, Walrasian theory concentrates on the logical existence of equilibrium states, at the expense of the mechanisms of market operation (Costa, 1998). Overall, theories of complex phenomena that aim to be general, typically turn out to be very narrow in their scope.

Nevertheless, Hahn (1984) and others have tried to legitimise general equilibrium theory as an attempt to show 'what the world would have to look like' if markets were to operate properly. The declared aim was to demonstrate that real markets could work only at best under highly restrictive conditions. However, this legitimation of general equilibrium theory is unconvincing, because it is only one of many possible theoretical attempts to represent market mechanisms in the real world. It cannot simply be assumed that general equilibrium theory is the only possible theory. Another (perhaps undiscovered) theory might demonstrate that markets can always operate perfectly. To demonstrate that real world markets could 'work' only under highly restrictive conditions, we would have to look at all possible theoretical representations and formalisations of the market system and show that they too all 'worked' at best only under restrictive conditions. This, of course, is an impossible task for mere mortals. Hahn's argument is invalid. Once again, the problem of intractability confounds the general theorist.

In practice, attempts at general theorising in economics, and in other sciences dealing with complex phenomena, turn out to be restricted in their sweep, and thereby fail to be truly general. Although general principles or laws may exist, general theories are either not so general, or of very limited explanatory value. The elaboration of a truly general theory of complex phenomena can be confounded by severe problems of computation and tractability.

WHY A GENERAL THEORY OF BARTER WOULD LOSE MONEY

To recapitulate: it has been argued above that there are several problems with general theorising in the social sciences. One is of analytical and computational intractability. Facing such computational limits, general theorists typically simplify their models, thus abandoning the generality of the theory. Another related problem with a general theory is that we are confined to broad principles governing all possible structures within the domain of analysis. In practice, a manageable theory has to confine itself to a relatively tiny subset of all possible structures. Furthermore, the cost of excessive generality is to miss out on key features common to a subset of phenomena.

Em resumo, a teorização geral apresenta como problemas:

To illustrate the latter argument, we shall consider two very simple 'models', of respectively a barter and a monetary economy, and consider which involves fewer assumptions and which is more general. Robert Clower's (1967) theoretical framework is the starting point. In a barter economy, every commodity can in principle be traded for every other commodity. By contrast, in a money economy without barter, commodities are traded for money only. Hence, for Clower (1967, pp. 5–7) in a monetary economy:

> the peculiar feature of money as contrasted with a barter economy is precisely that *some* commodities in a money economy *cannot* be traded directly for all other commodities. . . . *Money buys goods and goods buy money; but goods do not buy goods.*

The following diagrams – taken and amended slightly from Clower (1967) – represent these two contrasting arrangements:

	C_1	C_2	C_3	C_4
C_1	x	x	x	x
C_2	x	x	x	x
C_3	x	x	x	x
C_4	x	x	x	x

Exchange relations in a barter economy

	M	C_2	C_3	C_4
M	x	x	x	x
C_2	x	x	0	0
C_3	x	0	x	0
C_4	x	0	0	x

Exchange relations in a monetary economy

Figure 1.1 Exchange relations under money and barter

In Figure 1.1, C_1, C_2, C_3 and C_4 each represent commodities. M is money. The presence of symbol 'x' indicates that an exchange between two commodities is possible; a '0' indicates that no such exchange normally takes place. This restrictive structure of an exchange economy is a necessary but not sufficient condition for the existence of money. In addition, money has other special attributes – such as a store of value and means of dealing with an uncertain future – that are not represented here.[18]

18 Accordingly, Clower (1967, p. 5) was wrong to suggest that *'a barter economy is one in which all commodities are money commodities.'* On the contrary, commodities under barter do not possess all the characteristics of money. Clower stressed universal exchangeability to the exclusion of other characteristics. But his identification of the contrasting exchange structures of a barter and a monetary economy was nevertheless correct. It was notably endorsed by Davidson (1978, p. 142 n.). For further discussions of Clower's exchange framework see Hodgson (1982, ch. 12), Mirowski (1986, pp. 212–19) and Potts (2000).

At least at first sight, a barter economy model in which all exchanges are possible involves fewer restrictive assumptions than a model in which there is money. A model of a monetary economy must include *additional* restrictive assumptions in order to obtain the special structure of a monetary economy in Figure 1.1 above. The theoretical representation of a monetary economy requires *more* rather than *fewer* restrictive assumptions.

Which model is 'more general'? Of the two models in Figure 1.1, in a sense the barter economy model is more general. The presence of an 'x' in any cell in a matrix in Figure 1.1 indicates that an exchange is possible, not that the exchange has to take place. In this sense, therefore, a monetary economy is a special case of a barter economy: the barter economy model is more general. However, this gives us a partial and potentially misleading picture and the statement needs to be qualified.

Crucially, the very process of apparent 'generalisation' – from a monetary to a barter model – means that some essential features of a monetary economy are lost. Because everything in a barter economy has the money-like property of being able to exchange with everything else, then nothing has the property of money. If all men are kings, then there are no kings, because kingship implies the existence of non-regal inferiors.

Money exists only because some exchanges are admitted and some are excluded. If all exchanges are admitted, then money is excluded. In this sense the barter model is not general: it excludes money. Hence, from this point of view, neither a barter model nor Walrasian-type theory (which excludes money) is an adequate representation of a monetary economy. For a theory to accommodate money, it has to incorporate the special qualities of money, with some forms of exchange being excluded.

This example shows that, while seeming more general in scope, the barter economy model loses key features of the monetary economy. A general theory of barter would not include money. Greater generality in some respects can be gained at the cost of an ability to discriminate between and explain concrete particulars.

GAME THEORY AND THE ESCAPE FROM GENERALITIES

Without much discussion, mainstream economics quietly dropped the search for a general theory in the 1980s. The general equilibrium theory project had broken down (Kirman, 1989; Rizvi, 1994a, 1994b). Game theory had originally been developed and applied to economics by John von Neumann and Oskar Morgenstern in 1944. But it did not become popular until after the general equilibrium project had stumbled upon intractable problems in the 1970s. The eventual turn to game theory was an abandonment of a general theory of market behaviour. This 1980s' bonfire of former generalities meant an important shift in preoccupation – to use the terms of Franklin Fisher (1989) – from 'generalising' to 'exemplifying' theory. Exemplifying theories are theories that say what might

Nos anos 80 a teoria dominante abandonou o equilíbrio geral discretamente ao começar a usar a teoria dos jogos.

happen under specific conditions; generalising theories are ones that attempt to say what must happen.

In game theory there are few general results. Outcomes depend on the assumed structure and parameters of the game itself. Such theoretical constructions exemplify rather than generalise. However, most game theorists retain ahistorical models of human motivation and agency. The individual remains a payoff or utility maximiser. Payoff maximisation is a general theory of individual behaviour but it does not constitute a complete theory of socio-economic dynamics. Game theory mixes payoff or utility maximisation with specific game structures. Many other generalities have disappeared.

Robert Aumann (1985, p. 35) has claimed that the achievement of game theory would lie in 'organizing in a single framework many disparate phenomena and many disparate ideas'. This amounts to the claim that game theory involves a limited form of derivational unification involving a 'single framework' being used to organise 'many disparate ideas'. But this is a much weaker claim of derivational unification than that of general equilibrium theory. Exponents of the latter made the claim that it was possible to explain or predict many economic phenomena with a single, unifying theory. The shift from the general equilibrium to the game theoretic research programme was thus the replacement of a purportedly unifying theory by a purportedly unifying framework, and the replacement of claims of explanation or prediction by the looser claim of a capacity to *organise* phenomena or ideas.

With the exception of Fisher (1989), the abandonment by game theorists of the historical quest for a comprehensive general theory has occurred with remarkably little comment or reflection by mainstream economists. Nevertheless, the big message behind the abandonment of general equilibrium theory should not be overlooked. The true achievement of all the efforts behind the development of the Walrasian and Arrow–Debreu models is to show the severe limits of general theorising in economics. In addition, developments in computability theory in the 1980s and 1990s have shown that optimisation problems typically involve difficulties not only of specification but also of computability.[19]

Perhaps the greatest overall achievement of mainstream economic theory in the last half of the twentieth century has been to confirm the suspicion that substantive general theorising in economics will always bring highly limited and inadequate results. All substantive general theories in complex systems are characterised by shortcomings.

If we put together the results of Gödel and the computability theorists, and combine these with insights gained from complexity theory and the failure of the general equilibrium project, then there is every reason to suppose that attainable general theories in the social sciences, even if important, are always of limited value. While there is no proof of this proposition, the balance of argument has now shifted. We have very strong reasons to believe that attainable and

19 For general statements see, for example, Cutland (1980), M. Davis *et al.* (1984) and Bennett and Landauer (1985). For applications to decision theory and economics see Gottinger (1982), Lewis (1985), Spear (1989), Anderlini and Sabourian (1995) and Velupillai (1996).

Hoje temos indicações suficientes que mostram que a teorização geral não nos leva muito longe.

substantive general theorising will not take us very far; the onus on any remaining general theorists is to show how the immense problems that have been encountered in the past can be overcome. By embracing game theory, economic theorists have seemingly declined this challenge: they have abandoned generalising theories for specific games that serve as exemplars.

With this statute of limitations we may move on. But our route does not at first take us to the future. Instead, we first turn back to nineteenth century, and move forward from there, in order to retrieve what we have lost from the past – to recover what has been long crushed and discarded by the reckless juggernaut of general theorising in social science.

Hodgson afinal nega a possibilidade de uma teoria geral, qdo era mais razoavel rejeitar o excesso de generalidade das teorias "derivacionais" (hipotetico dedutivas) e aceitar a generalidade mais modesta das teorias "ontologicas" (historicas ou empiricas).