FROM PHYSICS TO SOCIOLOGY

The Differences in Scientific Explanation[1]

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In recent times the neurosciences have claimed the right to investigate consciousness (primary and of higher order), intentionality, the self (individual and collective), and free will. They have thus occupied domains that traditionally pertained to philosophy and had been assumed as the foundations of the social sciences. This incursion by the natural sciences into the social sciences has had consequences in the epistemological domain as well.

I assume that physics is the prototype of the natural sciences and that sociology is the prototype of the social sciences. I shall seek to show not only their shared bases but also and especially their specificities. In doing so, I shall consider biology to be a science intermediate between physics and sociology, in that it possesses features that can be related to both the former and the latter. The transition from physics to biology will proceed upwards: at every step the specific nature of individual sciences will emerge. As a consequence, any type of reductionism will avoided. Particular importance will be given to the concept of 'reality' in physics, biology and sociology. It will thus been seen how the ontology of the social (social being) can be introduced into the ontology of the external world (of physics and biology).

I begin by describing the essential features of the physics at the origins of modern science. The scientific revolution of the sixteenth and seventeenth centuries, whose protagonists were Galileo, Descartes and Newton, today represents the beginning of what we call 'science'. At that time, science coincided with mechanics and astronomy. Galileo, in particular, was convinced that mechanics was the supreme science, the foundation and origin of all the sciences. Since mathematics performs an essential role in mechanics, it was not surprisingly a decisive and essential component of Galileo's conception of science. Famous in this regard is the definition that Galileo gave to 'nature' in *Il Saggiatore*: "The book of nature cannot be understood unless one first understands the language and recognises the characters with which it is written. It is written in a mathematical language, and its

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[1] This paper is a part of my publishing book *La conoscenza umana. Dalla fisica alla sociologia alla religione (The Human knowledge. From physics to sociology to religion).*

characters are triangles, circles, and other geometric figures, without which means it is humanly impossible to understand a single word of it; without them it is like wandering hopelessly through a dark labyrinth"[2].

Galileo's mechanics is a science formed by laws expressible with the language of mathematics. Mathematics is therefore its necessary and sufficient condition.

Physics (mechanics and astronomy) becomes the archetype, the model of science in general. Every discipline that aspires to becoming a science must, like physics, have natural laws, and these must be mathematizable.

The fundamental concepts of physics are the following: observation, experimentation, laws, theories formed of laws, mathematization, closed world, determinism, causality, reductionism.

In the sixteenth century, however, the birth of physics was accompanied by other disciplines, such as cosmology, geology, psychology, linguistics, philology and history. The first problem that arose in their regard was establishing whether they were sciences in the same way as physics was a science. Some philosophers, mainly of German culture, broadened the concept of 'science' to encompass the social and historical sciences as well. Thus was born the distinction between natural sciences and human sciences, and the task was to draw a demarcation line between the former and the latter.

Opposed to this distinction was logical positivism, which maintained that only the model of science elaborated by Galileo and Newton could be the basis for a discipline which aspired to becoming a science. The positivists believed that the social sciences were still in their infancy and that they could develop by adopting the models used by the most advanced sciences, like mathematical physics. This entailed that the social sciences must have general laws, nomological models of explanation and prediction, and axiomatic theories. It was precisely the transfer of the hypothetical-deductive method from the natural sciences to the social sciences that gave rise to difficulties which severely strained the positivist theory and fuelled criticisms against it.

In identifying the relationship between physics and sociology, both the positivists and their critics ignored biology, as if that science was an embarrassment to both of them. Yet biology – at least as its nature and method have been recently formulated – can shed a great deal of light on the concept of 'science' from physics to sociology.

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[2] G. Galileo, *Il Saggiatore,* in *Opere di Galileo Galilei,* Edizione Nazionale, Barbera, Firenze, 1929-1939, 20 voll., vol. 6, pp. 197-372.

Biology is today a science which enjoys equal dignity with physics. The theory of evolution, genetics, and molecular biology have definitively dispelled doubts concerning its scientificity. However, before achieving its current status, biology had to overcome numerous difficulties.

Since antiquity, philosophers had sought to define life and the characteristics of living beings, and they had put forward the most disparate solutions. Descartes, for example, proposed that the problem of life could be solved by cancelling it: a living organism, he maintained, is nothing other than a machine. Philosophers with backgrounds in mathematics, logic or physics supported Descartes and sought to erase the difference between animate and inanimate nature.

The majority of naturalists, however, were reluctant to accept this position, and in order to vindicate the autonomy of living beings they concocted the concept of 'vital force': just as the planets and the stars were controlled by the invisible force which Newton called the *force of gravity*, so the motions of living organisms were controlled by an invisible force called the *vital force*. Those who believed in the existence of this force were termed 'vitalists'.

Vitalism immediately became popular, and it represented a qualified reaction to Cartesian mechanicism. Among its numerous proponents were H. Bergon (1859-1941) and H. Driesch (1867-1941), who sought, authoritatively but in vain, to demonstrate the existence of a vital force. It has been latterly genetics and molecular biology which have definitively confuted that hypothesis.

Teleology was another obstacle that biology had to overcome before achieving the same scientific status as physics. Vitalism disappeared from biology when it was clearly understood that the experiments intended to demonstrate its existence in reality had failed to do so. But eliminating teleology proved more difficult, and mainly because the term 'teleological' was applied to diverse natural phenomena. There thus arose the need to examine the biological and philosophical literature and find a way to classify the term's different meanings.

E. Mayr[3] demonstrated that four of the five phenomena traditionally considered to be teleological could be entirely explained by science, whilst the fifth phenomenon, cosmic teleology, did not exist.

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[3] E. Mayr, *What Makes Biology Unique? Considerations on the Autonomy of a Scientific Discipline,* E. Mayr 2004.

The elimination of vitalism and finalism from biology was a first important step towards its foundation as a science with the same dignity as physics.

A second and equally important step was demonstration that it was impossible to apply certain fundamental principles of physics to biology. Physicalists and positivists like Carnap, Hempel, Popper and Kuhn continued to argue that disciplines aspiring to be sciences could be reduced to physics. And biology, even if they neglected it, was no exception. In the 1970s and 1980s authoritative philosophers like D. L. Hull, M. Ruse and E. Sober based the philosophy of biology on physics. But their training was logical-mathematical rather than biological. There thus arose the task of founding the philosophy of biology, no longer on logic and mathematics, but on concepts unique to biology (the biological specificity). This led to definition of 'biology' as an autonomous science.

On conclusion of its centuries-long philosophical vicissitudes, biology now divides into two distinct parts: *mechanistic* biology (genetics and molecular biology) and *evolutionary* biology (theory of evolution). The former deals with the physiology of living organisms, in particular the cellular processes (including those of the genome) which can be explained in terms of chemistry and physics. The latter instead has to do with aspects of the living world which concern historical time and evolution. These cannot be explained with the laws of physics or chemistry. Required instead is a specific methodology founded on the *historical narrative* and on hypothetical scenarios. The biological specificity not reducible to physics is given by evolutionary biology.

Having defined the twofold nature of biology, now to be established is what principles and concepts of physics are applicable to it. From what has already been said it is evident that biology is partly similar to physics and partly different from it.

If biology, with its mechanistic and evolutionist parts, is a science, then it is necessary to revise and enlarge the concept of 'science' adopted by Galileo, Newton and the positivists so that it includes the characteristics typical of evolutionary biology.

Unlike physics, biology does not have a mathematical basis. This means that there exist sciences which do not satisfy the requirement of mathematization imposed by Galileo, Newton and the positivists.

Every science is constituted by theories. And theories in their turn are constituted by laws or by concepts. Whilst the theories of the physics are constituted by laws, those of biology are constituted by concepts. The most important concepts of biology are those of 'evolution', 'biopopulation' and 'natural selection'.

The difference between physics and biology is evident if we compare the nature of living beings with that of inanimate ones. Because of their complexity, biological systems are endowed with the capacities of reproduction, metabolism, replication, regulation, adaptability, growth and hierarchical organization. Nothing similar exists in the inanimate world of physics.

The concept of 'biopopulation' is perhaps the one which best characterizes the difference between the inanimate and animate worlds. The former is constituted by classes whose members are identical, so that apparent variations among them are random and therefore irrelevant. Conversely, in the living world represented by a biopopulation, every individual is unique and unrepeatable. Variation is not irrelevant but instead crucial for evolution.

From the twofold nature of biology derives a twofold causality: the first causality is constituted by the natural laws that hold for physical and inanimate phenomena; the second consists in the *genetic programs* which characterize solely the living world. There is not a single living phenomenon or process that is not controlled by a genetic program contained in the genome. Nothing similar exists in the inanimate world.

A process absolutely unknown in the inanimate world is the *natural selection* propounded by Darwin[4] to confute the concept of 'design' put forward by the natural theologians, and according to whom it is God's design if organisms are perfectly adapted to each other and to the environment in which they live. Natural selection, unlike the deterministic laws of physics, was the result of interaction among numerous factors, principal among them being randomness.

Because evolutionary biology – or simply biology, since the specificity of biology resides in its evolutionary part – is not reducible to physics, it cannot use the latter's methodology. Biology's methodology must instead take account of the uniqueness of the phenomena that it studies, like the extinction of the dinosaurs or the origin of the human species. In explaining such phenomena, it cannot resort to laws, nor can it conduct experiments. The extinction of the dinosaurs was a unique occurrence which cannot be derived from a general law nor be subjected to experimentation. Used to explain it is the method of *historical narrative*, which constructs a scenario whose explanatory capacity is verified on the basis of the existing evidence.

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[4] Ch. Darwin, *On the Origin of Species by Means of Natural Selection,* 1872.

It is thus obvious why the reductionism essential for physics cannot be applied in biology. Biological systems are constituted by parts structured into levels which interact with each other. The interactions take place among genes, between genes and tissues, between cells and other components of the organism, between the organism and the inanimate environment in which it lives, and among different organisms. According to physicalism, the higher levels should be reducible to the lower ones, so that their properties can be determined and the system as a whole explained. Applying reductionism to biological systems would deprive the individual levels of their specificity: everything would assume the meaning of the lowest level, namely physics.

The attempt to create a philosophy of biology based on physics was bound to fail. It was therefore necessary to leave the narrow ambit of physicalism to assert the autonomy of biology as a science enjoying equal dignity with physics. The twofold nature of biology has entailed enlarging the concept of science as understood by Galileo, Newton and the positivists.

If we were to draw a boundary between the natural sciences and the social sciences, we would find that this boundary traverses biology in its middle, connecting its mechanistic part (genetics and molecular biology) to physics, and its evolutionary part to sociology.

These reflections on the foundations of physics and biology have served to set out the epistemological bases of sociology. The foundation of sociology can now be viewed as an extension of physics and biology. I shall describe this process step by step.

The development of the concept of ‘science’ that starts from physics and traverses biology must continue to sociology as well. Just as biology was born from an extension of physics, so sociology must be an extension of both physics and biology. Thus, corresponding to the twofold nature of biology will be the threefold nature of sociology. Just as biology has a specificity irreducible to physics, so sociology has a specificity irreducible either to biology or to physics. An epistemology of sociology must be founded on that specificity. It must proceed from the bottom (from physics) upwards (to sociology). Hence the procedure in reverse, from the top down, is invalid because it would justify forms of reductionism like Wilson’s proposal to reduce sociology to biology.

As I have compared the characteristics of biology with those of physics, so I shall now compare the characteristics of sociology with those of evolutionary biology. Such comparison reveals similarities in epistemology and methodology (the method of historical narrative). However, sociology profoundly differs from biology when it is examined in terms of the concept of ‘reality’. Does social reality exhibit the same characteristics as biological

reality? If the answer is 'no', in what does the difference consist? The answers to these questions will evince the specificity of sociology.

When we speak of biological reality, we refer to living organisms, concretely existing and observable. They exist objectively in the same way as the objects making up physical reality (mountains, trees, rivers, stars, etc.) exist. They are horses, fishes, reptiles, people, etc. They are constituted by matter, and we can perceive them with our senses. From this point of view, the objects of biology are like the objects of physics. The difference between the two is that, whilst biological reality is animate, that of physics is inanimate.

Does social reality display the same characteristics as the realities of biology and physics? Is it too perceivable through our senses? Is it objective and pre-existent to humans? Answering these questions requires analysis of the characteristics of social reality.

The point of view of the positivists on social reality is clear and precise: since sociology is a science like physics, the objects that make up its reality display the same features as do physical objects (they objectively exist independently of humans). It is precisely this objective existence of social reality which makes identification of its laws and their mathematization possible.

The philosophers who sought to give the social sciences a positivist basis (scientific in the meaning specified above), for instance A. Comte and H. Spencer, embraced the above gnoseological assumption in its entirety. Hence they sought to give social reality a foundation utterly similar to that of physics.

It is here that resides the positivist foundation given to the social sciences by E. Durkheim, and which has profoundly influenced one of the most important traditions of contemporary sociology. Durkheim's main assumption was that, ontologically, social facts are 'things' and therefore similar to natural facts. As a consequence, social reality possesses an objectivity which can be investigated using the methods of physics.

Contrary to what the positivists thought, however, social reality is a human creation. It exists as long as the people who have created it believe in it; it stops existing when they no longer believe it.

In my book *Le regole dell'azione sociale*[5], I showed – especially in the seventh chapter entitled "La fondazione della sociale" – how social reality is built by humans by means of constitutive rules. Some years later, in 1995, J. Searle published a work of great importance, *The Construction of Social Reality*, where he envisaged the use of constitutive rules for the

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[5] G. Di Bernardo, *Le regole dell'azione sociale,* il Saggiatore, Milano 1983.

creation of social reality. Compared with the treatment made in my book, Searle's investigation is broader, deeper and more exhaustive. I agree with the fundamental theses that he has proposed and developed in his works, and I shall relate them to my personal contributions to the epistemological foundation of sociology.

The construction of social reality, according to Searle, starts from the distinction between natural facts and social facts. In order to illustrate how social reality is constructed, I shall cite an example provided by Searle. He writes:

"Consider a simple scene like the following. I go into a café in Paris and sit in a chair at a table. The waiter comes and I utter a fragment of a French sentence. I say, "*un demi, Munich, à pression, s'il vous plaît."* The waiter brings the beer and I drink it. I leave some money on the table and leave. An innocent scene, but its metaphysical complexity is truly staggering, and its complexity would have taken Kant's breath away if he had ever bothered to think about such things. Notice that we cannot capture the features of the description I have just given in the language of physics and chemistry. There is no physical-chemistry description adequate to define "restaurant", "waiter", "sentence of French", "money" or even "chair" and "table", even though all restaurants, waiters, sentences in French, money and chairs and tables are physical phenomena. Notice also that the scene as described has a huge, invisible ontology: the waiter did not actually own the beer he gave me, but he is employed by the restaurant which owned it. The restaurant is required to post a list of the prices of all the *boissons*, and even if I never see such a list, I am required to pay only the listed price. The owner of the restaurant is licensed by the French government to operate it. As such, he is subject to a thousand rules and regulations I know nothing about. I am entitled to be there in the first place only because I am a citizen of the United States, the bearer of a valid passport, and I have entered France legally.

Notice, furthermore, that though my description was intended to be as neutral as possible, the vocabulary automatically introduces normative criteria of assessment. Waiters can be competent or incompetent, honest or dishonest, rude or polite. Beer can be sour, flat, tasty, too warm, or simply delicious. Restaurants can be elegant, ugly, refined, vulgar, or out of fashion, and so on with the chairs and tables, the money, and the French phrases.

If, after leaving the restaurant, I then go to listen to a lecture or attend a party, the size of the metaphysical burden I am carrying only increases; and one sometimes wonders how anyone can bear it[6].

This example is one of the innumerable cases that we experience every day and which overall constitute our social lives.

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[6] J. Searle, *The Construction of Social Realily,* J. Searle 1995, pp. 9-10.

The first important consideration in this regard is that social reality has a twofold ontology: a *visible*, observable one constituted by the waiter, the beer, the table, the money, and an *invisible* one constituted by the meaning of the money, the rules on operating the restaurant, judgments about the beer, the waiter, the place, etc.

The second important consideration, which follows from the first one, is that every ontology of social reality must be based on both its visible and invisible part. The visible part is similar to the ontology of physics, whilst the invisible part, which is not reducible to physics, is that specific to sociology. The problem which then arises is how to incorporate the specific ontology of social reality into the general ontology.

Schematically, we may state that the ontology of the reality external to humans is based on two theories: the *atomic* theory of matter and the *evolutionary* theory of biology, which respectively explain inanimate and animate matter. From this it follows that reality is constituted by physical particles organized into systems like mountains, planets, rivers, and humans. Certain living systems evolve according to natural selection. Some living systems have developed a brain, and the brain has developed consciousness, as in humans and in the higher animals. Consciousness is expressed through intentionality, or the ability to represent to oneself objects and states of the external world. The question that now arises is this: how is it possible to insert social reality as described here into this ontology?

The third important consideration, which ensues from the first two, is that there exist in the world both characteristics independent of us and ones that depend on us. Mountains, stars and rivers exist independently of the representation that we can have of them. However, there also exist objects in the world which depend upon us, like the social institutions.

One constructs social reality from this ontology by specifying the notions of 'collective self' and 'constitutive rule'. The *self* (individual and collective) derives from the *me*. It is therefore important to define the concept of 'me'. However, this task would require entering a labyrinth of philosophical analyses, substantially different and conflicting (from Hume's scepticism to Husserl's transcendental foundation), and from which it would be difficult to emerge with a clear and precise notion of 'me'. I shall therefore abandon philosophy to see what the neurosciences tell us in this regard.

According to G.M. Edelman[7], the neural changes manifest at the origin of language are the same as those from which higher-order consciousness emerges. This enables a self to be constructed from social and affective relationships. The emergence of higher-order

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[7] G. M. Edelman, *Second Nature (Brain Science and Human knowledge),* G. M. Edelman 2006.

consciousness made possible by language finds necessary support in social relationships. If people did not communicate with each other, there would be no development of language and therefore of intentionality and the self. Hence it follows that the *me*, the *self*, the collective *self*, and *intentionality* are at the basis of the development of higher-order consciousness and regulate social relationships. If we consider real-life experiences like the performance of a concert, a game of chess, a religious ceremony or a university lecture, we see the collective self in operation.

The collective self (also in its expression as collective intentionality) represents social facts. However, there exist some social facts which exhibit specific characteristics that require, for the representation, the use of constitutive rules.

We owe the notion of constitutive rules to J. Rawls, who, in his 1955 essay *Two Concepts of Rules*[8], drew a distinction between regulative and constitutive rules. Regulative rules are those which discipline activities that exist independently of the rules: for example, the ban on smoking in public places or the obligation to obey the highway code. In such cases, the public places and the highway exist prior to the rules that regulate them. The latter control forms of behaviour that exist previously to the rules. However, not all rules are regulative. There are some that do not regulate but instead constitute: they create what is regulated. These are constitutive rules. A classic example is the game of chess. In order to play chess, it is necessary to know not only the regulative rules that concern the strategy with which to checkmate the opponent but also the constitutive rules by which the chess pieces (king, queen, knight, bishop, etc.) have been created. We will say, for instance, that the "bishop" is that piece which, in the game of chess, moves diagonally. This means that any object (a piece of woods, stone, glass) that moves diagonally in the game of chess is a "bishop". Vice versa, if I place a real bishop, with sceptre and mitre, on the chessboard, but he does not move diagonally, that bishop is not a bishop. It is precisely the constitutive rule that creates the object "bishop" in the game of the chess. The same holds for all the other pieces, their moves, etc. The set of all the constitutive rules creates something that did not exist before and is denominated the "game of chess". It is clear that, although the constitutive rules are necessary, they are not sufficient to play chess: it is not enough to move the bishop diagonally to play. Necessary to be able to play chess are also the regulative rules that state the strategy of the game, which is to checkmate the opponent. The set of the constitutive and regulative rules defines the game of chess. Classic examples of constitutive

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[8] J. Rawls, *Two Concepts of Rules,* in "Philosophical Review", 64, 1955.

rules are those that concern baptism and Masonic initiation. A person is not born a Christian but becomes one with baptism, which confers upon that person a dimension (Christian) that s/he did not possess before. In this case, the rule constitutes a Christian at the moment when the priest utters the sentence: “I create you Christian”. The same happens in Freemasonry. One becomes a freemason at the end of the initiation ceremony when the Venerable Master of the Lodge utters the sentence: “I constitute you, I create you freemason” From that moment on, the neophyte acquires a dimension (Masonic) which he did not possess before and will characterize him for the rest of his life.

Just as constitutive rules create the game of chess, so they create the social facts that have been denominated ‘institutional’. Institutional facts can only exist within a system of constitutive rules. If institutional facts are precisely those facts that allow the birth and development of societies, then the importance of constitutive rules is understandable. Typical examples of institutional facts are governments and all state institutions, marriage, and money.

The logical form of constitutive rules is as follows: “X equals Y in context C”. Thus, if X is an object (made of wood, iron, glass, etc.) and Y is a bishop, we will say that object X is a bishop in the context (in the game) of chess.

In conclusion to this brief inquiry into the foundations of sociology, I now summarize its main points.

1. The construction of sociology starts from physics and proceeds upwards. Hence it enlarges the concept of ‘science’ without losing the specificities of the individual sciences. Vice versa, if one follows the reverse procedure, of reductionism from sociology to physics, one loses, at every reduction, the specificities of the individual sciences. All attempts to reduce sociology to biology, including the recent one by E. O. Wilson are therefore to be rejected.

2. The consequence is that sociology must be founded on its threefold nature: physical, biological, and its specific invisible dimension created by constitutive rules. Since the invisible dimension can be characterized as normative, it brings into discussion the relationship between ‘is’ and ‘ought to be’, in which the ought-to-be should be understood as normative. In this case, however, it is necessary to revise the ‘is/ ought-to-be’ relationship, since the formulations given to it in philosophy are inadequate. I refer in particular to analyses on the matter produced by analytic philosophy and to the inconclusiveness of their results. Apart from the critical rethinking of this relationship by authoritative scholars like H.

Putnam[9], if it is considered outside the ethics to which it has been confined, but related to the way in which social reality is understood here, then the reality in question, that social reality constructed by constitutive rules, assumes a completely new and different meaning. Between a normative (ought-to-be) fact and a social and an institutional one (is), there is not the 'logical leap' that Hume declared and repeated in a thousand ways, but rather a direct relationship of constitution and regulation. Consider the case cited by Searle of drinking a glass of beer in a cafe.

3. The previous results require a revision and extension of the ontology founded on physics, chemistry and biology. The closed world characterizing that ontology should be opened up in a manner such that it also encompasses social reality in its invisible specificity.

Having argued for the connection among values, norms and actions, the problem that now arises is that of justifying the connection. Can values and norms be reasons that explain action? Can reasons be understood as causes? Two answers can be given to these questions, and they correspond to two possible ways to understand the connection between reasons and action: 1) reasons are sufficient causes from which action logically follows, 2) reasons are not sufficient causes of action. In the investigation that follows, I shall express my preference for the latter view.

Explaining reasons is perhaps the main task of the human and social sciences. It therefore requires a model that demonstrates the connection between values and norms, on the one hand, and action on the other. But what characteristics should this model possess?

When Aristotle studied man, he constructed the practical reasoning (different from the theoretical reasoning of the *Organon*), and he based it on the following inferential scheme: the major premise expresses the end of the action, the minor premise connects an action with this end through a means/end relationship, the conclusion consists in use of this means to achieve that end. In synthesis:

Major premise: End
Minor premise: Means

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Conclusion Action

The second half of the last century saw interest in the practical reasoning revive through the work of some analytic philosophers who – taking up Wittgenstein's criticisms of the causal theory of action – sought to develop a scheme which could stand as a valid

[9] H. Putnam, *The Collapse of the Fact/Value Dichotomy and Other Essays including the Rosenthal Lectures,* President and Fellows of Harvard College 2002.

alternative to the causal one. Interesting in this regard are the studies by A. I. Melden and G. E. M. Anscombe. Drawing on these studies, G. H. von Wright has constructed a model to explain action which represents an alternative to the nomological-inferential model developed by Hempel within positivism. According to von Wright, the practical inference is for explanation in social sciences what Hempel's nomological-inferential is for explanation in the natural sciences.

This scheme of practical inference raises some questions, of which the following are of particular importance:

1. is the practical inference logically conclusive?
2. is the model of practical inference also a model of explanation?

As regards the first question, von Wright's argument is based on the relationship of logical dependence between the premises and the conclusion in explanation of action, and every refinement that he makes to the inference scheme is intended to demonstrate its deductively conclusive character. Nevertheless, after formulating some unsatisfactory proposals, he declares that the premises of a practical inference do not entail the action with logical necessity. We have a logically conclusive inference only when the action has been performed, and we build an inference to explain it. One might say that the necessity of the practical inference is a necessity conceived *ex post actu*.

Hence, the relationship between premises (intentions and epistemic attitudes that concern values and norms) and conclusion (action) in a practical inference is neither causal nor logically conclusive. It becomes logically conclusive only if the action has already been completed and one wishes to explain it by relating it to a set of values, norms, intentions, etc.

The second of the above questions concerning the practical inference (is the model of practical inference also a model of explanation?) can be answered in the affirmative, as I shall now show with a practical-inferential model for the explanation of action.

This model has the following argumentative structure. A series of chains of practical inferences start from the agent's aspiration to certain values that he endorses. They pass through the area of encoded norms until they reach the last practical choice of the agent, who decides, in the practical situation in which he finds himself, to abide by a norm or a set of norms that he deems suitable for achieving the values in question. This series of chains of practical inferences introduces a complexity that depends on the agent's degree of awareness and responsibility, as well as on possible paradoxical situations due to the relationships between his actions and the reality in which he operates.

The chain of practical inferences takes the following form.

Evaluative practical inference

Intentioning premise: x intentions value V

Evaluative epistemic premise: [Vb1]

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Intentional conclusion: x intends to achieve b1

The following definitions are necessary to specify this type of practical inference:

1. Def.: to intention $=_{def}$ recognize a value and aspire to it.

2. Def.: "bi" is a variable indicating a "something" that may become the object of an intention.

3. Def.: [Vbi] $=_{def}$ x believes that bi is a realization of value V.

4. Def.: good (or end) $=_{def}$ a "bi" that realizes a value V.

It follows from definitions 2, 3, and 4 that

[Vbi] → bi is a good for x.

From these definitions emerges the evaluative nature of this type of practical inference, which possesses characteristics of abstractness in that the premises lack the disposition to the final resolutive choice. In other words, "intends to achieve" simply means "wishes" and not "wants". In order to move from simple "wish" to "want *sic et simpliciter*", it is necessary to eliminate possible impeding conditions, interferences with high values, objective difficulties, etc.

From the first type of practical inference, one consequently moves to the second type of practical inference. During this passage, the relationships with the complexity of the concrete situation and with the normative context are made explicit.

Intentional practical inferences

Intentional premise: x intends to achieve b1

Epistemic premise: [b1 → b2]

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Intentional conclusion: x intends to achieve b2

Here too, note that [b1 → b2] means that b1 → b2 holds x. One may have a series of similar practical inferences:

Intentional premise: x intends to achieve b2

Epistemic premise: [b2 → b3]

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Intentional conclusion: x intends to achieve b3

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Intentional premise: x intends to achieve b_{n-1}

Epistemic premise: [$b_{n-1} \rightarrow b_n$]

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Intentional conclusion: x intends to achieve b_n

Here $b_2 \rightarrow b_n$ are again "goods" for x. Normally, among these "goods" are observance or fulfilment of norms or sets of norms such as those to be found in legal codes, because they are considered to be means necessary to realize particular values. It was argued earlier that norms should be understood as the applications of values to concrete cases that arise in a particular society. For this reason, bn can be replaced by "Obs A" (observance of norm A). One thus obtains the following intentional practical inference:

Intentional premise: x intends to achieve b_{n-1}

Epistemic premise: [$b_{n-1} \rightarrow$ Oss A]

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Intentional conclusion: x intends to abide by norm A

Note that also this second type of practical inference has characteristics of abstractness, for two main reasons:

1. the individual bi's do not make refer to the particular concrete situation in which x operates. The conclusion "x intends to abide by norm A" is still abstract, in that the subject intends to abide by the norm in general, even if the empirical situation to which the norm applies has not yet been presented.

2. Subject x has not yet made the *final* practical choice, because he has not expressly formulated the rejection of other inferential chains alternative to the present one.

One must therefore move to the following type of resolutive intentional practical inference:

Resolutive practical intentional inference

Intentional premise: x intends to abide by A

Epistemic premise: [x is in the concrete situation foreseen by norm A]

Proairetic premise: x prefers *hic et nunc* value V to other alternative values, and the present inferential chain to other alternative chains.

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Intentional conclusion: x intends *hic et nunc* to abide by norm A

The conclusion of the resolutive practical inference represents the last practical judgement that allows the action to be reached. We thus come to the final type of practical inference:

Practical normative inference

Normative premise: Norm A prescribes action a
Intentional premise: x intends *hic et nunc* to abide by norm A

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Practical conclusion: x performs action a

The specifically practical stage in the chain of practical inferences is the two last premises of the resolutive practical inference. The agent, in fact, does not merely recognize the logical relationships between values and norms, or between norms in abstract and the action that derive of them. Rather, he makes a definitive judgment on the nature of the situation, reaching the conclusion that it coincides with the concrete situation foreseen by the norm. It is this conclusion, which the agent reaches and is made explicit in the second premise, that does not have a purely logical structure but a content strongly influenced by the agent's emotional state. However, also the third premise is decisive in determining the practical character of the resolutive practical inference. Made explicit in it is the fact that the agent applies all his personal weight in resolving the complex network of alternative inferential chains, making the final preferential decision on the choice of values and the means to achieve them. Therefore, nor can this premise be derived in a purely logical way; rather, it represents the result of the agent's attitude to both the concrete situation in which he finds himself and the totality of means available to operate in it. The second and the third premises are hence the two decisive premises in determining the passage to the final practical opinion.

There may be cases in which the agent does not arrive at the practical inference of the third type. This happens in the case of paradoxes. In moral and legal systems, for example, agents may be in concrete situations coincident with the premises of conflicting norms. In this case, there arises conflict in the entire normative domain. Since situations are much more complex in moral systems, conflict is much more likely to arise than in legal systems. It is necessary to give the appropriate emphasis to the role performed by paradoxes in the

relationship among values, norms and action. Paradoxes of a particular kind, which Leibniz called "perplexing cases", they operate within the practical-inferential model.

Finally to be noted is that action may result from several norms or several inferential chains linked with different values. Nevertheless, action is reached through just one practical inference of the third type in which practical inferences of the first and second type concur.

Analysis of the practical inference requires some considerations which, although they do not resolve the problems connected with practical activity, should clarify the meaning of the practical inference.

Firstly, it should be specified that the chains of practical inferences combined in the above tree do not in themselves constitute an explanation of "social" action as such. The practical-inferential model, in fact, allows explanation of only the *individual* actions of the members of a society. I have elsewhere described the conditions that must be satisfied in order to explain social action as such[10].

The practical-inferential model to explain action that I propose is a typical case in which the conclusion (action) is not a logical consequence of the premises. Given certain premises, it is *possible* not to reach the conclusion logically.

The reason for this is the fact that, there are three specific points in the model at which the subject intervenes with the entire weight of his personality, when:

1. he intentions the values obtain in the society in which he lives;
2. resolves the contradictions arising at the normative level;
3. confirms, with the proairetic premise, all the choices made until that moment or rejects them by changing his will.

The model cannot be considered a purely logical inference, precisely because of interventions that the subject must undertake before reaching the proairetic premise, which is the final practical judgement from which ensues the performance or otherwise of the action. This means that the subject will act only if he: 1) has intentioned particular values assumed as reasons for his action; 2) has resolved possible contradictions at the normative level; 3) has confirmed, in the proairetic premise, all the choices already made. Vice versa, there will be no action if the subject is unable resolve the contradiction among conflicting norms (unable to prefer one norm to another, so that the chain is interrupted) or if he changes his will in the proairetic premise.

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[10] G. Di Bernardo, *Op. cit.*

There thus arises the problem of free will versus determinism. Here I have opted for free will. Nevertheless, there are those who argue that free will is only an illusion. If this were true, the entire model would be invalid, because from the reasons for action (understood as causes) would logically follow the action itself. The reasons would be sufficient causes of the action. For this reason, we must examine the problem of free will.

Unlike myself, there are scholars who are convinced that the scheme of practical inference possesses logical conclusiveness, and they consequently treat it as if it were a theoretical inference endowed with a logical connection between premises and conclusion. It would be easy to direct these scholars, with backgrounds in logic-mathematics or physics, to Aristotle's distinction between theoretical reasoning (*Organon*) and practical reasoning (*Ethica Nicomachea*) with their relative domains of validity. But I prefer to cite an opinion similar to mine but of greater prestige: that of B. Libet, who has demonstrated free will experimentally, and therefore the non-deterministic nature of the practical-inferential model.

Libet's contribution to clarification of the relationship between neural events and experience consists in the discovery that we unconsciously decide to act before we think that we have taken the decision to act. This finding inevitably concerns the philosophical problem of free will.

The numerous experiments conducted by Libet and his colleagues have been published in *Mind Time. The Temporal Factor in Consciousness*[11], in which Libet addresses the crucial problem of the delay in our conscious sensory awareness. If I tap a table with my finger, I perceive the event as if it has happened in 'real time'. Subjectively, that is, the touch is felt in the same moment as the finger contacts the table. But experiments have led to a surprising discovery directly at odds with intuition and perception: the brain takes a relatively long time – up to around half a second – to activate itself and induce awareness of the event! If the awareness of all sensory stimuli is delayed by around 0.5 seconds, then our *awareness of the sensory world is substantially delayed with respect to its actual occurrence*. What we become aware of has already happened around 0.5 seconds earlier. We are not aware of the real moment of the present. We are always a little late.

Libet focuses on cases in which the unconscious produces effects well before awareness of them. It is possible that all conscious mental events begin as unconscious events, before some form of awareness appears. We already possess experimental evidence that this happens in the case of bodily sensations. It seems likely that this applies to other types of awareness as well: not only sight, hearing, the sense of smell and touch, but also

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[11] B. Libet, *Mind Time. The Temporal Factor in Consciousness,* President of Fellows of Harvard College 2004.

conscious thoughts and sensations, emotional or otherwise. Thoughts of various kinds, imaginings, attitudes, creative ideas, the solution of problems, and so on, initially develop unconsciously. These unconscious thoughts arise in a person's conscious awareness if the appropriate cerebral activities last for a sufficiently long time.

Some examples follow: in the case of speech, this means that the process of starting to speak, and even the content of what is to be said, has begun and has been unconsciously prepared before the actual action of speaking. If the requirement of duration for awareness also held in this case, it would be evidently impossible to utter a rapid sequence of words, as we do fluently, if we had to be conscious of every single word before uttering it. In fluent speech, the words appear "on their own", that is, unconsciously. But also playing musical instruments like the piano or the violin, or singing, involve a similar unconscious performance. Pianists often play a rapid sequences of notes in which the fingers of both hands hit the keys so rapidly that they are barely visible. Moreover, each finger must not only hit the correct piano key in every sequence of notes. It would be impossible for a pianist to be *consciously aware* of each finger's action if there was indeed a substantial delay before awareness of each finger's movement. In reality, musicians report that they are unaware of the intention to activate every finger; they tend instead to focus on expressing their feelings, their musical emotions. Also these emotions arise *unconsciously*, before any awareness of them develops, based on the principle that the duration is essential to produce awareness. Instrumentalists and singers know that if they stop to "think" about the music that they are performing, their expressiveness becomes forced and stilted.

The experimental results just described have prepared the ground for analysis of free will. The discovery that the volitional process begins unconsciously raises a problem: does the conscious will perform a role in the performance of a voluntary action? Libet thinks that it does. Consciousness appears 150 msecs before the motor action and follows the beginning of the cerebral action by at least 400 msecs. This makes it potentially possible to influence or to control the *final* result of the volitional process. Conscious will can decide whether to allow the volitional process to reach completion, giving rise to the motor act. Or the conscious will can "veto" the trial and block it so that no motor act occurs. Conscious free will does not initiate our voluntary actions. But it can control their outcomes or performance. It can allow action to continue, or veto action so that it does not occur. Libet's conclusion is that free will exists even if it does so in a way partly different from its representation in philosophy. *Free will is not only an expression of the brain's conscious activity but it begins in the unconscious and exercises a veto on whether or not the action is performed*.

Libet's experimental results confirming the existence of free will give validity to my "proairetic premise" in the practical-inferential model to explain action

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