Extended abstract

On Situational Logic as a Method in a World of Propensities

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Departing from Popper's (1990) outline of his propensity interpretation of probability theory, the paper demonstrates by means of examples from physics, biology, psychology and anthropology how situational logic may function as a method for investigating and explaining phenomena within these domains.

As cases of, say, loaded dies and human life tables show, it is, Popper (1988, p. 12-13) argues, necessary to develop a probability theory to account for the different ways in which both the inanimate and animate worlds appear in realizing themselves according to their weighted possibilities, or propensities.

The idea of propensities draws attention to the existence of dispositional properties of physical and organic entities, as matter has a tendency 'to urge' depending on its composition and the surrounding fields. Propensities are thus *relational properties* since they are determined by the total set of generating conditions pertaining to the entire system under consideration. This modification of classical probability theory also permits an interpretation of the probability of *singular events* as properties of the very events themselves, and where the probability is to be measured by a conjectured potential or virtual statistical frequency rather than by an actual or observed frequency – as Popper (1983, p. 356) explains: '…we can say that the singular event *a* possesses a probability *p*(*a*, *b*) owing to the fact that it is an event produced, or selected, in accordance with the generating conditions *b*, rather than owing to the fact that it is a member of a sequence *b*. In this way, a singular event may have a probability even though it may occur only once; for its probability is a property of its generating conditions: it is generated by them.'

It is here that the importance of the propensity theory for the life sciences becomes obvious in that a strain of organisms may be seen to form sequences of repeatable entities while each singular organism can be shown to possess distinctly individual properties. Life's urge to realize itself may be compared to crystal formation – as Popper (1982, p. 209) suggests: '…we might call these peculiar propensities towards autarky, with their surprising independence of environmental conditions, "*inherent propensities*" of the system. They are relational, as all propensities, and yet they do resemble Aristotle's inherent potentialities of a thing more than other physical or biological propensities.'

When we move from the inanimate to the animate world there appears an increase in complexity of the propensities due to this kind of superposition of 'inherent propensities' which, in a rudimentary way, already plays a role in phenomena like loaded dies, osmotic pressure, resonance, and the like, and seem to consist of a superposition onto the physical world of 'a hierarchy of systematic and increasingly purposeful biases' (Popper, 1982, p. 210).

Examples of organic phenomena conducted by propensities, or systems of propensities, are numerous – from chemical cycles to behavioural preferences in living organisms (Bonner,1993, Ch. 2). Biological structures and processes are not deterministic as they change with the inherent developmental pre-programming of the individual and with the dynamics of the environment; their assigned propensities refer to calculable, relative probabilities with regard to both individual properties and those of the life situation of the individual. Although greatly simplified this type of calculation can be read out from *life tables* used by insurance companies to fix life insurance fees of people according to their age and state of health; but the content of such tables also change with nutrition and the administration of medical treatment for given illnesses. Life expectancy is thus a propensity class on which statistics can be based, and this, in principle, will be the case for other biological characteristics and behavioural dispositions.

With a precision of 'situational logic' as a method that employs *a rational reconstruction or model* of a given situation in order to identify the contributing factors responsible for the observed phenomena and their inherent 'animating principles' – that is, what is *implicit* in the situation (Popper, 1983, pp. 357-59), the paper ends with a preliminary analysis of typical life situations with examples from behavioural science and anthropology to illustrate that situational logic may contribute to answer questions of how organisms solve the problem of adapting themselves to varying life-conditions. Indeed, one of Popper's thrilling insights is that natural selection in the Darwinian sense only works as a powerful explanatory system because it is, in itself, *a case of applied situational logic* (Popper, 1974, pp. 133-43).

According to a preliminary analysis of problem situations, which I have carried out, *life situations* of given species may be considered to belong to two main categories:

(i) Repeated species-typical ('a priori') situations;

(ii) Singular or repeated ('a posteriori') situations of learning.

To these biological problem situations we have to add a third, and very different category of situation, namely that of

(iii) Singular or repeated exosomatically constrained situations.

ad i. In such species-typical situations, repeated over generations as part of their life-conditions, the genetic endowment of members of extant species is supposed to have evolved through natural selection as solutions to problem situations belonging to the history of the species. This will hold for species-typical organs and behaviour patterns of most species, *Homo sapiens* included. In other words, the genetic endowments are the result of *long-time problem solving* in, or adaptation to, species-typical life situations, *i.e*. to situations that each and every individual of the species had to face some time or other during its lifetime. This may be how both the resulting organs and problem-solving activity, which may be observed in present-day individuals of the species under consideration, come to follow something that resembles universal laws. It is such law-like behaviour typical of the species, together with the typical set of organs of each individual, which make up the initial conditions for any new attempt at solving problems for these and later species-members. In this sense, the phylogenetic results of problem solving in the past can be called 'a priori' initial conditions since, for each generation of individuals, they influence organic growth and behavioural functioning to a high degree. The counterpart of the initial conditions was provided by the changing ecosystem of each generation of the species.

ad ii. Singular or repeated learning situations make up a class of 'everyday' situations which an individual may encounter in the typical eco- and social system of the species, and also of situations that may be encountered less frequently, perhaps only once in a lifetime. They are problem situations in the sense that the individual only comes to know them and their character through encounters and, as a consequence, may remember them positively if the problem was solved or, if not, in a negative vein or with fear. The term 'a posteriori' is here used to designate experience or learning obtained during such encounters. It will be situations of varying degrees of freedom in that both the individual and the situation will be constrained either by limiting dispositions to act or by limiting conditions of the situation. This is seen, for instance, when an individual is faced with a given problem for the first time and then spontaneously performs, say, a pre-programmed or previously learnt behaviour that turn out to be either partially 'to the point' or not at all. It will then depend on the *short-time* learning capacity of the individual, whether it shall manage to make another, more appropriate, trial. Another constraint may occur if the individual adheres too strongly to something already learnt or imitated from others.

ad iii. Singular or repeated exosomatically constrained situations are such 'everyday' situations which, for example, due to environmental pollution or other man-made inventions, have been disturbed to such an extent that some pre-programmed or learnt solution to problems do not work any longer. The kind of situations encountered by animals in most laboratory experiments, and those in which many industrial workers spend part of their lives, are known to provoke stress and stereotyped behaviour while only casually or gradually rendering gratification to the participants. In such constrained situations of individual or joint problem solving, the participants are often seen to rush for the 'first and best' solution, which makes them miss the real causes of the misery. Nevertheless, it is remarkable that living beings are able to solve problems in such non-biological and artificial situations. As Medawar (1957, p. 96) pointed out, not all exosomatically evolved systems and tools are evils as such – perhaps only their misuse and other *unintended consequences* are – whose genetic and organic side-effects we may, however, only come to know hundreds of generations from now.

Finally, three examples from behavioural science and anthropology, illustrating how species-typical behaviour in humans of different cultural backgrounds may be elicited in the same way in situations of Category 1, 2, and 3, as described above, are subjected to analysis by means of situational logic.

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Author's Academic background:

(1) As Research Assistant to Popper I prepared, with the help of a secretary, for publication his *Postscript to The Logic of Scientific Discovery* (1100 typed pages) during the last four months of 1969. The *Postscript* was only published in the 1980s by Rowan and Little-field, Totowa, persuaded by William W. Bartley III to accept it for publication (as the main part of his "Popperian harvest" campaign).

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