A Theory of Society Derived from the Principles of Systems, Psychology, Ecology, & Evolution (Part 2).

John A Challoner BSc(Eng) CEng MICE, Rational-understanding.com. June, 2024.

1. Introduction

In this part, the work of the English philosopher of science, Roy Bhaskar (1944 – 2014), and the English sociologist, Margaret Archer (1943 - 2023), is described and commented upon.

Bhaskar's contribution to the theory of society was twofold. Firstly, his "transcendental realism" dealt with the nature of science in general, and secondly, his "critical naturalism" with the social sciences in particular. The two terms were later conflated by his followers into "critical realism", the philosophy of science of which he is now regarded as the founder. His transcendental realism is consistent with the author's "Systems Theory from a Cognitive and Physicalist Perspective" (Challoner, 2023). The latter was derived independently, largely from work on symbolic logic. However, Bhaskar also provides further insights that will be described here. His work can be regarded as falling within the discipline of systems science, although Bhaskar makes little reference to systems. Regarding Bhaskar's critical naturalism, the author generally agrees. However, there are details on which we diverge that will also be described.

Archer's main contributions to the theory of society were her explanations of social morphogenesis and reflexivity, both of which will also be described and commented upon.

The following principles can be derived from Bhaskar and Archer's work:

Principle 11: Emergent generative mechanisms are the basis of causality.

Principle 12: Stratification of the sciences is based on rootedness and emergence.

Principle 13: Social change is a consequence of the morphogenetic cycle.

Principle 14: The reflexivity of individual agents is a component of the morphogenetic cycle.

2. Principles 11 & 12. Bhaskar's Transcendental Realism

This section is derived largely from the book "Critical Realism. An Introduction to Roy Bhaskar's Philosophy." by Andrew Collier (Collier, 1994). Much of the text is a direct quote from this book. However, modifications are often made for reasons of clarity, or to draw out the parallels between Bhaskar's work and systems theory.

Bhaskar saw nature as being real and the rules that govern it as being fixed. He referred to reality as "the intransitive object of science". However, our scientific understanding remains flexible no matter how much we increase our knowledge. So, he referred to this knowledge as "the transitive object of science".

Bhaskar also saw nature as being stratified in the form of a hierarchy, and the "strata" as being reflected in the different scientific disciplines (Law R01). For example, the natural sciences are arranged hierarchically, in descending order, as follows:

- Biology;
- Chemistry; and
- Physics.

Each stratum comprises a set of “generative mechanisms”, i.e., holons or systems comprising lesser holons or systems from lower strata that, by virtue of the way they are structured or arranged relative to one another, can operate together to produce outputs that individually they cannot. That is, generative mechanisms are emergent properties. It is these generative mechanisms that are stratified rather than objects or events. Bhaskar referred to the relationship between higher-level generative mechanisms and the underlying lower-level ones in terms of rootedness and emergence. The higher-level ones are rooted in and emergent from the lower-level ones (Collier, 1994. P110) (Law R02). Regarding rootedness, there can, for example, be no biological generative mechanisms unless there are chemical ones, whilst the reverse is not true. Many (though not all) cases of rootedness-emergence relationships are also ones of composition. Biological organisms for instance are composed of chemical substances. It is because they are so composed that they are rooted in chemistry. Regarding emergence, what emerges at each level are new causal relationships. Biological organisms, for example, are emergent from chemical substances. However, they obey laws other than chemical laws and do things that could never have been predicted from chemicals alone (Collier, 1994. P116). So, when reality is seen as comprising generative mechanisms, the hierarchy is one way (Law R03).

Bhaskar saw the pursuit of science as being the identification and understanding of generative mechanisms. He also saw the essential feature of science as being that of explanation rather than prediction. The generative mechanisms discovered by science explain what happens, deeper mechanisms explain surface ones, and so on. Thus, neither atomism, which claims that reality is only understood when it is resolved into its smallest components, nor holism, which makes the opposite claim that the part is entirely explicable in terms of the whole, provide a satisfactory explanation of reality.

Lesser generative mechanisms, holons, or systems provide “vertical explanations” of those in the higher stratum. However, it is not possible to predict from a set of lesser generative mechanisms, holons, or systems what properties will emerge to define higher-level ones (Collier, 1994. p110). The higher-level generative mechanisms, holons or systems must first be recognised and then explained by lesser ones (Law R04). This determines the direction in which scientific knowledge progresses, i.e., towards more detail. However, this detail does not eliminate the emergent properties of higher-level generative mechanisms.

Interactions between generative mechanisms, holons, or systems at the same level comprise a discipline, and provide a “horizontal explanation” of it. These interactions are causal. Effects are due to causes comprising generative mechanisms and their outputs. However, only in experimental situations can causes be relied upon always to produce the same effects. Bhaskar referred to an experimental situation as a “closed system”, i.e., one in which other potential influences are excluded or held constant to identify what a particular generative mechanism does on its own (Collier, 1994. P33). However, most of our knowledge is not acquired experimentally, but rather by the observation of “natural open systems” (Collier, 1994. P31). In the latter, generative mechanisms only have the potential to produce outputs. So, these outputs were referred to by Bhaskar as the generative mechanism’s “powers”. Generative mechanisms can still exist while they are not operating. They only produce their outputs when circumstances permit, i.e., when the generative mechanism, holon, or system is in receipt of the necessary inputs or has an adequate reserve of them, and when its processes are unimpeded by the outputs of other generative mechanisms (Law R05). Furthermore, in a natural open system, the outputs from a generative mechanism can be interfered with by the outputs of others, and so, may not necessarily produce the same effect as would be observed in a closed experimental situation (Law R06). What happens in a natural open system is the effect of a conjunction

of outputs, it is not what one would have predicted from any of those outputs taken in isolation (Collier, 1994. P35).

Thus, generative mechanisms, holons or systems can have: (a) unexercised powers, i.e., not deliver their potential outputs; (b) powers that are exercised but unrealized, i.e., outputs that do not result in the effects predicted by experiment; and (c) powers that are realized but unperceived, i.e., unobserved effects (Collier, 1994. p37) (Law R07). So, in natural open systems, Bhaskar describes generative mechanisms as having "tendencies" to produce effects that are not necessarily manifested or observed. For a law to be true, it must hold when the generative mechanism that it designates works unimpeded, i.e., in a closed system or experimental situation. Otherwise, we must refer to tendencies.

Explanation and prediction are only reciprocal in a closed system (Law R08). Generally, in an open natural system, explanations of reality will not generate predictions of it. In an open natural system complexity is such that prediction is impossible or unreliable. So, for a law to be useful it must contribute to explaining events in open systems, in which the mechanism is operating alongside others (Collier, 1994. P43).

Collier explains that "A stratified world is an open world. A world that does not naturally produce closed systems. But it is also a world in which we can produce closed systems at some strata. The lower the strata in the hierarchy of rootedness and emergence the closer we get to a closed system. For it is possible to isolate, for instance, a chemical process from the interruptions of organic processes, but it is not possible to isolate an organic process from the effects of chemical processes, since it is rooted in them. A science such as evolutionary biology deals with systems which are inherently and in principle open, since on the one hand random mutations (i.e., those determined by a purely physio-chemical process, not a biological one) are presupposed, and on the other hand, the environment which determines what constitutes fitness is governed by geological, meteorological and social processes as well as biological ones. It is often possible to isolate a system from processes generated by higher strata, but never possible to isolate one from those generated by lower strata. Hence the further up the hierarchy we go the more distant our approximations to closure become." (Collier, 1994. p121). This is particularly significant for the social sciences, which are high in the hierarchy of rootedness and emergence, and for which it is difficult to design satisfactory experiments.

To address this difficulty, Bhaskar offered the following process for obtaining explanations in open systems. He noted that the typical causal explanation in ordinary life is a transitive verb of the kind: "Tania pushed the door open". A multiplicity of such transitive verbs maps a complex causal sequence. The pattern of explanation for a complex sequence is a four stage one, which Bhaskar called RRRE: reduction, redescription, retrodiction, i.e., the reverse of prediction, and elimination.

- Resolution: the process is analysed into its various causal components;
- Redescription: given a background of theory about the various mechanisms operative in this open system, we can redescribe the causal components in terms of this theory. We will then be in a position to:
- Retrodict the causes of these components. However, since we are in an open system there may be any number of possible causes that could have co-determined these events. So, we need to:
- Eliminate such of these as we can by means of independent evidence about the antecedent event. (Collier, 1994. p122)

3. Stratification

The views expressed in this section are those of the author rather than Collier or Bhaskar.

There are many disciplines in the social sciences, i.e. psychology, social psychology, anthropology, sociology, economics, political science, and so on. We might arrange these in a hierarchy with each discipline having its own stratum, for example:

- Sociology;
- Psychology;
- Biology;
- Chemistry; and
- Physics.

However, there are reasons to believe that it would be incorrect to stratify the social sciences in this way. In particular, Collier suggests that each level in the hierarchy of rootedness and emergence is autonomous with its own irreducible set of generative mechanisms and laws. This appears not to be the case for the various disciplines within social science. To address this, the author proposes a single discipline, "Human Science", that occupies just one level. Thus, sociology, psychology, etc. become branches of this one discipline. A similar argument can be made for another single discipline, "Life Science". The hierarchy then becomes:

- Human Science, including psychology and sociology (Law R09);
- Life Science, including biology & ecology (Law R10);
- Chemistry; and
- Physics.

There is nothing unusual about a discipline having multiple branches. For example, physics comprises mechanics, electromagnetism, thermodynamics, quantum mechanics, relativity and so on, each with its own generative mechanisms and laws.

Collier notes that knowledge of society does not reduce to knowledge of people (Collier, 1994. P138). Nor does knowledge of people reduce to knowledge of society. He also notes that the explanatory relationship between various branches of Human Science is complex. For example, human psychological mechanisms can be explained in terms of both biological and sociological ones. If the branches of Human Science were forced into a hierarchy, then these explanatory relationships would mean that explanation is not only from the parts to the whole, but also from the whole to the parts. Clearly therefore, if the branches of Human Science were to be stratified then Bhaskar's rootedness-emergence criterion would break down.

It is emergence that defines a stratum. In the case of Human Science, what emerges at that stratum is not human needs and the satisfaction of those needs, as described in Part 1. Nor is it the relationships between people and organisations that are intended to satisfy or prevent the satisfaction of those needs, as also described in that part. Rather, human needs are merely an expression of generative mechanisms that have emerged at a lower stratum, probably physics, and whose satisfiers are their necessary inputs (Law R11). This can be explained as follows. In systems science, a human need is equivalent to a function, i.e., a mechanism that generates outputs. A function can only operate when it receives the necessary inputs or satisfiers. Relationships comprise outputs to other generative mechanisms. Contra-satisfiers can be regarded as akin to inhibitors of inputs or drains on reserves.

What does, however, emerge in Human Science is our ability to manipulate information (Law R09). That is, our ability to observe structure and order in reality, to encode this information in a cognitive form, and to communicate it to one another. Bhaskar's SEPM or Synchronic Emergent Powers Materialism regards mental powers as being emergent, not occurring in the absence of matter, but not reducible to material powers. This manipulation of information is apparent in all branches of Human Science, i.e., in psychology, sociology, economics, politics, and so on. The same is emergent in other social animals, of course, but not to the same extent as in humans.

The conclusion must therefore be that the branches of Human Science are not stratified. A similar argument applies to biology and ecology, and so they too can be regarded as branches of a single stratum that can be referred to as "Life Science". In this case what emerge are (a) self-maintenance or autopoiesis and (b) evolution comprising reproduction and natural selection. (Law R10). Information does of course play an important part in evolution. The design of an organism is encoded in its DNA. However, until recently, life has been unable to manipulate this information in the same way that humans manipulate their cognitive information. Rather, any changes have been random or a result of selective breeding.

There are notable similarities between the branches of Life Science and the branches of Human Science. Both biology and psychology focus on the related entities, whilst ecology and sociology focus on relationships between those entities. This suggests that the recommendations made by Bhaskar in the next section apply not only to Human Science, as he intended, but also to Life Science.

According to emergence theories, new higher strata emerged from lower ones at certain times in history (Collier, 1994. p157) and may continue to do so. Bhaskar states that it is impossible to predict what new generative mechanisms will emerge (Law R04). However, we can speculate. For example, emergence due to human biological evolution is unlikely in the short term. This is because biological evolution in higher organisms normally proceeds very slowly and takes many thousands of years to produce a noticeable effect. Human cultural evolution, on the other hand, proceeds relatively quickly with noticeable differences between generations. Our scientific knowledge and technology in particular are proceeding very quickly. So, it may be that cultural evolution or technological development will result in the emergence of new generative mechanisms. Finally, the pattern of rootedness and emergence, together with the way in which humanity interacts with the natural environment, suggest that we may be emerging as nature's control component, i.e., the component that governs and co-ordinates the activities of the others. It also suggests that other species may be emerging to fill that role. So, if the role is to be a human one, then we should take it far more seriously than we have to date. There are, for example, obstacles to be overcome that will be discussed in more detail in Part 3.

4. Bhaskar's Critical Naturalism

Returning to Bhaskar's work, again the description in this section is derived largely from the book "Critical Realism. An Introduction to Roy Bhaskar's Philosophy." by Andrew Collier (Collier, 1994). However, modifications have been made for reasons of clarity.

Human Science can be regarded as having two main branches: (a) the network of relationships and interactions between individuals and groups that forms the structure of society and is the subject of sociology; and (b) the individual human volition or agency that is the subject of psychology. Bhaskar reconciled these two branches through his transformational model of social activity (TMSA). In this model, both society and individual agency are ever-present. Peoples' conscious activity largely reproduces the social structures, practices, and conventions that govern their activity. Individuals

acquire certain duties and responsibilities by virtue of the occupation of certain roles. On the other hand, society depends on individual human activity for its reproduction and transformation over time (Law S01). Society is thus a necessary condition of individual human action and influences it, but individual human action is, in turn, a necessary condition of society, which it continually shapes and reshapes (Webpage A).

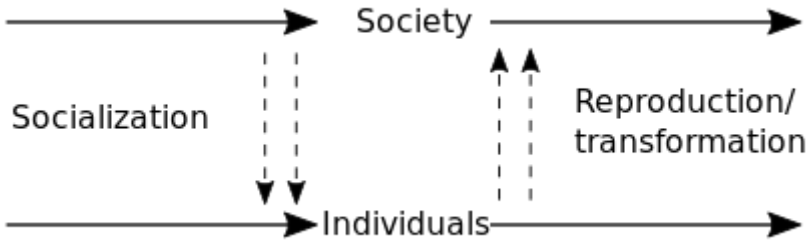

Figure 1 – Bhaskar's Transformational Model of the Society/Person Connection (TMSA)
(From Wikimedia Commons, the free media repository)

The TMSA model is described in Figure 1. However, to socialisation, in which others reward us for compliance and punish us for non-compliance with their values and norms, the author would add other ways in which society influences our individual beliefs, such as advertising, formal laws, propaganda, and social learning, i.e., the emulation of role models.

Bhaskar's TMSA is, of course, a co-evolutionary feedback loop whose subject is information. That is, the culture of a society, i.e., its shared values, norms and beliefs, affects the values, norms and beliefs of individuals. The values, norms and beliefs of individuals, in turn, affect the culture of a society. It is notable that there is a similar co-evolutionary feedback loop in Life Science. That is, the evolution of species causes evolution of the ecosystem which in turn affects the evolution of species.

There is a question over whether individual reasons, beliefs, and knowledge can be regarded as causal. They are information held in our minds and communicated between us. Thus, the view is often expressed that they differ from other more tangible generative mechanisms and cannot, therefore, be regarded as causes. However, in Bhaskar's opinion this is incorrect. Reasons and beliefs are causal and act in conjunction with other generative mechanisms in reality's open system to direct human behaviour (Law T01). However, it should be noted that reasons and beliefs are transitive, can alter with time, and are not necessarily a true reflection of intransitive reality.

Bhaskar offers a way of progressing our scientific knowledge in the field of Human Science. The aims are the same as those of the physical sciences, i.e., the identification of generative mechanisms and the explanation of reality. However, experiment is difficult and, in many cases, impossible. So, an alternative approach is required. His suggestions are to: (a) inquire into open systems in the same way as the natural sciences, i.e., using the RRRE (resolution, redescription, retrodiction, elimination) approach; (b) find a partial analogue to experiment; and (c) find a compensator for the absence of experiment (Collier, 1994. P162).

Once a hypothesis about generative mechanisms has been produced, it can be tested empirically, although not necessarily quantitatively, exclusively in terms of its explanatory power (Collier, 1994. P164). That is, do the generative mechanisms satisfactorily explain what we observe in reality?

Social pathologies can be helpful in identifying generative mechanisms. By seeing how something goes wrong we can find out more about the conditions for it working properly than would otherwise be the case. If a generative mechanism operates as it should, then it is often unactualized, and thus, unobserved. When it fails, on the other hand, it is often actualized and can be observed (Collier, 1994. P165).

Regarding the compensator for lack of experiment, there are proto-scientific or ideological theories about society. They do not exist in a closed system; psychological, economic, political, and ideological mechanisms also play a part. In Bhaskar's view these proto-theories (P) can be transformed into scientific ones (T) as follows. "The first step in the transformation P to T will thus be an attempt at a real definition of a form of social life that has already been identified under a particular description. Note that in the absence of such a definition, and failing a closure, any hypothesis of a causal mechanism is bound to be more or less arbitrary. Thus, in social science attempts at real definitions will, in general, precede rather than follow successful causal hypotheses – though in both cases they can only be justified empirically, viz. by the revealed explanatory power of the hypotheses that can be deduced from them." (Collier, 1994. P165)
The process of theoretical transformation includes empirical testing and, for that reason among others, nothing in its premises is unrevisable (Collier, 1994. P166).

5. Principle 13: Archer's Morphogenesis

The concept of the morphogenetic cycle originated with the British sociologist, Margaret Archer (1943 - 2023), (Archer, 1995). Although she developed the concept independently, it is remarkably similar to Bhaskar's TMSA and led to them working together under the banner of critical realism (Webpage A). Archer borrowed the term morphogenesis from biology. There, it describes the process by which an organism is shaped by the differentiation of its cells, tissues, and organs according to the genetic blueprint of the organism and environmental conditions. Archer used the term to describe the way in which human society is shaped.

She recognised the dualism of structure in society and individual agency, and also that of culture in society and agency. Neither on its own explains human affairs. The structure of society gives individuals roles and with these roles come rights and responsibilities. These rights are to receive from others, with whom we are structurally related, particular satisfiers and not to receive contra-satisfiers. The responsibilities are to provide particular satisfiers and not to provide contra-satisfiers (Law S02). Culture provides certain values, norms, and beliefs that others in society expect us to follow. However, we also have individual agency, and this can operate on both structure and culture to reproduce or alter them (Law S03).

Structure, culture, and agency operate on different timescales however, i.e., it takes time for social structures and/or culture to alter individual beliefs, and for individual beliefs to alter social structures and/or culture (Law S04). So, although the three are causally related, the time lag means that each can be analysed individually, at any point in time, to provide an explanation of human affairs at that point. The causal interactions can also be analysed to provide an explanation of social change over time.

6. Principle 14: Archer's Reflexivity

Archer also recognised the importance of reflexivity in bringing about social change. She defined reflexivity as "…the regular exercise of the mental ability, shared by all normal people, to consider themselves in relation to their (social) contexts and vice versa" (Archer, 2007). "…it is the process through which reasons become causes of the courses of action adopted by social subjects. Their subjective internal deliberations – internal conversations – are responsible for mediating the conditional influence of objective structural and cultural factors upon social action." (Archer, 2003)

There has been philosophical argument regarding the possibility of internal conversations. Clearly, however, we can converse internally, and we do. This ability is a consequence of the author's feedback model of consciousness. The conversation is between the cognitive processing and decision making function of our minds, which is largely unconscious, and the behaviour processing function, which is largely conscious, and which vets and can veto those decisions before they lead to actual behaviour.

"We perceive the consequences of our actual behaviour with our senses, and this provides external feedback. For example, when driving a car, we continuously observe our position in the road and correct it when necessary. With sufficient practice, this can be done almost unconsciously. However, we can also "know" proposed behaviour before we act. For example, we can "hear" words that we might speak before saying them, "hear" music that we might play without playing it and "see" actions that we might take before taking them. Sensory processing functions are, therefore, connected to and aware of behaviour processing functions. Awareness of our own minds and awareness of the external world can be similar because both are processed by the same sensory processing functions. This creates the potential for feedback, and it is this feedback which, in the author's view, leads to the emergence of consciousness." (Challoner, 2021)

This internal reflexivity or conversation is essentially an ongoing review of the extent to which the structure and culture of society fails to satisfy our needs and/or provides us with contra-satisfiers. When our social circumstances become unacceptable, then we form beliefs or adopt beliefs from others that we feel are likely to improve those circumstances. We also communicate the beliefs to others. They can, of course, be objectively true or false (Law T02). Nevertheless, they are the generative mechanism that, in conjunction with the generative mechanism of unsatisfied needs, motivate our behaviour (Law T01).

Returning to Archer's work, she identified four types of reflexivity that, currently, are equally distributed throughout the population but whose proportions can alter over time (Archer, 2013):

Communicative reflexivity. Internal conversations need to be confirmed and completed by others before they lead to action, thus fostering normative conventionalism. She also found that such reflexives principally invest themselves in family, thereby contributing to social cohesion. However, she found that communicative reflexivity is harder to sustain in modern Western society, due to the demise of community and geolocality, and is therefore in decline. There are also difficulties owing to the very wide variety of beliefs that we now hold and promote. It is impossible to please everyone.

Autonomous reflexivity. Internal conversations are self-contained, leading directly to action and characterised by instrumental rationality. Archer found these reflexives to devote themselves to the market and to contribute most to economic development.

Meta-reflexivity. Internal conversations that critically evaluate previous inner dialogues and are critical about effective action in society, in promoting value rational action. Archer found meta-reflexives to promote social transformation by gravitating towards employment in the non-profit sector. Meta-reflexivity is currently gaining ground.

Fractured reflexivity. Internal conversations cannot lead to purposeful courses of action and only intensify personal distress and disorientation, leading (temporarily) to passive agents. She found that fractured reflexivity most often results from failed communicative reflexivity and is also currently gaining ground.

7. Implications of Bhaskar's and Archer's work

Again, the comments in this section are those of the author rather than Collier, Bhaskar, or Archer.

Firstly, we will take a short diversion into the practice of meditation. This is basically a process of quieting the mind, i.e., preventing internal conversations, particularly those begun by a welling up of thoughts from the unconscious. Thus, meditation can give relief from the anxieties caused by fractured reflexivity. It can also train us not to engage in internal conversations over contra-satisfiers about which

we can do nothing, thus avoiding anxiety from that source. However, the latter can lead to denial, and so, care is necessary.

Moving on, the author suggests that roles in society are twofold: i.e., biological and economic (Law U01). Broadly speaking, the biological roles are: childhood, pre-parental adulthood, parental adulthood, and post-parental adulthood. Each has its own sub-culture which is pre-determined, but which we propagate and transform as we pass through that stage of life (Law U02). Not all individuals fit the following model, of course, but it is the one that is most common. In childhood we learn our society's general culture. In pre-parental adulthood we learn to find and maintain our economic role in society, thus acquiring the necessary relationships and infrastructure for our parental role. In the parental role we learn to raise children and pass society's general culture on to them. Finally, in the post-parental role we support the younger generations.

In relatively simple societies, economic roles may have been hunting, herding, gathering, camp building, etc. However, in modern society, roles are increasingly specialised and differentiated ones in organisations. Again, each organisation has a sub-culture which is predetermined and that we propagate and alter whilst occupying it (Law U03).

Finally, the author suggests that the infrastructure, artifacts, flow of materials, and flow of energy that are necessary for human economic activity must form a part of the structure of society (Law S05). Without them our economic activity would be very limited indeed. This is comparable to the inclusion of the similar but more limited factors in the field of ecology. There too, the flow of energy and minerals through ecosystems are considered to be important.

In summary, the generative mechanisms relevant to human society are as follows, beginning with the lowest level of stratification. Each level is rooted in the one below, i.e., the generative mechanisms in lower levels must exist before those in the higher level are possible. It follows therefore that the generative mechanisms must have emerged in a sequence over time (Law R03).

Interestingly, the hierarchy of emergence of these generative mechanisms is broadly consistent with both the human hierarchy of needs and the priorities that we give to levels in multi-level selection theory. So, these three concepts tend to support one another, and also, a history of emergence.

- **Needs, satisfiers, and contra-satisfiers.** These emerged at a very low level of stratification, possibly physics, and are more generally referred to in systems science as functions, necessary inputs, and inhibitors of inputs or drains on reserves. This generative mechanism will, therefore, apply to all levels in the hierarchy of emergence, although different names may be used.
- **Reproduction and natural selection in evolution.** Reproduction is thought to have emerged with autocatalytic sets of complex biochemicals (Kauffman, 1971). In living organisms, including humans, reproduction is a basic need, that, if not satisfied, will lead to the expiry of an organism's line. In multi-level selection theory, greatest weight is placed on survival of the individual, followed by that of close relatives.
- **Autopoiesis**, i.e., the ability of a living system to maintain and renew itself by regulating its composition and conserving its boundaries, emerged with living organisms. This generative mechanism includes self-maintenance. It can be regarded as a defense against natural selective pressures in the environment. It is a basic need, that if not satisfied will result in the organism's death. Controversially, the German sociologist, Niklas Luhmann (1927 – 1998), used the term to describe the defenses that various human groups and organisations erect to protect themselves from selective pressures in their social environment. These autopoietic

defenses, our needs, and the levels in multi-level selection theory are all hierarchical and prioritised by the individual in the same way. We generally prioritise ourselves, followed by family members, followed by non-family but otherwise related individuals, followed by humanity in general.

- **The manipulation of information.** This generative mechanism has emerged with humanity. However, information takes two forms: a) Bhaskar's intransitive object of science, i.e., information at source or the way that reality is structured; and b) Bhaskar's transitive object of science, i.e., our subjective knowledge or beliefs about reality. Whilst the former is always true, the latter can be either true or false. Any attempt to gain true knowledge of reality requires skill and objectivity. So, such efforts can be regarded as satisfiers for the growth need, our highest level of needs. Success in this endeavour is usually of benefit to humanity as a whole. For example, our progress in the bio-sciences has led to better resistance to diseases.

However, we also use our ability to manipulate information more generally. Our environment comprises not only the natural environment but, increasingly, the social one. We are becoming ever more reliant on this social environment for the satisfaction of our needs. Thus, we often believe or propagate beliefs that we think will best satisfy a personal need or avoid a contra-satisfier. In this way, two generative mechanisms, our beliefs which may or may not be true and our unsatisfied needs, co-determine our behaviour (Law T01). This will be discussed in more detail in Part 3.

Furthermore, the transmission of beliefs, whether true or not, results in a feedback process from individual, to society, to individual, that can lead to cultural evolution (Law Q18). Again, this will be discussed further in Part 3.

Appendix A - Laws

These laws are a continuation of those in part one and their numbering reflects this.

Q. Laws of Evolution

Law Q18: Cause of cultural evolution. The transmission of beliefs, whether true or not, results in a feedback process from individual, to society, to individual, that can lead to cultural evolution.

R. Emergence and Stratification

Law R01: Stratification of nature. Nature is stratified in the form of a hierarchy, and the "strata" are reflected in the different scientific disciplines.

Law R02: Strata are defined by emergence. Each stratum is defined by the emergence of generative mechanisms, holons, or systems whose outputs, and thus, causal relationships cannot be produced by component generative mechanisms, holons, or systems alone.

Law R03: Stratification is unidirectional. Each stratum relies on those below for its existence. However, the reverse is not the case. Thus, generative mechanisms have emerged in a sequence over time.

Law R04: Impossibility of predicting emergence. It is not possible to predict from a set of lesser generative mechanisms, holons, or systems what properties will emerge in a higher stratum. Emergent generative mechanisms must first be observed and then explained by lesser component ones.

Law R05: Generative mechanisms can operate or be idle. Generative mechanisms, holons or systems can still exist while they are not operating. They only produce their outputs when circumstances permit, i.e., when the generative mechanism, holon, or system is in receipt of the necessary inputs or has an adequate reserve of them, and when its processes are not impeded by the outputs of others.

Law R06: Interference of outputs. In a natural open system, the outputs from a generative mechanism, holon, or system can be interfered with by the outputs of others, and so, may not necessarily produce the same effect as would be observed in an experimental closed system.

Law R07: Unobserved effects. In a natural open system, the outputs of generative mechanisms, holons or systems can have effects that go unobserved.

Law R08: Explanation and prediction are only reciprocal in a closed system.

Law R09: Emergent properties of humanity. Human Science comprises a single stratum whose emergent property is the human ability to manipulate information.

Law R10: Emergent properties of life. The biological and ecological sciences comprise a single stratum, i.e., Life Science, whose emergent properties are (a) self-maintenance or autopoiesis and (b) evolution comprising reproduction and natural selection.

Law R11: Human needs, satisfiers and contra-satisfiers and the relationships based on them are NOT emergent in humanity. Human needs are an expression of generative mechanisms that have emerged at a lower stratum, probably physics, and whose satisfiers are their necessary inputs. This can be explained as follows. In systems science, a human need is equivalent to a function, i.e., a mechanism that generates outputs. A function can only operate when it receives the necessary inputs or satisfiers. Relationships comprise outputs to other generative mechanisms. Contra-satisfiers can be regarded as akin to inhibitors of inputs or drains on reserves.

S. Structure, Culture and Agency

Law S01: TMSA. Human Science can be regarded as having two main branches: (a) the network of relationships and interactions between individuals and groups that forms the structure of society and is the subject of sociology; and (b) the individual human volition or agency that is the subject of psychology. Bhaskar reconciled these two branches through his transformational model of social activity (TMSA). In this model, both society and individual agency are ever-present. Peoples' conscious activity largely reproduces the social structures, practices, and conventions that govern their activity. Individuals acquire certain duties and responsibilities by virtue of the occupation of certain roles. On the other hand, society depends on individual human activity for its reproduction and transformation over time.

Law S02: The relationship between structure and agency. The structure of society gives individuals roles and with these roles come rights and responsibilities. These rights are to receive from others, with whom we are structurally related, particular satisfiers and not to receive contra-satisfiers. The responsibilities are to provide particular satisfiers and not to provide contra-satisfiers.

Law S03: The relationship between culture and agency. Culture provides certain values, norms, and beliefs that others in society expect us to follow. However, we also have individual agency and this can operate on both structure and culture to reproduce or alter it.

Law S04: Structure, culture, and agency operate on different timescales. It takes time for social structures and/or culture to alter individual beliefs and for individual beliefs to alter social structures and/or culture.

Law S05: Infrastructure and artifacts. The infrastructure, artifacts, flow of materials, and flow of energy that are necessary for human economic activity form a part of the structure of society.

T. Reflexivity and beliefs

Law T01: Reasons and beliefs are generative mechanisms, and thus, causal. They act in conjunction with the generative mechanism of unsatisfied needs to motivate a human agent's behaviour.

Law T02: Reflexivity. Agents engage in an ongoing review of the extent to which the structure and culture of society fails to satisfy their needs and/or provides them with contra-satisfiers. When their social circumstances become unacceptable, they form beliefs or adopt beliefs from others that they feel are likely to improve those circumstances. They also communicate these beliefs to others. These beliefs can, of course, be objectively true or false.

U. Roles in society

Law U01: Roles in society are twofold, i.e., biological and economic.

Law U02: Biological Roles. Broadly speaking, the biological roles are: childhood, pre-parental adulthood, parental adulthood, and post-parental adulthood. Each has its own sub-culture which is pre-determined, but which we propagate and transform as we pass thorough that stage of life.

Law U03: Economic Roles. In relatively simple societies, economic roles may have been hunting, herding, gathering, camp building, etc. However, in modern society they are increasingly specialised and differentiated roles in organisations. Again, each organisation has a sub-culture which is predetermined and which we propagate and alter whilst occupying it.

Appendix B - Glossary

Agency. The ability of individuals to think and act independently of social structures and affect change.

Autonomous reflexivity. Internal conversations that are self-contained, leading directly to action and characterised by instrumental rationality.

Autopoiesis. The ability of a living system to maintain and renew itself by regulating its composition and conserving its boundaries.

Closed system. Bhaskar referred to an experiment as a closed system , i.e., one in which other potential influences are excluded or held constant to identify what a particular generative mechanism does on its own.

Communicative reflexivity. Internal conversations that need to be confirmed and completed by others before they lead to action, thus fostering normative conventionalism.

Fractured reflexivity. Internal conversations that cannot lead to purposeful courses of action and only intensify personal distress and disorientation leading (temporarily) to passive agents.

Generative mechanisms are holons or systems comprising lesser holons or systems from lower strata that can operate together, by virtue of the way they are structured, to produce outputs that individually they cannot. That is, generative mechanisms display emergent properties.

Hierarchy of disciplines. This is the way in which scientific disciplines are arranged such that a higher-level discipline is dependent on lower-level disciplines for its existence.

Horizontal explanation. This is the explanation of a discipline provided by interactions between the generative mechanisms, holons, or systems on the same level that comprise that discipline.

Human science. A single discipline whose branches include psychology, sociology, anthropology, economics, politics, and so on.

Intransitive object of science. The term intransitive is normally used in English grammar to describe a type of verb that has no object. However, here it is used to mean the immutable nature of reality. The intransitive object of science is essentially the same as information at source.

Life science. A single discipline whose branches include biology, ecology, etc. and whose emergent properties are (a) self-maintenance or autopoiesis and (b) evolution comprising reproduction and natural selection.

Meta-reflexivity. Internal conversations that critically evaluate previous inner dialogues and are critical about effective action in society, in promoting value rational action.

Morphogenesis. In biology, morphogenesis is the process by which an organism is shaped by the differentiation of its cells, tissues, and organs according to the genetic blueprint of the organism and environmental conditions. The term was borrowed by Margaret Archer to describe the way in which human society is shaped.

Natural open system. This is essentially reality as it is, in which a multiplicity of generative mechanisms interact with and interfere with one another.

Power. This term was used by Bhaskar to describe the potential of a generative mechanism to produce outputs but not necessarily the actual production of them.

Reflexivity. The regular exercise of the mental ability, shared by all normal people, to consider themselves in relation to their (social) contexts and vice versa" (Archer, 2007). "…it is the process through which reasons become causes of the courses of action adopted by social subjects. Their subjective internal deliberations – internal conversations – are responsible for mediating the conditional influence of objective structural and cultural factors upon social action (Archer, 2003)."

Retrodiction. The analysis of a causal sequence backwards in time from effect to cause, to previous cause, and so on.

Rootedness. A term used by Bhaskar to describe the dependence of a discipline in a higher stratum on lower-level ones for its existence.

Strata. Levels within the hierarchy of disciplines.

Tendencies. A term used by Bhaskar to describe the ability of generative mechanisms in natural open systems to produce effects, but in which those effects are not necessarily manifested.

Transitive object of science. The term transitive is normally used in English grammar to describe the type of verb that has an object. However, here it is used to describe the scientific knowledge held by people. Unlike information at source this knowledge is mutable and changes with time and circumstances.

Vertical explanation. The explanation of greater generative mechanisms, holons, or systems in terms of lesser ones from the stratum below.

Appendix C – References

Archer, M., 1995. "Realist Social Theory: The Morphogenetic Approach". Cambridge University Press, Cambridge.

Archer M., 2003. "Structure, Agency and the Internal Conversation". Cambridge: Cambridge University Press.

Archer M., 2007. “Making our Way through the World: Human Reflexivity and Social Mobility”. Cambridge: Cambridge University Press.

Archer M., 2013. “Reflexivity”. Sociopedia.isa, DOI 10.177/205684601373

Challoner, J.A. 2021. “Consciousness”. https://rational-understanding.com/2021/10/22/consciousness/

Challoner, J.A., 2023. “Systems Theory from a Cognitive and Physicalist Perspective”. https://rationalunderstanding.com/my-books/

Collier, A. 1994. “Critical Realism. An Introduction to Roy Bhaskar’s Philosophy.” Verso, London, UK. ISBN 0-86091-437-2.

Kauffman, S.A., 1971. “Cellular homeostasis, epigenesis and replication in randomly aggregated macromolecular systems.” J Cybern 1(1):71–96.

Appendix D – Webpage references

A https://en.wikipedia.org/wiki/Roy_Bhaskar