

12 Points of Departure and Development

published as a monograph (Howard, 1973). Some of the concepts involved were introduced in a paper on stability and style in communication (Pask, 1971b). Viewed thus, it turns out that the stable entities in a learning group are coalition-like structures (in the sense of stable game playing coalitions) and not single human beings. These coalitions are the most resilient and tractable units to study.

1.3 Comparable phenomena are manifest in connection with the type of computation called concurrent as well as cooperative; especially if the computation images a reproducing population of automata. In order to substantiate this approach the preview of these systems, given in Chapter 3, has been extended and related more firmly to the standard theory of self-reproducing automata (in essence, by considering reproducing configurations on a tessellation plane that is, itself, a reproducing configuration). Moreover, it is necessary to show that this construction does not inevitably lead to an indefinite regress of systems. This development provides the dynamic or mechanistic backbone that makes it possible to embed the procedures executed during a conversation into a class of processors.

1.4 At various points, languages with a full semiotic (a pragmatics, semantics and a syntax) have been contrasted with formal syntactic languages. In order to theorise about dialogue and to make sense of reflective systems it is necessary (at the beginning of the next volume) to examine command and question languages in some detail, and to elaborate upon the ideas of 'information' appearing in Chapter 1 as well as the notion of 'tense'.

1.5 The following summary remarks are chiefly culled from the prefatory note to the series of papers in which some aspects of the work are set out (Pask, 1972).

The theory has eight compartments.

1. The theory of conversations between two or more individuals. A conversation takes place within a contractual framework and this, rather than a stimulus/response system, is argued to be the least meaningful experimental situation. In a conversation (and conversations are many faceted, enough to adumbrate most types of experiment) it is possible to observe psychological events; whereas in other situations, it is not. Observation consists in recording and interpreting dialogue between the participant individuals. Experimental regulation, parameter change, and so forth, is achieved by instructing one participant to execute a prescribed heuristic. It is crucial, however, that a participant does so and not the observer, and that the participant retains the necessary partiality as well as the liberty of his role; hence, the heuristic is not to be equated with an algorithm. Often

In order to resolve the problems which were chiefly obtrusive in the last chapter and which were mooted and superficially aired in Chapter 4, it is necessary to introduce very radical and not always welcome innovations. The book has laid the necessary groundwork, in showing that a revision is required, in pointing out the reasons for disquiet and in indicating an embryonic form of the new theory. The theory itself is tersely stated in a monograph on cognition (Pask, 1973) and in a series of papers (Pask, 1972; Pask and Scott, 1972a, 1973; Pask, Scott and Kalikourdis, 1973) and it has been quite widely discussed, debated and modified as a result of criticism. The notions are presented, from a systemic or cybernetic point of view in the next volume.

1 Outline

In essence, the theory follows the recommendation of Chapter 4 and takes a conversation as the fundamentally observable unit. As a result, it is possible to cope with *reflective* systems in stages.

1.1 The participants (whether there are just two of them or many, as in a social organisation) are no longer distinct as processors, though under special conditions they may be *rendered* distinct. The cogency of this point of view (which on the face of it, is hard to stomach) is buttressed by some empirical data derived from work with small groups of individuals learning collectively about their surroundings and one another (the theoretical underpinnings are in Pask and Von Foerster (1960, 1961) and the empirical data is in Pask (1962), Lewis and Pask (1964), and Pask and Lewis (1969)).

1.2 In order to sample the interaction between the human beings in such a group, it is essential to employ multi-level indices of communication. These are based upon the IPM tests used by Laing, Phillipson and Lee (1966) (much in the spirit of Bateson's work on the 'double bind' situation) and these techniques are embedded in a special extension of game theory, the theory of *metagames*, presented by Howard (1966a,b) and recently

it is convenient to study man/machine conversations and, in this case, the heuristic becomes a special type of non-deterministic programme or a fuzzy algorithm executed, without numericisation, in the participant machine. For a limited, but outstandingly important class of conversations (so called *strict* conversations), it is possible for an observer to maintain the position of an external observer and thus to report precisely and often in quantifiable terms about the dialogue.

Clearly a conversation involves individuals who participate in an ongoing process of understanding, retaining and learning, and it also involves a set of topics, the conversational domain. As a result, further compartments (sub-theories) are generated.

2. The (sub)theory of individuals is concerned with characterising potentially conscious entities (human, mechanical, or both) which have certain invariant and unitary qualities (by virtue of which they count as 'individuals' rather than widely disseminated organisations).

It appears that many characterisations are possible and all of them rely upon a general notion of stability which can, with rectitude and some advantage, be conceived as a property of self-replication, which is usually contingent upon the choice of conversational domain.

One characterisation is familiar; 'an individual is a human being (or his brain) regarded as a biologically self-replicating system'. We call this an M-Individual or mechanically characterised individual. The other characterisation to receive serious attention rests upon a nested series of definitions; concept \triangleq procedure; memory \triangleq a procedure for replicating a concept; individual \triangleq procedure for replicating a class of memories. The resulting entity is called a P-Individual (psychologically characterised individual) and has many of the properties ascribed by anthropologists to a role, in society or industry, for example. A P-Individual is also a procedure and, as such, is run or executed in some M-Individual, *qua* processor. However, it is quite exceptional to discover the (usually assumed) one to one correspondence between M-Individuals and P-Individuals; in general, the latter are more convenient units to work with though conversations involve both of them.

3. The (sub)theory of conversational domains in which P-Individuals may converse (and remain stable) is concerned with the representation of knowable and learnable relations. The representation schemes found adequate closely resemble 'verb networks' but have only a peripheral (and ambiguous) connection with 'noun trees', such as a species/genus classification. Moreover an acceptable representation of what may be known or learned (here called an entailment structure) is invariably cyclic (which gives it a Gestalt property) and invariably associated with a task structure that indicates what may be done to bring about the relations for which concepts

have been learned. The entailment structure may be given by some numinous authority (for example, a curriculum specialist), or, within certain limits, it may evolve in so far as the participants in a conversation on this domain are able to act upon and modify the structure. In either case, generation rules must be given and justified.

4. The (sub)theory of process is applicable to all manner of decision making, interrogation, and so on, but is chiefly developed for a theory of learning and teaching; i.e. the conversation is a tutorial contract, the entailment/task structures represent 'subject matter', one of the participants has the role of student and one (either human or machine) the role of teacher. Within the structure afforded by the other (sub)theories it is possible to predict well-defined styles and strategies of learning, to confirm their existence, and to check their efficacy. This aspect of the theory is the most directly applicable in designing maximally informative experiments, interventions, and so forth, or in specifying effective modes of tutorial conversations (some of them dramatically superior to others). However, the process theory is based upon the individual and the knowledge theory; moreover, these can be applied independently (the latter to prepare potentially informative data for advertising, course assembly, mass media presentations and management, for example).

5. The (sub)theory of vehicles comes about as follows. The dual characterisations (M-Individual, P-Individual) which proves to be a prerequisite for the developments mentioned already, give rise to the notion that P-Individuals (cultural entities, minds) inhibit M-Individuals (processors) able to interpret these procedures, and *a fortiori*, brains. It is legitimate, though at first sight bizarre, to remark that developmental psychology is a study of how a P-Individual comes to be correlated with a vehicle which is a developing M-Individual. Odd though it sounds, this concept turns out to be useful, though it has not yet been properly exploited.

Equally, we may regard a P-Individual in equilibrium with (inhabiting, replicating in) a different sort of M-Individual. Some example are a collection of human beings in an institution or society (i.e. a cult), some plexus of human beings and mechanical data retrieval systems in a library or a government; and, in the purest and most thoroughly investigated case, a vehicle such as a motor car or an aeroplane designed for moving around in space. Quite literally, a driver regarded as a P-Individual comes to terms with the perceptual-motor/effector-receptor facilities of his motor car which is an M-Individual very different from the body with limbs he uses to walk down a street.

The argument can be inverted to show that the (sub)theory of process makes use of various facilities (the most advanced is the Course Assembly System and Tutorial Environment, CASTE). These too, are vehicles with

which people drive through knowledge, rather than over space. It is a fascinating fact that this theoretical gambit permits the externalisation of rather subtle modes of discovery; even more (given that the entailment structure is modified by the participants), to a reification of the idea that learning is symbolic evolution.

6. The (sub)theory of *uncertainties* and *values* characterises certain macroscopic or molar-level measures upon the types of transaction (for example, explanations of explanations) symptomatic, in a conversation, of the (reproductive) processes that make up and give integrity to the 'P-Individuals' noted in (2). If a conversation is *strict*, in the sense of (1), then these are uncertainty/information indices (Chapter 1) since the goal relation is known to an external observer; otherwise, if the goal is determined by an innate preference, they are also indices of value. In either case, the measures are multidimensional (with minimal components expressing doubt about the focus of attention, about *method* or *means* for achieving a goal and about the 'outcomes' which may be immediately reached).

7. The sub-theory of conscious processes starts off as follows. The operating region (Chapter 7) is identified with a region in this 'space' of uncertainty/information index 'dimensions'. It is defined if, and only if, the conversation is genuine, i.e. if it is associated with consciousness. That, of course, in no way *explains* conscious phenomena. Nor, for that matter, does another aspect of the study which identifies information transfer with the synchronisation of otherwise asynchronous procedures (those of (1)), since 'information' was used with two quite different meanings in the last two sentences. But an attempt is made to unify these concepts by relating consciousness to a special interaction between a P-Individual as in (2) and one or more M-Individuals (5) which, from a commonsensical point of view, is where we might expect to find it.

8. The (sub)theory of compatibility bears upon such issues as conflict resolution, cognitive fixity and cognitive dissonance (or, at a more particular level upon interference effects). It is a kind of immunology concerned with the recognition, as similar or dissimilar, of certain P-Individuals or components of P-Individuals executed in the context of one conversational domain (as in (3)) and it closely resembles the immune-response dynamics of biological organisations (hence, the name). In this case, of course, the competing entities are procedures and it is tempting to call this facet of the enquiry a (very primitive) immunology of ideas.

2 Some Applications of the Theory

Apart from the specific cases cited in section 1, several more global applications are of interest and potential significance though, at this point, empirical

support is either sparse or altogether lacking. For instance, the theory predicts forms and levels of responsibility (notably in government, management, and so on) as a generalisation of the distinctions noted in section 1.5(4) and in Chapter 11. As part of the same theme, it predicts regulatory strategies likely to prove effective in the management of ecosystems. It is also possible, within the general framework, to comment usefully upon problems of architecture and urban development.

On a very different tack, the distinction between P-Individuals and M-Individuals casts doubt upon the usually accepted approximation that samples (as in a questionnaire survey) really are quasi-independent so that head counting is justifiable. On the one hand, it is maintained that such sampling operations, though useful because of an ingrained disposition to act as though a one to one M/P correspondence existed, have little validity when that condition does not (quite often) apply. Conversely, it is possible to explain the *actual* reliability of appropriate small-sample measurements (whether in the laboratory, for experiments with few, carefully handled, subjects or in the real life context of surveys; for example, the small sample data in Chapter 1). This orientation has repercussions, also, in the area of large system modelling (the 'world dynamics' model), or the on-line computation system of Beer (1973), 'cyberstride', which, although not yet fully exploited, is more in the cybernetic idiom.