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PRACTICAL RATIONALITY FROM AN EVOLUTIONARY PERSPECTIVE*
Some Reflections on an Integrated Approach

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1. Background

1.1. Introduction : The Moral Philosopher's Embarassment

Matters of practical or ethical rationality are obviously not easy to tackle; the more so when the foundation issue (how are "ultimate" value judgments to be justified ?) is involved. After all, some of the deepest of human drives and motives, the individual's *Lebensanschauung*, and — maybe — his freedom and dignity (whatever is implied by these notions) are at stake. It is not surprising, then, that "this depth of feeling remains manifest in ethical controversies, even in the most rarefied formulations in abstract terms" (Arrow, 1976, p. viii). Yet, this difficulty is but one of the reasons for the moral philosopher's frustration[1]. (The problem is, admittedly, a general one. In a sense, every social scientist is acquainted with it, since any attempt at genuine theorizing in the social sciences has to account for at least some of the numerous conflicts arising between man as a social animal[2] (whose multiple social bonds may be in turn mutually conflicting) and man as an *assertive individual*[3]. In fact, this difficulty is probably as old as speculation about "self-conscious" social organization itself; cf. Boulding et al., 1977, pp. 88-89.) The distress in contemporary moral philosophy certainly has additional causes.

This takes us to what has sometimes been called the "paradox" or "contradiction" of the problem situation as to the rational foundation of ethics in our scientific era. On the one hand, the need for a *universal ethic* — i.e., an ethic binding upon human society as a whole — has never been more acute than in our time, in which we witness the emergence of a truly planetary civilization as a

consequence of the unifying impact of technological and scientific developments. On the other hand, it seems that it has never been more difficult than at present to secure a rational foundation for an ethic — not to mention a *universal* ethic. For in the vein of the dominant scientistic ideology of a value-free "objectivity", *which is itself a product of science*[4], the possibility of an interpersonally valid ethic is in general denied (cf. Apel, 1976, p. 359)[5].

Although one could take issue with Apel over certain details of his formulation of this paradox — we actually reformulated it so as to present a weaker, that is, more positivistic version of it —, we think it would not make much sense to try to wholly dismiss the message it contains. (One way to "avoid" the paradox would consist in claiming that both technology and science are just *option-generating* processes, not *option choosing* ones; in contrast to the application of technology, which would be seen as the only genuine instance of an option choosing process (cf. Brooks, 1972, p. 585). Thus, the impingement of scientific and technological developments on society could be "denied" in that control of (and responsability for) societal change would be located exclusively at the level of the "transducers" (organizations, market, political processes, etc.) through which science and technology interact with society. In fact, most informed observers of the field of values and science/technology will at present acknowledge the inadequacy of such a one-sided view, and accept — to mention only this one counter-example —, that the "Eigendynamik" of science and technology operates also as an option reducer[6]. Taken for granted that there is some truth in Apel's view, is there a *non-escapist* "way out"? We repeat that the problems we are facing are dramatic and require drastic intervention; what is at issue has — probably rightly — been called an "ethic for survival" (H. T. Odum, 1977, p. 175; cf. Apel, 1976, p. 431). Unfortunately, we feel that most fashionable postures vis-à-vis the interrelationship of values and science/technology have little to offer us in this respect. For convenience, these attitudes will be forced into four categories. (In doing so, we are basically following Scheibe, 1972, pp. 566-567).

— According to the *Luddites*, scientific and technological development is fundamentally and inevitably corrupting and dehumanizing; but there is hope in the emergence of a post- or anti-technological mentality (for instance, Roszak's "counter-culture").

— The *Apocalyptic* diagnosis is basically the same; its advocates also hold that it is through the very use of his rational powers that man creates the means of his own destruction (cf. Adorno's "negative dialectic"). However, they are rather fatalistic as to the possibility of

avoiding "Doomsday"; their only hope is that the apocalypse will act as a "cultural electric-shock treatment" to survivors, if there are any (cf. Toffler's "future shock").

— According to the (new) *Technocrats*, technology is our only strength; if man wants to survive, he must adapt to it (Skinner).

— What writers of the fourth category offer could be called a *cautionary moral sermon*. Often scientists themselves, they want to follow Einstein's example by dedicating themselves to the "highest" human values instead of trusting to politicians to run the world (and to social scientists to offer practical advice)(e.g., Monod, Hardin). In doing so, they want to make up for their former "naivety" and "unwitting irresponsibility" in the pursuit of their calling.

It can easily be seen that with a view to our problem, these four common postures are escapist in one way or another. (Which is not to deny that there may be some merit in each of them.)

— By disparaging human rationality — which, eventually, amounts to *discrediting man's ability to elicit adaptive behaviour in problem solving situations* (Newell and Simon, 1972, p. 53), both Luddites and Doomsday prophets in fact propose to give up what could be called the *operator paradigm* of human activity, represented by Cartesianism, Marxism, and (to a certain extent) by the Judaeo-Christian tradition, and so on. (Of course, the *rational* foundation of ethics is no longer at issue in their view.) But the type of *regulation paradigm*[7] they are advocating instead is, unfortunately, a very inadequate one. It is based on the idyllic idea of achieving a "balanced" or "harmonic" relationship between human beings and their natural environments. Now, it is simply wrong to assume that the history of mankind elicits a (repeated) failure to achieve "harmony with nature". In fact, history shows us that "it is only in the most extreme kinds of environment, such as those found in Australian deserts or Greenland icefields that the 'simpler peoples' (quotation marks ours) have become in any way aware of the possibility of ecosystem balance. It is only in such extreme circumstances that human beings of the past have been in any way motivated to achieve belance between their society and their environment (Leach, 1972, p. 39). The cost, in terms of the quality of life, of living in such bare, "un-sheltered" circumstances (Dubos, 1965, 1973) is all to easily forgotten. The fatalistic reading of the Apocalyptic position must not be discussed here, since as a moral *appeal*, intended to have beneficent impact on societal developments, it is self-denying.

— The technocratic "solution" to the paradox of values and science/technology makes blind to the foundation issue by *accepting*

science itself as a universal ethic (as Comte did). Obviously, such a position cannot stand the criticism that ultimate values — i.e., those value assumptions underlying the choice of systems of moral preferences — cannot be founded on the value system(s) inherent in science (or the *ethos* of science); cf. Habermas' "dezisionistische Restproblematik" (1975, pp. 140-152). The same holds, *mutatis mutandis*, for the "cautionary moral sermon" : the humanistic values that, in this view, should guide scientific and technological developments are to be justified in turn.

It is also striking that each of these perspectives contains presuppositions about the origin and operation of human values which, from both a psychological and a sociological viewpoint, must be called naive. (i) They all suffer from *prioristic conceptions about what values must be.* Typically, one set of values (the "bad" values that are taken to be responsible for our present world problems), is criticized and replaced by a set of "good" values that should enable us to reorientate societal developments. It is hoped that this new, "enlightened" perspective will *automatically* attract the cooperation of those in positions of power, i.e., by sheer example. The problem of closing the gap between values and behaviour gets little or no attention. Yet, daily experience shows that people do not always do what is, or seems, good for them, even if they are aware of the consequences of their actions. It looks like man is "capable of considerable self-deception when it comes to considering the impact of (his) ideas" (Scheibe, 1972, p. 567). The point we are trying to make is that prophets, in order to be effective, have to be realistic as to the origins and the modes of operation of human values. Much could be learned here from the observation of the actual genesis of the value systems of individuals and groups, which is the subject of socialization theory, learning theory, and the sociology of man, among other disciplines. (ii) The second shortcoming is related to the first. If a plan to secure our future can be derived from these positions, which is not always the case (of course, it would be unreasonable to look for a "blueprint for survival"), we are rarely told how this plan is going to be implemented. That is, the *political* issue of finding and organizing a power base to implement a policy is usually dismissed. (We want to stress that, contrary to the received opinion, we feel that these two remarks are relevant to the viewpoint of moral philosophy, as will be explained).

1.2. The problem situation

At this point, it seems worthwhile to draw some tentative

conclusions from the foregoing discussion and to assess the results obtained. After that (at least, so we hope), it will be easier to define the basic situation we believe contemporary moral philosophy is confronted with, and to state our aim in this article.

1. *The way out is still ahead :* the "contradiction" between the necessity and the apparent impossibility of a rational foundation of ethics in our scientific era that Apel has pointed to is not really dealt with in fashionable writings on the issue of values vs. science and technology.

2. Yet, for this very reason, *activism could turn out to be a bad strategy* (at least, for the moral philosopher). The moral philosopher's task has always been a very precarious one, since it is constantly endangered by the differing life experiences and hence differences in perception of its practitioners, or even by egotism from their part. We believe that activism in moral philosophy — under one of its *anti-rationalistic* forms or as a naive form of *naturalism* — would thwart, or even make impossible, "the attempt at communication which may serve to reduce differences by clarifying the issues" (Arrow). By the way : Apel's ethical theory is precisely an attempt to delineate what *an ideal communication situation* "ideale Kommunikationsgemeinschaft" would be like, not in moral philosophy, but *at the macro social (and eventually : planetary) level*, and what conditions would have to be met in order to realize it (e.g., "die Beseitigung aller sozial bedingten Asymmetrien des interpersonalen Dialogs"; 1976, p. 432).

3. The counterpart of activism is futile intellectualism. Although it is sometimes true that arguments are best developed at a very abstract level, there are also many cases in which theoretical progress stems from the careful study of practical, real-world problems. We believe that the dictum of a "practicing scientist", Herbert A. Simon, that "the areas of application are an indispensable source of new problems and new ideas" is also true in moral philosophy. More specifically, the moral philosopher faces a situation not unlike the one described by Olson with regard to socio-political cost-benefit analysis, where theoretical development seems to demand that the investigator "distinguish *different classes of practical problems* in order that the theory might be elaborated to deal optimally with each of them" (1977, p. 372; italics ours). We mention only two of the typical problem classes we have in mind.

— The issue of *time horizons.* In actual decision-theoretic and cost-benefit analyses of choice situations, time boundaries must be established in a non-arbitrary way; yet it is well-known that *higher order* consequences of chosen actions continue to be realized into

the indefinite future. Since these consequences are usually not evaluatively neutral, the initial solution may yield counterintuitive, insatisfactory consequences (see our (1978), p. 162 ff. and especially Olson, 1977). Related to this general problem are (i) the psychological issue of *delay of gratification*: if individuals may accept a small reward now or a larger reward later, it appears that certain individuals make decisions in a larger time framework than others (Scheibe, 1972, p. 569); (ii) the issue of *intergenerational justice*, which one faces when studying, say, the distribution of scarce resources (energy, medical services, etc.). and which is only partially and inadequately dealt with in moral philosophy (for instance, in Rawls's ethical theory); and (iii) the issue of *altruistic genes*, studied in sociobiology (Wilson) and economics (Becker) (cf. *infra*). It goes without saying that all these issues are relevant from an ethical perspective.

— The *paradox of parts and wholes.* It is intuitively obvious that "individual prudence may inexorably produce collective disaster" (Scheibe). The biologist Hardin has amply documented this fact in his account of *the tragedy of the commons* (Hardin & Baden, 1977). On the other hand, ecologists study the "value" of a part of an ecosystem to the global ecosystem in terms of its contribution to "useful work", where useful work is related to the maximization of energy gains and effectiveness of energy use (H. T. Odum, 1977, p. 184). Thus, the interrelationship between the requirements for the survival of units and the requirements for the survival of their supporting system is conceptualized; and the effects of both "constructive" and "destructive" behaviour of components on the whole system (and its other components) may be analyzed. Economists and political scientists are dealing with the paradoxes of *collective goods and services* (cf. our (1978)). Or they are analyzing the "social limits to growth" (Hirsch) in terms of *diseconomies of scale*, and so on. Neglecting such developments more often than not, moral philosophers usually do not question the assumptions of methodological individualism underlying the bulk of their work.

These are typically *problems of extension.* In the former case, extension of the time horizon yields paradoxical payoffs. In the latter, extension from a smaller unit to a more comprehending one results in unanticipated "transvaluations". *We believe that theorizing on matters of practical or ethical rationality could, at present, be furthered considerably by adopting certain insights gained in the careful and detailed study of practical problems of the types mentioned.* We also feel that after the substantive problems will have been analyzed, it may be possible "to proceed to a more abstract or

formal level, ultimately obtaining a theory that is no less elegant or general, yet far richer and more useful, than it had been before the investigator had re-examined the empirical diversity to which the theory pertains" (Olson, 1977, p. 372). It is in this vein that this article has been conceived.

Before we proceed, however, a caveat is in order. A third class of problems, pertaining to *the intrapsychic value conflicts of individuals* (Scheibe, 1972, pp. 570-571) on the one hand, and *conflicts between the value systems held by different social groups* on the other hand, will not be discussed here, though we believe that they are of the utmost importance for moral philosophy. The main reason for this is technical. In our opinion, the extension problems we are going to investigate can most fruitfully be analyzed in terms of *decisions*[8] and *games*, that is, eventually, in terms of purposeful behaviour or *action* (see section 2). Such an approach emphasizes that, contrary to the opinion of behaviourists and the like, "it makes a difference" whether people have purposes. (Or rather, whether human behaviour is *genuinely goal-directed*, and not only supposedly as in the case of biological processes — goal-directedness being a property of a *system*, in virtue of the organization of its parts; see Nagel, 1977, esp. pp. 272-276). Compared to a behaviouristic approach, the decision-theoretic approach is certainly advantageous. Yet, we feel that "the whole difference" between the behaviour of human and non-human systems — fundamental to moral philosophy — is still not captured this way. In fact, we tend to favour the view (admittedly, difficult or even impossible to justify at present) that the "more radical peculiarity of the human mind is the generation of multiple and often conflicting standards" for appreciating and regulating ongoing factual processes (cf. Vickers, 1972, p. 202). And we doubt that game theory alone suffices to deal with the generation of, and change in standards and values (cf. our (1978), p. 187). We also think that there is some sense in the remark that, man "being at war with himself" (cf. Freud) and thus not having *unequivocal* values, the solutions to what he thinks of as his problems always produce other problems. (This issue is related to the problem of limited needs and unlimited escalating wants; see McCall, 1976, pp. 18-19). Now it is posible that basically, decision theory can only solve problems of the "Sancho Panza variety" (Scheibe); that is, problems pertaining to drive-reducing, equilibrium-(re)establishing behaviour. Then, the Don Quixote that is certainly also a part of us all would be left in the cold. These fundamental problems should always be kept in mind. (It is for this very reason that in the title of this article, we refer to "practical" rationality in general and do not mention "ethical"

rationality. Cf. our discussion of "practical attitudes" in the following section.)

1.3. Proposal : An Integrated Approach to Practical Rationality from an Evolutionary Perspective

Ir goes without saying that our proposal to reorient ethical investigations by adopting the *applied theoretician*'s strategy is heavily marked by our personal views on ethical matters. Specifically, we were rather strongly impressed by Vermeersch's (1974) remarks on "d-rationality" as well as by Batens's account of rationality in terms of the justification of the processes (cognitive and other) resulting in "world views" (1974; 1978). We felt, however, that as both approaches are valuable in their own way, they ought to be combined in some satisfactory manner. Moreover, we thought that both approaches being *formal*, they did not cover the whole story about practical (or, for that matter, "ethical") rationality; and that they ought to be supplemented — or at least, made compatible — with some "material" hypothesis (or hypotheses). The first problem can, we believe, be solved in principle by means of Simon's theory of weakened rationality, as will be shown in section II. The second problem is much more difficult to tackle. Both Vermeersch's and Batens's accounts of practical rationality can be called *minimalistic* in that neither of them tells us where ultimate values — taken for granted that there are such things — come from, nor how they could possibly be justified[9]. We believe that in order to deal with real-life problems, a more realistic theory is needed; that is, *a theory that can account for the hypothesis — which looks quite plausible to us — that in situations involving the choice of ultimate values, the behaviour of "rational" people actually does not elicit a degree of freedom (in the technical sense) as high as the one implicitly postulated in, or implied by these theories.*

To fill up this theoretical gap, one can only resort to material hypotheses[10], e.g., with a view to *basic needs* (the "necessary conditions of human existence on the individual, the social and the planetary level" — Van den Enden, 1974, p. 109), and/or to the *possibilities for further human evolution or development* (p. 111), the latter being a more dynamical approach. (Other possibilities are not considered here.) Though in principle, we agree with such programmes, we have serious doubts as to the possibility of their implementation in the near future. For one thing, it seems extremely difficult, if not downright impossible, to determine unambiguously what needs (not to mention wants), and the objective and subjective

requirements for their satisfaction, really are. (This is actually the central issue in social indicators and quality of life research). We know that even primary drives such as hunger, thirst and pain are to a large extent controlled by the human cognitive apparatus (Zimbardo). Thus, somatic deprivation must not always have psychic consequences; while inversely, cognitions can have dramatic effects at the physiological level. Also, emotions — which have been generally taken as the psychic correlates of physiological needs — are at present more and more conceptualized in terms of products of the interaction between physiological activation and cognition (Schachter). Certain alert observers of the field are tempted to draw a methodological conclusion from such evidence, namely, that a conceptualization of needs in terms of *cognitions* and *volitions* is much more fruitful than one that leaves out or even dismisses the valuative aspect of needs (cf. Kmieciak, 1976, p. 12).

Of course, an advocate of the basic needs approach might acknowledge these and related difficulties and yet defend his programme on the ground that, given a certain type of human personality (which is the product of historical and sociocultural factors) and given the factual possibilities and limits for further evolution, "ethical rationality" could be defined with respect to value-choices for "progress". His programme would then amount to define some of the *necessary* conditions for ethical rationality (Van den Enden 1974, p. 113). The domain thus confined (by the restriction of possible alternatives), within which morality would be taken to be "rational", would then further be delimited by taking certain "irreversible" moral principles and values as guiding principles for the elaboration of a morality (cf. p. 117). In our opinion, the moral philosopher adopting such a strategy will face a basic difficulty that is related to the extension problems we already mentioned. Specifically, he will have to deal with problems related to the "social limits of growth" (Hirsch); beyond some point that, for many goods and services, has long been surpassed in crowded industrial societies, "conditions of use tend to deteriorate as use becomes more widespread" (Hirsch, 1977, p. 3). In the long run, such social growth limits might even prove to be more important than the physical limits studied in the first and second generation reports to the Club of Rome. One implication is that in this light, *distribution* problems (with the many technical intricacies these elicit) might again come to the fore — how is quality of life to be optimized with a view to the consequences of egalitarian and non-egalitarian distributions respectively? —, and so on. Another implication is of a methodological character. We repeat that in order to deal with the

"parts-and-wholes" problems involved here, we believe only a systems-theoretical approach can yield adequate results. As to the factual developments the advocates of the basic needs approach are interested in, much could be learned from the evolutionary approaches surveyed in section 4, provided these insights could be cast into a common conceptual and theoretical framework. In our opinion, this framework has again to be conceived in systems-theoretical terms.

2. *Practical Rationality : the Broadened Utilitarian Approach*

2.1. Advantages of a Utilitarian Approach

If one is willing to tackle matters involving the issue of practical or ethical rationality, there are several reasons — at least, so we believe — for adopting a strategy that can be labeled *utilitarian* in that its leading conception is the organization of social and political institutions with a view to the *maximization* of the interests or well-being or quality of life of the persons involved.

— Such an approach is in line with the "human yardstick" view advocated *supra.*

— It lends itself naturally to interpretation as an application of a *general theory of decisions and games* (Hooker et al., 1978, p. xi). Specifically, individual moral behaviour, as defined by the utilitarian moral philosopher, can be studied as an instance of rational behaviour

(i) under certainty : under circumstances of perfect information and a transitively ordered scale of preferences,

(ii) under risk : where all probabilities are known objective probabilities, and/or

(iii) under uncertainty : where some or all probabilities are unknown, or may be undefined as objective probabilities.

These situations are studied in *utility theory* and *decision theory.*

Collective moral behaviour can be studied as an instance of rational interaction between two or more individuals, each of them reationally pursuing

(i) his own objectives against the other(s) (this case is the subject of *game theory*); or, alternatively

(ii) the common objectives of a particular group, or

(iii) the common objectives of society as a whole.

The second case is studied in the *theory of teams* (Marschak and Radner, 1976); the third case is the subject proper of Harsanyi's *ethics* that will be discussed here. These disciplines are linked to each

other, not only because the axioms they are using are closely related, but primarily because it is possible to reduce certain basic problems of game theory, ethics and the theory of teams to decision-theoretical problems (cf. Harsanyi, 1977, pp. 629-631). As a formally sophisticated theory, utilitarianism in its decision-theoretical interpretation has no serious rivals among competing ethical theories — a fact that is readily acknowledged, even by the more radical critics of decision theory (e.g., Arnaszus, 1974). (The advantages of formalization — e.g., in counteracting ambiguity — are taken for granted here).

— The considerable degree of generality of the utilitarian theory is definitely advantageous when it comes to applying the latter to situations the moral philosopher is usually unfamiliar and unacquainted with. For instance, Pugh has recently introduced a "decision science model of conscious behaviour" — very similar to the version of utilitarianism we are advocating — that elicits how genetically inherited behavioural tendencies can be linked to actual behaviour in man and other higher vertebrates. This theory is taken to explain our enduring values as "manifestations of a built-in *value system*, which is an essential part of evolution's basic 'design concept' for a biological 'decision system'" (Pugh, 1978, p. 5). We also witness the emergence of a general theory of rationality, applicable to both human action and machine-executed "intelligent" behaviour; e.g., D. E. Campbell's theory of "rationality from a computational standpoint" (Schwartz, 1972; D. E. Campbell, 1978). In such a theory of "general intelligence", the properties of the behaviour of systems *more general than biological systems* are studied. The theory is taken to shed light upon such questions as why learning systems, such as man, usually direct their "attention" to one goal at once (Pugh, 1975, p. 3 ff.) — a question highly relevant to the problem of *satisficing behaviour* we are going to discuss[11].

— The utilitarian approach is basically in line with conceptualizations and theories of rationality developed by organization theorists and management scientists. Now, these two disciplines may inspire moral philosophers in many ways (Apostel, 1965). We only note here that organization theory and management science (as developed by Ackoff, Churchman, Simon, etc.) have a long tradition in studying the limits of individual and collective rationality and in dealing with the problem of *enhancing rationality in human choice, given the radical limits inherent in the psychology of choice.* Simon conceptualized organizational rationality in terms of the bounding of discretion in the decision making of the individuals within an

organization by the specification of factual and value premises (Ostrom, 1974, p. 44). Actually, his theory of rational choice might be applied to *any* aspect of social organization (in so far as a hierarchical ordering is implied), though curiously enough, Simon himself confines his analysis to the enterprise (private or public) (cf. ibid.)

— Finally, utilitarian views underly theories (Baumol, Buchanan, etc.) that are an attempt to justify political institutions in a rational way by means of a formal, "economic" conceptual apparatus. Recently, these theories have also been applied to social institutions such as marriage, bureaucracy, etc. (see McKenzie and Tullock, 1978). Their central notion is the resolution of a situation through the creation of a collective social institution that will be capable of enforcing a "fair solution" (cf. Rawls) (see Hooker et al., 1978). This "new political economy" sheds light on issues which, in the past, had only been studied in an intuitive manner and/or without duly accounting for the problems of practical rationality pertaining to them. We want to stress that "rational behaviour", as it is understood in all these approaches, is not to be confined to behaviour that is "selfish" in some sense. (Recall Adam Smith's dictum that "it is not from the benevolence of the butcher, the brewer, or the baker, that we expect our dinner, but from their regard to their own interest" — 1970, p. 119). It is notitious that in addition to the *economic* motive of "self-love", Smith — in his theory of *moral sentiments* — also had to introduce the concept of "sympathy", thus expounding a dualistic view on human nature.) Recently, economists have come to recognize the impact of altruistic behaviour — behaviour actuated by a sense of others — in and outside markets, and some of then have incorporated altruistic behaviour postulates into their theories (cf. our (1978), pp. 186-187). The main point of Becker's theory of altruism is that altruistic behaviour of individuals and groups can perfectly be accounted for in terms of the basic neo-classical assumptions, which need not be relaxed, as for instance Sen (1978) seems to imply (for a succinct discussion of Becker's views on altruism, see Lepage 1978, pp. 351-356). It is important to note that decision theory and game theory hold for both selfish and altruistic behaviour; e.g., a nontrivial game situation "can arise just as easily among altruists as it can among egoists — as long as these altruists are pursuing partly or wholly divergent altruistic goals" (Harsanyi, 1977, p. 629).

As to the disadvantages of an utilitarian approach, we shall make only two remarks. First of all, the brand of utilitarianism we will expose here — *rule utilitarianism* — is not subject to the "standard"

criticism that utilitarianism eventually amounts to a supra-Machiavellistic morality, permitting infringement of all individual rights in the name of some social utility. For this criticism applies only to act utilitarianism, not to rule utilitarianism (cf. *infra*). Secondly, we are perfectly aware of the fact that in practice, the adoption of rule utilitarianism may — under certain circumstances — have some anti-egalitarian consequences that, from a moral standpoint, are an abomination to us. (As the theory stands here, this problem will not show up, however). We do not take very seriously the remark (due to Harsanyi), adressed to egalitarianists, that their theories involve morally highly objectionable discrimination against those individuals who happen to enjoy high utility levels, even if the latter result from morally legitimate behaviour (see Harsanyi, 1976, ch. 5) — simply because an anti-egalitarian, utilitarian approach may have consequences that are morally much more objectionable. (See our (1979) article, in which we try to show that rule utilitarianism, provided with some very plausible *ad hoc* assumptions, is compatible with certain brands of egalitarianism). Our main reason for adopting a rule utilitarian approach here, then, is that its advantages from a systems-theoretic viewpoint are considerable. Specifically, rule utilitarianism introduces a form of *complexity reduction* (in that an infinitely great number of possible systems of moral preferences is replaced by a unique system) that enables one to remove some of the intricacies related to the extension problems mentioned in the introduction.

2.2. Critique of the Traditional Maximization Model ("Homo Oeconomicus")

We do not intend to discuss utilitarianism for its own sake in this chapter, as we assume the reader is acquainted with the essentials of this theory. We rather want to point to certain difficulties in and limitations of utilitarianism and discuss their consequences. Some of these obstacles can be remoded by reformulating the theory (which will be done). Others are of a more principle nature. In our opinion, the latter call for a systems-theoretic and evolutionary approach.

1. According to traditional utility theory, there is one and only one criterion of rationality applying to all situations of choice, and this criterion is identical with the principle of efficiency. However, this principle can be stated in two alternative ways, according to what is "given" as an independent variable : ends (preferences, values, and so on) or means (resources, which are usually regarded as being scarce). For a given application of means, the criterion of

efficiency dictates the choice that produces *the largest result* (from the given application of means). When the output is specified, the criterion of rationality dictates the choice that implies *the smallest usage of means.* In the first case, output is maximized; in the latter, "costs" are minimized. It is obvious that if one tries to apply this Janus-faced criterion to practical situations (e.g., a moral problem), he will have to face several difficulties. For one thing, it may be extremely difficult, if not downright impossible, to determine what the means and/or ends actually *are*, not to mention the question how they are to be *measured.* We will consider only one paradigmatic case. In many accounts of practical rationality, great importance is attributed to the ultimate values in value hierarchies. Now, the concept of (moral) *ideals* (such as progress, freedom, dignity, equality, emancipation, etc.) is certainly relevant to these ultimate values (cf. Bloch's basic concept of "realistische Utopie"). *Ideal-seeking systems* are the apex of Ackoff and Emery's typology of purposeful systems. One of the most interesting characteristics of ideal-seeking systems is that they are able "to derive at least as much satisfaction from progress toward an ideal as (they do) from attaining a short-run goal" (Ackoff and Emery, 1972, p. 246; cf. Vermeersch's requirements for d-rationality and the macro level — 1974, p. 78). Our point here is that there are good reasons to believe that if one would try to translate ideals into some manageable, operational form, and then investigate what it means to "realize" an ideal individually or collectively (of course, by the very definition of "ideals", this would be possible only to some extent), difficulties will occur that are of the same kind as those that arise if one tries to establish the output of organizations providing public goods (in Olson's sense; cf. our (1978))[12]. *For moral ideals, in some basic way, have the properties of supply jointness (indivisibility) and non-exclusiveness that are typical of public goods.* This has to do with the fact that Kant's criterion of universality, in one of its formulations (be it reciprocity, or Hare's universalization argument, or Singer's, or Baier's) pertains to ideals[13]. We think the moral from this is clear. Even taken for granted that a complete and consistent ordering of both factual and value premises were possible in principle (the traditional assumption of maximization or optimization) the actual assessment of the "highest" preferences and of the cost of their implementation would turn out to be an extremely tedious or even impossible task. This is a first reason to cast about for another model of rationality, one that does not assume a godlike kind of knowledge on the part of either the moral agent or his rational beholder, the moral philosopher. A second reason will be mentioned

later on.

2. In order to obtain a more realistic theory of rationality, a number of proposals have been made, some of which in the vein of utilitarianism, other ones taking an anti-utilitarian stand. One of the most promising developments is due to Herbert A. Simon. In their pioneering work — a genuine example of multi-, trans-, and interdisciplinarity covering disciplines as "diverging" as administrative science, econometrics, psychology, epistemology, computer science and artificial intelligence — Simon and his co-workers have shed light in a number of different ways on the psychological characteristics of man (as well as other organisms) as an information-processor with limited processing capacities. (These limitations are related to the restrictions on the complexity of organisms as mass-energy systems — cf. section 3.) One of the earlier results was Simon's theory of limited, weakened or "bounded" rationality, in which the concept of *satisficing* behaviour is a very basic one. This theory has recently been elaborated by other investigators. Studying the behaviour of organisms (under laboratory and field conditions) confronted with multiple goals in psychological environments that display certain plausible characteristics (e.g., need satisfaction can only take place on "rare" points), Simon concluded that there is no need for one general utility function, as there is no real-life problem of over-all allocation or coordination (1957, p. 271).

This is so because most human decision-making, "whether individual or organizational, is concerned with the discovery and selection of satisfactory alternatives; only in exceptional cases is it concerned with the discovery and selection of optimal alternatives" (Simon and March, 1963, pp. 140-141). An alternative is called *satisfactory* if (i) "there exists a set of criteria that describes minimally satisfactory alternatives" (instead of a set of criteria that permits *all* alternatives to be compared); and (ii) "the alternative in question meets or exceeds all these criteria" (instead of being preferred, by these criteria, to *all* other alternatives) (p. 140). Note that the introduction of the concept of "satisficing" does not lead to arbitrariness (though there is *non-uniqueness* of solutions). This is so because the standards that choices have to meet in order to be satisfactory are not "given". Rather, these standards are themselves part of the definition of the situation. That is, *the standard-setting process may, and in fact must itself meet standards of rationality.* For instance, one might "set the standard at the level where the marginal improvement in alternatives obtainable by raising it would be just balanced by the marginal cost of searching for alternatives meeting the higher standard" (p. 141). A

similar result would be obtained "if the standards were raised whenever alternatives proved easier to discover, and lowered whenever they were difficult to discover" (ibid.) If the *cost of search* were taken into consideration, the alternatives chosen would actually not be far from the optima. (It seems that human standards tend to have this characteristic under very many conditions.) We note that in *non-simultaneous choice situations*, i.e. situations in which a decision maker has to decide whether to search for further alternatives or not, his decision will be wholly or strongly determined by the *utility* associated with the alternatives at hand.(In general, the individual has difficulties in calculating the expected utility of alternatives not yet available). For instance, consumer research has shown that a typical buyer, having to choose between purchasing a good that is immediately accessible or looking for further offers, often identifies and examines very few alternatives (references will be found in Olander 1975, where the reader will also find a review of recent developments in the theory of satisficing). Another basic feature of satisficing behaviour is that alternatives are often identified by, or made available to a decision maker *sequentially* (cf. Pask's learning theory mentioned *supra*). The theory of satisficing has a number of implications bearing on moral philosophy that will be discussed *infra* (2.3). It will already be clear, however, that this consistent attempt to "psychologize" the traditional maximization model of decision making by taking into account the limitations of man both as a cognitive being (pursuing a very limited number of goals at a given time) and a volitive being (selectively valuating the range of his possible action alternatives) can provide the link enabling us to supplement a clear-cut, but somehow "poorer" account of practical rationality (such as Vermeersch's) with more realistic psychological assumptions (such as those formalized in Batens's account). Moreover, in doing so, the *relativism* that characterizes these views could be counteracted to some extent.

3. Apart from psychological considerations, there are also some basic socio-psychological and sociological facts that an encompassing theory of practical rationality shoul be able to account for. It seems only plausible to assume that the circumstance that the actual genesis of values and norms (and the like) in the child occurs by means of *internalization*, and, as well as the fact that the process of *socialized* drains on time, leave their marks on the patterns and content characteristic of the value systems, preference scales, etc. of the adult. Sometimes moral philosophers readily acknowledge that much could be learned from these processes. For instance, Harsanyi notes that Piaget's investigations of the moral judgment of the child

come up with a model very similar to his theory of the "impartial but humane and sympathetic observer" (1977, p. 623)[14]. But usually, such ideas are dismissed as "not belonging to the realm of moral philosophy". We take this view to be wrong for several reasons. Firstly, if moral philosophy is not to be confined to the splendid isolation of *academe* but is to be of some practical use, its function(s) in guiding and controlling individual and collective human behaviour should be investigated empirically, i.e., in a non-prioristic manner (with a view to their eventual optimization). This, in turn, requires the study of the actual "emergence of norms" as the resultant of complex patterns of social interaction (cf. Ullmann-Margalit, 1977, pp. 7-8) as well as of the way these norms, once generated, are actually *transduced* and *conserved* (or, alternatively, selected against).

We believe, with Ullmann-Margalit, that in addition to asking "under what conditions would we say that a norm x exists ? " (a problem philosophers of law are chiefly concerned with), it is also perfectly legitimate to ask "why does norm x exist ? " (or, alternatively, "why do norms of type X exist ? "). Secondly, the circumstance that the genesis and operation of the value systems of individuals and social groups is influenced to a large extent by the culture they share has important implications as to the complexity of the range of actual and potential value systems within that culture (cf. 2.4), an issue that is certainly relevant from an ethical point of view. Finally, by carefully studying the societal functioning of moral value systems, moral philosophers that are eager to device blueprints for a more "rational" society could (re)gain some sense of respect and even of (critical) reverence for existing moral traditions and the *tacit knowledge* (Polanyi) these often contain. After all, these traditions are the never-ended products of societal learning processes that are partly or even prominantly the effect of trial and error (cf. D. T. Campbell's "blind-variation-and-selective-retention") and to a minor (but increasing ?) extent the result of conscious design. It is here — so we believe — that every utilitarian approach must fall short in providing a conceptual and theoretical apparatus that could yield adequate results. This failure has to do with the assumptions of *methodological individualism* underlying utilitarianism. We have argued elsewhere (1978, p. 187), joining with Ullmann- Margalit, that the generation and the subsequent change of societal goals, norms and values cannot be explained adequately in terms of game theory alone; because the *connotations* of games — which are basic to the emergence of norms — cannot be treated by means of game theory (cf. Arnaszus, 1974, p. 191 ff. on the causes of conflicts)[15]. In this

sense, Harsanyi's contention that "the emergence of modern decision theory has made ethics into an organic part of the general theory of rational behaviour" (1977, p. 627) is certainly an overstatement. We, to the contrary, believe that here, systems-theoretical considerations must come to the fore. Only after acceptable solutions will have been obtained for the extension problems mentioned in the introduction and evidence from the different evolutionary approaches will have been cast in systems-theoretical terms will it be possible to assess the "rationality" of complex (natural or man-made) social institutions (as envisaged in note 2).

2.3.Practical Rationality and the Model of Satisficing Behaviour.

Some of the implications of Simon's theory of satisficing behaviour for a theory of ethical rationality are immediately clear. E.g., the idea of sequential decision making : at any given time, a moral agent will try to realize only a very few of his "micro goals", thereby using some, but not all of his "macro goals" as standards; at another time, he will try to realize other goals that meet other standards etc. Other considerations do not follow immediately from Simon's accounts; it is these we are going to discuss now.

Satisficing and the fact-norm distinction. Simon, standing in the empiricist tradition (he was a student of Carnap), has always maintained that one ought to distinguish clearly between judgments of value (cf. the "policy questions" of political science) and judgments of fact ("administrative questions"). In his view of the organization (public or private), policy questions are confined to another body (the "legislator") than administrative questions (which are faced by executors). He has even pleaded for "the invention of procedural devices permitting a more effective separation of the factual and ethical elements in decisions" (1976, pp. 57-58). This view has been challenged repeatedly by authors stressing that authority implies recognition ("l'autorité ne va pas du supérieur vers l'inférieur mais de l'inférieur vers le supérieur : un ordre n'est exécuté que s'il est fondamentalement accepté" — Apostel, 1965, p. 6), that administrative bodies cannot function without issuing their own judgments of value, etc. According to Ostrom, Simon has reduced the theoretical impact of his challenge by bounding his theory with "a preoccupation for intra-organizational arrangements" (1974, pp. 46-47). Thus, he left aside the more fundamental question how the basic premises for human rationality are to be established. For what theory is to guide legislators ? Moreover, Simon rejects unity of command (which is in line with the concept of satisficing)

but holds on to the "fact" of hierarchy. The discussion bears on individual rationality too, since a person can be conceptualized as if he were an organization (Apostel, 1965, p. 4, p. 8 ff); cf. Freud's metaphor of the rider. It is not our intention to introduce arguments derived from organization theory into the traditional philosophical debate over the fact/value distinction, which we feel is rather futile (since no interesting new results seem ever to be yielded). Rather, we want to remark that the concept of satisficing behaviour shows clearly that in real-life situations, decision making continuously moves back and forth between judgments of fact (decision to choose a satisfactory alternative) and judgments of value (decision to trigger search behaviour with a view to costs, decision to lower or raise standards). A more sophisticated model of satisficing behaviour, such as Olander's, enables us to determine where "jumps" are to be located exactly. We believe such evidence would fundamentally refute the traditional view on decisions, in which a logical *primacy* (and often, a temporal *priority*) is attributed to value judgments over judgments of fact.

2. In a sense, the satisficing principle may be said to imply that "decision makers possess a utility scale which can only assume two values, 0 and 1' (Olander, 1975, p. 318). According to Simon, such a "scale" is applied in decisions whether to search for further alternatives. On the other hand, he seems to imply (though he has not taken a firm standpoint on this issue) that in other cases, an ordinal or cardinal scale is used. In Olander's opinion, it is possible that it is "the lack of attractiveness and plausibility of this notion (that) has contributed to the diversion of researcher's interest from the satisficing phenomenon" (ibid.) We are not so sure as to the implausibility of this notion (cf., e.g., Pask's learning theory). We will not enter the discussion of the fact of the matter here. But we want to stress that *if* the idea of a binary utility were justified, some interesting conclusions would follow. After all, the binary operation could be *reiterated* a very great (yet finite) number of times, so as not to loose too much of the complexity of a "proper" decision process in which, say, an ordinal utility scale is used (cf. 3). As to the (non-) attractiveness of this view, we want to remark that similar ideas are to be found elsewhere in the social science literature.

a. For instance, the sociologist Luhmann has explicitly adopted a "binary" view in his conceptualization of the "codes" of certain types of highly differentiated systems ("Funktionssysteme") such as science, religion, morality, etc.: "Werte sind allgemein geltende Präferenzen, sie sind in vielen Funktionsbereichen *binär schematisiert* und können dann als 'Codes' bezeichnet werden. Für die

Wissenschaft hat der Code wahr/unwahr den funktionalen Primat" (1978, p. 12; italics ours). Other "codes" apply to morality, religion, and so on. Elsewhere, Luhmann elaborates on the question "Warum und wozu gibt es zwei und nur zwei moralische Wertungen — seien es gut und schlecht, seien es (im Sonderfalle von Gesinnungsmoralen) gut und böse ? Und wie weit lässt diese Differenz sich schematisieren ? " (p. 57). In general, *binary schematizations can be regarded as one of the most powerful means to "institutionalize" a complementarity of expectations* (Luhmann, 1973, pp. 114-115) *that enables both personal and social systems* (in the sense of note 10) *to reduce considerably the uncertainty characteristic of all system-environment relationships.* Cf. Emery & Trist : "Social values are here regarded as coping mechanisms that make it possible to deal with persisting areas of uncertainty. Unable to trace out the consequences of their actions as these are amplified and resonated through their extended social fields, men in all societies have sought rules, sometimes categorial (...) to provide them with a guide and ready calculus" (1974, pp. 251-252).

b. We think it is worthwhile to stress that these systems-theoretical views are in line with certain *intuitionistic* ideas concerning ethical attitudes. According to Moore and the other intuitionists, "should" and related words are to be treated as primitives. What this view amounts to if one tries to define an ethic as a special *attitude* with a view to other practical attitudes has been investigated thoroughly by Plott (1972, especially pp. 188-195; readers interested in details should consult the original). The first two practical attitudes, those of *preference* and *indifference*, are well known to any utilitarian. Their regularities are ceptured by the class of all total, reflexive, binary relations over the set of conceivable alternatives (cf. the traditional view on maximizing behaviour). The third practical attitude identified by Plott is "a feeling of *'relative likelihood'*". The regularities of this type of attitude are captured "by the class of all binary relations which are weak orders defined over some family of subsets of social states and which satisfy certain separability properties", cf. subjective probabilities : the binary relation is taken to be consistent with the laws of probability; "e.g., if $B \subset A$ then, where L_i records individual i's attitude of 'at least as likely', we know that AL_iB (A is *always* felt, under these conditions, to be at least as likely as B)" (p. 189). This attitude is also covered in modern decision-theoretic approaches. Finally, the intuitionist maintains that there is a fourth attitude, which differs from the preceding ones in some basic way; and that this attitude is about what action "should" or "should not" be taken, i.e. what "ought" or "ought not" to be

done in various situations. Though it seems impossible to define this *"ethical" attitude* operationally — at least, no definition, to date, seems to have been discovered —, much can be said about it by means of mathematical representations, which, anyway, help to specify it a lot. E.g., Plott distinguishes between different "deeper" attitudes : an ethic of "anonymity" ("equality"), an ethic of "neutrality", an ethic of "rationality", etc; thus showing — this is the least one can say — that a clarification of conceptual issues (with the therapeutical intentions dear to the analytical school) can be envisaged with regard to intuitionism too, and that such clarification can yield interesting results. Specifically, we believe the concept of satisficing behaviour can provide the rationale for the intuitionist's idea of binary schematizations ("ought"-"ought not", etc.) as regards moral behaviour. This way, one does not need to resort to an obscure "moral faculty" or another odd perculiarity of the human mind. Rather, moral behaviour is shown to be consistent with other types of "value-driven" behaviour.

3. Satisficing behaviour as a form of complexity reduction. We already indicated that in principle, degrees of complexity comparable to those typical of the *hierarchical* decision processes of maximizing agents can also be obtained in situations where the agents "only" satisfice, provided their *sequential* decision chains are long enough. Does this point imply that there is complete translatability, or, to put it another way, radical equivalence of both types of decision making ? We think a consistent Simonian would remark that this is to ask the wrong question, since in real life, there simply is no such thing as maximizing behaviour. All one can observe in problem situations ("task environments") is that the integrated activities of information-processing systems that constitute problem solving are *adaptive* and, in this sense, rational (cf. Newell & Simon 1972, p. 3 and p. 53). Only in this sense, real satisficing behaviour may be said to be less complex (in most cases) than the (fictitious) maximizing behaviour of *homo oeconomicus.* Note that, since models and theories based on the maximizing postulate are widespread in- and outside the realm of economics, it may often be useful to actually compare degrees of real and fictitious complexity. In such comparisons, the first may be regarded as the degrees of complexity characteristic of "plausible" systems, while the latter may be taken as the degrees of complexity that "improbable" systems could elicit if they would exist — cf. Simon, 1977, p. 511 and, as regards the "bridge" between the two types of systems, Luhmann, 1974, p. 115 : "Der Begriff der Komplexität bezeichnet (...) eine Relation zwischen System und Welt, nie einen Seinszustand". The concept of

world is here understood in the sense of phenomenology : "Die Eigenart der Welt des Menschen (ist es), ins Unendliche zu verweisen und doch sinngebend wie endlich zu wirken" (ibid.; cf. Husserl's "Horizont").

4. Another feature of the satisficing model that is interesting from the viewpoint of moral philosophy — one that, to our knowledge, is hardly, if ever, treated in the relevant literature — pertains to the *opportunity costs* of making decisions. Yet, this is but a generalization of the cost of thinking-arguments (Marschak, 1971) realistic decision theorists are bound to consider. In solving a given problem, say A, an agent's decision to search for further alternatives will almost always have consequences as to his opportunities of solving problems B_1 ... B_n in a satisfactory way (since he acts in real time). Therefore, opportunity cost considerations will have to be part of the rational individual's utility calculus.

2.4. Utilitarianism and the Humanistic Tradition

Until now, nothing substantial has been said as to the material aspects of practical or ethical rationality. In fact, these will only be discussed briefly in section 4, where a number of evolutionary theories are surveyed and explored as possible avenues that might eventually enable us to "fill up" our utilitarian and systems-theoretical framework with plausible material hypotheses. Broadly speaking, the ethical ideas that can logically be derived from an evolutionary view on man and society [16] may be said to belong to the humanist tradition. The humanist typically "emphasizes the capacity to improve the human condition and to achieve self-realization through the proper application of rational thought" (Pugh, 1978, p. 386), while regarding "the moral tradition" as valuable for the greater part (cf. Campbell's "adaptive wisdom"). (Of course, such a general characterization allows of many interpretations, from conservative to moderately "emancipatory". However, a discussion of these views is beyond the scope of this paper.) Since classical ("act") utilitarianism has sometimes been criticized for being unable to cope with arguments based on the "functionality" of the moral tradition (e.g., by a number of authors inspired by evolutionary biology), it seems necessary to outline a version of utilitarianism that is compatible with the evolutionary approach. We feel this can best be done by referring to Harsanyi's ethical theory.

According to Harsanyi, each individual has two preference scales. One scale consists of his *personal* preferences, defined as "his *actual*

preferences which are typically based on his own interests and, to a minor extent, on the interests of his 'closest associates'" (1976, p. ix). (We recall the well-documented fact that "men labour and save chiefly for the sake of their families and not for themselves", as Alfred Marshall (quoted in Becker, 1976, p. 817), put it). This preference scale is represented mathematically by the individual's *utility function*. The other scale consists of the individual's *moral* preferences, defined as "his *hypothetical* preferences that he *would* entertain if he forced himself to judge the world from a moral, i.e., from an impersonal and impartial, point of view" (ibid.) These preferences are represented by his *social welfare function*. Harsanyi specifically holds that "an individual's moral preferences can be defined as those preferences he would entertain if he assumed to have the same probability 1/n to be put in place of any one of the n individual members of society" (ibid.) Such a definition presupposes, of course, the possibility of interpersonal comparisons of utility. Harsanyi's argument in favour of this possibility is based on introspection : he maintains that *inter*personal utility comparisons are essentially the same kind of mental operation as intrapersonal utility comparisons are" (p. x). E.g., if I try to compare the utility X would derive from reading *Sein und Zeit* with my utility in that case (the example is not Harsanyi's), I am essentially trying to assess — by an act — of "imaginary empathy" — the utility that I would derive from reading *Sein und Zeit* if I had X's individual and social background, and compare it to my own utility. We also notice that this *equiprobability model* for moral value judgments can be related to *rule utilitarianism* (a theory devised by the moral philosopher R. B. Brandt), which is "the view that the utilitarian criterium must be applied, in the first instance, not to individual acts but rather to the basic general rules governing these acts" (Harsanyi, 1977, p. 626). This is so provided that one regards as correct moral rules those rules that would "maximize social utility if (...) were followed by everybody in all social situations of (a) particular type" (ibid.)[17].

The main reason for adopting rule utilitarianism is related to its *coordination effect:* it is "in a much better position to organize cooperation and strategy coordination among different people" (p. 649). An act-utilitarian agent "keeps constant" the strategies of all other agents, while a rule-utilitarian agent, in contrast, regards "not only his own strategy but also the strategies of all other rule-utilitarian agents as variables to be determined during the maximization process so as to maximize social utility" (ibid.) As compared with act utilitarianism, rule utilitarianism will often by much closer to traditional morality (e.g., as regards promise breaking,

decisions whether to vote, etc.)

Limits of space prevent us from discussing the consequences of this view in any detail, but we hope it will be obvious that rule utilitarianism is in a much better position to cope with the types of problems we are basically focusing, e.g., the extension problems mentioned in the introduction. We only want to make three critical remarks.

(i) Like most theories of rational behaviour to date, Harsanyi's ethical theory is conceived in terms of maximizing behaviour. Though Harsanyi has considered the possibility of increasing the explanatory and predictive power of his theory be paying closer attention to the actual limitations of human rationality "in accordance with Simon's theory" (1977, p. 628), this task remains entirely to be accomplished. This is a fundamental limitation which we should keep in mind.

(ii) One willing to adopt the basic ideas of rule utilitarianism is not bound to adopt also Harsanyi's definition of a social welfare function, since the latter does not follow logically from the former. Actually, we see no reason to suppose that other social welfare functions (e.g., a more egalitarian social welfare function) could not do the job equally well. (This point will be elaborated in our (1979) article.)

(iii) The *dualism* that characterizes Harsanyi's theory as well as other versions of utilitarianism — an individual has two sets of preferences, and the "personal" set has nothing to do with the "moral" set — is certainly counterintuitive. One does not act in his capacity of a moral agent on certain occasions and as an egotistic agent on other occasions. Both aspects of human action are fundamentally intertwined. A possible solution to this problem, based on evolutionary ideas, has been suggested recently by Pugh (1978, p. 356 ff.) According to this author, an individual facing a moral decision will consider (a) decision alternatives that can be evaluated against his scale of personal values, and (b) decision alternatives that can be evaluated against the "scale of social values" that, in some well-specified sense, can be said to reflect "the innate values of all individuals in the society" (p. 357; more on this in section 4). Both types of alternatives are represented on the two axes of the individual's decision space respectively. Each decision alternative can have personal and social consequences. Because of his innate "desire for approval", the individual will finally select a "balanced alternative", somewhere between the extreme labeled "best personal alternative" on axis X and the extreme labeled "best social alternative" on axis Y. Pugh calls the vector space within which

moral decisions can fall "the decision range of 'should'" (p. 358). His primitive model has a close correspondence with commonsense concepts of morality ("like to do" vs. "ought to do", etc.)

Before we proceed to a discussion of complexity reduction that is in line with the systems-theoretical and the evolutionary approach, a caveat is in order. A browse into the literature (both general and scientific) shows that more often than not, authors tend to label certain kinds of behaviour as either "(ir)rational" or "rational to some degree" (i) without referring to the particular theory of rationality they hold, and (ii) without checking whether the assumptions of this theory are actually met in the real-life situation examined. We mention only one example. Some anthropologists debating over India's sacred cattle (among whom a rather famous one, Marvin Harris) have claimed that its economic use was rational; others (for instance, Alan Heston) said it was not. As Schneider (1974, p. 208) justly remarks, both Harris and Heston are treating rationality as a measurable trait, that is, as a property of behaviour that has empirical standing. In fact, rationality — a label for behaviour reflecting man's propensity to maximize, to satisfice, or simply to adapt himself when placed in problem solving situations — is a *theory-laden* concept. Every theory of rationality is constructed so as to conform to the assumptions of a certain model or class of models (very often, these are market assumptions) [18]. If one changes any conditions of the model to make it more realistic in specific cases, the "rational" course(s) of action is (are) likely to be altered. Thus, in the case of cattle use, the first question to ask is not whether the Indian people are rational, but rather if one can predict, using a market model, what they will do in certain situations. This in turn involves operationalizing the (market) model in India, i.e., "plugging the sacred cattle into it as a parameter and seeing what happens when one predicts" (ibid.)

3. Practical Rationality and Complexity Reduction

In this chapter, a general theory of the reduction of the complexity of systems (both "natural" and "human") will briefly be outlined. In a sense, the idea of complexity reduction is tantamount to an old ideal of the advocates of a General Systems Theory, namely, the ideal of a *comprehensible world.* Time and again, scholars with differing social backgrounds have been tempted to proclaim systems-theoretical views, generally without much success. In our opinion, this repeated failure is mainly due to the fact that much of the work done in systems theory was inspired by certain

ideas (e.g., about holism) resting on too speculative a methodological basis. Ironically, these were mostly ideas dear to Ludwig von Bertalanffy, a biologist hostile to neo-Darwinian evolutionary theory for its being too "vague", "insufficiently verifiable" and "far from the criteria otherwise applied in 'hard' science" (quoted approvingly by Gould, 1978, p. 530 — a geologist critical of the recent tide of sociobiological explanations which, in his opinion, usually proceed "in the mode of storytelling for individual cases" (p. 531) without being supported by solid evidence). In a similar sense, the work of Luhmann — a sociologist working in the "grand theory" tradition of Persons — may also be said to be plagued by too much speculation (see Offe, 1975, p. 82 and Tönnies, 1975, p. 76 ff.) Yet, we feel it may be worthwhile and, indeed, very useful to consider Luhman's ideas, and to apply them to the particular types of problems discussed here, provided they can be cast in a less speculative framework. We believe such a framework is to be found in Simon's theory of complexity reduction, which, as we shall see, is a natural development of his views on satisficing behaviour. According to Simon, the comprehensibility of the (physical) universe lies in its "near-compossibility" (a term yet to be specified). In this respect, Simon's views contrast with the radical anti-reductionism of writers standing in Bertalanffy's tradition (Sutherland, Laszlo, Jantsch, etc.) Specifically, Simon's position seems to be basically in line with recent views combining holism with reductionism (e.g., E. P. Odum, 1977, pp. 1289-1290) so as to allow of an evolutionary mechanism that has awkwardly been labeled "downward causation" (D. T. Campbell). In this view, all processes at higher levels "are restrained by and act in conformity to the laws of lower levels", and "teleonomic achievements at higher levels require (...) specific lower-level mechanisms (...)". Additionally, it is believed that where "natural selection operates (...) at a higher level of organization, the laws o the higher-level selective system determine in part the distribution of lower-level events and substances" (D.T. Campbell, 1974, p. 180) — a view absent in traditional reductionism.

Systems theory is often criticized for being ideologically biased (e.g., Tönnies, 1975, pp. 76-77). We think such arguments are too general from one standpoint and not general enough from another. *Too general:* the views of different authors working in the field of systems theory should be "judged" individually and for their own sake instead of being melted. E.g., most of the criticism that applies to Parsons's "grand theory" does not apply to Luhmann's views properly. (Contrary to Parsons's views, Luhmann's allow of a radical

questioning of the present organization of society, as any objective reader of his work might acknowledge.) *Not general enough* : a "conservative bias" is inherent in all reasoning on men and society once a certain level of abstraction is exceeded, since theoretical "non-awareness" of certain historical peculiarities (e.g., the specific class structure of present-day society) can always be interpreted as being of an "ideological" nature (in Marx's sense of "false consciousness"). However, from a methodological viewpoint, this criticism does not make much sense, since it would be utterly unrealistic to demand of a theory that it be all-embracing.

We believe another strategy of argumentation is more fruitful, namely, one that acknowledges that the search for complexity reduction is inherent in any genuine scientific endeavour. We believe that contrary to a received opinion, this strategy is also in line with *historical materialism*. Cf. Labriola's dictum that "the materialistic conception of history is nothing other than an attempt to provide *a methodological mental image of the origin and ever increasing complexity of human life*, as it has developed over the centuries" (quoted in Mlinar, 1978, p. 29).

In the discussion of complexity reduction that follows, we will mainly focus on Simon's views. Luhmann's "strategies of complexity reduction" — which are taken to apply to all learning systems — will be considered only briefly. It will be shown that they are, on the whole, compatible with Simon's theory.

Simon's "systems philosophy". — The core of Simon's theory of complexity[10] is that (i) complex biological and social systems are *causally ordered systems with a hierarchic structure*, and that (ii) for this very reason, they are amenable (not only in principle, but very often also in practice) to analysis by the same methods that have proved to be successful in treating relatively "simple" physical phenomena (such as those studied in celestial mechanics). Thus, Simon's theory amounts to a "plea for simplicity". It is important to stress from the beginning that Simon's views on complexity reduction cannot be insulated. They are intertwined with other aspects of his general systems philosophy (mostly of a methodological or epistemological nature) that will be mentioned briefly.

(1) (a) According to Simon, what is at issue in axiomatization of empirical theories (he mentions econometrics as a paradigmatic case) is not so much the definition problem (determining which terms in a theory are to be defined, and which are to be treated as primitives), but rather, the identification problem : how to use observational data to estimate the parameters of a theory, and the conditions

under which such estimation is possible. *Identifiability* can be regarded as a weakened form of definability (in Tarski's sense). (b) Moreover, Simon has shown that identifiability and *causal ordering* are closely related.

(2) (a) Simon feels that the fascination of so many historians and philosophers of science with competition between theories (wave theory of light vs. particle theory, phlogiston vs. oxygen, etc.) has been excessive. In his view, such competition occurs only occasionally. In the more typical situation, a scientist faces a set of phenomena without having a theory that explains these in even a minimally acceptable way. His task, then, is neither to choose between alternative theories (in the Kuhnian sense) nor to test ("verify or falsify") theories, but to *discover* candidate theories that might explain the data. Only after this task has been accomplished will the scientist be able to test his hypotheses, (b) This, Simon argues, cannot be done without once more considering the processes that generated these hypotheses initially — i.e., the discovery processes. Summarizing, one may say that according to Simon, "data precede theories more often than theories precede data".

(3) Disclaiming Popper's view on scientific discovery — shared by so many — as "mystical", Simon argues that the greater efficacy of one process compared with another in discovering laws need not be attributed to "chance", "irrationality" or "creative intuition". To the contrary, the processes leading to discovery are systematic; and a normative theory or "logic" of discovery — in fact, a *logic of retroduction* (cf. Hanson) — can be constructed that studies the laws of effective search. *Heuristics*, *effective problem solving algorithms* and *pattern induction* are relevant keywords here. Efficacy of discovery is defined in terms of the capability of detecting the "pattern information" contained in data and the use of this information to recode these data in more parsimonious form.

As a whole, these are rather unorthodox views that not everybody is willing to accept. (As we had to outline them in an extremely simplified form, the reader who wishes to judge Simon's views should consult the author's original presentation.) One could also easily envisage a selective adoption of these views; for instance, some people might accept (2a) while rejecting (2b) and (3) and being indifferent to (1a) and (1b), and so on. This is not the place to discuss issues in epistemology and methodology of science. Yet, we must be aware of the *coherence* of Simon's philosophy. His views on complexity reduction loose much of its attraction, viz. his theory looses a great deal of its explanatory power, if separated from the philosophy underlying it. The reasons for this cannot be spelled out

before the theory proper has been dealt with. With this warning as to the limitations of Simon's theory in mind, we now finally arrive at the heart of the matter.

Simon's analysis of the complexity of systems (which is not necessarily identical with the complexity of the *structure* of systems, as we shall see) is not confined to the type of systems to which biocyberneticians originally applied this concept, i.e., open physical systems the complexity of which was defined and measured in terms of

(i) the number of their components (the cardinality of a set); or

(ii) the degree of interdependence among their components; or finally,

(iii) their information content (in the Shannon-Wiener sense) : systems with many identical components are simpler than systems of "comparable size" (Simon does not offer a definition of size. What he means is probably not size as we understand it intuitively, for this does not seem to make sense; but size as it could somewhat awkwardly be defined by a combination of (i) and (ii) — but what combination ?) whose components are all different.

Simon's concept of a system is a very general one; in addition to "World One" configurations [19] (that do not have to be "real" in the sense of existing; they might also be "possible" or "plausible" systems), it applies to the systems of "World Two" (say, clusters of attitudes, or world views) and of "World Three" (conceptual systems, hypotheses, theories, computer programmes, etc.) In this way, a number of additional dimensions of complexity may be introduced. We mention only a few :

(iv) Systems that are undecidable may be regarded as complex in comparison with decidable systems.

(v) The complexity of theories can be expressed in terms of the number of their parameters, or by the number of symbols that is minimally required to state them (cf. (iii)).

(vi) If a theory is axiomatized to some degree, there are several ways to measure the complexity reduction to be gained from the introduction of explicit definitions (for instance, simplification of formulas; simplification of proofs). (Actually, this possibility is not caught in Simon's account but mentioned by Suppes (1977, p. 545) in his discussion of Simon's paper.)

(vii) Computational complexity : the maximum (or expected) number of elementary computational steps required to solve the problems in a given class. (Closely related to this are measures of problem difficulty.).

Converging Views on Complexity Reduction: Simon and Luhmann. The various forms of interconnectedness of the elements of physical systems that are possible ("strong" — "weak" — "absent", or another ordering) can be represented by *incidence matrices* as devised in econometrics. Simon's theory states that there "are a number of different reasons why we might expect most real-world systems to have rather sparse incidence matrices" (1977b, p. 510). (Notice that for convenience, we have slightly altered Simon's arguments.)

(i) A first reason for simplicity is related in the fact that in most physical systems (e.g., the solar system, ecosystems, etc.) the strengths of interactions decrease with *distance.* Each element, then, can have strong interactions only with the few elements surrounding it. The reason may be (a) that the forces impinging on the elements of the system depend on *propinquity;* or (b) that interaction involves some kind of expenditure of *scarce energy*, either by the element that exerts an influence or by the one subject to it ("energy" is here taken very broadly: it also includes motivational energy, attention, etc.) The fact that this scarce resource has to be *allocated* — with a resulting limit on the amount of possible interaction — works as a factor limiting complexity, "especially when the elements must process outgoing or incoming information *serially*" (cf. satisficing) (p. 511, italics ours). This circumstance has two important consequences. Let us suppose first that the behaviour of each element of a *one-dimensional* system (one whose elements can be arranged along a line) can be described by a differential equation, whose independent variables are the positions of the other elements. "If we now display the matrix of coefficients of these equations, with the rows and columns ordered as the elements are, the large entries will be close to the diagonal, for these near-diagonal entries represent the interactions among elements that are close neighbours" (p. 510). *The (partial) differential equations of physical systems typically have this neardiagonal structure* (ibid.) Moreover, if the system is also homogeneous (so that successive rows measured from the diagonal are essentially the same), then the system is usually amenable to the type of analysis described in textbooks on physics.

(ii) *"Evolution prefers hierarchy".* Evolutionary processes, such as those discussed in section 4, are likely to produce and retain hierarchical systems rather than non-hierarchical systems of comparable size. There are many reasons for this (see the chapter on "The Architecture of Complexity" in Simon, 1969). We only remark that hierarchical systems with their specialized subsystems can better resist environmental perturbations — which they can "insulate" —

and that they are, therefore, better adapted. It can be shown that the behaviour of hierarchies is much simpler than the behaviour of systems of comparable size in which all elements interact with each other.

(iii) "It's an illusion" *(comprehensibility to the viewer).* At a first glance, the next argument may look odd. Yet, it gains some plausiblity in the context of Simon's "logic of discovery". The circumstance that most well-known complex systems have rather sparse incidence matrices may simply be due to the fact that systems lacking this property are inscrutable.

(iv) *Comprehensibility to the system* . The amount of interaction in a system may be limited not only by comprehensibility to the beholder, but also by comprehensibility to the system itself. Especially in the case of learning systems that change their own structure adaptively, this can be an important reason for simplicity. Such systems are *reflexive :* they require as understanding of their own structure in order to identify the substructures in which changes should be made and to define the nature of these changes (cf. D. T. Campbell's "internal selection criteria"). As a result, most incidence matrices of biological and social systems are not only sparse, but they also have some definite structure (near-diagonal, hierarchical, etc.) that makes them amenable to the same kind of analysis as the one applied to physical systems. A common characteristic of hierarchical systems is that they are *nearly-decomposable* : as one proceeds "upward", the strengths of the interactions between elements of different components become more weaker. According to Simon, this near-decomposibility of the physical universe is the principal key to our understanding of it.

Luhmann's typology of the possible "strategies of complexity reduction" of social systems and their combinations (see especially his 1973, pp. 114-115) as well as his original views on the reflexivity of social systems (1974, pp. 92-112) can for the greater part be translated into the more "physicalistic" language of Simon's theory which, we feel, is more appealing, especially to someone envisaging applications in both biological and socio-cultural evolutionary theories. E.g., Luhmann's "Subjektivierung der Umweltlage" can be defined in terms of (iii) and (iv); his concepts of the "internal differentiation" of systems and of the "differentiation of systems environments" can be rendered in terms of Simon's theory of hierarchy, and so on. (We are investigating this convergence, as well as the remaining divergences, in a rather ample discussion of complexity now in preparation.) We can only assert here, without proof, that modern systems theory provides a tool powerful enough

to analyze many types of complex biological and social systems, which then "turn out to be special cases of relatively few basic types", as H. T. Odum (1971, p. vii) put it.

The preceding discussion was basically confined to reasons for the simplicity of "World 1" systems. A systematic study, in the same vein, of complexity reduction as to "World 2" and "World 3" systems is still due. (Note, however, that Luhmann's views are taken to apply also to the institutionalization of forms of "Erlebnisverarbeitung" as well as to science as an objectivated "Funktionssystem".) Learning theory, genetic psychology, social psychology and other disciplines on the one hand, philosophy of science and particularly, theory dynamics on the other, provide ample evidence for such reductions. But to date, this evidence has not been cast into a firm and consistent body of knowledge. As to an evolutionary "foundation" of strategies of complexity reduction applying to "World 2" and "World 3" systems, we are more often than not at the mercy of speculations, intellectually fascinating as they may be. See, e.g., Pugh's discussion of the evolutionary origin of our "intellectual values" : curiosity, humour, esthetic values, etc. The criteria of *simplicity*, *comprehensiveness*, and *elegance* — important factors for the explanation of the "simplicity" of theories — could be "learned almost automatically as a result of experience in Bayesian thinking" (1978, p. 331). Pugh believes nevertheless that "there is some evidence that the criteria of simplicity and elegance may actually reflect innate values" (ibid.) This "evidence" is related to the observation that many creative people "react to the elegance of a theory much as they would to the beauty of a face" (ibid.); and this essentially *esthetic* response (as opposed to a purely "rational" one) is taken to reflect "some subtle, but nevertheless innate" intellectual values. (Some might feel this view is highly irrational. We must add that elsewhere, the author argues more convincingly for the a-rationality of ultimate valuative sensations (he quite misleadingly calls these "irrational" values) (cf. *infra*).

4. Practical Rationality in Different Evolutionary Approaches

Our aim in this section is to show that the theory of complexity reduction that was briefly outlined before is more than an intellectual game, and that it can be operationalized so as to be of practical use in real-life situations involving basic moral problems. Often, the latter are of the *extension type* mentioned in the introduction. To accomplish this, the theory will have to be supplemented with certain material hypotheses. These are borrowed

from differing evolutionary approaches to the study of man and society[20]. For convenience, we distinguish between "biological" and "socio-cultural" evolutionary theories (mainly with a view to the respective scientific disciplines the authors and advocates of these theories belong to). Which is not to deny the recent anthropological insights to the effect that a clear-cut distinction between biological and cultural aspects is really impossible. We take for granted here that whatever sets man "apart" from other species — be it his ability to invent tools, or his ability to use and develop language, or his technoeconomic development, or simply the *increased complexity* (Carneiro) of his realizations — is basically a matter of graduality. (For a discussion of these anthropological insights with a view to the "increasingly complex cybernation of human societies", we refer to Corning, 1974.)

Biological theories. From the standpoint of moral philosophy, biological evolutionary theories are mainly interesting because they permit to define a number of *constraints* on human action, thus enabling to specify the "Handlungsspielraum" of morality in some basic way. We only single out the following approaches, now fashionable (which is not to deny the merits of older neo-Darwinian theories) :

— *Ethology* ("Human-Ethologie", "Verhaltensforschung" in Lorenz's, Wickler's and Tinbergen's sense). Broadly speaking, this discipline sheds light on the "irrational" (that is, *a-rational*) factors — biological drives, "instincts", "innate human values" etc. — such as agression, fear, love and hate, that are taken to influence dramatically individual and collective behaviour (these mechanisms can be regarded as so many option-reducers, and, therefore, as mechanisms coping with complexity). In this view, conscience is an innate mechanism for controlling behaviour; together with a (rather Kantian) faculty or moral judgment, it guides "free" and "responsible" human action. An ethic based on ethological considerations specifically focuses on the *common preservation* of species : "(...) alle Probleme (müssen aus dem Bereich dieser Ethik ausscheiden, die nicht an den Bestand der Menschheit rühren (...). Gleiches gilt für den Bestand der anderen Arten von Organismen, deren Erhaltung ebenfalls primäres ethisches Ziel sein müss" (Kadlec, 1976, p. 29). In addition to Kantian "action principles" ("treat other people the same way you want to be treated by them", etc.), this ethic introduces a "reaction principle" ("Notwehrreaktion"). Without engaging in a discussion of these views, we want to remark that the idea of an "irrational" (a-rational) ultimate value base has important consequences, both from a decision-theoretical and a

systems-theoretical viewpoint. This idea is taken to provide the *rationale* for the paradox of "man's apparent ability to think rationally and his inability to behave rationally" (Pugh, 1978, p. 32), a paradox that seems to originate in the conflict between rational thought and the variable, fluctuating instinctive value system. Decisions must eventually be evaluated in terms of their effects on the ultimate value system. Yet, the latter's fluctuations cannot be accurately predicted. This has to do with the *autonomy* of the value system, related to the fact that the human decision system does not seem to be able "to tinker with its own primary 'value system'" (ibid.) If such "tinkering" were possible, the system would be able to modify randomly its own ultimate criteria of decision, "so that the resulting decisions would be inconsistent with the evolutionary objective" (a genetically determined specification of the principle of survival of the species) (ibid.) If this hypothesis would eventually be shown to be true, human rationality would be bounded by the type of rationality inherent in the evolutionary strategy. Now, it might be possible in principle to question this rationality (see, e.g., Pugh, pp. 411-414 on the "deliberate modification of innate values"). Yet, the project of making the paths of biological evolution amenable to a "utilitarian" treatment faces considerable — maybe insurmountable — difficulties. This has to do with the circumstance that the type of "optimization" problems involved in the basic mechanisms of evolution (mutation, selection, "crossing-over" of chromosomes, sexual reproduction, etc.) in general do not allow of the analytical solutions Simon was referring to. (Of course, one cannot preclude that such solutions will be found in the future.) To the contrary, engineers dealing with optimization problems of this type are looking at evolutionary mechanisms such as those studied in biology, which they simulate in order to develop "better" engineering systems. In *bionics*, the "quality" of an engineering system is compared with the fitness of living organisms (see, e.g., Rechenberg, 1973). Thus, we are confronted with a vicious circle. As a consequence, any systems-theoretical approach to practical rationality might have to take into account the ultimate value system of man — the social animal — as a *constraint*. This would considerably decrease the degree of *freedom* of "personal systems", as postulated by Luhmann [21], thereby affecting the "utopian" appeal of systems theory (in Bruno de Finetti's sense; cf. our (1978) article).

— *Sociobiology*. According to the sociobiologist Wilson, the central problem studied in this discipline is how altruism, "which by definition reduces personal fitness", can possibly evolve by natural selection (1975, p. 3). Genetic fitness is the relative distribution of

one genotype to the next generation's distribution of genotypes; genetic selection is "the change in relative frequency in genotypes due to differences in the ability of their phenotypes to obtain representation in the next generation" (p. 67).The relevance of a sociobiological approach for a theory of practical rationality has already been discussed earlier : it could provide the *rationale* for the altruistic behaviour postulates economists have recently come to consider (cf. Becker). From a decision-theoretical and systems-theoretical viewpoint, sociobiological theories on group selection, kinship relations and other processes and structures can provide evidence for certain "coordination modes" (Mesarovic, Macko & Takahara, 1970) involving both cooperative and conflicting collective behaviour.

— *Ecology.* From a systems-theoretical point of view, long-term biological evolution may be characterized in terms of "increased control of, or homeostasis with, the physical environment in the sense of achieving maximum protection from its perturbations" (E.P. Odum, 1971, p. 251). As a short-term process, *ecological succession* ("eco-system development") — the "orderly process of community development that involves changes in species structure and community processes with time" — seems to follow basically the same "strategy". Furthermore, both long- and short-term biological "strategies" have parallels in the evolution of human societies, which seems only natural since human systems are subject to the same bioenergetical principles as any other living systems. Any rational design of an "ethic for the survival of man" (H.T. Odum, 1975, p. 175) will necessarily have to meet certain requirements that pertain to these bioenergetical principles. H. T. Odum's discussion of these principles — e.g., thermodynamic energy principles, Lotka's principle of maximum power selection[22], the need to develop order and feedback, competitive exclusion, compensation with reward loops[23]), inertia, etc. — is fully compatible with Simon's principles of complexity reduction. For instance, his idea of modeling the world system by means of energy flows ("energy" is here defined in a very broad sense, and an "energy quality scale" is introduced : high-quality energy, e.g., information, is energy costly to store and degrading readily) can be viewed as a systematic attempt to put Simon's "argument from distance" into practice (H.T. Odum, 1971). Moreover, an energy theory such as Odum's can pave the way for a systematic reconsideration of a number of fundamental abstractions underlying mainstream economics as well as other social sciences, abstractions that are more and more found to be very unrealistic and inadequate (cf. Perroux, 1975, especially pp. 89-105 : "L'agent et

l'énergie").

The reason why ecology is treated here in its own right is that it may be seen as a "new integrative discipline" (E.T. Odum, 1977), studying phenomena that cannot wholly be reduced to lower-level processes. According to the Odums, there is a "holistic strategy for ecosystem development" in that "ecological succession can (not) be explained adequately on the basis of competitive exclusion and other species-level processes" alone (id., p. 1290). (On the question of the units of analysis in biological evolutionary theory, see Hull, 1978.)

Socio-cultural theories. Conceptualizations of socio-cultural evolution are often of a mechanistic or, alternatively, biologistic nature. In recent work — e.g., in *social ecology* — investigators have attempted to overcome the limitations of both approaches (Emery & Trist, 1973; Mlinar & Teune, 1978). Limitations of space prevent us from discussing these issues. We will only consider two variants of the socio-cultural approach.

— D. T. Campbell's theory of "blind variation and selective retention". According to this theory, socio-cultural evolution is, minimally, "a *selective* cumulation of skills, technologies, recipes, beliefs, customs, organizational structures, and the like, retained through purely social modes of transmission, rather than in the genes" (D.T. Campbell, 1975, p. 1104). One of the more interesting features of this theory is that it sheds light on the meaning of moral tradition, regarded as "adaptive wisdom". According to Campbell, "there is (...) today a general background assumption that the human impulses provided by biological evolution are right and optimal, both individually and socially, and that repressive or inhibitory moral traditions are wrong" (p. 1120). In his opinion, "this assumption may now be regarded as scientifically wrong from the enlarged scientific perspective that comes from the joint consideration of population genetics and social system evolution" (ibid.) The teaching of such a perspective may contribute "to the undermining of the retention of what may be extremely valuable social-evolutionary inhibitory systems which we do not yet fully understand (ibid.) We think Campbell's caveat can be of great help in pointing to the danger inherent in all attempts to judge all existing social institutions "by an impartial rational test" (Harsanyi), from a radically "enlightened" perspective that regards our present knowledge of man and society, as absolute. Utilitarians have, in the past, often tended to underrate the "adaptive wisdom" contained in many social institutions. (On the other hand, we believe it is also true that Campbell underrates the possibilities of conscious design.) Anyway, any "balanced" solution of this problem will have to rely on general

hypotheses about the dynamics of systems, since "all evolutionary adaptations are to past environments, not future ones", as Campbell (1974, p. 195) himself admits.

— *Theories of social change underlying social indicators research* (e.g., Sheldon & Moore's). Often pragmatically oriented, these sociological theories focus on social evolution from the standpoint of the implementation of values that are regarded as "desirable" with a view to maximizing the quality of life. In these theories — that may be regarded as the most ambitious attempt to define human needs and wants and the "use values" needed for their realization hitherto — extension problems such as those studied in Olson's theory of collective action or in Fox's theory of time budgets are a central topic of investigation (see our (1978) article).

5. Postscript on the Foundation Issue

In discussion, Van den Enden pointed out to us that an advocate of the evolutionary approach runs into trouble when it comes to the issue of rationally justifying the ultimate values of human systems. Our reply was along the lines of D. T. Campbell's remark that all one might reasonably expect from a moral philosophy using biological and socio-cultural evolutionary evidence, is that it will eventually "also be able to predict which ultimate values animals such as social humankind are likely to choose, even though it would not thereby philosophically justify such normative values" (1975, p. 1109). We thought this was all there is to say about the foundation issue. Anyway, most, if not all other ethical theories also feel to provide *logical* grounds for ultimate moral values and take it for granted that "reasonable" beings already adopted some.

We now feel one might say "something more", yet. Consider the following idea, recently discussed by Ladrière :

"Si nous parvenons à construire une science satisfaisante (des systèmes naturels et artificiels), nous connaîtrions leurs lois d'évolution et nous pourrons alors agir sur eux en pleine connaissance de chose, de façon précisément à mieux assurer leur évolution dans la direction qu'ils indiquent d'eux-mêmes, et cela en limitant le plus possible l'intervention des facteurs de perturbation et la part des circonstances aléatoires qui pourraient retarder cette évolution, la dévier partiellement, voire la compromettre radicalement." (1977, p. 148). In this case, the "immanent" value constituting science – objective knowledge – would be taken as the ultimate foundation for judging any system of moral norms (ibid.) What is wrong with this idea ? According to Ladrière, it involves a

"second order principle" : "le passage de propositions nomologiques (relatives au fonctionnement d'un système ou à son évolution) à des propositions normatives (relatives au comportement qui est proposé comme adéquat et éthiquement justifié à l'égard de ce système) présuppose un principe normatif de second ordre qui consiste à admettre une telle transposition comme éthiquement fondée" (ibid.) Specifically, what this principle would amount to is "à prendre pour maxime de la volonté une loi venue de l'extérieur; ce serait donc un principe hétéronome, en contradiction évidente avec l'exigence d'autonomie caractéristique de la volonté libre" (p. 149).

Is this conclusion inescapable? We believe it is not. A systems-theoretical interpretation of evolutionary approaches, to the contrary, tends to show that there is no justification for the adoption of the Kantian dichotomy "heteronomy — autonomy"; since it is found more and more that human systems are subjected to precisely the same regularities as those regulating non-human systems. (Moreover, we believe a Kantian approach must be deficient for other reasons too. These have to do with Kant's bifurcation of the human self and its experience between the temporal and the nontemporal (Sherover, 1975) and with the occurrence of the naturalistic fallacy in his ethics (Ilting, 1972). However, a discussion of these problems is outside the scope of this article.)

Aspirant N.F.W.O.

NOTES

*An outline of this paper was read at the meeting of the "Interuniversitaire Contactgroep Ethische Rationaliteit" at Ghent University on November 16, 1978. We wish to thank the participants and in particular Etienne Vermeersch, Hugo Van den Enden and Ronald Commers for their stimulating criticism on this occasion, which lead to the reformulation and clarification (at least, so we hope) of certain issues; and our friend Jean Paul Van Bendegem for useful advice on the topic of complexity reduction.

[1] The task of the moral philosopher we have in mind is not confined to a purely *meta-ethical* study of moral or ethical language in the analytical tradition. In our opinion, for reasons to be explained yet, moral philosophy should also encompass (i) the (historical and cross-cultural) *descriptive study of moral and ethical systems, and*

(ii) *theorizing* on social and political organization and their optimization with a view to the maximization of the quality of life of the individuals and (micro) groups involved. (Cf. the "rational test" method in our (1978) article.) Though this usage of the term "moral philosophy" is rather unusual, we prefer not to speak of a "science of ethics" (or "ethicology"), because we find that the latter term is pretentious regarding the actual state of the field (cf. D. T. Campbell, 1975, p. 1109).

[2] It is usually taken for granted that to conceive of man as a *zôon politikón* or *animal sociale* implies, at least, two things; namely, that man is seen as a social being that can only exist in social situations, and that as a consequence of this, man is the measure of all "his" institutions, i.e., that his "perfection" is their ultimate purpose (cf. Luhmann, 1978, pp. 29-30). Our own definition of moral philosophy in the preceding note lends itself to such an interpretation. To avoid misunderstandings, we want to make two remarks. (i) We do *not* assume here that our "yardstick" for judging social institutions is an immovable one. In fact, we tend to believe that there is a genuine *dialectic of needs* ("Bedürfnisse") *and means to satisfy these needs* ("Produktivkräfte"), as conceived of by Marx in the third volume of "Capital" (MEW 25, p. 828). Therefore, the quality of life has always to be specified relative to the particular historical and cultural situation under study (more specifically, relative to the social utillity function — in Harsanyi's sense — that can be derived from that situation; cf. section 2). The relativity of the "human yardstick" is the very reason why we favour a systems-theoretic and evolutionary approach to practical rationality. (ii) we do not want to restrict the application of our "rational test" method to those institutions that are the result of "conscious" human *design* (actually, such *artificial* institutions are only a minority). To the contrary, we hope that moral philosophy will *eventually* also be able (we do not hazard to say : in the near future) to judge of the "perfection", i.e. *(sub)optimality*, of (a) social patterns and institutions that are not the product of human execution of a human plan, yet the result of human action (these are the candidates of so-called "invisible-hand explanations"; see Nozick, 1974, and Ullmann-Margalit, 1978), and (b) *natural* institutions as those studied in sociobiology (the "strategy" of biological evolution can be viewed as an optimization problem; see Rechenberg, 1973 and Pugh, 1978).

[3] An objectivist — say, a behaviourist — could object here that man, *as an assertive individual*, can not be an object of scientific investigation; and that at best, an issue such as "free will" (which is

one aspect of assertiveness) belongs to the realm of philosophy. We would reply that science should be practiced "philosophically" (admittedly, a value judgment; but, in our opinion, one that is amply justified by the history of science). In the case at issue, this admonition amounts to asking if it "makes a relevant difference", either from the point of view of the scientist (the external observer) or from that of the "agent" (the internal observer), whether the latter is "free" or "programmed" in deliberating, making decisions, etc. If it does not, there is no object for further investigation, neither scientific nor philosophical. If it does (for both an external and an internal observer, or for one of them), this difference should be studied *scientifically*, which could require an appeal to (repeated and, in the sense, *controlled*) introspection. By the way, we note that our plea for the possibility of interpersonal comparisons of utility (cf. *infra*) will be based on an argument that appeals to introspection.

[4] As it would be difficult to uphold that scientism is a *necessary* by-product of scientific and technological developments, it should be clear that the "paradox" or "contradiction" is itself contingent of a specific historical situation. Therefore, it is not a paradox or contradiction in the logical sense, but only metaphorically.

[5] The well-known claims of emotivists, "decisionists" à la Carl Schmitt, and existential subjectivists or "transcendental solipsists" à la Wittgenstein will not be discussed here. We only note (cf. Harsanyi, 1976, p. xi) that although significant changes in the climate of opinion are under way, most practitioners of the "queen of the social sciences", economics, still entertain an anti-comparisonist position with regard to interpersonal utility comparisons (an issue very similar to the problem of interpersonal validity in moral philosophy).

[6] According to the renowned Dutch physicist Casimir, R&D programmes requiring important investments in people and resources are hardly ever terminated "from the inside", i.e. without compelling interference by supporting agencies (oral communication by Dr. Chang, Amsterdam).

[7] The concepts of operator paradigm and regulation paradigm are borrowed from Vickers, 1972 (see "The Need for Regulation, pp. 121-132; cf. Jantsch, 1975).
A thorough discussion of these concepts goes beyond the scope of this article. We only note that the emergence of the operator view of human activity, in the Modern era of Western culture, is often associated with the understanding of a greater range of physical laws, coupled with the novel abundance of energy; while the need to

transcend this "too narrow" view is a recurrent theme in contemporary scholarship (for instance, medecine and the agricultural sciences are often invited to view their problems as regulative rather than operative problems).
These "paradigms" imply not only different (normative) anthropologies, but also different ontologies and epistemologies; e.g., their respective advocates usually have divergent views on causality (cf. Luhmann, 1973, p. 24 ff.)

[8] Karl Menger's "Ethics of Decisions — a Dialog on Demystified Ethics" (in Menger, 1974, pp. 22-40), originally a chapter in his "Moral, Wille und Weltgestaltung" (1934) still reads as a fascinating, albeit too restricted outline of this programme, in the vein of Logical Empiricism.

[9] "Ultimate values" are here taken to correspond to the "basic value system" or to the goals at the "macro level" defining the top of Vermeersch's "goal hierarchy" (1974, p. 78); or, alternatively, to his "value system of a society" (p. 81). In Batens's view, (formal) rationality is "circular"; therefore, ultimate values do not occur here. We want to stress that the question whether (relative) value hierarchies — and thus, (relatively) "ultimate" values — "exist" in people's minds is an *empirical* question, studied in psychology, organization theory and so on, and actually to be answered in the affirmative (by "relative", we mean here : "relative to a person's world-view at time X and with regard to value sector Y). The formalist's position (in its absolute or relative reading), if we understand it rightly, is that the question whether the choice of ultimate values is rational or not does not make sense. We agree with the formalist who maintains that such a choice cannot be justified by means of the same (formal) criteria that apply in "instrumental", i.e., "non-final" cases. But this does not imply that we believe that the choice of ultimate values cannot be justified *in principle;* in fact, we believe that other criteria apply in this case.

[10] At least, if one is willing to accept the "human yardstick" (cf. note 2), as we do. That is, if one regards man as "irreducible" in some sense, which all writers in the humanist tradition — Kant, the Utilitarians, certain Marxists, etc. — seem to have done. If, however, one adopts a radical systems-theoretic point of view and conceives of social and personal systems as systems that are fundamentally discernable and separable, so as to define the one type of system as the *environment* of the other (Luhmann, 1978, p. 30), an alternative solution, more in accordance with the formalists's position, could be considered (at least in principle). Under certain circumstances, the

ultimate values of personal systems could then be considered as being hierarchically subordinate (and therefore, instrumental) to the "values" of more encompassing systems (e.g., ecosystems; see H. T. Odum, 1977). Thus, formal criteria of rationality could again be applied. Of course, the foundation issue is only displaced this way; since the "higher" values of the more embracing system will have to be justified "materially" in turn.

[11] In addition, it seems worthwhile to stress that decision theory has also been applied fruitfully to epistemological problems and in particular, to the problem of induction. Specifically, problems concerning the relationship between subjective probabilities and "epistemic utilities" and concerning decision-theoretic rules of epistemic acceptance have been studied. We make this remark because subjective (Bayesian) probability theory plays an important role in Simon's theory of discovery, which in turn is relevant to this theory of complexity reduction (to be discussed in section 3).

[12] As early as 1947, Simon has explicitly recognized the difficulty of establishing an explicit and measurable "social production function" when the service being rendered is the provision of police protection or some other public service (Ostrom, 1974, p. 431). He remarked that it "is hard to see how rationality can play any significant role in the formulation of administrative decisions unless these production functions are at least approximately known" (1976, p. 189). This is precisely one of the basic problems dealt with in Olson's theory of collective action.

[13] We believe that learning theory and sozialization theory offer some evidence as to the view that if one mounts the (moral) value hierarchy of the (modal) individual, his values tend to become less idiosyncratic and, concomitantly, more common or "social" (though we see no immediate *logical* grounds for this fact) — even in the more specific senses of "more universalizable" and/or "more unselfish". These are, of course, quite strong assertions that need to be elaborated in the near future (cf. note 14).

[14] Some stimulating ideas concerning the relationship between the genesis of moral systems and identity formation are to be found in Habermas, 1976 (especially, chapters 1, 3 and 4).

[15] In a critical discussion of decision theory and game theory, Höffe writes : "Ein Entscheidungsprozess, in dem man den eigenen Vorteil als solchen wenigstens teilweise aufgibt und eine gemeinsame Handlungsbasis sucht, die nicht ausschliesslich nach Massgabe von Vorteil, Macht und Geschicklichkeit definiert ist, kurz : ein als

Strategie der Humanität zu qualifizierender Entscheidungsprozess ist ab ovo ausgeschlossen" (1975, p. 94). This is certainly too pessimistic an assessment of game theory, since this theory can cope with altruistic behaviour, as we already indicated. Moreover, decision theoretical models can be applied fruitfully to situations involving the coordination of non-egotistic, and even "humanistic" strategies; see 2.4. The issue of the *emergence* of norms must be separated clearly from these other issues.

[16] On the peculiarities of this "valuative deduction", see Pugh 1978, pp. 371-374.

[17] Certain market mechanisms can be regarded as coping mechanisms that make it possible to deal with areas of uncertainty, in Emery and Trist's sense. For instance, in the face of incomplete information on the mass-energy processing capacities of ecosystems, it is useful to "hedge" against certain types of uncertainties through the use of ecologically consistent price mechanisms, as has been shown convincingly by Koenig and Tummala (1972). Cf. also our (1978) article on the altruistic assumptions underlying non-Walrasian markets involving imperfect information (p. 186).

[18] See his (1977a), especially chapters 4.2 ("Aggregation of Variables in Dynamic Systems", with A. Ando), 4.3 ("The Theory of Problem Solving") and 4.4 ("The Organization of Complex Systems"), as well as his (1977b).

[19] This terminology is only adopted here for convenience, and does not imply that we adhere to Popper's "Third World" theory.

[20] We take for granted that Popper's argument as to the impossibility of evolutionary (and historical) laws is fundamentally mistaken. See Olding (1978) and Urbach (1978).

[21] In this respect, Luhmann's systems theory has been compared with existentialism.

[22] Systems retained by natural selection develop relatively more power than other systems, which they channel into adaptive mechanisms.

[23] Units that draw potential energy from other units (for instance, a predator from a prey) diminish the energy resources of the supplier This may put both supplier and recipient in a competitive disadvantage, unless the recipient "returns its services" to the supplier (with an amplification factor, as some energy is always lost).

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