

# The quest for the intelligence of intelligence

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The question "What is intelligence?" can be approached with at least two attitudes:

- (a) to assume 'intelligence' denotes a distinct property or attribute of some organisms;
- (b) to assume there is a class of behaviour of organisms in general, that an observer calls 'intelligent behaviour', making connotative reference to the relations that take place between the participating systems.

We take the second approach and pose the biological question "What is intelligent behaviour as a phenomenon proper to living systems and how is it generated?". The notions of problem-solving or goal-oriented behaviour, being observer-dependent descriptions, are shown to be irrelevant in this view, since intelligent behaviour results from a kind of interactions between organisms within a particular context.

Living systems are autopoietic entities with a plastic structure which allows them to interact with each other in a recursive manner, generating a form of ontogenic structural coupling called consensual domain, or to interact with its environment, generating another form of ontogenic structural coupling called ontogenic adaptation.

The processes that generate intelligent behaviour are those that participate in the establishment of any domain of ontogenic structural coupling and those that participate in the operation of the involved organisms within such a domain.

Although one can refer to intelligence as a phenomenon, because it is a configuration of relations between processes occurring during structural coupling, it is not directly observable and thus it cannot be measured. All that can be observed are instances of consensuality or of ontogenic adaptation in the form of intelligent behaviour. The IQ Test can, at most, estimate a subdomain of the domain of consensuality between the observer and the subject.

No biological basis can be found for racial, social or educational discrimination, based on intelligence since the word 'intelligence' does not refer to a discrete individual attribute or property.

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## Introduction

We, as modern human beings, frequently act as if that to which we refer when we speak of intelligence constituted a great individual and social asset. Furthermore, we frequently use the word intelligence, and others related to it, in many different circumstances of sociological significance that range

from class discrimination to international politics. The following sentences are examples of this.

- (i) He is very intelligent; he has solved all the problems in physics with the greatest ease.
- (ii) The conduct of this animal is only instinctive, it is not a case of intelligent behaviour.
- (iii) I wonder if the plastic conduct of this automaton is a case of artificial intelligence.
- (iv) He dealt with the internal disagreements in his party with tact and intelligence.
- (v) Their behaviour reveals some recent intelligence between them.
- (vi) How did he become so prosperous when I know that he is not intelligent? His IQ is only 100.
- (vii) This is a problem of foreign intelligence.

In all these statements the words intelligence or intelligent are used either to qualify a certain kind of behaviour (which would otherwise be denoted as intelligent behaviour), or to refer to a property that is implicitly assumed to be present in different degree or quantity in the different actors of the referred conduct. Yet, the question of which is the phenomenon that one connotes by speaking of intelligence, or by pointing to an intelligent behaviour, that would allow us to understand the many uses of this word in human and technical affairs, as far as we know, remains open, and the decision of whether a given mechanical behaviour is or is not comparable to animal intelligent behaviour is still, mostly, a matter of taste or preference.

Our purpose in this article is to shed some light into this subject by asking precisely this last question: To what biological phenomenon are we referring when we speak of intelligence or denote a case of intelligent behaviour? Furthermore, we ask this question in the biological domain because it is in this domain where the question first arises associated to human activities, and any reference to machines is necessarily secondary to the human experience.

### **What is intelligence as a phenomenon in living systems?**

This question can be approached in at least two different ways that imply two different attitudes with respect to what would constitute an adequate answer. They are the following.

(1) One approach is to assume that the word intelligence denotes a distinct property or attribute that some organisms have as individuals, and which can be detected, grasped or abstracted, by observing the form of what an observer would call their intelligent behaviour. This is what one usually implies if one says that intelligence is the capacity to solve problems or to grasp the meaning of a situation and handle it in an adequate manner. Accordingly the question *What is intelligence?* should be answered by proposing a characterization of this property or attribute in terms of the features that must be exhibited, or of the relations that must be embodied, in the performance of an intelligent behaviour by an individual; and, therefore, the attempt to explain how an intelligent system operates must go through the specification of what constitutes a problem to be solved as the object of an intelligent action, and through the specification of what constitutes a procedure to solve it as the

realization of the intelligent action.

In this approach it is the individual who has the property of intelligence, with constitutive independency of the situation that reveals it: if a given conduct does not exhibit the proper features, or does not embody the prescribed relations with respect to the acting individual, then it is not a case of intelligent behaviour and the subject does not possess intelligence, at least in that situation.

(2) The other approach starts from accepting: (i), that there is a class of behaviour exhibited by animals in general, and by man in particular, that involves the interactions of two or more organisms or the interactions of an organism and its medium, that an observer calls intelligent behaviour; and (ii), that the word intelligence is used by the observer to make a connotative reference to the relations and changes of relations that take place between the systems participating in this behaviour, without denoting a particular property or attribute of the individual organisms, or without denoting a particular feature of the individual performances. Accordingly, the question *What is intelligence?* should be transformed into the question *How is intelligent behaviour generated?*, which is a question that should be answered by pointing to the processes that, taking place in the interactions of the living systems, lead to the relational situation that the observer calls intelligent behaviour.

In this approach the notion of problem solving does not enter, because intelligent behaviour is viewed as an expression of a kind of interaction that involves the history of interactions of the participating systems, and not as an action directed towards an object. Therefore, since in this view the problem is the generation of intelligent behaviour, if the mechanism proposed does not generate a conduct that the observer would call intelligent behaviour, then the proposed mechanism must be rejected.

In summary, it is apparent that for both approaches an agreement is needed for the recognition of a case of intelligent behaviour, but it is also apparent that they differ because in the first case intelligent behaviour is viewed as a manifestation of a property of the acting organism, and in the second case intelligent behaviour is viewed as a conduct whose peculiarity consists in that it is enacted in a particular context as a result of a particular history of interactions of the acting organism with other organisms or with its medium.

### Our approach

In these circumstances, we prefer the second approach for the following reasons.

(i) *Scientific validation.* We as scientists can only handle structure-specified systems; that is, we can only handle systems whose dynamics of states are, at any instance, specified by their individual structures as a result of the operation of their components. That this is so is apparent because a scientific explanation necessarily consists in the proposition of a model (explanatory hypothesis) that in its operation as a structure-specified (mechanistic) system generates, through the realization of the properties of its components in their neighbourhood relations, the phenomenon to be explained. A proposed explanation which explicitly or implicitly includes the phenomenon to be explained as a feature of the proposed system, is not a scientific explanation.

(ii) *Structure-specified systems.* A particular structure-specified system is defined as a system of a particular class by an organization which is the set of the relations that define the class to which it belongs, and it is realized by a structure that consists of the components and their relations that concretely constitute it as an entity in the space in which they exist. Accordingly, the relations of the organization are a sub-set of the relations included in the structure. Also accordingly, for a system to maintain its class identity its organization must be an invariant. Therefore, the structure of a system may change without the system losing its class identity as long as the relations of the organization are not destroyed. In these circumstances, an interaction takes place between structure-specified systems only as a result of the interplay of the properties of their components, and it consists in the mutual triggering of structural changes that take place in the interacting systems in a manner specified in each one by the structure which it had at the moment of the interaction.

(iii) *Structural plasticity.* Living systems are structure-specified systems defined as unities by their organization as living systems (autopoietic organization in the physical space; Maturana, 1975). Therefore, in accordance with their being as structure-specified systems, all the changes of state (as structural changes that take place without loss of organization) taking place in them, are specified by their individual structures and not by any external or internal perturbing agent (Maturana, 1978). In other words, the structure of a living system necessarily determines: (a) the domain of transitions of state that it may undergo and, hence, the domain of states that it may adopt at any instance of internal or external perturbation; and, (b) the domain of perturbations (internal or external) that may trigger in it a change of state, by specifying the structure that any operationally independent entity must have in order to interact with it. Therefore, any structural change that a living system may undergo, without disintegrating as a living system, may give rise in it to a change in its domain of states, or to a change in its domain of perturbations or to both. Furthermore, since all the interactions of a living system as a composite entity are necessarily structural, in the sense that they must take place through the operation of the properties of its components (Maturana, 1978), and, since the relations between these components can change or they themselves can undergo structural changes through processes triggered by the play of their properties in the interactions, the interactions of a living system may result in its structural change. If due to the homeostatic operation of the organization (autopoiesis) of the living system these structural changes take place in it without its disintegration (death) as a result of them, then the interactions that trigger them are plastic interactions in which the structural changes are compensated in such a manner that the system continues its life (autopoiesis) in the perturbing medium with a different structure, a changed domain of states and a changed domain of perturbations.

(iv) *Structural coupling.* If a living system undergoes recurrent plastic interactions with entities of its external medium, living or not, and with its own states (its internal medium) along its ontogeny, it undergoes changes in its domain of states and in its domain of perturbations specified by its structure but selected by the interactions. The result is the phenomenon of

structural coupling of the organism to the system or systems which provide the perturbations that trigger its changes of state. In general, when two or more plastic dynamic systems interact recursively under conditions in which their identities are maintained, the process of structural coupling takes place as a process of reciprocal selection of congruent paths of structural changes in the interacting systems which result in the continuous selection in them of congruent dynamics of state. If no structural coupling takes place, the systems separate. If structural coupling takes place then the result may be a domain of interactions which allows for endless recurrent interactions without loss of organization.

The relations that constitute the organization of any particular system that participates in a structural coupling, constitute an effective operational reference for the selection of its path of structural change during the structural coupling because if these relations change the system disintegrates. In the case of living systems, their autopoietic organization constitutes this final reference for structural coupling because anything that violates it results in death. In these circumstances, since the medium (system of perturbations) within which an organism operates selects in it a permitted path of structural change without specifying the structural changes produced, the structural coupling constitutes within the structure of the organism an operational embodiment of its history of interactions.

(v) *Conduct or behaviour*. The interactions in which it is seen to enter as well as the active relations that a living system is seen to adopt while operating (realizing its autopoiesis) within a given context, and which are described by an observer with reference to this context, constitute its conduct or behaviour.

(vi) *Acquired and innate behaviours*. If two living systems have isomorphic structures, then their respective domains of states as well as their respective domains of perturbations are also isomorphic, regardless of whether the structure of one living system was inherited while the structure of the other was acquired during its ontogeny. The result is that these two living systems under isomorphic systems of perturbations undergo isomorphic changes of states that are seen as equivalent conducts by an observer. Therefore, the distinction that we make between instinctive and learned behaviours has significance only if referred to the different origins of the individual structures of the organisms concerned (instinctive if inherited and learned if acquired during ontogeny), and not to the manner in which the structure of an organism determines its behaviour.

(vii) *Instructive versus selective interactions*. As can be seen from (i) and (ii), we answer the general question of whether the structural changes that a system undergoes as a result of an interaction with an independent entity are specified by this independent entity, so that an instructive interaction takes place, or whether they are only selected by it from a domain of possible structural changes that the system may undergo, so that a selective interaction takes place, by claiming that the selective process is the case. Furthermore, we claim that instructive interactions do not take place in the phenomenal domains submittable to scientific inquiry. In fact, if instructive interactions did take place, then we would be in a situation comparable to that of King Midas of Phrygia who, according to the myth, received from the God Dionysos the gift of the golden touch. Due to this gift whatever King Midas touched became gold, and, whether he liked it or not, henceforth he could not make material

distinctions through touch because his touch specified the material nature of the things he touched. If we were endowed with the 'golden touch' science could not exist. Science as a cognitive system can only generate descriptions and statements about structure-specified entities.

(viii) *Problem solving behaviour.* It follows from (i) to (vii) that in a situation in which a living system is seen to interact with independent entities of its medium (whether living or not), and in which an observer would describe the conduct of the living system under his attention as a problem-solving behaviour, the living system necessarily operates specified by its structure and not by the features of the medium that the observer calls 'the problem to be solved'. Accordingly, then, a behaviour that appears to an observer as solving a problem can only be an expression of a previous history of structural coupling (ontogenic adaptation), and not a manifestation of the properties that would have to be admitted if approach (1) were chosen.

(ix) *Relativity of descriptions.* When an observer sees that an animal faces a particular situation without he (the observer) knowing the previous history of interactions of the animal so that he does not know its domain of structural coupling, he may describe the situation as a problem to be solved by the animal. Similarly, an observer can describe *a posteriori* any animal conduct with reference to its out-come as a goal-directed behaviour. Hence, an observer can describe a given sequence of interactions of an animal either as a problem-solving behaviour or as a goal-directed conduct, depending on the perspective from which he makes his description. Yet, to the extent that an observer admits that a given system operates as a structure-specified system, he admits that its internal dynamics is necessarily determined only by neighbourhood relations through the interplay of the properties of its components, and that the final state or goal is necessarily not operative in the actual dynamics of the components of the system. Therefore, because the concept of a structure-specified system does not include any notion of goal or problem-solving, these notions are artifices of a description relative to a reference defined by the observer that makes the description when he (the observer) chooses not to consider the origin of the structures that make possible the observed behaviour.

### Our proposal

In these circumstances, being our problem the generation of intelligent behaviour, we propose the following.

(i) That the processes that generate intelligent behaviour are those that participate in the establishment of a domain of ontogenic structural coupling between interacting organisms (consensual domain) or between an organism and its medium of interactions (ontogenic adaptation), and those that participate in the operation of the involved organisms within such a domain of structural coupling.

(ii) That for an observer, a domain of ontogenic structural coupling of an organism appears as a domain of behaviour that includes conducts acquired by the organism through its interactions with other organisms, with itself, or with its non-living medium, which he may describe as a domain of coordinated interlocked interactions that result from dynamically congruent structures that allow for reciprocal sequential triggering. The biological significance of

these interlocked modes of conduct, that is, their operative effectiveness in the realization of the individual life histories (individual autopoiesis) of the participating living systems, arises in the process of establishment of the ontogenic structural coupling, as a result of the selective reference established by the necessary invariance of the autopoiesis of the participating organism.

(iii) That the biological phenomenon that an observer connotes when speaking of intelligence takes place when an organism establishes a domain of ontogenic structural coupling with other organisms or with its medium, or operates, during its interactions, within a previously established one. We propose, therefore, that the word 'intelligence' makes a connotative reference to this phenomenon which is itself not directly observable and which results from a history of interactions of the organisms and which appears revealed in their structural couplings. We also propose that all that is observable in relation to intelligence are instances of consensuality or of ontogenic adaptation in the form of intelligent behaviour, and we propose that the behaviour of an organism which entails the establishment of, the expansion of, or the operation within a domain of ontogenic structural coupling already established, is that to which we refer to when speaking of intelligent behaviour.

### **General implications**

We want to make explicit the following general implications.

(1) Intelligent behaviour is necessarily always contextual, and the context is defined by the consensual domain, or the domain of ontogenic adaptation, in which it takes place.

(2) Any attempt (by an observer) to measure intelligence in an organism would necessarily result in an estimation of the extent of its participation in the domain of consensus, or in the domain of ontogenic adaptation, that he specifies by accepting or refusing its observed conduct as a case of intelligent behaviour.

(3) Anything that an observer may say about the heritability of intelligence is necessarily a function of what he may say about the heritability of the plastic structures that participate in the structural coupling of the organisms, and which, hence, determine in them the possibility that they may establish consensual domains or domains of ontogenic adaptations, and that they may operate within these.

(4) All the cases in which the word intelligence or its derivatives are used in ordinary daily life in our present western cultural tradition, refer to situations that actually involve the establishment of a domain of ontogenic structural coupling or the operation within such a domain.

(5) All systems that may undergo ontogenic structural coupling are capable of intelligent behaviour. Any restriction of the use of the word intelligence and related ones to a subset of these systems, is justified only by human art.

### **Particular implications**

We want to make explicit the following implications with respect to the identification and measurability of intelligence in man.

(1) If the word intelligence makes connotative reference to the processes through which interacting organisms establish consensual domains or domains of ontogenic adaptation, and operate within them, then one can say that the

phenomenon of intelligence takes place as an expression of the anatomical and physiological plastic structures that make possible for each organism its participation in the establishment of, and in the operation within, ontogenic domains of structural coupling in general. One can also then refer to these plastic structures as defining for each organism a general capacity for establishing domains of ontogenic structural coupling, regardless of whether such general capacity is measurable or not. Also, in these circumstances it would be biologically legitimate to expect individual observable differences in this general capacity among the members of any given population as a result of their individual structural differences. Yet, the phenomenon socially denoted by the word intelligence only arises in the interactions, and cannot be assumed to be the expression of some property of the individual organisms attached to some unique plastic structure in them, because the plastic structures of the organism that participate in the phenomenon of structural coupling do so only in a contingent manner while constitutively involved in the structural dynamics of the realization of the organism as a living (autopoietic) system. The phenomenon of intelligence arises in the interactions of living systems, through their living, in the process of their living.

(2) It should be obvious that any attempt to measure intelligence in man would necessarily be dependent of culture. Not only because culture is the network of consensual domains in which a man exists as a social organism, but also because the culture in which a man exists defines the context in which he becomes an intelligent human being by participating in culturally specified consensual domains and domains of ontogenic adaptations. Therefore, since the phenomenon of intelligence cannot be directly observed, any procedure designed to measure intelligence in man will necessarily fail and result only in an estimation of the frequency of intelligent behaviour of the subject in a particular domain of the culture. It will determine the extent to which the subject has developed consensuality in that culture, but it will not measure the extent to which he is able to participate in ontogenic structural coupling in general. In order to measure the latter, it would be necessary to explore all the possible consensual domains and domains of ontogenic adaptations in which the subject can participate, or else, it would be necessary to determine the domain of applicability of the processes that participate in the generation of any ontogenic structural coupling by the subject. Furthermore, the cultural domain in which any suitable procedure would estimate the frequency of intelligent behaviour by a given subject is necessarily determined by the structure of the procedure itself, and hence, explicitly or implicitly, the cultural domain for such a determination is chosen by the observer who selects or designs the procedure itself, and hence, explicitly or implicitly, the cultural domain for such a determination is chosen by the observer who selects or designs the procedure in use. It follows that, necessarily, any attempt to measure intelligence in man will result, foremost, in an estimation of the degree of acceptance, participation and adaptation of the subject to the culture specified by the measurement procedure, if no deception by the subject is involved. Moreover, the degree of acceptance, participation and adaptation (use of) to the cultural system in which he is immersed by any individual human being, also depends on factors such as socio-economic discriminations, social privileges, emotions and desires which may interfere or facilitate his involvement



in any particular consensual domain or domain of ontogenic adaptation, altering or without altering his ability to participate in others. Therefore, any particular estimation of the frequency of intelligent behaviour exhibited by a given subject will necessarily be an estimation of the subject's particular realization of a domain of intelligent behaviour after a particular history of socio-economic and emotional circumstances, and not an estimation of his general capacity for consensuality and ontogenic adaptation. Also, since the socio-economic position of an individual depends greatly on historical circumstances which are determined through socio-economic concessions by other individuals of the society to which he belongs, but which do not necessarily reflect the social recognition of his capacity for consensuality or ontogenic adaptation, the socio-economic position of an individual (social success) cannot be deemed as a necessary expression of the magnitude of his intelligence. As a consequence, to advocate the validity of one particular procedure which estimates the extent to which an individual has intelligent behaviour in one particular culture as the procedure which properly measures intelligence, is not only to advocate an error, but it is also to advocate one particular culture as the valid culture.

(3) It is apparent that to the extent to which intelligence results when a consensual domain or domain of ontogenic adaptation is established by interacting organisms, and hence, is a class of relations that take place between organisms in their history of interactions, one cannot speak about the heritability of intelligence. However, one can view the heritability of the capacity for intelligent behaviour as a function of the heritability of the structures of the organism (in the nervous system and in the rest of the body) that determine and participate in the establishment of ontogenic structural couplings. That this should be the case is in no way peculiar to the phenomenon of intelligence. As every biologist knows, there is no heritability of conduct but there is heritability of the structures that determine the morphogenic relations which, given the proper history of interactions of the organism, lead to the ontogenic establishment (in the organism) of the structures that make possible for it to realize a given conduct as a given dynamics of states in a given environment. In other words, natural selection acts upon behaviour through the selection that takes place via effective behaviour of the structures that make possible the realization of those conducts which result in a reproductive advantage for the organisms involved. For these reasons the occurrence of intelligence in an animal species would be favoured by natural selection only if natural selection favoured the establishment of domains of ontogenic structural couplings in general by the members of the species, and not if it favoured the stabilization of a particular collection of cultural conducts that they may have developed. If the latter were the case, then a particular collection of originally cultural conducts could become a genetically stabilized collection of stereotyped (ritualistic) behaviours, through the positive selection of those structures that more easily led to their establishment in the ontogenic history of the members of the species. This would be negative selection for intelligence, since a genetically stabilized ritual behaviour is not intelligent behaviour because it does not result from an ontogenic structural coupling.

Cultures, in general, tend to suppress the establishment of those consensual domains or domains of ontogenic adaptations that threaten their stability,

and to facilitate those modes of conduct that enhance it, and thus tend to restrict intelligent behaviour. Therefore, a given culture may indeed become a domain of negative selection of intelligence if the behavioural restrictions that it entails become sufficiently systematic in determining the possible experiences and the accepted modes of conduct of its members, giving reproductive advantages to those individuals who acquire and maintain unchanged the culturally stipulated proper modes of conduct more easily than others. If this were the case, the result would be the systematic selection of particular behavioural abilities and the general stabilization of the structures which make them possible. Contrarywise, any culture that favours the establishment of domains of ontogenic structural coupling in general, and not of any one in particular, may constitute a habitat that favours the positive selection of intelligence.

(4) The genetic endowment of an organism may have one expression or another according to the historical circumstances under which its ontogeny takes place, but what usually occurs is that the circumstances of ontogeny are recursively determined by ontogeny itself in a standard manner for the members of the same species. Therefore, since the structure of the organism in general, and of its nervous system in particular, are plastically specified during the life of each organism along its ontogeny through a dynamics of selective interactions between the organism and its medium, it would not be legitimate to consider intelligence as a biological phenomenon of simple genetic or environmental determination. Furthermore, since intelligent behaviour is the expression of the repetitive and recursive application of the operations that lead to the establishment of a consensual domain or of a domain of ontogenic adaptation, and since these operations are independent of the circumstances of their application, the genetic dependence of the structures which make these operations possible will be apparent only when there are no ontogenic (environmental or genetic) interferences, either with the establishment of these structures or with the application of their operation. In these circumstances, to the extent that the detailed operation of the structural coupling during ontogeny is not known, it is not yet possible to determine those conditions that interfere with the establishment of the structures that permit it, nor when those conditions are changed as a result of cultural or genetic change. So, it is not properly known to what extent a family, a socio-economic class, or the society at large provide similar or different environmental conditions for the development of the structures that permit in any particular case the establishment of a consensual domain. Also, it is not well known to what extent interferences, which are not as extreme as malnutrition or language deprivation, with the participation of a growing child in the dominant consensual domains of the society in which he grows, so that he becomes socially maladapted according to the accepted standards of the society, result in an impairment of his structural development that interferes with his general ability to establish domains of ontogenic structural couplings. Consequently, although it is obvious that for any organism intelligence is a function of its genetic constitution, to talk about the heritability of intelligence is not only phenomenally meaningless, but it is also a semantic trap leading to the false belief that hierarchies established through differences in intelligent behaviour are biologically founded. From all that we have said it should be

apparent that the latter cannot be seriously considered to be the case. At most, one could talk about the heritability of the structures which make intelligent behaviour possible, but one cannot do this at present because these structures and their heritability are unknown.

To the extent that human evolution has been bound to the evolution of consensuality and ontogenic adaptability, through the evolution of language (consensuality) coupled to the evolution of the ability to manipulate the medium (ontogenic adaptability) and as long as these continue being central human features, all human races can be expected to be similarly submitted to the fundamental ecological selection for consensuality and ontogenic adaptability typical of human evolution, and hence, to constitute human populations whose members have comparable genetic variabilities in the structures responsible for their intelligent behaviour. If this is the case, one can then expect that most differences in the distribution of intelligent behaviour observable in different populations should be the result of a cultural bias introduced by the observation procedure.

(5) In any attempt to measure intelligence, all that one can do is to try to make an estimation of the frequency of intelligent behaviour of a given subject in a given consensual domain or in a given domain of ontogenic adaptation, and express this estimation either as an index of individual performances relative to an arbitrary standard scale of reference, or as an index of comparative performances relative to the distribution of instances of intelligent behaviour in a population.

(6) It is apparent that point (2) in this section applies to IQ measurements, and, therefore, that an IQ test measures the degree of cultural adaptation of a given subject regardless of what the observer may infer from it about the subjects' capacity for consensuality or ontogenic adaptation. Hence, any cross-cultural application of IQ measurements is necessarily culturally biased in a manner that cannot be corrected by any statistical method because the cultural bias does not depend on the sample or sampling procedure. In this case the cultural bias depends strictly on culture, that is, it depends strictly on the ethical validation of the cultural equivalences implicitly (or explicitly) assumed by the observer in his decision of applying cross-culturally an IQ test designed for one of the involved cultures only.

All cultures are biologically equivalent as well as biologically and culturally self-contained because they all provide operationally independent (though not necessarily isolated) biological and cultural media for the individual realization of its members. History shows that this is always the case, and that he who does not comply with the demands of his culture either becomes antisocial and is eliminated by forceful destruction or exclusion (social criticism, prison, banishment), or else he may become socially acceptable as a social innovator after his disturbing influences have resulted in social change. Yet, to the extent that all cultures are biologically equivalent, cultural values (that is, values in general) have no other reference for validity than the *cultural consensus* to which they belong. Therefore, no cross-cultural equivalences of intelligent behaviour can be established through the application of a test designed for one culture without implying an ethical bias in the validation of the equivalences, and, hence, without implying in a metadomain a decision that specifies one culture as a preferential reference system for the evaluation

of the cross-cultural measurements. Consequently, although the cross-cultural application of IQ tests is irrelevant to the question of intelligence, it is highly relevant and revealing in the social and political domains because it always entails an ethical choice made by the observer. However, if one insists in making some cross-cultural comparison with respect to intelligent behaviour, the best that one could do would be to design a specific test for intelligent behaviour distribution for each culture, and consider the relative position of each individual in his own culture as an expression of his cultural adaptation. If this were done, one could then say that subject A in culture  $\alpha$  and subject B in culture  $\beta$ , are either similarly or differently adapted to the culture to which they have been assigned by the test procedure.

### Conclusions

The following are some of our conclusions.

(1) Although one can make connotative references to intelligence as a phenomenon resulting from the operation of the processes that participate in ontogenic structural coupling, intelligence as a configuration of relations between processes occurring in the structural coupling is not measurable and not directly observable. In fact, intelligence is realized as a phenomenon only through particular instances of consensuality or ontogenic adaptation in the form of cases of intelligent behaviour, which are all that can be observed.

(2) Intelligent behaviour as an instance of consensuality or as an instance of ontogenic adaptation has no magnitude; either there is intelligent behaviour in a given domain of structural coupling or there is not. Therefore, as it occurs with intelligence, intelligent behaviour is not measurable. All that an observer can do in quantitative terms is to estimate the use which a given subject makes of a consensual domain or of a domain of ontogenic adaptation that he, the observer, defines by specifying a subdomain of it by means of a test procedure, and thus, to obtain an estimation of the actual consensuality existing between himself and the subject in the domain of his stipulation. This is what the IQ test does.

(3) The IQ index only reflects the relative position of the tested subjects according to a rating defined by the observer in relation to each subject's use of a collection of stipulated modes of behaviour proper to a consensual domain or to a domain of ontogenic adaptation of the observer's choice. Therefore, although IQ indices necessarily imply consensuality or ontogenic adaptation, and the subjects can be listed in a performance series according to them, they are not measurements of intelligence or of the intrinsic capacity for ontogenic structural couplings of the subjects.

(4) No racial, social or educational discrimination can be justified under the argument of the heritability of racial or social class differences in intelligence or intelligent behaviour.

(5) Social success cannot be considered as an expression of the greater intelligence of the successful person with respect to the less successful ones, because social success depends on the consensual concession of power by others regardless of the intrinsic consensual capacity of the subject.

(6) Any attempt to make cross-cultural assessments of intelligent behaviour entails the choice by the observer of a value system as a reference value system

for specifying the cultural equivalences that he will necessarily impose in the assessment.

This is so because any assessment of the capacity for ontogenic structural coupling in a subject requires that the observer and the subject should operate in the same consensual domain.

In consequence any cross cultural assessment of intelligent behaviour is necessarily biased by the desires or preferences of the observer.

(7) All sentences presented at the beginning reflect cases of operation in some domain of ontogenic structural coupling, or constitute references to their establishment. In this sense the treatment of the question 'What is intelligence?' offered in this article adequately accounts for the phenomena connoted by the current uses of the words intelligence or intelligent. At the same time, this treatment reveals that frequently these words are used in a manner that obscures the actual phenomenon of intelligent behaviour by treating it as the expression of some particular property of the individuals and not as a feature of the interactions in which these participate. This concealment of the phenomenon of intelligence as it takes place in the actual operation of the organisms is of no consequence as long as one does not ask the question 'What is intelligence?', or one does not attempt to pursue the social implications of assuming that the word intelligence refers to a discrete individual property.

#### **An ethical remark**

The stability of a society as a particular social system distinguishable by a particular configuration of consensual (social) relations between its component human beings, necessarily depends on the stability of the domains of behaviour of its individual members. Therefore, the social restrictions of conduct which reduce original (for that society, extravagant) behaviour, specifically those restrictions that reduce to a minimum the intelligent behaviours that define new dimensions in the social relations, are desirable from the point of view of the stability of the social relations that characterize any particular society. This is clearly expressed in Aldous Huxley's *Brave New World* where those individuals capable of intelligent behaviour (the Alphas) who conceived new social relations or institutions through the establishment of new domains of ontogenic structural coupling, had to be excluded and sent to the 'Island'. In fact, a human society which is efficient in discriminating and restricting human behaviour in the domain of intelligence, as every totalitarian system attempts to be, is a society more stable than one less efficiently restrictive. In other words, the institutions and social relations that define such a society as a particular social system remain invariant for a longer period than the institutions and social relations which characterize a society that more readily accepts new modes of behaviour (novel ontogenic structural couplings) and does not eliminate innovators. In a restrictive society intelligent behaviour is a social threat that must be neutralized either through its elimination, or through the rigid stipulation of the permitted modes of conduct which define a domain of behavioural variability within which the society as a social system can compensate (and absorb without change) its disturbing influences. For these reasons, if one does not want to live in a society that justifies social, political, cultural or economic discrimination and abuse with false notions of scientific truth, respect for mankind, social wellbeing, national superiority

or flag veneration, then one must continuously contribute to create a society defined by nondiscriminatory and nonhierarchical relations and institutions in a domain of social interactions which accepts intelligent behaviour. The society that a person contributes to create with his conduct is his undeniable exclusive responsibility, and any attempt to justify discrimination or abuse by any reason (falsely) founded on science, biology, or on any system of transcendental notions, reveals the conscious or unconscious choice of discrimination and abuse as legitimate modes of social interactions by the person who proposes such a justification.

### References

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