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MANUSCRIPT submissions should be sent electronically (in MSWord or Rich Text File format) to each of the editors: Karl-Heinz Simon (simon@usf.uni-kassel.de), Barry Gibson (B.J.Gibson@sheffield.ac.uk) and Juan Aguado (jmaguado@um.es). In general, please follow the Chicago Manuel of Style; citations and bibliography should follow the current journal style (APA). Normally, articles should be original texts of no more than 6000 words, although longer articles will be considered in exceptional circumstances. The Journal looks for submissions that are innovative and apply principles of General Systems Theory and Cybernetics to the social sciences, broadly conceived.

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SOCIOCYBERNETICS traces its intellectual roots to the rise of a panoply of new approaches to scientific inquiry beginning in the 1940's. These included General System Theory, cybernetics and information theory, game theory and automata, net, set, graph and compartment theories, and decision and queuing theory conceived as strategies in one way or another appropriate to the study of organized complexity. Although today the Research Committee casts a wide net in terms of appropriate subject matters, pertinent theoretical frameworks and applicable methodologies, the range of approaches deployed by scholars associated with RC51 reflect the maturation of these developments. Here we find, again, GST and first- and second-order cybernetics; in addition, there is widespread sensitivity to the issues raised by "complexity studies," especially in work conceptualizing systems as self-organizing, autcatalytic or autopoietic. "System theory", in the form given it by Niklas Luhmann, and world-systems analysis are also prominently represented within the ranks of RC51.

The institutionalization of sociocybernetic approaches in what was to become RC51, the Research Committee on Sociocybernetics of the International Sociological Association, began in 1980 with the founding of an ISA Ad Hoc Group and proceeded with the organization of sessions at succeeding quadrennial World Congresses of Sociology. The eventual RC51 became a Thematic Group and then a Working Group. Finally, in recognition of its extraordinary success (growing from some 30 members in early 1995 to 240 in 1998), the group was promoted to the status of Research Committee at the 1998 World Congress of Sociology in Montreal.

Over these past two decades, sociocybernetics has attracted a broad range of scholars whose departmental affiliations represent the entire spectrum of the disciplines, from the humanities and the social sciences through the sciences, mathematics and engineering. Furthermore, the many countries of origin of these RC51 members attest to the wide international appeal of sociocybernetic approaches. Within this highly diverse community, there is wide agreement on some very general issues, for instance, on developing strategies for the study of human reality that avoid reification, are cognizant of the pitfalls of reductionism and dualism, and generally eschew linear or homeostatic models. Not surprisingly, however, there are also wide divergences in subject matter, theoretical frameworks and methodological practices.

Many have argued that models developed for the study of complexity can be usefully appropriated for the study of human reality. Moreover, however, the emphasis in complexity studies on contingency, context-dependency, multiple, overlapping temporal and spatial frameworks, and deterministic but unpredictable systems displaying an arrow-of-time suggest that the dividing line between the sciences and the historical social sciences is fuzzier than many might like to think. What is more, in the humanities, the uniquely modern concepts of original object and autonomous human creator have come under serious attack. The coincidence of these two phenomena substantiate the impression that across the disciplines there may be observed a new concern for spatial-temporal wholes constituted at once of relational structures and the phenomenological time of their reproduction and change.

In this context of rich history and exciting possibilities, the Research Committee on Sociocybernetics of the International Sociological Association extends an open invitation through the Journal of Sociocybernetics to all engaged in the common quest to explain and understand social reality holistically and self-reflexively without forsaking a concern for human values--human values not construed simply as a matter of individual ethics, but conceived as an integral part of a social science for our time.
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NOTES FROM THE EDITORS

The current edition of JOS comprises contributions to sociocybernetics in an impressively broad range of themes and approaches. The paper on A/D-converters by FK Kroenig deal with the concept of structural couplings, a concept introduced in social systems theory to thematise interrelationships in a way compatible with ideas of autonomous systems. In the paper by B Scott, which discusses aspects of higher education aiming at sustainability challenges, the potential of the “two cybernetics” (first and second order) for providing commonly agreeable concepts and values in searching for a sustainable future is analysed. Then, in a Methodology Section, a contribution by J van der Zouwen, S Draisma and JH Smit is published which deals with a special chapter in empirical social research: the problem of question characteristics and their influence on response quality. A book review by J.H.G. Klabbers discusses in depth and on the basis of a sound methodological overview a recent contribution to Cybersemiotics by S Brier.

The paper by E Nissan has a part I in JOS (1) (2008) as a basis. The concept of episodic formulae is used to analyse the case of stigmatization of people in an urban society at the end of the 19th century.

In issue 2 (2009) of JOS selected contributions to the 2009 International Conference on Sociocybernetics in Urbino/Italy are published. The guest editors Fabio Giglietto and Luca Rossi bring together papers centered on new developments in communication technology and internet applications.
A/D-Converters of social systems.

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Abstract. The general answer to the question of how operationally closed social systems relate to each other is the concept of structural coupling. This cognitive opening under the condition of operative closure is described as an order-from-noise process – or as one could say: as a miracle. This paper makes the proposition that social systems can apply analogue-digital converters in order to transform environmental irritation (analogue) into binary coded system-internal operation (digital). The instrument of this A/D-conversion is described as a metaphorical de-paradoxization process which facilitates the productive mistake of connecting to the unconnectable.

As an example of such an A/D-conversion by generative metaphorization this paper takes the quality concept of the educational system. The metaphor of quality manages to integrate the economic coding into educational operation by invisibilizing and de-paradoxizing the confrontation of two each other excluding codes.

I. Methodological annotation:
Chances and problems of system comparison

System comparison is a creative, productive, but also risky kind of heuristic instrument – an instrument the German sociologist Niklas Luhmann mastered perfectly and used widely. All that is known about a certain type of system, this is the guiding observation, is likely to play a role in all other kinds of systems. Taking the apparent differences between social, psychic, organic and neuronal systems into account, the first step must be a generalization of the system properties in question in order to respecify the abstract structures in application to other systems (cf. Luhmann 1995: 14). This “(theoretically directed) conceptual abstraction” (Luhmann 1995: 2) – works easily in the case of the systems theory’s functionalist approach. One does not have to find real or objective similarities between system structures, but one can ask for problems which systems share as systems, and one can then look for solutions for the same problems (functional equivalents). The hypothesis that different kinds of systems share the same kinds of problems is quite plausible when we take the lowest common denominator of all systems as a basis: We are dealing with systems which do not just have a boundary to their environment, but which maintain this boundary actively. This makes the environmental relation of these systems highly
problematic. The need to perpetuate their own boundary in every operation, to keep their boundary closed, seems to be incompatible with the need to actively adapt to their environment which affords a certain cognitive opening. This fact which is easily understandable in reference to organic systems – a cell depends on its membrane in order to distance itself from its environment, but is at the same time dependent on the permeability of the membrane (nutrition) – shall apply to social systems as well.

II. The key problem: operative closure and cognitive opening

The abstract conception of this problem is the compatibility of operational closure with cognitive opening. Operational closure is a concept on the verge to tautology: a system is co-extensive with its operations. It is where it operates. This distinguishes the system from its environment as the sphere where no operations of the system take place. When we consider that we are speaking of dynamic systems which define and produce their own boundary in every operation, it is clear that systems cannot operate out of themselves into their environment. This implies that there can be no blurred distinction, no indetermination in regard to the question whether certain operations belong to a certain system or not. The membrane does not partly belong to the environment, but completely to the system. There is no moment when the substances incorporated by an organic system (food) could be something third between environment and system: either the food is assimilated or not. That not yet metabolized stomach content (which appears to be inside – seen from outside) does not belong to the organic system, is contra intuitive only at the very first glance.

The same is true for thoughts as operations of psychic systems. Thoughts are – and must be – clearly separable from organic, neuronal and social operations. A confusion of psychic operations with social operations could be said to happen in case of severe mental illness. But if the psychic system did not differentiate most clearly between organic (bodily) or neuronal operations and its own operations, it could not function at all. Of course, systems are always solving this key problem. But how? The mere reference to the term of structural coupling of a system to its environment does not answer this question. Systems theoretical theory must show in detail which types of structural couplings are performing the cognitive opening of certain systems to certain environments.

III. Operative closure of social systems

Function systems of society are not clearly separated from each other in reference to the specific problem they try to solve (cf. Luhmann 1998: 748). There can always be indistinctions whether a certain communication focuses on political problems or for example on legal questions. There are many common self-descriptions of the political system which include the claim to solve any social problem. Today it is also often heard that economy could solve political problems (Milbradt 2004) and it is a common idea in the Romantic tradition that art solves religious problems providing transcendent meaning and immortal fame. If a system had no solution to this problem and could not clearly distinguish its own operations from communications of other systems, it would hardly have a chance to find connective operations (among all the others).

Systems solve this problem by the binary coding of their operations, which specifies the system operations in an unmistakable way. This coding into a positive and a negative value digitalizes communication so that there is a digital boundary between differently coded systems. For any system, communication is either in its own coding, which means connective and understandable, or it is outside, which means: disturbing: “coded events operate as information in the communication process, uncoded ones as disturbance (noise)” (Luhmann 1995: 142). Either communication focuses on the difference of true and false (science) or on the difference between legal and illegal (law system). There is no »as well as« or any other kind of third position between a system’s coding and other codings, respectively uncoded communication. Even under the condition of bodily presence (interaction system), which increases the connectability of communicative offers, one can easily see how this strict exclusion of other codes works. If there was a participant at a sociological conference who would argue with reference to his religious belief or who would raise the question whether a certain sociological theory would endanger the mental health of the researchers or who would make a confession regarding his political position, this communication would become excluded from the system (ignoration, no connection) or the complete system would break down (everybody would start contributing non-scientific communication). In some cases there can be uncertainties whether communication in an interaction system of the science system (conference) switches to pedagogic communication. This could be seen to happen when experienced scholars do not argue properly (scientific criteria), but rather teach their point of view to younger scholars. But: The system does not allow this uncertainty. The following communication determines whether the preceding one belongs to the science system or not. Either the young scholars keep on arguing scientifically or they leave the science system by pointing out the fact that there was an inappropriate communication which means switching to moral communication. However, from the viewpoint of a certain system, all other – this means: differently coded – communications are not informative for the system.

This does not mean that systems cannot observe the operations of other systems but it means that a system can only observe communicative events of other systems in its very own specifically coded observation mode. For example: the purchase of a work of art in an art gallery is not an economic operation in the system of art, but is a purely economic operation in the economic system. A work of art is then neither beautiful nor not-beautiful but just a good or a bad investment. And this economical observation cannot instruct or determine any art-specific and beauty-orientated operations.

IV. A/D-converters as devices for cognitive opening under the condition of operative closure

We have seen that social systems are operationally closed by the specificity of their binary coding. Communication which focuses on the guiding difference legal/illegal takes place in the legal system and nowhere else. Since all communication of a certain system works with the same binary difference, we can say that social systems operate digitally. The environment of each system is, in contrast, an analogous sphere. It makes no difference if there are communications in this environment which are digitally coded communications of another system or not-coded everyday talk. For the system, there can be no other-digitally-coded communication, since non-connectible digital communication is in fact analogous noise. When the code does not match, only an external observer can decide

3 It is most interesting that, from a semiotic perspective, one can observe a tendency to a digitalization of all communication. Bense (1969: 97) speaks of a “Zunahme der digitalen Redeweise”, whereas the “abbildende analoge Sprache” recedes.

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that this noise stems from differently coded information. Hence, the system/environment-distinguish – in other terms: the in/out-distinguish – can also be understood as a digital/analogue-distinguish.

We have seen that the compatibility problem of operational closure and cognitive opening is a – one could almost say: the – joint problem of psychic, organic, neuronal and social systems. What are the solutions the different kinds of systems have generated? When I said earlier that system comparison is a risky kind of heuristic instrument at the beginning of this paper, we are increasing this risk when we take especially diverse types of systems into the comparison. There are systems which solve the problem of cognitive opening under the condition of operational closure in a highly effective and easy way: Technical systems with their device of A/D-conversion. Whereas we know that our understanding and languaging operates analogously and digitally, we are far away from understanding how these two kinds of operationality relate to each other and how they can be translated or transformed into each other. All theories which deal with this question – namely the problem of categorization of cognition (cf. Rosch/Lloyd 1978) –, are highly complex and specific. A single prototype theory of understanding for example can hardly be applied to organic, neuronal or social systems. The transition from analogue noise to digital information appears rather to be a miracle which can be called emergence. The concept of emergence could be said to fulfill exactly the function of an “explanatory principle” (Bateson 2000: 38) answering a problematic question with a name instead of an explanation.

In case of technological systems, however, we know exactly how this transformation works: A/D-converters make productive – and in many cases acceptable – mistakes. A/D-converters identify elements of two incompatible domains by systematic ignorance of this paradox. When the output of a microphone is connected to a digital recorder, a certain analogue voltage change is identified with digital information. Since this paradoxical equation of an analogue input and a digital output leads to information which is regarded as useful, A/D-converters are widely used for cognitive opening of digital systems.

Such A/D-conversions are not only found in technological contexts, but also in language or human cognition in general. Every conceptualization of perception depends on A/D-conversions. A certain color, for example, is at first an analogue quality out of a continuum of colors, which can as such only be perceived but not comprehended. Linguistic expressions for color-perceptions are discontinuous elements, which reduce the rich and dense analogue medium of color into a highly restricted variety of digital differences (blue, green, yellow and so on). The – in principle (Eisenhardt et al. 1995: 105) – unavoidable loss of information in every digitalization can be linguistically moderated by using analogue modulators like »something between yellow and orange« or by reference back to the analogue sphere of perception: »blue like the Adriatic Sea on a sunny day«.

The fact that A/D-conversion is ubiquitous in human cognition must not allude the paradoxical structure of this process. Watzlawick/Beavin/Jackson (1967) speak of “very curious dilemmas” (66) in reference to the problem of translation from the digital to the analogic mode and vice versa. One must not forget that we speak of a translation of something that is, according to a certain coding, uninformative, into something that happens to be informative. Such a translation can be nothing but a mistake, or a productive misunder-

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4 “Whereas linear organization is generally predictable in its consequences, emergence is characterized by a nonlinear mode of organization that can generate nonobvious or surprising consequences” (Mihata 1997: 32).
standing. Productive because it makes information possible where otherwise there would have been only noise.

V. The generative metaphor as an A/D-converter

I will try to show that generative metaphors function as such productive mistakes which achieve the de-paradoxization of the impossible connection to unconnectable operations. Or in other words: the de-paradoxization of the inclusion of different, each other excluding codes. The generative metaphor, as described by the American sociologist Donald A. Schön (1993), is a cognitive instrument that is not bound to language, but is a general capacity of thought. Schön describes this kind of quasi-cognitive structure as the generative process of seeing-as. This means that the generative metaphor is not something observed, but something observing. When these metaphors see something as something else, this takes place in a reciprocal semantization process where two elements alter continuously by seeing themselves in the light of the other – synchronously altering – element. In cybernetic terms this is a non-linear process. If A is seen as B, and if the semantic effect of this seeing-as on A falls back on B, a feed-back loop has started:

The making of generative metaphor involves a developmental process. It has a life cycle. In the earlier stages of the life cycle, one notices or feels that A and B are similar, without being able to say similar with respect to what. Later on, one may come to be able to describe relations of elements present in a re-structured perception of both A and B which account for the preanalytic detection of similarity between A and B, that is, one can formulate an analogy between A and B. Later still, one may construct a general model for which a re-described A and a redescribed B can be identified as instances. To read the later model back onto the beginning of the process would be to engage in a kind of historical revisionism (Schön 1993: 142f.).

Schematically we can describe the generativ metaphor as a circular semantization process $\mathcal{C} \circ \mathcal{D}$ of two incompatible elements A and B, in which the paradox of the equation "A is B" becomes dynamized and invisibilized.

$$A \not\equiv B$$

In contrast to this metaphor concept, a classical substitution metaphor (Kurz 1982) like »man is a wolf« is just a linear predicate transfer. The substitution of predicates like »cruel« or »dangerous« by »wolf« is completely revertible and has no effect on the concept of »man« or »wolf« at all. Understanding the phrase »man is a wolf« as a generative metaphor would mean that the seeing-as of the man as a wolf changes the concept of man as well as the concept of wolf in a circular feed-back process. This would of course be a very unusual way of understanding this metaphor.

A better example for a generative metaphor is Schopenhauer’s »architecture is frozen music«. The notion of architecture changes when it is seen as »frozen music«, as well as the notion of music, which then becomes something like »architecture in motion«. It is important to see that these metaphors do not only fulfill the common falsity criterion, which can – with some problems – serve as a diagnostic criterion to identify metaphors (Beckmann 2001: 55). In the substitution view on metaphor the occurrence of a contradic-
tory statement points to the question whether it is just a wrong or a metaphorical statement. Generative metaphors are not just literally false statements which can be understood when the metaphorical term is substituted by the literal term. Of course architecture is not »frozen music« so that this equation is wrong. But when both concepts are re-interpreted by the seeing-as of each other as the other one in a circular process, the false identification, that would be paradox, is de-paradoxized in a circular semantization process. So the structure of the generative metaphor is that of a self-de-paradoxizing paradox. And this is on an abstract level that can be said to be an A/D-conversion.

VI. The A/D-converter of the educational system for economic noise

Obviously society is confronted with a huge quantity of economic communication (cf. Krönig 2007). The several function systems have two options for reaction to this circumstance: ignorance or cognitive opening. Both options are dangerous since a system can hardly afford to ignore its environment, especially such an – at least in quantitative measures – influential environment. One can speak of a »conservation of adaptation« which systems must maintain in order to be successful. This adaptation depends on information about the environment. But we have seen that systems cannot gather information from their environment, since this »gathering« would be the system’s operation and this operation is co-extensive with the systems, so that there is no environmental contact. The system can only take the environmental irritation, or noise, as information. One way to do this is the kind of A/D-conversion we are talking about. On the other hand this cognitive opening risks the system’s stability. A self-steering of a system in its environment on the basis of self-constructed information could be compared with blind-folded driving on the basis of imagination.

In the following I would like to pose the question how the educational system deals with this ubiquitous economic irritation. What kind of A/D-converter has the educational system formed in order to guarantee a certain cognitive opening to economy. First, we have to differentiate the educational communication from the economic one. We follow one of Niklas Luhmann’s proposals that educational communication is coded by the digital opposition »better learning/worse learning«. Only when communication focuses on this guiding distinction do we talk of educational communication. The economic communication which focuses on the difference of efficiency/inefficiency ⁵ is of course not connectible to this digital code. An A/D-conversion must be a transformation of the economic code into the educational coding.

It seems that the educational system has found a powerful device for such a connection to the unconnectable: The generative metaphor of quality manages to deparadoxize the paradox »better learning is efficient«.

better learning$\neq$»efficient«

quality

⁵ Luhmann speaks of payment/non-payment, but he points out that payments “always require a counter movement, transferring goods, services, or other monetary variables” (Luhmann 1995: 462). So our proposition of efficient/inefficiency seems to respect this important fact better. Though payments are the operations of the economic system, this does not mean that the coding must be payment/non-payment as well. Besides that, efficiency makes more sense as a preference value than payment, since payment as such must be regarded as neutral. Only in relation to the »what for« of payments, can payments be preferred or rejected to non-payments.
This can explain the development in the educational system which is often described as economization with terms like output orientation, functionalization, competition, result orientation and the inflationary boom of all kinds of tests and competitions of school and educational performance. It has become common to demand an as high educational output as possible in an as short education time as possible.

Every system is confronted with different and necessarily contradicting demands of other systems. Science wants the education of scientists, religion wants confessional education, politics demands responsible citizens – or at least active voters – and economy wants qualified human capital for small money. This has always been the case and will never change in a functional differentiated society. And similarly it has always been the case that the educational system could easily decline these demands in reference to its very own preference value which cannot be other than incompatible with all other systems’ preferences.

Now, the beginning of this development can be dated to the early 1990s, since when the educational system seems to have followed the demand of the economic system in trying to increase its performance in economical categories. Quality is the key concept which invisibilizes the paradoxical attempt to identify the educational with the educational preference. It is interesting that the locus for this development which is by the way extensively complained about in the educational system, is education itself. The metaphorical seeing-as of the educational as the economic is nothing but an autonomous (and effectively impossible) attempt of the educational system to connect itself to the economic system. When education modulates its own preference in this way, it does of course not operate in an economic way at all, but merely with the illusion of doing so. Though the self-economization of education must be seen as a paradox attempt which does not reach its goal, this development is far from being without consequences. The A/D-conversion of economic noise into educational information distances education from its own preference which is linked to the system’s function, so that this definitely endangers the system’s performance.

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7 Cf. Luhmann, 1997b: 27.
11 PISA, MARKUS, TIMMS, VERA, IGLU, DESI.
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The Role of Higher Education in Understanding and Achieving Sustainable Development: Lessons from Sociocybernetics

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Abstract: Throughout the world, educational, political and other social systems are in transition under the combined impact of ecological, demographic, cultural and technological changes. Arguably, there is a special role for Higher Education Institutions (HEIs), not only to accommodate themselves to these changes, but also to lead the way in understanding them, to help avoid or ameliorate the painful consequences of change and to contribute to the practical achievement of sustainable development. In order to move towards these goals, it is worthwhile, if not essential, for there to be a reappraisal of the roles and functioning of HEIs. This paper addresses these issues by first briefly summarising the developments that have led to the age of global information and the ‘great debates’ concerning ownership, poverty, literacy and sustainable development that have been engendered. It goes on to consider the special roles of HEIs in understanding what is happening and in promoting constructive action. It argues that is a particularly constructive role for the trans-disciplines (first and second order cybernetics, sociocybernetics). These latter can fruitfully be a source of order and simplicity amidst disorder and complexity, by providing a ‘lingua franca’, conceptual understandings and (hopefully) shared values. Particular reference is made to the conversation theory of Gordon Pask. Finally, there is a brief discussion of how developments in e-learning can contribute to ensuring a secure and sustainable future for all.

“Human history becomes more and more a race between education and catastrophe” (H G Wells, 1938).

“As civilised human beings, we are the inheritors, neither of an enquiry about ourselves and...
the world, nor of an accumulating body of information, but of a conversation, begun in the primeval forests and extended and made more articulate in the course of centuries. It is a conversation which goes on both in public and within each of ourselves.... Education, properly speaking, is an initiation into the skill and partnership of the conversation in which we learn to recognise the voices, to distinguish the proper occasions of utterance, and in which we acquire the intellectual and moral habits appropriate to conversation”, Michael Oakeshott (1962).


“A theory is a model, together with its interpretation”, Frank George (1973).

1. Higher education in the information age, setting the scene

A majority of informed opinion is now agreed that our world faces serious catastrophe from a number of sources: terrorism, weapons of mass destruction, population growth, global warming and other effects of industrialisation and pollution. Some argue that catastrophe is already here. Some go further suggesting it is already too late. Alongside the possible disaster scenarios run ongoing human problems of poverty and lack of opportunity for personal development. As many as two thirds of the world’s population live below the poverty line, while in developed countries adult literacy rates are above 90%. In other regions they are less than 50%, sometimes considerably less.

It is also increasingly recognised that security and sustainability go hand in hand. World security calls for the existence of robust, stable democracies. Literacy and basic education are essential ingredients here. A culture that has access to a written knowledge and cultural heritage, including a range of dissenting voices, is far less vulnerable to the one-sided extremism of demagogues who promote other than peaceful, democratic forms of governance. UNESCO, e.g., reports that a key ingredient of sustainable economic development is a ‘within state’ system of higher education.²

According to many commentators, we are now in a post industrial information age, an age in which we have grasped the concept of sustainable development but seem to slip further and further away from its being achieved. Sharing information one with another is called ‘communication’. Communication affords prediction and control. It took the genius of Norbert Wiener (1948, 1954) to recognise the ubiquity, the universality of processes of control and communication throughout the man-made and natural worlds. He (and others) recognised it was possible, in principle, to automate most if not all of the functions of control and communication being carried out by humans in industrial processes. It is but a short intellectual step to move from the idea of the automation of the industrial processes to consider the implications of being able to ‘automate’ much of what happens within the educational systems.

Visionaries of the information age have predicted and anticipated these developments over several decades, (Vannebar Bush, 1945; Gordon Pask, 1975; Ted Nelson, 1990). H G Wells in the 1930s predicted the coming ‘World Brain’, an electronic repository for all human knowledge, available to support the education of all humanity (Wells, 1938). Aldous Huxley and others were warning of ecological disasters as early as the 1940s (Huxley, 1946). Vannebar Bush in the 1940s developed the concept of vast electronic archives through which scholars would lay down ‘personal trails’ (Bush, 1945). In the 1970s, Gordon Pask and colleagues designed prototype learning environment which Pask characterised as ‘vehicles for driving through knowledge’ (Pask, 1975; Pask and Scott, 1973).

Also in the 1970s, Heinz von Foerster and colleagues proposed the construction of ‘an individual/society cognitive interface’ to support education and democratic processes (von Foerster et al, 1972).

Over his lifetime, R. Buckminster Fuller wrote critically about the problems of ‘planet earth’ and proposed many solutions. ‘For the first time in history it is now possible to take care of everybody at a higher standard of living than any have ever known. Only ten years ago the ‘more with less’ technology reached the point where this could be done. All humanity now has the option to become enduringly successful.’ (Fuller, 1980). Sadly, this option has not been taken.

From the 1970s and onwards, Ted Nelson, inventor of the term ‘hypertext’, developed Project Xanadu, a global document archiving and retrieval system (Nelson, 1990). In terms of implementation, he was beaten to the punch by Tim Berners-Lee with the invention of the world-wide web in 1989 (Berners-Lee, 2000).

Full, global internet connectivity is still coming into being. In HEIs there is a slow but discernible shift, a change of culture away from traditional teaching methods towards the increased use of resource based learning and social networking tools that support collaborative learning. When supported by information and communication technologies, these new ways of conducting learning and teaching are referred to as ‘e-learning’ (aka ‘technology-enhanced learning’ or TEL).

2. Current ‘great debates’ concerning HEIs in the information age

My reasons for addressing this topic are fairly straightforward. I have longstanding intellectual interests in systems and cybernetics. I am also an e-learning practitioner and educational technologist. As a sociocybernetition, I am obliged, by the tenets of the discipline to address global issues holistically (Scott, 1998; Scott, 2002) As an educational technologist, I wish to apply my knowledge and skills to a broader set of questions than those I routinely address in the context of my day-to-day employment in higher education.
I am pleased to note that mine is not the only voice concerned with this topic. David Hawkridge, Professor Emeritus in the UK Open University’s Institute for Educational Technology, has written of the great debates it behoves us to engage in concerning the effects of the “globalisation, electronification and commodification” of education and how they may or may not contribute to “domination or liberation” in developing countries (Hawkridge, 1995).

Some of the current great debates within and about HEIs include the following.

Is the distinction between traditional forms of higher education and distance learning breaking down? To some extent the answer is affirmative. The use of learning technologies to enhance the learning, both inside or outside the classroom or laboratory, is now quite ubiquitous. In recent years’ the term ‘blended learning’ has come into vogue to refer to the many ways in which different ways of delivering learning experiences may be combined.

Is there a call for one or more global world university systems?

As steps towards this latter, or as part of this larger framing of educational systems on a trans-national scene, should there be more cohesion amongst educational institutions at state and nation state levels, with for example, universal transferability of credits and shared curricular structure? The ‘Bologna Process’, initiated in 1999 continues to make progress in pursuing this aim.³

The overarching aim of the Bologna Process is to create a European Higher Education Area (EHEA) based on international cooperation and academic exchange that is attractive to European students and staff as well as to students and staff from other parts of the world.

The envisaged European Higher Education Area will

• facilitate mobility of students, graduates and higher education staff;
• prepare students for their future careers and for life as active citizens in democratic societies, and support their personal development;
• offer broad access to high-quality higher education, based on democratic principles and academic freedom.

The Bologna Process is named after the Bologna Declaration, which was signed in the Italian city of Bologna on 19 June 1999 by ministers in charge of higher education from 29 European countries. Today, the Process unites 47 countries - all party to the European Cultural Convention and committed to the goals of the European Higher Education Area. An important characteristic of the Bologna Process - and key to its success - is that it also involves European Commission, Council of Europe and UNESCO-CEPES, as well as representatives of higher education institutions, students, staff, employers and quality assurance agencies.

A google search will show that many individual institutions now include ‘global university’ in their titles. In 2006, the World Economic Forum initiated a community of leading university presidents, the Global University Leaders Forum (GULF).⁴ In doing so, the Forum pursued three main objectives:

Develop a global community of university leaders

Foster collaborations among top universities in areas of significance for global policy

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Shape the agenda of the World Economic Forum

The GULF^\textsuperscript{5} community now includes 25 heads of universities from 9 different countries, currently representing the premier university leaders’ forum in the world.

In a review of a text on e-learning, Anthony Smith, President of Magdalen College, Oxford, notes that the university is “an institution through which society forms itself” and bemoans the fact that the authors of the book under review do not address fundamental questions about the purposes of education and the role of the university in particular (Smith, 1999).

3. The global perspective

At the trans-national level the great debates about the future of higher education inevitably overlap with other great debates, such as how to address world poverty and the need for sustainable development. Associated with the problem of world poverty, there is the problem of world literacy levels. When as many as 80% of the world’s population cannot read or write, how are educational opportunities to be delivered?

What is the role for HEIs and a (possible) virtual, global university in all this? There are then at least two main ways in which the internet may be expected to play a significant role.

(i) It may serve as the key medium for delivering quality information and educational materials to the parts of the world where it is most needed.

(ii) It may provide the forum and the many sub-forums for planetary conversation to take place, a medium for supporting political debate locally, nationally, and internationally.

Debates about poverty, literacy, sustainable development and the impact and relevance of the new technologies inevitably encounter a number of issues which are traditionally grouped together under the heading of ‘politics’. The political question is essentially the question of who is in control. Where does power lie, and who is exercising it? What is the realpolitik determining how new technologies are to be deployed? Viewing the world community as a whole, tied together by communicative and economic exchanges, there are a number of major players and stakeholders with a multiplicity of goals and operative agendas. Sociocybernetics tells us developments are multiply caused, the outcome of complex material and symbolic interactions.

4. The concept of sustainable development

The concept of sustainable development is not well defined. Rather than denoting well understood and agreed scientific, technical criteria the term appears to serve as a useful way of referring to overlapping and possibly contradictory sets of aspirations.

The term itself embodies contradictions: development implies change; sustainability implies conservation of some sort. Sometimes what is to be sustained is set against a world of limited resources, sometimes what is sustained is set against systemic damage to ecosystems or the biosphere as a whole. It seems that either of these may lead to direct conflicts between aspirations for improved standards of living (for example supplying drinking water or electricity) or aspirations concerned with conserving resources or limiting the damage to particular ecologies.

^5 The World Economic Forum is an independent international organization committed to improving the state of the world by engaging leaders in partnerships to shape global, regional and industry agendas.

One thing that is generally agreed is that any agreements about what is meant by sustainable development should include aspirations and criteria concerning social justice. This immediately places discussion and debate about scientific and technical issues within the larger context of discussion and debate about values. I shall use the traditional social science term ‘attitudes’ to refer to this juxtaposition of scientific knowledge, theory and belief with questions of value.

5. Lessons from sociocybernetics

What might a concerned member of the HE community hope to do in the face of this seemingly impossible to predict or control complex unfolding of events? What indeed does it mean to be a ‘person’, a member of a community?

To help answer these questions, we can use some formal concepts from cybernetics. Three are focused on: information, requisite variety and self-organisation. Although well understood by Wiener and others in the cybernetic community they are perhaps most clearly expressed as general principles in the writings of W Ross Ashby (1956).

Ashby points out that for any complex system, whose range of possible behaviours is not yet exhausted (or, in equivalent terms, whose subsystems are not yet fully coupled) and that is subject to a constraint (any ‘lawful’ or regular occurrence that has the power to affect the system), then that system will become ‘informed-of’ that constraint.

The second cybernetic concept we need expresses the idea that a control device needs both to be in receipt of sufficient relevant information about the state of the controlled system and must also have available to it a sufficient range of possible behaviours with which to affect the controlled system. Ashby expresses this theorem as a general law of cybernetics, the law of requisite variety, expressed tersely in the aphorism, “Only variety can control variety.” In the limit, failure of the system to become fully informed about a constraint that is affecting its repertoire of behaviours, is that the system dies. It ceases to be a system.

This then is our challenge. If we are to achieve sustainable development and avoid environmental or other global disasters, we must do all we can to ensure the behaviours of the systems that make up our natural world and social worlds remain within ranges which are controllable.

The third cybernetic concept we need is self-organisation, which serves as a bridge between the first-order study of observed systems and the second-order study of observing system. As von Foerster (1993) notes, an observer may enter the space of his own descriptions and contemplate his status as a self-organising, self-observing system and address the question of what it is to be a ‘person’.

As the limits of our continued sustained development and existence are approached we may hope to be more informed of, to have a better of understanding of those limits. This gives us the opportunity to consciously adapt, to share amongst ourselves understandings of what is happening and what it is necessary for us to do to avoid disaster. In Ashby’s terms, there is a need to ‘amplify intelligence’, to improve the second order, self-organising processes of ‘controlling control’, of ‘regulating regulation’.

HEIs have a role to play in amplifying intelligence, understanding and awareness. Here the internet may well prove extraordinarily important for the delivery of information and education to members of the worlds communities at all ages, levels and stages. It behoves the academic community to accept reflexive responsibility for its key role. As already noted, one of the founding predications of the cybernetics and systems movement (for expository convenience I package these together, although I am well aware of the ongoing de-
bates about overlaps, similarities and differences between cybernetics and systems theory) is that systemic problems need to be addressed holistically (Beer, 1967). For cybernetics, this means addressing human system issues holistically within the context of varied ecological and, indeed, cosmological settings.

It is now reasonably well understood in the relevant literatures that, as participant observers, we can never access the privileged position of being able to demarcate and observe the whole. We can, however set being holistic as an intention and share that intention (Scott, 2002). We may also within a given set of parameters hope to compute a measure of ‘requisite holism’ to ensure that, whilst we are not exhaustively addressing all variables, we can have confidence that significant ones have not been excluded. (Mulej and Kakzer, 1998; Mulej et al, 2004).

The founders of both cybernetics and systems theory unashamedly addressed global issues (von Foester et al, 1953; Wiener, 1948; Bertalanffy, 1950). The human species has one shared gene pool, sustained by one shared ecosystem. We lose sight of these founding empirical generalisations at our peril.

Sociocybernetics is concerned with individual and societal governance as ‘self-steering’ (Geyer, 1995). It would be remiss of sociocybernetics not to look to see where global system issues afford leverage. Let us not just address specific problems. Let us address the meta-problem of identifying what are the solutions for a whole class of interrelated problems. I believe this is our greatest challenge. I further believe that such a meta-analysis clearly indicates that we need to seek to affect those structures and processes that, at the most fundamental level, are instrumental in ensuring societies, as systems of collective, mutually tolerated and supportive beliefs, are reproduced. In a nutshell, alongside any material sustenance or ‘daily bread’ that is available, people need access to intellectual and spiritual sustenance, ‘the bread of life’. I submit that access to educational opportunities to a high level for all is the meta-solution, the key, that we seek. (For a contemporary holistic account of society as a self-reproducing system, see Semashko, 2002.)

What then are the right attitudes including the right attitude to have towards the attitudes of others? If there is a disagreement about the existence or not of first order universals concerning human moral behaviour can we at least construct a second order set of universals to be agreed upon amongst a community of observers?

Addressing this question is the key role of higher education. This is the sociocybernetic enterprise. This is what is aspired to in Pask’s conversation theory, von Foerster’s second order cybernetic ethics and Habermas’s normative pragmatics. As Pask succinctly puts it, we may not always agree but we may agree to disagree and understand that this is what we have done, within the context of a prior set of agreements about the right of actors to interact. This is the cybernetic way of distinguishing good and evil: evil is that which, in the long term, limits or destroys the right of actors to interact. As a rule of thumb, we should aim for unity in diversity and be very wary when we see uniformity being imposed upon a community of actors.

Second order theorists insist that we are actors and that as such we are reflexively responsible for creating and maintaining the right to interact, for making it part of our forms of life and for creating narratives that maintain it as such. Our use of language serves more than a descriptive function, it also coordinates, organises, regulates, empowers or disempowers (Scott, 1996).

Many so-called ‘post-modernist’ thinkers have complained about the failure of grand narratives and have attempted to point to the impossibility of having universal narratives about what is ‘real’ and what is ‘true’. They fail us when they leave us with a cultural, mo-
eral relativism as a by default meta-narrative about narratives. Such thinkers put themselves and all others at risk if they fail to appreciate and live out the truth that, although a universal moral imperative, or universal ethic, such as, “Do unto others as you would have them do unto you” does not come with a universally agreed rational justification, it is not undoable as an ethical choice for which an actor takes responsibility.

There is a need within our education systems at all levels, beginning or at least putting priority on the higher education sector, to distil and articulate our best understandings of what it is for observers to come to know and to share understandings. The next section is an essay in that direction.

6. An excursion into learning theory

6.1 Introduction
In this section, some theoretical frameworks are introduced that are designed to help conceptualise and understand what takes place when effective learning and teaching occur.

6.2 What is learning?
When considering what learning is and how it occurs, it is useful to recall that humans, like all other biological organisms, are dynamical, organisationally-closed, self-organising systems, surviving - and evolving - in a hostile world. Such systems survive by adapting to their worlds and by actively becoming ‘informed’ of how their worlds work. ‘Learning’, as biological adaptation, happens incidentally in the context of the pursuit of current ‘need-satisfying’ goals.

If this view of learning as a process of adaptation is accepted as valid, then it follows that it is going on all the time. One cannot not learn. In humans, learning finds its highest expression. Our ‘need to learn’ is so strong, we experience boredom and actively seek out novel environments. We readily acquire habits, construct mental models and solve problems. In addition, humans learn intentionally. We consciously set ourselves goals. We practise habits and skills. We reflect, conceptualise and converse. We come together to learn and to teach.

6.3 What do we learn?
When we learn, we are said to acquire ‘knowledge’. There are many ways of conceptualising forms of knowledge.

Here, we will make use of one particular distinction, familiar from the time of Aristotle onwards, the distinction between ‘knowing why’ (theoretical, conceptual knowledge) and ‘knowing how’ (practical, performative knowledge).

6.4 Learning as a process of cognitive construction.
‘Learning’ implies that new cognitive structures are acquired, if only as a consequence of adaptation. Constructivist theories of learning emphasise that, in addition, some cognitive structures and processes actively guide these constructive activities. Learners have intentions, they form plans and adopt particular learning strategies. Learners can learn to learn; cognition can pull itself up by its own boot straps.
Kolb (1984), using ideas from Kurt Lewin and Jean Piaget, provides a simple but useful (and frequently cited) model of the processes involved in constructivist learning (see figure 1).

Kolb proposes that learning is a cyclic activity with four stages. These are: Concrete Experience, followed by Reflection on that experience, followed by Abstract Conceptualisation (the derivation of general rules or theory construction) and, finally, Active Experimentation (the construction of ways of modifying the next occurrence of the experience).

Rescher (1973, 1977), also building on ideas taken from Piaget, has constructed a more detailed model than that of Kolb, in which two cycles of activity are distinguished: one corresponding to the acquisition and justification of ‘why’ knowledge, the other corresponding to the acquisition and consolidation of ‘how’ knowledge (see figure 2).

In the ‘why’ cycle, new conceptual knowledge is integrated with existing conceptual knowledge to form a coherent whole. In the ‘how’ cycle, new ‘methods’ (procedures, operations) are constructed and tried out and are subject to pragmatic correction.

6.5 Learning as conversation.

Here we consider theories of learning that include the role of the teacher, where learner and teacher can be said to be ‘in conversation’ with one another.

The late Gordon Pask is the thinker who has most thoroughly developed a theory of conversations. Throughout several decades, he actively applied his ideas in education and in the development of man-machine teaching systems (v. Pask, 1975, 1976). Pask’s basic model is shown in figure 3. Pask refers to this model as the ‘skeleton of a conversation’. It shows a ‘snapshot’ view of two participants (learner and teacher) in conversation about a topic.
Metaphysical assumptions
Theoretical interpretations
Conceptual systems

Models
Methods
Procedures

Application

Pragmatic correction

Correction by coherence

Why?

How?

Figure 2. Rescher's “two-cycle” model of learning

Teacher

Receives or offers explanations in terms of relations between topics

Offers demonstrations or elicits models and problem solutions

Why?

How?

Learner

Receives or offers explanations in terms of relations between topics

Receives demonstrations, builds models or solves problems

Why?

How?

Modelling facility for performance of tasks such as model building and problem solving

Figure 3. The “skeleton” of a conversation
Notice how it distinguishes verbal interaction (questions and answers) from behavioural interaction via a shared modelling facility or ‘micro-world’ or other ‘learning context’ such as a laboratory or a classroom.

The horizontal connections represent the verbal exchanges, conceived by Pask, not as direct transfer of information, but as ‘provocations’ that are designed help the participants construct knowledge and ‘come to know’. Pask argues that all such exchanges have, as a minimum, two logical levels. In the figure these are shown as the two levels: ‘how’ and ‘why’. As in Rescher’s model, the ‘how’ level is concerned with how to ‘do’ a topic: how to recognise it, construct it, maintain it and so on within the given learning context; the ‘why’ level is concerned with explaining or justifying what a topic means in terms of other topics.

The modelling facility allows the teacher to instantiate or exemplify the topic by giving non-verbal demonstrations. Typically, such demonstrations are accompanied by verbal commentary about ‘how’ and ‘why’. In turn the learner may use the modelling facility to solve problems and carry out tasks set. He or she may also provide verbal commentary about ‘how’ and ‘why’.

Laurillard (1993) provides a more elaborated account of each of the 12 possible exchanges that make up the skeleton of a conversation, interpreted for the kinds of learning conversation that take place in Higher Education. Here, a brief example will have to suffice.

Consider topics in the applied sciences. A teacher may provide explanations of why certain processes take place and may request that a learner teaches back his or her conceptions of why certain things happen. A teacher may give verbal accounts of how to bring about certain events or ask a learner to provide such an account. A teacher may model or demonstrate certain processes or events. A learner may be asked to carry out experiments or other practical procedures pertaining to particular events or processes.

These distinctions allow Pask to give a formal definition of what it means to understand a topic. For Pask, understanding a topic means that the learner can ‘teachback’ the topic by providing both non-verbal demonstrations and verbal explanations of ‘how’ and ‘why’.

6.6 Conversation about conversation

In order to round-out our discussion of ‘learning as conversation’, following Thomas and Harri-Augstein (1991), we will elaborate the Pask model in a different way.

Pask notes that conversations may have many logical levels above a basic ‘why’ level: levels at which conceptual justifications are themselves justified and where there is ‘commentary about commentary’. Indeed, reflexively, the conversation itself may be the topic of conversation.

Thomas and Harri-Augstein make this notion central in their work on ‘self-organised learning’, where the emphasis is on helping students ‘learn -how-to-learn’.

In brief, they propose that a ‘learning conversation’ has three main components: (i) conversation about a topic, as in the basic Pask model, (ii) conversation about the processes of learning (for example, discussing study skills and reflecting on experiences as a learner), (iii) conversation about purposes, the ‘goals of learning’, where the emphasis is

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6 Since living organisms are organisationally closed systems, it is not possible to directly transfer ‘information’, as one might input data into a computer. Organism select (capture) and interpret perturbations from the environment as being meaningful or not.
on encouraging personal autonomy and accepting responsibility for one’s own learning (figure 4). Boyd (1993) and Laurillard (op. cit.) make many similar points about the importance of these higher levels in the conversations that take place in HEIs.

![Figure 4. A full “learning conversation” (after Harri-Augstein and Thomas)](image)

**Why e-Learning?**

In educational circles in developed countries, the debates about whether or not to invest in information and communication technologies (ICT) to support educational processes have largely been won. However, with a few notable exceptions, these debates are relatively inward looking. The developed world addresses the needs and requirements of the developed world. Less developed parts of the world tend to be regarded as opportunities for business developments. Mass courses can be delivered to large numbers with corresponding savings to scale. Niche markets can be brought into being by networking together an otherwise distributed and fragmented community of practice.

ICT - and e-learning in particular - is a great driver for increased synergy: within and between institutions and parts of institutions, within and between nation states. (For an still relevant overview of e-learning developments see Ryan et al, 2000.) Systems that support institutional processes oblige the parts of a whole to work together like never before.

Figure 5 shows a diagram produced by the UK’s Joint Information Systems Committee (JISC). (The JISC is responsible for all ICT developments and related projects on digital repositories and e-learning for the Higher and Further Education sectors in the UK.) The diagram is well-known in the UK and shows how a virtual learning environment (VLE) is positioned within the larger context of a managed learning environment (MLE). (In the corporate world the system equivalent to an MLE is known as a Learning Management System or LMS.)
Figure 5: A Managed Learning Environment

Notice in the figure the two star shapes, each with ‘IMS’ inscribed inside. IMS stands for ‘Instructional Management Systems’. This is a reference to the ongoing international efforts to establish specifications and standards for e-learning. IMS is the name of the main forum for developing these specifications and standards, in particular, metadata standards for referring to learning materials, assessment items, student records and standards for ensuring interoperability between the components that make up an MLE. The full story is complex. I have likened these international endeavours to the old story about four blind men encountering an elephant but where the goal is to build an elephant where no one person knows what an elephant looks like. (The UK has a JISC funded Centre for Educational Technology and Interoperability Standards – CETIS, whose website is an excellent source of information on these matters: www.cetis.ac.uk.)

More recent developments in the world of e-learning concern the deployment of Learning Content Management Systems (LCMSs) and ‘learning object repositories’). These are systems that support the production and archiving of learning materials. They occupy the space indicated in the top right hand corner of Figure 5, ‘learning resources’.

In terms of pedagogy, the social networking tools and collaboration tools loosely designated as ‘Web 2.0’ are facilitating online learning conversations and providing learners with opportunities to be active ‘constructors of knowledge’ rather than being conceived as passive ‘recipients’ or ‘consumers’.
Some Current Activities

Examples of some current activities aimed at supporting ICT and e-learning developments for the developing world can be found on the following sites:

*Education for sustainability (www.secondnature.org)*

Second Nature's mission is to accelerate movement toward a sustainable future by serving and supporting senior college and university leaders in making healthy, just, and sustainable living the foundation of all learning and practice in higher education.

*Global Knowledge Partnership (www.globalknowledge.org; www.ict-4d.org)*

“Global Knowledge Partnership (GKP) is the world's first multi-stakeholder network promoting innovation and advancement in Knowledge and Information and Communication Technologies (ICT) for Development. GKP brings together Public Sector, Private Sector and Civil Society organisations with the goal of Sharing Knowledge and Building Partnerships in Knowledge and ICT for Development. GKP activities and programmes foster the innovative application of knowledge and technology to address and solve development issues in four strategic themes - Access to Knowledge, Education, Poverty Reduction and Resource Mobilisation.”

*MIT OpenCourseWare (http://ocw.mit.edu/index.html).*

“MIT OpenCourseWare (OCW) is a web-based publication of virtually all MIT course content. OCW is open and available to the world and is a permanent MIT activity.”

*Open Educational Quality Initiative (http://oer-quality.org/)*

“The Open Educational Quality Initiative will focus on provision of innovative open educational practices and promote quality, innovation and transparency in higher and adult education. The OPAL Initiative is a partnership between seven organizations including the ICDE, UNESCO, European Foundation for Quality, the Open University UK, Aalto University and the Catholic University Portugal. It is led by the University of Duisburg-Essen, Germany and partly funded by the European Commission.”

What Next?

Should we not now be looking to educate and ‘manage knowledge’ on a global scale, together with an explicit agenda to act towards a future that is secure and sustainable for all? Just as locally we find that ICT obliges to join up our thinking and to work collaboratively like never before, so, more globally, we should expect to see similar challenges and opportunities. As an example, the UK Defence Academy supports lifelong learning for military and defence related personnel. E-learning and forms of flexible learning are deployed. Quite rapidly it has been recognised that e-learning solutions are also part of knowledge management solutions. We are now seeing synergy between these areas of development.

Let us raise our awareness of issues, threats and opportunities. Let us brainstorm possible futures and how to get there. For example, let us consider the roles that could be (or are being) played by the UN and government policies, by educational systems and institutions, by other public sector bodies and business organisations. What is the place of philanthropy in our thinking? Should we consider new forms of tithing or taxation? What have the sociocybernetics and sociology communities to say about these issues?

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7 In this context, it would be remiss of me not to mention Wikipedia, Google and WolframAlpha as initiatives that are transforming how we archive and compute information.
I believe that sociocybernetics can help in some very specific ways, including:

1. the promotion of holistic thinking
2. arguing coherently for global improvement strategies that have a key role for the development of ICT to support e-learning and global knowledge management
3. developing a road map of how to get to where we wish to be
4. gathering and presenting relevant data
5. deploying computer based modelling methodologies that map the positive and negative outcomes of different forms of intervention
6. identifying systemic ‘soft spots’ where relatively small inputs may have large, positive effects.

7. Concluding comments

In this paper I have given any broad overview of the role that HEI's can play in helping to bring about global sustainable development. The essential idea is that access to higher education is an essential part of any proposed solution. I have briefly noted that the inter-nets and the development of learning technologies are transforming how education is done, not least in providing blended learning experiences that can be delivered both locally and globally.

As a central theoretical contribution, I've drawn on sociocybernetics to provide us with some useful key concepts: information, requested a variety and self organisation. In an extended discussion, I have discussed learning theory, in particular, the cybernetic ‘conversation theory’ of Gordon Pask and his collaborators, in the belief that a profound theoretical understanding of how humans learn and communicate is essential if the internet and learning technologies are to fulfil their potential in facilitating a ‘global conversation’.

Pask was particularly motivated to promote the understanding that the right kind of story-telling is that which promotes the freedom to be different and individual while conserving the unity of love and mutual respect (Pask, 1990). Knowledge elicitation and modelling methodologies may usefully serve to help ensure participants in conversation do understand each other, even though they may agree to disagree about the ‘truth’ of particular knowledge content. Pask’s ‘skeleton of a conversation’ helps delimit ‘what may be known’: ‘how’ finds meaning in the context of ‘why’; ‘why’ is contingent on the workability of ‘how’. This epistemological complementarity serves as an intellectual safeguard against prejudice and dogmatism.

In similar spirit, Bertrand Russell (1961) notes that: (i) causal explanation (‘how’) is always incomplete - we cannot know the ‘prime mover’, (ii) teleological explanation (‘why’) is also always incomplete - we cannot know the mind of God.

Margaret Mead, the American anthropologist and systems thinker, in her 1968 Presidential address to the American Society for Cybernetics says, “Never forget that a small group of activists can change the world” (Mead, 1968).

In a seminal paper, Felix Geyer refers to “The challenge of sociocybernetics” (Geyer, 1995). What I have set out here is a ‘challenge for sociocybernetics’. In my work with University and Defence Academy Colleagues producing learning materials for Army Officers to be delivered by e-learning, I have absorbed some Military Doctrine. Amongst this body

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8 In the paper I mention that the concept of sustainable development is problematic. In Scott (2009a), I take a more in depth and holistic look at global problems and discuss possible world futures.

9 See Scott (2209b) for an extended discussion of the concept of the ‘global conversation’.
of extant wisdom and conceptual and procedural knowledge there are a set of ‘Principles of War’. In brief these are:

- selection and maintenance of the aim
- maintenance of morale
- offensive action
- security
- surprise
- concentration of force
- economy of effort
- flexibility
- co-operation
- sustainability

Together they represent good, effective applied cybernetics. ‘Selection and maintenance of the aim’ is placed first because it is the master principle.

I quote “In the conduct of war as a whole and within every operation within it, it is essential to select and clearly identify the aim. Once the aim is decided all efforts are directed at its attainment…. Every plan or action must be tested by its bearing on the chosen aim” (Military Knowledge 1, Module 2, “The British Approach to Operations”, MOD, 2003). Clausewitz in his (1976) classic On War (originally published in 1812) puts it very succinctly: “Pursue one decisive aim with force and determination.”

Margaret Mead, the American anthropologist and systems thinker, in her 1968 Presidential address to the American Society for Cybernetics says, “Never forget that a small group of activists can change the world” (Mead, 1968).

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Methodology

Question Difficulty and Control by Interviewers; design and test of a nonlinear model

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Abstract: In a methodological study on the effects of an important question characteristic, i.e., the difficulty of the question topic, we found that in face-to-face interviews, questions about topics that require more complex cognitive activities of the respondents, received as few refusals, and don’t know answers, as questions about easier topics.

In view of the common linear models describing the effects of question characteristics on response quality, this is an unexpected result. Its explanation can possibly be found in interventions by the interviewers: they probe inadequate initial responses of the respondent, ideally until this kind of ‘repair’ results into an adequate final response. Or interviewers, in anticipation of problems respondents will encounter when confronted with a difficult question, rephrase the question such that it is much easier to answer, e.g., by splitting up a broad question into its components (partial questioning).

This paper reports the design and test of a nonlinear model that takes into account these feedback and feedforward processes of ‘repair’ and ‘anticipation’ by the interviewers. The model is confronted with data from an interaction analysis of 233 interviews in which elderly respondents were asked detailed retrospective questions about physical activities like walking, cycling and performance of household tasks. The difficulty of a question topic is assessed by applying a model of the question-answer process.

As predicted by the model, questions about difficult topics lead to more (need for) repair, and to larger differences between the interviewers concerning their readiness to use partial questioning.
1. The relationship between question characteristics and response quality: linear or nonlinear?

In numerous methodological studies in the domain of data collection by questioning, it has been shown that there exists a relationship between characteristics of the questions and the quality of the responses to these questions. For example, the type of question (open-ended or closed), the length of the question, and the number of response alternatives provided, has impact on the reliability and validity of the answers (see e.g. Sudman and Bradburn, 1974 and 1982; Schuman and Presser, 1996; Saris and Gallhofer, 2007).

In this type of research it is usually assumed that the relationship between a question characteristic and response quality is a linear one. So one would expect that the probability that the answer will be inadequate, increases if the question becomes more difficult; for example, because the number of cognitive operations that have to be performed by the respondent, and therewith the probability of making errors, becomes larger.

However, if the questionnaire is used in face-to-face or telephone interviews, the linearity of this relationship is endangered. For interviewers are not only instructed to read out the questions and record the answers, but they also have to probe inadequate initial answers, that is, incomplete, vague, ambivalent or 'don’t know’ answers; possibly until an adequate answer is eventually given by the respondent. And interviewers may want to assist respondents in understanding more difficult questions and finding adequate answers to them.

2. A theoretical model of the communication process in face-to-face interviews.

In order to obtain more insight into the relationship between an important characteristic of a question, i.e. the difficulty of its topic, and the quality of the answers to this question, we use a nonlinear model of the communication processes in face-to-face interviews. The model presented here is an elaboration of earlier models; (Van der Zouwen and Smit, 2005, 2006).

A standardized face-to-face interview consists of five subsequent phases, indicated by the boxes 1 thru 5 in Figure 1. Box 1 represents the question from the questionnaire as designed by the researcher. The question as it is actually posed by the interviewer is represented by box 2. Box 3 stands for the cognitive processes within the respondent involved in understanding the question, and searching for an adequate answer. The answer that is actually given is represented by box 4. This initial answer is evaluated by the interviewer with the criteria for an adequate response, represented by box 6. If the answer meets these criteria, it receives a code from the interviewer (box 5), a code that is entered into the database of the survey.

The interview can thus be viewed as a controlled communication process involving at least two actors - apart from the survey researcher, who designs the questionnaire, and under whose responsibility the interviewers are instructed, and the collected responses are analyzed.

The first actor is the interviewer, who reads out the questions from the questionnaire (phases 1 and 2), and evaluates the initial answers of the respondent (phase 4). If an initial answer is inadequate, e.g., not complete, or ambivalent, the interviewer has to probe further until she obtains an adequate answer.
Figure 1. Repair and Anticipation in Interviews

1. The question from the questionnaire as designed by the researcher and the instructions for the interviewers
2. The (probing) question as posed by the interviewer
3. The cognitive process within the respondent
4. The answer given by the respondent
5. The response code assigned by the interviewer
6. Criteria for the evaluation of the adequacy of the response
7. Expectations of the interviewer about problems facing the respondent

The second actor is the respondent, who by means of an internal cognitive process (represented by box 3), interprets the question, searches for relevant information, combines and evaluates this information and reports his answer (box 4) (Tourangeau, 1984; Tourangeau and Rasinski, 1988; Tourangeau et al., 2000).

If the cognitive process within the respondent leads to an answer that is inadequate, at least according to the perception of the interviewer, she is instructed to make an attempt at repair, for example by asking a probing question. By doing so, there emerges a feedback loop from phase 4 back to phase 2: the respondent is asked to reconsider and redo his initial answer (Moore and Maynard, 2002). This feedback loop may be repeated until an adequate answer is obtained; or the interviewer gives up and accepts the inadequate answer, for example, because she does not want to endanger the necessary ‘rapport’ with the respondent.

Previous research (Van der Zouwen and Smit, 2005) has shown that, apart from the repair loop just described, interviewers sometimes use another procedure to increase the probability of obtaining an adequate response. If they expect (box 7) that the question as worded in the questionnaire (box 1) will lead for this (type of) respondent to an inadequate answer, they may rephrase the question such that the question itself becomes easier to answer, hopefully leading to an adequate initial answer (Houtkoop-Steenstra, 1995).
By this anticipatory behavior of the interviewer, based on expectations (Hyman et al. 1954/75) about the respondent, - depicted in Figure 1 by an arrow from box 7 to box 2 -, the ‘official’ question is replaced by one ‘invented’ by the interviewer. This alternative form of control can be described as feedforward control: on the basis of the expected inadequate answer of the respondent to the ‘official’ question designed by the researcher, the interviewer constructs a question that hopefully avoids the necessity of repair. If the topic of the question so allows, one of the possibilities the interviewer has to make a broad question easier, is by splitting it up into its components (so called partial questioning).

3. Question difficulty, repair and anticipation in interviews

Using face-to-face interviews in surveys is an expensive method of data collection, as compared with mail surveys or web surveys, or even telephone interviews. One of the reasons for nevertheless using face-to-face interviews is that it is assumed that in this mode of data collection, difficult to answer questions can be asked. For interviewers may assist the respondent in producing an adequate answer, by explaining the meaning of the question, encouraging the respondent to search into his memory, and by further probing inadequate initial answers. So if researchers want to collect data with questions that are hard to answer, they may choose the face-to-face interview as their mode of data collection.

The difficulty of a question will have an impact on the course of the communication process: the more difficult a question from the questionnaire is, the more interviewers will be inclined to rephrase it such that it is more easy to answer (more occurrences of anticipation by the interviewers), and the higher the probability that the initial answer of the respondent is inadequate, and thus repair activities by the interviewer become necessary.

The assumed relationship between question difficulty on the one hand, and the activities of anticipation and repair on the other hand is depicted in Figure 2.
The message of Figure 2 can be summarized in one statement: the more difficult a question from the questionnaire, the more active the feedbackloop of repair, and the feedforward loop of anticipation, will become.

Whereas necessary repair by the interviewers is encouraged by the researcher, but rephrasing the questions of the questionnaire strongly discouraged, one may expect that as questions become more difficult, first the feedbackloop of repair will be activated, and only if the questions are really hard to answer, the feedforward loop of anticipation by rephrasing the questions will be activated.

4. Question difficulty and differences between interviewers

One of the ideals concerning data quality in surveys is the comparability of the responses of different respondents to the same question of the questionnaire. In view of this ideal, the questions of the questionnaire, and often also the response alternatives, are scripted in the questionnaire, and the interviewers are instructed to stay close to these scripts. Ideally, it does not make much difference which interviewer reads out a particular question, because the wording of the question is similar for each and every interviewer.

However, if the initial response of the respondent is not adequate, the interviewer has to take a decision by herself: either to accept the inadequacy (e.g., by entering the code for a ‘don’t know answer’), to restore it by herself (by interpreting and transforming an ambivalent or vague answer into an acceptable code), or to make an attempt at repair by asking the respondent to redo his answer (probing).

The decision how to deal with an inadequate response, may be part of the training of the interviewers; e.g. learning to avoid suggestive probing questions. But during the interview itself this decision cannot be observed by the researcher, let alone be influenced, because the researcher is not present. Thus inadequate initial responses of the respondent give room for non standardized behaviour of the interviewers, and consequently, for differences between interviewers.

As mentioned above, if interviewers expect, or observe, that the question from the questionnaire is too difficult to answer for this respondent, they may try to change the question wording, in order to make it easier to answer. This rephrasing of the question is contrary to the ideal of comparability mentioned above, and thus certainly not encouraged, let alone instructed and trained, by the researcher. So we may expect even larger differences between interviewers with respect to the use of this ‘deviant’ interviewer behaviour as questions become more complex.

5. Making the conceptual model empirically testable

The conceptual model depicted in Figure 3, and described in the preceding sections of this paper, may look plausible, but in the present form it is not empirically testable, because too many variables are unobserved.

In common survey research with face-to-face interviews, one only has information about the components of the model that are shaded: the wording of the question from the questionnaire, the code given by the interviewer to the (final) response of the respondent, and some characteristics of the interviewer (at least her identification number). But we lack an estimation of (1) the difficulty of the question, and we lack an indication whether (2) anticipation and (3) repair activities of the interviewer have occurred during the interview process. And exactly the relationship between these three components constitutes the study object of this paper.
Thus, in order to increase the testability of our model we first have to develop an instrument for assessing the difficulty of the questions from the questionnaires. This instrument, and the outcome of its application, will be described in section 7.

We will also have to ‘open up the black box’ of the interview process, by performing a detailed analysis of the actions of both actors - the interviewer and the respondent - especially looking for instances of repair activities and instances of anticipation by the interviewer. The procedure for this interaction analysis is shortly described in section 8. But first we will shortly describe in the next section the dataset used for testing the model.

6. The LAPAQ-study

The subject of the survey, from which part of the data is used here, is “the prevention of fall accidents in older persons” (Stel, 2003). It has been shown in the literature that the performance of physical activities is an important factor in the reduction of falls and fractures (Graafmans et al., 1998). For that reason, a couple of instruments are used in this survey to measure these physical activities (Stel et al., 2004).

The survey was performed within the framework of LASA, the Longitudinal Aging Study Amsterdam (Deeg and Westendorp-de Serière, 1994). One year after the third data collection of LASA in 1998/1999, four trained research nurses visited 430 participants, all aged 65 years or more, at home. Verbatim transcripts were made of 233 of these interviews.

One of the instruments to measure the physical activity of respondents is called LAPAQ, a questionnaire for face-to-face interviews that covers the frequency and duration of
walking outside, bicycling, gardening, light and heavy household activities, and sport activities during the previous two weeks.

Concerning each of these six topics (abbreviated with X) of the LAPAQ questionnaire, a few questions are asked. The first question is the base question “Do you do X?” If the answer to this question is positive then the frequency question is asked: “How many times did you engage in X during the last two weeks?” The last question is the duration question “How long, on average, were you engaged in activity X?” (Van der Zouwen, Smit and Draisma, forthcoming). If the answer to the base question is ‘no’, the interviewer will skip to the next topic of the questionnaire.

The whole series of subsequent questions, responses and remarks related to one topic is called a macro-sequence. A macro-sequence thus contains the question-answer sequences of the separate questions for each topic; see Excerpt 1 in section 8 for an example.

If a macro-sequence contains all questions and answers about the topic, it is called a complete macro-sequence; otherwise it is called incomplete. For example, if the respondent answers with ‘no’ to the base question (“Do you do X?”) and the interviewer goes to the next topic, the result is an incomplete macro-sequence, since the follow up questions and answers do not occur in the sequence.

The topic ‘gardening’ has led to many incomplete macro-sequences (69%), so we excluded it from the analysis. The analysis in this paper is thus restricted to the 856 complete macro-sequences, related to the five remaining topics.

7. Assessing the difficulty of the questions

7.1 The distinction between format and topic of the question

To assess the difficulty of the different questions of the LAPAQ questionnaire, a distinction is made between two aspects of question difficulty. The first one relates to the format of the questions; the second one relates to the type of physical activities that are questioned (in the remainder of this paper indicated with ‘topic’).

The general format of the base question (Q1) is the same for all five topics: “Do you do X?”. However, the exact wording of the base question differs between the five topics (here indicated by the capitals A through E).

Q1A Do you walk outside? With walking outside we mean walking to go shopping or doing other daily activities, like visiting someone. We do not mean: a walking tour.

Q1B Do you cycle? With cycling we mean cycling to go shopping or doing other daily activities, like visiting someone. With cycling we do not mean: a cycling tour.

Q1C Do you do sports? (I have here a list of sport activities).

Q1D Do you do light household tasks? With light household tasks we mean washing the dishes, dusting, making the bed, doing the laundry, hanging out the laundry, ironing, tidying up, and cooking the meals.

Q1E Do you do heavy household tasks? With heavy household tasks we mean window cleaning, changing the bed, beating the mat, vacuuming, washing or scrubbing the floor, and chores with sawing, carpeting, repairing or painting. (Stel, 2003).

If a respondent answers the base question positively, follow up questions are posed. The formulation of these follow up questions hardly differs between the five topics:

Q2 In the past two weeks did you do X? (only asked for Walking and Cycling).
Q3 How many times did you engage in X during the past two weeks?
Q4 How long did you usually do X?

In assessing the difficulty of these questions, we use a well-known distinction of four general cognitive tasks necessary to answer a question, and we evaluate the relative task difficulties of each of these tasks both with regard to the format of the question and the topic of the question. (Cannell et al., 1981; Tourangeau, 1984; Tourangeau and Rasinski, 1988; Tourangeau et al., 2000).

Table 1. The computation of the difficulty of the questions for each of the five topics

<table>
<thead>
<tr>
<th>Task</th>
<th>Question</th>
<th>A. Walking</th>
<th>B. Cycling</th>
<th>C. Sport</th>
<th>D. Light HW</th>
<th>E. Heavy HW</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Comprehension &amp; interpretation</td>
<td>Q1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Q2</td>
<td>0</td>
<td>0</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
</tr>
<tr>
<td></td>
<td>Q3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Q4</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2. Retrieval of information</td>
<td>Q1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Q2</td>
<td>0</td>
<td>0</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
</tr>
<tr>
<td></td>
<td>Q3</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Q4</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>3. Judgment &amp; estimation</td>
<td>Q1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Q2</td>
<td>0</td>
<td>0</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
</tr>
<tr>
<td></td>
<td>Q3</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Q4</td>
<td>2</td>
<td>0.5</td>
<td>0</td>
<td>1.5</td>
<td>1</td>
</tr>
<tr>
<td>4. Mapping &amp; editing</td>
<td>Q1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Q2</td>
<td>0</td>
<td>0</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
</tr>
<tr>
<td></td>
<td>Q3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Q4</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

During this evaluation process questions obtain points for their difficulty regarding the aspect evaluated. Table 1 gives an overview of how many points a question receives with regard to each of the four tasks that have to be performed by the respondent when answering the question. Differences between the topics are also made visible. In the following subsections arguments for this scoring will be presented.

**7.2 Task 1: Question comprehension and interpretation**

According to Groves et al. (2004) comprehension includes attending to the question and instructions. Interpretation comprises - among others - assigning meaning to question components, determination of the kind of information sought, and of the set of permissible answers.

With regard to the format of the questions, an ordering within the task of comprehension and interpretation is possible. A simple criterion is the existence of extra instruction text for the interviewer to explain the question. The base question Q1 (“Do you do X?”) will be the most difficult within this task. The explicit instructions to be mentioned by the
interviewer of which activities belong to the topic of the question, illustrate the conceptual problems that the researchers, who constructed the instrument, expected. For example, in question Q1A for the topic ‘Walking’ an extra instruction is given, stating ”… we mean walking to go shopping, or doing other daily activities, like visiting someone. We do not mean: a walking tour”.

Such extra instructions to delimit the activities are provided in the questionnaire for all five topics. They seem to be necessary to prevent some conceptual overlap between the topics. For instance, without extra instructions in the form of examples, the interpretation of the distinction between light and heavy household tasks is left to the respondent. Furthermore, going on long cycling or walking tours is apparently seen as belonging to the activities of the topic Sport, since only cycling or walking for daily activities belong to the topics Cycling, respectively Walking.

The amount of extra instructions to be given by the interviewers after the base question is posed, is about the same for each topic.

The three follow up questions (Q2, Q3 and Q4) do not have such elaborate instructions and are therefore expected to be not at all difficult in this respect. The wording of these questions is – apart from the topic mentioned – the same for each of the five topics.

7.3 Task 2: Retrieval of information from memory

This task refers to the process of recalling information from long-term memory, which is relevant to answering the question (Grovess, 2004, p. 205). Most information relevant to survey questions is not stored in memory as a tally that answers a question. Instead, relevant information chunks seem to need a construction process, for which cues provided to memory are relevant.

It is obvious that the questions Q1, Q2, Q3 and Q4 differ with respect to the burden they place on memory. The base question, Q1, ‘Do you do X?’ refers to activities within the present situation in general, and as such places hardly any burden on memory, but simply requires an image of current activities in daily life. Question Q2 (“In the past two weeks did you do X?”), is slightly more difficult with respect to retrieval, since the memory activities have to place X within a period of the last two weeks. Especially for activities that do not occur daily, some memory search seems necessary. Nevertheless, one can imagine that some kind of tally is available, an image of the activity itself in the most recent period.

Questions Q3 (“How many times did you engage in X during the past two weeks?”) and Q4 (“How long did you usually do X?”) are more difficult with regard to retrieving information from memory, since they expect a memory search in which numbers and separate durations of the activities belonging to topic X are expected as output of memory search.

At this point, a distinction between the five topics with respect to memory burden does not seem suitable. Differences in frequency in which one engages in the different activities may indeed influence the construction process of an answer. But for this construction, specific strategies that interact with the frequency of occurrence are necessary. Such strategies belong to the next task to be discussed.

7.4 Task 3: Judgment and estimation

A third cognitive task consists of the combination of information chunks retrieved from memory, or a judgment about its accuracy and completeness with respect to the question. Such combination processes require the choice for a strategy.
Estimation and judgment play an insignificant role in the first two questions: no combination of information chunks is necessary for question Q1; retrieval of relevant information is sufficient to answer it. For question Q2, it can be argued that one either remembers or does not remember (in)correctly relevant activities in the last two weeks. However, especially with the frequency (Q3) and duration question (Q4) the burden of estimation and judgment processes are expected to be heavy (Tourangeau et al., 2000).

Also, we can expect differences in the burden of these tasks between the five topics. These expectations are based on knowledge about the occurrence of relevant events in the daily lives of the elderly Dutch people.

Several authors claim that the choice of an estimation and calculation strategy depends on the frequency and regularity by which events occur in respondents’ life (Menon, 1994). A simple recall and count strategy, in which the numbers of occurrences of the intended events are remembered separately and then totaled up, may be sufficient for non frequent events. However, a base rate strategy will be more appropriate for relatively frequent events, e.g. cooking a meal. Or one could use an impression-based estimation, in which a vague impression is translated into a number. This strategy is supposed to be the most error prone (Knaüper et al., 2004).

For the elderly, one can expect that activities belonging to the topics Light Household Work and Walking occur more frequently than Heavy Household Work, riding a bicycle and being engaged in sports. For the former topics, an estimation based - or base rate strategy may be necessary to answer the frequency question. For the latter topics a simple recall and count strategy may be sufficient.

For the duration question (Q4), one could argue that the degree of variation in duration will complicate the calculation concerning average duration one has to make. It may be expected that Sport - on the one end of a continuum -, will take up non varying durations and Walking - on the other end - will vary heavily, depending on the distance.

### 7.4 Task 4: Mapping and editing the response

This task comprises the translation of the initial response to an acceptable format, according to the question formulation.

Questions Q1 and Q2 have a simple yes-no answering format, whereas Q3 and Q4 (the frequency and duration questions) are numerical open ended. Questions Q3 and Q4, despite their implicit open-endedness, require an exact answer. This ambiguity of the format of the question may result in mapping problems.

### 7.5 The difficulty score of the macro-sequence

Each complete macro-sequence regarding a particular topic consists of the questions related to that topic. As each question is scored with respect to the difficulty of the four tasks involved in question-answering, the total difficulty of the questions contained in the macro-sequence can be computed by adding up the difficulty scores of the separate questions. As it appears in the last row of table 2, the total question difficulty score of the macro-sequences ranges from 8.0 (Sport) to 11.0 (Walking). In the remainder of this paper this variable will be indicated by the label ‘Topic Difficulty’.

In view of the relatively high Topic Difficulty scores of the macro-sequences and the fact that the respondents were all elderly people, who had to make an estimation of the time spent with a variety of physical activities, one would expect quite a lot of the macro-sequences resulting in a lot of ‘missings’: refusals, vague answers or ‘don’t knows’. And
given the variety of the difficulty scores of the five topics one would expect that the more difficult topics would receive less substantive answers.

To check these expectations we computed for each topic the percentage of macro-sequences ending up with a substantive response: an estimate of the respondent about how much time he has spent to these particular activities. Table 2 shows the results.

Table 2. Topics ordered by Topic Difficulty, and the percentage substantive responses

<table>
<thead>
<tr>
<th>Topic</th>
<th>Topic Difficulty</th>
<th>Percentage substantive responses</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sport</td>
<td>8.0</td>
<td>88%</td>
<td>140</td>
</tr>
<tr>
<td>Cycling</td>
<td>8.5</td>
<td>100%</td>
<td>106</td>
</tr>
<tr>
<td>Heavy HW</td>
<td>9.0</td>
<td>94%</td>
<td>180</td>
</tr>
<tr>
<td>Light HW</td>
<td>10.5</td>
<td>99%</td>
<td>228</td>
</tr>
<tr>
<td>Walking</td>
<td>11.0</td>
<td>100%</td>
<td>202</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>96%</td>
<td>856</td>
</tr>
</tbody>
</table>

Contrary to these expectations, the percentage of substantive responses is very high (on average 96%), and both variables are positively correlated (Spearman’s rho = .58) meaning that more difficult topics also get more substantive responses.

This counterintuitive result can only be explained by the interviewers, working hard to eventually obtain substantive responses; no matter how difficult they are to be produced by the respondents. In the next section we will therefore focus on the interviewers at work.

8. Anticipation and repair in macro-sequences

As mentioned in section 6, verbatim transcripts were made of the interviews. These transcripts form the basis of the following analysis of interviewer behavior. In excerpt 1 an example is given of the transcript of that part of an interview that relates to the topic Walking. We see the interviewer and the respondent working hard to get an answer to the questions about how much time is spent with walking.

The negative answer of the respondent (in turn 2) to the first question is changed into a positive one (in turn 4) after an intervention of the interviewer (in turn 3). This intervention can be viewed as a form of repair by the interviewer. In turn 5 the interviewer uses another strategy: she in a way decomposes the question about walking in general into a specific question about walking to a particular destination, i.e., the sister-in-law of the respondent. This rewording of the question of the questionnaire is an instance of ‘partial questioning’.

Repair does not always mean that the quality of the information obtained increases. In turn 12 the respondent gives a somewhat inadequate, but clearly negative answer to the question (Q3) how often she has walked during the past two weeks. But the interviewer then suggests that the respondent has walked to her brother. The respondent correctly remarks that these visits do not belong to walking outside. But the interviewer continues questioning about these visits, although according to the instruction she has given herself in turn 1, only walking outside is under discussion here. The end result of 15 minutes daily (turns 29 and 30), is clearly an overestimation of the time the respondent has spent with walking outside.
Excerpt 1. An example of a macro-sequence (from interview 11826)

1. I: I now want to ask you some questions about your physical movements pattern. Do you walk now and then? And by ‘walking’ we mean walking outside, to visit someone or to go shopping.
2. R: No, I only walk for my pleasure.
3. I: Yes, but you never go out shopping?
4. R: Yes.
5. I: So that happens now and then. And if you visit somebody; then you walk to that person? Your sister-in-law lives nearby, and then you go there on foot?
6. R: Yes.
7. I: Have you walked during the past two weeks?
8. R: No, not much, because it was quite windy.
9. I: Yes, but you have done it?
10. R: Yes.
11. I: And how many times did you walk during the past two weeks?
12. R: No. 13. I: And not to your brother?
14. R: Yes, but that is here.
15. I: But then you walk through the corridors?
16. R: Yes and he comes along too.
17. I: Yes, but how often have you visited him the last two weeks?
18. R: Two or three times.
19. I: The last fourteen days; how often have you been there; two times, three times?
20. R: I come there once every day.
21. I: Everyday, also Saturday and Sunday?
22. R: Yes.
23. I: That is 14 times then.
24. I: And how long do you walk then? If you walk through the corridors how long is that; a few minutes or is it ten minutes?
25. R: I walk a quarter of an hour back and forth.
26. I: I mean in the house, because the house is so big. Because if you go to your brother you walk through the corridors and these corridors are quite long.
27. R: Yes, but I do not go up the stairway.
28. I: No, then you go with the elevator.
29. I: But you walk daily about fifteen minutes?
30. R: Yes, that’s right.

The transcripts of all 856 macro-sequences were coded for the following two aspects with two dichotomous variables: Repair and Partial Questioning. If repair occurs somewhere in the macro-sequence, then the variable Repair receives a score of 1, otherwise it remains 0. In the same way, the variable Partial Questioning receives a score of 1 if somewhere in the macro-sequence partial questioning occurs, otherwise it remains zero.

These two variables can be combined into a new variable called Degree of Control (by the interviewer). The variable Degree of Control consists of all possible combinations of the two dichotomous variables Repair and Partial Questioning: see the first three columns of Table 3.
From Table 3 it appears that in nearly three quarters of the macro-sequences some intervention of the interviewers occurred, mostly via repair (42% + 26% = 68%), but to a substantial degree (5% + 26% = 31%) also via anticipation in the form of partial questioning.

The Degree of Control differs significantly (p<.001) among the five topics: with Walking and Cycling the interviewer intervenes mainly via repair, whereas with Light and Heavy Household Work partial questioning is the main form of intervention the interviewer uses to obtain substantive responses.

### 9. Difficulty of the questions and degree of control by the interviewers

In section 3 we came up with the following prognosis from our model: the more difficult a question from the questionnaire, the more active the feedback loop of repair, and the feedforward loop of anticipation, will become.

As we translate this expectation to the data we are analyzing here, we can predict that the higher score a topic has on the variable Topic Difficulty, the higher will be the average Degree of Control in the macro-sequences belonging to that topic.

The data from Table 4 show that the prediction from the model is clearly supported by the data. For these five topics, the rank correlation between the two variables is strongly positive: Spearman’s rho = .60.

### 10. Differences between the interviewers

Both repair and partial questioning are types of ‘unscripted’ behavior of the interviewers. The interviewer is instructed by the researcher to do an attempt at repair if the initial
answer of the respondent is in someway inadequate. But it is beyond the control of the researcher when and how this repair is actually done during the interview. For that reason we expected differences between the interviewers with regard to repair.

The exercise of partial questioning is certainly not scripted; it is based on the initiative of individual interviewers who think that decomposing the questions will lead to better results. We expected even larger differences between the interviewers with respect to this latter form of control by the interviewer.

Table 5 Degree of Control by Interviewer

<table>
<thead>
<tr>
<th>Interviewer</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>Total</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1</td>
<td>27%</td>
<td>49%</td>
<td>2%</td>
<td>22%</td>
<td>100%</td>
<td>238</td>
</tr>
<tr>
<td>#2</td>
<td>18%</td>
<td>28%</td>
<td>14%</td>
<td>41%</td>
<td>100%</td>
<td>228</td>
</tr>
<tr>
<td>#3</td>
<td>46%</td>
<td>32%</td>
<td>2%</td>
<td>20%</td>
<td>100%</td>
<td>98</td>
</tr>
<tr>
<td>#4</td>
<td>27%</td>
<td>50%</td>
<td>3%</td>
<td>19%</td>
<td>100%</td>
<td>292</td>
</tr>
<tr>
<td>Total</td>
<td>27%</td>
<td>42%</td>
<td>5%</td>
<td>26%</td>
<td>100%</td>
<td>856</td>
</tr>
</tbody>
</table>

Chi-square = 105.7; df = 9; p<.001

Table 5 shows significant (p<.001) differences among the interviewers regarding their control behavior. Interviewer #3 stayed closest to the script of the questionnaire, whereas interviewer #2 used a lot of partial questioning: in more than 55% (14 + 41) percent of the macro-sequences she was involved in.

In section 4 we formulated the expectation that the differences among interviewers will be larger the more difficult the questions belonging to a particular topic are. Transforming this expectation to the data at hand, we may expect larger differences between interviewers with respect to the Degree of Control, as questions become more difficult to answer.

Table 6. The relationship between Topic Difficulty and the association between Interviewer Number and the Degree of Control, as estimated by Goodman & Kruskall’s tau_b.

<table>
<thead>
<tr>
<th>Topic</th>
<th>Topic Difficulty</th>
<th>Association between Interviewer Number and Degree of Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sport</td>
<td>8.0</td>
<td>.007</td>
</tr>
<tr>
<td>Cycling</td>
<td>8.5</td>
<td>.117***</td>
</tr>
<tr>
<td>Heavy HW</td>
<td>9.0</td>
<td>.049**</td>
</tr>
<tr>
<td>Light HW</td>
<td>10.5</td>
<td>.087***</td>
</tr>
<tr>
<td>Walking</td>
<td>11.0</td>
<td>.212***</td>
</tr>
</tbody>
</table>

From Table 6 it appears that as the Difficulty of the Topic increases, the association (indicated by Goodman & Kruskall’s tau_b) between Interviewer Number as the independent variable and Degree of Control by the interviewer as the dependent variable, increases too, therewith signalling an increasing idiosyncratic effect of the interviewer on the course of the macro-sequence. Spearman’s rank correlation coefficient rho is 0.70.
11. The effect of Control on Topic Time

In line with the expectations formulated in our model, we found that as the questions become more difficult, the interviewers increased their Control of the interview process, in order to keep the number of not substantive answers as small as possible.

In doing so they were quite successful: the percentage of substantive answers to even hard to answer questions is on average about 96%; an unusual high percentage especially if one keeps in mind that all respondents in this survey were aged 65 and over.

The question now arises whether this frequently occurring additional control had an impact on the data the researcher wanted to collect with his survey, i.e. estimates of the time respondents spend to physical activities belonging to each of the five topics. Do macro-sequences in which a high level of control is exercised lead to estimates that are different from those in which the interviewer only poses the questions and notes the answers?

To answer that question the database with the 856 macro-sequences was extended with information about the number of minutes the respondent, had - according to his responses -, spent in the previous two weeks to each topic (Topic Time for short).

Table 7. Some characteristics of the five topics

<table>
<thead>
<tr>
<th></th>
<th>Walking</th>
<th>Cycling</th>
<th>Sport</th>
<th>Light HW</th>
<th>Heavy HW</th>
<th>All macro sequences</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Mean Topic Time in minutes</td>
<td>35.5</td>
<td>26.2</td>
<td>65.2</td>
<td>83.9</td>
<td>65.8</td>
<td>56.4</td>
</tr>
<tr>
<td>b. Standard deviation of Topic Time</td>
<td>31.2</td>
<td>22.2</td>
<td>64.8</td>
<td>63.6</td>
<td>67.1</td>
<td>58.2</td>
</tr>
<tr>
<td>c. Correlation between Repair and Topic Time</td>
<td>-.21***</td>
<td>-.16</td>
<td>-.10</td>
<td>.15*</td>
<td>.31***</td>
<td>-.04</td>
</tr>
<tr>
<td>d. Correlation between Partial Questioning and Topic Time</td>
<td>-.06</td>
<td>-.12</td>
<td>.05</td>
<td>-.12</td>
<td>.06</td>
<td>.09**</td>
</tr>
<tr>
<td>e. Correlation between Degree of Control and Topic Time</td>
<td>-.16</td>
<td>-.18</td>
<td>-.08</td>
<td>-.02</td>
<td>.20*</td>
<td>.03</td>
</tr>
<tr>
<td>N</td>
<td>202</td>
<td>106</td>
<td>140</td>
<td>228</td>
<td>180</td>
<td>856</td>
</tr>
</tbody>
</table>

As is shown in row a. of Table 7, the average time spent on physical activities belonging to a particular topic, differs largely between the five topics: from 26.2 minutes for Cycling to 83.9 minutes for Light Household Work. Within each topic there also is a large variance, as indicated in row b. Moreover, the distribution of Topic Time is quite skewed. Therefore, we use a nonparametric measure to express the degree of correlation between characteristics of Control and Topic Time, i.e., Spearman’s rank-correlation coefficient rho.

The correlation between Topic Time and Repair, as presented in row c. varies strongly between the five topics: from minus .21 with Walking, to plus .31 with Heavy Household Work. However, the overall correlation, with the time spent on all physical activities, is insignificantly low (-.04).

Partial Questioning is somewhat stronger, but also unsystematically, correlated with the outcomes of the time estimates for the different topics (see row d.). This means that on the estimation of the time spent on all five topics together, the degree of Control only has a very small effect (.03). So there is no evidence here that the additional control by the inter-
viewers of the question—answering process has had a systematic biasing effect on the time estimates provided by the respondents.

**12. Summary and discussion**

In this paper we investigated the relationship between the difficulty of the topic of a question, and the adequacy of the answers to that question. Usually a linear relationship is assumed between both variables: the more difficult the question, the less adequate the responses will be.

However, in a survey with elderly respondents, it appeared that questions about difficult topics received as few non substantive answers, as questions about easier ones.

To explain this counterintuitive result, we developed a nonlinear model of the question-answer process in interviews, in which the interviewer plays an important role: interviewers have to ‘repair’ inadequate initial responses and they even change the wording of the questions (i.e., by ‘partial questioning’) in anticipation of problems respondents could possibly encounter.

We hypothesized that question topics requiring more complex cognitive activities of the respondents, will not only lead to more need for repair, but also to larger differences between the interviewers concerning their readiness to use partial questioning, in addition to, or as an alternative for, the control as designed by the researcher.

The model was confronted with data from an interaction analysis of 233 interviews in which respondents were asked detailed retrospective questions about physical activities like walking, cycling and the performance of household tasks. The difficulty of the questions was measured with an instrument based on an analysis of the cognitive tasks to be performed by respondents, confronted with these questions.

As predicted by the non linear model, the degree of control by the interviewers of the question-answer process increases significantly if the questions become more difficult. Differences between interviewers as regards the degree of control they exert, become also larger as the difficulty of the question topic increases.

The high degree of control by the interviewers clearly has a beneficial effect on the adequacy of the response to difficult questions. The percentage of substantive answers is very high, and we even found that - contrary to the usual assumption - more difficult topics received not less, but more, substantive responses. There is a clear need to modify the linear model of the relationships between question characteristics and response quality, at least for face-to-face interviews with experienced interviewers.

The effect of the additional control by the interviewers on the time estimates is very small: the correlation coefficient for repair is only -.04, and with partial questioning only +.03.

Although the additional control by the interviewers leads to a strong reduction of non substantive answers and although it has hardly an effect on the overall time estimates, there is still reason to try to reduce these interventions. Both repair and partial questioning cost a lot of extra turns, and therewith interviewing time, and they endanger the comparability of the responses of different respondents.

In order to reduce the additional interventions by the interviewers, researchers would do well to reckon with the differences regarding the cognitive difficulties of topics of the questions. For quite difficult topics (like average time spent on irregular, but at the same time quite mundane activities of respondents), a different question format could be necessary, providing the respondent with clear information about the delineation of the topic,
and with memory aids. Even a decomposition of the question topic into its components could be considered. In the interviewer training ample time has to be devoted to learn interviewers to react adequately to inadequate initial responses of the respondents, i.e., to perform appropriate repair.

A detailed analysis of the interactions between interviewers and respondents during pilot interviews may provide the researcher with information about what topics need these extra efforts.

**Notes**

1 Although this paper is written with the face-to-face interview in mind, most of its results are also relevant for telephone interviews.
2 “Design” has a very broad meaning here. It also includes using parts of questionnaires developed by other researchers.
3 For the sake of readability, interviewers are indicated in this paper by she and her, whereas researchers and respondents are indicated with he and him.
4 Dependent on the topic some additional questions are asked. For example, for the topic ‘gardening’ a question reads “Did you turn over the soil in your garden?” These questions are ignored in the present analysis.
5 Each sequence is identified by the number of the interview, followed by the number of the topic. For example, macro-sequence #11622-1 is the sequence about ‘walking’ in interview 11622. Each turn of a macro-sequence is identified by a consecutive number.

**Acknowledgements**

This paper is based on data collected in the context of the Longitudinal Aging Study Amsterdam (LASA). This program is conducted at the Vrije Universiteit in Amsterdam and is supported by the Ministry of Health, Welfare, and Sports.

**References**


Book Review

Cybersemiotics: Why information is not enough!
Søren Brier, 2008. Toronto:
University of Toronto Press. 470 pp.
ISBN 978-0-8020-9220-5 (hardcover), 0-8020-9220-9 (Cloth)

A Review by Jan H.G. Klabbers

First Impression

While looking at the book as an object, the following signs stand out: hard cover is night-blue; loose cover shows a black background with book title and author’s name in white and turquoise letters.

I interpret these signs as an impression of both seriousness, and gloom. This contrasts with the illuminating discussion of the book’s content. However, the seriousness of the subject matter meshes with the cover of the book.

Content of the book

Foreword by Marcel Danesi, titled “From cybernetics to cybersemiotics”, followed by Brier’s introduction: “The quest of cybersemiotics”, and subsequently twelve chapters revolving around two main themes: (1) foundations of cybersemiotics, and (2) its implications for library and information science (LIS), more particularly BIOSIS - the on-line database for the life sciences. Brier, while aiming at deepening our understanding of human-to-human communication through machine-mediated documents, distinguishes at least three ways to determine the content of a (scientific) document: the indexing system, the perspective of the author, and the user’s perspective (p. 75). Strictly speaking, Brier addresses fundamental questions concerning what information science has to say about science. On a highly abstract level he pays attention to the multiple realities of the authors, information system developers, users, and those responsible for the maintenance of those systems. Those multiple realities trigger various ongoing, interconnected language games that impact on the usability of those information systems.

Mindset of the author

Brier is a biologist by training, starting his analysis of cognitive information and communication from the perspective of living systems, and basing himself on the theories of Lorenz, Tinbergen, and von Uexküll, who founded the discipline of behavioural and cognitive biology, in current terminology: ethology. The reader should keep that ethological frame of reference in mind when following Brier’s style of reasoning about the various conceptions about the term “information” in the natural, behavioural, social sciences, and humanities.

Purpose of the book

Brier attempts to develop a transdisciplinary and meta-disciplinary theory of information, cognition, and communication, bringing forward the foundation of Information Science. The purpose is to help “(a) frame the problems that are inherent in understanding the interface between humans and machines as well as the linguistic interaction by clarifying
the epistemological problems of the difference between how digital machines work and how a living system’s cognition of the living and non-living parts of nature work; and (b) understand the biological, psychological, and social basis of communication.” (p. 352) More particularly, he wishes to elaborate on the question of threshold in the broader epistemological and ontological context of the metaphysics of knowledge systems, as well as in the context of a philosophy of science emerging from biology, cybernetics, and information science. The threshold problem arises at the crossroads of the scientific worldview, epistemology (conceptions of nature and reality), and theories of cognition (understanding of the human mind) and signification (nature of knowledge). Conquering that threshold means looking for solutions that create a unifying framework for nature, cognition, and mind.

**Five basic models for bridging knowledge about inanimate and animate systems**

Brier argues that “past attempts to understand how we acquire knowledge about nature have not produced satisfactory answers to our questions, … , especially concerning the differences and continuities between inanimate and animate systems, between living and socio-linguistic systems, and among socio-linguistic, mechanical, and cybernetic informational digital systems.” (p. 353) He identifies the following five basic significant models that have attempted to explain these matters, ranging from the related basic patterns, laws, and forces of inanimate nature to the phenomena of life and consciousness (p.353-357).

1. Mechanical materialistic or thermodynamic physicalism, which refuses to address information and signs in nature, including animals.
2. Pan-informational metaphysics, arguing that information is an objective part of all nature and culture, like matter and energy.
3. The Luhmannian second-order cybernetics approach, seeing nature as a source of countless differences, in which the cybernetic system determines what should make a difference for a system and become information in the organism and its social communication with society (system/environment divide).
4. Peircean (bio) semiotics, dealing with intentional signs of communication as well as encompassing non-intentional signs such as symptoms of the body and patterns of inanimate nature. Peircean semiotics breaks with the traditional dualistic epistemological problem of first-order science by framing its basic concept of cognition, signification through abduction, within his triadic semiotic philosophy.
5. Pan-semiotic metaphysics, arguing that all environmental phenomena are ultimately semiotic. The universe being perfused with signs. Brier distinguishes two versions of pan-semiotics: a. Constructivistic - the only way we can know anything is through semiosis; b. Realistic - signs are as real as atoms and energy and that the latter are also signs: sign processes are considered intrinsic in nature.

Brier’s line of reasoning throughout the book revolves around the pros and cons, strengths and weaknesses of each of these five perspectives, stressing over and over again Peirce’s non-reductionist and overarching framework that connects science and the phenomenological aspects of reality and the experiences of meaning.

**The long and winding road to cybersemiotics**

The core concepts of the book are communication, information, cognition, and signification by living systems. All deal with the exchange of signs, messages, and the production of meaning to grasp the relationships between our (embodied) knowledge, and some sort of
stable reality, be it external or internal to us as individuals, acknowledging that no absolute criteria for scientific knowledge can be constructed (p. 7-8). Brier notes: “Researchers and practitioners in the arts and the natural, medical, and social sciences have been forced together by new developments in communication and knowledge technologies - developments that have broken the traditional limits of professional knowledge. They are forced together even more by problems arising from the limitations on the kinds of knowledge that we have long cherished. The weaknesses of traditional information and communication analysis based on data or information-flow theories are raising fundamental problems with respect to how knowledge systems are constructed and organized. New concepts of communication can help us understand and develop social systems as self-organizing and self-producing networks, and a deeper understanding of ethics and aesthetics is going to be foundational to these new networks. Instead of the communication of information, we might speak of a jointly actualized meaning.” (p. 20)

Brier is looking for “a genuinely non-reductionist interdisciplinary view of knowledge that will enable different kinds of knowledge to interact in non-ideological ways.” (p. 20)

While beating that road, he discusses and assesses the various conceptualizations of information science, keeping in mind the threshold problem, mentioned above. I will characterize those conceptualizations that I find most worthwhile, considering the book’s main thesis.

1. The (cognitive) information-processing paradigm and the physical concept of entropy: From the perspective of the transmission of signals and statistical information processing, Shannon and Weaver (1969) argue that there is maximal information in chaotic random behaviour. Brier, discussing Shannon and Weaver’s theory of information, observes that it never had anything to do with the semantic content of messages. Shannon and Weaver wrote: “The fundamental problem of communication is that of reproducing at one point either exactly or approximately a message selected at another point. Frequently the messages have meaning; that is they refer to or are correlated according to some system with certain physical or conceptual entities. These semantic aspects of communication are irrelevant to the engineering problem. The significant aspect is that they are selected from a set of possible messages.” (Quoted by Brier, p. 186). Therefore Brier concludes that what people and animals conceive as information is quite different from Shannon and Weaver’s theory of information. Brier refers to von Foerster’s comment that, when looking more closely at these theories, it becomes clear that they are not really concerned with information but rather with signals and the reliable transmission of signals over unreliable channels (von Foerster, 1980). While discussing problems of order and chance in physics, particularly thermodynamics and the related concepts of energy entropy and dissipation of energy, Brier points out that thermodynamics fundamentally breaks with the determinism and time reversibility and the mechanistic idea that the movements of particles are determined by deterministic, mathematically describable, and time-reversible laws. Prigogine and Stengers (1984) point out that our scientific understanding of evolution, life and human consciousness is not possible without the increasing entropy of irreversibility and an increase of objective randomness. Thermodynamics introduced in physics the notion of time direction and evolution (see Prigogine and Stengers’ concept of “the arrow of time”). From a realist perspective and mechanistic worldview, reality is full of objective information waiting to be discovered. It does not need to be perceived to exist. It requires no intelligence (an observer) to interpret it. Information exists, similar to particles, energy and so on. It does not have to have meaning to exist (p. 188-189). Brier dismisses this claim by arguing: “Not only do determinists claim to be in accor-
dance with the physical sciences, but they also claim that their determinism is logically valid and true. Such claims, however, require consciousness and knowing, both of which physicalistic determinism rejects.” (p. 191) He further notices: “From the Age of Enlightenment’s encyclopedists through Comte’s positivism to the Vienna Circle and logical positivism, the idea of information has been interpreted in increasingly rationalistic and materialistic ways. .... The humanities have difficulty finding a common ground on which to formulate their value assumptions, since they wish neither to make ethics into religion or science, nor to define human nature beyond socio-linguistics material consciousness.” (p. 82)

2. The cybernetic turn of first- to second-order cybernetics: Since Wiener published Cybernetics: or control and communication in the animal and the machine (1948), scientists have been searching for an information science with the wide scope, overarching the realm of classical science, that was capable of connecting information and control in natural, artificial and living systems by linking the domains of cognition and steering in man, machine, culture, and nature. The (non-) linear feedback control theory, and more recently, complexity science, which emphasizes algorithmic complexity, dissipative systems, self-organization and emergent phenomena, employ analytical tools for the study of the evolution of material, energetic, and information systems. This so-called first-order cybernetics has brought forward a mechanistic and functionalistic science, based upon an unembodied, or disembodied information concept, and models of cognition and communication that fit well the goals of the natural and engineering sciences. Nevertheless and regrettably it does not acknowledge the connotative and emotional aspects of cognition and communication: the tacit and embodied dimension of knowing of living systems. Brier points out that the cognitive information paradigm, including first-order cybernetics, posits major difficulties to modelling both the semantic dimensions of language, perception, and intelligence and their influence on cognition, communication, and action. Those scholars, working in the adjacent field of ethology, illustrate best the resulting tensions with the first-order cybernetics paradigm. Brier refers to the work of Konrad Lorenz, Niko Tinbergen, and Jacob von Uexküll, who were studying a biological theory of innate cognition and communication (p. 23). They came to the conclusion that somehow the cognition of a living system partly creates the ‘reality’ in which it is living. Through the creative power of cognition, the environment (the animal’s Umwelt) is enacted, constructed. It is not merely given, waiting out there to be discovered. Therefore, the cognitive information paradigm, and first-order cybernetics are incomplete with regard to explaining the role and operation of information in living systems. Bateson’s cybernetic idea of the mind as a system of differences travelling in cybernetic loops, and his definition of information as ‘a difference that makes a difference’ illustrated the departure of Wiener’s first order cybernetics, and the development of von Foerster’s second-order cybernetics. While first-order cybernetics definition of information ignored the observer, secondorder cybernetics defines information as something recognized by an observer. The observing system becoming an integral part of the system to be observed. This radical shift in the idea of information enabled the distinction between the internal and external world of living systems, and a move towards more constructivist theories in biology, and a steppingstone towards a psychology and sociology of signification and meaning. The typical features of the observing system frame information, here and now. If first-order cybernetics focuses on the goal of a system, second-order cybernetics questions the goal of that goal. Von Foerster views this switch both a cognitive and ethical shift of position. Second-order cybernetics deals with non-trivial machines, which are history dependent, mathematically
unpredictable, and transcomputational to an outside observer, because of the evolving internal states, which impact on the transfer function of inputs into outputs. By including the observer in the cybernetic system, von Foerster introduces the basic problem of cognition in science itself. The theoretician, describer, observer of the system, they are going to describe, include the observer in the descriptions of their observations. Von Foerster formulates an important critique of the central ideas of functionalistic cognitive science as follows: “How can a brain scientist develop a theory of the brain when the theory of the brain is written in such a fashion that it writes itself?” (Quoted by Brier, p. 210.). Brier argues that there is no information without mind, no mind without body, no body without nature, and no linguistic meaning without society and culture (p. 211). Second-order cybernetics has abandoned the objective view of information, but has yet to develop a theory of meaning and signification. Nevertheless, it is open to the biological as well as to the social in its theories of cognition and communication.

3. Autopoiesis - the self-reproduction of living systems: Maturana and Varela (1980 and 1986) have taken second-order cybernetics a next step further. Maturana’s theory of autopoiesis - based upon the closure of the nervous system - applies to people and animals. The nervous system does not react to its environment. It enacts the environments through its structural coupling to it. The basic position of an autopoietic system in relation to its environment is not objective and separated from it. The domain of living is an integrated part of the structure of the system. It predates any cognitive separation between self and non-self. Maturana argues that the world is as we ‘see’ it in our praxis of living. It is a Multiverse (p. 92). Brier notes that their main achievement is that through the idea of the autopoietic system, they have conceptualized basic limits of living and knowing, and have shown that there is a basic connection between living and knowing: To live is to know! (p. 194). Brier takes a different view by saying: “Maturana and Varela go too far when they claim that there is no world without an observer, that we live in a Multi-verse created through our observing and acting, and that we can say nothing meaningful about the world as such.” (p. 194) Two observers, both being autopoietic systems, only connect through their structural coupling. Each of these autopoietic systems is closed in its structure dependent internal organization. Brier concludes: “The theories and concepts of von Foerster and Maturana lead to a much better grasp of the basic situation of observing and cognition; yet in their radicality, they also seem to have removed too much when they neglect completely ‘das Ding an sich.’ The problem is that they have attempted to find a scientific solution to a basically philosophical problem. For their part, many social constructivists avoid these basis questions. .. Both von Foerster’s second-order cybernetics and Maturana’s ‘bring-forth-ism’ are correct to focus our attention on creative processes in perception and cognition. As I have already demonstrated, one cannot resolve the problem of mind and intentionality in an evolutionary philosophy through either mechanical materialism or physical indeterminism. Nor do I believe that this can be accomplished through pure phenomenalistic idealism (there are only phenomena), subjective constructivism (I construct the world), or mentalism (everything is mental), all of which underestimate the importance of the relative stability of the ‘outside’ world to the possibility of knowledge, communication, and meaning.” (p. 92) For those reasons, Brier views their approach as too limited.

4. Autopoiesis - the self-reproduction of social systems: Autopoiesis: processes of self-reproduction in living systems - biological organisms and eco-systems - are very different from processes of self-organizing of self-referential social systems. The components for shaping those systems are very distinct, and therefore, they are
based upon distinct ontology. The biological foundation of autopoietic systems and the make up of social systems do not match. Second-order cybernetics introduced the observer into the system’s description. Brier, referring to Heidegger, notes that as observers (knowers), we are already part of the world when we start describing it. The idea of observer brings forward the distinction between ‘inside’ and ‘outside’ reality, and between system and environment. He stresses that although second-order cybernetics abandons the notion of ‘objective reality’, we should not give up the notion of a partly independent ‘outside reality. So, he positions himself in between realism and nominalism. Brier discusses extensively Luhmann’s view on autopoiesis. Luhmann (1990, p. 3) definition of autopoietic systems reads as follows. “Autopoietic systems are systems that are defined as unities as networks of production of components that recursively, through their interactions, generate and realize the network that produces them and constitute, in the space in which they exist, the boundaries of the network as components that participate in the realization of the network. Autopoietic systems, then are not only self-organizing systems, they not only produce and eventually change their own structures; their self-reference applies to the production of other components as well. … Even elements, that is, last components (individuals) which are, at least for the system itself, indecomposable, are produced by the system itself. … This applies to elements, processes, boundaries, and other structures and, last but not least, to the unity of the system itself” (quoted by Brier, p. 93). Luhmann distinguishes three levels in his representation of self-referential autopoietic systems: Level 1, the self-referential autopoietic systems itself; level 2, living, psychic, and social systems; and level 3, grouping 1 - cells, brains, organisms - linked to living systems and grouping 2 - societies, organizations, and interactions - linked to social systems. There are no connections between psychic systems (level 2) with underlying groupings at level 3. (Brier, p. 238) Psychic systems seem to float in abstract space with no connection to cells, brains and organisms: no embodiment. Does Luhmann consider psychic systems to be ghosts? He speaks of collective networks with basic elements - individuals - that are indecomposable. Does this mean that individuals are black boxes in his theoretical framework? Those individual elements - components - interact and produce and self-reproduce the social system. The glue that keeps the social network together is communication: a shared actualization of meaning. The autopoietic quality of social systems is based on communications that re-produce themselves over time. Communications are operations, which cannot directly be observed. Luhmann argues that actions are the observables of the system (Brier, p. 245). This notion implies that, empirically, (observable) actions should replace (nonobservable) communications. Luhmann’s theory would have been more coherent and consistent, if he would have based it on action and interactions between human actors. Luhmann claims that systems exist that are not primarily biological but autopoietic, such as the psychic and social-communicative systems. Brier questions that view by arguing that, as far as we know, these systems can only function if based on a biological autopoietic system. He notes that Luhmann fails to take this fact seriously enough, and that he therefore fails to develop a theory of embodied meaning. I would say that there are no bodies - no actors - in Luhmann’s conception of autopoietic systems. Luhmann understands that human bodies and psyches are the environments of socio-communicative systems. This view confronts Brier with the problem of how to establish an integrative individual subject or self, which does not exists in Luhmann’s system theory. (p. 237). Luhmann’s theory of social communication is not populated with acting individuals. He asserts: “Social systems use communication as their particular mode of autopoietic reproduction. Their
elements are communications that are recursively produced and reproduced by a
network of communications and that cannot exist outside of such a network. Com-
munications are not “living” units, they are not “conscious” units, and they are not
“actions.” (Brier, p. 239) As there are no subjects and emotions in Luhmann’s phi-
losophical framework, Brier asks himself how one can relate the results of a theory
that does not accept subjects and individuals as real systems back into a political
and juridical system that is based on individuals with free will who are deemed re-
 sponsible for their actions? (p. 241) Therefore, Luhmann’s autopoietic systems the-
ory and its interpretation of information and communication are incomplete and too
limited of scope. Brier is looking for a theoretical framework that includes the sub-
ject as an intentional observer with a free will. He sees the following paradox: “No
cybernetic theory, including Luhmann’s, can support a self-conscious embodied ex-
 istential subject from which meaning and selections can emerge in symbolic inter-
action when it tries to determine its place in society, nature, and irreversible time.
…. Neither a pure structuralism nor a pure systemic analysis can catch will, emo-
tions, and qualia and their dynamics in the models and concepts. I still think it
needs those self-consciously embodied subjects to grasp theoretically the important
dynamic and experimental aspects of human meaning.” (Brier, p. 247) With this
goal in mind, he turns to Peirce to find the proper foundations for cybersemiotics.

5. Cybersemiotics: Over and over again Brier distances himself from the mechanistic
view on information and communication. He argues: “.. when working from an
evolutionary basis, epistemologically we cannot continue to embrace the naïve real-
  istic epistemology hoped for by logical empiricism which could then be combined
with rationalism and atomistic mechanicism - the view that Lakoff (1987, p.9) re-
  refers to as objectivism.” (p. 264) He refers to Prigogine and Stengers (1984) who
emphasize that chance and complexity are basic concepts in science. According to
Peirce one cannot build a metaphysic of science on the understanding of chance as
the mere absence of law. Peirce perceives chance and chaos not only as encompass-
ing all possibilities, but also as endowed with the tendency to form habits and regu-
lar behavioural patterns, which in science we identify as laws. He distinguishes
three forms of evolution: Tychastic - based on random variation and natural selec-
tion (Darwinian); Anachastic - a mechanically determined necessity; and Agapastic
- nature’s tendency to form habits. (Brier, p. 265) Brier’s main thesis is that Peirce’s
semiotics is capable of forming the foundation for biosemiotics, and that it can es-
 tablish a new, transdisciplinary foundation that integrates into cybersemiotics new
results from other disciplines such as second-order cybernetics, cognitive seman-
tics, and pragmatic language philosophy. Brier notes that Peirce bridges the two
cultures, addressed by Snow. Peirce wrote: "The present writer holds that in ad-
 vance of positive knowledge, the presumption ought to be that there is such a unity
in the universe that the difference between mental and natural phenomena is only a
difference of degree. Presumably, the same elements are in both, and if so, there is
no essential difference in their intelligibility.” (Brier, p. 267) Following Peirce,
Brier points out that signs exist in communicative societies, and biosemiotics dem-
 onstrates that this includes animal communications as well. The sign represents the
immediate object that contains some aspect of the dynamical object that has the ob-
server’s interest. In his semiotic theory Peirce presented an alternative to the dual-
ism of rationalism as well as the materialistic monism of empirical science. His ob-
jective idealism combined idealism with realism. (Brier, p. 266-268) Brier stresses
that we cannot escape the ontological presumption that a sign must refer to some-
thing in order to be sign. Basic to the cybersemiotic view is that we become con-
scious through the semiotic development of living systems in general, and their
autopoietic semiospheres in the form of sign games for shared communication, which eventually evolve into human language games. He wraps up his fundamental thesis: “In combining the ethological, autopoietic, and semiotic, one can say the following: meaning is habits established as structural couplings between the living autopoietic system and the hypercomplexity that we call environment (including other living systems). ‘Objects’ are cognized within the environment - through abduction - by ascribing sign habits to them that relate to activities of survival such as eating, mating, fighting, and nursing - what we, extending Wittgenstein’s concept, call ‘life forms’ in a human society. With the reflective linguistic consciousness of human beings in a culture, the concept of meaning expands beyond the body and its immediate needs. We thus take a step forward in our understanding of how signs acquire meanings and produce information within communicative systems when we theorize signification as actualized meaning in shared sign or language games without leaving a realist world view - the knowledge of the world provided by the sciences and the insights of social constructivism.” (p. 276) Therefore, information as such is not enough for living systems that are trying to survive and flourish in evolutionary space. Signs must be triadic, according to Peirce. They consist of the interplay between the primary sign (Representamen), the Object that is referred to, and the interpreter (Interpretant, or Signifier) who deciphers the sign in relation to the historical processes of life and culture. The sign is a unit of the three. (Brier, p.284) Brier calls Peirce both a phenomenalist and a realist. “His theoretical rhetoric is the science of how signs become effective in a constantly evolving historical and social context in which there are no final referents.” (Brier, p. 286) It is an infinite game with no stop rules. Figures 10.2 - internal semiotics - and 10.3 - exosemiotics - illustrate Brier’s view on cybersemiotic, combining in persons three levels of communication systems: socio-communicative, autopoietic language games, sign games, and cybernetic languaging through signals, driven by mutual structural couplings among persons and with the environment.

These five conceptualizations enlighten Brier’s views on cybersemiotics, and characterize the various styles of reasoning of representative authors with regard to the meaning of the term ‘information’.

**Summarizing comments**

Brier starts the book with positioning himself in this broad and complex field of enquiry, and then moves on through open concentric circles, paying attention to specific areas to prove his point. As the book is an extended synthesis of Brier’s past articles, the subsequent chapters repeatedly cover the same questions and puzzles, while referring to arguments presented earlier or later in the book. He is of opinion that he cannot prove his point of view through a linear argument: building up momentum in his argument from the information-processing paradigm, through second-order cybernetics to cybersemiotics. The resulting spiralling through the text hampers building and maintaining a coherent argument about each of the various conceptualizations sketched above. As a consequence, his core line of reasoning - the story line - is dispersed over the chapters. The way I have wrapped up the five conceptualizations - see above - shows that a linear build up of the story line is very well possible, and suitable. Brier’s style of reasoning emphasizes the use of declarative knowledge - ‘knowing that.’ Providing the foundational and highly abstract character of the book, it would have been a great advantage if he had supported his argument with examples from information systems science. More particularly, an empirical case study of the bibliographic system with real actors such as, BIOSIS in operation (chapter 11), taking into account the multi-actor scheme of Figure 6.4, would have added procedural knowledge embedded in the language games involved in the design, use, and maintenance of
BIOSIS - in ‘knowing how’ those information systems operate in practice and how they should and could operate. Such an empirical underpinning would have given meaning to the core concept of embodied knowledge. Moreover, such an empirical study could have shown that the evolution of BIOSIS is not merely a language game. It also is an ongoing multiple-reality power game, and a distributed access game to social and cultural capital, driven by varying interests of the actors involved. Considering the spiralling argumentation, the titles of the chapters, which raise expectations about their scope and content, are somewhat misleading. In each chapter Brier covers the same subject matter although from slightly different angles, underpinning arguments sometimes partially, and leaving it up to the reader to glue together the pieces, dispersed over the chapters. This left this reader with a disappointing feeling, as it takes much extra time and effort to sort out things in the text. That is a pity because this daring and inspiring book challenges the current structure of academia, which sub-divides departments of informatics, communication, cybernetics, systems science, cognitive science, game science, and semiotics over different faculties, and leaves their synthesis into cybersemiotics to the mercy of different disconnected flows of funds. Brier, presents cybersemiotics as a non-reductionist and integrative framework, and a thoroughly meta-level discourse. The frame-of-reference he presents is theoretically intriguing, methodologically challenging, and highly valuable for professional practice. Every information, computer, game, cognitive, ethology, and environmental science department at universities should include the book in its curriculum. Information science and information technology research teams - focussing on the design of information systems - should have it available as a basic resource assessing the usability those systems in practice.

References
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CONTINUATION

Medieval (and Later) Compulsory Signs of Group Identity Disclosure.
Part II: The Intervention of Joseph Cazès in Teheran in 1898, Set in Episodic Formulae

Ephraim Nissan

Abstract

This article is a sequel of Part I (Nissan 2008a), in which I provided formal representations for the core pattern of such social dynamics of prejudice, that takes the form of forcing members of a dispreferred group to wear a sign of recognition. The main notation adopted there, episodic formulae, is applied in the present article to a specific narrative. For a feedback mechanism in the social phenomenon considered, refer to the block schemata given in Part I. The phenomenon has occurred several times throughout history: e.g., the Jewish badge in medieval Europe as well as, earlier on, at certain times under the Abbasid Caliphate. Twentieth-centuries examples consist of the Jewish badge imposed under Nazi rule, as well as of a similar device imposed on Hindus under Taliban rule in Afghanistan.

The specific narrative we analyse in the present Part II is from the final years of the nineteenth century in Teheran. What makes it especially interesting for analysis in terms of a goal hierarchy as represented by means of episodic formulae, is that the representative of a French educational philanthropic organisation sought to have the red patch that had been imposed on Jews replaced with the badge of his own organization. He thus intended to subvert the humiliating purpose with which the compulsory sign disclosing affiliation in the given faith community had been imposed in 1897.

1. Joseph Cazès in Teheran

Part I (i.e., Nissan 2008a) provides the background for this article. We described there several historical instances of members of a minority being forced to disclose that group identity by means of a signal incorporated in their dress, which often was by means of a badge. Moreover, in Part I we captured the goal structure of the core pattern of that social phenomenon by means of a formal representation in terms of episodic formulae, and we also made the feedback mechanism explicit, by means of a non-equivalent, complementary formalism in terms of block schemata as known from systems & control.

In this sequel article, we are going to analyse a particular narrative, for which the remark we made at the end of Section 3 is quite relevant:

When it comes to formal, mathematicized representations of narrative patterns, [...], it is an interesting challenge to distinguish between the context of a badge, in circumstances such as the ones described, as opposed to the badge of a company being worn by its employees, or to the badge an organization being worn by peo-
ple associated with it, or to the badge worn by campaigners of a given cause. A pertinent example that combines more than one context is the following.

In Section 4 of Part I, we described an episode that took place in Iran at a time when a rather weak monarchy’s attempts at modernization (including giving a more palatable status to religious minorities, in order to assuage Western humanitarian concerns) were being successfully thwarted by the clerical camp:

Amnon Netzer (1996, p. 247) writes: “In July 1898, Joseph Cazès arrived in Teheran as the emissary of the AIU”, i.e., the Alliance Israélite Universelle, in order to establish a modern Jewish school. The AIU [was] a philanthropic organization whose aim was to establish in the Levant and North Africa schools that would foster among local Jews modern Western culture, and more specifically French culture. Cazès was faced with the following situation in Tehran: “Since 1897, the Jews had worn a red patch on their clothes, as ordered by the Shi’ite mullah, Reihollah. They were loath to leave the Jewish quarter for fear of being attacked or murdered by their oppressors” (ibid.). Ben-Jacob (1979, pp. 326–327) mentions how in 19th-century premodern times, a red badge was imposed on the Jews of Hilla, Iraq, along with other disabilities in their attire and in walking around; this makes Hilla very different from Baghdad, [even as] both cities were in the same province of the Ottoman empire, conditions for Jews in Iraq having been at the time all in all better than in the Kingdom of Persia. In Tehran, “Cazès’s great efforts and the intervention of foreign representatives enabled him to reach a compromise with the Persians: the Jews would replace the red patch with the symbol of the AIU” (Netzer 1996, p. 248) — still making them recognizable. Yet, the reigning King (who made a donation to the AIU school) was keen on introducing reforms, and, e.g., issued a decree abolishing the reward, for converts, of becoming the sole heir of deceased family members, to the exclusion of relatives remaining Jewish. The decree was ignored (ibid., p. 246). The conceptual operation of replacing the red patch with the AIU symbol is interesting on more than one level. It implied the acceptance, on the part of the wearers, of the Frenchifying, secularizing aims of the AIU. It also, as intended, implied that wearers weren’t being humiliated by wearing a patch imposed on them as being a stigma, but rather were “willingly” displaying the logo of a communal organization.

Nissan (2010) provides an extended discussion of that historical episode from the perspective of the humanities. Here, instead, we develop the mathematics for representing that episode in episodic formulae. In the rest of this article, we are going to represent in formulae these specific episodes. Having discussed formally in Part I the general pattern of the social dynamics of the discriminatory badge, we now consider in the present Part II how a specific narrative could be represented. Figure 1 shows themes in the kind of knowledge representation we call *episodic formulae*, in relation to the earlier paper in which it was introduced, namely: the one concerned with an amnesia case from Italy in the 1920s, i.e., the “Smemorato di Collegno” case (Nissan 2001); the paper whose formalism captures elements of the plot and identity relations in Pirandello’s play *Henry IV* (Nissan 2002); and the suite of five articles (Nissan 2003) referred to as “Identification I” to “Identification IV” in Figure 1. “Identification V” (Ma and Nissan 2003) resorts to a different kind of formalism; the theme is a situation of mixup of individual identities.
Figure 1(a). Themes in the knowledge representations in the papers Nissan (2001, 2002, 2003) and Ma and Nissan (2003). Double boxes stand for articles.

Figure 1(b). Themes in the knowledge representations in the papers Nissan (2001, 2002, 2003) and Ma and Nissan (2003). Double boxes stand for articles.
2. An Introduction to the Notation of Episodic Formulae

In the following, some symbology of episodic formulae is defined. Temporal relations include:

\[ \preceq \quad \text{precedes} \quad \succeq \quad \text{succeeds} \]

\[ \preceq \quad \text{precedes or equals} \quad \succeq \quad \text{succeeds or equals} \]

Standard logical operators we are going to use in the next section include:

\[ \land \quad \text{and} \]

\[ \lor \quad \text{or} \]

\[ \neg \quad \text{not} \]

Symbology specific of our notation includes:

\[ (\mu_a^b \text{whatever}) \]

Agent \( a \) communicates to agent \( b \) whatever. If the latter is followed by an exclamation mark, then this communication is an order.

\[ (\text{has}_x \lambda^B y) \]

Agent \( x \) is the legal owner of \( y \).

\[ (\text{has}_x \Phi^B y) \]

Agent \( x \) has the physical possession of \( y \).

The proposition which is on the left side eventuated, and this \textit{motivated} the eventuation of the proposition which is on the right side.
The proposition on the left side (if eventuated) **would motivate** the eventuation of the proposition on the right side.

The proposition which is on the left side eventuated, and this **enabled** the eventuation of the proposition which is on the right side.

The proposition on the left side (if eventuated) **would enable** the eventuation of proposition on the right side.

The proposition which is on the left side eventuated, and this **caused** the eventuation of the proposition given on the right side.

The proposition on the left side (if eventuated) **would cause** the eventuation of proposition on the right side.

The proposition which is on the left side eventuated, and this **includes** the eventuation of the proposition which is on the right side.

A notation for “crumpled”, i.e., discarded relations between proposition was also defined:

“**And this did crumple,** at time t, agent A’s motivation for $\xi$”:

“**And this did crumple,** at time t, agent A’s enablement for $\xi$”:

“**And this would crumple,** at time t, agent A’s motivation for $\xi$”:

Agent A can, ontologically, $\xi$ (e.g., agent A has the ability to have $\xi$ eventuate).
Agent $\mathcal{A}$ can, deontologically, $\xi$
(e.g., agent $\mathcal{A}$ has the permission
to have $\xi$ eventuate).

Agent $\mathcal{A}$ sees to it that $\xi$
(stit is a standard modal operator of agency).
On the stit operator, see Hory and Belnap (1995).

At time $t$ agent $\mathcal{A}$ believes that $\xi$

We don’t distinguish between belief and knowledge,
but see Abelson (1979) about the differences. Abelson
listed seven differentiating features.

At time $t$ agent $\mathcal{A}$’s belief that $\xi$ is discarded.

At time $t$ agent $\mathcal{A}$ has an active goal $\xi$

At time $t$ an active goal $\xi$ is set, for agent $\mathcal{A}$.  

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At time $t$ agent $\mathcal{A}$’s goal $\xi$ is successfully achieved.

At time $t$ agent $\mathcal{A}$’s goal $\xi$ is discarded.

At time $t$ agent $\mathcal{A}$ realizes that $\xi$ (i.e., $\mathcal{A}$ conceives of the idea that $\xi$).

At time $t$ agent $\mathcal{A}$ has an active hypothesis $\xi$.

At time $t$ agent $\mathcal{A}$ conceives of, as a hypothesis, that $\xi$. 

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At time $t$ agent $A$’s hypothesis $\xi$ is discarded.

General symbol for **perception**
(a four-leaved clover contour).

At time $t$ agent $A$ perceives visually that $\xi$

Auditory perception

Tactile perception

General symbol for **testimony**
(a double-edge contour shaped as a four-leaved clover).
It is possible to insert inside it the identifier of proposition
that would specify the mode of this testimony.

Self testimony

Eyewitness

Earwitness, i.e., auditory witness. This is not the same as hearsay. On earwitness, see Yarmey (1995).

Typically one would only use a subset of these symbols. In particular, in analyzing the narrative of Joseph Cazès in Teheran in 1898, we are going to use just a small subset. Experience with applying the notation explained in this section to several narratives has shown that the techniques converges. There is no risk of going on defining more and more symbols. For sure, it would be possible to replace words (names of predicates) for the graphic symbols. The advantage of the graphics (for all of such preference being subjective) is that the episodic formulae tend to look compact, and one can relatively quickly make sense of what is on the page, whereas with verbal strings identifying standard predicates or modal operators, one is forced to read line by line.

3. Supplementary Remarks

3.1. A Caveat

Just a few more symbols were defined, e.g., for affective attitudes. But there is something I must point out right away. It is important to realize that in our model in terms of episodic formulae for the narrative at hand, treatment of the primitives for emotion (see Appendix A), just as treatment of their subclass being primitives for negative or positive prejudice (see in the next subsection), is quite rudimentary. We don’t delve into the workings of emotion.

We just use a predicate, like in a logic predicate, and what is special is that as in episodic formulae we use graphic icons instead of names for predicates, also for such primitives the identifier of the predicate is a graphic symbol instead of a name written as a string of letters.
Actually, we do not even employ here the graphic symbols for hope or despair, and so forth (see Appendix A). Those for positive or negative prejudice shall suffice for our formulae. Any of a number of models of emotions now extant in artificial intelligence could conceivably be used, in order to augment our episodic formulae method, should the need arise, but this is not part and parcel of episodic formulae. Models of emotion are just very briefly surveyed in the Appendix B.

3.2. Icons of Prejudice

In Part I (Nissan 2008a), of which the present article is a sequel, we had introduced a notation for prejudice:

These symbols respectively mean that agent $A$ (at a given time, if indicated by a superscript) is positively, very positively, negatively, or very negatively prejudiced concerning $\xi$ (which may be an abstract issue, or a human group and so forth).

While modelling the narrative of Joseph Cazès in Teheran, we are going to include explicitly:
- prejudice (including even favourable attitude), as well as
- pride and humiliation.

By contrast, we are going to avoid including hope explicitly. Rather, we focus on the hierarchy of agent’s goals, including such a goal that sub serves a counterplan. Cazès strives to have the red patch that the Jews of Teheran were forced to wear replaced, with the badge of his own organization, the Alliance Israélite Universelle (AIU), short of being able to have the decree forcing group identity disclosure abolished altogether. His assumption is that sporting the AIU badge ought to be reason for pride, and that this would defeat the humiliating purpose with which the decree about the red patch was intended. It should be fairly easy to incorporate into the episodic formulae we are going to provide for the given narrative, also hope, dread, disappointment, and relief.

4. The General Pattern as Set in Episodic Formulae

Before we turn to providing the episodic formulae for the Teheran narrative of Joseph Cazès, we quote from Section 5 in Part I the formulae for the general pattern of a malevolent authority trying to foster negative social attitudes towards members of a minority, by forcing these to make themselves recognized by means of some element of their dress, typically a badge.

Bear in mind that in my notation, communication from $a$ to $b$ is symbolized by
followed by a parenthesis enclosing the communicated message; if this is an order being given, then an exclamation mark follows the parenthesis. This is how we are going to represent the 1897 decree of the top cleric in Teheran. The superscript to the exclamation mark indicates the time at which the order must be enacted, rather than the time at which the order is given.

Agent $A$ setting a goal for itself is notated by means of a hollow $g$ inside a concave box; a hollow $g$ on its own stands for an active goal; whereas a concave box by itself stands for conceiving of an idea. A hollow arrow closed on its left side and containing an $m$ stands for “and this motivated” what follows the arrow. The symbol $\neg$ stands for logical negation. A four-leaf clover stands for perception; a double-edged four-leaf clover stands for testimony; these are ocular (i.e., visual perception and eye-witness testimony) if there is an eye inside the symbol. Ability, i.e., ontological possibility, for agent $A$, is symbolized by $\text{can}$ with $\text{ont}$ as a superscript and $A$ as a subscript. If instead of $\text{ont}$ the superscript is $\text{deont}$, then it is permissibility, i.e., deontological possibility, that is meant. Transgressions on it are symbolized by a lightning-like arrow directed from the transgressing agent towards a $\Gamma$ symbol, as indeed the set of duties of agent $B$ to agent $A$ is symbolized by $\Gamma_{A/B}$.

Let us notate an authority as $J$ and a society as $S$. We notate the master relation, here, as follows:

$$J \triangleright S$$

Sometimes in history an authority, $J$ over society $S$, is very negatively prejudiced against a human group $\mathcal{H}$. It may happen, then, that $J$ is keen on having members of society within $J$’s jurisdiction ($S$) other than members of social group $\mathcal{H}$ hold the same prejudice against $\mathcal{H}$ and mistreat its members. It has historically happened that such an authority $J$ has ordered that members of the disliked group wear visibly a mark of their belonging to that group, so that they may be recognized as belonging to it. We represent that pattern as follows:
\[\exists t, \exists S, \exists H, \exists J, \text{ At } t:\]

\[
(J \triangleright S) \land \left( \neg \underbrace{J \ H}_J \right) \implies \underbrace{\left( \underbrace{\forall j, j \in H \ j \in S :}_{\pi'} \pi'' \in \Gamma_{j/S} \right)}_J
\]

That is to say: there exist a time \(t\), a society \(S\), a social group \(H\), and an authority or jurisdiction \(J\), such that at time \(t\), \(J\) has authority over the society \(S\), and \(J\) is very negatively prejudiced against social group \(H\), and this motivated (at time \(t\)) the setting of a goal on the part of \(J\), this goal being as expressed by proposition \(\pi'\). This in turn motivated an order, given (at time \(t\)) by authority \(J\) to society \(S\), to the effect that for every \(j\) who is an individual member in both set \(H\) and set \(S\), proposition \(\pi''\) is a duty within the duties that \(j\) owes to society \(S\). The propositions are nested inside a formula such as this one as a macro (i.e., you can just replace the formula for the proposition in place of the name of the given proposition), rather than as a logic truth value.

By \(\equiv\) we mean “is identical to”.

\[
\pi' \equiv \begin{cases} 
\text{if} & (j \text{ is-a person}) \land (m \text{ is-a person}) \land \\
\text{then} & (j \in H) \land (m \in S) \land (m \notin H) \\
\end{cases}
\]

Proposition \(\pi'\) (i.e., the state of affairs that authority \(J\) has set for itself as a goal to be achieved) states that: if \(j\) and \(m\) are persons, and \(j\) is a member of social group \(H\), whereas \(m\) is a member of society \(S\), but not of \(H\), then \(m\) is very strongly prejudiced against social group \(H\), and if \(m\) believes that \(j\) is a member of \(H\), then \(m\) mistreats \(j\), and if \(m\) sees \(j\), then \(m\) believes that \(j\) is a member of social group \(H\). That is to say, the authority has the goal that not only members of society other than the disliked group, will dislike members of that group, but that moreover, when seeing these targeted individuals, these could be recognized as members of the persecuted group.

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Proposition $\pi''$ (i.e., the duty that authority $J$ imposes on members of society other than those who are also members in the group the authority dislikes) states that: for every $j$ and for every $m$, $\beta_j$ (which is something associated with $j$) is an individual instance of kind $\beta$, and $j$ must (as an obligation, i.e., $j$ cannot deontically not to) wear $\beta_j$. And moreover, $m$ must not wear $\beta_m$, where $\beta_m$ is an individual instance of kind $\beta$. And moreover, also proposition $\pi'''$ applies.

Proposition $\pi'''$ (i.e., part of duty $\pi''$ that authority $J$ imposes on members of society other than those who are also members in the group the authority dislikes) states that: for every $j$ and for every $m$, if $m$ is able to (i.e., if $m$ ontologically can) see $j$, then $m$ is able to see that $j$ is wearing $\beta_j$, and $m$ believes (is aware) that $\beta_j$ is an instance of kind $\beta$. That is to say, such members of society who are not members of the persecuted group will both be able to see the badge, and to know what it is. The formulation of the condition part of proposition $\pi'''$ ensures that the action part would not apply, say, to some $m$ who is blind, or somewhere else out of sight where $m$ could not see $j$ anyway.
Bear in mind that in our notation as used here, we do not distinguish between belief, knowledge, and awareness. That is a distinction that is important, instead, in Adamatzky’s (2005) pioneering model of how a coalesced mind and irrationality emerge in a crowd, that in such circumstances may become a mob.

5. The Episodic Formulae for the Narrative of Joseph Cazès in Teheran: The AIU Setting its Goals There, and Cazès’s Arrival in Town

Let AIU stand for the Alliance Israélite Universelle. In the second half of the nineteenth century and the early twentieth century, the AIU was heavily involved in setting up modern schools for the Jewish communities of the Levant and North Africa. This, of course, had a major impact on the curriculum taught. To the AIU, becoming modern actually meant: Westernized, secularized, and hopefully Frenchified, as in the meliorist worldview of the managers involved, there could be no better blessing than becoming an enlightened person of French culture. The narrative we are considering was in the late 1890s, at a time when such rosy hopes were in upheaval, for French Jewry, because of the Dreyfus affair and the outpouring of raw hostility.

Let TJ stand for Teheran’s Jewish community, and JC stand for Joseph Cazès. Moreover, let R stand for the Shi’ite mullah Reihollah, who at the time at which the narrative unfolded, was able to impose his will on behalf of the established faith in Teheran.

Bear in mind that we have much leeway in the chunking of events or other propositions. We do the chunking in a manner convenient for writing down the formula for each chunk. The first formula given in this section states a succession of events. This is indicated by their being separated by semicolons:

\[ e'; e''; e'''; e'''' \]

The next formula states that in 1898, the AIU set for itself the goal, that the Jewish community of Teheran becomes modernized:

\[ E' \equiv \begin{array}{c} 1898 \\ \text{AIU} \end{array} \begin{array}{c} G \\ \text{AIU} \end{array} \begin{array}{c} \text{stet} \\ G_0 \end{array} \]

\[ G_0 \equiv \begin{bmatrix} \text{At-time} & t, t \geq 1898: \\ T.J \text{ becomes modernized} \end{bmatrix} \]

We turn to a subgoal which fits in a plan for achieving the latter goal. Event \( e'' \) states that from 1898 on, the AIU believed that if the AIU managed to achieve its goal \( G_1 \), then
this would cause the achievement of the AIU’s goal $G_0$ of Teheran’s Jewish community becoming modernized:

\[ E'' \equiv \square_{\text{AIU}} t, \; t \geq 1898 \quad \left[ \begin{array}{c} \text{AIU} \\ G_1 \\ \rightarrow \\ \text{AIU} \\ G_0 \end{array} \right] \]

Event $e'''$ states that event $e''$ eventuated, and motivated the AIU setting (also in 1898) the goal $G_1$.

\[ E''' \equiv \left[ E'' \quad \begin{array}{c} \text{AIU} \\ \leftrightarrow \\ \begin{array}{c} 1898 \\ \text{AIU} \\ \text{stet} \\ G_1 \end{array} \end{array} \right] \]

Goal $G_1$ is that from 1898 on, there exists in Teheran a school whose taught curriculum would be the AIU’s own curriculum (note the value-assignment operator $\equiv$ as usual in computer programming), and such that the typical student of that school would belong to the Jewish community of Teheran:

\[ G_1 \equiv \left[ \begin{array}{c} \text{At-time} \quad t, \; t \geq 1898 \quad \exists q_0 \text{ in Teheran} \\ \land \quad (q_0 \text{ is-a school}) \land \\ \land \quad (\text{curriculum}(q_0) \equiv \text{curriculum}(\text{AIU})) \land \\ \land \quad (\text{typical}(\text{student}(q_0)) \in \text{T.J}) \end{array} \right] \land \]

The AIU’s goal $G_1$ being active in 1898 motivated the AIU setting for itself, also on that year, the goal $G_2$:

\[ E''''' \equiv \left[ \begin{array}{c} \text{AIU} \\ G_1 \\ \leftrightarrow \\ \begin{array}{c} 1898 \\ \text{AIU} \\ \text{stet} \\ G_2 \end{array} \end{array} \right] \]

Let us state a chain of such events that each eventuated in turn, and motivated the next event:
Goal $G_2$ is that from 1898 on, there should be in Teheran an AIU employee competent for implementing goal $G'_2$ and the latter goal be implemented indeed:

$$G_2 \equiv \left[ \exists d_0 \text{ in Teheran} \wedge \left( q_0 \text{ is-a employee (AIU)} \wedge \left( q_0 \text{ is competent for } G'_2 \right) \right) \wedge \left( \text{At-time } t, t \geq 1898 : \right) \right] \wedge G'_2 \wedge$$

Goal $G'_2$ is that during an interval of time contained in 1898, that employee of the AIU would established the school, and that from the start of that time interval, up to a point in time to be decided by the AIU, that employee would direct that school:

$$G'_2 \equiv \left[ \exists d_0 \text{ in Teheran} \wedge \left( q_0 \text{ is-a employee (AIU)} \wedge \left( q_0 \text{ is competent for } G'_2 \right) \wedge \left( \text{At-time } \tau_0, \tau_0 \subset 1898 : \right) \right) \wedge \left( d_0 \text{ establishes } q_0 \right) \wedge \right] \wedge \left[ \text{At-time } \tau_1, \text{ start}(\tau_1) \leq \tau_1 \leq \text{end}(\tau_1) : \right] \wedge \left( d_0 \text{ directs } q_0 \right) \wedge \left( \text{end}(\tau_1) \text{ to-be decided by AIU} \right) \wedge$$

Event $e_0$ states that in 1898, before July of that year, the AIU appointed Joseph Cazès to be its employee in Teheran, the one who should establish and direct the AIU school in that city:
Then, at a time starting at some point in July 1898, Joseph Cazès was in Teheran, and it was his own goal to implement goal $G_2$:

$$e_0 \equiv \left[ \text{At-time } t_0, t_0 \subset 1898, t_0 \prec \text{July(1898)} : \right. $$

$$\text{AIU stet } (d_0 := JC)$$

6. Reiḥanollah’s Decree Concerning the Jews of Teheran

At the times of the events narrated, the top cleric was the Shi'ite mullah Reiḥanollah, whose tenure was inclusive of the years 1897 and 1898:

$$e_1 \equiv \left[ \text{At-time } t, t \succeq t_1, t_1 \subset \text{July(1898)} : \right. $$

$$(JC \text{ is in Teheran}) \land \begin{bmatrix} \text{g}^t_{JC} \end{bmatrix} G_2$$

Whether he actually was the top cleric who held authority on behalf of the established faith in Teheran, is not as important as the fact that it proved to be quite in his power to impose his decree upon the Jewish community, and to have the general society see to it that the measure was observed. For the sake of making things simpler here, let us suppose that he was the top cleric in town. That is expressed in proposition $f_0$. An equivalent formulation is as follows (note the triangular symbol for the binomial relation of authority):

$$f_0 \equiv \left[ \text{At-time } \mathcal{T}, \{1897, 1898\} \subset \mathcal{T} : \right. $$

$$(R \text{ is-the clerical (authority (Teheran)))}$$

This fact enabled the conjunction of three chunked facts:

$$f_0' \equiv \left[ \text{At-time } \mathcal{T}, \{1897, 1898\} \subset \mathcal{T} : $$

$$R \gtrless \text{Teheran how: top (cleric (established (faith))) } \text{in Teheran}$$

This fact enabled the conjunction of three chunked facts:
Let us consider those three facts in turn. At a time in 1897, Reihanollah had ordered Teheran (a µ stands for communication, and the exclamation mark indicates that this was an order) the following: that from that time on (as indicated by the superscript to the exclamation mark), everybody who was a member of the Jewish community of Teheran was to wear that person’s respective badge:

\[
\begin{align*}
\mathbf{f_1} & \equiv \left[ \begin{array}{c}
\text{At-time } t', t' \in 1897 : \\
\mu_{\text{Teheran}} \left( \forall j, j \in \text{TJ} : \right) (j \text{ wears } \beta_j) \\
\forall t, t > t'
\end{array} \right]
\end{align*}
\]

From that time on, for every member of the Jewish community of Teheran, wearing the badge was part of that persons’ obligations towards Teheran, and that person was wearing the badge indeed:

\[
\begin{align*}
\mathbf{f_2} & \equiv \left[ \begin{array}{c}
\text{At-time } t, t \geq t', \forall j, j \in \text{TJ} : \\
(j \text{ wears } \beta_j) \in \Gamma_{j/\text{Teheran}} \\
\wedge (j \text{ wears } \beta_j)
\end{array} \right]
\end{align*}
\]

The badge was a patch of red cloth:
We state a further enablement relation:

\[
\begin{align*}
\mathbf{f}_3 & \equiv \left[ \begin{array}{c}
\text{At-time } t', t' \subseteq 1897, \forall j, j \in \text{TJ} : \\
R \text{ stet } \left[ \begin{array}{c}
\beta_j \text{ made-of cloth} \\
\land \\
\beta_j \text{ is-a patch} \\
\land \\
\beta_j \text{ is red} \\
\end{array} \right] \\
\end{array} \right] \\
\end{align*}
\]

At a time equal or successive to July 1898, Joseph Cazès was aware of a conjunction of propositions:

\[
\begin{align*}
\mathbf{e}_1 \xrightarrow{\text{enb}} \left( \mathbf{f}_4 \land \mathbf{f}_5 \land \mathbf{f}_6 \right)
\end{align*}
\]

7. Conflicting Norms, and Contrary-to-Duty (or Reparational) Obligations

7.1. Preliminaries

Before we proceed any further, let us explain something about conflicting norms, and contrary-to-duty obligations. Of course, Joseph Cazès would like the decree about the Jews of Teheran having to wear the badge to be repealed entirely. Yet, failing that, he settles for trying to achieve compromise: even though those Jews would still be forced to wear the badge, let them at any rate wear a positively connotated badge, namely, the organizational badge of the AIU.

The \textit{locus classicus} of conflicting imperatives is the predicament of the protagonist of Sophocles’ tragedy \textit{Antigone}: Antigone is entombed alive by King Creon, who had forbidden under pain of death the burial of one of her brothers; she is betrothed to Creon’s son and could abide by his decree, yet, bound by fraternal duty, she nevertheless transgressed on Creon’s order, and is punished accordingly. Only, Antigone is perceived (other than by Creon) to have been righteous in behaving the way she did.
7.2. An Example: The Dilemma After the Kidnapping of Aldo Moro

It is not difficult to exemplify. Within the context of violence originating in the political armed underground in Italy during the 1970s, a moral as well as practical dilemma faced the authorities after the kidnapping of Aldo Moro, a former prime minister who at the time was the president of the Christian Democrats. On 16 March 1978, Moro was abducted from his car in Rome, the five men of his escort having been killed by a squad of the Red Brigades. (The similarity was noticed, with the kidnapping, by the Baader–Meinhof terrorist group, of the president of West German industrialists, Hans Martin Shleyer, which had taken place in Köln on 5 September 1977; he was eventually killed.)

The country reacted to Moro’s kidnapping with initial incredulity, then reeled in shock, a strike in protest was declared, and public transport no longer worked for the day. The present author was an undergraduate student at the time, and recalls that at the end of a lesson at the university, students coming into the classrooms for the next lesson gave the news, but on the spot were not believed; eventually, he had to walk home over a distance of almost 25 km, as no public transportation was available.

A few Sudtiroler students gathered to discuss the situation, in the classroom after lessons: for them, the challenge would have been not just to reach the other end of town, but a different region. Contrary to the worst expectations, lessons started again on the next day, and things went back to “normal”. Almost so.

The Red Brigades requested that thirteen prison inmates from the revolutionary Left be released, for Moro’s life to be spared. Moro’s own desperate letters requested that his captors’ demands be met. The government and all mainstream political parties were in agreement not to surrender to the terrorists’ requests. None was more adamant than the Communist Party (which had reached some limited agreement to support the government from the outside, thanks to Moro). Only the Socialists, as well as former president Giuseppe Saragat (the founder of the Social Democrats) vaguely proposed to make some concessions which would not fulfil the terrorists’ requests. On 19 April, the newspaper *Lotta Continua* published an appeal for negotiation, signed by some exponents of the Left, as well as Catholic intellectuals; the initiative was Moro’s son’s (Selva & Marcucci 1978, pp. 63–64).

Whereas *Lotta Continua* consistently asked for negotiation, other circles of the far left did likewise: Democrazia Proletaria, and the newspaper *Il Manifesto*, while the Partito di Unità Proletaria was against. It need be understood that the late 1970s, the so-called anni di piombo (“the Years of [Bullets] Lead”), punctuated by Red Brigades and related shootings, were no longer the early 1970s years of the *strategia della tensione*, which had been punctuated by far Right bombings (and, according to the Left, the alleged cover-up of connivances).

Far Left violence had become more focused, deadly, professional, but by 1978, there also was in Italy a far Left which no longer advocated armed struggle within Italy; it used to overtly refer to the Red Brigades as *compagni che sbagliano*, i.e., “camarades who are in error”.

Fifty-five days after his kidnapping, on 9 May, Moro’s body was discovered inside the boot of a car in central Rome, close to the headquarters of both the Christian Democrats and the Communist Party. During a TV broadcast, two former leaders of the Resistance, Saragat and Republican leader Ugo La Malfa, expressed contrasting views about what was to be done. La Malfa (high pitched): “La pena di morte, la pena di morte!” (invoking death penalty). Saragat (disagreeing, in a low tone): “No, no, la pena di morte no”. La Malfa, again: “La pena di morte, la pena di morte!”. And Saragat, again: “No,
Arguing for agreeing to the terms for Moro’s release, as proposed by part of the legitimate far left, was by itself a legitimate stance. Saving Moro’s life certainly was an ethical goal; certitude of more to come if such surrender took place would have entailed other people’s death, but no specific person was involved as yet. Either decision, refusing or agreeing to terrorist blackmail, is a bad decision. There had already been the kidnapping of Judge Sossi; the release of convicted terrorists was blocked by Francesco Coco, another member of the judiciary. Sossi was released, but Coco was shot dead instead.

In retrospect, tentatively: opting for saving Moro would have been a reasonable stance, as reasonable as refusal to surrender. At any rate, relenting at the time would have been more moral than, years later, the early release of the leadership of the Red Brigades, carried out and presented as a measure of pacification and turning a historical page.

The Moro case is the subject of a few books in English (Wagner-Pacifici 1986; Drake 2002). Also see the English translation of a polemic book by novelist Leonardo Sciascia (1978, English 1987).

7.3. Another Example: The Jabril Deal

The Moro case was a classic case of conflicting imperatives. Another episode with such a conflict was Israel’s going ahead with the so-called Jabril deal in May 1985, with disastrous consequences, as about 600 of the prisoners it released and who were let to reside in the West Bank were then able to sweep aside moderate elements and take over the Arab communities in whose midst they dwelt; eventually this cost the lives of hundreds.

As Newsweek magazine of 3 June 1985 reported (Deming & Kubic 1985):

Israel had always prided itself on never abandoning a soldier who falls into enemy hands. But last week Jerusalem paid a very high price to maintain that tradition. The Israelis released 1,150 prisoners, including terrorists and 167 convicted murderers, to obtain freedom for three Israelis held in Syria. The lopsided swap threatened to undermine Israel’s basic rules of self-defense: never give in to terrorists. [...] Relatives of Israelis killed by terrorists who were freed in the exchange were outraged.

For example, Japanese Red Army’s Kozo Okamoto, perpetrator of a massacre at Lod airport, was fêted on arrival in Libya. There were precedents for Israel: 4,600 PLO prisoners of the war in Lebanon were swapped in 1983, for six Israeli soldiers in return, and in 1984, 300 Syrian soldiers were traded for three Israeli soldiers and six civilians; in those cases, both the PLO and Syria had previously killed Israeli prisoners, only keeping a few for an exchange.

7.4. Logic and Computational Models of Contrary-to-duty Imperatives

Conflicting imperatives have been studied in artificial intelligence for law, in connection to deontic logic, i.e., the logic of obligations, on which, see, e.g., Åqvist (2002). Contrary-to-duty imperatives include such conflicts, but in practice they also deal with other situations where a norm violation has occurred, yet the same agent still needs to proceed normatively in other respects.

In the words of the late Hector-Neri Castañeda:

Conflicts of duties or obligations are an essential part of life. Some conflicts of duties arise from contradictions in a system of norms. In such cases we simply
have to revise the system and restore consistency. However, most conflicts arise from collisions between systems of rules converging at the same circumstances. Then we confront sets of deontic truths in tension; clearly a tension among truths does not yield a contradiction. For instance you have two debts having payments due on the same day, but you cannot make both payments. Here typically there is no question of revising a system of rules. The rules remain in place, and you must find a solution that acknowledges both obligations to pay. The obligation you leave unfulfilled remains operative: later on you can truly assert that you ought to (should) have paid it, even though you didn’t and couldn’t (Castañeda 1992: p. 116).

Conflicting norms as treated in logic for the purposes of contract-driven e-commerce, were discussed in Abrahams and Bacon (2002). Contrary-to-duty obligations are sometimes called reparational obligations, when the concept is concerned (as it often has been in the scholarly work of logicists within research into deontic logic) as remedial obligation for a state of affairs contravening a previous obligation; see, e.g., Parent (2003). A related example is that of the gentle murderer: one shall not murder, but if he does, let him do it gently; “gentle murder” is also called the Forrester paradox (Forrester 1984).

Research on contrary-to-duty obligations is related to conditional obligations; on the latter, see Chellas (1974), and on the relation between the two classes of obligations, see Tomberlin (1981, 1983). Horry (1993) deals with both classes in terms of nonmonotonic deontic logic; cf. Horry (1994, 2003). In a cognitive perspective, see Holyoak and Cheng (1995). On normative conflicts and their formal analysis from the viewpoint of lawmaking, i.e., legislation, see Elhag et al. (1999).

For a discussion of contrary-to-duty obligations (or imperatives), see e.g. Carmo and Jones (2002), which is an encyclopedic entry, as well as Chisholm (1963), Åqvist (1967), Hage (2001), Carmo and Jones (1996), Prakken and Sergot (1996a, 1996b, 1997), and Governatori and Rotolo (2002).

An approach that resorts to Petri nets for the representation of deontic states, including contrary-to-duty obligations, has been proposed in Raskin et al. (1996). By the same team, the paper by van der Torre and Tan (1999) is on contrary-to-duty reasoning. Ursu and Zimmer (2002) are concerned with the representation of duty and contrary-to-duty statements, in computer-aided design tools of the class of critiquing intelligent design assistants. Examples given by Ursu and Zimmer in their article’s Section 4, of a secondary (contrary-to-duty) obligation that comes into effect when the primary obligation is violated, include: “Preferred design: uniform wall thickness should be used”, yet: “When unavoidable” — i.e., when walls must have a different thickness — “transition from one wall thickness to another should always be as smooth as possible”. Or then this other example: “There must be an alternative escape route from all parts of the building. However, in the following situations a single route is acceptable”.

8. Joseph Cazès Tries to Have the Decree Partly Repealed:
Or, Getting the Best Deal Out of a Bad Fix

8.1. The Formulae

Let us resume the representation in episodic formulae, of how Joseph Cazès tried to cope with Reiḥanollah’s decree that forced Teheran Jews to wear a red patch. We start by recalling that Cazès became aware of that decree, and was also aware of some general goals of the AIU:
and then by stating the goal entertained by the AIU at any time it has been in existence, that every Jew everywhere should enjoy full civil rights:

Moreover, at all times when the AIU has been in existence, the latter goal had motivated the AIU entertaining two further goals:

Those two goals respectively state that at any time the goal of Jews enjoying full civil rights is not achieved, then the AIU should have the goal that it should be achieved:
G^2_r \equiv
\begin{cases}
\text{if } \text{At-time } t : \neg g^t_{AIU} G^1_r_{AIU} \\
\text{then } g^{t', t' \succ t}_{AIU} G^1_r_{AIU}
\end{cases}

and that for any place, for any Jews in that place, if the AIU is unable to (i.e., it cannot ontologically) see to it that Jews enjoy full civil rights in that place, then the AIU should set for itself the goal that such Jews should have the best deal of a bad fix, in terms of civil rights:

G^3_r \equiv \begin{cases}
\forall p, \ p \text{ is-a place, } \forall j, \ j \text{ is-a Jew in } p : \\
\text{if } \square^t_{AIU} \neg \text{can}^{\text{ont}}_{AIU} \left( \text{AIU stet } G^3_{r'} \right) \\
\text{then } g^{G^3_{r'}}_{AIU}
\end{cases}

G^3_{r'} \equiv \begin{cases}
\text{if } t', t' \succ t \\
G^1_{r \text{ in } p}
\end{cases}

G^3_{r''} \equiv (j \text{ has best-deal-of-bad-fix (civil (rights (j)))})
Joseph Cazès was an employee of the AIU, and moreover he was aware of both Reiḥanollah’s decree, and those goals of the AIU. This motivated him to set for himself the goal that from the time he became aware of the decree, on, Teheran Jews should at least enjoy the best deal of a bad fix in terms of civil rights:

\[ f''''_4 \equiv \left[ (JC \text{ is-a employee (AIU)}) \land f_4 \right] \]

\[ f'''_4 \xrightarrow{m} e_2 \]

\[ e_2 \equiv (t, t \geq \text{beginning}(f_4)) \]

\[ G^4_r \]

\[ JC \]

\[ \begin{cases} \text{At-time } t, t \geq \text{beginning}(e_2) : & \\ \text{if } (j \in TJ) & \\ \text{then } G'''_r & \end{cases} \]

Now, we chunk some information into several propositions, and state that the conjunction of those propositions eventuated, and motivated event \( e_3 \):

\[ f_5 = \left( f'_5 \land f''_5 \land f'''_5 \land f''''_5 \right) \]
At any time that the AIU was in existence and Joseph Cazès was alive, he believed that the AIU was an educational organization, that it was not forbidden, that it was meritorious, and that it was proud:

\[
\forall t, \text{At-time } t \ (\exists \text{AIU} \land (\text{JC is alive})) : \\
\begin{align*}
&\quad \text{AIU is-a organization} \land \\
&\quad \text{AIU is educational} \land \\
&\quad \neg \text{AIU is forbidden} \land \\
&\quad \text{AIU is meritorious} \land \\
&\quad \text{AIU is proud}
\end{align*}
\]

At any time that the AIU was in existence and Joseph Cazès was alive, he believed that anybody who was a Jew ought to be very favourably disposed towards the AIU:

\[
\forall t, \text{At-time } t \ (\exists \text{AIU} \land (\text{JC is alive})) : \\
\begin{align*}
&\quad \text{if } (j \text{ is-a Jew}) \\
&\text{then ought (\inj{j} \text{AIU})}
\end{align*}
\]

Starting at the time of the beginning of event \(e_2\) (i.e., his setting the goal of obtaining the best deal in a bad fix), Joseph Cazès believed that any person very favourably disposed towards a given organization that is meritorious and is not forbidden, if that person believes that he or she is connected to that organization, then that person ought to feel pride if he or she was wearing the organizational badge of that organization:
At that same time, Cazès also believed that any member of the Jewish community of Teheran ought to have the goal of being connected to the AIU:

\[
\begin{align*}
\exists t \geq \text{beginning}(\mathcal{E}_2) : & \quad \square_{JC}^{t} f_5'''
\end{align*}
\]

\[
\begin{align*}
\Longrightarrow & \quad \text{if} \quad (i \text{ is a person}) \quad \land \\
& \quad \land (\text{org}_0 \text{ is a organization}) \quad \land \\
& \quad \land (\text{org}_0 \text{ is meritorious}) \quad \land \\
& \quad \land \neg (\text{org}_0 \text{ is forbidden}) \quad \land \\
& \quad \land \left( +_1 \text{org}_0 \right) \quad \land \\
& \quad \land \left[ \text{if} \quad (i \text{ wears badge}_0) \quad \land \\
& \quad \land (\text{badge}_0 \text{ is a organizational-badge (org}_0)) \quad \land \\
& \quad \text{then} \quad (i \text{ feels pride}) \right]
\end{align*}
\]

At that same time, Cazès set for himself the goal stated in the parenthesis following the goal-setting symbol and itself consisting of two subgoals, and moreover Cazès believed \( f_6 \) (which is not itself part of the goal):

\[
\begin{align*}
\exists t \geq \text{beginning}(\mathcal{E}_2) : & \quad \square_{JC}^{t} f_5''''
\end{align*}
\]

\[
\begin{align*}
\Longrightarrow & \quad \text{if} \quad j \in \text{TJ} \\
& \quad \text{then} \quad \text{ought} \quad g_j^{t} \left( j \text{ is connected-to AIU} \right)
\end{align*}
\]
The two subgoals respectively were as follows. Namely, that the decree about Teheran Jews having to wear a badge would stand, but that the detail specifying that it should be a red patch be rescinded, and that the badge would be instead the AIU organizational badge:

\[ e_3 \equiv \left[ \text{At-time } t, t \geq \text{beginning } (e_2) : \right] \]

\[ \bigg( g(t) \wedge \left( G^1_b \wedge G^2_b \right) \wedge \square^{t}_{JC} f_6 \bigg) \]

and that if that subgoals was achieved, then any member of the Jewish community of Teheran would wear the AIU organizational badge and feel pride:

\[ G^1_b \equiv \left( f_2 \text{ stands } \right) \wedge \left( f_3 \text{ to-be rescinded } \right) \wedge \left( \beta_j := \text{organizational-badge (AIU)} \right) \]

\[ G^2_b \equiv \left[ \begin{array}{c} \text{if} \; \begin{array}{c} \text{JC} \end{array} \; G^1_b \\
\text{then} \; \text{ought} \; \begin{array}{c} \text{if} \\ j \in TJ \end{array} \; G^2'_b \end{array} \right] \]
As to proposition \( f_6 \), which as seen Cazès believed, it states the following: if he succeeded in achieving the goal that upon obtaining that the patch be replaced with the AIU organizational badge, Teheran Jews would wear it and feel pride, then Reihanollah’s goal that Teheran Jewry be humiliated would not be achieved. The formula is as follows:

\[
G^2_{b} \equiv \left[ (j \text{ wears organizational-badge (AIU)}) \land (j \text{ feels pride}) \right]
\]

Now, let us state the eventuation of a succession of events:

\[
f_6 \equiv \left[ \begin{array}{c}
\text{if} & \begin{array}{c}
\begin{array}{c}
\text{if} \\
G^2_{b}
\end{array}
\end{array} \\
\text{then} & \begin{array}{c}
\begin{array}{c}
\text{if} \\
R
\end{array}
\end{array}
\end{array}
(\text{TJ is humiliated})
\right]
\]

Moreover, we state a chain of enablements between pairs of eventuated events:

\[
\begin{align*}
e_3 & \rightarrow m \rightarrow e_4 & \rightarrow \text{enb} \rightarrow e_5 & \rightarrow \text{enb} \rightarrow e_6
\end{align*}
\]

That is to say, Cazès seeking to obtain the best deal and believing that it would be a good counterplan, enabled his setting for himself the goal that he should see to it that \( G_v \) and this in turn enabled the achievement of the goal that the red patch be replaced with the AIU organizational badge. The formula stating the setting of goal \( G_v \) is as follows:
That goal itself is expressed by this formula:

\[
e_4 = \exists t, t \geq \text{beginning} \left( e_3 \right) \quad (JC \text{ set } G_v)
\]

\[
G_v \equiv \begin{cases} 
\text{At-time } t, t \geq \text{beginning} \left( e_4 \right), \\
\exists K, K \equiv \{ k_i \}, K \neq \emptyset, \forall k_i, \\
\left( k_i \text{ is-a diplomat} \right) \land \left( k_i \text{ is accredited in Teheran} \right)
\end{cases}
\]

It states that at a time starting at the beginning of the event \( e_4 \), there would be a non-empty set of diplomats accredited in Teheran, who would set for themselves the goal that Joseph Cazès’ goal be achieved, of having the red patch replaced with the AIU organizational badge.

Eventually, Cazès’ goal \( G_v \) was achieved:

\[
e_5 \equiv \begin{cases} 
\text{At-time } t, t \succ \text{beginning} \left( e_4 \right), \\
\left( \text{g} \right)_{k_i}^{t} \left( \text{K} \right) \left( \text{JC} \right) \left( G_v \right)
\end{cases}
\]

Moreover, his goal of having the red patch replaced with the AIU organizational badge was achieved:
8.2. Considerations in the Social and Historical Context

Whether the Jews of Teheran wearing the AIU badge actually felt relieved is another matter, as they actually feared for their safety at being recognized, and whether the identifying signal was the red patch or the AIU badge, would have made little difference, had it not been the case that the very fact that the red patch was replaced with the AIU badge, was a signal to society at large that they enjoyed some protection, and they were not at the total mercy of their enemies. Netzer (1996, p. 247) points out the context:

Upon his arrival in Teheran, Cazès was surprised to find the Jews in the capital living in acute fear and at the mercy of enemies persecuting them in the name of religion. Since 1897, the Jews had worn a red patch on their clothes, as ordered by the Shi‘ite mullah, Reihanollah. They were loath to leave the Jewish quarter for fear of being attacked or murdered by their oppressors. It is not hard to imagine how Cazès must have felt in those days.

Netzer (ibid., p. 246), having remarked that “[a]s early as the 1860s, Persian Jews made contact with the leaders of the AIU in Paris, requesting that they help them establish modern schools”, quotes from a document from 1865, in which locals were describing their predicament; e.g.: “A Muslim who kills a Jew will not go to trial; even if there were witnesses to the crime, the Muslim would at most pay a fine for his deed”. Therefore, there was a sense of impunity. The same passage claimed: “We are subject to the scorn of our enemies who view us as defenseless and do with us whatever they like”.

As can be seen, our formal representation in terms of episodic formulae focuses on the hierarchy of goals. This is so by choice. Other aspects could have been expanded. Whereas the representation may appear to be prolix, it is important to understand that its merit resides precisely in that it forces us to make explicit many components of processes that can be easily be overlooked. We tend to be so used to taking them for granted because of our socio-cultural common sense, that we run the risk of missing some factors. Whereas resorting to episodic formulae is not enough, per se, to save us from that risk, it nevertheless enables us to make things explicit.

9. On the Ascription of Beliefs

In communication, agents reason about the beliefs of their interlocutor. Our episodic formulae enable to express, among the other things, the beliefs of agents, as well as their ascribing beliefs to each other. Yet, we do not distinguish between awareness, belief, and knowledge. Nested beliefs have been used in various computational systems modelling dialogic argumentation, such as Sycara’s PERSUADER (Sycara 1989, 1992; Lewis and Sycara 1993), or NAG of Zukerman et al. (1998), or then DAPHNE of Grasso et al.(2000). Whereas in cooperative dialogues, i.e., such dialogues that none of the participants is committed to any form of deception, three levels of nesting of beliefs are sufficient, this is not enough when it comes to modelling some situations involving deception, and deeply-nested belief levels are required, as argued by Jasper Taylor (1994a, 1994b).
Mutual beliefs are modelled in part of artificial intelligence’s models of teamwork. We quote from an overview of multi-agent research within artificial intelligence, Katia P. Sycara (1998, pp. 84–85):

[A particular] direction of research in cooperative multiagent planning has been focused on modeling teamwork explicitly. Explicit modeling of teamwork is particularly helpful in dynamic environments where team members might fail or be presented with new opportunities. In such situations, it is necessary that teams monitor their performance and reorganize based on the situation.

The joint-intentions framework (Cohen and Levesque 1990) focuses on characterizing a team’s mental state, called a joint intention. A team jointly intends a team action if the team members are jointly committed to completing the team action while mutually believing they were doing it. A joint commitment is defined as a joint persistent goal. To enter into a joint commitment, all team members must establish appropriate mutual beliefs and commitments, which is done through an exchange of request and confirm speech acts (Cohen and Levesque 1990). The commitment protocol synchronizes the team in that all members simultaneously enter into a joint commitment toward a team task. In addition, all team members must consent, using confirmation, to the establishment of a joint commitment goal. If a team member refuses, negotiation could be used; however, how it is done remains an open issue.

What psychologists call attribution and in artificial intelligence is termed agent beliefs, i.e., how people (and computational cognitive models) reason about their own beliefs and the ones they ascribe to others, was applied to legal evidence in two papers that adopt different approaches: Ballim et al. (2001), and Barnden (2001). Previously Ballim and Wilks (1991) proposed an AI formalism for nested beliefs, which in Ballim et al. (2001) they applied to legal narratives. (On agents’ beliefs, also see Maida (1991). Maida (1995) is a review of Ballim and Wilks (1991).) Barnden (2001) describes an application of agents’ simulative reasoning by agents on each other, by means of the ATT-Meta system, which deals with agents’ beliefs in respect of a formal approach to uncertain reasoning about them.

BASKETBALL is an expert system that was developed in an ad hoc fashion (rather than according to some neat theory) by two students of mine under my direction. BASKETBALL is an expert system that gives advice to a basketball team on the opening five and the playing strategy, for a given upcoming match. It does, by analyzing the present assets of the two teams, and based also on the likely course of action of the adversary team, even though the information on the present state of the adversary team is likely to be only partial; some general information about the league or the place is also relevant (Simhon, Nissan and Zigdon 1992). This is relevant, in our present context, because the reasoning in BASKETBALL is partly based on reading the minds of the other team, by considering how they are likely to plan how they should play, according to their assets. Yet, no further levels of nesting are involved: BASKETBALL does not consider the possibility that the other team, too, may be trying to guess how our own team is going to plan its own strategy, based on our own assets.

In our formal representation, we saw Cazès devising a counterplan. For the structure of players’ planning and counterplanning, which has to be understood by an artificial intelligence tool while analysing a narrative, see Carbonell (1981, p. 281, Fig. 11.5, and p. 283, Fig. 11.6). There are other ways to account, in a computer tool, for expecting a plan to be adopted by a competitor, and for counterplanning accordingly. This is, indeed, the case of the already mentioned BASKETBALL, a program implemented by students of mine.

A philosophical controversy on knowledge and belief is the one between Vendler (1975a, 1975b) and Aune (1975). Also consider the difference between dispositional be-
Robert Audi (1994) questioned the explanatory validity of antecedent belief:

Do you believe that this sentence has more than two words? [...] It would be natural to answer affirmatively. And surely, for most readers considering these questions, that would be answering truly. Moreover, in affirmatively answering them, we seem to express antecedent beliefs: after all, we are aware of several words in the first sentence by the time we are asked if it has more than two [...] Antecedent belief of the propositions in question — believing them before being asked whether we do — is also the readiest explanation of why we answer the questions affirmatively without having to think about them. These considerations incline many people to attribute to us far more beliefs than, in my judgment, we have. [...] I contend that, here, what may seem to be antecedently held but as yet unarticulated dispositional beliefs are really something quite different: dispositions to believe. [...] The terms ‘tacit belief’ and ‘implicit belief’ have been used for both dispositional beliefs and dispositions to believe [...] (ibid., p. 419).

The notion of common knowledge plays a significant role both in artificial intelligence models of agents’ beliefs, and in game theory. Mokherjee and Sopher (1994) is a paper on real players’ belief learning behaviour in economic games:

The assumption of Nash equilibrium plays a central role in modern noncooperative game theory. This theory is usually based on the notion that players have “common knowledge” regarding the payoffs and behavior modes of each other (see Aumann (1987) and Brandenburger and Dekel (1987)). It is commonly acknowledged that the assumption of common knowledge is a demanding one, and that a satisfactory theory should also describe the process by which players arrive at their beliefs (see, e.g., Binmore (1985)). Moreover, it is unlikely that most real players rely entirely on a cognitive process of thinking in order to arrive at their beliefs, rather than past experience at playing the same or related games. (ibid., pp. 62–63).

10. Conclusions

In this article, being a sequel to Nissan (2008a), I have applied episodic formulae to the analysis of a narrative that unfolded in 1897–1898 in Teheran. The viewpoint is that of the envoy of a philanthropic educational organization based in Paris; his task was to establish a school, but he found himself trying to get the best deal out of the bad fix, of a recent decree forcing local Jews to wear a red patch. With the help of some Western diplomats, he managed to have the red patch replaced with the badge of his own organization — short of being able to have the decree repealed altogether. We relegated all cultural discussion of the case at hand to a separate article, in a humanities journal (Nissan 2010); in fact, there is much to say, in a humanities perspective, about the narrative we analyzed.

In Parts I and Part II (i.e., Nissan 2008a and its present sequel), I have extended, with the introduction of prejudice, episodic formulae, a notation for representing episodic knowledge of social narratives, as well as situational patterns, that I have applied extensively in recent years, e.g. in Nissan et al. (2004) and Nissan (2003, 2007, 2008b, 2009a, cf. 2001, 2002). The usefulness of episodic formulae is that they enable us to make explicit and include in formulae various qualitative aspects of social interaction narratives and of human ratiocinative behaviour. This in turn is a first step towards integration with approaches to inference from artificial intelligence (AI), approaches that can be considered to be complementary to episodic formulae, even though the latter are committed to none of these in particular. The notation is based on logical predicates, with some elements from set theory as well as from semantic nets (e.g., Schubert et al. 1979) from AI, also drawing part of the
inspiration from the so-called conceptual dependency school in AI treatments of narratives (e.g., Schank and Riesbeck 1981; Dyer 1983a).

The specific narrative analyzed in this paper is such that the goal hierarchy plays a prominent role, and that planning (including counterplanning) has to do with emotions such as pride and humiliation. We haven’s adopted an explicit notation for plan selection, as this can satisfactorily be implicitly conveyed through the notation for goal setting, goals being active, and goals being achieved, along with the explicit representation of relations such as causality, motivation, and enablement.

Appendix A: A Notation for Hope and Despair

In the formulae we have been considering in this article, we have used some notation for positive or negative prejudice. Such primitives belong in a wider class of primitives for the emotions. We have relegated explanations about these to the appendices, as whereas they may be of interest to some readers, and are pertinent if one is to try and replicate for some different narrative the kind of analysis in episodic formulae as illustrated in this paper, by contrast discussing the emotions in episodic formulae and the modelling of the emotions in artificial intelligence is not necessary in order to make sense of the present article.

Let us start with such emotions that are associated with situations strongly affecting the agent, and either

(a) currently foreseen by the latter as with some likelihood for them to eventuate, or
(b) with these situations having actually eventuated or failed to eventuate once the agent had been experiencing the former kind of emotion.

At time $t$ agent $A$ hopes that $\xi$

The following four symbols show hope along with three other emotions — these being dread, despair, and relief — in double symmetry among themselves:
In our notation, any of these symbols, if placed inside a concave box, would stand for the conception of the respective emotion. The following considerations on those four emotions, as well as the brief overview of the literature about emotions, are based on a section in Nissan (2007, Part I).

Hope that \( \xi \), being entertained by agent \( A \) is not the same as the logical conjunction of \( A \) entertaining \( \xi \) as a goal, and of that agent’s belief that \( \xi \) is possible (ontologically possible, and for that matter not just theoretically possible yet utterly unlikely; and moreover — if the agent considered is very law-abiding or moral — deontologically possible (i.e., permissible, as this agent wouldn’t consider something impermissible to be feasible for him). Hope is not synonymous with such an epistemic state for the agent, but is, instead, an emotion that is likely to be associated with it.

Likewise, for agent \( A \) to dread the possible eventuation of \( \xi \) is an emotion associated with an epistemic state, rather than that state itself, which in turn can be formulated as the logical conjunction of \( A \) entertaining the negation of \( \xi \) as a goal, and of that agent's belief that \( \xi \) is ontologically possible, and indeed likely to occur.

For agent \( A \) to hope against hope, the content of that hope being \( \xi \), is to experience an emotion of hope concomitant with an epistemic state which can be described as the logical conjunction of: \( A \) entertaining \( \xi \) as a goal; and \( A \) being aware (which we don’t distinguish here from “believes”) that the likelihood of \( \xi \) eventuating is very low; and (in a sense) \( A \) entertaining a further goal to the effect that the degree of likelihood for \( \xi \) to eventuate is not such that an eventuation of \( \xi \) is virtually precluded as a foregone matter. Should \( A \) entertain the eventuation of \( \xi \) as a goal, while also believing that it is definitely impossible that it would eventuate, this is an epistemic state which would be likely to be accompanied by an emotion of despairing beforehand, as opposed to a similar emotion of despair experienced once the state of affairs is such that the same agent knows that \( \xi \) failed to eventuate and will not eventuate in the (useful) future.

And then again, such an emotion of despair is not the same as the epistemic state of discarding or having discarded a previously active goal (which I represent as the symbol for an active goal, surrounded by a crumpled contour). Also note that one thing is discarding a goal, whereas another thing is something like a preservation goal ceasing to be active, because there is no longer a threat. This in turn leads us to an associated emotion of relief.

In Dyer’s BORIS system (Dyer 1983a), it was precisely such details in the input narrative text that betray, in the behaviour of the characters as described, an emotion as triggering the given behaviour (typically, an emotion associated with a failed goal), which constituted the main cues for automated understanding of the story.

Appendix B: A Sketchy Overview of Models of the Emotions

There is a developing and already vast literature, within artificial intelligence, about the modelling of emotions (see, e.g. Nissan 2009b, 2009c). Picard’s book (1997) is now a classic; reviews included Sloman’s (1999) and mine own (Nissan 1999). I had previously published about the emotions in communication (Nissan 1997). Addressing a broad audience of computer scientists, Bates (1994) discussed the role of emotion in believable agents in computer interfaces. In the AbMaL project, reported about by Paul O’Rorke and
Andrew Ortony (1994), emotions were modelled in a framework for which, situation calculus was adopted. Some of the research on modelling emotions is mainly concerned with computer graphic aspects (Costa and Feijo 1996). Computational modelling of emotion was also devised within computer music (Camurri and Ferrentino 1999). A thematic special issue of *Cybernetics and Systems* (Vol. 32, No. 5 of July 2001) was devoted to the emotions. A special issue of *Applied Artificial Intelligence* (Vol. 16, No. 7), in 2002, was devoted to the merging of cognition and affect in human-computer interaction. There also is such research, whose aim is to elicit human emotion at the sight of an artefact; such is the case of the survivor project from robotic art (Cassinis et al. 2007, Nissan et al. 2008).

In the words of Aaron Sloman: “One of the notable features of recent AI literature is the proliferation of architecture diagrams in which there is a special box labelled ‘emotions’”, but “some theorists write as if all motives were emotions”, which is questionable (Sloman 2000, p. 7). In Sloman’s own work, see Sloman (1987), on drives as motive generators, in relation to emotions. AI models of emotion from the 1980s include Sloman’s work (1987) — cf. Wright et al. (1996) — as well as Pfeifer (1988). In the words of the philosopher Ronald de Sousa (2003), by the 1990s “Aaron Sloman has elaborated the sort of ideas that were embryonic in Shank and Colby into a more sophisticated computational theory of the mind in which emotions are virtual machines, playing a crucial role in a complex hierarchic architecture in which they control, monitor, schedule and sometimes disrupt other control modules” (de Sousa 2003, citing Wright et al. 1996).

The Ortony–Clore–Collins (OCC) cognitive model of emotions has often been applied in computer models of emotion. “Ortony et al. [(1988)] wrote that they did not think it was important for machines to have emotions; however, they believed AI systems must be able to reason about emotions — especially for natural language understanding, cooperative problem solving, and planning. Some structure was needed so computers could begin to represent the thicket of concepts considered to be emotions” (Picard 1997, p. 196).

The OCC model emotions according to cognitive eliciting conditions. In particular, it assumes that “emotions arise from valenced (positive or negative) reactions to situations consisting of events, agents, and objects. With this structure, Ortony, Clore and Collins outlined specifications for 22 emotion types [...] Additionally, they included a rule-based system for the generation of these emotion types” (Picard, *ibid.*, p. 196).

Valenced reactions may be to consequences of events (the reaction being: pleased, displeased, etc.), or to actions of agents (the reaction being: approving, disapproving, etc.), or to aspects of objects (the reaction being: liking, disliking, etc.). Valenced reactions to aspects of objects give raise to attraction emotions: love or hate.

Valenced reaction to consequence of events may focus on consequences for other, or consequences for self. Consequences for other are either desirability for other, or undesirability for other, and in both cases, valenced reactions to consequences for other give raise to fortunes-of-others emotions: happy for, or resentment, if the consequences of events are desirable for other; or then: gloating, or pity, if the consequences of events are undesirable for other.

Valenced reaction to consequences of events, if focusing on consequences for self, are differentiated according to whether prospects are relevant or irrelevant. If prospects are irrelevant, then emotions arising are ones of well-being: joy, or distress. If, by contrast, prospects are relevant, then emotions which arise are prospect-based, and include hope or fear, which may be confirmed or disconfirmed.

- Emotion arising if hope is confirmed is satisfaction.
Emotion arising if fear is confirmed is: fears-confirmed.
Emotion arising if hope is disconfirmed is disappointment.
Emotion arising if fear is disconfirmed is relief.

Valenced reaction to actions of agents may focus on self agent, or on other agent. Emotions arising are attribution emotions. For focus on self agent, they include: pride, or shame. For focus on other agent, they include: admiration, or reproach.

Well-being emotions together with attribution emotions give rise to well-being/attribution compounds. These include: gratification or remorse (if the focus is on self-agent), and gratitude or anger (if the focus is on other agent). A schema showing these relations appears in Figure 2.1 in Ortony et al. (1988) and in Figure 7.1 on p. 197 in Picard (1997).

In his entry for “Emotion” in the online Stanford Encyclopedia of Philosophy, Ronald de Sousa (2003) has pointed out the relation between emotions and their stories:

Some philosophers suggest that the directive power which emotions exert over perception is partly a function of their essentially dramatic or narrative structure (Rorty 1988). It seems conceptually incoherent to suppose that one could have an emotion — say, an intense jealousy or a consuming rage — for only a fraction of a second (Wollheim 1999). One explanation of this feature of emotions is that a story plays itself out during the course of each emotional episode, and stories take place over stretches of time. de Sousa (1987) has suggested that the stories characteristic of different emotions are learned by association with “paradigm scenarios”. These are drawn first from a daily life as small children and later reinforced by the stories, art, and culture to which we are exposed. Later still, they are supplemented and refined by literature. Paradigm scenarios involve two aspects: first, a situation type providing the characteristic objects of the specific emotion-type (where objects can be of the various sorts mentioned above), and second, a set of characteristic or “normal” responses to the situation, where normality is first a biological matter and then very quickly becomes a cultural one. Once our emotional repertoire is established, we interpret various situations we are faced with through the lens of different paradigm scenarios. When a particular scenario suggests itself as an interpretation, it arranges or rearranges our perceptual, cognitive, and inferential dispositions.

A problem with this idea is that each emotion is appropriate to its paradigm scenario by definition, since it is the paradigm scenario which in effect calibrates the emotional repertoire. It is not clear whether this places unreasonable limitations on the range of possible criticism to which emotions give rise. What is certain is that when a paradigm scenario is evoked by a novel situation, the resulting emotion may or may not be appropriate to the situation that triggers it. In that sense at least, then, emotions can be assessed for rationality.

It is not only the emotions of individual human characters that have been modelled computationally. Andrew Adamatzky has published a book, Dynamics of Crowd Minds (Adamatzky 2005) which I reviewed (Nissan 2009c), and in which he has modelled mathematically collective emotions and how these affect rationality. The formation of a crowd, according to his models, causes fusion of the minds of individuals into one collective mind, whereas individual members lose their individuality within the crowd. Effects include patterns of emotional, impulsive and irrational behaviour. There are perceptual distortion, and hyper-responsiveness, as well as self-catalytic activities. Adamatzky has applied, to collectives of abstract agents far from mental equilibrium, discrete models from cellular automata and artificial chemistry. Methods he applied also include lattice swarms, algebra, finite automata and Markov chains, and differential equations.
In Michael Dyer’s BORIS system (Dyer 1983a), a vast gamut of knowledge structures (ibid., p. 171) included AFFECTs (ibid., Chapter 4: pp. 105–139; and pp. 341–343), ACEs, i.e. Affects as Consequence of Empathy (ibid., pp. 120–124, 348–349), and interpersonal themes, actions, relationships and roles (ibid., Chapter 10 and Section 4.5). Also see Dyer (1987, 1983b) on affect in the automated understanding of narratives, or on (early) computer models of emotions. Characters’ plan failures within a plot are the central concept resorted to by BORIS in order to understand an input narrative.

Such NLP requirements admittedly were the only criterion when designing the representation and treatment of affects in BORIS: “BORIS is designed only to understand the conceptual significance of affective reactions on the part of narrative characters. To do so BORIS employs a representational system which shares AFFECTs to one another through decomposition and shared inferences” (Dyer 1983a, p. 130). For example, somebody who has just been fired may go home and kick his dog; the former event explains the latter (ibid., p. 131).

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