

The International
JOURNAL

of KNOWLEDGE, CULTURE
& CHANGE MANAGEMENT
in ORGANISATIONS,

Organizations and Orgonizations

Piero Mella

VOLUME 5, NUMBER 4

INTERNATIONAL JOURNAL OF KNOWLEDGE, CULTURE AND CHANGE MANAGEMENT
<http://www.Management-Journal.com>

First published in 2005/2006 in Melbourne, Australia by Common Ground Publishing Pty Ltd
www.CommonGroundPublishing.com.

© 2005/2006 (this paper), the author(s)
© 2005/2006 (selection and editorial matter) Common Ground

All rights reserved. Apart from fair use for the purposes of study, research, criticism or review as permitted under the Copyright Act (Australia), no part of this work may be reproduced without written permission from the publisher. For permissions and other inquiries, please contact <cg-support@commongroundpublishing.com>.

ISSN: 1447-9524 (print), 1447-9575 (online)
Publisher Site: <http://www.Management-Journal.com>

The INTERNATIONAL JOURNAL OF KNOWLEDGE, CULTURE AND CHANGE MANAGEMENT is a peer refereed journal. Full papers submitted for publication are refereed by Associate Editors through anonymous referee processes.

Typeset in Common Ground Markup Language using CGCreator multichannel typesetting system
<http://www.CommonGroundSoftware.com>.

Organizations and Organizations

The Holonic View of Organizations

Piero Mella, University of Pavia, Italy

*Abstract: A silent conceptual revolution has been under way for less than forty years now, beginning in 1967 with the publication of Arthur Koestler's *The Ghost in the Machine*, which formally introduced the concepts of holon and holarchy. According to Koestler, in observing the Universe surrounding us, we must not only consider atoms, molecules, cells, individuals, systems, words or concepts as autonomous and independent units but must always be aware that each of these units is at the same time a whole – composed of smaller parts – and part of a larger whole. In fact, they are holons forming a nidified hierarchical order known as a holarchy. The entire machine of life, in the whole universe, evolves toward increasingly more complex states, as if a ghost were operating the machine. This short theoretical essay will examine in what sense the holonic view can be extended to organizations according to which organizations are holons or org-ons. A network of production organizations thus becomes either an organization or an orgonic network; both arrangements obey the strict laws that characterize holarchies. At the global level we are witnessing the constant and accelerated economic progress of mankind. It is natural to ask what activates and governs these phenomena. The answer is that they self-generate and self-organize within reticular holarchies and orgonic networks formed by production enterprises, or productive organizations. It seems that there is a "Ghost in the Production Machine", whose invisible hand produces growing levels of productivity and quality, increases the quality and quantity of satisfied needs and aspirations, reduces the burden of work, thereby producing ever higher levels of progress in the entire Economic Kosmos.*

Keywords: Holons, Holarchies, Organizations, Organizations, Holonic Networks

Holons and Holarchies

Introduction

A SILENT CONCEPTUAL revolution has been under way for less than forty years now, beginning in 1967 with the publication of Arthur Koestler's *The Ghost in the Machine*, which formally introduced the concepts of *holon* and *holarchy*.

According to Koestler, in observing the Universe surrounding us (at the physical and biological level and in the real or formal sense) we must take into account the *whole/part* relationship between observed "entities". In other words, we must not only consider atoms, molecules, cells, individuals, systems, words or concepts as autonomous and independent units but must always be aware that each of these units is at the same time a *whole* – composed of smaller parts – and *part* of a larger *whole*.

In fact, they are *holons*.

By systematically applying the *whole/part* conceptual relationship, or the equivalent one of *container/content*, the Universe appears to us as a hierarchy of *holons*: that is, as a *holarchy* where, at each hierarchical level, the holons undergo the effects of the structural or operational variations of the subordinate

holons and in turn produce variations in the behaviour of the super ordinate ones.

This short theoretical essay, after discussing the original meaning, will examine in what sense the *holonic view* can be extended to organizations in order to interpret these as holonic organizations. An organization can in turn become a *holon*, or *orgon*, and form organizations of *orgons*, that is organizations.

The Holon According to Koestler

there is no single notion of *holon*.

From the *holistic* view "Reality" is observed as a nested *structure* in which each *element* "exists", or takes on significance, only in a context of relations both with those elements it is composed of and with the structure it belongs to.

Holon – which derives from the combination of the Greek "*holos*", which means *all*, and the suffix "*-on*", which indicates the neutral form and means particle or part (as in *proton*, *neutron* and *electron*) – is the term coined by Arthur Koestler¹ to represent the *basic element* of every holistic view.

Koestler viewed the *holon* as a *whole* that is *part* of a vaster whole, which at the same time *contains*

¹ A complete biography of the author can be found at: <http://www.kirjasto.sci.fi/koestler.htm>.



elements, or subparts, that compose it and provide it with its structural and functional meaning.

It is an *autonomous* entity (whole) capable of *self-determination* (self-assertive tendency), *independent* (self-reliant) and *dependent* at the same time, interactive in a *vertical* direction (*integrative tendency*) and characterized by a behavioural *canon* which represents not only constraints imposed on its actions, but also embodies maxims of conduct, moral imperatives and systems of value.

A holon is a Janus-faced entity “*which displays both the independent properties of wholes and the dependent properties of parts.*” (Koestler, 1972: 111-112): if it observes its own interior it considers itself a *whole* formed by (containing) subordinate *parts*; if it observes its *exterior*, it considers itself a *part* or *element* of (contained in) a vaster *whole* (Barlow, 1991). If, however, in observing itself it sees itself as a *self-reliant* and *unique* individual that must survive (each holon must preserve and assert its autonomy).

Nevertheless, observed Koestler, “superior” and “inferior”, “wholes” and “parts” do not exist in an absolute sense, but are defined by observational rules and strategies regarding those relations, which are called observational *canons*. “*The concept of holon is intended to reconcile the atomistic and holistic approaches.*” (Koestler, 1967, Appendix I.1).

Wilber's Classification “By Nature”

Ken Wilber (1995)² tried to generalize the idea of a holon by pointing out its *relative* and *conceptual* nature (Kofmann, 2000) and stressing not so much the logical nature of *containing/contained* but above all the concept of *entity/part/whole*, which is characterized by interiority and by the consciousness of an inner and an outer world³, which belongs to a vaster entity based on a typically, though not exclusively, hierarchical arrangement. (Battista, 1985).

According to Wilber the holon must have four basic characteristics:

- *Self-preservation* (agency) in order to maintain its own structure “as such” (pattern) independently of the material it is made up of;
- *Self-adaptation* (communion), to adapt and link up with other super ordinate holons in order to react mechanically, biologically or intentionally to their stimuli;
- *Self-transcendence*: the holon has its own characteristics and qualities, which are new and emerging; the universe is not only dynamic but also

“creative”, since it makes new properties emerge for subsequent inclusion in super ordinate holons and creates new classes of holons;

- *Self-dissolution*: the holons break up along the same vertical lines they followed when they formed.

Wilber has also proposed a classification of holons by *nature* in a coherent summary (Kofman, 2000), specifying four types of holons that are divided into (a) *sentient* and (b) *non-sentient*:

- *Sentient holons*:
 - *individual holons*, or proper holons: are entities that have agency and localized interiority or consciousness, in addition to unified exteriority. If the interiority was not localized or the exteriority not unified we would be talking about collective or macro, as opposed to individual or micro holons;
 - *social holons*: are groups of individual holons that have a patterned mode of interaction but do not have either localized interiority or consciousness or unified exteriors; the individual holons do not *constitute* the social holons – they do not represent its components – but take shape as individual members based on a relation of *belonging* but not *constituentency*;
- *non-sentient holons*, or pseudo-holons:
 - *artifacts*: are entities with no interior dimension which have been (instinctively or purposefully) produced by holons (machines and instruments created and used by sentient holons, including all types of language);
 - *heaps*: are entities without any imprinted organizing pattern.
- If, on the one hand, this classification has the merit of clarifying that we can conceive of different types of holons, it also is open to a number of criticisms on account of the logical difficulties in identifying a clear separation between the four classes (Jantsch, 1980; Edwards, 2003; Smith, 2004).

Holarchies

According to Koestler, due to their Janus-faced nature, holons must necessarily be connected to other holons in a typical vertical arrangement, with a progressive accumulation, thereby forming a hier-

² A complete biography can be found in Wilber's personal web page at: <http://wilber.shambhala.com/index.cfm/>. “It is not by accident, I believe, that the two founders of holon theory [Koestler e Wilber] have both come from outside of academia. One from the world of journalism and real politic [Koestler] and the other [Wilber] from the world of contemporary spirituality and the human potential movement.”: Edwards (2003).

³ “Conscious means “having an awareness of one's inner and outer worlds; mentally perceptive, awake, mindful.””: Wilber (2004a).

archical order known as a *holarchy*⁴, which can be represented as a tree structure (“*Hierarchies can be regarded as 'vertically' arranging structures whose branches interlock with those of other hierarchies at a multiplicity of levels and form 'horizontal' networks*”: Koestler, 1967: 345). Each holon is a *head* holon for the subtended part of the branch and as a *member* holon for the upper part.

Formally, holarchies begin with the *base* holons – the *primal holons* – and end with the *final*, or *top*, *holon*. These are linked to the environment and are, by definition, open.

Because of the typical *whole/part* relation, direct horizontal relations are not contemplated in Koestler’s model (Mesarovic et al., 1970; Pichler, 2000)).

One further point: holarchies are not holons but arrangements of holons that represent conceptual entities whose function is to bring out the essentiality of the vertical interactions among holons.

In the context of the *holonic* view of “reality” we can identify three fundamental types of holarchies, which depend on an equal number of interpretations of the holon:

- *structural holarchies*: here the holons are viewed as similar modules arranged according to their qualitative and structural features and to their genus and species connections (Baldwin & Clark, 2000) (Fig. 1);
- *self-organizing cognitive holarchies*: these are composed of holons considered as autonomous cognitive entities: that is, sentient, individual and social holons, vertically arranged to form increasingly larger entities (Smith, 2000);
- *operational holarchies*: these derive from the arrangement of holons – sentient or artificial – considered as processors, or processes, which are interconnected in ever larger operational structures by means of their inputs and outputs (Mesarovic et al., 1970).

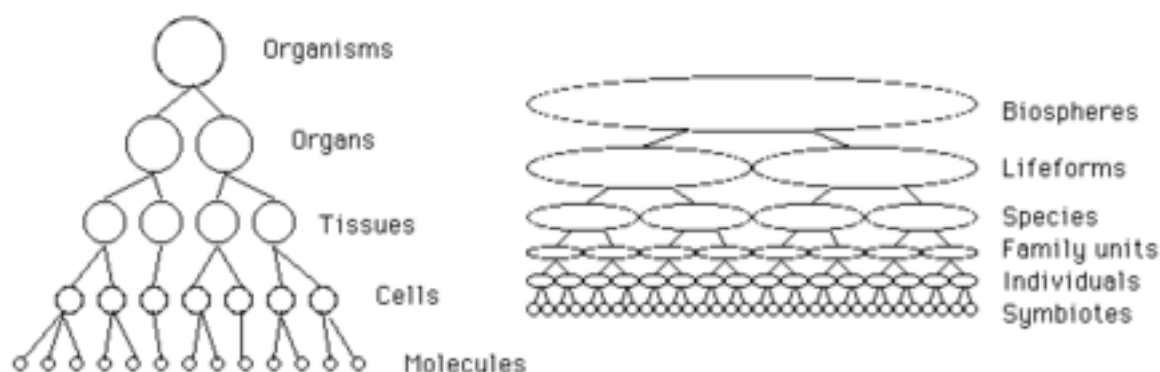


Fig. 1: Examples of Holarchies, Source: Funch, 1995.

Koestler’s SOHO, Wilber’s Kosmos and Shimizu’s Cognitive Computer

The *Selforganizing Open Hierarchical Order* (SOHO) is the concept by which Koestler (who introduced the simplified term: *Open Hierarchical Systems*) indicates a holarchy viewed as a vertical system of ever larger cognitive units possessing consciousness, in which a holon from a given level, with its own cognitive processes, includes and coordinates those from a lower level and sends the information necessary to shape the super ordinate

holon⁵, thereby producing an evolutionary dynamic process.

In this sense, for Koestler the holarchy has order and its own dynamic process (“[The holarchy] is open-ended in the downward, as it is in the upward direction”) and is able to self-organize its changes, producing cognitive performances that become more relevant the more they are produced by higher-level holons (Koestler, 1967, Appendix I.1, n. 1.3).

In his “metaphysical” view of evolution toward the consciousness that characterizes man and his social groupings, Wilber conceives of the Kosmos as a general *cognitive holarchy* (Ashok, 1999).

⁴ The terms artifactarchy and heaparchy have been coined from artifacts and heaps, respectively.

⁵ Koestler stresses not only the cognitive aspect of holons but also the possibility of their reproduction, here referring specifically to sentient holons.

Wilber adopts a method he defines as *integral* (or AQAL, All Quadrants All Levels)⁶ and observes holons (understood as units of consciousness) according to *four dimensions*: interior/exterior and individu-

al/collective, presenting a model (Fig. 2) many aspects of which have been criticized (Smith, 2001, 2002, 2004).

	INTERIOR	EXTERIOR
INDIVIDUAL	I Prehension Subjective Identity Agentic memory	III Autopoiesis Individual morphic resonance and formative causation Genetic inheritance
COLLECTIVE	II Habitus Cultural Memory Mutual prehensions Intersubjective background	IV Systems memory Ecosystem autopoiesis Chaotic and strange attractors Social autopoiesis Collective formative causation

Fig. 2: Outline of Wilber's Four Observational Levels (The Numbers are Ours)., Source: Wilber, 2004b.

Quadrant I indicates the holons with an *individual dimension* and an *interior perspective*, each of which represents a transcendent unification (*prehensive unification*) of all the holons that have preceded them, thereby forming the individual memories ("This is karma, yes?").

Quadrant II presents the holons with a *collective dimension*, but still from an *interior perspective*; here there is an inter subjective consciousness that defines a cultural environment (*cultural background*) and gives rise to cultural memories and social histories

that represent stable models of reproductive and social behaviour.

Quadrants III and IV analyze the *individual* and *collective aspects* of the holons but from an exterior vision that marks the exterior observation of each holon, in the third person and no longer the first.

Thus the Kosmos tends towards improvement, since the individual holons interact and evolve, in part through *creative changes* with the awareness that the improvement of the *int e gral and essential health* is a positive factor.

⁶ "The *four quadrants* are four of the basic ways that we can look at any event: from the inside or from the outside, and in singular and plural forms. This gives us the inside and the outside of the individual and the collective. These four perspectives are not merely arbitrary conventions. Rather, they are dimensions that are so fundamental that *they have become embedded in language* as pronouns during the natural course of evolution. These embedded perspectives show up as first, second, and third person pronouns. Thus, the inside of the individual shows up as "I"; the inside of the collective as "you/we"; the outside of the individual as "it/him/her"; and the outside of the collective as "its/them." In short: I, we, it, and its." Wilber (2004b).

Wilber spells out *Twenty Tenets* of evolution⁷ which are parallel and in part complement the rules for the functioning of the holarchies presented by Koestler in his Appendix (Leonard, 2000; Smith, 2000).

The two basic postulates are indicated in *Tenet 3* and the correlated *Tenet 4*, which state that in nature the holons appear spontaneously and are holarchic in form, in a chain of whole/part or containing/contained relations. The holons emerge not so much in the form of increasingly larger structures but as compositions of structures that have new and emerging properties⁸.

Tenets 5 and *6* are equally important. They postulate that each holon includes all the holons from the lower levels (parts of parts of parts, etc.), but at the same time transcend them, though deriving from them. The holarchically-ordered Kosmos has an evident, inevitable, and useful asymmetry. At each level of the holarchy the holons contain those from the previous level, but *not vice-versa*.

The field of possibility of a holon of a given level depends on that of the sub-holons, though not entirely: new possibilities emerge as a result of the creative tendency of the Kosmos.

Reciprocally a holon contains the subordinate holons in its own structure, and in order to survive it must preserve and regenerate these; their destruction would in fact imply that also of the level (*n*) holon – as claimed in *Tenet 9* – making it more likely that the holons from levels below (*n*) will be maintained and strengthened.

Because of the interrelation between *micro* and *macro*, between containing and contained, between whole and parts (*Tenet 11*), and because of the natur-

al co-evolution of the holarchies – in the sense that the improvement of any class of holons affects all the super ordinate as well as all the subordinate holons – the Kosmos itself reveals an evolutionary dynamic process with directionality (*Tenets 12.a* to *12.e*), since holons tend to increase in complexity, differentiation and integration, organization and structuration, as well as relative autonomy and finalization.

The structure and dynamics of the Kosmos, as a holarchy of individual and social (cognitive) holons then takes shape.

Shimizu (1987) introduced the idea of bioholonics as a discipline that studies the holonic applications in biology and theorizes about the construction of an *autonomic cognitive computer*, conceived of as a holarchy of holonic modules that process information in parallel.

The *cognitive computer* produces an organized summary (synthesis), increasingly more thorough, of a mass of elementary information from the base holons (*microscopic level*) that is synthesized by the higher-level holons until the *bottom holon* is not able to produce a *semantic* formula to give meaning to the final synthesis (Shimizu, 1987: 211).

The stable holarchy of processors, understood as a *correlator* among signals from different levels, is an artifact in Wilber's sense if its construction, from the highest to the lowest levels, is subsequent to the semantic analysis of the *bottom holon*; it is a true holon if the processors of the higher levels are *spontaneously* created by the same lower level modules, as seems to have occurred in the gradual evolution of inanimate nature toward an intelligent

⁷ The Twenty Tenets are classified as follows (we must take account also of the subnumeration):

"1. Reality is not composed of things or processes, but of holons, which are wholes that are simultaneously parts.

2. Holons display four fundamental capacities:

- a. self-preservation (agency)
- b. self-adaptation (communion)
- c. self-transcendence
- d. self-dissolution

3. Holons emerge.

4. Holons emerge holarchically.

5. Each holon transcends and includes its predecessors.

6. The lower sets the possibilities of the higher; the higher sets the probabilities of the lower.

7. The number of levels which a hierarchy comprises determines whether it is 'shallow' or 'deep;' and the number of holons on any given level we shall call its 'span.'

8. Each successive level of evolution produces greater depth and less span.

9. Destroy any type of holon, and you will destroy all of the holons above it and none of the holons below it.

10. Holarchies co-evolve. The micro is always within the macro (all agency is agency in communion).

11. The micro is in relational exchange with macro at all levels of its depth.

12. Evolution has directionality:

- a. increasing complexity
- b. increasing differentiation/integration
- c. increasing organization/structuration
- d. increasing relative autonomy
- e. increasing telos."

⁸ "Reality, in the modern conception, appears as a tremendous hierarchical order of organized entities, leading, in a superposition of many levels, from physical and chemical to biological and sociological systems. Such hierarchical structure and combination into systems of ever higher order, is characteristic of reality as a whole and is of fundamental importance especially in biology, psychology and sociology." Bertalanffy (1977: 74.)

form, or in the gradual hierarchical development of political structures.

Holonic Bionic and Fractal Manufacturing Systems

The Holonic Manufacturing Systems (HMS) are operational modular reticular holarchies (Schilling, 2000) that are typically found in the manufacturing or transport industries (Kawamura, 1997; Jacak, 1999). In this case the holons are machines that form increasingly larger structures (parts of successive structures) that carry out elementary processes that are often arranged in modules of identical machines.

Holons at a given level carry out processes that derive from those produced by holons arranged before or below, and the holons are necessary for the processes of those positioned after or above.

To study the HMS a Consortium has been created (<http://hms.ifw.uni-hannover.de>) that has defined the technical, informational and operational specifications necessary for a network of machines to be considered an HMS.

A set of blocks that process in parallel materials or produce similar services form a module; several modules can comprise a super ordinate holon that, in turn, can be included in other blocks at a higher level.

The Holonic Manufacturing System is the “holarchy that integrates the entire range of manufacturing activities from order booking through design, production, and marketing to realize the agile manufacturing enterprise”.

A *Bionic Manufacturing System* (Okino, 1989; Tharumarajah et al., 1996) is a special holonic network of production units similar to an HMS but conceived of as an interaction of elementary operator holons that are absorbed into autonomous cells that, in turn, are grouped into *modules*, similar to organs, and are arranged in various hierarchical levels that form a holarchy that is similar to a biological organism. By means of the increasingly complex operations occurring at the various holarchic levels, the final holon is able to carry out some high-level operations, functions or process as specified in a *model* “reproducing” the final result (the finished product represents the model “of itself”).

A different type of holonic structure are the Fractal Manufacturing Systems (Savage, 1996; Warnecke, 1993), which are complex holarchies, typically bottom-up, formed by autonomous modules whose operational logic is repeated at various vertical levels, as a fractal, reproducing at each level the characteristics of the entire structure.

The holonic nature of these structures is not so much the processors (usually men or men-machine production units that self-coordinate) as the subdivi-

sion of responsibilities in terms of the objectives they must pursue.

Organizations and Organizations

Not only Holarchies. Organizations as Social Systems

Even if the notion of *holarchy* permits us to interpret in a particular way the hierarchical interconnections of the *containing-contained* type among autonomous elements, “Reality” can also be observed from a different perspective, that of the *organization*.

By organization I mean a *social system* that forms when a group of individuals (the personnel structure) accept, based on their *own motivations*, to be bound by stable, horizontal and vertical structural relations (the organizational relations), thus becoming *organs*, or components of organs – specialized according to *functioning*, *function*, *functionality* and spatial-temporal *placement* – of a larger structure, in order to achieve a *common goal* that can not be attained by the single individuals or by their subsystems.

The horizontal and vertical interaction of the element-organs produce *emerging* properties (a macro structure, a macro dynamics, a macro function, the achievement of a common (institutional) goal) that refer to the *system* and not to its constituent parts or its partial subsystems.

The Holonic View of Organizations

According to the *holonic* point of view, each member of the organization can be considered a base holon (in both Koestler’s and Wilber’s sense); it is a whole, if observed as an organ, and a part, if observed as a component of a larger organ.

Organs can therefore be conceived of as *holons* forming an *organized holarchy*, since they have the typical vertical order (*holarchy*); but they are also distinguished by the different specializations (functions) they have in the structure they compose (*organized*).

The four characteristics of organs (Fig. 3) – *functioning*, *function*, *functionality* and spatial-temporal *placement* – can be placed parallel to the *four dimensions* in Wilber’s model in Fig. 2).

The *functioning* (quadrant I) refers to the internal characteristics of the element-organ; the *function* (quadrant III) defines its characteristics and specificity as an entity that necessarily differs outwardly from the other entities.

The *functionality* (quadrant II) characterizes, from an internal point of view, the contribution of the element-organ to the constitution and functioning of the organization; finally, the *spatial-temporal placement* (quadrant IV), from an external perspective, characterizes the “topological” relations of the

element-organ in the system's space-time dimension in terms of authority, responsibility and coordination.

DIMENSIONS	INTERIOR	EXTERIOR
INDIVIDUAL	<p>I</p> <p><i>Functioning</i></p> <p>Internal structure</p> <p>Vital processes</p> <p>Cognitive activity</p> <p>Performance</p>	<p>III</p> <p><i>Function</i></p> <p>Activity</p> <p>Specificity of the functioning with respect to the other organs</p> <p>Role of the hierarchy</p>
COLLECTIVE	<p>II</p> <p><i>Functionality</i></p> <p>Contribution of utility to the functioning of the structure</p> <p>Instrumentality for the other super and subordinate organs</p> <p>Aim of the functioning</p>	<p>IV</p> <p><i>Spatial-temporal placement</i></p> <p>Vertical hierarchical relation of authority (top-down) and responsibility (bottom-up)</p> <p>Coordination along horizontal lines</p>

Fig. 3: The Four Observational Levels of the Organs. Reference: Based on Wilber's Model in Fig. 2.

According to the dimension we observe (Fig. 3), there are at least three ways to consider organs as ordered holons in *organized holarchies*.

The structural *interpretation stresses the topological dimension* (quadrant IV in Fig. 3); the organs represent *modules of coordination* and form a *structural holarchy* in which they are *holons* hierarchically ordered in terms of *authority, responsibility and delegation* (Malone & Crowston, 1994; Ferber, 1999), as is usually the case in the organization charts depicting the formal hierarchical structure of the organization.

The *cognitive interpretation* focuses on the *structural dimension* (quadrant I in Fig. 3); the organs are observed as *cognitive holons* that gather and coordinate information and make decisions (Fox, 1981); they make up a *cognitive holarchy* where each organ/holon of a given level is an autonomous information and decision-making entity, whose decisions influence those of the subordinate organ/holons, and comprise those of the higher-level organ/holons, following a *pull* or *push* approach depending on the type of organization.

According to the *operational interpretation*, the organs are observed carrying out their *function* (quadrant III of Fig. 3) and form a *directional holarchy*, usually in the form of an *output holarchy* of

the *pull*-type, where the activity of the input and intermediate organ/holons is usually led by the activity of the output organs/holons.

According to these interpretations an organization can be viewed as a macro system set up to achieve a macro objective; we can thus immediately compare it to a *Holonic Manufacturing System*, or an *Autonomic Cognitive Computer*; that is, to a holarchy with operators at different levels – each embedded in the other, to form increasingly smaller parts – each capable of pursuing a part of the macro objective⁹.

Holonic Organizations

Finally, we can consider organs in terms of their *functionality*, as *parts-holons* whose activity accounts for the *functioning* of the *entire* organization (quadrant II of Fig. 3), in order to allow the latter to reveal its own *functionality* as an *entity-whole* in the largest possible *environmental* super system so as to achieve its objectives, which are instrumental to attaining the common aim.

From this viewpoint, each *organ/holon* is not only a *linking element* between the levels of functioning, function and spatial-temporal placement of the organs but becomes a component of a holarchy (and/or a *holonic network*) of *functional holons* that make

⁹ In particular, if we consider organs as mono-personal entities, or multi-personal modules, composed of agents and their instruments, then the organization can be represented as a *Multi-Layer Agent System* in Mesarovic's (1970) sense; since the agents are grouped together as organs, it becomes an *Organisational Multi-Agent System* (OMAS) (Ferber, 1999; Hewitt, 1989; Mathews, 1996).

up the same organization and allow its functioning and existence over time (Adam et al., 2002)¹⁰.

Because the organization is composed of functional organs-holons and derives from the functional holarchy it forms, or from organs/holons directed toward objectives, we can conceive of it as a *holonic organization*.

Nevertheless there is a basic difference between the *holonic organization* and the *holarchy of organs* that comprise it, which has not been fully exposed in the literature: the *holonic organization* does not correspond to the holarchy of its own organs but represents the *final holon* of the holarchy (Fig. 4).

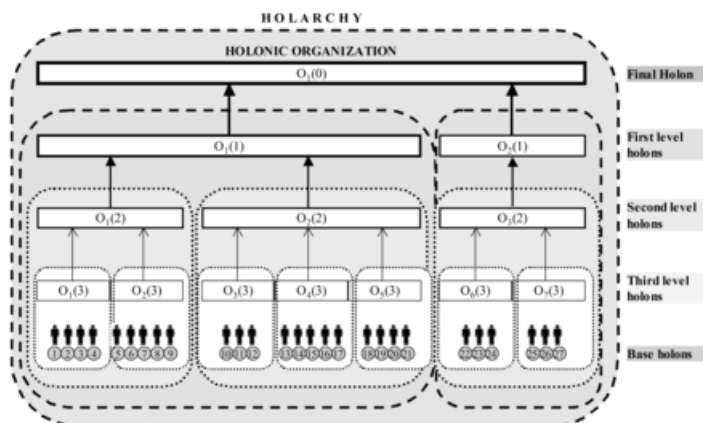


Fig.4: The Holonic Organization as a Maximum Holon in the Holarchy of Organs.

The Nature of the Holonic Organization

To clarify the *nature* of the *holonic organization* with reference to Wilber's classification of holons (section 1.3), we can identify three interpretations according to the organization's formation process.

The organization is an *artifact*, without interiority (this is Wilber's view), if it is created through a *top-down* process by a generator holon – external to the organization or to its constituent element – that, in order to achieve its aim, which is beyond its possibilities, coordinates other agents, forming with them lower-level organs that are artifacts specialized by function and always controlled by a superior holon¹¹ on which its existence depends.

The organization is a *social holon* formed by individual holons and possessing interiority (but with a vast consciousness), which is composed of the base holons through a *bottom-up* process characterized by a gradual hierarchical ordering of the lowest-level holons into organs, thereby creating higher-level organs. As a result, at any level of the holarchy the existence of the *organs* depends on that of the *subordinate organs*¹², since *the organization is the instru-*

ment through which the base holons realize their own special interests.

There is a *third important interpretation*: organizations are conceived of as *individual holons*, characterized by persistence, internal consciousness and operational autonomy.

In fact, it is by now accepted that organizations are vital economic agents (Beer, 1979, 1981) that seek to maintain their existence over a long period of time (Capra, 1982) and to preserve their identity in a lasting autopoietic process (Maturana & Varela, 1980; Uribe, 1981);

For this reason they produce, like other sentient individuals, a *cognitive* activity capable of observing the outside environment and form representations and models of this that are turned into internal plans and programs (de Geus, 1988; Mella, 2002), while displaying a learning process that does not refer to the single individuals or organs but to the entire organization (Senge, 1990).

If we accept this view, it is clear that we can consider organizations not simply as *artifacts* or *social holons* but as *individual holons* possessing *interiority* and *consciousness* that *centers* on the maximum cognitive organs, which include and transcend the

¹⁰ "The choice of words which we use suggests to the reader the organizational structure of a country, a company, or a governmental administrative division as a valid example of a SOHO-structure.": Pichler (2000).

¹¹ "A company (as a social holon) is composed of the individuals (at the appropriate level of consciousness) that belong to it plus the production, management, information and all other systems (artifacts) that support the individuals' relational exchanges.": Kofman (2000).

¹² In this sense the conception of an organization as a social holon created by the base holons has even greater significance than that which sees the organization simply as a SOHO. "In the organizational structure of a company, the people at the highest management level and the workers on the lowest level are in that sense critical holons, which realize the input/output processes on the interfaces of a SOHO-structure which is embedded in an environment consisting of the market.": Pichler (2000).

component *functional organs/holons* at the various levels of the holarchy¹³.

Holonic Principles of Organizations

We can consider the organization from the functional dimension of the *organs-holons* and can identify several principles which can be inferred from those Koestler indicates for the SOHO and Wilber mentions for the Kosmos (sec. 1.5):

1. *emergence* (or effectiveness): *organizations* emerge in that they carry out a functionality (to reach an objective, undertake a task, carry out a project) that can not be achieved through partial groupings of lower-level *organs-holons*¹⁴.
2. *adaptation* (or contingency): both the organization and its component holons must adapt to the required functionality.
3. *expansion*: organizations tend to grow, increasing both the depth of the holarchy of the organs as well as the number of base holons.
4. *inclusion*: the *organs-holons* comprise all the subordinate *organs-holons*.
5. *transcendence*: although the function, functionality and functioning of a *holon-organ* depends on those of the subordinate holons, they do not coincide with any of them but are emerging.
6. *self-preservation* (agency) (or conservation): each organ-holon survives by adapting to the higher-level and developing the vital capacities of the holons that comprise it (*"The egotism of the social feeds on the altruism of its members"*: Koestler, 1967: Def. 9.8).
7. *well-being*: each organ-holon must be aware that its well-being depends on that of a higher-level and influences that of the subordinate holons.
8. *utility*: each organ-holon must carry out *useful* behaviour for the subordinate and super ordinate holons.
9. *efficiency*: each organ-holon must improve its performance to allow the super ordinate to ensure it with better conditions for survival.
10. *asymmetry*: the higher one goes in the holarchy of the organs-holons, the greater flexibility there

is in the function and functioning; the lower down one goes the greater the inflexibility of the admissible behaviour.

From Holonic Organizations to Organizations

With reference to the *holonic organizations*, the *organs/holons* can assume two forms depending on their *vital autonomy* – that is, *their capacity to have an autonomous existence with respect to the organization*, and in particular to survive in case the latter dissolves:

1. *as member* holons with *reflex* vitality, closely structured in the *top-down* organization that justifies their existence, so that the breakup of the organization implies the cessation as well of its organs/holons (for example, the local, communal and provincial offices of an association do not survive the closing of the regional and national offices, just as the organs of a biological individual do not outlive the individual itself, if not artificially); the existence of the organs/holons depends on that of the holonic organization they belong to;
2. *as component* holons with autonomous vitality, able to survive as individual holons even if the organization they belong to ceases to exist. The existence of the bottom-up holonic organization depends on that of the organs/holons. This means that the component holons, at levels above the base holons, must in turn be holonic organizations (for example, communes, provinces and regions can survive even if the state ceases to exist, just as an army or a convent can survive if the organization they belong to ceases to exist).

We now introduce the term *org-on* (or simply *or-gon*) to denote an *organization-holon* that, in turn, represents a *constituent member of a larger holonic organization*.

We can then refer to this larger holonic organization by the term *organization*¹⁵ (Fig. 5).

¹³ In this sense Smith (2000) as well recognizes that the four classes of holons presented in Wilber's view are not enough to understand the Kosmos; nevertheless the author does not explicitly consider the holons represented by the organizations.

¹⁴ "An organization is not just a physical artifact; it is also a conceptual one (legal, financial, etc.). From this perspective it makes sense to understand a hierarchical evolution of these artifacts congruent with the hierarchical evolution of the holons that design them. Commons and Richards trace the cognitive development of the individual from the capacity to grasp entities, to the capacity to grasp systems of interrelated entities, to the capacity to grasp systems of interrelated systems (of interrelated entities), to the capacity to grasp systems of interrelated systems (of interrelated entities). Along this line, we can trace the development of organizational forms." Kofman (2000).

¹⁵ "The concept of levels of organization makes it possible to consider the embedding of one level into another. In the same way that, in biology, a cell is considered as being an organization of macromolecules and at the same time an individual being for the multicellular organism of which it forms a part, we can similarly consider that an organization is an aggregation of elements of a lower level and a component in organizations of a higher level." Ferber (1999).

- In this sense the social and economic reality does not consist only of *individual holons* and *social holons* but also of holons that are *holonic organizations*, and perhaps primarily of *organizations*,

which involves a *new type of* that entails a *functional integration* of the holonic organizations.

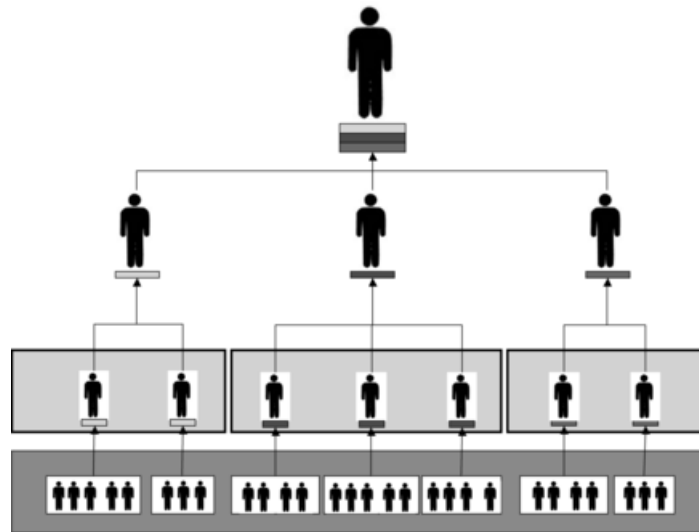


Fig. 5: Organization (the Underlined Icon Indicates an Organization; Otherwise a Base Holon)

Organizations are quite common and are formed according to various processes, among which: strong strategic alliances, corporate groups, processes of organizational segmentation and processes of privatization.

Org a ns Vs. Org o ns. Distinctive Differences

There are several important differences between organs and organs that derive from the various aspects indicated in Fig. 3); some of the main differences are:

1. From a structural point of view, organs are constituent, intrinsic elements of the organization. Instead, organs, as individual holonic organizations, are part of the organization but are autonomous with respect to it.
2. Genetically, organs are generated along with the organization and by the organization; on the other hand, since they are autonomous, organs can themselves generate the organization by annexing other organs.
3. The functioning (structure, processes, flows) of the organs is thus dependent on and directed by super ordinate organs. The functioning of the organs is self-directed and only coordinated by the organization.
4. The organs have a reflex vitality, since their existence depends on that of the organization, and vice-versa. The organs are only coordinated by the superordinated organs and have an autonomous vitality.
5. The organs are functional for the organization; the organization is functional for the organs that it coordinates. The operativeness of the organs is based on functionality; that of the organs is centered on function.
6. The spatial collocation of the organs is decided by the organization and represents one of their intrinsic dimensions. The organs autonomously decide their localization, which, moreover, does not substantially affect the functionality of the organization.
7. The extinction of the organization normally leads to that of its organs; the autonomy of the organs results in their showing vitality even after the organization ceases to exist.
8. The autopoiesis of the organs depends on the organization. The autopoiesis for the organs is a necessary condition for their participation in the organization.
9. The competences of the organs are established by the organization. Those of the organs are autonomously established and represent a condition for their participation in the organization.
10. The resources necessary for the functioning of the organs belong to the organization that “capitalizes” the organs based on their need. The capitalization of the organs is carried out as a function of the objectives and is normally autonomous and exogenous.
11. The base holons that constitute an organ also constitute the organization and are employed by request of the organ, according to its need. The base holons in the organs are employed with regard to the objectives; they comprise only the organ, not the organization.

Not only Holarchies and Organizations: Holonc Networks

According to the Janus-faced view, a holon maintains its characteristics as a conceptual entity (unity, autonomy, interiority) even if it is considered to be part of a *network of horizontal relations* – with holons of the *same level* – that can be called a Holonic Network.

In the *holonic network* the holons are not arranged in a hierarchy with others and there are no vertical links, only relations among elements at the same level. Each holon is an entity that acquires its existence and meaning at the same time from the connected elements that are observed as *antecedents* (before) and that make it up, and by the connected ele-

ments that are observed as *successive* (after) and that the holon helps to comprise.

An important point: like *holarchies*, the *holonic networks* are not holons but *conceptual entities* – horizontal or grid systems – whose nodes are holons which are interconnected according to their nature as entities whose meaning comes from their important horizontal interactions, in order to form a whole: that is, the holonic network.

The holons that comprise a holonic network do not necessarily have to be *single-level holons*; on the contrary, they can be final holons of an underlying holarchy or an underlying *organization*. In the former case the holonic networks become *reticular holarchies* (Fig. 6a); in the latter they are comprised of *organizations-holons* that can more properly be called *orgonic networks* (Fig. 6b).

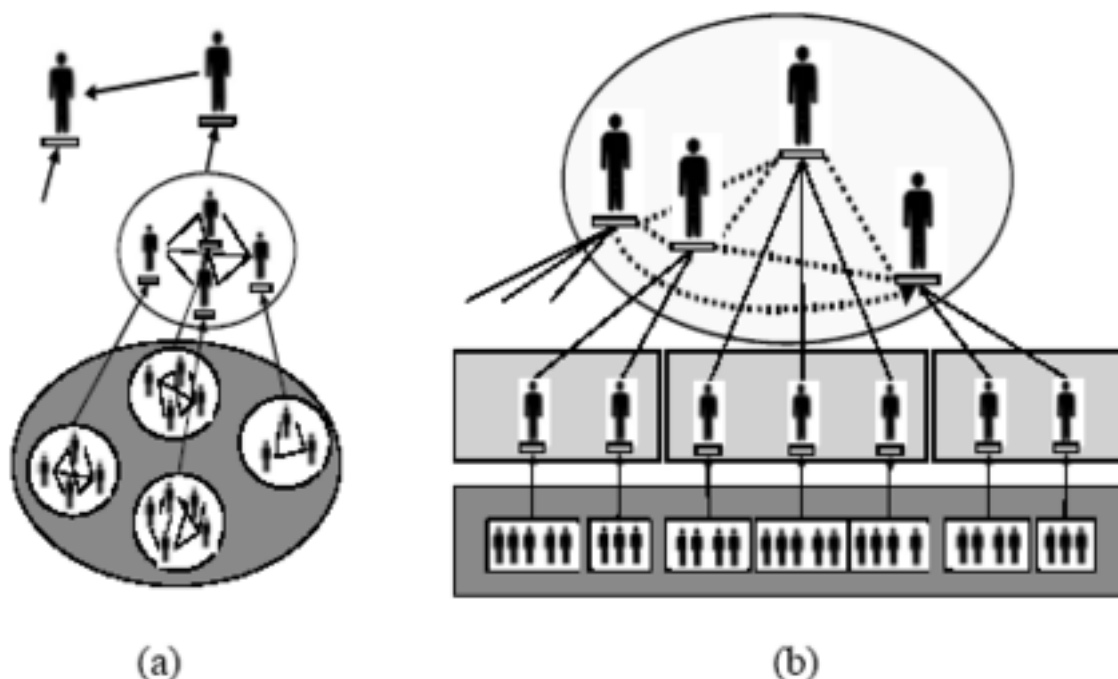


Fig.6: Models of Holarchies as a Multi-layer Agent System. (a) Reticular Holarchy (Network or Networks) - (b) Orgonic Network (Network of Orgons)

Conclusions

The entire *machine* of life, in the whole universe, evolves toward increasingly more complex states, as if a *ghost were operating the machine*.

At the global level we are witnessing the constant and accelerated economic progress of mankind.

Organizations, organizations, holonic networks and orgonic networks are the main engines of this change.

It is natural to ask what activates and governs these phenomena. The answer is that they self-generate

and self-organize within *reticular holarchies* and *orgonic networks* formed by production enterprises – or productive organizations – that constitute the integrated process of global production in which the large orgonic networks produce within themselves self-organization and self-development.

It seems that there is a *ghost in the Production Machine*, whose *invisible hand* produces growing levels of productivity and quality, increases the quality and quantity of satisfied needs and aspirations, reduces the burden of work, thereby producing ever higher levels of progress in the entire Kosmos.

References

- Adam, E., Mandiau, R., and Kolski, C. (2002). *Une Methode de modelisation et de conception d'organisations Multi-Agents holoniques*. Hermes, Paris.
- Ashok, A. V. (1999). KEN WILBER, Messenger of the Kosmos, at: http://www.integralworld.net/rev/rev_ashok2.html.
- Baldwin, C. Y. and Clark K. B. (2000). *Design Rules, Volume 1: The Power of Modularity*. The MIT Press Cambridge
- Barlow, C. (1991). *From Gaia to Selfish Genes*. The MIT Press Cambridge MA: 87-100.
- Battista, J. R. (1985). The holographic model, holistic paradigm, information theory and consciousness. In K. Wilber (Ed.), *The holographic paradigm and other paradoxes*. Boston: New Science: pp. 143-150.
- Beer S. (1979). *The Heart of Enterprise*, Wiley. London and New York.
- (1981). *Brain of the Firm* (2nd edition). Wiley. London and New York.
- Capra, F. (1982). *The turning point: Science, society, and the rising culture*. New York: Bantam Books.
- de Geus, A. (1988). Planning as learning. *Harvard Business Review*, 66(2): pp. 70-74.
- Dyer, J. H. (1997). Effective Interfirm Collaboration: how firms minimize transaction costs and maximise transaction value. in *Strategic Management Journal*, Vol 18: p. 7, John Wiley & Sons.
- Edwards, M. (2003). Through AQAL Eyes, Where Ken goes wrong on applying his understanding of holon theory, at: <http://www.worldofkenwilber.com/edwards9.html>.
- Ferber, J. (1999). *Multi-Agent Systems: An Introduction to Distributed Artificial Intelligence*. Addison Wesley Longman.
- Fox, M. S. (1981). An Organizational View of Distributed Systems. *IEEE Transactions on Systems, Man and Cybernetics*, SMC-11: pp. 70-80.
- Funch, F. (1995). Holarchies, at: <http://www.worldtrans.org/essay/holarchies.html>.
- Hewitt, C. (1989). Toward an Open Systems Architecture. In G. X. Ritter, editor, *Information Processing 89, Proceedings of the IFIP 11th World Computer Congress*: pp. 389-392.
- Jacak, W. (1999). *Intelligent Robotic System: Control, Planning and Design*. Kluwer Verlag Plenum, New York.
- Jantsch, E. (1980). *The Self-Organizing Universe*. New York, Pergamon.
- Kawamura, K. (1997). *Holonic Manufacturing Systems: An Overview and Key Technical Issues*. 4th IFAC Workshop on Intelligent Manufacturing Systems: IMS'97, Seoul, Korea, pp. 33-36.
- Kofman, F. (2000). Holons, Heaps and Artifacts, at: <http://www.worldofkenwilber.com/kofman.html>.
- Koestler, A. (1967). *The Ghost in the Machine*. Arkana, London.
- (1972). *The Roots of Coincidence*. Hutchinson (2nd ed. Paperback, 1973).
- Leonard, G. (2000). Ken Wilber's Twenty Tenets, at: <http://www.esalenctr.org/display/confpage.cfm?confid=10&pageid=113&pgtype=1>.
- Malone, T. W. and Crowston, K. (1994). The Interdisciplinary Study of Coordination. *ACM Computing Surveys*, 26: pp. 87-119.
- Mathews, J. A. (1996). Holonic Organisational Architectures. *Human Systems Management*, 15/1: pp. 27-54.
- Maturana H. and Varela F. (1980). *Autopoiesis and Cognition: The Realization of the Living*. Dordrecht, Holland; Boston. D. Reidel Pub. Co.
- Mella, P. (2002). The operative logic of the firm. *Proceedings of the 2002 International Conference in Management Sciences*. Taipei (Taiwan).
- Mesarovic, M., Macko, D., Takahara Y. (1970). *Theory of Hierarchical, Multi-Level Systems*. Academic Press, New York.
- Okino, N. (1989). Bionical manufacturing systems, Sata T. (ed.). *Organization of Engineering Knowledge for Product Modelling in Computer Integrated Manufacture*, Elsevier, Netherlands
- Pichler, F., (2000). On the Construction of A. Koestler's Holarchical networks, at: <http://www.cast.uni-linz.ac.at/Department/Publications/Pubs1998/holons.doc>.
- Savage, C. M. (1996). *5th Generation Management: Co-creating through Virtual Enterprising, Dynamic Teaming, and Knowledge Networking*. Butterworth Heinemann.
- Senge, P. M. (1990). *The Fifth Discipline - The Art & Practice of The Learning Organization*. Currency, Doubleday.
- Schilling, M. A. (2000). Toward a general modular systems theory and its application to interfirm product modularity. *Academy of Management Review*, 25: pp. 312-334.
- Shimizu, H. (1987). A General Approach to Complex Systems in Bioholronics. In R. Graham & A. Wunderlin (eds.). *Lasers and Synergetics*. Berlin: Springer-Verlag.
- Smith, A. P. (2000). Worlds Within Worlds. The Hierarchy of Life. at: <http://www.geocities.com/andybalik/chapter1.html>.
- (2001). All Four One and One For All. at www.geocities.com/andybalik/allfour.html.
- (2002). Wilber's Eight-Fold Way How Many Sides Does a Holon Have? at: <http://www.integralworld.net/smith18x.html>
- (2004). The Spectrum of Holons - A Response to Fred Kofman, at: <http://www.integralworld.net/smith2.html>.
- Tharumarajah, A., Wells, A. J. & Nemes, L. (1996). Comparison of the bionic, fractal and holonic manufacturing system concept. *International Journal of Computer Integrated Manufacturing*, vol. 9, n 3: pp. 217-226
- Uribe R. B. (1981). Modeling autopoiesis. In Zeleny, M., *Autopoiesis, a theory of living organization*. Elsevier, North Holland.
- Warnecke, H. J. (1993). *The Fractal Company*. Springer-Verlag.
- Wilber, K. (1995). *Sex, Ecology, Spirituality: The Spirit of Evolution*. Shambhala Publications (2nd edition, 2000).
- (1996). *A Brief History of Everything*. Shambhala, Boston & London (2nd ed. 2001).
- (2004a). Foreword to *The Spirit of Conscious Business*. Fred Kofman at: <http://wilber.shambhala.com/html/misc/foreword-spirit.cfm>.
- (2004b). An Integral Age at the Leading Edge, at: <http://wilber.shambhala.com/html/books/kosmos/excerptA/part1.cfm>.

von Bertalanffy, L. (1976). General System Theory: Foundations, Development, Applications. Publisher: George Braziller.

About the Author

Prof. Piero Mella

Born in Pavia in 1946, graduated in March 1969 with a first class degree in Industrial Control at the Faculty of Economics at the University of Pavia Head of the Department of Business Research at the University of Pavia Dean of the Economics faculty at the University of Pavia Dean of the II Faculty of Economics based in Varese Director of the Masters in ACCOUNTING, BUDGET AND FINANCIAL CONTROL set up by the University of Pavia Co-ordinator of the Doctorate in Economics Business Research at the University of Pavia; author of over 200 texts which include books, articles, software, Creator of the scientific web site www.ea2000.it

THE INTERNATIONAL JOURNAL OF KNOWLEDGE, CULTURE AND
CHANGE MANAGEMENT

EDITORS

Mary Kalantzis, RMIT University, Australia.

Bill Cope, Common Ground, Australia.

EDITORIAL ADVISORY BOARD

Chryssi Vitsilakis-Soroniatis, University of the Aegean, Rhodes, Greece.

Eleni Karantzola, University of the Aegean, Rhodes, Greece.

Gerasimos Kouzelis, University of Athens, Greece.

Leslie Johnson, University of Greenwich, UK.

Bruce Cronin, University of Greenwich, UK.

Martyn Laycock, University of Greenwich and managingtransitions.net, UK.

Dave Snowden, Cynefin Centre for Organisational Complexity, UK.

Stavros Ioannides, Pantion University, Athens, Greece.

David Lyon, Queens University, Ontario, Canada.

Krishan Kumar, University of Virginia, USA.

Claudia Schmitz, Cenandu Learning Agency, Germany.

Bill Martin, RMIT University, Melbourne, Australia.

Paul James, RMIT University, Melbourne, Australia.

Robert Brooks, Monash University, Melbourne, Australia.

Margaret Jackson, RMIT University, Melbourne, Australia.

David Hakken, University of Indiana, Bloomington, Indiana, USA.

Zainal Ariffin, Universiti Sains Malaysia, Penang, Malaysia.

David Gurteen, Gurteen Knowledge, UK.

Verna Allee, Verna Allee Associates, California, USA.

Rod Dinnitt, William Bethway and Associates, Melbourne, Australia.

Judith Ellis, Enterprise Knowledge, Melbourne, Australia.

Kirpal Singh, Singapore Management University, Singapore.

ASSOCIATE EDITORS, 2005

Visit: <http://www.Management-Journal.com>

SCOPE AND CONCERNS

Visit: <http://www.Management-Journal.com>

SUBMISSION GUIDELINES

Visit: <http://www.Management-Journal.com>

INQUIRIES

Email: cg-support@commongroundpublishing.com