

ISO 31/ISO 1000 BioScalar Portal

A Search Engine Based on Multi-Related Hierarchies

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Abstract

Scalar Hierarchy, both of observer and observed, Specification Hierarchy, from vagueness to crispness and Systems of Interpretance Hierarchy, from machine language to cultural standards, when inter-related, enable Meaningful Knowledge Item searches to be carried out by each and every citizen of the world, thus opening up a new bridge, based on Semio-Anthropology, over both the current abyss of the “digital divide” and between the citadels of compartmentalised knowledge. Economic Anthropology, liberally defined, aims to use new modalities in the Computer-Human Interface to retrieve, record, present and store Global Knowledge for the benefit of all.

1. Introduction

My original education was in Economic Anthropology. That is to say I know that, ideally, the design for a search engine should take full account of cultural diversity, while aiming to benefit whichever citizen of the world may use it. The United Nations Organisation (UNO) is only too familiar with the astronomical cost of teaching English to all the planet's non-English speakers. I consider each Internet-user interface which uses English or any other culturally-dominant language to be unfinished on the part of the IT engineers who design it.

Sharing Global Knowledgeⁱ, whether or not it is composed of many local knowledges, means refining human interactive interfaces semiotically. Five or more sensory modalitiesⁱⁱ are available in the accessibility domain and the bio-organism's motor capabilities permit inputs via microprocessor to be received by computer from dynamic peripherals.

Semioticsⁱⁱⁱ is a way of reading information and acquiring meaning which can be learned and brought into use in the daily life of every citizen of the world^{iv}. System science is very helpful when it comes to issues of coherence and pluralism.^v

In the Milan Declaration^{vi} we read :

« 1) The Right to Communicate is a universal human right which serves and underpins all other human rights and which must be preserved and extended in the context of rapidly changing information and communication technologies,

2) All members of civil society should have just and equitable access to all communication media,... »

Multimediality must be linked to multimodality, thus involving the whole bio-organism of each and every citizen of the world, without discrimination or segregation, so numerous input peripherals and displays have to be made available to cancel the current bias towards English-language preference.

I make the assumption that Dermoscience could be the key to multi-cultural and multi-dialectal open interfaces, since each of our cerebral-senses are no more than specialisations of small portions of the two square meters of multi-layered receptors on the human skin. According to embryology, the stem cells of the ectoderm develop skin and its captors –tactors – over time, as well as the other facial senses, the brain and the nervous system. Skin mechanoreceptor transmission deserves special attention.^{vii}

Multimodality theory is developing at a fast rate today and a wide range of new interfaces have been invented recently. A complete theory may even emerge before this year 2001 is out.^{viii}

The human bio-organism's receptors and effectors need to be linked smoothly to IT smart interfaces if the « digital divide » is to be bridged. My preferred modes of interacting with knowledge databases^{ix} are: intuitively selectable diagrams and icons, stretchable computer graphics, eligible dialects, dermoscience-based two-way haptic interfaces. Smellophones are coming onto the marketplace. So too are auditory displays.^x

In OECD 2000 handbook « Education at a glance », I read : « The 1990s have witnessed growing demand for learning throughout OECD countries. Compelling incentives for individuals, economies and societies to raise the level of education have driven increased

participation in a widening range of learning activities by people of all ages, from earliest childhood to advanced adulthood. The challenge, in this area of expanding, deepening and diversifying demand for learning over a lifetime, is how best to meet the volume of demand while ensuring that the nature and types of learning respond effectively to needs. »

ISO 31 and ISO 1000 happen to be a very convenient framework to store and retrieve knowledge.^{xi} System scientists and semioticians now invite you to the presentation of a search engine - and a portal, as well - to knowledge providers such as the Union of International Organisations.^{xii}

This is the first public presentation of the outline specification for the search engine under assembly and design by the European Forum of Semioticians, in collaboration with eminent members of the Semiotic Society of America and under the overall umbrella of the International Association of Semiotic Studies. A debt of thanks is due to Pr. Okyay Kaynak, Unesco Chair of Mechatronics for his profound inspiration.^{xiii}

The Natural Systems scientist and developmental biologist Stanley N. Salthe has, with the concept of hierarchies,^{xiv} guided the project from its earliest beginnings. World Bank anthropologist and agronomist Reinhard Woytek lit the first flame.

2. Formatting our multi-layered or hierarchical sign system

When a citizen of the world, whoever He/She may be, from whichever culture, speaking and/or understanding whichever language or dialect, interacts with the new search engine, the complete range of digital material gathered for education purposes, including text, voice, sound, music, illustrations, diagrams and charts, photographs, pictures or video - in short « multimedia » - must be offered upfront as a selection of interactive options.

In semiotic jargon, the user is the interpreter and the decoding of the displays is done through « a system of Interpretance^{xv}. »

The facility to request that material has to be presented in such a way as to be interpreted within a common code system, well synchronised for any change in attention speed,^{xvi} represent a minimal communication right we all use in first encounters, so as to enable code-sharing experience as a base-line to exchange.

Now I have spelled out the master word in economic anthropology : people exchange through dermoreceptors, some being teleceptors others of the tactor-type being more mechanical or vibratory. But the sensory motor channels cannot be overlooked, as they carry the wave-packets of what is hopefully meaningful information within nanotubules running everywhere in the human

nanoanatomy and nanophysiology, eventually delivering their message to the mind's eye if formatted to do so.

Layers of transduction processes lead to layers of decoding processes and interpretation might occur in the end, with a « final interpretant » if one is available within the biosystem of the learner code storehouse. This interpretant may not be adequate according to a teacher's standards, meanwhile the meaningful effect might have been produced elsewhere in the attention sequences of the autobiographical memory. Stripping the message of any ambiguity might be a more powerful process if continuously monitored by the search engine user, using interactive options.

Factor	Prefixe	
	Name	Symbol
10^{24}	yotta	Y
10^{21}	zetta	Z
10^{18}	exa	E
10^{15}	peta	P
10^{12}	téra	T
10^9	giga	G
10^6	méga	M
10^3	kilo	k
10^2	hecto	h
10	déca	da
10^{-1}	déci	d
10^{-2}	centi	c
10^{-3}	mili	m
10^{-6}	micro	μ
10^{-9}	nano	n
10^{-12}	pico	p
10^{-15}	femto	f
10^{-18}	atto	a
10^{-21}	zepto	z
10^{-24}	yocto	y

The Internalist^{xvii} perspective is tested in developing areas of the world and with children learning how to learn. The key element chosen here is based on ISO 31 and ISO 1000, international standards with normative value, very coherent indeed : the hierarchical^{xviii} theory-based « prefixes »..

These prefixes are framed in the International Standard and function very « realistically » as a model for

representing the dimensions which we all share. As the human skin (the “derm”) is the natural limit between observer and observed, let’s take the derm as the frontier between the endo-world or « Innenwelt » and the ecto-world or « Umwelt »^{xix}

Intuitively, each and every citizen of the world discriminates easily between inside and outside of his/her skin when relevant Knowledge Items are looked for.

Thus a biological domain has been introduced, containing the observer most of the time, as distinct from an immediate environment and the content of the cavities of the human body – gases, liquids and solids. Scalar levels, layers of membranes and strata of surrounding atmospheres may be defined and observed methodically, finding locations of each and every Knowledge Item provided by all the different past, present and future cultures the planet nurtures.

Every citizen of the world may define the datasuit He/She is embedded or “embodied” in thus: a semi-solid chemical entity composed, on a molecular count, of 99% of H₂O. Using scalar hierarchy (Hsc), the human bio-organism may equally well be described as a large number of electrons orbiting around a smaller number of nuclei. And so forth, up and down the scalar ladder. The surrounding and interpenetrating materials may be arranged in layers, according to the distance, both internally and externally, of each element in focus from the derm. This operation may be named toposcopic and the tool - a “toposcope”.

Toposcopy is a spatial domain locator with the highest possible definition, and fuzzy logic may be used to refine the modeling of sub-domains. Observer scan, scout and evaluate through Hsi – a hierarchy of systems of interpretance – as well as projecting models – gestalten – in the perception inputs.

Hsc and Hsi are functionally related for a given user. Hsc functions as a model to organise sensory data and Hsi as a model to relate models of Hsc, enabling the user and empowering the learner and seeker. Hsp - a specification hierarchy, going from general to crisp - is the way of organising Knowledge Fields to arrange and retrieve Knowledge Items through proper enforcement of Hsi – under the ISO 31 & ISO 1000 common code of sign-representation .

3. Search Engine.

A search engine is a server or a group of servers dedicated to referencing Internet pages. When particular requests are made, these engines gather lists of links according to demand. Obtaining a listing in these engines is most often the work of robots.

The system we are intending to develop to the fullest extent is a search engine, in the sense that the results provided are URLs, but the idea of searching is radically different from « classical » search engines.

4. A Citizen of the World’s Portal.

A portal refers to a site where a great number of cybercitizens can log on and receive orientation and interact with options. I claim that haptic, acoustic and optic two-way interfaces may operate as facilitators not only for handycapped human beings, but equally to help the technophobic and digitally illiterate ones as well as the developing world’s citizens to partake in Knowledge Items.

5. Economic Semio-Anthropology

Wherever ethnological data are recorded, it emerges that the natural phenomena of “to feel a taste for” with its archetypal double “to feel disgusted by”, which is the ectodermic reaction to a substance or other stimulus – metaphorically – approaching the endo/ecto border of “my body, myself”, are the dynamic fundamentals from which the “let’s draw a distinction” mind-operation derives and metonymises in an infinite set of palimpsests.

With people who live traditionally, it is called: the purity/impurity principle, the stem cell of all further distinctions, which divide and multiply through a series of bifurcations. “Pure/impure” is a culture’s ready-made meaning framework, and can sometimes apply to opposite acts, i.e. when Comparative Semio-Anthropology studies the data, “sacred” can apply to both sides. For instance,; either white or black may be equally acceptable dress for a funeral or for mourning, in a specified cultural context - object of Pragmatics. Such distinctions guide systems of Interpretance throughout the neurochannels we call “the senses”.

The Hierarchy Principle is centrally located in the topologically smallest-scale unit-observer, in the scientific-materialist actual and consensual world-view. From this utmost imperceptible tiny zero-point of focusable awareness some named “soul”, a “spotlight” or focusable macro-microscope is ready to convey the “Soul-Will’s intentions” to make it effective and perceptible through body language: activating – by means of smart electromagnetic communication – the vibrating field we call a human body to the point where a key is stroked, a fingertip slid across or pushed on a relatively hard surface, which in turn – by means of IT and electronic components – activates certain displays for the observer/participant himself/herself or some other person – who is also an observer/participant , in communication mode.

Telecommunication means being present and operational, someone else will be the provider/consumer of commodities: “Knowledge Items”; and I too shall be a part of the consumer/provider commonality, a fellowship made up of human relationships which are based on

mutual recognition or “cross-recognition”. Telecommunication systems based on Internet-type protocols with the facility to connect every citizen of the world to any other can be employed in a special portal/search engine using a simple, conventional and already-agreed exchange code system : SI, the International System of Units, as described since 1992 by International Standards ISO31 & ISO 1000.

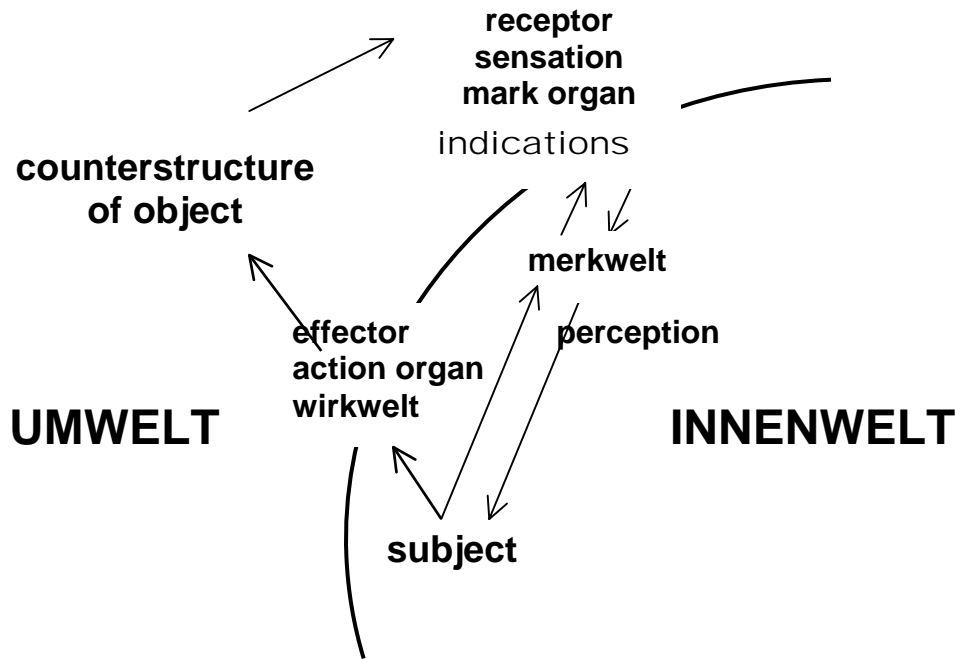
The European Forum of Semioticians, using the server at Liège University in Belgium, intends to build the

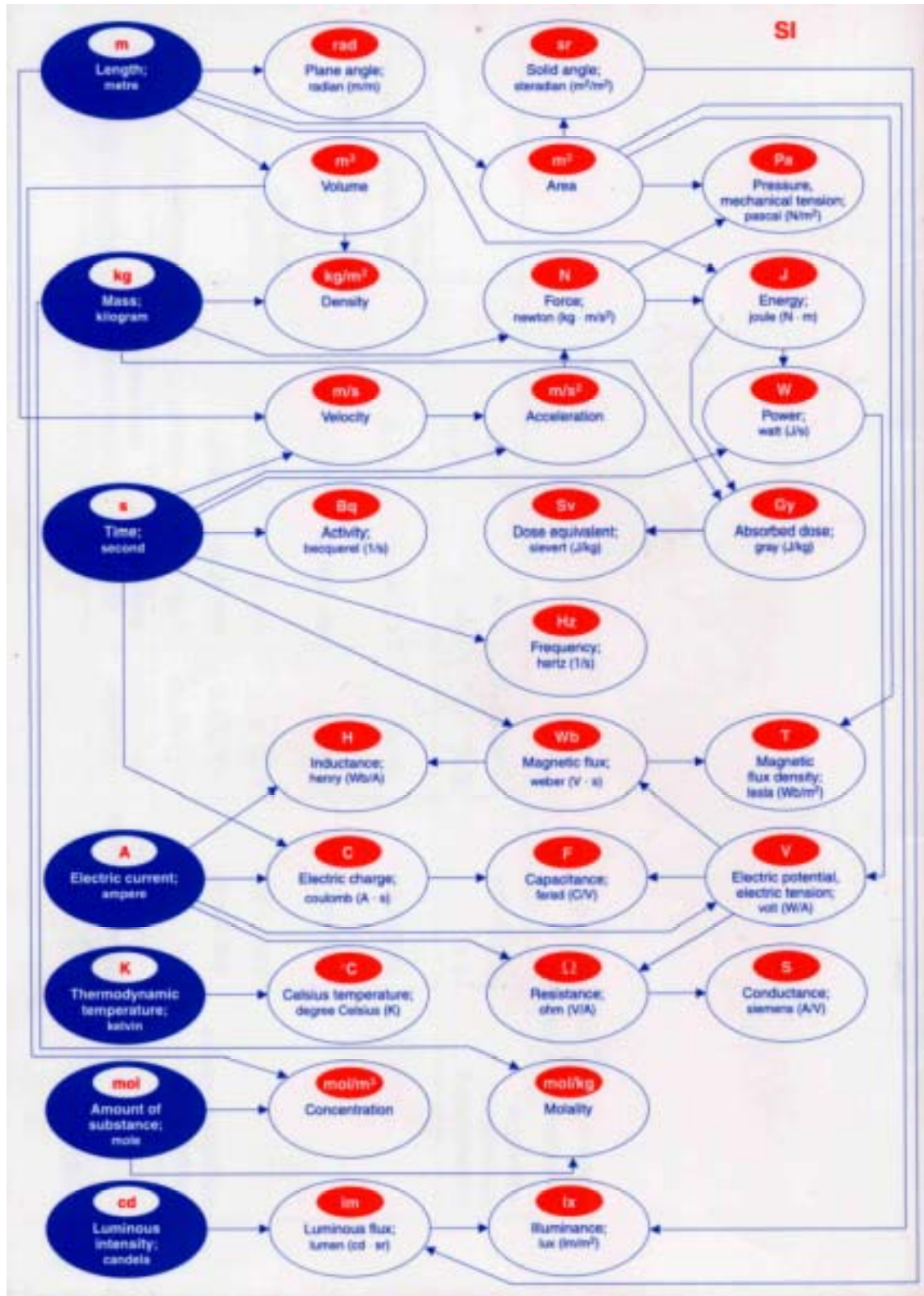
architectonics of a totally intuitive approach to the Meaningful Information Market, enabling and empowering all human beings to exchange “goods, news and bodies” - as the anthropological motto goes.

The final displays should be constructed by providers in collaboration with users, in each and every culture and sub-culture.

Uexküll’s function cycle concept interpreted as Peircean triadic semiotic concept

S. N. Salthe, 2001





ⁱ [1] Reinhard Woytek, *Les Savoirs Locaux au service du développement*, Centre pour le savoir et le développement des connaissances, Region Afrique, Banque Mondiale, Nov. 1998.

ⁱⁱ [2] Tim Halliday, *The Senses and Communication*, Springer, Berlin, 1998.

ⁱⁱⁱ [3] R. Posner, K. Robering, T. A. Sebeok, *Semiotics, A Handbook on the Sign-Theoretic Foundations of Nature and Culture*, Walter de Gruyter, Berlin, 1997, Vol. 1, p.3 : « ...Semiotics has been constituted not only as an object-science on the same level as the sign-related academic disciplines but also as a metascience which takes all academic disciplines as its domain, regardless of whether they themselves study sign-processes (the humanities, the social sciences, biology and medicine) or not (physics, chemistry, and astronomy). »

^{iv} [4] Sristi and Honey Bee Network are wonderful breakthroughs into this capital domain, see <http://sristi.org> or honeybee@iimahd.ernet.in.

^v [5] Ludwig von Bertalanffy, *General System Theory*, Braziler, New York, 1968.

^{vi} [6] *Communication and Human Rights*, www.amarc.org.

^{vii} [7] W. R. Loewenstein and R. Skalak, *Mechanical Transmission in a Pacinian Corpuscle. An analysis and a theory*, *J. Physiol.*, 1966, p. 346-378.

^{viii} [8] Dr. Paul Gérôme, *Convergence, multimediality and multimodality*, International Telecommunication Union meeting in Bangalore, India, August 2001.

^{ix} [9] see : 1) Ed. Alan Blackwell, *Thinking with Diagrams*, Porstmouth, UK, 1997. 2) Ed. A. Blackwell and Al. *Is there a science of Diagrams*, Aberystwyth, Wales, 1998 and 3) Ed. M. Anderson, P. Cheng, V. Haarslev, *Theory and Application of Diagrams*, Edimburg, Scotland, 2000. 4) *SmartGraphics Conference*, Hawthorne, 2001, www.smartgraphics.org

^x [10] Ed. Gregory Kramer, *Auditory displays*, *Studies in the Sciences of Complexity*, Santa Fe Institute, Addison-Wesley, New York, 1994.

^{xi} [11] SI GUIDE, *International System of Units*, ISO 1998. See as well : F. Cardarelli, *Scientific Unit Conversion*, Springer, London, 1997.

^{xii} [12] see *Yearbook of International Organisations*, Saur, München, 2001 or <http://www.uia.org>.

^{xiii} [13] See Pr. Kaynak, *Recent Advances in Mechatronics*, at : <http://mecha.ee.boun.edu.tr>.

^{xiv} [14] Stanley N. Salthe, *Evolving Hierarchical Systems*, Columbia University Press, New York, 1985.

^{xv} [15] Stanley N. Salthe, personal communication : « Systems of interpretants would be systems of downstream consequences of semiosis, i.e., sign process, with one interpretant following another, perhaps branching as well. Semiosis itself could be viewed as a system of interpretants. Systems of interpretance (SI) would be systems of semiotic systems. »

^{xvi} [16] Ernst Poepfel, *Time*, Aarhus, University booklet, 1999.

^{xvii} [17] Stanley N. Salthe, *Internalism*: This is a newly emerging point of view in science, with few antecedents, which include phenomenology, the thinking of J.J. von Uexküll, and the autopoiesis model of Maturana and Varela. Current major thinkers include Koichiro Matsuno, Yukio-Pegio Gunji, Otto Roessler and George Kampis. My own perspective on this is that internalism becomes necessary if we try to make a science which begins with the fact that we are inside, as participants in, the universe that we are studying. Internalism applies to such advanced technological situations as cosmological knowledge in

the face of the finite speed of light (we cannot get outside the universe, or see it whole) and operationalism, as well as to the situation of a newborn infant trying to manage in the world. Internalism is a viewpoint that accepts in advance limits to knowledge, and any viewpoint expressing limitations, like Herbert Simon's <bounded rationality> is internalist

Matsuno has been trying to examine the most reduced internalist situations possible in a search for principles. Here we can place the internal predicament of a newborn infant, living in the present progressive tense, with little stored record to aid it. I focus on this situation because it brings to the fore the important notion, from Peirce, of vagueness. All aspects of nature are to some degree vague, while our discourses -- especially science and mathematics -- try to be as explicit as possible. This mismatch is another reason to try to advance an internalist science. This has been begun in a small way using logics that forgive the law of the excluded middle, like fuzzy logic, dialectical and trialectical logics. But in these logics, while set membership is unclear, set definition is still crisp. This is not vague enough to model the actual world as it appears. I believe that we will have no understanding of evolutionary progress without an internalist science.

^{xviii} [18] Stanley N. Salthe, *Hierarchy Theory* encompasses both the scalar hierarchy of nested extensions (represented as scalar levels), and also the specification hierarchy of ordered intensional complexity, modeled as integrative levels, as in the following example: { physical world { chemical world { biological world { social world { mental world }}}}}. Differences in scale of objects or processes are measured as orders of magnitude, while integrative levels are apprehended when it is discovered that some discourse is insufficient to deal with certain phenomena, as when we find it impossible to understand biological systems using only chemical discourse. This requires us to make a new discourse, signifying a new integrative level.

The specification hierarchy is fundamentally a pattern of thought, congenial to natural philosophy, and requires that we stipulate an observer in the inmost level, to whom the system is relevant. So it is not an objective approach, as the scalar hierarchy can be.

The specification hierarchy also supplies a model of development, with the inmost level then being a unique individual material embodiment of the various classes in the outer levels, as in {dissipative structure { organism { animal { mammal { hominoid { human { male { white { middle class { ageing { {{{ Stan Salthe }}}}}}}}}}}}}}. This form, as a model of development, originated with Aristotle, but was used prominently by Linnaeus merely to signify new taxonomic levels. As a model of development, it can also serve as the basis for a generation myth associated with natural philosophy (using <myth>, not as a pejorative term, but as in ethnography).

^{xix} [19] Uexküll, Jakob von, *Theoretical Biology*, Kegan Paul, London, 1926.