Cultural Complexity

Wolfgang Fikentscher

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# Contents

**Introduction**  
4

I. **Definitions**  
6  
1. System and "Less Than Systems"  
2. Complexity  
3. Adaptation. Kinds of Systems

II. **Culture and Cultures as Matters of Complexity**  
21  
1. Culture, Cultures: Definitions  
2. The "Point of the Ought"  
3. Subdivisions of Culture  
4. Modes of Thought, and the Inside-Outside Issue  
5. Complexity and Development of Cultures  
6. Understanding the Past

III. **Culture(s) and Modes of Thought as Complex Adaptive Systems (CAS)**  
41

IV. **Some Implications**  
43  
1. The Ontology-Metaphor Problem  
2. Anthropological Systems Theory  
3. Artificial Culture(s)?  
4. Recognition of Cultures

V. **Summary**  
59

VI. **12 Theses**  
59

**Sources for the Figures to "Cultural Complexity"**  
64

**References**  
65
## List of Figures

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The curve of the invisible hand</td>
<td>7</td>
</tr>
<tr>
<td>2 a,b,c</td>
<td>Sketches of systems</td>
<td>8, 9</td>
</tr>
<tr>
<td>3</td>
<td>Thought-modal kinds of orderings</td>
<td>12</td>
</tr>
<tr>
<td>4</td>
<td>Concepts of time</td>
<td>19</td>
</tr>
<tr>
<td>5</td>
<td>Themes of Culture</td>
<td>24</td>
</tr>
<tr>
<td>6</td>
<td>Modes of thought</td>
<td>28</td>
</tr>
<tr>
<td>7</td>
<td>Offices in the Pueblos</td>
<td>33</td>
</tr>
<tr>
<td>8</td>
<td>Ontological and metaphorical reasoning</td>
<td>46, 47</td>
</tr>
<tr>
<td>9</td>
<td>Classical subdivisions of anthropology</td>
<td>52</td>
</tr>
<tr>
<td>10</td>
<td>Anthropology as an integrated system</td>
<td>53</td>
</tr>
</tbody>
</table>
Introduction

This paper entitled "Cultural Complexity" is divided into four parts¹.

The first section (I.) consists of definitions which center around the concept of complexity. As a minimum, the terms, system, complexity, and adaptation as used in this paper need an explanation. The second section (II.) is a sketch of cultural complexity in the real world. I will use Pueblo tribal laws and other ethnographic material as examples of that complexity. This part draws on

¹ This Working Paper draws from five unprinted presentations in the Santa Fe Institute: "Modes of Thought in Law: Pueblo Tribal Court Studies in Cultural Complexity", January 17, 1992; "Cultural Complexity in Human Behavior", December 15, 1995; "Behavior: A Taxonomic Attempt", February 7, 1996 (with Dan McShea); "Pueblo Law Research - An Example for a Study in Cultural Complexity", Santa Fe Institute Science Symposium, March 9, 1996; and "Cultural Complexity", March 22, 1996. - I want to thank the SFI, its directors and staff, for assisting me with a desk, and other working facilities twice, in 1991/92 and 1995/96, and thus enabling me to gather legal-ethnographic material on Native American reservations, in particular in the Rio Grande Pueblos. This research contributed to the present paper on "cultural complexity". - I am indebted to Kai Fikentscher for reading a draft and commenting on it. - Other articles reporting research results from my Pueblo studies are listed in the references, infra. - A terminological remark: Pueblo denotes a certain geographic place, such as Zia Pueblo, NM. A Pueblo may also be the inhabitant of a pueblo (Puebloan is obsolete). Thus, Pueblos may be the plural of anyone of the twenty still existing Pueblos in New Mexico and Arizona, or inhabitants of them. The word Pueblo is also used for historic, no longer existing Pueblos such as Pecos Pueblo, Guisewa Pueblo (near Jemez Pueblo), San Lazaro Pueblo (near Santa Fe), etc. On the other hand, pueblo denotes any Spanish or Indian settlement in the form of a little or medium-sized town or village after the Spanish colonization.
anthropological fieldwork on the customary laws of Southwestern Indian tribes, especially the Pueblos of New Mexico and Arizona. With intermissions, this fieldwork took place between 1987 and 1998, comprising periods of time that add up more than thirteen months.

This research included the internal laws ("tribal law") of the following nations: White Mountain Apache, San Carlos Apache, Jicarilla Apache, Yavapai–Apache, Pascua Yaqui, Tohono O`odham, Pima–Maricopa, Navajo, Kaibab Paiute, Moapa Paiute, Las Vegas Paiute, Taos Pueblo, Picuris Pueblo, San Juan Pueblo, Santa Clara Pueblo, Pojoaque Pueblo, Nambe Pueblo, San Ildefonso Pueblo, Tesuque Pueblo, Jemez Pueblo, Zia Pueblo, Cochiti Pueblo, Santa Domingo Pueblo, Santa Ana Pueblo (I and II), San Felipe Pueblo, Sandia Pueblo, Isleta Pueblo, Laguna Pueblo, Acoma, Zuni, and Hopi.²

The third part of the paper is (III.) what a lawyer would call a subsumption, and a logician a minor premise. In a brief but central remark I would like to state that cultural variety (II.) meets the requirements of complexity in the defined sense (I.).

A fourth and final section (IV.) offers some implications of this theoretical point of departure. The implications are, in part, of philosophical nature, and, among other aspects, deal with the ontological and epistemological difficulties of drawing conclusions in complex settings (in nature and culture). Ontology in this sense is — in short — the philosophy of truth, and epistemology the philosophy of discovering truth. A summary (V.) and some theses (VI.) conclude the paper.

I. Definitions
Intuitively, cultures appear complex, and culture in the singular ("holistic meaning" of culture) also seems to be complex. Do the cultures, and does culture, meet the essentials of a complex adaptive system? This depends on the definitions of complexity, adaptiveness, and system.

1. System and "Less Than Systems"
John Holland begins his seminal book on the "Hidden Order" of things with the question, how in a big city like New York everyone gets his or her breakfast. Holland calls this a mystery, a magic, because he sees no system that takes care of the supply (Holland 1995, p. 1).
The mystery unravels when the observer turns from the system within the context of the natural sciences to the system as a methodological concept within the humanities and the social sciences. The latter concept works, in a scientific way, with values, and value judgments. Of course, in the first place one has to accept that working with values in a scientific sense is possible. David Hume denies this, Immanuel Kant affirms it, and here I follow Kant (for details, see Fikentscher 1995a, 39; concisely stated by Hahlbrock 1995). The fact that social sciences are sciences in this country, but humanities in Europe, tells a story about the Kant reception in the U.S.

The values that regulate the availability of breakfast in New York are technically often called preferences (Raiffa 1969; Tietz 1981; Fikentscher 1981). Economic value judgments within a market defined by alternatives lead to a system of competing offers at diminishing returns, at least in the bulk markets (W. Brian Arthur 1994; 1995; Waldrop 1992, 252). Such a market attracts suppliers of breakfast wherever there is a demand, at prices near cost, as long as there is enough competition. Competitive markets follow what Adam Smith has
called the "invisible hand". Figure 1 attempts to make the invisible hand visible:

(Figure 1: The Curve of the Invisible Hand)

Every offeror, and every customer, finds its place along this curve, because the curve represents a system, the system of a market, the term market being understood in a subjective, perceived sense (Fikentscher 1996).

This illustrates the idea that a system is a combination of a general principle, the so-called genus proximus, which here is the working of the invisible hand, and one or more applications of this principle, the so-called differentia specifica, here the spots where suppliers and customers find themselves along the curve of the invisible hand.

(Figures 2 a,b, and c: Sketches of Systems)

From the differentia specifica 1 and 2 a principle is derived (inferred, induced). The principle (= the genus proximus) is then applied (deduced) to a new specific 3. Example: cranes (point 1) and gulls (point 2) are orders of birds (a class). So are
storks (point 3). Systems serve to reasonably define items in two directions, *genus proximus* and *differentia specifica*.

The following two examples demonstrate incorrect systematic reasoning. A system does not emerge if the principle does not cover the third point (Figure 2b): A bat, although flying, is not a bird. Nor does a system emerge if the principle does cover that point, but the third point does not belong to the same level of abstraction as points 1 and 2 (Figure 2c): Point 3a is a subspecies of gulls, Point 3b is archaeopterix belonging to the underclass of archaeornithes.

We learn from the New York breakfast example that there are systems observable that may concern values and value judgments. Moreover, we note that such systems may be quite complex: There is a multitude of birds. Thus, there are complex value systems, or, to say the same in other words: There is cultural complexity.

Through its constituent parts, that is, the principle, and the items brought under the principle, a system brings order into a disorderly, motley world. However, there are many more ways to order things besides by a system. The system is an
invention of the ancient Greek mind. Herodotus wondered why the Persians and the Egyptians did not know the system, and accordingly distinguished the Greek, the Persian and the Egyptian mind (logos). In cultural anthropology, it appears that the system is a culture-specific trait (Fikentscher 1975-77: vol. IV (1977), 108ff.; idem 1995a, 157ff., 183, 351, 465).

Viehweg (1993, 27; Jacob 1995, 19, consenting) warns us: "But if we succumbed to that impulse (of systematization) we would undercut the actual intention of the topoi ... In the end, we would be forced to ascertain a clearly discernible rift yawning between the system we have developed and the world of problems, which through all these systematizing efforts has lost none of its problematical character. Obviously we would have disturbed originally complex interconnections. There seems to be an inter-relationship that cannot be simplified to a merely logical one, so that our deductive systematizing efforts in the end yield only constructions that are isolated and do not matter."

Therefore, let us look to other ways of ordering items. Another way to order things is to list them in form of a mere compilation - possibly even at the edge of chaos; or assort them serially, that is,
either by way of a simple series such as the letters in an alphabet, or in an associative series as in story-telling, or as a topical series, such as in aspective art (Brunner-Traut 1990; Viehweg 1993; Jacob 1995); or in a cyclical manner like the unending cycles of life in the Karma belief of Brahmanism. The various ways of ordering things reflect what, in anthropology, is called the modes of thought (Fikentscher 1995).

Hence, system is a qualified order. Compilation; simple, associative, and topical series; and cyclicity may suitably be identified as "less-than-systematic" orderings. Consequently, once we will have added complexity (2) and adaptiveness (3), there will be complex adaptive systems, and complex adaptive less-than-systems.
A non-exclusive survey of orderings shows:

**Figure 3:** Thought-modal kinds of orderings

<table>
<thead>
<tr>
<th>kinds</th>
<th>examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>compilation</td>
<td>faunal population on a new volcanic island, result of a brainstorming session, Islamic umma (congregation)</td>
</tr>
<tr>
<td>simple series</td>
<td>alphabet, brotherhood in segmented society (Evans-Pritchard), late renaissance suite</td>
</tr>
<tr>
<td>associative series</td>
<td>biblical story-telling by word identities, most fairy tales</td>
</tr>
<tr>
<td>topical series</td>
<td>mnemotechnic rhyme, Bach suite, aspective presentation (Ancient Egyptian art), older brother - younger brother - relation in Confucianist 5-rules ethics</td>
</tr>
<tr>
<td>cyclicity</td>
<td>harvest cycles, powwow dance, Reigen dance, karma belief</td>
</tr>
<tr>
<td>system</td>
<td>Linnaeus' botanical work, table of chemical elements, Greek polis, monograph by Ramee 1570, treatise, Pueblo dance, Shakespearean plot, Latin Grammar</td>
</tr>
</tbody>
</table>
2. Complexity

Complexity is a property of things making them fit to be ordered, whether by self-organization or by some outside effort. Complexity does not imply the way in which things have to be ordered. It can be ordered in a compilatory; simple, associative or topical serial; cyclical; systematic; or possibly still other way. Thus, complexity is not a direct correlate to a certain kind of ordering, e.g., a system. Usually there are a large number of things to be ordered, and after having been ordered, their disorder turns into the complexity of compilations, serials, cycles, or systems. In the following discussion, I want to concentrate on systems.

It follows that reductionism and complexity are not mutually exclusive: Ongoing systematic (and other ordering) work, in nature or in culture, is necessarily, of a reductionist nature. This is so because it concerns complex details, for instance of a system, and thus thrives on complexity (the differentia specifica) while reducing it to scientifically manageable chunks (the genera.

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3 The interpretation of a galaxy as a vortex attributes to the galaxy the essence of a complex system. On other ways of ordering things, Fikentscher 1995a, 175-188. On systems, see Canaris 1969, 1983.
proxima). Hence, complexity should not be invoked against reductionism.

The opposite of complex is simple. There are simple compilations, series, cycles, or systems. Simple topically serial orders are, e.g., the two last emu birds before their species became extinct, the Confucianist older brother - younger brother relation, or a mnemotechnic rhyme.

By referring to ongoing systematic work, the element of time is introduced, and by adding time to system and complexity, we approach a definition of adaptation.

3. Adaptation. Kinds of Systems

In order to understand adaptation, two different kinds of systems have to be distinguished, namely closed and open ones\(^4\). A steam regulator that throttles down the steam pressure whenever the pressure is rising, is the classic example of a closed system. Closed systems have been described by Richard Wagner, Norbert Wiener, Niklas Luhmann and

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\(^4\) Canaris, 1969, 1983; Fikentscher 1975-77: vol. I (1975) 568; vol. II (1975) 64, 68f., 252; vol. IV (1977) 115ff., 162 ff., 380; both with further materials. The openness of the system is generated by the open extension of the genus proximus: in Figures 2 a,b,c, the upper line is open at both ends.
others. Closed systems are time-neutral in that they do not evolve over time. Closed systems do not adapt to outside factors.

a) Most systems are open. This means they work across time. They develop. Hence, they are able to adapt. Moreover, they may be complex. Open systems are, e.g., botanical systems as long as additional species are developing or being developed (e.g., by breeding); legal systems; or a city growing according to city-planning.

b) But the steam regulator does not evolve, and a symphony does not develop, or adapt. Steam regulators and symphonies are closed systems. Take a Beethoven symphony: If the orchestra were to leave out the second movement, or ten measures in the scherzo, most people in the audience would say: "There`s something missing". This is a test that these compositions are closed systems, because it is to be assumed of an open system that there are still differentia specifica missing. (What can be adapted, though, is the systematic way in which the conductor conducts the symphony, for example in correspondence to the dominant pseudoromantic taste. The art of conducting is a complex adaptive system, it is open.)
Closed systems are unable to evolve or adapt. A crystal which no longer grows and has no chance to grow is a closed system.

c) From the foregoing it follows that the term "dynamic system" can be used in two senses, focusing on either open or closed systems:

Since an open system can only exist in the course of time, "dynamic" may just mean "open". Examples are: A recently discovered kind of bird fits under the genus proximus "bird", and the word "recently" demonstrates the openness over time of the class "bird". The law of the sea may develop to be applied by way of analogy to the law of outer space. One way to express this is that systems develop, or evolve, or adapt. A system can be "dynamic" in this developing, evolving, or adapting sense. If it is complex, it is a complex adaptive system. In this context, "dynamic" designates nothing more than the openness of a system.

However, if somebody says: A steam regulator is functioning and therefore is working "dynamically", or: this Beethoven Symphony is "dynamic", "dynamic" is used in a different way: It assumes the sense of
"functioning", or "working". No development takes place.

d) Focusing on open systems, social sciences combine system and time in the sense of the Great Antinomy as defined by the economist Walter Eucken: In the social sciences, every issue can only meaningfully be raised, and answered, both in terms of system and time,\(^5\) (and by the way, only if two more categories are added, evaluation, and method (Fikentscher 1975-77: vol. IV 1977, 357).

Open systems are more frequent than closed systems. Open systems involve the factor of time. There are numerous concepts of time. In Western culture (Fikentscher 1995, 355 ff.), open systems are able to imply only one understanding of time, namely, "time as a straight line".

For "Westerners", open systems and time as a straight line constitute one another (Fikentscher 1975-77: vol. IV 1977, 19 ff.).

Time as a straight line is the understanding of time used, in Western culture, to interpret evolution.

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\(^5\) Eucken 1950, 34; see also de Saussure 1916; Fikentscher 1960, where the distinction between synchrony (system, no time) and diachrony (time, no system) in various social sciences is discussed.
Therefore, to speak of a complex adaptive system, in the sense as it is developed here, is just another way of saying that there are systemic rules in evolution. It is promising to catch evolutionary systemic rules under the conceptual net of complex adaptive systems because, in Western thought, this helps to understand evolution as a process.

Note, however, that most non-Western cultures do not systematize.

This is a sweeping statement, and it requires substantiation. This, in turn, requires a definition of the term "system". For this definition, reference may be made to the preceding text under I.1., supra (a system is a combination of a general principle and one or more applications of this principle to specifics, applications that deserve, under ontologies and epistemologies still to be chosen, the judgment "true"). Thus, a system always defines a specific from at least to points of view: the principle and the comparison with other specifics. Graphically, a system needs at least two lines, and connecting lines between those two lines (see Figures 2 a,b,c). Hence, systematic thinking is perspective (Fikentscher 1975 - 1977, IV, 61-107). Perspective thinking is an attribute of Greek (today: Western) thinking (Hamburger 1967; Richter
It follows from the foregoing that, empirically, one can check this non-systematic ordering in non-Western cultures by investigating the time concepts of these cultures. They correlate to culturally specific ways of ordering things:

(Figure 4.: Concepts of Time)

It is "time as a straight line" that is at the bottom of the openness of a system (see Figures 2 a, b, c). Other concepts of time may but do not necessarily conflict with systematic thinking. E.g., the "perspective antiquarianism" of the humanists ("ad fontes" - and nothing between those "fontes" and yourself), or the "aspective use of historical development for the explanation of the present" ("pure Roman law" is to be preferred over
epigonic developments) tend to permit only closed systems. This is important, for example, for the understanding of texts of legal history.\textsuperscript{6}

The "understandings of time" in Figure 4 are not the only possible ones. Empirical observation of the real world may produce more (Kirste 1998; Fikentscher 1975-1977, IV, 76 ff., 637, 650; 1995, 181 ff., 238, 289 ff., 334, 376, 394, 419 ff., 452, 473), and computational theory seems to permit new concepts of time for chosen purposes, unknown to the real world.

The evolutionary tendency which is part and parcel of complex adaptive systems gives these systems the inherent quality of a pluralist "ought": They are on the way to developing into subsequent evolutionary states. The "ought" implied in this development is open and indeterministic. Consequently, it is a noticeable limitation to the argument of the naturalistic fallacy. The implications for natural law theories, and for Kant`s categorical imperative cannot be discussed here (see, for the time being, Fikentscher 1997, 43 f.).

\textsuperscript{6} A similar statement is made by Dieter Nörr (1972).
II. Culture and Cultures as Matters of Complexity

1. Culture, Cultures: Definitions.

The word culture may be used with regard to a specific culture (a) ("Inuit culture") or as an abstract term that denotes "culture as such" (in the "holistic" sense) (b).

a) Edward Burnett Tylor`s definition of culture in the specific sense, posited in 1881 (1881,1), is still applied by most culture comparatists and anthropologists:

"Culture is that complex whole which includes knowledge, belief, art, moral, law, custom, and any other capabilities and habits acquired by man as a member of society."

With respect to our subject of discussion, complexity, a more modern form of this definition may be the following:

"Culture is the complex attribute of a society that refers to the patterns of conduct of its participants - traditional but open to change - to societal situations concerning knowledge, beliefs,
Thus, a culture (in the specific sense) is not identical with a society, a concept that focuses on the relations among individuals and between individuals and groups; and hence anthropology, the empirical science of humans as a cultural beings is not identical with sociology.

b) Culture, without an s (= culture in the "holistic" sense), is an abstraction of the various cultures. Thus, it can be said that humankind is defined by having "culture".

In the following text, both meanings are used, the specific and the holistic. The context indicates what is being discussed.

2. The "Point of the Ought".

Historically, culture (in general) occurred when, in the animal–human–transition field, beings started to critically relate to their natural (physical and biological) environment and abilities. This enabled these beings, from now on entitled to be called humans, to constrain incest and power behavior
normatively, and to reflect these normative constraints back upon nature (hereby forming a belief system).\textsuperscript{7}

It follows that there is no human society without law, law forming an essential part of culture. And once culture had occurred, said reflection about culture and its relation to physical and biological environment began. Historically, this is the shaman's task, so that there is no human culture without a belief system either.\textsuperscript{8}

Let's call this point of reflection about culture and nature the "point of the ought". Margaret Mead called it the point where nurture and nature split. Murray Gell-Mann defines it as the point from which on human ideas cause complexity to become "potential", by which he means that complexity, having entered the realm of culture, becomes much more variform and greatly expands.\textsuperscript{1}

\textsuperscript{7} See for the pro and con of this normative theory of the definition of humanity Fikentscher (1975-77), vol. I (1975), 71-79; cf., Johanson & Edey, 418 ff.

\textsuperscript{8} See the discussion in Fikentscher (ibid.), 79-104.

\textsuperscript{9} Gell-Mann (1994) 68 f., 70, 294 ff.; the center of this line of thought is on p. 70 (potential complexity).
The reverse conclusion is permitted: Empiry demonstrates that there is no human society without a shaman (defined as the functionary of bridging world and other-world). Therefore, there is no human society without the shaman`s task to reflect on the "point of the ought", on the breaking away from nature by introducing human constraints and liberations. Thus, even for those who stipulate a continuum from nature to culture by imperceptible degrees, a change of quality from not-reflected to reflected constraints and liberations is inescapable (Fikentscher and McGuire 1994).

3. **Subdivisions of Culture**

Culture, thus defined and explained, is subdivided in various ways, according to different standards of categorization, e.g., formal (a) and substantive (b). (This is the material of cultural complexity.)

a) A **formal subdivision** is the following. It subdivides a culture by its themes. A culture is composed of its themes. The term "theme" serves as a *genus proximus* and is composed of, but not limited to, its observable *differentia specifica*. The subdivision of a culture according to themes listed here is, with minor variations (e.g. Pospisil 1986,
in general use for teaching purposes with minor variations.

(Figure 5: Themes of Culture)

To illustrate:

- "traits" are the most commonly used "atoms" of a culture. Pueblo reclusiveness is a cultural trait. A complex is a set of traits (e.g. "art").

- Ruth Benedict introduced the term "pattern", as an English translation of "Gestalt", taken from German "Gestaltpsychologie". It describes coherent aggregates of cultural traits such as the proverbial "peacefulness" of the Hopi, or the - equally proverbial - nomadic way of life of the Roma and Sinti (the so-called "gypsies").

- A cultural "purpose" may be the "happiness" of the people in a socialist culture. It need not be reached.

- A cultural behavioral "function" may be hegemony, or - less than that - sovereignty. U.S. Justice Oliver Wendell Holmes, Jr., defined sovereignty as
the ability and willingness of a nation, through its army, to tolerate other nations to exist.\textsuperscript{10}

Covert themes need full familiarity with the language, and two to three years of living in the culture observed (communication Pospíšil, personal communication). - The other items of Figure 5 are self-explanatory.

b) Substantively, there are thousands of cultures in this world, more than 3000 alone south of the Sahara. Some say that there are about 10 000 cultures in this world, in history and present. The Human Relations Area Files (HRAF), George Peter Murdock's and others' work at Yale, Pittsburgh etc., cover 300 "important" cultures, compiling 700 traits for each of them, in total 210,000 traits. The private laws of the twenty Pueblos, collected by Robert D. Cooter and myself between 1986 and 1996, consist of overt, ideationally valued, patterns and traits.\textsuperscript{11}


\textsuperscript{11} See footnote 1, supra.
4. The Modes of Thought, and the Inside-Outside Issue

Having subdivided cultures to show their complexity, the question is permitted whether there is a more "reductionist" unit behind the cultures. It is the same kind of question that seeks subunits of atoms, particles of atoms, and as of now leads to the quarks.

There is indeed a unit behind the cultures. Since E.B. Tylor, the various cultures were the basic unit. However, the cultures build upon what may be called the "modes of thought" (see, e.g. Horton & Finneghan 1973). For example, the Hinayana-Buddhist mode of thought is the foundation of Thai culture. I have attempted to describe this relationship between the modes of thought and the cultures in my book on the "Modes of Thought" (1995) and will no longer dwell on this issue here (cf. Figure 6).

(Figure 6: Modes of Thought)
However, the modes of thought may be helpful in solving a well-known problem in anthropology, the inside-outside issue.\textsuperscript{12}

A culture may be viewed from the outside. This approach is taken where, e.g., an anthropologist asks a pueblo judge: "Does the law of your tribe know intestate succession?" (= inheritance without a will). The anthropologist who is asking in this manner applies Western analytical concepts (the distinction between intestate and willed inheritance) to tribal law. He or she works "etically", as the term goes (from phon-etic).

The anthropologist should not ask in this manner, because tribal inheritance law may be conceptually different from Western law. For example, tribal law may know the transfer of property at the time of the agreement among the heirs apparent on the one side, and the owner still living and decedent-to-be on the other. This agreement – a kind of stipulated "civil death" for the purpose of succession – is a transfer of an estate by a will inter vivos. To my knowledge, Western law does not know this kind of transfer.

\textsuperscript{12} Pike 1954; Headland, Pike, and Harris 1990.
Thus, the anthropologist should ask conceptually in terms of the law she or he is going to investigate. But this law is still unknown to the anthropologist who sets out to investigate it.

Logically, this impasse is insurmountable. Of course, an anthropologist knows this seemingly unsolvable problem, and will carry on the investigation in the "emic" way (from phon-emic), once she or he has gained insight of the "inside" of the culture to be studied.

From this current anthropological practice draws the conclusion that "emic" is the "folk-way", and "etic" is the scientific analysis of this "folk-way".

However, this is a rather conceited, ethnocentric position which strides against the anthropological principle of the equality of cultures. Because upon closer examination, the analytic, "etic", interpretation of culture is nothing but the emic view of the Western culture;\textsuperscript{13} so that a seemingly "etical" analysis of another culture is an ethnocentric emical effort. Instead of the purported "etical" objective analysis, nothing other than emic

\textsuperscript{13} Pospísil 1978/85, 3 ff.
The way out to resolve this dilemma of cultural complexity is shown by the theory of the modes of thought. A mode of thought is a mind-set that connects human data perception with mentally reflected behavior in a culture-shaping way that is predominantly covert.\textsuperscript{14} Modes of thought induce a conceptual and value-related meta-thinking. Thus, they enable the observer to compare, on a meta-level, all "emically" analyzed cultures, including the culture of Western (historically: Greek) thinking.\textsuperscript{15}

5. Complexity and Development of Cultures

Cultural complexity is to some degree structured differently from physical and biological complexity.

\textbf{a)} In physics and biology, as a rule evolution \textit{promotes} complexity.\textsuperscript{16} I refer to well-known phenomena such as the Cambrian explosion, the

\begin{flushright}
\textsuperscript{14} Fikentscher (1995a), 21.
\textsuperscript{15} Details in Fikentscher (1995a), 116 ff.
\textsuperscript{16} Cf. Gell-Mann (1994) 244, 329 ff.
\end{flushright}
mutation-selection process, or the niche theory—
developments that underline increasing complexity
over time as developed by Murray Gell-Mann, 1994.
Once in a while, though, events usually called
catastrophes occur, such as the relatively sudden
disappearance of the dinosaurs. Gumerman may have in
mind this slow-rise-sudden-fall pattern when he
speaks of a pattern to the evolution of human
culture, of poorly understood and poorly articulated
laws of social evolution which, of course, do not
exclude the uniqueness of historic details.  

b) In culture, however, complexity and evolution
rather tend to go separate ways. Often, complexity
evolves (for example: Feeley and Lester 1994), but
not always. The following examples from my own
research are intended to illustrate this latter
point.

aa) The Hopi society, to cite one example, is based
on the following highly complex system of cultural
traits (= a complex, see Figure 5, supra):
(1) exogamous households; (2) the central clan
households; (3) exogamous lineages; (4) totemically

I am quoting from a draft note for our Working Group on
human behavior; cf. footnote 1.
named exogamous clans; (5) phratries, as ceremonial clan combinations; (6) villages; and (7) nation.\textsuperscript{18}

This system is much more complex than the nuclear family, county, state and nation system of white society. I do not see the Western society evolving towards the more complex Hopi system.

bb) The US have a tripartite government (legislature, administration, judiciary; following Montesquieu`s "De l`esprit des lois"). Germany has four separate powers, the three from Montesquieu`s repertoire, plus the Bundesbank (the United Kingdom followed this pattern in 1997, and the European Union has promised to follow it for the European currency, the Euro, administered by the European Central Bank); Taiwan R.O.C. has five separate powers of government, the Keresan pueblos have eight, and the Tewa pueblos nine, everyone in control of all the others. Again, I do not sense any development from lower to higher complexity.

cc) For the pueblo communities, tradition often means retaining traditional older customs while accepting and adding cultural developments. For example, the Pueblo of Taos long ago added the

\textsuperscript{18} See Sekaquaptewa`s (1995) precise analysis.
buffalo dance, a traditional dance common to many Plains Indians, to the standard repertoire of the Taos dances.

Historically, offices in the pueblos were piled on top of the other, until the octopartite system of governmental powers emerged which is presently in use among the Keresan speaking Pueblos. As mentioned, the Tewa speaking Pueblos have nine governmental powers since there are two moiety heads that take turns in guiding the pueblo (Fikentscher 1995 b: 8 ff., 17 ff.); further details in this respect were discussed in my SFI lecture of Jan. 17, 1992 (Fikentscher 1992).

Figure 7: Offices in the Pueblos (subject to substantial variations)

From Pre-Columbian Time:
- moiety heads
- tribal council (principales, elders. etc.)
- society heads
- war captains

Under Spanish Influence:
- governor
- lieutenant governor
- alguacil (sheriff)
- fiscales (church officials)

Under US-American Influence:
- modern court
The cultural complexity of the office and power situation in the Pueblos is apparent. Here, a trend towards increased complexity is noticeable, but this complex system will hardly diffuse to other cultures. In most other cultures, traditions may change. But they are not compiled and added up layer by layer.

dd) Many tribes (including Hopi) have a religious system that consists of at least four religious types: Totemism, animism in the narrow sense, magic and ancestor worship.\textsuperscript{19} Compared with this elaborate religious system, Islamic, Judaic and Christian monotheism, even in the more elaborate Judaic and Christian versions, is quite simple and not at all complex (for details see Fikentscher 1995a, chapters 6, 7, 9 and 10). Is there an evolution from less to more complex? In religious culture, the opposite seems to prevail. One of the most simplifying events in the development of the modes of thought and the cultures was the axial age (700 – 450 B.C.E.). It was the period during which many religious types of animism (in a wider sense) became reduced to total religious (in Pospíšil’s terms).

\textsuperscript{19} A description of religious types in Fikentscher (1995a) 170-294.
c) Maybe it is an anthropological inclination to get excited when really complex data are being discovered. Often cultural complexity and its study seems to come down to a school of circumspection, and of tolerance. The Chief Judge in one of the major tribes in the North American Southwest asked me in 1996: "What do you think tribes are good for?"

Thinking about this question (after having answered to the Chief Judge in a very unsatisfactory way), I gathered some possible answers: Let me submit them to you for critical review:

aa) It has often been stated that animism (in the narrow sense of a belief in animated nature, not in the wider sense of pre-axial age belief system) is the feeling of being caught between culture and nature, nature in its double role of a feeder and destroyer. Indian fairy-tales tell about hunters who got punished by nature because they hunted more than was necessary for the sustenance of family and tribe. Indians tend to minimize the impact on nature. Hence, one may conclude: Tribes are good in order to understand the need for environmental protection, for sustaining the complexity of our environment, and of our cultures.
bb) A person who studies the "multiplicity of cultures" (cf. Pospíšil 1971; Fikentscher 1995a: 21 ff. following Pospisil) will try to refrain from ethnocentric judgments, and thus tend to honor complexity as a value. Gell-Mann's two last chapters in "The Quark and the Jaguar" (1994) give eloquent witness of environmental complexity as a value. The same holds true for cultural complexity. There is tolerance and justice due to every single culture, as long as it is willing to be tolerant towards others. Someone who grows up in a totally red environment does not know other colors, but she or he does not know what red is either (Pospíšil's example, in 1982, 13).

cc) Since cultures can be traced back to their underlying modes of thought (see II. 4., supra), not only cultures but also the modes of thought are complex. If the other culture belongs to another mode of thought, concepts such as space, distance, time, causality, risk, social and societal ordering, aesthetic judgments, and the respective use of adjectives or process descriptions for characterizations may be different (Fikentscher 1995, 181 ff.). Islam, for instance, knows no causality in the Western sense, Confucianism uses a

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20 This is the meaning of the term "cultural justice", as it is intended in Fikentscher (1991 and 1992a).
concept of holistic causality different from the Western concept (which may be called a rather eclectic approach to causal phenomena), and the "activism" of the early Greek mind in Homer's Iliad causes the shield of Achilles to be described not by its appearance but by how it is made.

It follows that a culture which uses, e.g., non-Western concepts of causality and risk is exempt from Robert Axelrod's "Evolution of Cooperation" (Axelrod 1984). Axelrod's cultural convergence and polarization model does not exactly take up the cooperation issue again, rather, it underlines the improbability of cooperation under a number of given cultural conditions (Axelrod 1995). In a similar vein, testing the iterated Prisoner's Dilemma game for analyzing the evolution of island societies, Gumerman (1986, at 49) holds that modeling the complexities of human behavior on the basis of the abstract formulation of a computer simulation game masks many potentially important variables, such as the relationship between hierarchical social orders and competition and cooperation.

John Holland's "Hidden Order" starts on p. 3 with the Platonic notion (transmitted to us by Aristotle) that "the whole is more than the sum of its parts", a theory that does not function in Confucianism, nor
in Islam.\footnote{Cf. Nader (for a Shia Moslem village); Fikentscher 1995 (307 ff., 349 ff.) (for Confucianism).} Holland continues on p. 4 with the Western concept of an individual agent, a notion unfit for Hinayana Buddhism and many pre-axial-age ethnia. He also mentions on p. 7 the stimulus-response theorem which in this broadness is inapplicable in Islam, however.

Thus, these non-Western modes of thought, and the cultures building upon them, emically do not know what in Western thinking is meant by cooperation, or "hidden orders" (which Holland on p. 4 defines as generalizations of complex adaptive systems - our subject of discussion). And if we were to say: Well, that's our scientific analysis, we are thrown back on the emic/etic issue, realizing that etic means "just western" (see II. 4., supra).

It follows that the scientific observer here comes to terms with the fact that in order to cope with cultural complexity one has to re-think the analytic premises of physical and biological complexity. This may imply that the concept of complex adaptive system begins to oscillate.

I think culture-comparative observation can put the concept of complex adaptive system back on its feet, though. We only have to take cultural complexity
seriously, and familiarize ourselves with its epistemology. The epistemology of cultural complexity is the key to culture-independent research and understanding. This topic will be discussed in Parts III. and IV. below.

6. Understanding the Past

Cultures as substance matter of complexity include past cultures. It is only in passing that I can mention here the studies of archeologists and archeological anthropologists (Gumerman (1986, 1992, 1994); Gumerman and Dean (1994); Gumerman and Gell-Mann (1994a, 1994b); Gumerman and Kohler (1996); Carla van West (1994); Jeffrey Dean, A.J. Lindsay and W.J. Robinson (1978); Jeffrey Dean, William Doelle and Janet Orcutt (1994); Emma Brunner-Traut (1990) and others). They provide us with ample materials of cultural complexity in the past, often linked with the present, as is the case of the Pueblos.

To mention just some examples: Room functions may indicate historical data referring to demography, social organization, and subsistence activities (Gumerman 1992, 86 f.). In 1990 an SFI Working Group examined how increases or decreases in the complexity of regional systems of exchange and
sociopolitical alliances might be modeled using John Holland's Genetic Algorithm (Holland 1995), as modified by workshop participant Robert Reynolds from Wayne State University. Using surrogate measures to monitor dimensions of demographic, economic, social, and political behavior, the working group investigated the potential of a model generated from the Genetic Algorithm to reproduce systems of comparable complexity to those known from archeology. Incongruencies between the results of the model and the actual archeological findings may contribute to the assumption or—most probably—exclusion of factors for explaining hitherto inexplicable historic events: "efforts such as this one will eventually allow us to specify the ways in which systems of human behavior mirror or depart from the behavior of other complex adaptive systems" (George J. Gumerman, Murray Gell-Mann, and Linda Cordell in their introduction to Gumerman and Gell-Mann 1994b, 11).

If the modeling does not confirm the archeological findings, and vice versa, other unnoticed factors may be of importance, inviting to be researched and eventually included.

If cultural complexity is subdivided by themes as is proposed here, and aspects of the modes of thought,
and the apparent disconnectedness of complexity and evolution are taken into consideration, new discoveries may lie ahead. One, among many possible, may be that the Anasazi lived under a rather different risk concept, compared with our modern Western. This could perhaps explain abandonment better, and implement artificial Anasazi simulation.

III. Culture(s) and Modes of Thought as Complex Adaptive Systems (CAS)

In Part I., the CAS was defined.

In Part II., cultures (and modes of thought, shaping cultures) were described as complex.

Inspite of their complexity, cultures each represent a genus proximus of their themes, as their differentia specifica (II. 3., supra). Therefore, a culture may be regarded as a system.

The themes can be empirically observed. New themes may be discovered. This means that culture is an open system.
Thus, a culture is able to develop across time, it is adaptive. Hence, culture change and culture transfer are established subfields of anthropology.

Culture as such (in the "holistic" sense, see II. 1.b), supra) is an abstraction from cultures. The modes of thought are substantively qualifying factors of cultures. Hence, culture as such, as well as the modes of thought, share the quality of a culture of representing a genus proximus for cultural themes.

One can now draw the conclusion that the several cultures, present and past, and culture as such (in the "holistic" sense), fit the concepts of system, complexity, and adaptiveness. Cultures and culture are open systems across time). The same holds true for the concept of the mode of thought, as a culture-embracing and culture-backing concept.

This is a matter of mere syllogisms. Hence, cultures as well as culture, and the modes of thought behind the cultures, are CAS.
IV. Selected Implications

If cultural complexity is subjected to the theory of complex adaptive systems, important consequences may be drawn, and several possible advantages may be identified. For example (1.), a new view may be gained on the ontology-metaphor problem in computational theory and beyond; and (2.) a new theoretical field of anthropology may be indentified: anthropological systems theory. (3.) Moreover, a broader approach may be opened to simulate cultures and societies ("artificial culture(s)"), for the patterning, among others, of multicultural societies; and (4.) the legitimation of independent cultures may be facilitated; for there is the "political" advantage of granting cultures a right to exist, because adaptiveness implies evolution, and evolution involves a "yes" to existence.

For reasons of space and time, I confine myself to the discussion of these four possible advantages. Of course, there are further advantages, such as (5.) a better understanding of the various concepts of time and history, and (6.) a more accentuated survey on the many cultures of this world. This survey should be perceived as a plea for cultural multiplicity,
and against the proverbial melting pot.\textsuperscript{21} However, these and other implications of the treatment of culture and cultures as complex adaptive systems cannot be discussed within the framework of the present paper.

1. The Ontology-Metaphor Problem

Since complex adaptive systems (CAS) offer scientific processing opportunities, the question arises as to the way in which cultures can be processed as CAS. The technicalities may not be simple. I am not equipped to speculate or comment in this regard. However, the processing element touches upon the representational side of the issues at stake, and representation, in this context, involves the confrontation, in computational theroy, of what there is "in reality", with means how to express it.

I will call this issue the ontology-metaphor problem.

a) In computer science, there is frequent talk of viruses, neurons, learning, hardwired, a forest, niches, noise, fitness, landscapes, nets and networks, basin, spin glass, etc. The

\textsuperscript{21} This amounts to a restatement of Gell-Mann's (1994, 294 ff) argument.
representational or ontology-metaphor issue includes the question of whether the results obtained from using these terms are true in the sense of formal logic; or just made plausible by (1) the induction-deduction inference called analogy; or by (2) the use of a model; or (3) simulation; or (4) metaphor; or (5) by the use of a comparison.

These are just some possibilities for giving an answer to the ontology-metaphor problem; there may be more. Cowan, Pines and Meltzer (1994) discuss a great number in this respect. If these possibilities are brought into an order, in the form of a series (not a system!), the result may look like this: formal logic; analogy; model; simulation; metaphor, and comparison. You will notice a decreasing scale of plausibility, from the strongly convincing force of formal logic belonging to the "ontology" of things, down to a "mere comparison"; and even to what David Sherrington called "caricatures of biology" in his lecture on Feb. 23, 1996, at SFI. Another warning comes from John Searle, who is quoted by Alice Boatwright as having said in an interview: "It`s very important to distinguish between simulated thinking and the real thing" (Boatwright 1997, p. 2).
Figure 8 shows a number of reasonings achieved by way of making use of biological or other natural-science inferences:

b) Let me draw your attention to the fact that so far the ontology-metaphor problem has mainly been discussed in relation to the borderline between physics and mathematics on the one side, and biology on the other. For example, ideas and methods from complex systems` research, including adaptive computation, are used to solve problems in immunology. Or – reversely – neurons of the brain are taken as models for "neurons" in the computer (Sante Fe Institute 1995, C-4 through C 7, offering numerous examples of conclusions drawn from complexity research).

However, if the borderline between physics, mathematics, and biology on the one side and cultures on the other comes into focus, the ontology-metaphor problem (for example when Anasazi pueblo abandonment is contemplated) poses no less, even additional (Gell-Mann (1994) 70: "potential") difficulties.
Figure 8: Ontological and metaphorical reasoning

A. Ontological conclusions

1.) Mathematical proof
2.) "Direct reasoning from structure" (Doran & Nigel, in Nigel and Doran, 5); also called the "analytical approach" (Doran & Nigel, in Nigel and Doran, 2, 4, 5)
3.) Conclusions by formal logic, "first-order logic" (Doran & Nigel, in Nigel and Doran, 10)

B. Metaphorical conclusions (target (or goal) metaphor behavior, Doran & Nigel, in Nigel and Doran, 12, 14); Cowan and Pines; untechnical language: "expressing", reproducing (Doran & Nigel, in Nigel and Doran, 12, 14)
4.) analogy, using an induction - deduction inference (M. Mitchell 1993)
5.) modeling (Mithen, in Nigel and Doran, 191; M. Mitchell (1996 b); Reynolds, in Nigel and Doran 243; Doran & Nigel, in Nigel and Doran, 9)
   a) fully numerical differential & recurrence equations, incl. non-linear models of chaos theory (Doran & Nigel, in Nigel and Doran, 9, also for the following:)
   b) stochastic and statistical models
   c) models of traditional operations research
   d) ai (artificial intelligence) models ("usually symbolic")
      aa) symbolic models
      bb) CAS, or "agent", models
6.) simulation (= "running a model", Doran & Nigel, in Nigel and Doran, 9; Reynolds, in Nigel and Doran 223 ff.; Mithen, in Nigel and Doran, 179)
7.) comparison (Cowan and Pines)
8.) approximation (Doran & Nigel, in Nigel and Doran, 14)
9.) biological metaphor (Haasdijk/Barrow/Gerrets; Helmreich 335)
10.) other metaphorical conclusions (e.g., a loose use of the term "metaphor", Holland 68)
11.) pejoratively: "caricatures from biology" (Sherrington, see supra, bevor Figure 8)
The solution of the ontology - metaphor problem depends on improved insights into the nature of mathematical and scientific cognition and conclusion. This by far surpasses the limits of my presentation. Here follow just some more or less general remarks:

First, a survey on the logically possible inferences should be obtained. This refers, in a very general sense, to the work of Frege (1879) and Boole (1847). Potentially admissible inferences include mathematical proof, logical formulization, symbolization, analogy (about which Melanie Mitchell (1996) has written a seminal book), and the metaphor.

Secondly, for a solution of the ontology-metaphor problem much depends on the philosophy chosen. Because the philosophical view determines what is meant by "ontology". Upon this - it is generally claimed - depends the determination of the epistemological approach to this ontology, including the definition of "metaphor".

2) This leads to the philosophical issues of how the "truth" can be defined, and how, by using human thinking capacities, the ways of "knowing the truth" can meaningfully be related to those definitions of
the truth. The first issue may be called the "ontological" one ("what is there"), the second the "epistemological" ("how do I know what is there?"); see the Introduction, supra, before I.

Of course, these basic questions of philosophy cannot be dealt with here at some length. Moreover, I am not a philosopher. In view of these limitations, I have to take refuge to a generally accepted students book that tries to identify the various ways of ontological and epistemological theorizing.

In his famous introduction to the kinds of philosophizing, Stephen C. Pepper (1942) distinguishes, four major ontologies in Western philosophy, and consequently four appertaining epistemologies as the pertinent kinds of knowing the truth. It is permissible to use Pepper's classifications for explaining the ontology-metaphor issue because they are both simple and circumspect:

One of these four ontologies/epistemologies is pragmatism in the form that was developed by Charles Peirce (1931 – 1958) and William James (1907), of which John Holland says that it is at the philosophical base of the genetic algorithm used by himself (communication). Pragmatism unites "is" and
"as if" to the extent they have the same practical outcome ("the same" being pragmatically interpreted as identity of event, Pepper 232). Hans Vaihinger calls pragmatism "the philosophy of the as-if" (1911). In Pepper's book pragmatism is called contextualism. Contextually, $2 \times 2$ is 4.

According to Pepper, for the "formist" view of Plato and Aristotle, ontologies in mathematics, biology, social sciences, etc. would be distinct from one another, with the consequence that only analogous conclusions are permitted. The root metaphor of formism is similarity, Pepper 151). Thus, $2 \times 2$ is not 4, but equals 4.

Pepper's third, so-called "mechanistic" ontology (of Isaac Newton, e.g.) looks for truth by symbols and inferences (Pepper 221). It may produce\textsuperscript{22} "hidden orders" (Holland), "inherent orders" (St. Kauffmann), and "original conditions" (M. Gell-Mann), and therefore the term "metaphor" is particularly appropriate for similarities produced by such concealed regularities. By inference, $2 \times 2$ corresponds to 4.

\textsuperscript{22}my examples, not Pepper's; also the $2 \times 2$ "mathematics" are mine, with a posthumous apology to Pepper.
In Pepper's system, the fourth Western ontology, "organicism", deduces from higher principles and would have to solve the ontology-metaphor problem by thinking in terms of emanations, unfoldings, or derivatives (Pepper's example: Hegel, at 293). From $2 \times 2$, 4 emanates as if from a higher principle.

In addition, and in passing, Pepper lists a few non-Western ways of philosophizing, such as animism. Pepper discards them for his purposes. I would like to include them and think it worthwhile to consider some more non-Western "modes of thought" except animism, such as East and South Asian detachment, Islam, and secular totalitarianism (for details, see Fikentscher 1995). It is evident that each philosophic way of reasoning (Pepper) or "mode of thought" (from an anthropological point of view) offers a different answer to the ontology-metaphor problem.

However, almost never, to my – rather limited – observation, is an inference used for tackling the ontology-metaphor issue which Horgan (1995) refers to in the center of his criticism, namely the syllogism. The syllogism is the inference which in logical science is technically called the Modus Barbara II. It is, e.g., the classical way of a conclusion in law. In Figure 8, the syllogism
belongs to the ontological conclusions by formal logic (A.3.).

Melanie Mitchell (1996 b) correctly rejects Horgan`s syllogistic requirement, and instead prefers the "modeling" metaphor:

"He (scil.: Horgan) points out that 'numerical models of natural systems' cannot be absolutely verified, that 'the only propositions that can be verified - that is, proved true - are those concerning `closed systems`, based on pure mathematics and logic.' Somehow, this non-controversial point is used to imply that 'the entire field of complexity' is based on a false 'syllogism'. However, Horgan neglects to point out that the same argument can be applied to all of natural science - no model of nature can ever be proven correct. Scientists are well aware of this, and, unlike mathematicians, they are not in the business of proving their theories correct, but rather in the business of coming up with and supporting - or falsifying - explanations of the mechanisms of nature. The criteria for the success of a theory or model are not absolute verification and proof - rather they are predictive power, new insight, contribution to new technologies, and so on."
d) Let me conclude this sketch of the ontology-metaphor problem and its elusive bunch of solutions by trying to demonstrate where and how the anthropologist is confronted with the ontology-metaphor issue. The classical subdivisions of anthropology are ordered as follows

(Figure 9: Classical Subdivisions of Anthropology)

However, it makes much more sense to relate physical (=biological) anthropology to all subfields of cultural anthropology (Figure 10):

Relating physical (=biological) anthropology to corresponding fields of cultural anthropology produces, in Figure 10, a vertical line in the center of the chart. It is apparent that the vertical middle line represents one of an anthropologist`s several possible views on the ontology-metaphor issue: e.g., the legal culture of contracting may be related to reciprocity as an ethological universal; or; "cognition" can be culture- or brain-related.
Of course, these anthropological statements concerning the relation of cultural and physical aspects of the *conditio humana* are of statements of truth. (Culture is not an analogy to nature, nor nature to culture.) But they are statements of similarity, of correspondence, and of mutual confirmation. Almost every anthropological statement can be made in terms of culture and in terms of behavior. Comparison as one form of metaphorical conclusion might be the fitting epistemological tool in this context.

2. **Anthropological Systems Theory**

The subjection of the study of cultural complexity to the theory of complex adaptive systems renders another considerable advantage. It is indirectly connected to the ontology-metaphor problem. The ontology-metaphor problem concerns the epistemological foundations of reasoning, in science, in the humanities, and also in the social sciences. If one looks at the substance matter of natural sciences, the humanities and the social sciences as contrasted to their epistemologies, a general theory of systems surfaces, that concerns the systematic arrangements of those sciences, humanities, and social sciences. There has long
since been talk of a general systems theory (e.g., Canaris – see footnote 3, supra; Kambartel 1969).

What will happen if this general systems theory is applied to a specific natural science, or "art" science, or social science, let us say to the social science of anthropology? Anthropology is the social science of culture comparison, of the comparison between exactly those cultures that furnished the complexity we are being called to study.

The result is a new field of anthropology that may be called "anthropological systems theory". Anthropological systems theory concerns the rules of systematic (and other ordering of) thinking, of complexities, and of adaption in anthropology. This appears to be a promising field of anthropological theory. The emic/etic issue\textsuperscript{23}, for example, seems to belong to this new field, as well as the study of concepts such as correct "reasoning", concept-forming, "concluding" between cultural and physical anthropology by going from one side to the other of the vertical line in Figure 10, and thus understanding and "interpreting" cultures and culture, as well as human behavior.

\textsuperscript{23} Meta-reasoning in culture comparison is one of several possible reductions of cultural complexity, Fikentscher 1995, 140; idem 1992a.
3. Artificial Culture(s)?

As has already been mentioned, another benefit of applying complexity research to the study of cultures and culture may consist in the improved possibility of drafting artificial culture(s).

a) In the book on the "Modes of Thought" (1995a) one of the main interests was to break down cultures to particles. I may again refer to Figure 5, supra. I assumed that then three operations would be possible:

- explaining extant or extinct cultures by referring to their components,

- asking for patterns behind the cultures in order to find the "missing links" (for example: projecting and predicting religious sects), similar to the use of the chemical table following Mendeleyev's discovery, and

- inventing cultures from the set of available components (Fikentscher 1995, 172 f.). It became possible to envisage artificial cultures. In writing
the "Modes of Thought", I was not aware how close I came to what in compu
ter science is called artificial life. Hence I called my artificial, constructable cultures "culture chemistry". I could have called them "artificial culture", or "simulated societies" as well (in 1995, 173, I called them "artificial" modes of thought). Thus, there is a close relationship between modes of thought research and the study of artificial societies.

b) However, it may not always be necessary to expand the scope of analogous, modelled, simulated, metaphoric, or compared culture so broadly. Rather than addressing cultures, or culture as such, it might often be more appropriate to begin with smaller objects of study, for instance with certain, representative cultural traits.

For example, as a cultural trait fit for being subjected to a test in "culture chemistry", or artificial culture, or artificial mode of thought, a certain kind of behavior may be selected (e.g. aggression against foreigners). Behavior often is culture-specific, and it may reach both into physical=biological, and cultural, anthropology.
Hence, according to the results reached above, culture-analogous, model-induced, computationally-simulated, metaphoric, or culturally-compared behaviors become conceivable. Whether they may be called "simulated behavior", "ethological simulation", "computational ethology", or "artificial behavior" is inconsequential (Nigel and Doran). Nigel and Doran have collected a series of essays on the simulation of societal and cultural phenomena (by Doran, Nigel, Séror, Nowak, Latané, Drogoul, Ferber, Mithen, Palmer, Mellars, R.G. Reynolds and others). W. Brian Arthur (1993, 1994, 1996) employs similar simulations in economics. George Gumerman's and others' work in simulating past culture have already been mentioned (II.6.).

Society, economy, and objects of archeology are themes of cultural anthropology, at least in part. Therefore, what remains to be claimed is a general access of artificial life to culture.

To make such a cultural study operational, it often will be advisable to concentrate on specific kinds of human cultural behavior. Two promising candidates among others seem to be risk-related behavior (risk transfer, etc.) and the subject-object relation and its behavioral-cultural expressions. Because, how a subject faces an object within a given culture, is
indicative of a lot of other cultural traits. Thus, both risk- and subject-object-related behavior are interesting objects for cross-cultural investigation in simulated, that is, artificial cultures.

4. Recognition of Cultures

For lack of space and time, only brief mention can be made of the "natural law issue" as to whether existing cultures should enjoy a right to exist and to be protected (for a more detailed discussion, see Fikentscher 1992a).

It is generally accepted that drawing a conclusion from what is to what should be amounts to a naturalistic fallacy. Repetition of facts does not justify an ought (David Hume, 1740 and 1777). Immanuel Kant (1785) tried to help out with the categorical imperative, in order to render the ought reasonable.

It touches upon these fundamental issues of Western philosophy to discuss the question whether one may possibly draw the conclusion that, due to the obviously and empirically observable evolution of nature and cultures, nature and cultures deserve recognition and protection.
Still, it seems plausible that an ought is contained in evolution. Here is not the place to decide this issue of natural law. Suffice to say that anthropological systems theory, i.e., the application of the theory of complex adaptive systems (and less-than-systems) to the several cultures, raises the is-and-ought issue anew, and from a hitherto less conspicuous angle. A modification of the doctrine of naturalistic fallacy may be one of the most far-reaching consequences of regarding cultures as complex adaptive systems.

V. Summary

Cultural complexity fits the concept and the processing-possibilities of complex adaptive systems, shares the ontology-methaphor problem, and is therefore open to artificiality.

The following 12 theses serve as my conclusion.

VI. 12 Theses

1) A system is only one of a number of possibilities to order non-complex (=simple) or complex things.
Other possibilities are topical, serial, cyclical, and compilatory orderings (may be that edge-of-chaos ordering may also fit here).

2) A system is defined by at least one upper proposition, the genus proximus, and (usually) more subordinate propositions, the differentia specifica. A system can be closed or open.

3) Complexity is the material, the substance, being ordered, whether by self-organization, or by some outside effort. Complexity is therefore nothing more and nothing less than the acknowledgment that something can be ordered.

4) Thus, complexity invites a comparison of the ways and means in which the multitude of perceivable things can be ordered in a systematic, topical, serial, cyclical, compilatory order or otherwise. There may be talk of a study of "comparative orderings". It could also be called the study of possible orders.

5) In essence, this study of possible orders is the study of complexity. One example is the development of computer immune systems from biological immune systems; another insight gained from such
6) Orderings, including systems, are open to adaptation. Examples are open systems, series which get longer, and compilations that grow bigger or begin structuring themselves. Any adaptation introduces the concept of time. To speak of an complex adaptive system is but another way of saying that there is a structure in evolution, a structure that permits generalizations and particularizations (because this dichotomy is the essence of a system).

7) Human evolution includes physical and biological complexities, forming the field of physical or biological anthropology. It also includes a point from which the human mind reflects on these physical and biological complexities. This reflection is the source of ought-behavior ("the point of the ought"). From then on human complexities greatly expand (Gell-Mann: potential complexity). This kind of expansion is called culture.

8) Hence, culture is susceptible to order, including systematic order. This is the field of culture comparison which studies cultural complexity in a comparative way.
9) Cultural complexity has substantive and methodological aspects.

a) In substantive regards, culture comparison views the complexities of

- conceptional subdivisions of culture such as overt or covert traits; or the emic/etic distinction;
- the various cultures whereby early (esp. animist) cultures are often more complex than cultures of longer development;
- the modes of thought lying at the foundation of the various cultures; and
- culture as an abstract from the various cultures (as opposed to civilization, society, etc.)

b) In methodological regards, and using a meta-language, culture comparison studies the complexities of

- the cultures as complex adaptive systems
- culture itself as a complex adaptive system
- the "modes of thought", and
- artificial cultures (in order to trace, to quote just one example, the reasons for the abandonment of Anasazi pueblo before the entrada).
c) Note that 9a) represents (complexity-centered) cultural anthropology, and 9b) what within the present context has been called "anthropological systems theory" as a new field of anthropological research.

10) There is evidence to assume that the studies of physical and biological complexity, or cultural complexity, can learn from one another, and even use common tools and methods such as simulations, or the emic/etic dichotomy (the "vertical line" in Figure 10).

11) However, in experimenting with such comparisons, common concepts and methods, consideration must be given to

a) the expanding nature of the potential complexity once "the point of the ought" has been passed,

b) the ontology-metaphor problem, and

c) the possibilities of artificial cultures and culture-traits.

d) the political question whether cultures should be protected because they exist (to a certain extent,
evolution may be able to bridge the is-and-ought dichotomy), thus correcting to some extent the naturalistic fallacy.

12) Contrary to other opinions, the ontology-metaphor issue cannot be answered in a simple yes-or-no manner. There is a descending scale from ontological, non-metaphorical use of biological discoveries for explanations in the cultural field and vice-versa, to an increasingly metaphorical or simply comparative use. This scale of imperceptible degrees is more than a linguistic trick. It might lead to hidden orders, hidden behind the metaphors, and thus to a new concept of a "scientific law", which most probably will be no "syllogism". Moreover, the answer depends on the kind of the ontology/epistemology chosen.

In sum, one should not hesitate to embark on the study of cultural complexity. In archeology, sociology, and economics, research in cultural complexity has already commenced. We may continue to explore these fields and others under the wider concept of cultural complexity.
Sources for the Figures to "Cultural Complexity"

**Figure 1**: Fikentscher, Wolfgang, Die umweltsoziale Marktwirtschaft – als Rechtsproblem –, Juristische Studiengesellschaft Karlsruhe No. 197, Heidelberg: C.F. Mueller, 1991. p.7.


**Figure 2 a,b,c**: Fikentscher, Wolfgang, Methoden des Rechts, vol. 4: Dogmatischer Teil, Tuebingen: Mohr, 1977, chapter 32.

**Figure 3**: new for this Working Paper

**Figure 4**: Fikentscher, Wolfgang, Modes of Thought: A Study in the Anthropology of Law and Religion, Tuebingen: Mohr, 1995, p. 182.

**Figure 5**: same as Figure 4, p. 24.

**Figure 6**: same as Figure 4, p. 160.

**Figure 7**: SFI lecture of Jan. 17, 1992, unpublished

**Figure 8**: new for this Working Paper

**Figure 9**: same as Figure 4, p. 92

**Figure 10**: same as Figure 4, p. 96.
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