

## **Epistemological aspects of indeterminacy in postmodernist science**

Gerhard Budin  
University of Vienna, Austria  
gerhard.budin@univie.ac.at

### **Abstract**

This paper critically discusses the concept of ‘indeterminacy’ as it has developed over time in some scientific disciplines, in particular in their post-modernist communities. Against this background, some epistemological implications of the concept of ‘indeterminacy’ for terminology studies are suggested.

Key words: modernism, postmodernism, science, terminology

### **1. Introduction: purpose and orientation**

The orientation of the paper, i.e. the epistemic interest of its author, is to contrast two positions – modernism and post-modernism – by summarizing their major tenets and to reflect on the intensive debates about post-modernism between defenders and those who oppose it. I try to show that the concept of ‘indeterminacy’ is not limited to post-modern positions, although post-modernism has clearly been most interested in using and further developing this concept. Finally it is my goal to position ‘indeterminacy’ in an appropriate way in the context of terminology studies by relating it to other concepts that are particularly relevant. We can only hope that this discussion contributes to further developing terminology theory.

### **2. Modernism vs. Post-modernism in science**

The debate on post-modernism has been going on for about 40 years. Unavoidably, people keep asking themselves – what *is* post-modernism? This is where the debate starts: while non-post-modernists try to pin down the meaning of the term by formulating a condensed definition, post-modernists flatly reject this attempt. The epistemology of post-modernist thought maintains that language does not represent reality at all. Language is a social construct that pretends to represent reality, that is, in society people use language as an instrument to construct social reality. Linguistic signs do not refer to objects; the signifier does not represent the signified. This also means that linguistic truth assertions are invalid. There is no uniform meaning in a text that we just need to discover or make explicit. Instead, Derrida (1976) prefers to let each reader interpret discourse in its socio-historical context for him/herself. Interpretation becomes an indefinite process; the same person will interpret the same text in different ways in different situations and contexts. The preferred discourse method is the language game (Lyotard 1979).

We have to differentiate very clearly between (1) post-modernism as a life-style, a fad or fashion, a mood, a philosophy (and other characterizations that authors have come up with to describe or to criticize this socio-cultural phenomenon) and (2) the term 'post-modern' as it was originally used in the 1960s and early 1970s in order to describe a society living in a post-industrial age. As has been confirmed by two analyses of the history of the concept of 'post-modernism' (Köhler 1977 and Bertens 1987), one of the first to use the term 'post-modern' was Ihab Hassan (1971) to describe contemporary literature. Although the term 'post-modern' had been used since the 1940s in US American literature essays, Hassan was indeed the first to found a new 'episteme', i.e. a new epistemological orientation, well before the Francophone intellectuals who made post-modernism a fashion (albeit against their intention and much to their surprise!).

The post-industrial age has often been described as the information age. Lyotard's report to the Science Council in Quebec on the situation of knowledge in post-industrial societies was published in 1979 under the title *La condition postmoderne*. He takes over the well-established term 'post-modern' as it had been used in North American sociology for several years before. Lyotard promotes scepticism against the so-called grand meta-narratives, i.e. the pre-dominant political ideologies of capitalism as well as of Marxism. In the post-industrial age, the production of knowledge has been separated from the ideal of education and from the *condition humaine*. Knowledge has become a commodity that is traded, knowledge now has 'added value', and knowledge has become the crucial productive force in capitalism. This commercialization of knowledge needs a societal legitimization that Lyotard criticizes. Post-modern science must reveal these capitalist mechanisms, its discourse (language game) that is used to legitimize the commercialization of knowledge.

In a more recent article Hassan (2005), reflects on the history of the term 'post-modernism' in a somewhat ironic but pertinent way:

What was postmodernism, and what is it still? I believe it is a revenant, the return of the irrepressible; every time we are rid of it, its ghost rises back. And like a ghost, it eludes definition. Certainly, I know less about postmodernism today than I did thirty years ago, when I began to write about it. This may be because postmodernism has changed, I have changed, the world has changed.

But this is only to confirm Nietzsche's insight, that if an idea has a history, it is already an interpretation, subject to future revision. What escapes interpretation and reinterpretation is a Platonic Idea or an abstract analytical concept, like a circle or a triangle. Romanticism, modernism, postmodernism, however, like humanism or realism, will shift and slide continually with time, particularly in an age of ideological conflict and media hype.

All this has not prevented postmodernism from haunting the discourse of architecture, the arts, the humanities, the social and sometimes even the physical sciences; haunting not only academic but also public speech in business, politics, the media, and entertainment industries; haunting the language of private life styles like post-modern cuisine--just add a dash of raspberry vinegar. Yet no consensus obtains on what postmodernism really means (Hassan 2005).

These paragraphs show very clearly the complexity of the issue. Post-modernism has influenced and changed not only the sciences but also public and private life, the media, architecture, and other spheres of society. Architecture was in fact an area where the adjective 'post-modern' became a familiar concept in general society, obviously in a rather blurred manner: many people think they know how 'post-modern architecture' looks like. In the sciences, the highly emotional debate or fight between the two 'camps' (let us simplify the complex issue a bit) has had its climax in the so-called 'Sokal affair'. With his 'hoax', i.e. a text that perfectly looked like a typical 'post-modernist' text but that did not make any sense, and that was accepted after peer-review by a French journal considered the premier publishing organ of post-modernist thought, Alan Sokal succeeded in provoking the post-modernist camp by revealing that for them form (i.e. the proper language game) is everything, while content is nothing (i.e. arbitrary and secondary in importance). Sokal criticized the inappropriate use of terms from physics in social science discourse.

Hassan also points out the difference between post-modernism and post-modernity:

For the moment, let me simply say that I mean postmodernism to refer to the cultural sphere, especially literature, philosophy, and the various arts, including architecture, while post-modernity refers to the geopolitical scheme, less order than disorder, which has emerged in the last decades. The latter, sometimes called post-colonialism, features globalization *and* localization, conjoined in erratic, often lethal, ways.

This distinction is not the defunct Marxist difference between superstructure and base, since the new economic, political, religious, and technological forces of the world hardly conform to Marxist "laws." Nor does post-modernity equal post-colonialism, though the latter, with its concern for colonial legacies, may be part of the former.

Think of post-modernity as a world process, by no means identical everywhere yet global nonetheless. Or think of it as a vast umbrella under which stand various phenomena: postmodernism in the arts, post-structuralism in philosophy, feminism in social discourse, postcolonial and cultural studies in academe, but also multi-national capitalism, cyber technologies, international terrorism, assorted separatist, ethnic, nationalist, and religious movements--all standing under, but not causally subsumed by, post-modernity.

From what I have said, we can infer two points: first, that post-modernism (the cultural phenomenon) applies to affluent, high-tech, consumer, media-driven societies; and second, that post-modernity (the inclusive geopolitical process) refers to an interactive, planetary phenomenon wherein tribalism and imperialism, myth and technology, margins and centres--these terms are not parallel--play out their conflict energies, often on the Internet (Hassan *ibidem*).

In these paragraphs Hassan refers to conceptual differences between post-modernity as a global phenomenon and post-colonialism as a much more restricted topic such as the others that he lists.

In a critical analysis of post-modernism, Mocek asks whether it is only an intellectual fashion or rather a cultural sign of the times (1995). He first describes post-modernism as a Western movement to criticize capitalism that was either ignored or hardly taken into account by Marxism in their similar goal to criticize (Western) capitalism. In order to describe post-modernism, Mocek uses the rhetorical means of conceptual opposition in categories such as sensibility vs. rationality, unity vs. diversity, dialogue vs. language game, etc. In the following I use these oppositions to continue the description of post-modernism.

- **Sensibility vs. rationality:** post-modernism has fundamentally criticized modernity that is usually equalled to the Enlightenment with its total preference for rationality. Rationalism has been the only accepted mind set in the sciences, in particular the natural and technological sciences. Descartes and his 'Cartesian' system have been accepted in modern science as the only legitimate form of reasoning and doing science in general. In its extreme form, rationalism became a rigorous scientism that even excluded the 'humanities' (it is no coincidence that these disciplines did not deserve the term 'science' in some languages such as English) from the science system. In an emancipatory development within the modernist movement, these disciplines defended their methods as 'scientific' in a broader sense; hermeneutics was legitimated as a scientific method for the humanities. But post-modernists did not accept rationalism as such and have questioned its dominance in science. They advocate the use of hitherto 'un-scientific' methods that enable us to look behind the curtain of mass media and to reveal underlying problems and processes that would evade rationalist methods.
- **Diversity vs. unity:** Enlightenment and its Cartesian science have been fascinated by harmony in the universe and by building theories that would describe this *harmonia mundi* and unity in the world. In modern physics the quest for the 'grand theory' that would explain the whole universe is still the primary goal. Post-modern scientists, on the other hand, focus on diversity, *discontinuities*, and *disharmony*: they are fascinated by the contradictions between socio-cultural phenomena and the attempts of their explanation. In cultural studies and sociology universalistic approaches and theories have become suspicious and unpopular, while relativistic explanations are fashionable. This leads to a pluralism of explanations and descriptions. It is interesting to note that post-modernist approaches refuse to explain diversity on the object level (on the level of the objects of investigation) by trying to establish universal laws on the meta-level. They are rather interested in individual theories describing individual phenomena. This approach is directly linked to the following opposition pair:
- **Contingency vs. scientific law:** Enlightenment and modernist science are oriented towards discovering and identifying universal scientific laws. Scientism values and ranks scientific disciplines according to their achievement in 'proving' such universal scientific laws. Contingency is viewed as a flaw in the theory or as an

expression of the fact that researchers were not yet able to discover regularities or a scientific law. This is also true for social science and humanities theories. In the 1960s, Chomsky's universalistic, rule-based language theory was appreciated in this modernist sense. Today, the same Chomsky is one of the most ardent post-modernist political observers and writers.

- **Language game vs. dialogue:** Modernist science is founded on scientific communication and the effort of all scientists to write articles and books in such a way that their colleagues will be able to understand them. Transparency and precision in expression as well as terminological consistency are ideals that every scientist is expected to follow both in written and oral communication. Scientists can claim intellectual property on their findings only if they are published by publishing houses. Modern science and the publishing industry are closely interconnected. The communication model of Modern science assumes that scientific dialogue is not only possible but it is also capable of solving problems in the real world. Modernist science communication is clearly visible in adhering to its linguistic rules and terminological principles.

Modernist and universalistic philosophy and theory of language also generated a translation theory that consequently assumes that it is possible to translate every text from one language to the other. All languages are able to express any thought that has been expressed in one language. This assumption and underlying mindset was also the legitimization of machine translation projects in the 1950s and 1960s. Due to the colossal failure of such projects, more modest and more relativistic language theories gained more attention. The other extreme assumption on the translatability of text from one language to another is that translation is essentially impossible due to insurmountable cultural differences between different life-worlds. It is not surprising that in post-modernist communities in cultural studies the famous Sapir-Whorf hypothesis from US American anthropology had a renaissance.

Post-modern language theory (essentially shaped in the 1970s by Derrida and Lyotard) rejects the communication principles of modernist science. Concept systems, precise terminology and exact expressions are rejected as inappropriate and deceiving principles. The concept of 'language game' of the late Wittgenstein is used as the main concept in their approach. People use their language games that are basically incommensurable and incompatible. Derrida points out that modernist science discourse is centrist in nature, striving for universal truth and a uniform discourse. But post-modern discourse theory is fundamentally non-centrist and non-normative. The latter property led to an intensive debate between Jürgen Habermas (1985) who had been promoting a normative, universalistic, and ethical discourse theory, and Lyotard and Derrida on the other hand who criticized the normative assumptions of Habermas.

Post-modernism must not be confused with methodological liberalism that Feyerabend propagated. The slogan 'Anything goes', attributed to Feyerabend (1976) was actually meant to encourage researchers to feel free to choose a scientific method in their empirical research. It was never meant by Feyerabend to get rid of any well-grounded and specified method in science (although some of his formulations were quite

provocative). Any claims by post-modernists that Feyerabend would support their position are at least problematic.

It is also interesting to note that some post-modernists claim Karl Popper as a supporter of their position. This is also illegitimate, since Popper did point out that all scientific knowledge is hypothetical in nature and that there is no final, eternal truth in science, but this does not support the post-modern model of science.

Some critics of post-modernism also claimed that the modernist project has in fact not finished yet and thus it is inappropriate to talk about a period after modernism (Habermas 1985). Other critics observe that the relation between post-modernism and modernism is of an oedipal nature: Post-modernism defines itself through the opposition to modernism.

Post-modernism has been welcome by, and integrated into, the arts much earlier and probably more openly than by the sciences. Surrealism was an early and prototypical form of post-modernism. From the late 1920s onwards, René Magritte, for instance, worked together with surrealist writers and discussed questions of the relationship among language, image and reality with philosophers. With his magical paintings (such as *La condition humaine*, *Les mots et les images*), Magritte reminds us very forcefully of the fact that what we believe to see often differs from what we expect it to be from a rational perspective. Purposeful contradictions leave us with the impossibility of a precise and clear interpretation of the painting, sometimes combined with a contradictory text. The 'surreality of reality' is demonstrated by a special method: seemingly realistic representations of objects suddenly become surreal projections of ourselves, the observers (Magritte 1940, according to Müller 1989). In 1966 he corresponded with Michel Foucault, who analyzed Magritte's famous painting 'Ceci n'est pas une pipe' and who published a book under the name of this painting with illustrations by René Magritte.

### **3 Indeterminacy in (post-)modern science**

The concept of 'indeterminacy' has become popular as a basic principle in the post-modern conception, in post-modernist communities in general and in post-modern science in particular. In 1977, Hassan coined the term 'indertermanence' as a combination of cultural 'indeterminacy' and technological 'immanence', in order to express the convergence of two tendencies within post-modernism. The term 'indertermanence' has not been used much since then, but it still characterizes very succinctly the interaction between two major post-modernist aspects. Indeterminacy is in fact a complex concept that includes as well as implies closely related phenomena such as uncertainty, openness, ambiguity, vagueness, under-determination, pluralism, as well as deconstruction, yet another foundational concept of post-modernism that also implies a whole range of subsequent processes of how deconstruction is carried out.

Hassan points out that in contemporary society, due to the omnipresence of technologies, in particular information technologies and mass media, that have been fundamentally changing and shaping society, indeterminacy manifests itself daily in

somewhat 'immanent' ways, i.e. imbued in everyday life. Related metaphors have been used or even created in post-modernism: labyrinths, networks, and the famous 'rhizomes' (by Deleuze/Guattari 1976).

It is not surprising that post-modern science has frequently been using the concept of 'indeterminacy' as it represents one of the most typical traits of the world as seen through a post-modern lens. The term is obviously derived as an antonym from 'determinism', one of the most important accusations and criticisms against the Modernist project of Enlightenment that very much focused on a deterministic model of the universe. This model is inseparably linked to another property discussed above, i.e. that of universality or uniformity. Consequently, post-modernism rejects this deterministic world view and maintains that the world in general is indeterministic. In post-modernism, the concept of indeterminacy is somehow presented as normality, as the default for both, everyday life and scientific research. Scientists should actually focus in investigating ambiguity, vagueness etc. and accept it as something normal, in contrast to modernist scientists, for whom ambiguity and vagueness are problems that need be removed or otherwise treated and managed in such a way that there are no negative consequences. For modernist science, indeterminacy has a bad connotation, while it has a positive connotation for post-modernist science.

It should be pointed out that this opposition between modernism and post-modernism in terms of determinism vs. indeterminism is a gross simplification of the problem. Many research teams in different disciplines focus on studying phenomena that are essentially and inherently vague (such as semanticists study meaning in discourse), while they would never want to be classified as 'post-modernists'.

In the first half of the 20<sup>th</sup> century, quantum physics fundamentally changed modern science. Many paradoxes, contradictions, inexplicable phenomena, and enigmas were discussed, many new hypotheses were formulated in order to explain them, new theories emerged. Linear thinking was replaced by nonlinear thinking; complexity became a crucial category in scientific research. These developments have led to a 'theory of nonlinear complex systems' (Mainzer 1996) that includes an interdisciplinary non-reductionist methodology of mathematical modelling of complex phenomena that range from the physical world, biological processes, cognitive systems and neural networks, to societal systems such as economics and the market equilibrium, cultural systems and digital communication networks. Nonlinear thinking implies multi-causal explanations, the modelling of irregular and chaotic processes, bifurcations, dissipative self-organization, and the sudden emergence of order in dynamic systems. Evolutionary processes can be described at all levels. Synergetic models are included in this powerful theory and its method. Heisenberg's uncertainty principle is of course included in the model. Nothing comes as a surprise; everything can be modelled as soon as data representing such processes are available. What is interesting and important in this theory is that it summarizes and integrates a broad range of well tested theories from physics, mathematics, biology, economics, neurology, biomedicine, etc. But even more importantly, Mainzer includes solid philosophical and even ethical reflections of this theory. This takes place 100% within the rationalist paradigm, buzz words such as 'post-modernism' or 'indeterminacy' are not even mentioned once. We can refer to the theory of nonlinear complex systems as an example for a powerful modernist approach

that does address the same issues as post-modernist science but in a completely different way.

At the same time, however, we must not ignore innovative approaches and insights in cognitive science, artificial intelligence research, and related disciplines that investigate “the way we think” (John Dewey). Douglas Hofstadter – after his seminal book *Gödel, Escher, Bach* – published another, equally important book in 1995: *Fluid Concepts and Creative Analogies. Computer Models of the Fundamental Mechanisms of Thought* (Hofstadter 1995). This book summarizes the results of Hofstadter’s research into the complexity, unpredictability, dynamics and creativity of human thought processes.

Modern communication and cognition in digital environments are characterized by additional properties: interactivity and collectivity: interactivity is defined as a social emergence (emergent property) of cyberspace and its complexity (Leggiewie & Bieber 2004). Collective intelligence is described as an anthropological feature of cyberspace (Lévy 1995).

#### **4 Conclusions: epistemological implications for terminology studies**

Beaugrande (1997) has presented an alternative approach to linguistics, in particular text linguistics. He has presented a multi-dimensional model where a number of factors are related to each other in a powerful way: For the opposite pairs of fluctuation vs. stability, novelty vs. familiarity, complexity vs. simplicity, and indeterminacy vs. determinacy, a positive side and a negative side are distinguished, resulting in 8 additional opposite pairs, e.g. flexibility (positive fluctuation) vs. fixity (negative stability), creativity (as positive novelty) vs. banality (negative familiarity), vagueness (negative indeterminacy) vs. perspicuity (positive determinacy), and openness (positive indeterminacy) vs. bias (negative determinacy) (Beaugrande 1997). It is evident that such properties are not inherent in any text, but are rather a function of the situation a text is embedded in and the intentions that communication partners have in mind. These properties emerge in complex and dynamic situations. This means that they are inherently ephemeral and dependent on countless situational aspects.

This model is definitely applicable to terminology. As a number of publications have shown (Beaugrande 1988, 1991a, 1991b, Budin 1990, Budin 1996, Toft 1990, Temmerman 2000, and many others), terms are not necessarily fixed in their meanings. Their conceptual content may also depend on situations in which they are used. Conceptual development in a domain is driven by the dynamics of knowledge, which in turn is driven by the constant interaction of people who follow common goals in organizations. Language change is a function of conceptual change and in turn inspires further conceptual change.

In summing up we can state that concepts and approaches of post-modern science have definitely contributed to a useful development of terminology studies.

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