

Complexity, Literature, Sciences: Initial Remarks on Discourse and Dialogue

Jola Škulj

ZRC SAZU, Institute of Slovenian Literature and Literary Studies, Ljubljana, Slovenia
jsk@zrc-sazu.si

Deep insights into the complex poetic system of modernism, a period founded during key historical shifts when views on language (as a system of signs) and its crucial role were newly valorised and the idea of point of view became thought-provoking for literature and arts as well as hard sciences (say, for Heisenberg), help shed new light on the role of humanities, later discussed in the rethinking of sciences by Nowotny et al. as one of five concrete contexts for the new production of knowledge in effective science policies. Literature exists as a vital segment of our living phenomenology, and the process of reading texts is a direct encounter with our human autopoietic adaptation and our own identity questioning. Two points are considered: autopoiesis and its sense in poiesis, and the potential of discourses in complex life dynamics.

Keywords: literature / humanities / science / language and consciousness / modernism / self-reference / self-reflexivity / dialogue / Maturana, Humberto R. / Heisenberg, Werner / Jakobson, Roman / Lotman, Yuri / Thibault, Paul J. / Nowotny, Helga

UDK 82.0:001.2

Language was a trap, but the whole experience was a wonderful school in which one could discover how mute, deaf and blind one was. It was easy to be caught in one's own ego, but if one succeeded in attaining at least some degree of freedom from *it*, one began to listen and one's language began to change; and then, but only then, new things could be said.

(Maturana on his experience of May 1968 when the University of Chile entered a state of revolution: Maturana and Varela xvi)

Technology is [...] a queer thing. It brings you gifts with one hand, and stabs you in the back with the other.

(C.P. Snow, *New York Times*, 15 March 1971)

Both sciences and arts are, in essence, *inventive* instances, authorising and generating the potentials of human mind through history, and giving

power to new meanings. *Transgressive thinking* and *transgressive competence*¹ are effectively implicated in both, just as they are involved in any process of writing and reading literature. The spheres of the arts and literature are as much a part of human capital as are the sciences. Any discourse – literary or scientific – involves us in *transgressive*² operations; in fact, it opens up the issues of *transgressive cognition* (Perkins). Mark Turner even insists that ‘the mind is essentially literary’ (5) and that ‘narrative imagining – story – is the fundamental instrument of thought’ (4).³ Such views bring to the fore not only a rethinking of the basic task the humanities can have in the coming knowledge society, but also to supply more detailed insights into (and newly elaborated concepts to grasp) the reality principles of the world and man. A range of epistemological ideas elaborated by Nowotny, and by Maturana and Varela, have both stimulated and supported my recent thoughts on complexity, literature, and sciences.

The latent dialogue between different methodological traditions – of the *two cultures*⁴ (to echo a well-known lecture by C. P. Snow in 1959) – and the potent interplay of science, literature and the humanities has found an echo in early modernist shifts in the arts, calling for more complex schemes and notions in apprehending facts about the world and human existence in their *transient* actuality, as well as grasping the very facets of *conflict* and *contradiction*. Modernist art in actual fact encapsulates this very latent dialogue. The brief remark that ‘interfaces often start to show because of controversies’ made by Nowotny when interviewed by Hans Ulrich Obrist (see Obrist) is worthy of note here as it points to a better understanding of what lies behind modernist changes. Modernist art actually promotes (and thematises through its procedures) truth as *becoming* (see also Skulj, ‘Landscape’). Behind the modernist matrix (indicating the character of *complexity*, chaos, modelling, ‘networking’, etc) can be identified the system of knowledge which manifests a certain tendency to overcome binarism (as a logic of exclusion⁵). Hence a growing interest in *tropological* accounts found in modernist new art schemes and in scientific shifts of that time: both can be identified as a creative response of the *thinking brain*⁶ in the early 20th century. These trends underlying 20th century art and sciences give an early indication that what is happening is a shift from the disciplinary mode of knowledge production to a more transdisciplinary one, employing *scopic vision* (Spivak) or a double-oriented view of representations, aware that the role of ‘the observer is part of the described phenomena’ (Maturana). This visibly results in a breakthrough of the *transgressive thinking* in current trends of science policies.⁷ In an interview with Hans Ulrich Obrist, Nowotny advocated the idea of ‘presenting things visually’ – since ‘*seeing*’ and the ‘*image*’ open up other creative spaces – and

thus grasping *dynamic* knowledge, the very issues in the process (Obrist).⁸ As a strong supporter of contextualised knowledge and a promoter of the idea of moving from *reliable* knowledge⁹ – which ceases to be defined in a universalistic sense and becomes tied to a particular context – to *socially robust knowledge*, she argues for transforming science deep in its epistemological core. Her concept of

social robustness is a relational, not a relativistic or (still less) absolute idea. [...] [S]ocial robustness, in an important sense, is *prospective*; it is capable of dealing with unknown and unforeseeable contexts. [...] and last, socially robust knowledge has a strongly empirical dimension; it is subject to frequent testing, feedback and improvement because it is *open-ended*. (Nowotny, Scott and Gibbons, *Re-Thinking Science* 167)

Her research credo is revealed in Robert Musil's thought, quoted in her interview: *it is a movement that is supported by the sense of the possible*. A modernist disposition is easily recognizable in the vocabulary. The modernist matrix,¹⁰ which was, as Husserl later commented in his Vienna lecture, a response to the crisis of consciousness, was definitely inspiring. Sensible of complexity and of 'the human factor', it triggers new insights into reality principles. It also generates a much more dialogic response of human self-understanding. At the peak of modernism, science as well became aware, as Heisenberg commented, of the seminal role of language. Post-saussurean impact was fairly obvious.

Communication across institutional boundaries can give a fresh impetus to valid and responsive research interests. Literary studies, due to its theoretical and methodological advances and its conceptual territory, can seriously contribute to the new production of knowledge in transdisciplinary approaches.

A model case of valuable dialogue between literary studies and 'hard' science can be given. Commenting on Humberto Maturana's earlier fundamental views on the *Biology of Cognition* (1970), his fellow researcher Francisco J. Varela who is co-author of the seminal book on *Autopoiesis and Cognition: Realization of the Living* (1972) observed: 'If indeed the circular organization is sufficient to characterize living systems as unities, then one should be able to put it in more formal terms.' (Maturana and Varela xvii) The idea of *autopoiesis*, which they introduced to refer to 'the dynamics of the autonomy proper to living systems' (ibid.), points to the circular organisation or self-referential system as a key concept to understanding the organisation of living systems. The notion has its prehistory in literary studies, although Maturana, who in his 'Introduction' to *Autopoiesis and Cognition* records how he came upon his conceptual initiative, was not

aware of the well-circulated structuralist idea of a *self-referential, self-focused message* or *recursive reference* and of a *corollary feature of poetry* as discussed in Jakobson (370–371), i.e. of basic organising principles of the *poetic function* well thought-out in semiotic studies of literature.¹¹ Maturana gives the following explanations about the power of the word ‘poiesis’ he came upon by chance in literary studies.

[W]e were unhappy with the expression ‘circular organization’, and we wanted a word that would by itself convey the central feature of the organization of the living, which is autonomy. It was in these circumstances that one day, while talking with a friend (José Bulnes) about an essay of his on *Don Quixote de la Mancha*, in which he analyzed Don Quixote’s dilemma of whether to follow the path of arms (*praxis*, action) or the path of letters (*poiesis*, creation, production), and his eventual choice of the path of *praxis* deferring any attempt at *poiesis*, I understood for the first time the power of the word ‘poiesis’ and invented the word that we needed: *autopoiesis*. This was a word without a history, a word that could directly mean what takes place in the dynamics of the autonomy proper to living systems. Curiously, but not surprisingly, the invention of this word proved of great value. It simplified enormously the task of talking about the organization of the living without falling into the always gaping trap of not saying anything new because the language does not permit it. We could not escape being immersed in a tradition, but with an adequate language we could orient ourselves differently and, perhaps, from the new perspective generate a new tradition. (Maturana and Varela xvii)

The quotation not only reminds us how science, literature and the humanities may perhaps interface, but above all how elegantly and simply the world and the living being in it can be grasped in an integrated view of knowledge. Maturana’s use of the term *autopoiesis* exemplifies how to share and reuse relevant knowledge. Could it be said that the semiotics of literature and phenomenology of living systems are, deep at the epistemological core, much more interrelated than is usually assumed? The affirmative answer, no doubt, hints at an indispensable involvement of our own historical existence.

Autopoiesis literally means ‘self-creation’ (from the Greek *αὐτό* [*auto*], ‘self’, and *ποίησις* [*poiesis*], ‘creation, production’) – and according to the *Babylon English-English Dictionary* – implies ‘a process by which an organism or organization produces itself by repeating the reproduction process and constantly recreating itself (such as cells or organisms)’. A corresponding view of the corollary or self-referred sign in the poetic message as an essential element of literary discourse has been circulating since the early debates among the Prague Linguistic Circle (Mukařovsky, Jakobson) in the mid-thirties. In elaborating the idea of the self-oriented or *reflexive* poetic message, Jakobson in his ‘Closing Statement’ at a symposium on linguistics and poetics in late fifties explicitly stated: ‘*poeticalness* is *not a supplementation*

of discourse with rhetorical adornment *but a total re-evaluation of the discourse and all its components whatsoever*' (377; italics mine). A semantic issue turns out to be a structural matter, denoting the essential characteristics or organising principle of literariness, the very *differentia specifica* of verbal art.

As repeatedly stated, modernist inventions in literature gave a significant boost to extensive theoretical studies on literary phenomena (OPOJAZ, i.e. Obščestvo izučeniya POëtičeskogo JAZyka, Bakhtin's circle, the Prague Linguistic Circle, Ingarden's phenomenology, new criticism, structuralism, etc.) and finally prompted the initial steps towards the semiotics of literature and arts. The groundbreaking linguistic views of Saussure had an impact on the thorough examination of the systemic parameters of literature and the textual, and the idea of literary science (German *Literaturwissenschaft*) began circulating: one can find the phrase also in Jakobson and later in Lotman. Manifested in the materiality of language, literature was recognised as a complex,¹² rather tricky research subject. But this very complexity triggered a persistent interest in comprehending basic questions such as what literature is, why literary phenomena exist, how to explain the *differentia specifica* of literature in relation to ordinary language and to other schemes of art, how to identify the core of its literariness (i.e. *poeticalness* in Jakobson's sense), how to clarify its mode of existence. A historical outline of the advance of literary theoretical thoughts in the past century offers a remarkable picture.

The modernist breakthrough came about as a result of several crises – of language, of culture (Beebe; Bradbury and McFarlane; Calinescu; Luft), and of the self or identity (Le Rider). In two earlier articles, I discussed the issue in the context of Husserl's comments on the *crisis of consciousness* (Škulj, 'Landscape' 63–82; Škulj, 'Modernizem' 45–74). Modernism was, no doubt, a manifest crisis in *representational* modes. Its complex poetical schemes and reinvented narrative form with the inclusion of the reader in its structuring make clear modernist awareness of the *role of constructive act* through the reading process. Semiosis is a microcosm of human agency and consciousness (Thibault). Modernist inventions of poetry or the novel touch upon the very terrains of reinterpreted identities.

At the same time, language also became a vital issue in the hard sciences and Heisenberg made the noteworthy observation that *the very words applied to the description of the atomic level turn out to be problematic*. Aware of the role of language, he wrote:

Quantum mechanics have placed even more serious demands on us. We have had altogether to renounce the objective description of nature – in the Newtonian sense, according to which definite meanings were ascribed to such basic features of system as place, velocity, energy; and in its stead we have had to put the description of observation points, and for them the only certainty are the probabilities of

some of the results. The very *words* applied to the description of the atomic level then turn out to be problematic. We may talk of waves and particles, while remembering that we are not dealing with a dualistic, but with a fully unified description of the phenomena. *The meaning of old words has lost precision.* (Heisenberg, *Schritte über Grenzen*, 1973; qtd. in Lotman 270)

In his semiotic theory of culture, Lotman (269) makes the insightful remark that ‘questions of language affect all the sciences’ and reminds us of changes in modern science. He argues that it

has moved away from the naive view according to which the normal methods of perceiving and generalizing data were held to be valid, and the problem of the position of the describer in relation to the world being described was barely accounted for; it has moved away from the view according to which the scientist looked at reality ‘from the position of truth’, into the world of relativity. (Lotman 270)

The myth of scientist as an external observer and of reliable ‘objective’ knowledge thus collapsed. Three points in Heisenberg’s quotation are essential for modern science. First, that science has had to incorporate ‘the description of observation points’; second, that ‘the only certainty are probabilities’; and third, ‘that we are not dealing with a dualistic, but with a fully *unified* description’. Yet the most important is that ‘modern science from nuclear physics to linguistics sees *the scientist as inside the world being described and as a part of that world*’ (Lotman 270; italics mine).

In Maturana one can find similar assertions. Pointing to the cognitive function of the observer, he emphasises his strong awareness of the role of language in science: ‘*Everything said is said by an observer.* In his discourse the observer speaks to another observer, who could be himself. [...] The observer is a human being, that is, a living system, and whatever applies to living systems applies also to him.’ (Maturana and Varela 8; italics mine) ‘*The observer is a living system and an understanding of cognition as a biological phenomenon must account for the observer and his role in it.*’ (9) Maturana’s thought on the role of the observer in scientific discourse as if he ‘speaks to another observer, who could be himself’, is in conformity with Lotman’s position that ‘the object and the observer are as a rule described in different languages, and consequently the *problem of translation*, is a universal scientific task’. He goes on to remind us of Plato, who ‘defined thought as the *dialogue* of the soul with itself, [while making] the assumption that the conversation would be carried on in one language’ (Lotman 270). Nowadays, semiotics is aware of the agency of the *self* and of its relation to consciousness.¹³ And because the self is regarded as possessing *narrative identity* (Ricoeur 1991), its fluid, ever-changing, *responsive* ingredient is continually inscribed in the language use and in any signification.

Maturana (9) asserts that ‘the observer beholds simultaneously the entity that he considers (an organism, in our case) and the universe in which it lies (the organism’s environment). This allows him to interact independently with both and to have interactions that are necessarily outside the domain of interactions of the observed entity’. In his introductory paragraph, Thibault (2–3) reminds us that alterity is the primitive intrinsic value that motivates self-other relations and meaning-making activity.

The dialogic process also clearly has effect in the representation of scientific knowledge. The explanatory statement about scientific facts is the observer’s *construct* as a complex formed from a number of researched aspects; it also involves observer’s code, his own complex and heterogeneous world picture. The account of scientific facts is a result of preparatory analysis. It is created by the observer/researcher in the research process and is never something absolute. A fact is relative (true to a certain degree) and its understanding is in Lotman’s sense a *translation*. Such an idea of understanding as *translation* recognises the researcher’s presence – the *interference of a thinking being*, the *interference of his creative consciousness* (Lotman 233) – and the awareness of ‘how this presence affects the description’ (271).

Considering Lotman’s comments on the role of translation in cognition, two passages can be quoted in conclusion to disclose Nowotny’s position on the new paradigm of knowledge production (‘Mode 2’), leaving behind ‘Mode 1’ – ‘characterised by the hegemony of theoretical or, at any rate, experimental science’ (Nowotny, Scott and Gibbons, “‘Mode 2’ Revisited’ 179). The first quote concerns *reflexivity* and the *dialogic process*, while the second points to *the role of the humanities* in the production of knowledge. Her arguments on one of the characteristics of new mode of sciences and on one of the concrete contexts of sciences offer strong support to our discussion.

The fourth characteristic of ‘Mode 2’ knowledge is that it is *highly reflexive*. The research process can no longer be characterised as an ‘objective’ investigation of the natural (or social) world, or as a cool and reductionist interrogation of arbitrarily defined ‘others’. Instead, it has become a *dialogic process*, an intense (and perhaps endless) ‘conversation’ between research actors and research subjects – to such an extent that the basic vocabulary of research (who, whom, what, how) is in danger of losing its significance. As a result, traditional notions of ‘accountability’ have had to be radically revised. The consequences (predictable and unintended) of new knowledge cannot be regarded as being ‘outside’ the research process because problem-solving environments influence topic-choice and research-design as well as end-uses (Nowotny, Scott and Gibbons, “‘Mode 2’ Revisited’ 187; italics mine).

Discussing the specific contexts of current sciences, the commercialisation of research, development of mass higher education, globalisation,

the potential of refiguration of institutions and the management of Mode 2 knowledge, the most important, from my point of view, is that she highlights the role of the humanities.

The third context was *the role of the humanities* in the production of knowledge. The conventional view is that the humanities are the most detached disciplines, furthest removed from the turmoil of application and contextualisation. Their 'uses' are almost entirely internalised. Our account in *The New Production of Knowledge* challenged that view. Instead we saw the humanities as *the most engaged* of all disciplines, not simply because they flow through into the culture industry (for example, through novels and popular history), but because they comfortably (and inevitably) embody notions of *reflexivity* which the natural, and even social, sciences distrust (Nowotny, Scott and Gibbons, "Mode 2" Revisited¹⁸⁸; italics mine).

Complexities inherent to literature and the fascinating qualities, interesting and attractive, that our thoughts tend to concentrate on it and that prompt literary studies to research, are through the above comments seen from a different angle. In line with the views of Nowotny and Maturana, literary studies are a valuable ingredient in the new production of knowledge. The dialogue and mutual understanding between the 'two cultures' – exploring potentialities embedded in shared paradigms of investigation, such as the ideas of complexity, creativity, 'networking', the human factor, as well as the system, autopoiesis, self-reference, self-reflexivity, narrativisation, focalisation, etc. – demonstrate the need for *integrated* knowledge; it validate as well that the ACUME 2 project on interfacing 'hard' sciences, literature, and the humanities was a valuable step towards the new production of knowledge because our sense of *being* and our human condition are, as a rule, always inscribed in any cognition.

NOTES

¹ The notions can be found in Helga Nowotny ('Transgressive'), who also discussed 'The Potential of Transdisciplinarity' as one of characteristics of so-called 'Mode 2' knowledge production and who co-authored two seminal books, *The New Production of Knowledge* and *Re-Thinking Science*.

² Boundary transgression refers to mental moves that cross the boundaries of past practice and convention, tying together academic disciplines in unexpected ways, redefining not only means but often the problem itself, and challenging entrenched beliefs about the limits of the possible. (*Invention* 9)

³ The literary mind, according to Turner (4–5), is not peripheral but basic to thought. He claims that *language itself is a child of literary mind*. 'Narrative imagining – story – is the fundamental instrument of thought. Rational capacities depend upon it. [...] It is literary capacity indispensable to human cognition generally. This is the first way in which the mind is essentially literary.'

⁴The *Two Cultures* (see Snow) is the title of an influential 1959 Rede Lecture at Cambridge University by British scientist and novelist C. P. Snow. He highlighted that the breakdown of communication between the ‘two cultures’ of modern society — the sciences and the humanities — was a major hindrance to solving the world’s problems. As a trained scientist who was also a successful novelist, Snow was well placed to pose the question. The term *two cultures* has entered the general lexicon as a shorthand for differences between two attitudes. These are (1) the increasingly constructivist world view suffusing the humanities, in which the scientific method is seen as embedded within language and culture; and (2) the scientific viewpoint, in which the observer can still objectively make unbiased and non-culturally embedded observations about nature. ‘The phrase has lived on as a vague popular shorthand for the rift—a matter of incomprehension tinged with hostility—that has grown up between scientists and literary intellectuals in the modern world.’ (See http://www.physicsdaily.com/physics/The_Two_Cultures)

⁵The very logic of exclusion, as Husserl commented it, is inherent to wrongly grasped rationality and reason.

⁶The phrase is borrowed from Goethe’s *Faust* (Goethe 101).

⁷See also Nowotny’s views, or the report of the Committee for study of invention, sponsored by the Lemelson-MIT program and the National Science Foundation (*Invention*).

⁸Modernist matrixes were capable of grasping contradictions of reality and truth. Spatial form (Frank) was able to represent the narrated reality from multiple perspectives.

⁹‘Reliable knowledge is knowledge that has a high probability of being true because its veracity has been justified by a reliable method. Reliable knowledge is sometimes called justified true belief, to distinguish reliable knowledge from belief that is false and unjustified or even true but unjustified.’ (Schafersman).

¹⁰Confronting the consciousness of never-ending contradictions of reality and truth about it, modernism with its Baudelairean sense of the *immediacy of life*, of the fleeting instant, of *the present in its presentness*, in its purely instantaneous quality, i.e. quality of contingency, demonstrates through the features of fortuitousness and fragmentariness in Imagist, Futurist, Expressionist, Constructivist, Dadaist or Surrealist schemes, its unique ability to grasp the openness and uncertainty in the process of *poiesis*. Cf. also the emerging new experience of humanistic informatics (Aarseth, ‘From Humanities Computing’) and the features of e-textuality; their *logic of transfinite* confirms its own roots in the modernist matrix as well (Aarseth, *Cybertext*; Skulj, ‘A Dynamic’).

¹¹In views of semiotics literature is an *emerging*, developing system.

¹²Literature clearly shows features of complex systems for which *the boundaries are difficult to determine* and the decision about it is ultimately made by the *observer*; literature exists as an *open* system; literature as a system has a *memory* and the history of literary system is important for it; it exists as a *dynamic system*; it exhibits behaviors that are *emergent*; its components may themselves be complex systems, etc. Literature exists as a complex mode of systemic interaction in a multidimensional systemic environment.

¹³Thibault explores the ways in which agency and consciousness are created through transactions between self and other (see Thibault).

WORKS CITED

- Aarseth, Espen. *Cybertext. Perspectives on Ergodic Literature*. Baltimore and London: Johns Hopkins University Press, 1997.
 ——. ‘From Humanities Computing to Humanistic Informatics’. *Human IT* 4 (1997): 7–13.
 Beebe, Maurice. ‘What Modernism Was’. *Journal of Modern Literature* 3.5 (1973): 1065–1080.

- Calinescu, Matei. *Faces of Modernity: Avant-garde, Decadence, Kitsch*. Bloomington: Indiana University Press, 1977.
- Frank, Joseph. 'Spatial Form in Modern Literature'. *Sewanee Review* 53 (1945): 221–240, 433–456, 643–653.
- Gibbons, Michael, et al. *The New Production of Knowledge. The Dynamics of Science and Research in Contemporary Societies*. London: Sage, 1994.
- Goethe, J. W. von. *Faust, Part Two*. Trans. Philip Wayne. Hamondsworth: Penguin Classics, 1987.
- Husserl, Edmund: 'Die Krisis des Europäischen Menschentums und die Philosophie'. *Husserliana. Band VI: Die Krisis der Europäischen Wissenschaften und die transzendente Phänomenologie*. Ed. Walter Biemel. The Hague: M. Nijhoff, 1962. 314–348.
- — —. 'Philosophy and the Crisis of European Man'. Husserl, *Phenomenology and the Crisis of Philosophy*. Trans. Quentin Lauer. New York: Harper Torchbooks, 1965. 149–192. Available at: http://www.users.cloud9.net/~bradmcc/husserl_philcris.html (24 July 2012).
- Invention. Enhancing Inventiveness for Quality of Life, Competitiveness, and Sustainability: Report of the Committee for Study of Invention, sponsored by the Lemelson-MIT Program and the National Science Foundation*. 2004. Available at: <http://mit.edu/invent/n-pressreleases/downloads/report.pdf> (24 July 2012).
- Jakobson, Roman. 'Closing Statement: Linguistics and Poetics'. *Style in Language*. Ed. Thomas A. Sebeok. Cambridge (MA): MIT Press, 1960. 350–377.
- Le Rider, Jacques. *Modernity and Crisis of Identity. Culture and Society in Fin-de-Siècle Vienna*. Trans. Rosemary Morris. Oxford: Blackwell, 1993.
- Livingston, Ira. *Between Science and Literature: An Introduction to Autopoetics*. Urbana and Chicago: University of Illinois Press, 2005.
- Lotman, Yuri M. *Universe of the Mind: A Semiotic Theory of a Culture*. London and New York: I.B. Tauris & Co Ltd Publishers, 1990.
- Luft, David S. *Robert Musil and the Crisis of European Culture, 1880-1942*. Berkeley: University of California Press, 1980.
- Maturana, Humberto R. and Francisco J. Varela. *Autopoiesis and Cognition. The Realization of the Living*. Dordrecht, Boston and London: D. Reidel Publishing Company, 1980.
- Nowotny, Helga. 'The Place of People in Our Knowledge'. *European Review* 7.2 (1999): 247–262.
- — —. 'Transgressive Competence. The Narrative of Expertise'. *European Journal of Social Theory* 3.1 (2000): 5–21.
- Nowotny, Helga, Peter Scott and Michael Gibbons. "'Mode 2" Revisited: The New Production of Knowledge'. *Minerva* 41.3 (2003): 179–194. Available at: <http://www.flacso.edu.mx/openseminar/downloads/gibbons.pdf> (24 July 2012).
- — —. *Re-Thinking Science. Knowledge and the Public in an Age of Uncertainty*. Cambridge and Malden (MA): Polity, 2006.
- Obrist, Hans Ulrich. 'Interview with Helga Nowotny'. *Tirana Biennale 1: Escape*. Milan: Giancarlo Politi Editore, 2001.
- Perkins, David. 'Mapping the Inventive Mind'. *Invention. Enhancing Inventiveness for Quality of Life, Competitiveness, and Sustainability: Report of the Committee for Study of Invention, sponsored by the Lemelson-MIT Program and the National Science Foundation*. 2004. 37–45. Available at: <http://mit.edu/invent/n-pressreleases/downloads/report.pdf> (24 July 2012).
- Ricœur, Paul. 'Narrative Identity'. *On Paul Ricœur. Narrative and Interpretation*. Ed. David Wood. London: Routledge, 1991. 188–199.
- Schafersman, Steven D. 'An Introduction to Science. Scientific Thinking and the Scientific Method'. Available at: <http://www.geo.sunysb.edu/esp/files/scientific-method.html> (24 July 2012).

- Schwanitz, Dietrich. 'Selbstreferentielle Systeme'. *Zeitschrift für Literaturwissenschaft und Linguistik* 77 (1990): 100–125.
- Škulj, Jola. 'A Dynamic Authenticity of Texts in E-archives: On Digitized Cultural Resources in Comparative Literary Studies'. *Literatures in the Digital Era: Theory and Praxis*. Ed. Amelia Sanz and Dolores Romero. Newcastle: Cambridge Scholars, 2007. 185–200.
- – –. 'Landscape and the Spatial in Modernist Representations'. *Das Paradigma der Landschaft in Moderne und Postmoderne*. Ed. Manfred Schmeling and Monika Schmitz-Emans. Würzburg: Königshausen & Neumann, 2007. 63–82.
- Snow, C. P. *The Two Cultures and the Scientific Revolution*. Cambridge: Cambridge University Press, 1959.
- Spivak, Gayatri Chakravorty. *Death of a Discipline*. New York: Columbia University Press, 2003.
- Škulj, Jola. 'Modernizem in njegove poteze v lirski, narativni in dramski formi'. *Primerjalna književnost* 21.2 (1998): 45–74.
- Thibault, Paul J. *Agency and Consciousness in Discourse: Self-Other Dynamics as a Complex System*. London and New York: Continuum, 2004.
- Turner, Mark. *The Literary Mind*. Oxford and New York: Oxford University Press, 1996.
- – –. 'The Future of the Humanities: Experimenting'. *Institution and Interpretation*. Ed. Samuel Weber. Stanford (CA): Stanford University Press, 2001. 236–252.