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The Networked Mind

The Brain as a Small-World Network

This paper will discuss the role of networks in cognition on two levels: on the level of the organization of ideas, and on the level of interpersonal communication. By way of introduction, however, let me refer to the level which is the most basic: that of neurophysiological organization. The adult brain has around 100 billion neurons, linked to each other by axons. Most axons connect nearby neurons within the same functional region, some axons link up with neurons in neighbouring brain regions, and a small number of axons link brain regions that are far apart. Neurophysiological processes make up an efficient and concerted whole due to the fact that the neurons of the brain constitute a "small-world" network in the sense of Milgram¹ and Watts–Strogatz,² with "weak ties" in the sense of Granovetter³ connecting clustered nodes.

In an experiment Harvard professor Milgram conducted in 1967, persons in the U.S Midwest were asked to attempt to reach a certain addressee in Boston by postcard. If the participants knew the addressee on a first-name basis – a very unlikely assumption – they were to send the postcard to him directly. Otherwise they were to send the postcard to someone they knew on a first-name basis who could be assumed to be more likely to know the addressee. Milgram wanted to find out in how many iterated steps the postcard would reach, if at all, the addressee. An average of 5.5 was the surprising result. Milgram's problem was soon taken up by Mark Granovetter, who in his classic paper pointed to the indispensable social role of personal relationships leading beyond one's intimate circle of friends and thereby connecting distant circles with each other. Granovetter's approach was then further developed and generalized by Duncan Watts and Steven Strogatz. Let us note that the famous formula "six degrees of separation" did not originate with Milgram. It was first introduced in John Guare's 1991 play of that title. As Guare put it: "Everybody on this planet is separated by only six other people."

Nodes and Hubs in the Network of Ideas

Discussing the issue of the association of memories, William James made a clear connection between links in the brain and links in the mind:

Let n be a past event; o its "setting" (concomitants, date, ...); and m some present thought or fact which may appropriately become the occasion of its recall. Let the nerve-centres, active in the thought of m , n , and o , be represented by M , N , and O , respectively... *the more other facts a fact is associated with in the mind, the better possession of it our memory retains.* ...

Together, they form a network of attachments... The "secret of a good memory" is thus the secret of forming diverse and multiple associations with every fact we care to retain.⁴

Implied by James' formulation is the insight that for the network of ideas to be well-ordered, it is necessary that at least some ideas in it should have a higher-than-average number of links to other ideas. Douwe Draaisma, referring to Ribot's *Les maladies de la mémoire* (1881), makes a related point. Ribot introduced the notion of "time markers", events whose place in time is well-entrenched in our memory. Time markers serve "as milestones or signposts along our path, all starting from the same point but spreading out in different directions".⁵ Typical time markers are "my first meeting with...", "the first time I...". As Draaisma puts it, time markers order "networks of associations".⁶ A similar role is played by "stronger associative links between older memories that are often repeated and hence more closely linked with other memories".⁷

The network of ideas is not a random one. In a random network most nodes would have roughly the same number of links, and no node would have a very large number of them, so that the distribution of links would follow a bell curve. By contrast, networks of ideas typically consist of a great number of nodes with just a few links, and a small number of hubs with very many links; that is, they are, to employ Albert-László Barabási's term, "scale-free".⁸ Many fundamental networks in nature and society are scale-free (but it is not yet clear if the neurons of the human brain form such a network). What Barabási has shown in particular is that the *internet* is a scale-free network, following a so-called a power-law distribution, with most nodes having only a few links, and over-all connectedness being ensured by a few hubs having very many links. A random network is similar, say, to the U.S. national highway system. A scale-free network, by contrast, resembles the flow of air-traffic, where a large number of small airports are connected to each other via a few major hubs. Real-world social networks tend to have much the same pattern; this is, precisely, the explanation for the baffling phenomenon discovered by Milgram. Incidentally, the earliest suggestion of the six degrees phenomenon, as Barabási observes, occurs in the short story "Chains", written in 1929 by the Hungarian author Frigyes Karinthy.

The Mediated Mind: From Austria and Hungary to the Toronto Circle

It is not known if Milgram, the son of a Romanian mother and a Hungarian father, was familiar with Karinthy's piece; but certainly Hungarians had an influence on the philosophy of communication as developed at another North-American centre, viz. Marshall McLuhan's Toronto Circle. In fact, it was this circle in which some Hungarian and *Austrian* ideas on mediated collective thinking first came together – a telling testimony to the conditions of disturbed communication and idiosyncratic networking typical of East-Central Europe, past and present.

In a brief essay written in the late 1950s, McLuhan quoted a passage from the "Preface" of the Austrian philosopher Wittgenstein's *Philosophical Investigations*.⁹ His aphoristic way of composition, Wittgenstein here wrote, was connected with "the very nature" of an investigation which "compels us to travel over a wide field of thought criss-cross in every direction. The philosophical remarks in this book are, as it were, a number

of sketches of landscapes which were made in the course of these long and involved journeyings." To this passage, McLuhan added the astonishing – but to my mind appropriate¹⁰ – comment: "All that need to be said is that Wittgenstein is here trying to explain the character of oral as opposed to written philosophy." The logic of written language, McLuhan implies, is linear; pre-literal and post-literal forms of communication, by contrast, generate patterns of interlaced thoughts. And it is perhaps worth noting that although Wittgenstein's "Preface" in the version printed does not actually employ the term "network", an earlier draft indeed does: "each thought stands in a complicated network of relations with each other".¹¹ That any interesting system of ideas forms a network, that ideas cannot really be presented in a linear order, the order forced upon us by the culture of the printed book, is a fundamental insight of Wittgenstein.

His other basic insight, of course, was that of the mediated mind, forcefully put forward, for example, in one of the opening remarks of the *Blue Book*: "We may say that thinking is essentially the activity of operating with signs. This activity is performed by the hand, when we think by writing; by the mouth and the larynx, when we think by speaking... If we talk about the locality where thinking takes place we have a right to say that this locality is the paper on which we write or the mouth which speaks."¹²

Of the Hungarian representatives of the idea of the mediated/extended mind the Toronto Circle was aware of film theorist Béla Balázs and paleographer István Hajnal, and McLuhan's student Walter J. Ong later became aware of classical scholar József Balogh; certainly the Circle was unaware of philosopher Menyhért (Melchior) Palágyi.¹³ Palágyi's tenet, formulated in a number of books written in German between 1902 and 1904, was that language is not just a means of communication; it is, in all its forms – as spoken, written, etc. – also a vehicle of thinking. Balogh's essay " 'Voces Paginarum': Beiträge zur Geschichte des lauten Lesens und Schreibens" (1921/1926) was the first extended analysis of *silent reading* as a recent, modern, phenomenon – throughout most of history reading and writing involved the ear as much as it did the eye. Balázs described the suffocating effects of the printing press and the liberation film as a pictorial medium meant. "It is not the same spirit", Balázs wrote in 1924, "that is expressed now in words, now in gestures. ... For the possibility of expressing ourselves conditions in advance our thoughts and feelings. ... Psychological and logical analyses have proven that our words are not subsequent representations of our thoughts, but forms which will from the beginning determine the latter". Hajnal's achievement was to provide a historical and epistemological interpretation for the consequences of alphabetic literacy. As he put it in the early 1930s, discussing the beginnings of literacy in Greece: "Writing vividly accompanies the human being's outer and inner life, objectifying it and thus rendering it capable of being observed. It links together the past and the present in the life of both the individual and the community, it encourages rational thinking, and enables the building of complicated mental edifices." And a quote from a paper by Hajnal written some 20 years later, referring to universities in the 12th–13th centuries, which also meant a reference to the conditions of pre-modern European orality: "The quarters of students should not be regarded as mere necessities of a common subsistence but, in the first place, as forms of educational methods... It is simply indispensable for a student to have groups of mates, and elders around himself; they are his living educational tools, carriers of scientific material available for exercises." To sum up, this is what the Toronto Circle

learnt, directly or indirectly, from Balázs, Palágyi, Balogh, and Hajnal: *the medium is the message; language is part of the extended mind; the community of speakers is part of the individual's mediated/extended mind.*

Encyclopedias: From Linear Text to Hypermedia

An instructive effort to represent links between ideas arranged linearly was made by Ephraim Chambers in his *Cyclopaedia* of 1728. Though with the exploding volume and diversity of knowledge, and the consequent dissolution of earlier, primitive, unifying world-views, Chambers had no choice but to present the entries in alphabetical order, he was still intent on showing, by a "Chain of References", the network-like conceptual connections between them.¹⁴ The medium of the printed book, however, was not conducive to his cross-referencing ambitions. By contrast, today's virtual encyclopedias permit impressive displays of the network of ideas.

With the human mind itself being a network of mental representations, the linear order of written language, to repeat, necessarily has a constrictive, indeed distorting, effect on thinking. Hence from the point of view of cognitive psychology the trend of supplanting, on the web, extended linear texts by clusters of interlinked short documents is an unquestionably progressive one. *Hypertext* is a more natural form of organizing ideas than linear text. And *hypermediality*, the interlinking of multimedia documents, is – given the multisensorial character of the mind – an even more natural form. Supported by increasingly powerful search engines, the World Wide Web has the potential to become a hypermedia environment in which fragmented theoretical knowledge becomes more easily accessible than ever before.

Networks of Interpersonal Communication

In her book *Invisible Colleges* Diana Crane provides an analysis of networks of scientific correspondence – definitely networks with hubs. The term "invisible colleges" in Crane's book – a term that first seems to occur in the Boyle–Hartlib correspondence – refers to informal groups of scientific elites through whom the communication of information both within a field and across fields is directed. At the time of Boyle, scholarly and scientific correspondence was of course a rather less rapid affair than it is today. Being a node or a hub in the network of traditional letter writers did not save one from extended periods of solitary thinking, nor from the illusion that it was such thinking that gave rise to deep and interesting thoughts. But this really was an illusion. As Bacon saw: "whosoever hath his mind fraught with many thoughts, his wits and understanding do clarify and break up, in the communicating and discoursing with another; he tosseth his thoughts more easily; he marshalleth them more orderly, he seeth how they look when they are turned into words: finally, he waxeth wiser than himself; and that more by an hour's discourse, than by a day's meditation."¹⁵ However, the basic pattern of networking has not changed over the centuries. In the late 20th century, just as in the 17th and 18th centuries, members of research areas, as Crane summed it up, "were not so much linked to each other directly but were linked to each other indirectly" through the "highly influential members" belonging to the elite. These prestigious figures "were surrounded individually by subgroups of scientists who looked to them for information. They in turn

communicated intensively with one another". As Crane registered, it is through "the central scientists" that "information may be transferred to all other scientists in the network".¹⁶ But are the findings Crane accepted in 1972 still valid in terms of today's networking practices? Is it still the case that members of the scientific elite occupy a central place in the channelling of information? The question was answered in the affirmative both by László Babai in 1990,¹⁷ and by Albert-László Barabási in his book.¹⁸

The Network Individual

But precisely because the flow of information in the networks of communication has speeded up so radically, it appears to be warranted to speak of a new type of personality: the "network individual". The network individual is the person reintegrated, after centuries of relative isolation induced by the printing press, into the collective thinking of society – the individual whose mind is manifestly mediated, once again, by the minds of those forming his/her smaller or larger community.¹⁹ This mediation is indeed manifest: its patterns can be directly read off the displays of our electronic communications devices, of which the mobile phone has clearly become the central and most important. Also, there is a theoretical framework at our disposal in which those patterns can be conveniently classified and interpreted: Robin Dunbar's theory of the *social brain*.

According to this theory,²⁰ language came about primarily as a tool of social intelligence. People mostly converse about others and about each other, gossip is a cohesive force. Dunbar established a co-variation between on the one hand the neocortex volume of primates, and on the other, various aspects of primate social behaviour, including social group size. If a primate species embarks on a path to living in a larger group so as to be able to more effectively solve its ecological problems, it has to develop a sufficiently large neocortex to provide capacities for the social information processing needed. Calculations show that with a neocortex of the size humans possess, we should live in groups of about 150. And this in fact seems to be the case. "Although humans", writes Dunbar,

can obviously cope with very large urban environments and even nation-states, the number of people within those large population units with whom one can say that one has a direct personal relationship is very much smaller. Censuses of the population units of hunter-gatherers, the size of scientific sub-disciplines, the number of people to whom one sends Christmas cards and the number of people of whom one can ask a favour all turn out to be about 150 in number.²¹

Within this circle of 150 persons there is a series of smaller circles of individuals with whom we can maintain a relationship of a given degree of intensity. There is ample evidence to the effect that the number of persons we can have a particularly close connection with is limited to around 12–15, and that there is an inner circle of about 5 persons with whom this relationship is especially strong. We have, in addition, grounds to believe that there may be a series of layers, with upper boundaries at around 35 and 80–

100, each associated with a declining level of emotional closeness. Each of us as it were sits in the centre of a series of expanding circles of 5, 15, 35, 80 and 150 persons.²²

Let us now cast a glance upon our mobile phone. There are hundreds of telephone numbers stored (as well as, to say it parenthetically, thousands of e-mail addresses in our mailbox). The number of persons with whom in the course of time we have had SMS contact, is again several hundreds – since quite often we have to send SMS messages even to strangers. Recall the formula, dismissive but not at all unusual, on the mobile answering device: "Please do not leave a message at this number. Send an SMS, or write an e-mail." However, we conduct regular SMS communication with a limited number of persons only – the figure is certainly below 35, and with most people even below 15. Finally, MMS messages will not be exchanged beyond one's circle of the most intimate friends – on the average with 5 persons at the utmost.²³

With the rise of Skype we have yet more access to a rich source of experiential data. How many people figure on one's "Skype Contacts" list? According to my informal survey, the list seldom contains more than 35 Skype-names – that is, the number of persons with whom we occasionally talk over the internet does not exceed the third Dunbarian circle. I have chosen the word "occasionally", since my impression is that the number of persons whom we regularly call using VoIP is nearer to 5 than to 15. And the number 15 seems to indicate the approximate upper limit of the circle of persons with whom we maintain chat contact. I myself find it frustrating if my Skype contacts list refers to more than 15 persons, and again and again delete the Skype names of those to whom I do not have a really close relationship. For this is a list I have continuously before my eyes, and it shows intimate details. I learn who is online when, who has not touched their computer for more than 5 minutes ("Away"), has deserted it for more than 20 Minutes ("Not Available") and who is online, but does not wish to be contacted ("Do Not Disturb"). Also, I see faces. Chat in its newer versions appears to be restricted, quite unequivocally, to the two innermost Dunbarian circles.

My list of approximately 15 persons of course contains names, too, which do not figure on the lists of my intimate chat partners – each of us inhabits the centre of different concentric circles. The friends of my friends are not necessarily *my* friends – and it is important that through my friends I should also be able to reach, when the need arises, strangers. We are back at Stanley Milgram's small-world phenomenon. In a way, I find it astonishing that Dunbar nowhere refers to Milgram, and indeed that research does practically not connect the two names with one another. For there is a rather obvious point where the results of the two meet: Milgram's circle of acquaintances known on a first-name basis is identical with the Dunbarian circle of 150. And we might assume that should the number of individuals one has a personal connection with overstep the limit of 150 – a development Dunbar holds impossible for cognitive reasons – the Milgram figure would in its turn decrease. Now the latter today is actually the case: a repeated experiment has yielded the number 4.6. As *The Economist* recently wrote: "Being able to keep in touch with a much wider range of people through technologies such as e-mail has brought everyone closer."²⁴ Perhaps Dunbar does, after all, underestimate the effect of those most recent communications technologies upon our cognitive capacities.

Collective Thinking

Years before the mobile phone began its triumphal march, I gave a paper with the title "Thinking with a Word Processor" at a Wittgenstein conference. Here I concluded by saying: "When we think with a word processor it is a synchronous intellectual exchange with fellow thinkers all over the world we are, ultimately, engaged in. So what are we thinking with when we think with a word processor? The word 'with' here ... does in the last analysis point not to instrumental application – but to human companionship."²⁵ This paper was intended as a sequel to Wittgenstein's theory of the mediated mind, a theory essentially involving the position that the agent of thinking encompasses not just devices external to the individual brain, but also the community of thinkers playing the same language-game.²⁶ As he puts it in a well-known passage of the *Philosophical Investigations*: "If language is to be a means of communication there must be agreement not only in definitions but also (queer as this may sound) in judgments. This seems to abolish logic, but does not do so. ... human beings ... agree in the *language* they use. That is not agreement in opinions but in forms of life."²⁷ It is interesting to note that Heidegger, along with Wittgenstein the other great twentieth-century philosopher of post-literacy, had quite similar views, even if expressed in a rather different terminology. "We do not merely speak *the* language", he wrote, "we speak *by way of* it. ... We hear language speaking. ... *language* speaks."²⁸ Both for Wittgenstein and Heidegger, speaking, and thus thinking, is first, foremost, and to the end, a collective achievement. The primary agent of thinking is the community of speakers; the rules of traditional logic are a makeshift substitute in the mind of the solitary thinker for the absent voices of interlocutors. In the age of post-literacy linear logic is, once more, supplanted by the logic of conversation. As McLuhan's theory of the mediated mind foresaw: "In the electric age ... our central nervous system is technologically extended to involve us in the whole of mankind... the creative process of knowing will be collectively ... extended to the whole of human society".²⁹

But let me note, in closing, that the working of the collective mind does not always rely on networking. It was a fundamental insight of the economist and philosopher Friedrich August von Hayek that not only is social knowledge, under modern conditions, *fragmented* in the sense that "each member of society can have only a small fraction of the knowledge possessed by all, and ... each is therefore ignorant of most of the facts on which the working of society rests", but also that this knowledge must remain "widely dispersed among individuals", since it is tacit, practical, local, not of the kind that can be transferred, ordered, united. How can we benefit, Hayek asks, from "knowledge ... we do *not* possess"?³⁰ Hayek's question is echoed by James Surowiecki in his recent *The Wisdom of Crowds*,³¹ a stimulating albeit inconclusive book; but then Hayek himself, at the end of the day, was unable to outline a conclusive answer. Hayek emphasized the role the *market* plays in co-ordinating local segments of knowledge; he did not, however, build upon the fact that the marketed goods themselves bring together, embody, and carry such knowledge. Our tools and devices are materialized results and vehicles of, as well as ever new inputs to, collective thinking.

NOTES

¹ Stanley Milgram, "The Small-World Problem", *Psychology Today*, 1967.

² Duncan J. Watts and Steven H. Strogatz, "Collective Dynamics of 'Small-World' Networks", *Nature* 393 (1998).

³ Mark S. Granovetter, "The Strength of Weak Ties", *American Journal of Sociology*, 1973.

⁴ William James, *The Principles of Psychology*, New York: Henry Holt, 1890, ch. XVI, p. 655.

⁵ Ribot as quoted by Douwe Draaisma, in his *Why Life Speeds Up As You Get Older: How Memory Shapes Our Past* (2001), Cambridge: Cambridge University Press, 2004, p. 217.

⁶ *Ibid.*, p. 218.

⁷ *Ibid.*, p. 234.

⁸ Albert-László Barabási and Réka Albert, "Emergence of Scaling in Random Networks", *Science*, vol. 286 (15 Oct. 1999); Barabási, *Linked: The New Science of Networks*, Cambridge, MA: Perseus, 2002; Barabási, „Science of Networks: From Society to the Web”, in Kristóf Nyíri (ed.), *A Sense of Place: The Global and the Local in Mobile Communication*, Vienna: Passagen Verlag, 2005.

⁹ Marshall McLuhan, "Eminent Extrapolators" (1958), repr. in McLuhan, ed., *Verbi-Voco-Visual Explorations*, New York: Something Else Press, 1967.

¹⁰ Cf. my paper "Wittgenstein as a Philosopher of Secondary Orality", *Grazer Philosophische Studien* 52 (1996/97), pp. 45–57, also available as an electronic document: <<http://www.hunfi.hu/nyiri/gps97.htm>>.

¹¹ Wittgenstein's *Nachlaß*, MS 117: "die einzelnen Gedanken [stehen] in einem verwickelten Netz von Beziehungen zu einander". The term "network" occurs, also, in one of the crucial paragraphs of the *Philosophical Investigations*, § 66: "a complicated network of similarities overlapping and criss-crossing".

¹² Ludwig Wittgenstein, *The Blue and Brown Books*, Oxford: Basil Blackwell, 1958, pp. 6 f.

¹³ For a broader background of the following passages see my paper "From Palágyi to Wittgenstein: Austro-Hungarian Philosophies of Language and Communication", in Peter Fleissner and Kristóf Nyíri (eds.), *Philosophy of Culture and the Politics of Electronic Networking*, vol. 1: *Austria and Hungary: Historical Roots and Present Developments*, Innsbruck: Studienverlag / Budapest: Áron Kiadó, 1999, also available as an electronic document: <http://www.hunfi.hu/nyiri/Palagyi_to_Wittgenstein.pdf>.

¹⁴ The story is wonderfully told by Richard Yeo, in his *Encyclopaedic Visions: Scientific Discoveries and Enlightenment Culture*, Cambridge: Cambridge University Press, 2001.

¹⁵ Francis Bacon, "Of Friendship". I am grateful to Zsuzsanna Kondor for having directed my attention to this passage.

¹⁶ Diana Crane, *Invisible Colleges: Diffusion of Knowledge in Scientific Communities*, Chicago: University of Chicago Press, 1972, pp. 49 and 52 f.

¹⁷ As Babai writes: "E-mail is capable of creating an *ultracompetitive atmosphere* on a much grander scale than any medium before." The e-mailing of important research results

"may give unprecedented information advantage to a well chosen, sizable, and consequently extremely powerful elite group. The group of recipients ... may be fully capable of making rapid advances before others would even find out that something was happening. Although such elite groups belong to the very nature of the hierarchy of scientific research ..., their sheer intellectual force combined with the information advantage makes them look from outside like an impenetrable fortress." (László Babai, "E-mail and the Unexpected Power of Interaction", University of Chicago Technical Report CS 90-15, April 24, 1990, pp. 11 f.)

¹⁸ Barabási, *Linked*, see esp. chapters 6 and 7.

¹⁹ I have begun using the term "network individual", for designating what I think is a new psychological type – and in a sense also the return to a primordial type of personality – in the early stages of the project COMMUNICATIONS IN THE 21ST CENTURY (cf. http://www.socialscience.t-mobile.hu/2001_dec_konf/SUMMARIES.pdf, see also my preface to the volume Kristóf Nyíri, ed., *Mobile Democracy: Essays on Society, Self and Politics*, Vienna: Passagen Verlag, 2003, p. 16). The network individual is not the uprooted, free-floating being as depicted by Barry Wellman. Wellman uses the term "networked individualism". His description: "People remain connected, but as individuals rather than being rooted in the home bases of work unit and household. Individuals switch rapidly between their social networks. Each person separately operates his networks to obtain information, collaboration, orders, support, sociability, and a sense of belonging." (Wellman, "Little Boxes, Glocalization, and Networked Individualism", in Makoto Tanabe, Peter van den Besselaar and Toru Ishida, eds., *Digital Cities II: Computational and Sociological Approaches*, Berlin: Springer-Verlag, 2002.)

²⁰ See in particular Robin I. M. Dunbar, *Grooming, Gossip, and the Evolution of Language*, Cambridge, MA: Harvard University Press, 1996, as well as R. I. M. Dunbar, "Are There Cognitive Constraints on an E-World?", in Kristóf Nyíri, ed., *Mobile Communication: Essays on Cognition and Community*, Vienna: Passagen Verlag, 2003.

²¹ Dunbar, "Are There Cognitive Constraints on an E-World?", *loc. cit.*, p. 58.

²² *Ibid.*, p. 59.

²³ Cf. Nicola Döring et al., "Contents, Forms and Functions of Interpersonal Pictorial Messages in Online and Mobile Communication", in Kristóf Nyíri, ed., *Mobile Understanding*, p. 198: "The average number of people a person exchanges MMS messages with is estimated to be 2 to 5, usually including his or her partner and close friends. This at the same time implies that MMS messages require the communication partners to share a high degree of contextual knowledge and are often incomprehensible to outsiders."

²⁴ *The Economist*, 21 January 2006, special survey *The New Organisation*, p. 4.

²⁵ J. C. Nyíri, "Thinking with a Word Processor", in R. Casati, ed., *Philosophy and the Cognitive Sciences*, Vienna: Hölder-Pichler-Tempsky, 1994.

²⁶ Cf. my discussion of Wittgenstein in the essay "Collective Reason: Roots of a Sociological Theory of Knowledge", in my volume *Tradition and Individuality: Essays*, Dordrecht: Kluwer, 1992. The sociological theory of knowledge, as I use this term, "deals with [the] social constitution [of ideas], and is committed to the fundamental hypothesis that the ideas of the individual have no being or at least no coherence, independent of such a social constitution" (*Tradition and Individuality*, p. 27).

²⁷ *Philosophical Investigations*, §§ 241 f.

²⁸ Martin Heidegger, "The Way to Language" (1959), in Heidegger, *On the Way to Language*, New York: Harper & Row, 1971, p. 124. In the German original: "Wir sprechen nicht nur *die* Sprache, wir sprechen *aus* ihr. ... Wir hören das Sprechen der Sprache. ... die *Sprache* spricht."

²⁹ Marshall McLuhan, *Understanding Media: The Extensions of Man*, New York: McGraw-Hill, 1964, pp. 3 f.

³⁰ F. A. Hayek, *Law, Legislation and Liberty*, vol. 1: *Rules and Order*, London: Routledge and Kegan Paul, 1973, pp. 13–15.

³¹ James Surowiecki, *The Wisdom of Crowds: Why the Many Are Smarter than the Few and How Collective Wisdom Shapes Business, Economies, Societies, and Nations*, New York: Random House, 2004.