From Structure to Infrastructure: Some Glimpses on a Theoretical Movement in the Social Sciences and Humanities

Christian Meyer

Programmatic endeavours such as the "infrastructural turn"[1] or "infrastructuralism"[2] are not restricted to a new interest in technical systems but propose an entirely new axiom for the study of culture and society. In these endeavours, infrastructures are ascribed a new paradigmatic status far beyond technical installations that provide specific services for mankind. In other words, they are applied to immaterial—practical, symbolic, and ideational—phenomena. In doing so, infrastructuralist approaches put a particular focus on dimensions that have been overlooked by traditional approaches to the study of culture: materialities and proliferations, conditions and generative accomplishments, relations and regular operations, which are, often invisible and taken for granted, warranting the status quo of culture and society. Part of the concept "infrastructure" is the term "structure," literally meaning *setup*, *layout*, or *construction*, which is then qualified by the prefix "infra-," signifying *beneath* or *below (the ground)*. And yet, infrastructuralist endeavours critically distance themselves from ideas of structure that they view as overly static and overly metaphysical (i.e., transcendental in the sense of being latent and hidden as well as accessible only by scientific or otherwise sophisticated methods that are superior to everyday reason).

1 Explicitly: Stephen Graham, *Disrupted Cities: When Infrastructure Fails* (New York: Routledge, 2010), 10–16. Also see Susan Leigh Star and Karen Ruhleder, "Steps Towards an Ecology of Infrastructure: Complex Problems in Design and Access for Large-Scale Collaborative Systems," in *Proceedings of the Computer Supported Cooperative Work* (Association for Computing Machinery, 1994): 253–264.

2 E.g., Marshall Sahlins, "Infrastructuralism," *Critical Inquiry* 36 (2010): 371–385; John Durham Peters, *The Marvelous Clouds: Toward a Philosophy of Elemental Media* (Chicago: The University of Chicago Press, 2015).

In the Occident[3] the term "structure" has a colourful and consequential conceptual history. Originating in Latin Antiquity, it helped establishing the modern sciences in the 15th and 16th centuries by allowing them to conceptualize the interplay of different recurrent factors, or forces of nature, that are needed to initiate, constitute, produce, or causally determine, a phenomenon accessible to the human senses. In the 19th century, the term was transferred with quite some discussion to social, cultural, and mental phenomena. Here, the hopes were concentrating on the identification of long-term historical structures and their relation to events as well as on functions of structural elements that are required for a societal whole to continue existing. In this process, similarities, and differences between the sciences, that focus on nature, and the humanities, that address culture and society, were claimed, discussed, and reflected, and ever since, the well-known battles about the unity of the sciences versus the delimitation of the "two" or "three cultures," respectively, have become permanent.[4] These battles are partly about the concept of "structure" and its ontology.

It is the aim of this text to identify some of the theoretical potentials of the concept "infrastructure" by contrasting it to "structure" as it was used for centuries. I will therefore review in the following chapter some aspects the conceptual history of "structure." This necessarily broad-brushed review will enable me to consider some prospects and problems of the introduction of "infrastructure" as a social and cultural theoretical term in the subsequent chapter, before, in the conclusion, I will identify the main profits of a move forward from structure to infrastructure.

3 While there are some studies on the local particularity or on equivalents of the term "structure" in Non-Western regions, I will focus on the European and North American history of the originally Latin notion. Cf., e.g., Jana S. Rošker, "The Concept of Structure as a Basic Epistemological Paradigm of Traditional Chinese Thought," *Asian Philosophy* 20, no. 1 (2010): 79–96; Eni P. Orlandi, "On the Notion of Structure and Structuralism in Brazil," in *History of Linguistics*, eds. Eduardo Guimarães and Diana Luz Pessoa de Barros (Amsterdam: Benjamins, 2002): 207–222.

4 See e.g., Rudolph Carnap, *The Unity of Science* (London: Routledge, 1934); Eduard Spranger, "Die Einheit der Wissenschaft, ein Problem," *Archiv für Rechts-und Sozialphilosophie* 40, no. 1 (1952): 1–37; Otto Neurath, "Einheit der Wissenschaft als Aufgabe," *Erkenntnis* 5 (1935): 16–22; C.P. Snow, *The Two Cultures*, (Cambridge: Cambridge University Press, 2002); F.R. Leavis, *Two Cultures?* (Cambridge: Cambridge University Press, 2013); Wolf Lepenies, *Die drei Kulturen. Soziologie zwischen Literatur und Wissenschaft* (Munich: Hanser, 1985).

A Short and Selective History of "Structure"

The notion of structure has a long history as both a descriptive and analytical category.[5] The word "structure" originated from architecture in Roman antiquity. In addition, it was used in the fields of anatomy, botany, and geology. From Cicero on, the term was increasingly applied in rhetoric, denoting the interconnection of vocal sounds, or of the parts of a word, a phrase, or a performed or written text. Early Christian authors then put it into theological contexts and used it for further "immaterial" or imaginary phenomena. Classical conceptions of structure emphasize the connections, or relations, of individual parts to an encompassing, functional whole. This whole is thought of, mostly, as a passive, stable construction such as, prominently, a defence wall.[6]

From early to late modernity, the concept of structure adopted a more abstract meaning designating in philosophy and the emerging sciences the inner nature and arrangement of complex things and beings as well as hidden causal relations and invariant forces behind the visible which could only be discovered by experimentation.[7] According to Francis Bacon, for example, man would be able to explain the processes of nature if he fully understood the hidden structure and secret functioning of matter.[8]

From now on, the concept of structure was increasingly connected to an ambition to identifying "structures" in general as "real" causal forces "behind" perceivable appearances. Later, scholars such as Kant or Goethe dealt with the question whether

5 For overviews, cf. Matthias Kross et al., "Struktur," in *Historisches Wörterbuch der Philosophie*, eds. Joachim Ritter and Karlfried Gründer Bd. 10 (Basel: Schwabe, 1998), 303–335; Roger Bastide, ed., *Sens et usages du terme structure dans les sciences humaines et sociales* (The Hague: Mouton, 1962); Raymond Boudon, *The Uses of Structuralism* (London: Heinemann, 1971); Nicholas J. Allen, "On the Notion of Structure," *Journal of the Anthropological Society of Oxford* 21, no. 3 (1990): 279–282; François Dosse, *History of Structuralism*, Two Vols., (Minneapolis: University of Minnesota Press, 1997); Thomas G. Pavel, *The Feud of Language: A History of Structuralist Thought* (Oxford: Blackwell, 1990).

6 Godo Lieberg, "Der Begriff 'Structura' in der Lateinischen Literatur," *Hermes* 84, no. 4 (1956): 455–477.

7 Donald W. Mertz, "The Concept of Structure in Galileo: Its Role in the Methods of Proportionality and *Ex Suppositione* as Applied to the Tides," *Studies in History and Philosophy of Science* 13, no. 2 (1982.): 111–131; Nicholas Rescher, *Leibniz's Metaphysics of Nature: A Group of Essays* (Dordrecht: Springer, 1981); François Duchesneau, "Leibniz et Stahl: divergences sur le concept d'organisme," *Studia Leibnitiana* 27, no. 2 (1995): 185–212; John Earman, "Was Leibniz a Relationist?" *Midwest Studies in Philosophy* 4 (1979): 263–276.

8 Antonio Pérez-Ramos, *Francis Bacon's Idea of Science and the Maker's Knowledge Tradition* (Oxford: Oxford University Press, 1988).

events, or actions, are caused by these kinds of "structures" or by intentional subjects, as well as how causation can be related to structural part-whole relations.[9]

This also induced an increased interest in methodological questions. Some questions concerned the methodic discoverability and reducibility of manifest phenomena to other, structural factors hidden in some way.[10] "Structures" of cognition and knowledge (reasoning and understanding)—as being different to structures of the physical world—came into focus.[11] In the panlogical concept of structure, the structure of the mind, or of logic, is conceived of as corresponding to the structure of the world.[12] Another point of interest concerned the epistemological status of structure as actor's or observer's concept as well as its ontological status as, alternatively, "model of" or "model for" the external reality it represents.[13] This, in turn, entailed questions about the ontological status of causal, yet latent and hidden structures: are structures *behind, below*, or *between* events and manifestations?[14]

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9 Immanuel Kant, *Metaphysical Foundations of Natural Science* (1786); Hannah Ginsborg, "Kant on Understanding Organisms as Natural Purposes," in *Kant and the Sciences*, ed. Eric Watkins (Oxford: Oxford University Press, 2001), 231–258; Ronald H. Brady, "The Causal Dimension of Goethe's Morphology," *Journal of Social and Biological Structures* 7 (1984) 325–344; Jean Petitot "Morphology and Structural Aesthetics: From Goethe to Lévi-Strauss," in *The Cambridge Companion to Lévi-Strauss*, ed. Boris Wiseman (Cambridge: Cambridge University Press, 2009), 275–295; Charles Darwin, *On the Origin of Species* (London: J. Murray, 1859).

10 Jakub Dziadkowiec, "The Layered Structure of the World in N. Hartmann's Ontology and a Processual View," in *The Philosophy of Nicolai Hartmann*, eds. Roberto Poli, Carlo Scognamiglio, and Frederic Tremblay (Berlin: de Gruyter, 2011): 95–123; John E. Smith, "Hartmann's New Ontology," *The Review of Metaphysics* 7, no. 4 (1954): 583–601.

11 E.g., in Wilhelm Dilthey (who used the German word "Aufbau" for "structure"), see Frithjof Rodi, "Dilthey's Concept of 'Structure' within the Context of 19th Century Science and Philosophy," in *Dilthey and Phenomenology*, eds. Rudolf A. Makkreel and John D. Scanlon (Lanham: Center for Advanced Research in Phenomenology, 1987): 107–121; in Husserl, cf. Giulio C. Lepschy, "Osservazioni sul termine Struttura," in *Mutamenti di prospettiva nella linguistica*, Giulio C. Lepschy (Bologna: Il Mulino, 1981), 37–73; or in Dewey, cf. John Dewey, *The Later Works, 1925–1953, Volume I: Experience and Nature*, ed. Jo Ann Boydston (Carbondale: Southern Illinois University Press, 2008).

12 An example for this model is Bertrand Russell, cf. William Demopoulos and Michael Friedman, "The Concept of Structure in *The Analysis of Matter*," *Minnesota Studies in the Philosophy of Science* 12 (1989): 183–199; The early Wittgenstein of the *Tractatus* also assumed an isomorphic relation between the structure of the "things" in the world, connected in facts, and their representation in the mind of people. Wittgenstein's concept of structure found its way into analytic philosophy through representatives of the Vienna Circle.

13 Clifford Geertz, *The Interpretation of Culture* (New York: Basic Books, 1973), 93.

14 A consequential example of this metaphor is Marx's "base and superstructure" model of society that assumes hidden causal forces behind the visible appearances, dividing social reality into an economic-technological "base" which conditions, if not determines, the political-ideological "superstructure." Cf. Karl Marx, Preface to *A Contribution to the Critique of Political Econ-*

In the 19th century, along with epistemic and semantic structures, the emphasis was laid on the idea, and discovery, of long-term historical structures and their relation to events.[15] This was carried further in the 20th century by social scientists who analyzed the social functions of structural elements that are required for a societal whole to continue existing (structural functionalism), as well as by Saussure and Jakobson who formalized linguistic structures.[16] Drawing on this newly emergent tradition, Maurice Merleau-Ponty attempted to combine theoretical elements of phenomenology and structuralism,[17] which influenced later theoretical endeavours such as Lévi-Straussian structuralism in which the trend towards an ever more sophisticated systematization of empirically certifiable structural elements and wholes, relations, and derivations culminated.[18] Lévi-Strauss assumes the historically endless recombination of individual elements that integrate to the wholes of culturally and symbolically structured social groups for which human individuals serve as mere media. The assumed universal anthropological basis for all variant forms is an ultimately unbridgeable opposition between nature and culture grounded in the precarious human existence. Lévi-Straussian structuralism is intended to solve the question of how to conceptualize social stability over time and across generations. In doing so, however, Lévi-Straussian structuralism admits transformations and substitutions, but not mere additions and subtractions (since they would destroy the balance of the structure). Furthermore, structures, in Lévi-

omy (German original: 1859). The English translation of 1904 preserves the "base" metaphor, while the French translation of 1899 translates the German "Basis" as "infrastructure."

15 Leonilla Krol, "Spencer's Meaning of Structure," *Organon* 3 (1966): 201–218; F. Braudel, "Histoire et sciences sociales: La longue durée," *Annales Économies, sociétés, civilisations* 13, no. 4 (1958): 725–753; Michael Pickering, "Experience as Horizon: Koselleck, Expectation, and Historical Time," *Cultural Studies* 18, no. 2–3 (2004): 271–289.

16 Ernst A. Cassirer, "Structuralism in Modern Linguistics," *Word* 1, no.2 (1945): 99–120; Lewis A. Coser, ed., *The Idea of Social Structure* (New York: Routledge 1975).

17 James M. Edie, "The Meaning and Development of Merleau-Ponty's Concept of Structure," *Research in Phenomenology* X (1980): 39–57; Elmar Holenstein, *Linguistik, Semiotik, Hermeneutik. Plädoyers für eine strukturale Phänomenologie* (Frankfurt: Suhrkamp, 1976); James Daly IV, "Merleau-Ponty: A Bridge Between Phenomenology and Structuralism," *Journal of the British Society for Phenomenology* 2, no. 3 (1971): 53–58; William C. Gay, "Merleau-Ponty on Language and Social Science: The Dialectic of Phenomenology and Structuralism," *Man and World* 12 (1979): 322–338; James Schmidt, *Maurice Merleau-Ponty: Between Phenomenology and Structuralism* (New York: St. Martin's Press 1985); John Kultgen, "Phenomenology and Structuralism," *Annual Review of Anthropology* 4 (1975): 371–387.

18 Claude Lévi-Strauss, "Social Structure," in *Structural Anthropology* (New York: Basic Books, 1963), 277–323; Claude Lévi-Strauss, *Wild Thought: A New Translation of "La Pensée sauvage,"* trans. Jefferey Mehlman, Jeffrey and John Leavitt (Chicago: University of Chicago Press, 2021); Nathan Rotenstreich, "On Lévi-Strauss' Concept of Structure," *The Review of Metaphysics* 25, no. 3 (1972): 489–526; John B. Fisher, "The Concept of Structure in Freud, Levi Strauss, and Chomsky," *Philosophy Research Archives* 1 (1975): 88–108.

Strauss' conception, are not changed by mere external influences, but obey a law of self-regulation or self-organization. Its culminated obsession with structural combinations of meaningful entities was terminated by variants of neo- and post-structuralism (e.g., Althusser, Foucault, Bourdieu, Derrida) that were interested in the ongoing dynamics of structure formation, in vagueness of meaning, existential imponderabilities, and questions of embodiment and materiality.[19] However, it is certainly true that by voluntary opposition to structuralism, misrepresentations were created, and strawmen were built up, to the distortion of Lévi-Strauss' original aims.[20]

In sociology, in a renewed Galilean gesture of reducing all observations, even those of human beings concerned with meaning, to primary properties expressible in exact mathematical descriptions of the true, objective, and real world (mathesis universalis),[21] strong versions of 20th century (non-Lévi-Straussian) sociological structuralism conceptualize social structure exclusively in terms of measurable physical variables such as size, density, and propinquity.[22] Accordingly, strong

19 Caroline Williams, "Structure and Subject," in *The Edinburgh Companion to Poststructuralism*, eds. Benoit Dillet, Iain MacKenzie, and Robert Porter (Edinburgh: Edinburgh University Press, 2013), 189–206; Rodolphe Gasché, *The Tain of the Mirror: Derrida and the Philosophy of Reflection* (Cambridge: Harvard University Press, 1986).

20 See David R. Howarth, *Poststructuralism and After: Structure, Subjectivity and Power* (Basingstoke: Palgrave Macmillan, 2013); Edith Kurzweil, *The Age of Structuralism: Levi-Strauss to Foucault* (New York: Columbia University Press, 1980); John Sturrock, ed., *Structuralism and Since: From Levi-Strauss to Derrida* (New York: Oxford University Press, 1979); Sunil Manghani, ed., *Theory, Culture & Society* 39, no. 7–8, Special Section: *Notes on Structuralism* (2022); Iain Campbell, "Structuralist Heroes and Points of Heresy: Recognizing Gilles Deleuze's (Anti-) Structuralism," *Continental Philosophy Review* 55, no. 5–6 (2022): 215–234; Christopher Bryant and David Jary, eds., *Giddens' Theory of Structuration: A Critical Appreciation* (London: Routledge 1991), especially pp. 52–73; Derek Robbins, "Phenomenology and Poststructuralism," in *The Edinburgh Companion to Critical Theory*, ed. Stuart Sim (Edinburgh: Edinburgh University Press, 2016), 91–108.

21 In a way, this strong sociological structuralism manifests the ongoing desire to identify a "primum movens" (Aristotle) even for social and cultural phenomena. This endeavor was, sure enough, criticized from Vico (and his "verum factum principle") via Dilthey to Husserl (and his "Crisis") and others.

22 Peter M. Blau, ed., *Approaches to the Study of Social Structure* (New York: Wiley, 1976); Peter M. Blau, "A Macrosociological Theory of Social Structure," *American Journal of Sociology* 83 (1977): 26–54; Harrison White, S.A. Boorman, and Ronald Breiger, "Social Structure from Multiple Networks: Parts I and II," *American Journal of Sociology,* 81, no. 4, 6 (1976): 730–781, 468–498; Bruce Mayhew, "Structuralism vs. Individualism: Parts I and II" *Social Forces* 59, no. 2, 3 (1980): 335–375, 627–648; Charles Warriner, "Levels in the Study of Social Structure," in P. Blau & R. Merton (Eds.), *Continuities in Structural Inquiry*, eds. P. Blau and R. Merton (London: Sage, 1981), 179–190; David Rubenstein, "The Concept of Structure in Sociology," in *Sociological Theory in Transition*, eds. Mark L. Wardell and Stephen P. Turner (Boston: Allen & Unwin, 1986), 80–94.

structuralist sociologists insist on explaining action entirely by these types of structural factors and reject altogether explanations framed in terms of cultural orientation, intention, and purpose. It was partly this overly fossilized concept of structure that was addressed by poststructuralists as well as, in sociology, by the "interpretive paradigm"[23] and related movements such as symbolic interactionism and ethnomethodology. Some scholars, such as Bourdieu and Giddens, attempted to reconcile with their theoretical programs the antagonistic forces of "structure" and "agency."[24]

As we have seen, the notion of structure, in an abstract sense, denotes *the totality of relatively constant relationships between the parts of a whole*. The term "relatively constant relationships" mostly concerns relations of spatial arrangement or of temporal sequence. With the emergence of modern science and humanities in early modern times and, in particular, the course of the 19th century, it is also applied to relations of cause and effect (or power and powerlessness, or subject and object), of exchange or interaction, of reality, knowledge, and (linguistic) representation, or of social stability and continuity, as well as change and transformation. Once transferred from architecture to other realms of human activity, it is by no means limited to recurrent problems of "construction." However, the assessment of the concept of "structure" by the different scholarly traditions in the late 20th and early 21st century is anything but unanimous.

A first discussion concerns the relationships between the individual components and the whole of the structure. The basic question here is: Are these relationships, and if so, in what way, patterned in such a manner that the whole is more than the sum of its parts (emergence)? Or does the whole merely consist in an aggregation of the individual elements? Are structures subject to a gradation "upwards and downwards?" If so, how far does upward or downward causation occur? Do superordinate

23 Thomas P. Wilson, "Normative and Interpretive Paradigms in Sociology," in *Understanding Everyday Life: Toward the Reconstruction of Sociological Knowledge*, ed. Jack D. Douglas (Chicago: Aldine, 1970), 57–79; Thomas P. Wilson, "Conceptions of Interaction and Forms of Sociological Explanation," *American Sociological Review* 35, no. 4 (1970): 697–710; Thomas Luckmann, "Philosophy, Science, and Everyday Life," in *Phenomenology and the Social Sciences*, ed. Maurice Natanson (Evanston: Northwestern University Press, 1973), 143–185.

24 See, e.g., Alex Dennis and Peter J. Martin "Symbolic Interactionism and the Concept of Social Structure," *Sociological Focus* 40, no. 3 (2007): 287–305; Wes Sharrock and Graham Button, "The Structure Problem in the Context of Structure and Agency Controversies," in *Human Agents and Social Structures*, eds. Peter J. Martin and Alex Dennis (Manchester: Manchester University Press, 2010), 17–33; Omar Lizardo, "Beyond the Antinomies of Structure: Levi-Strauss, Giddens, Bourdieu, and Sewell," *Theoretical Sociology* 39 (2010): 651–688; J. D. Mendoza, "Structuralism and the Concept of Structure," in *Anthony Giddens: Critical Assessments*, eds. Christopher Bryant and David Jary, vol. 1 (London: Taylor and Francis, 1997), 234–256.

structures determine subordinate structures (supervenience)?[25] Are only transformations and substitutions admitted, as in Lévi-Strauss, or are additions and subtractions equally possible? Do structures obey laws of self-regulation and self-organization?

A second discussion concerns causality: Are structures principally causal? Do they essentially engender effects, or are they merely observed and inferred primarily or even exclusively through their effects?[26]

Thirdly, there are controversies about what structures are actually constituted of: individual entities as components or relations between components. Do they necessarily possess individual elements as components, or are relations the defining factors?[27]

Further debates concern the relationship of structures as either opposed to or inclusive of dimensions such as (a) dynamic phenomena, (b) time, (c) culture, (d) action and intention, and (e) manifestation.

(a) Drawing on the analogy with invariant natural laws, structures are sometimes viewed as opposed to dynamic phenomena. They are viewed as representing the static pole of the *stasis*/*dynamis* binarity (Auguste Comte) by some. Others—Lévi-Strauss among them—claim that structures as relational wholes are actually constantly adapting to changes of individual components, according to different timescales.
(b) For the same reasons, structures are often seen as atemporal. Again, Lévi-Strauss insisted that they are anything but super-temporal, but rather subject to time and transformation. If one element changes, systemic consequences

25 Cf. Jens Greve and Annette Schnabel, eds., *Emergenz. Zur Analyse und Erklärung komplexer Strukturen* (Berlin: Suhrkamp, 2011); Paul Hoyningen-Huene, "Zu Emergenz, Mikro-und Makrodetermination" in *Kausalität und Zurechnung*, ed. W. Lübbe (Berlin: de Gruyter, 1994), 165–195; Niklas Luhmann, *Die Gesellschaft der Gesellschaft* (Frankfurt: Suhrkamp, 1997); Marta Bertolaso, "Uncoupling Mereology and Supervenience: A Dual Framework for Emergence and Downward Causation," *Axiomathes* 27 (2017): 705–720.

26 See, e.g., Judea Pearl Causality, *Models, Reasoning, and Inference* (Cambridge: Cambridge University Press, 2000); Paul Lewis, "Realism, Causality and the Problem of Social Structure," *Journal for the Theory of Social Behaviour* 30, no. 3 (2001): 249–268; Philip Kitcher, "Explanatory Unification and the Causal Structure of the World," in *Scientific Explanation*, eds. Philip Kitcher and Wesley Salmon (Minneapolis: University of Minnesota Press, 1989), 410–505.

27 The concepts of structure advocated ever since Lévi-Strauss tend to the second answer that relations are defining. This argument might come from Gestalt theory. Cf. Talia Welsh, "From Gestalt to Structure: Maurice Merleau-Ponty's Early Analysis of the Human Sciences" *Theory & Psychology* 16, no. 4 (2006): 527–551; Sara Heinämaa, "Phenomenological Responses to Gestalt Psychology," in *Psychology and Philosophy*, eds. S. Heinämaa and M. Reuter (New York: Springer, 2009), 263–284; Also cf. Hans Buffart and Haike Jacobs, "A Gestalt Theory Approach to Structure in Language," *Frontiers in Psychology* 12 (2021).

are engendered for the structure as a whole. However, the temporalities and durabilities of (long-term) structures and of their (short-term) "effects" (manifestations, events) differ from each other in different ways and with different consequences.

(c) A much-disputed topic is the translatability and transferability of the concept of structure to matters of culture. The first question is whether culture possesses structures at all or whether it is "non-structural." Then, the question comes up whether structures are reducible in the same way to physical variables such as size, density, and propinquity as natural object, i.e., in accordance with the Galilean project of science. Alternatively, culture (or society, or life-world) might be conceptualized as possessing a "structure" that is entirely different, and yet analogous, to the physical world, as in Schütz and Luckmann's conception of "structures of the life-world," and that needs to be methodically dealt with in entirely different ways than physical objects.[28] Closely connected to this question is whether it is possible to speak of mental structures.

(d) Another controversy concerns the question of both the epistemology and the objectivity or subjectivity of structures. Many conceptions of structure (Lévi-Strauss and Foucault among them, as well as strong programs of sociological structuralism) view them as objectively determining subjective phenomena, as producing subjects, and as super-subjective. From this perspective, subjects are mere media of structures, incapable of free will and spontaneous action and intention. The alternative view, advocated in phenomenology, puts that structures are produced by subjects, thus not lying latently *behind* events but (temporally) *between* situations (thus Merleau-Ponty).

(e) This relates to the last dispute I want to mention here: differences among scholars also refer to the question of how structure relates to manifestation. Strong structuralisms claim that structures are hidden powers that produce and determine manifestations. Others would object that structures are mere regularities observed in the statistical aggregation of manifestations in the world. In regard to epistemology, structures are often viewed as epistemologically inaccessible for everyday actors and only identifiable by scientists who use specific instruments and methodologies. Others would say, in turn, that structures are part of our everyday assumptions that help us understand other persons and find our way in the world.

28 Alfred Schutz and Thomas Luckmann, *The Structures of the Life-World*, trans. Richard M. Zaner and H. Tristram Engelhardt, Jr., vols. 1–2 (Evanston: Northwestern University Press, 1973, 1989).

We are now in a position to reflect upon the concept of "infrastructure" against the foil of both the genealogy and basic features of the concept of "structure" and its variation in current scholarly discourse.

Two Stories of the Conceptual Past of "Infrastructure"

As a term, "infrastructure" has a much shorter history than "structure." As a phenomenon, however, some current schools of thought go as far as positioning the activity of "infrastructuring" as having been crucial for the emergence of homo sapiens. The cognitive equipment of homo sapiens is viewed as an evolutionary outcome of their constant active infrastructuring of their natural environment. Some types of environmentally coupled infrastructure are considered conditions for the sustained human existence from its earliest stages on (especially by the "ecological niche hypothesis"[29]). However, the materialization of these cognitive infrastructures has long left the genetic realm and part of the *conditio humana* are more or less preliminary and volatile social, communicative, transport, or protective infrastructures that become crucial for all kinds of social organization in human history.

As topic of systematic reflection, what today is called "infrastructure" came up relatively late in history, again partly in terms of "structure," with the emergence of the modern nation state in the context of market economy and industrialization.[30] The emergence of modern national economy depended upon infrastructures, and accordingly classical liberalist economists were theoretically attentive to them. Interestingly, they usually dealt right from the start with different types of infrastructure, such as traffic systems, general compulsory education, or a uniform school system in terms of "public" or "common good." Right from the start, they did not distinguish between material and immaterial, or "hard" and "soft" infrastructure.[31] This has its origins in the writings of liberalist writers of the 19th century and is most ex-

29 Kim Sterelny, "Social Intelligence, Human Intelligence and Niche Construction," *Philosophical Transactions of the Royal Society B* 362 (2007): 719–730; Kim Sterelny, *The Evolved Apprentice: How Evolution Made Humans Unique* (Cambridge: MIT Press, 2012); Emanuel A. Schegloff, "Interaction: The Infrastructure for Social Institutions, the Natural Ecological Niche for Language, and the Arena in which Culture is Enacted," in *Roots of Human Sociality: Culture, Cognition, and Interaction*, eds. N. J. Enfield and S. C. Levinson (Oxford: Berg, 2006): 70–96.

30 Ashley Carse, "Keyword: Infrastructure: How a Humble French Engineering Term Shaped the Modern World," in *Infrastructures and Social Complexity: A Companion*, eds. Penelope Harvey, Casper Bruun Jensen, and Atsuro Morita (London: Routledge, 2016): 27–39. Also cf. the introduction to the present volume.

31 John Durham Peters, *The Marvelous Clouds: Toward a Philosophy of Elemental Media* (Chicago: The University of Chicago Press, 2015), 32.

plicitly represented by John Stuart Mill.[32] For these systemic, mostly material, and often social establishments for the public good, the term "infrastructure" has found general usage only since, or better, during, the Second World War.[33] In today's public, it is mostly used in the narrow sense of technical pipes and lines *under the ground* or roads, railroads, electric and fibreoptic cables *on the ground* that offer specific service to society.

However, there is a second, parallel story of the emergence of the concept of "infrastructure," which starts in the French Third Republic and which is much less considered in the literature. Here, "infrastructure" is used in additional ways to "technical installation."

The story begins with that fact that, right after the publication of Marx's writings in German and English, "infrastructure" was used as the French translation of Marx's concept of "basis" or "real foundation" as opposed to "superstructure" in the sense explained above (n. 14). This translation makes perfect sense. Marx, in his intent to turn Hegel from his head to his feet, intended to identify the "material and more" foundations on which symbolic systems are grounded: "the ideas of the ruling class are in every epoch the ruling ideas, i.e., the class which is the ruling material force of society, is at the same time its ruling intellectual force."[34] For him, these bases, as infrastructures, are partly material, but also include other phenomena such as property rights or knowledge. Furthermore, the bases, as infrastructures, are, in a routinized way, productive of social reality, insofar as they constantly produce *forces* that make specific symbolic systems methodically plausible and unquestionable and at the same time produce societal contradictions that ultimately lead to conflicts and turn-overs.[35]

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32 Mill approves various restrictions on individual liberty if this serves to benefit others (and not only prevents harm). By this, he justifies enforceable duties to contribute one's fair share to the provision of various kinds of public goods, especially infrastructures of public safety (lighting, police, courts, correctional facilities), market regulation, common defence, transport (roads, docks, harbors, canals), public health (cleansing, sanitation, hospitals), mandatory education (schools, colleges), works of irrigation and drainage, printing-presses, banks, as well as support and encouragement of arts, letters, and science. Cf. John Stuart Mill, *The Principles of Political Economy: With Some of Their Applications to Social Philosophy* (1848), I.viii.6, 130, I.xii.3, 181, II.xiii.3, V.vii.1, V.xi.8, V.xi.15-16; *On Liberty* (1859), V 12–14; *Considerations on Representative Government* (1861), 467–470.

33 "*Infrastructure* was first a military term." John Durham Peters, *The Marvelous Clouds: Toward a Philosophy of Elemental Media* (Chicago: The University of Chicago Press, 2015), 30.

34 Karl Marx and Friedrich Engels, *The German Ideology*, ed. C. J. Arthur, (New York: International Press, 1947), 64

35 Karl Marx, *Critique de l'économie politique* (Paris: Schleicher frères, 1899); cf. Guillaume Fondu and Jean Quétier, "Comment traduire Marx en français?" in *Marx, une passion française*, eds. Jean-Numa Ducange and Antony Burlaud (Paris: La Découverte, 2018), 111–123.

Inspired by the translation of Marx' basis as *infrastructure*, in French vitalist philosophy around 1900 infrastructure is also referred to as "primordial vital needs, which the conscience notices, which it can to a certain extent counteract and direct, but of which it is not the author, and which resound in the consciousness in the form of sensations and emotions."[36] Morality, from this perspective, is but the rational legislation of these primitively irrational tendencies, the "suprastructure" raised by the intelligence on the organic "infrastructure." In this context, the term "infraconsciousness" is invented to precisely refer to these vital impulses forming the invisible basis of consciousness.

Henri Bergson has used in theoretically interesting ways the idea of an infralogical structure, applying it to the functioning of human existence and social phenomena in terms of consciousness and intellect. Georges Gurvitch[37] has summarized Bergson's approach in his book on *Laughter*[38] quite succinctly. Bergson, Gurvitch reports, explains the phenomenon of laughter by the conflict between spontaneous social life and its external symbolism. The conflict becomes grotesque, and laughable, when the external symbolism ceases to be appropriate to the phenomenon and is transformed into a kind of ready-to-wear garment, poorly matched to the social spontaneity it was intended to express. On this basis, Bergson develops an "extremely suggestive and fruitful theory of the deeper layers of social reality."[39] The layers of social reality are the organized and conventionalized *superstructures* and the spontaneous *infrastructures* that underlie any organization.

> As we are both in and of [society], we cannot help treating it as a living being. Any image, then, suggestive of the notion of a society disguising itself, or of a social masquerade, so to speak, will be laughable. Now, such a notion is formed when we perceive anything inert or stereotyped, or simply readymade, on the surface of living society.[40]

This ready-made is the organized, schematic, static superstructure, insofar as it closes itself to the vivifying penetration of the spontaneous social life that infrastructures it. In this case, "we have rigidity over again, clashing with the inner

36 Alfred Fouillée, "La Question Morale: Est-Elle Une Question Sociale?" *Revue des Deux Mondes* 160, no 3 (1900): 481–512, 503.

37 Georges Gurvitch, "La Philosophie Sociale de Bergson," *Revue de Métaphysique et de Morale* 53, no. 3 (1948): 294–306.

38 Henri Bergson, *Laughter: An Essay on the Meaning of the Comic*, trans. Cloudesley Brereton and Fred Rothwell (New York: Macmillan, 1913 [1900]).

39 Gurvitch, "La Philosphie," 298.

40 Bergson, *Laughter*, 44.

suppleness of life. […] It might be said that ceremonies are to the social body what clothing is to the individual body."[41]

The ceremonies, the organized superstructures, Bergson tells us in a metaphor, in which the hot interior of the earth represents the infrastructure, are like a "a cool and solid crust [covering over] the fiery mass of seething metals"[42] of the living social spontaneity. For Bergson, says Gurvitch, in every social organization "there is an element of artificial mechanization requiring that social mobility be regulated by the immutability of a formula."[43] If the organization is entirely detached from the underlying spontaneous social infrastructure, it becomes "something mechanical encrusted upon the living."[44] Then, as Gurvitch paraphrases Bergson, social explosions occur, revolutions, as similar to "volcanic eruptions."[45]

Furthermore, Bergson has also applied the idea of an infra-versus supralogical structure to knowledge, specifically to the relation between representations and intuitions. He distinguishes between what he calls the *infra-intellectual* and what, as he says, he would call the *supra-intellectual*, "if the word did not immediately and exclusively evoke the idea of superiority of value: it is just as much a question of priority in time, and of the relation between that which generates and that which is generated."[46] In the case of the infra-intellectual, the intuition is a consequence of, and stirred by, an idea or mental picture independent of it, while in the case of the supra-intellectual, the intuition is not produced by a representation but is itself *productive* of ideas and representations. It is, "in relation to the intellectual states which are to supervene, a cause and not an effect."[47] Therefore, "it is pregnant with representations, not one of which is actually formed, but which it draws or might draw from its own substance by an organic development."[48]

Bergson does not establish a hierarchy of value between infra-intellectual and supra-intellectual processes of intuition and knowledge, which ultimately represent the two "sources of morality" of which speaks in the title of his book. Instead, he seeks to show that there is a continuity and reciprocity between the two.

French vitalist philosophy is not the only example for the application of the notion of infrastructure to ideational matters. Even in the discussions during and after the second world war, the concept of infrastructure was anything but restricted to material supply lines and pipes under the ground. Instead, it was explicitly, and

41 Bergson, *Laughter*, 44–45.

42 Bergson, *Laughter*, 159.

43 Gurvitch, "La Philosphie," 298; referring to Bergson, *Laughter*, 48 and 46.

44 Bergson, *Laughter*, 37, emphasis left out.

45 Gurvitch, "La Philosophie," 298; referring to Bergson, *Laughter*, 159.

46 Henri Bergson, *The Two Sources of Morality and Religion*, trans. R. Ashley Audra and Cloudesley Brereton (Westport: Greenwood, 1935), 36.

47 Bergson, *Two Sources*, 35.

48 Bergson, *Two Sources*, 35.

non-metaphorically, applied to imaginary, immaterial phenomena as well, e.g. to the religious foundations of belief systems.[49]

Most relevant for the French usage of the term "infrastructure" in a non-technical sense in the 20th century was probably the phenomenological philosopher Maurice Merleau-Ponty. In his early work, *The Structure of Behavior*, Merleau-Ponty develops a concept of structure that shows the formal characteristics identified above: a structure is a totality whose elements are not individually determined for themselves, but by their position in relation to each other in the whole; which admits transformations and substitutions, but not mere additions and subtractions; which is not changed by mere external influences, but obeys a law of self-regulation or self-organization. For Merleau-Ponty, structure is neither thing nor idea, it belongs neither to a pure external world nor to a pure internal world, and it subverts classical oppositions such as empiricism and rationalism, materialism and idealism, and the epistemological duality of subject and object. However, Merleau-Ponty also has a number of reservations against the term which result from the fact that the concept is used within a polarity between two extremes: in a volatile way, as mere forms of consciousness, and in a reifying and naturalizing manner. This is why Merleau-Ponty—drawing on different theoretical resources provided by Edmund Husserl[50]—introduces a hierarchical and yet integrative gradation of structure into infrastructure and superstructure.[51]

In particular, Merleau-Ponty uses the concept of infrastructure to denote the bodily grounded conditions of perception that adopt qualities of media but are themselves invisible to our perception and reflection. He thus speaks of a "humoral"[52] and "bodily infrastructure."[53] His interest is to identify existential,

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49 Charles Harold Dodd, *According to the Scriptures: The Sub-structure of New Testament Theology* (Digswell Place: Nisbet, 1952); translated as: *Conformément aux Écritures. L'infrastructure de la théologie du Nouveau Testament* (Paris: Éditions du Seuil, 1968).

50 These theoretical resources are too complex to be depicted here. They encompass Husserl's distinction between "theme" and "horizon," his ideas of "sedimentation," "passive synthesis," "appresentation," and "anonymity," as well as his concept of "operative intentionality" which Merleau-Ponty uses in specific ways informed by Gestalt theory and the philosophy of Aron Gurwitsch. See, e.g., Richard McCleary, "Introduction," in *Signs*, Maurice Merleau-Ponty (Evanston: Northwestern University Press 1964), ix-xxxiii.

51 Maurice Merleau-Ponty, *Signs* (Evanston: Northwestern University Press 1964), 165; Bernhard Waldenfels, "Die Offenheit sprachlicher Strukturen bei Merleau-Ponty" in *Maurice Merleau-Ponty und das Problem der Struktur in den Sozialwissenschaften*, ed**s.** Richard Grathoff and Walter Sprondel (Stuttgart: Enke, 1976), 17–28, 18–19.

52 Maurice Merleau-Ponty, *The Primacy of Perception* (Evanston: Northwestern University Press, 1964), 5.

53 Maurice Merleau-Ponty, *Phenomenology of Perception* (London: Routledge, 2012), 455; Maurice Merleau-Ponty, *In Praise of Philosophy and Other Essays* (Evanston: Northwestern University Press, 1963), 174.

intellectual, and social functions which are tied to this bodily infrastructure.[54] The importance of the bodily infrastructure cannot be overestimated, it is a "living infrastructure without which reason and freedom are emptied or break down."[55] Human action, subjectivity, and intersubjectivity, human temporality and sociality, and the human relations to the world are grounded in, and produced by, it as well as our everyday consciousness, "for which the world is 'self-evident,' that finds the world 'already constituted' and present even within consciousness itself."[56]

In his later work, Merleau-Ponty has particularly focused on the relevance of the visual senses for our everyday consciousness that assumes self-evidence, stability and continuity: Through vision, "this superstructure," as he calls it, "gains a relative independence with respect to praxical infrastructures."[57] It is our visual sense that, as part of our bodily infrastructure, suggests the stable objectivity of the external world—physical, social, and historical.[58] However, "the visible," which continuously tricks us into believing in the sheer "thereness" of the external world is, Merleau-Ponty says, "pregnant with the invisible."[59] It is based on its own invisible "infrastructure of vision."[60] Dreyfus and Dreyfus[61] give an example of this "infrastructure of vision:"

> For example, when I perceive an object, such as a house from the front, the back is involved in this perception not merely as a possible perception which I judge could be produced if I walked around the house, nor as a necessary implication of the concept 'house.' Instead, the back is experienced as actually co-present—concealed but suggested by the appearance of the front. Philosophers of ordinary language such as Gilbert Ryle have made a similar point by noting that under ordinary conditions we do not say that we see the front of a house but say that we see a house from the front. Both Merleau-Ponty and the Oxford philosophers would go on from such considerations to suggest there is something wrong with the traditional view that we experience 'sense data'—isolated units of experience, which must then be organized by the mind.

54 Merleau-Ponty, *Phenomenology of Perception*, 9; Maurice Merleau-Ponty, *The Visible and the Invisible* (Evanston: Northwestern University Press, 1968), 120; Merleau-Ponty, *Signs*, 118–119; Maurice Merleau-Ponty, *The Sensible World and the World of Expression: Course Notes from the Collège de France, 1953* (Evanston: Northwestern University Press, 2020), 112.

55 Merleau-Ponty, *Phenomenology of Perception*, 57.

56 Merleau-Ponty, *Phenomenology of Perception*, 479–480.

57 Merleau-Ponty, *The Sensible World*, 107.

58 Merleau-Ponty, *The Visible and the Invisible*, 144–145.

59 Merleau-Ponty, *The Visible and the Invisible*, 216.

60 Merleau-Ponty, *The Visible and the Invisible*, 145.

61 Hubert L. Dreyfus and Patricia A. Dreyfus, "Translators' introduction," in *Sense and Non-Sense*, Maurice Merleau-Ponty (Evanston: Northwestern University Press, 1964), ix-xxvii, xi.

With his conception of infrastructure, Merleau-Ponty has added a further chapter to the French usage of the concept of infrastructure which was started by the translation of Marx "basis" and "real foundation," by its application to immaterial phenomena by vitalist philosophy, and its usage for processes of knowledge by Bergson.

Merleau-Ponty's doubts about the concept of structure have influenced Jacques Derrida's infrastructural conception of structure. It states that infrastructure must be understood as difference between "the ground" and "what is grounded," as generative condition of both "possibility" and "impossibility."[62] In this model, different infrastructures (in Merleau-Ponty's sense) are able to coexist equiprimordially.

This second, parallel story of the concept of infrastructure indicates that their dominant conception as primarily material and technical and only secondarily, and only in a figurative sense, applicable to immaterial, imaginary, or practical phenomena is not accurate. The parallel story shows that material and immaterial infrastructures must be understood right from the start as equiprimordial, since it turns the (Marxian) ideology of the primordiality of the material-technical aspect of infrastructure into an empirical question: how do ideational, or symbolic, infrastructures, interact with material and technical ones?

This is where the greatest prospects of "infrastructuralism" and the "infrastructural turn" are located. One example of this new programmatic endeavour is provided by Marshall Sahlins. He used the term "infrastructuralism"[63] to designate his position vis-à-vis Lévi-Straussian structuralism. As Sahlins recalls, Lévi-Strauss once said that he was not interested in "the exchange of women or words" but in "infrastructure," i.e., "the exchange of vital goods and the specializations of production this entails."[64] Thus, Lévi-Strauss was interested in the basic—elementary—structures of the social—i.e., its infrastructures—which, in Lévi-Strauss, however, culturally laden and symbolic as they are, are not part of what Marx called superstructure. Rather the economic base, as Marx calls it, is for Sahlins itself an objectification of culture—mediated by "values."[65]

Thus, Sahlins' concept of "infrastructuralism" is intended to resolve "the long-standing opposition between praxis and culture by encompassing the former in the latter."[66] This allows, he says, to reconcile Lévi-Strauss' structuralist approach with techno-determinism, which assumes that the cultural order is a reflex of real-practical activity.[67] Sahlins' idea is that "rather than a discontinuity, temporal as well

62 Gasché, *The Tain of the Mirror*, 155–156.

63 Marshall Sahlins, "Infrastructuralism," *Critical Inquiry* 36 (2010): 371–385.

64 Quoted in Sahlins, "Infrastructuralism," 372.

65 Sahlins, "Infrastructuralism," 375ff.

66 Sahlins, "Infrastructuralism," 373.

67 Sahlins himself refers to Leslie White, *The Evolution of Culture* (New York: McGraw-Hill, 1959), 21–26. Other theories of media and technology determinism could be mentioned as well. See Sally Wyatt, "Technological Determinism Is Dead: Long Live Technological Determin-

as ontological, wherein culture appears as the symbolic afterthought of a material practice that has its own rationality, what is entailed in infrastructuralism is the realization of encompassing conceptual schemes in the particular material function of provisioning the society. Economy, one might even say, is the objectification of cosmology."[68] Thus, the notion of infrastructure helps Sahlins' to preserve his focus on material practice while abandoning its traditional (Marxist) emphasis. More precisely, Sahlins assumes a cultural infrastructure underlying the economic and technological infrastructures of social practice which is mediated by values and orients its materializations. With his argument, Sahlins emphasizes that theories of practice, which are even more relevant today in anthropology and sociology than when he wrote his text, need an answer to the question how practices are regulated and oriented, and the idea of cultural infrastructure is his answer to that question.

The second theorist of infrastructuralism is John Durham Peters[69] (followed by Rubinstein, Robbins, and Beal[70]). Theoretically most relevant for his approach are phenomenology (in particular Edmund Husserl and Martin Heidegger) as well as media theory (especially Marshall McLuhan and Harold Innis). On this basis, Peters advocates a media theoretic conception of infrastructure in a broad sense. For him, media must be understood as material processes extended in, and themselves extending, the world. Aligning to this tradition, he states: "Infrastructure was pushed beyond large, heavy systems to be a question of how basic categories and standards are formed, and how they are formed as ordinary. How the taken-for-granted gets constructed in the first place is a classic phenomenological question: how did the water ever become invisible to the fish?"[71] Since infrastructure is often defined by being "off the radar, below notice, or off stage," his basic theoretical question is: What is it that the structure is *infra* to?[72] The question is: what is generated when the process of generating itself is hidden in such way that the product appears naturally given? Peters, in his conception of infrastructuralism, emphasizes, like the phenomenological

ism," in *The Handbook of Science and Technology Studies*, 3rd Ed., ed. Edward J. Hackett et al. (Cambridge: MIT Press, 2008), 165–180; Allan Dafoe, "On Technological Determinism: A Typology, Scope Conditions, and a Mechanism," *Science, Technology, and Human Values* 40, no. 6 (2015): 1047–1076; Robert Heilbroner, "Technological Determinism Revisited," in *Does Technology Have History?*, eds. M. R. Smith and L. Marx (Cambridge: MIT Press, 1994), 67–78; Bruce Bimbe, "Karl Marx and the Three Faces of Technological Determinism," *Social Studies of Science* 20 (1990): 333–351.

68 Sahlins, "Infrastructuralism," 374–375.

69 Peters, *The Marvelous Clouds.*

70 Michael Rubenstein, Bruce Robbins, and Sophia Beal, "Infrastructuralism: An Introduction," *Modern Fiction Studies* 61, no. 4 (2015): 575–586

71 Peters, *The Marvelous Clouds*, 35.

72 Peters, *the Marvelous Clouds*, 36.

traditions, the aspect of the hidden, taken-for-granted nature of infrastructures as well as their generative capacities.

Conclusion

As we have seen in the review of the concept of "structure," what today is called "infrastructure" was in former times termed "structure," especially related to buildings for transport and the military. Especially in modernity, the concept of structure took on a life of its own and, with the identification and formulation of natural laws, assumed transcendental qualities when transferred to the realm of the social and cultural. More and more, "structure" replaced the idea of an unmoved *primum movens* that causally determines manifest phenomena.

The notion of infrastructure, though not fully developed theoretically, as we have seen, is partly intended to turn back to non-metaphysical conceptions of structure. These conceptions imply that all notions of sharedness, commonality, and jointness (e.g., shared knowledge, joint action, common meaning) must be abandoned and a logic of ongoing constitution is defended. Thinking in terms of infrastructure (i.e. asking for the systems and operations that are generative for the phenomena under study) allows us to study cultural and social phenomena systematically as achieved and not as given.

Another difference concerns the ontological status of infrastructure: infrastructures, different to structures, are not observed in regard to being either "models for" or "models of" and of being either latent or manifest. Rather, they are observed in regard to their materialities and materializations as well as practices in time. In particular, practices of "infrastructuring"[73] are viewed as constitutive of precisely those dimensions that are taken for granted and reified by, in, and through, the concept of structure. These dimensions include, for example, collectivities, or assumptions of shared, common, and joint phenomena (shared knowledge, joint action, common meaning). Rather, the concept of infrastructure, as we have seen in our second story, focuses on the conditions of possibility of these phenomena, in terms of their *production*, and do not rely on the assumption of pre-established meanings, or entities, as putatively given.

While the concept of structure assumes a causal chain between structures, which are latent, and appearances (or events), which are manifest, the concept of infrastructure, drawing in the phenomenological tradition, posits infrastructures as di-

73 Cristina Alaimo and Jannis Kallinikos, "Social Media and the Infrastructuring of Sociality," in *Thinking Infrastructures*, eds. Martin Kornberger et al. (Bingley: Emerald, 2019), 289–306; Volkmar Pipek, Helena Karasti, and Geoffrey Bowker, eds., *Infrastructuring and Collaborative Design*, special issue of *Computer Supported Cooperative Work (CSCW)* 26, no. 1–2 (2017).

alectic, in an epistemological twist: Focusing on one infrastructure invisibilizes others, upon which it is dependent. Moreover, the process of focusing itself is dependent upon an embedded (epistemic, cognitive) infrastructure that when focused on becomes its own object. This is where the greatest potentials of the concept of infrastructure—as contrasted to a concept of structure that is beyond remedy—are located.