Belgeo

Revue belge de géographie

4 | 2021

Relating physical and human geography

Disciplinary chasm: questions on identification and mending

Fracture dans la discipline : questions sur son identification et les possibilités de la dépasser

Cristian Suteanu

Electronic version

URL: <https://journals.openedition.org/belgeo/52842>

DOI: 10.4000/belgeo.52842

ISSN: 2294-9135

Publisher:

National Committee of Geography of Belgium, Société Royale Belge de Géographie

Electronic reference

Cristian Suteanu, "Disciplinary chasm: questions on identification and mending", *Belgeo* [Online], 4 | 2021, Online since 01 March 2022, connection on 04 March 2022. URL: <http://journals.openedition.org/belgeo/52842> ; DOI: <https://doi.org/10.4000/belgeo.52842>

This text was automatically generated on 4 March 2022.

Belgeo est mis à disposition selon les termes de la licence Creative Commons Attribution 4.0 International.

Disciplinary chasm: questions on identification and mending

Fracture dans la discipline : questions sur son identification et les possibilités de la dépasser

Cristian Suteanu

The author would like to thank Professors Lorenzo Bagnoli, Pierluigi Brandolini, Chris Kesteloot, and Anton Van Rompaey for their insightful feedback.

Introduction

- 1 When a large and well-established field of study presents a fracture that runs across its whole domain, it draws everyone's attention: unless, of course, the fracture has been there for such a long time, that it has become a familiar feature of the landscape. And even when this is the case, questioning still occurs from time to time, and people wonder anew about the reasons for its presence, and about its implications for those who live on either side of the fracture. This situation is particularly discernible in a field with a long scholarly tradition, like geography. In this article we address cleavages between physical geography and human geography; however, this is not meant to suggest that theirs is the only deep line of separation. In fact, the intellectual topography of the domain of geography presents multiple fracture lines, which differentiate areas of specialization that are more or less deeply separated from each other (Johnston, 1998). Nevertheless, the fracture between human and physical geography is by far the dominant aspect of disciplinary fragmentation. The non-quantitative approach often applied in human geography was accused of lacking rigour and generality (Bailey *et al.*, 1999; Myers, 2000). Conversely, it was claimed that physical geography "has failed to take seriously the environment in its social context and has largely eliminated human values, ethics, and injustice from its research domain" (Slaymaker, 2017), and that it is "philosophically empty" (Inkpen, Wilson, 2013).

- 2 Significant advances have been made in an effort to overcome such discrepancies, but we still do not have an answer regarding reliable ways of bridging the abyss between the two. In this context, many scholars on both sides of the chasm continue to work in their own field, without being perturbed by questions on the crossing of disciplinary boundaries. Indeed, the fragmentation of the disciplines can offer enhanced focus on thematical areas, increasing productivity. On the other hand, its limitations – when compared to more encompassing methodological approaches – have become increasingly obvious (Dogan, Pahre, 1990). In the case of geography, the implications of the disciplinary fracture go deeper than that. As Johnston (1998) noticed, at the end of the second millennium this issue was “more acute” than in other fields, since geography’s status as a discipline was at stake: this challenge has certainly not vanished in the meantime.
- 3 On a pragmatic level, a series of serious implications of the separation between the two fields can be identified. They can be disturbing, for instance, for scholars who are dedicating their work to an integrative approach to complex problems in geographical inquiry, and who witness first hand consequences of the contrasting approaches. On the other hand, such implications can hinder or completely block burgeoning trends towards interdisciplinarity and transdisciplinarity (Nicolescu, 2002; Nissani, 2005). The far-reaching differences between the two fields, which start from ontological roots and reach high into the methodological realm, make it difficult to even communicate between fields or between sub-fields situated on different sides of the fracture.
- 4 A problem of such caliber cannot be expected to be comprehensively treated at the scale of an article. Nor would it be possible to list and test the range of possible solutions to this problem. The goals of this article are more limited. On one hand, the paper explores some contributions to the long-lasting presence of the rupture between the two fields of geography. On the other hand, it investigates the effect of scholarly approaches to potential gap-healing, with an emphasis on their impacts in geography. Finally, it attempts to bring together outcomes of these considerations, and while contemplating the resulting picture, to ask questions about future perspectives regarding the disciplinary chasm.

A closer look at the fracture: positivism

- 5 “Let the comedy begin”. This is how Kierkegaard (1846/1989, p. 205) summarizes his views of any attempt to reach reconciliation between two radically different approaches to the world (in his case, this was about reason and faith). One could argue that when it comes to human and physical geography, the situation may be different. And yet, decades ago already, the compatibility of these two fields of geography was viewed with distrust and concern (Johnston, 1983; Stoddart, 1987). This attitude has not weakened in intensity. On the contrary, Slaymaker (2017) undertakes an insightful investigation into the main reasons for this situation, and finds that a major factor is physical geography’s adopted positivism, with its exclusive focus on the measurable and the empirically observable, on quantitative analysis and modeling. In fact, aspects of positivism have been found to undermine scholarly endeavours that are not limited to the natural sciences.
- 6 The concept of positivism, with its numerous strands, has often given rise to confusion, and has even been applied in ways that would have surprised its most fervent

supporters. When positivism is mentioned, the actual specific meanings that are implied are often left to the reader to figure out. However, positivism is far from representing a monolithic – even less so a stagnant – philosophical current. When he made his decisive contributions to positivism, Auguste Comte (1865/2009) focused on the urgent need for rigour in the development of human knowledge. He emphasized the importance of consistently applying the scientific method, including the empirical observation of facts, their assessment using mathematics, and their interpretation in the framework of theory. He advocated for the application of these principles both in the “physical sciences” and in the “social sciences”. The major goal was the discovery of scientific laws, which were expected to apply to all fields of inquiry, from physics and chemistry to the human behaviour. Positivism has subsequently evolved and changed in significant ways, but its later streams will not be described here. As a matter of fact, key elements of Comte’s approach, such as the emphasis on quantitative evaluation and the identification of laws, are still among the main factors involved in the fracture discussed in this article. These elements are also applied in physical geography today... and criticized for their limitations.

- 7 Positivism has been particularly attractive in science due to its emphasis on clarity: this involved rejecting anything that does not satisfy the condition of being clear enough. And yet, limitations of this approach were revealed even in physics: Heisenberg (1971, p. 213), for instance, pointed out that “if we omitted all that is unclear we would probably be left with completely uninteresting and trivial tautologies.” In the context of the mentioned fracture, problems arise especially when positivism states that real knowledge can only be scientific, and as such it has to rely on measurable quantities. “Be measurable, or disappear!” is the warning of Lyotard (1979) in his postmodernism manifesto. Attempting to treat this idea in the field of human geography promises to lead directly to the above-mentioned sarcastic observation of Kierkegaard’s.
- 8 Schaefer (1953) argued from a positivist position that geography must leave behind its “fact-gathering phase” and become a science: geography was expected to be focusing on the identification of laws, especially those that govern spatial features and their distribution in space. It may seem surprising nowadays that by promoting the need for geography to adopt rigorous, quantitative methodology, he wanted to support the emergence of a unifying language, capable of bringing together human geography and physical geography. The quantitative revolution was subsequently vigorously advocated in human geography (e.g. Haggett, 1965): it was considered to eliminate subjectivity and vagueness by using systematically acquired data about objective facts, in order to establish “universal” laws. Positivism worked thus inside the realm of geography, by shifting the weight of research towards spatial science and statistical analysis, with the goal of establishing causal relationships and spatial laws (Hill, 1981). The enthusiasm for a positivistic attitude in geography gradually waned when it became clear that it is essentially incapable of grasping important elements of human thinking and feeling, values and views – including political views, leaving key geographical phenomena out of reach (Gregory, 1978).
- 9 On the other hand, efforts dedicated to the bridging of the disciplinary fracture emerged in both fields. Spatial analysis – supported by a fast-developing GIS theory and technology – has kept advancing on the path of scientific inquiry (Duckham *et al.*, 2003). Nevertheless, it recognized the limitations imposed by a positivist algorithmic approach, and realized the need for a nuanced way of looking at real-world problems.

Therefore, methodological solutions were developed to take in consideration incompleteness of data, ill-defined problems, and human subjectivity (Leung, 2009). Remote sensing was also gradually incorporated in ethnographic research (Jiang, 2003).

- 10 On the human geography side, Anne Buttimer (1974, 1994) developed a “post-positivist”, strongly interdisciplinary, comprehensive approach to the planet as human habitat, which integrated subjective human perceptions, attitudes, and values, as well as objectively analyzed physical environments on a range of scales. Later, in her “hybrid geographies”, Mei-Po Kwan (2004) focused on “hybrids” – both human and nonhuman entities that interact, creating and transforming geographical spaces. Thereby she integrated spatial analytical methods and lived experiences, including elements of knowledge, power, and social change.
- 11 In spite of such scholarly remarkable achievements, the overall picture of the field turned out to be subject to change, but not to fundamental change. Physical geography continued to be increasingly strong in the realm of science, growing along with other branches of the natural sciences. Its main instruments did not suffer a radical transformation in contact with integrative or hybrid projects. Its success did not appear to have a large influence on its dedication to the scientific method, with its strengths and limitations. One may wonder why scholarly efforts from both fields did not lead to a gradual overturn in the context of disciplinary separation. Bringing the sides of the fracture closer together seemed to require more than that – or something entirely different.
- 12 In fact, if the opportunities to bridge the fracture between physical and human geography depend on either the former giving up what has been seen as its most successful instrument, or the latter adopting it (or at least recognizing it as a valid approach to the problems studied by geography), these opportunities look rather weak. Olav Slaymaker (2017) points instead to a different approach to fracture healing: a comprehensive one, recognizing the limitations of positivistic narrowness, but also embracing diversity in terms of problem-posing and methodology. He recognizes these features in critical realism (Bhaskar, 1989), which can overcome the nature-culture dichotomy. Without a major change, Slaymaker warns, we will continue to have a field called physical geography that is incapable of moving beyond quantitative analysis and physical process modeling, and unable to consider invisible factors such as ethics, human values, human perception of risk, not to mention issues of social justice.

Another look at the fracture: time and change

- 13 And yet another fracture – running deep, even if less visibly, between the two fields – can be identified. It is overlapping with the one examined above (since it shares some of its sources), but only partially so. The tip of the problem became visible in the 6th century BC, when two towering figures emerged at the opposite ends of the territory of Ancient Greece: Heraclitus in the east, and Parmenides in the west. Both had their roots in the Ionian heart of the territory, but their doctrines on the fundamental question of time and change couldn’t be more different. To state their positions in a drastically simplified form, Parmenides claimed that nothing can change – change is, actually, an illusion, while Heraclitus stated, according to the dominant interpretation, that there is nothing but change – everything, other than change, is mere appearance (Kahn, 1981;

Kirk, Raven, 1983). Remarkably, these alternative views of the world have been following us throughout our history ever since.

- 14 Among the two, it is Parmenides' view that seems to be the most difficult one to reconcile with daily experience. And yet, it was its direct descendant that was absorbed in the natural sciences, as one of its firm and unyielding principles (Popper, 1998). The role of Plato in this regard can hardly be overemphasized: for him, what was "real", the Forms, belonged to the everlasting, the permanent and unchanging realm, whereas appearances – the physical world – was subject to unrelenting change: in the end, the insights of Parmenides and Heraclitus both touched the very core of reality, but they referred to ontologically different domains. Such a distinction can still be found, in one form or another, in science. An often-cited statement of Einstein (1922) points in a similar direction: "As far as the laws of mathematics refer to reality, they are not certain; and as far as they are certain, they do not refer to reality". The work where it appears, "Geometry and Experience" (Einstein, 1922), stipulates with utmost clarity the distinction between two realms. The "real world" should not be considered to be "in exact correspondence" with theory; mathematics and real objects have a fundamentally distinct status. We are definitely interested in both: we study the ephemeral events, the changing processes, in order to extract the permanent, the unchanging, the laws governing them all.
- 15 Expectedly, the natural-science-dedicated field, physical geography, has consistently adopted this worldview, with all its methodological consequences. This includes, on one hand, a keen interest in establishing general features and laws, and on the other hand, an immovable indifference towards particular, individual events – unless they can be used in the study of general laws that must be at work in each of them. On the contrary, the human geographer often finds essential insights in the uniqueness of certain events or situations, which quantitative approaches – interested only in "the general" – can crush into useless heaps of indiscernible mixtures. Differences in terms of attitude towards permanence vs. change, the immovable vs. the ever-changing, go beyond the consequences of positivism.
- 16 It would be hard to find a better epitome for geography than a map. Maps are part of an uncontested core, both in human and in physical geography. Maps provide a clear and concrete proof for the common core of the two fields. No fracture runs deep enough to break that core. When designing an approach to heal or suppress the existing chasm, one could thus begin from what the two fields have in common, and a strong element in that core is the map.
- 17 Maps, however, have an intriguing relationship with time. They are designed to refer to reality at one given moment, not to its change. This becomes particularly obvious when they are made to reflect change. Foreign elements are brought in for the purpose. Arrows are added, trajectories are drawn as dotted lines, possibly with time stamps distributed along the line to specify successive locations of an expedition or a hurricane. Sets of maps placed side-by-side can be designed to suggest a process of change. While such elements can usually be unambiguously interpreted, they are external to the essence of a map. The digital revolution, having geographical information science and technology among its most powerful drivers, has made it easy to navigate over different parts of the map, to change scale at will, to add one information layer or another. GIScience and technology make it thus easier to address change. However, the essence of the map remains the same. The map as such, a core

feature that both fields have in common, pushes the balance towards the “no change” side.

- 18 It is not surprising to see physical geography embracing the natural science view of time, including the value of general laws, even when change lies right in the focus of research. For instance, Phillips (2018) studied the variability in environmental transformations, recognizing the changing nature of Earth systems, but he mainly emphasized the laws governing any evolution of landscapes. An older and more subtle form of the conception on permanence and lack of change was the idea that “balance” is the natural state of environmental systems: the latter are expected to last unchanged indefinitely, unless external disturbances intervene, producing transformations. This view, which has mainly dominated approaches to ecosystems, has been proven wrong, and convincingly so (Cuddington, 2001; Simberloff, 2014). Approaches in human geography are different. One of the most influential geographers of the last century, Carl Sauer, established a way of thinking that emphasized the interaction between changing physical and cultural landscapes (Denevan, Mathewson, 2009) and the value of individuality and uniqueness, in processes that were “contingent” and “disordered” (Williams *et al.*, 2014). Another prominent human geographer, Yi-Fu Tuan (1991), not only highlighted the variable interplay of various forces at work to show “how places are made”: he also underlined the invisible, but powerful role that language plays in processes of interaction and change. Emphasis on change – and most importantly, not on the mere existence of change, but on the meaningfulness of actual change, compared to its immutable underlying mechanisms – characterizes much of the work in human geography. Even critical realism, mentioned above as a way of addressing the disciplinary fracture, was explicitly shown to operate in the time domain of Heraclitus (Graeber, 2001). One can thus notice that what distinguishes and even separates the two fields is not only “nature” vs. “culture”, “objective physical processes” vs. “emotional connection to landscapes”, etc., but also a Parmenidean vs. a Heraclitean worldview: an emphasis on persistence vs. change, invariance vs. variability.

Crossing the chasm: the nonlinear bridge

- 19 Nonlinear theory is not new. It emerged several decades ago, but it has been growing fast – not as an isolated core, but as a network of interrelated streams flowing in multiple domains. In this paper, the term “nonlinear theory” is applied to mean the ensemble of theories and methods developed in complexity theory, dynamic systems theory, fractal theory, chaos theory, self-organizing system theory, dissipative system theory, network theory, etc. The question that we ask in this context refers to the extent to which nonlinear theory, when understood and properly applied, has the potential of creating bridges between the two fields.
- 20 Suspicion naturally arises about nonlinear theory being possibly endowed with strengths in the realm of physical processes, but suffering from well-known weaknesses when used elsewhere. In fact, developed in science, nonlinear theory has a proven record of successful applicability on both sides of “the fracture” (Suteanu, 2005). This approach to reality is not proposed here as a solution to the challenge of the disciplinary chasm, but as a tool that has the potential of moving us further, in meaningful ways, in many areas of that challenge. It is not possible to draw even a brief outline of nonlinear theory and its branches within the limits of this article. Instead,

using application examples, we will attempt to shed some light on certain features to be expected from nonlinear theory in the described context.

- 21 The shortcomings of positivist approaches using hierarchic organization of systems – e.g. the “local vs. global” dichotomy – can be avoided with nonlinear theory, due to its multiscale and inter-scale relationship methodology (Lee, 1997). Approaches in terms of hard vertical control relationships can be replaced with dynamic relationships encompassing different levels, with system properties penetrating, changing, and exerting their influence from one level to another (Mayntz, 1997). In this context, John Urry (2005) approaches the phenomenon of globalization involving a series of adapting, co-evolving global systems, each associated with its characteristic unpredictability, and obtains the picture of a complex world that is “disordered”, but not random or anarchic. Clark (2005), a geographer focusing on ethical aspects of hazard-facing life, uses complexity theory to capture human undecidability. Connectivity phenomena in a complex society are studied in the light of self-organization principles by Cetina (2005). Nonlinear theory offers a conceptual framework that was unthinkable for the positivist scholar: for instance, Mackenzie (2005) demonstrates how it can help the conceptualization of feeling or sensitivity. Other application examples refer, for instance, to drinking water (Li *et al.*, 2020) and neighbourhood planning (Zhang *et al.*, 2020). On the other hand, as expected, nonlinear theory has also been used in a wide range of applications involving physical systems of major interest in geography (Phillips, 2006; Suteanu *et al.*, 2018; Volchenkov, 2021).
- 22 As pointed out by Slaymaker (2017), scientific methods often involve distinct, unrelated methods applied to specific spatio-temporal scales: this scale-conditioned fragmentation can hinder an understanding of the complexity of real-world phenomena. Scales should highlight and uncover, not hide connections (Urry, 2003, p. 122). In fact, in the framework of nonlinear theory, relevant phenomena are studied across a fluid range of spatial and temporal scales, and relations between processes on different scale ranges are identified and described. A flexible “lens” is used to zoom in or zoom out, not only to study a process in space or time, but also to explore relationships as they extend in a certain way over some scale intervals, and in other ways over different scale ranges (Lovejoy, 2019).
- 23 Another shortcoming of positivism, which is overcome in nonlinear theory, is its exclusive focus on generality and repeatability, and consequently its blindness with respect to individuality and uniqueness. In nonlinear theory, the fact that each “trajectory” is unique does not decrease its relevance. The sensitive dependence on initial conditions, which is typical of chaotic systems, changes the meaning of our expectations of repeatability, leading to new approaches capable of making sense of both individuality and strong space-time variability. Using one and the same approach (Lovejoy, 2019), one can capture both the individual events (the change), and the invariants (the permanent), which bridges the Parmenides-Heraclitus antagonism. Also, unlike the familiar positivist methodologies, nonlinear theory can be deeply metaphorical (Thrift, 1999): notwithstanding the dangers involved by an inadequate usage of this feature, it can produce imagery that supports a more profound and nuanced kind of communication.
- 24 These elements point to reasons why we should pay attention to the growing domain of nonlinear theory. The more important question, however, is whether or not there is hope to see it growing into – rather than only contributing to – the mending of the

disciplinary chasm. We will argue in the next chapter that the latter might not be achievable by nonlinear science alone.

Preliminary conclusions

- 25 It is prudent to admit, in our view, that given the complexity of the problem, only preliminary conclusions should be drawn from this brief investigation. We are witnessing a major fracture. It affects individual researchers, it affects research projects, it affects those who teach and those who are taught, and more importantly, it affects the very essence of geography, which makes the problem persist and possibly to grow in time. Its implications have consequences that go beyond disturbing limitations to scholarly accomplishment. If geographers are forced into a fragmented structure, incapable, for instance, to embrace causal factors in human interaction with physical processes, along with aspects of ethics, social injustice, and the condition of the underprivileged (Sen, 2009), no wonder that frustration is associated with an acute feeling of responsibility.
- 26 Nonlinear theory, with all its strengths, should not be expected to effectively operate with intangibles – with values, with human emotions – in a deep and yet practically applicable way. In spite of its potential to support our understanding of complex phenomena, it can only take us on a limited portion of the journey. At least in its current form, certain areas of human endeavor are out of its reach. In fact, we should probably not expect the same instruments to be applicable to distinct realms, no matter how advanced those instruments are.
- 27 Under these circumstances, it may seem reasonable to conclude that it should be enough to explicitly allow distinct approaches, distinct views, to live and thrive at the same time. It might be enough to “create space” for each of them to act side-by-side. After all, geography has a good handle on space. Several of the above-mentioned bridges incorporate the allocation of space for different or even contrasting positions.
- 28 Allowing space for the other is necessary, but insufficient. This amounts to what is usually called “tolerance”. In spite of what has often been suggested, tolerance is not the opposite of intolerance. Tolerance is only one step away from intolerance. It is a step in the right direction, but it should not be an end goal. Injustice, prejudice, and discrimination cannot be addressed at a fundamental level with tolerance. The dangerous nature of this notion stems from two main sources: its appearance as an authentic solution to intolerance, and its ability to wait in the shadows, until the threshold is reached when it flips into intolerance. Tolerance is essentially a temporary notion: one tolerates more and more, until tolerating is not found to be acceptable any longer. Tolerance is also a deprecating notion: it typically implies looking down on those who are tolerated. Notwithstanding its merits compared to intolerance, tolerance is far from involving true acceptance and appreciation. The latter notions may not capture the essence of where we want to go, but they are getting quite close. And if an aspiration towards *embracing* the other sounds inexcusably idealistic and impracticable, then *respect* may be a more easily acceptable goal. This can be true as long as respect is not flowing from the wrong sources – fear from something more powerful, angst in the face of the incomprehensible. Respect, and especially mutual respect, can help when it is based on genuine understanding and acceptance of the other’s values.

- 29 In the end, beyond all the differences in terms of views, objectives and methodologies, the two fields of geography seem to be separated by obstacles that prevent them from recognizing the other field's values. This creates a context for circular, endless impediments in communication. As long as the value of the work in the other field is perceived as minor, establishing a dialog is very difficult. Without dialog, the chances for mutual recognition are low, and dialog keeps being discouraged. On the other hand, as soon as the effort of the sister domain is perceived as valuable, the dialog can flow, driving both fields forward. As pointed out by Slaymaker (2017), "conversation is needed". It goes without saying that in order to be potentially successful, conversation must be based in genuine effort to leave behind tolerant attitudes. It can start from trust – and from curiosity. Trust in the fact that if, undeniably, the inhabitants from the other side of the fracture are dedicating their best efforts to a certain type of work, there should be some kind of values associated with it, even if we cannot see them for the moment. And curiosity to find out what those values are. Once we extend our views beyond the polite acknowledgement of the others, and reach true values in their work, communication will develop. There is no way to tell how far mutual discovery and cross-fertilization can go.

BIBLIOGRAPHY

- BAILEY C., WHITE C. & PAIN R. (1999), "Evaluating qualitative research: dealing with the tension between 'science' and 'creativity'", *Area*, 31, 2, pp. 169-178.
- BHASKAR R.A. (1989), *Reclaiming Reality: A Critical Introduction to Contemporary Philosophy*, London, Verso.
- BUTTIMER A. (1994), *Geography and the Human Spirit*, Baltimore, MD, The Johns Hopkins University Press.
- CETINA K.K. (2005), "Complex global microstructures: the new terrorist societies", *Theory, Culture & Society*, 22, 5, pp. 213-234.
- CLARK N. (2005), "Ex-orbitant globality", *Theory, Culture & Society*, 22, 5, pp. 165-186.
- COMTE A. (2009), *A General View of Positivism*, Cambridge, Cambridge University Press (originally published by Trubner and Co., 1865).
- CUDDINGTON K. (2001), "The 'Balance of Nature' Metaphor and Equilibrium in Population Ecology", *Biology and Philosophy* 16, pp. 463-479.
- DENEVAN W.M., MATHEWSON K. (eds.) (2009), *Carl Sauer on Culture and Landscape: Readings and Commentaries*, Baton Rouge, LA, Louisiana State University Press.
- DOGAN M., PAHRE R. (1990), *Creative Marginality: Innovation at the Intersections of Social Sciences*, Boulder, Westview Press.
- DUCKHAM M., GOODCHILD M.F. & WORBOYS M. (eds.) (2003), *Foundations of Geographic Information Science*, Clermont, FL, CRC Press, LLC.

- EINSTEIN A. (1922), *Sidelights on Relativity. I. Ether and Relativity. II. Geometry and Experience*, London, Methuen and Co. Ltd.
- GRAEBER D. (2001), *Toward an Anthropological Theory of Value: The False Coin of Our Own Dreams*, New York, Palgrave Macmillan US.
- GREGORY D. (1978), *Ideology, Science and Human Geography*, London, Hutchinson.
- HAGGETT P. (1965), *Locational Analysis in Human Geography*, London, Edward Arnold.
- HEISENBERG W. (1971), "Positivism, metaphysics and religion", in NANSSEN R.N. (ed.), *Werner Heisenberg - Physics and Beyond, Encounters and Conversations*, New York, Harper and Row.
- HILL M.R. (1981), "Positivism: a 'hidden' philosophy in geography", in HARVEY M.E., HOLLY B.P. (eds.), *Themes in Geographic Thought*, London, Croom Helm, pp. 38-60.
- INKPEN R., WILSON G. (2013), *Science, Philosophy and Physical Geography*, Abingdon, Routledge.
- JIANG H. (2003), "Stories remote sensing images can tell: Integrating remote sensing analysis with ethnographic research in the study of cultural landscapes", *Human Ecology*, 31, pp. 215-232.
- JOHNSTON R.J. (1998), "Fragmentation around a defended core: the territoriality of geography", *The Geographical Journal*, 164, 2, pp. 139-147.
- KAHN CH.H. (1981), *The Art and Thought of Heraclitus - A New Arrangement and Translation of the Fragments with Literary and Philosophical Commentary*, Cambridge, Cambridge University Press.
- KIERKEGAARD S. (1989), *Concluding Unscientific Postscript to Philosophical Fragments*, Princeton, NJ, Princeton University Press (originally published by Reitzel in 1846).
- KIRK G.S., RAVEN J.E. (1983), *The Presocratic Philosophers: A Critical History with a Selection of Texts*, Cambridge, Cambridge University Press.
- KWAN M.-P. (2004), "Beyond difference: From canonical geography to hybrid geographies", *Annals of the Association of American Geographers*, 94, 4, pp. 756-763.
- LEE M.E. (1997), "From Enlightenment to Chaos", in EVE R.A., HORSFALL S. & LEE M.E. (eds.), *Chaos, Complexity and Sociology*, London, Sage Publications, pp. 15-29.
- LEUNG Y. (2009), "Fuzzy set and fuzzy logic", in KITCHIN R., THRIFT N. (eds.), *International Encyclopedia of Human Geography*, London, Elsevier.
- LI L., RONG S., WANG R. & YU S. (2020), "Recent advances in artificial intelligence and machine learning for nonlinear relationship analysis and process control in drinking water treatment: A review", *Chemical Engineering Journal*, 405, 126673.
- LOVEJOY S. (2019), *Weather, Macroweather, and the Climate*, Oxford, Oxford University Press.
- LYOTARD J.F. (1979), *La condition postmoderne: rapport sur le savoir*, Paris, Editions de Minuit.
- MACKENZIE A. (2005), "The problem of the attractor: a singular generality between the sciences and social theory", *Theory, Culture & Society*, 22, 5, pp. 45-66.
- MAYNTZ R. (1997), "Chaos in society: Reflections on the impact of chaos theory on sociology", in GREBOGI C., YORKE J.A. (eds.), *The Impact of Chaos on Science and Society*, Tokyo, United Nations University Press, pp. 298-323.
- MYERS M. (2000), "Qualitative research and the generalizability question: Standing firm with Proteus", *The Qualitative Report*, 4, 3.
- NICOLESCU B. (2002), *Manifesto of Transdisciplinarity*, New York, State University of New York (SUNY) Press.

- NISSANI M. (1995), "Fruits, salads, and smoothies: A working definition of interdisciplinarity", *The Journal of Educational Thought/Revue de la Pensée Éducative*, 29, 2, pp. 121-128.
- PHILLIPS J.D. (2006), "Deterministic chaos and historical geomorphology: A review and look forward", *Geomorphology*, 76, pp. 109-121.
- PHILLIPS J.D. (2018), "Place formation and axioms for reading the natural landscape", *Progress in Physical Geography: Earth and Environment*, 42, 6, pp. 697-720.
- POPPER K. (1998), "Beyond the search for invariants", in PETERSEN A.F. (ed.), *The World of Parmenides*, London, Routledge, pp. 165-251.
- SCHAEFER F.K. (1953), "Exceptionalism in geography: a methodological examination", *Annals of the Association of American Geographers*, 43, pp. 226-249.
- SIMBERLOFF D. (2014), "The 'Balance of Nature' – Evolution of a Panchreston", *PLoS Biology*, 12, 10, e1001963.
- SLAYMAKER O. (2017), "Physical geographers' understanding of the real world", *The Canadian Geographer*, 61, 1, pp. 64-72.
- STODDART D. (1987), "To claim the high ground", *Transactions of the Institute of British Geographers*, 12, pp. 327-336.
- SUTEANU C. (2005), "Complexity, science and the public: the geography of a new interpretation", *Theory, Culture & Society*, 22, 5, pp. 113-140.
- SUTEANU C., LIUCCI L. & MELELLI L. (2018), "The Central Italy seismic sequence (2016): spatial patterns and dynamic fingerprints", *Pure and Applied Geophysics*, 175, 1, pp. 1-24.
- THRIFT N. (1999), "The place of complexity", *Theory, Culture & Society*, 16, 3, pp. 31-69.
- URRY J. (2003), *Global Complexity*, Cambridge, Polity Press.
- URRY J. (2005), "The complexities of the global", *Theory, Culture & Society*, 22, 5, pp. 235-254.
- VOLCHENKOV D. (ed.) (2021), *Nonlinear Dynamics, Chaos, and Complexity*, New York, Springer.
- WILLIAMS M., LOWENTHAL D. & DENEVAN W.M. (2014), *To Pass on a Good Earth: The Life and Work of Carl O. Sauer*, Charlottesville, University of Virginia Press.
- TUAN Y.-F. (1991), "Language and the making of place: A narrative-descriptive approach", *Annals of the Association of American Geographers*, 81, 4, pp. 684-696.
- ZHANG W., ZHAO Y., CAO X., LU D. & CHAI Y. (2020), "Nonlinear effect of accessibility on car ownership in Beijing: Pedestrian-scale neighborhood planning", *Transportation Research Part D: Transport and Environment*, 86, 102445.

ABSTRACTS

While the fracture separating human from physical geography is not new, its pervasive presence appears to hurt scholarship even more deeply than in the past. This article formulates questions about the major factors that are responsible for the current separation, and explores realistic opportunities for fracture-healing. The identified obstacles reach beyond the effects of positivism: the paper recognizes the role of differences in the meaning and value assigned to change and time. Nonlinear theory is shown to operate far from the expectations related to positivism, in innovative, fluid ways, both in physical geography and in human geography. Notwithstanding nonlinear theory's potential to act as a builder of bridges, the article argues

that neither this, nor other methodological instruments can mend the disciplinary fracture, as long as the question of the mutual recognition of value is not openly addressed. The resulting renewal and cross-fertilization are worth the effort.

Bien que la fracture séparant la géographie humaine de la géographie physique ne soit pas nouvelle, son omniprésence semble nuire à cette discipline, aujourd'hui encore plus que dans le passé. Cet article pose des questions sur les principaux facteurs responsables de la séparation et explore des possibilités réalistes de guérir ces fractures. Les obstacles identifiés vont au-delà des effets du positivisme : on reconnaît le rôle des différences concernant le sens et la valeur attribués au changement et au temps. On montre que la théorie non-linéaire offre des résultats inventifs et fluides, tant en géographie physique qu'en géographie humaine, qui sont très différents des attentes liées au positivisme. En dépit du potentiel de la théorie non-linéaire à agir comme un constructeur de ponts, l'article soutient que ni cet instrument, ni d'autres instruments méthodologiques ne peuvent réparer la fracture disciplinaire, tant que la question de la reconnaissance mutuelle des valeurs n'est pas ouvertement abordée. Le renouvellement et la fécondation qui en résulteront en valent la peine.

INDEX

Keywords: physical geography, human geography, nonlinear theory, time, change

Mots-clés: géographie physique, géographie humaine, théorie non-linéaire, temps, changement

AUTHOR

CRISTIAN SUTEANU

Department of Geography and Environmental Studies, and Department of Environmental Science, Saint Mary's University, Halifax, Canada, cristian.suteanu@smu.ca