Belgeo

Revue belge de géographie

4 | 2021

Relating physical and human geography

Human and physical geography and the question of space

Géographie humaine, géographie physique : questionner l'espace

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Electronic version

URL: <https://journals.openedition.org/belgeo/52790>

DOI: 10.4000/belgeo.52790

ISSN: 2294-9135

Publisher:

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

Electronic reference

Kevin Cox, "Human and physical geography and the question of space", *Belgeo* [Online], 4 | 2021, Online since 01 March 2022, connection on 04 March 2022. URL: <http://journals.openedition.org/belgeo/52790> ; DOI: <https://doi.org/10.4000/belgeo.52790>

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Human and physical geography and the question of space

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Kevin Cox

Many thanks to Chris Kesteloot for his careful reading and for helping me see where clarification of the argument was necessary.

Context

- 1 Human and physical geography are both evidently 'geographic'. They are both concerned with differentiation over the earth's surface. A concern with spatial arrangement is fundamental to both, even while the more concrete concepts vary: so continentality and storm tracks in climatology, drainage basins and outliers in geomorphology, and central places and hinterlands in human geography. In physical geography, we can also note a stronger vertical component in concepts of space: air rising over mountains, water flowing downhill and so on; but that is not significant for what follows. For regardless, even while space relations are central to what physical geographers do and what they regard as significant, they do not obsess about it in the way that human geographers do and write books about it (Gregory, Urry, 1985; Harvey, 1982; Massey, 2005). It is by no means sidelined. A comparison of the two Blackwell Dictionaries, *The Dictionary of Human Geography* and *The Encyclopedic Dictionary of Physical Geography* is fascinating in this regard: a multitude of maps in the latter and very few in its human geography counterpart. And then in addition, to complement its concern with the vertical aspects of space, lots of block diagrams. Space relations are simply assumed and not found worth examining for their own sake. Exploring why this is the case, will contribute to an understanding why the two sub-fields have diverged to the degree that they have.
- 2 To anticipate what follows, I am going to argue that in the first place, it is a matter of different conceptions of space; and in the second, why such different conceptions have

prevailed. In human geography, and despite recent attempts to move away from it, a conception of space as relative tends to prevail. Space exists because objects exist: it is relative to objects, as in distance from, to, away from, at the center of, and so on, but those objects are understood as separable from their space relations so that one can talk about, for instance, the ‘effects’ of distance, nodality or accessibility on them. In physical geography, on the other hand, space is implicitly relational, space is conceived as internally related to substance, and this has always been the case. Fluvial erosion necessarily assumes water moving downhill; sea breezes necessarily assume the juxtaposition of surfaces heating and cooling at different speeds. The substance, the breeze, is implicit in a particular geographic configuration. This will then help us appreciate the two different approaches to the question of space relations and convergence that emerged since the spatial-quantitative revolution: Bill Bunge’s (1962) attempt in *Theoretical Geography* to see both sub-fields in terms of relative space; and Doreen Massey’s (1999) conception of them as both ‘historical and complex sciences’ where relational space rules. This is then followed by a critical discussion to determine just why it is that human geographers, Massey included, still do not understand the fundamental issue; while, to the extent that they are concerned, physical geographers struggle to understand human geography’s obsession with space as a thing apart.

Conceptions of space in geography

- 3 In the introduction to his (1973) path-breaking book, *Social Justice and the City*¹, David Harvey outlined three different conceptions of space: space as absolute, relative and relational. To think of space as absolute, means understanding it as existing in and of itself without any relations to substance, as mere point or container: a particular intersection of longitude and latitude or an enclosed area like the Lake District or Ohio or even a residential lot – just empty and without reference to similar emptinesses elsewhere.
- 4 Once substance, differentially distributed across the earth’s surface, enters in, then places can be considered in their relation to other places: as lying in another city’s hinterland, or distributed in a linear form like the tectonically active areas of the Pacific’s ‘ring of fire.’ The residential lot is now considered in terms of distance from schools or places of work. In this conception, places exist independently of one another and preserve their essential character. As its relative location changes, in virtue of, perhaps, transport innovations, then a city can change quantitatively but not in its essential characteristics: its population grows or declines. Likewise, a river capture simply alters the discharges of different streams.
- 5 In relational space, on the other hand, questions of substance enter into how space is conceived. Something like the spatial division of labor where firms in particular cities are connected through the different roles that they perform for firms in other cities is an example of a relational space. In this instance, cities are what they are in virtue of their relations with other cities: they internalize aspects of elsewhere – coal mining only makes sense in terms of steel mills at other locations. The rent that can be appropriated from a particular residential lot can be regarded as an expression of a multitude of substantive connections: a particular school district, local government taxes, location in a city differentiated by exposure to pollution. This sort of reasoning is typical of physical geography: no deposition without erosion somewhere else – and,

incidentally, something crucial in reconstructing drainage diversions. No land and sea breezes without the differential heating and cooling properties of land and water. And in virtue of their geological origin, glacial erratics help reconstruct the advances of the Pleistocene ice sheets. How these different conceptions apply to human geography and to geomorphology and climatology respectively is exemplified in Table 1.

Table 1. Three conceptions of space exemplified.

	HUMAN GEOGRAPHY	GEOMORPHOLOGY	CLIMATOLOGY
ABSOLUTE	Belgium The Manufacturing Belt	The Great Lakes The Massif Central	The tropics London's climate
RELATIVE	Networks Time-space budgets	Morphometry of cirques Scarp and dip topography	Valley fogs Rain shadows
RELATIONAL	Chain migration The international division of labor	Climatic geomorphology The transience of lakes	The Gulf Stream and the climate of Western Europe The Asian monsoon and the differential heating of the Asiatic landmass

- 6 As Harvey points out, none of these conceptions are right or wrong in themselves; merely useful for particular purposes. Dividing space up into the absolute spaces of countries is important for capitalists rooted in particular places and anxious about the control of trade flows. The BBC shipping forecast with its different 'sea' or 'weather' areas – Bailey, Rockall, Wight, Dogger, and so on – is designed for the fishing industry. To talk of the South Downs and the Yorkshire Wolds, might be simply prefatory to a comparative study and requires no information about their respective space relations. States in the US promote themselves through their 'business climate' but without reference to locations relative to other states nor yet of the particular US-wide forces that allow them to talk about distinct business climates to start with.
- 7 On the other hand, when, say, scheduling daily activities, as in Hägerstrand's time-geography (1970), the locations of different places relative to one another – the post office, the super market, the gas station – become important: how to organize a trip so as to minimize the distance or rather the time-distance entailed. In geomorphology, the various morphometric measures provide useful preparatory information when trying to understand different sorts of topography as Strahler (1980) argued and Chorley and Morgan (1962) affirmed. Terjung (1976) made similar claims when discussing climatology for geographers. In short, drawing on conceptions of relative space can be useful in a descriptive sense.
- 8 But while for Hägerstrand's time-space traveler, it is a matter of relative location, for the firm operating the supermarket, flows of people, potential and actual, are a crucial aspect of why it is where it is and why it stocks the sorts of foods it does; it internalizes relations with its market area and reflects its characteristics. It is not just a matter of nearness but of flows of actual consumers with particular sorts of tastes and the

pattern of highways that enhances access; the supermarket is part of a wider structure of social relations, therefore, and its location relative to others will reflect personal transport possibilities. In physical geography, this sort of relational space is taken for granted. Floods disclose what has been going on, on the watersheds, particularly to vegetative cover, as well as the porosity of the rock. Periods of intensified erosion are to be understood in terms of these relations.

- 9 One way of grasping the idea of relational space is through the idea of material flows. Spatial analysis, with its focus on relative location, wanted to explain them, most notably through application of the gravity model. For relational space, on the other hand, they are explanatory rather than what is to be explained. In his (1996, Chapter 2) discussion of dialectics, Harvey refers to what he calls ‘permanences’: ‘permanent’ because they are relatively enduring, fixed aspects of our world, but in scare quotes because that sense of permanence is misleading. Everything is reproduced by flows of various sorts. Physiologically, people can only exist through intakes of water and food. In order to buy the food, they are inserted in a movement of money, most notably wages in exchange for value-enhancing labor. The fact that they depend on wages is an historical matter, and again depends on a set of flow relations involving discourse and beliefs, our exposure to them in everyday life and in the media, and the enforcement of laws. So we can also imagine capitalism as a ‘permanence’ sustained by various flows, most notably the circulation of commodities but also discourses, state action, a wage that keeps the worker alive but no more. As various flows shift, so ‘permanences’ get transformed and can disappear. Buildings are no more than a fixation of bricks, mortar, pipes and the like, and can slowly collapse if not maintained, just as people die of starvation. This is not just a matter of their physical character but also their exposure to the so-called ‘informal economy’ and the extraction of various pipes for re-sale.
- 10 This sort of reasoning is second nature to physical geographers, even if they do not talk about ‘permanences’. The ‘permanence’ of storms is on a different time scale when compared to the ‘permanence’ of the Asian monsoon, but they can both be interpreted as such; they come into being and they disintegrate. The flows of moisture-laden air on which the monsoon depends, depend in their turn on a particular arrangement of land and sea, and as that shifts over aeons, and through tectonic movement, so one can expect the Asian monsoon to mutate and ultimately be unrecognizable as such. The paradox of the seeming permanence of the physical landscape and its slow transformation through its breakdown into moveable materials which, through their movement, entrain more mass, is at the heart of geomorphology (see Table 2). But if this sort of reasoning is second nature to geomorphologists, in human geography that is not the case, as we will now see.

Table 2. ‘Permanences’ in geography.

HUMAN GEOGRAPHY	GEOMORPHOLOGY	CLIMATOLOGY
Cities	Physical landscapes	Storms
Cultural landscapes	Mountain ranges	‘Mediterranean’ climates
Highway networks	The continents	Smog

William Bunge's theoretical geography

- 11 Bill Bunge's (1962) *Theoretical Geography* provided a metatheory and legitimation for a broader intellectual movement of which it was an essential part. The movement was the spatial-quantitative revolution. This was influential, primarily in human geography, from the late 'fifties through to the early 'seventies. Why it emerged and became as important as it was when it did, has been discussed and contested (Cox, 2014, pp. 26-30, pp. 236-239). The crucial point was its attempt to make human geography into a generalizing science based on a particular view of space as relative; this conception was in contrast to notions of space as absolute, as expressed in the particularizing regional geography. The latter was part of what the new generation wanted to displace, even while it exaggerated its presence. A new human geography would rise based on the geometry of location – and the idea of location was central to the new dispensation – including distances between points, their connections to others, orientation of points in terms of flows to others, relations of point-locations to areas or lines, the effect of boundary lines on movement, and so on. But from the start it was recognized that if progress was to be made in this direction, the new generalizing science could not be merely inductive. There had to be some theory to structure the research process and make sense of the accumulating evidence about predictability in the geography of the world. This would be the location theory of people like Christaller, Lösch, Von Thünen and Alfred Weber. There were also some patterned relations, notably those yielded by the gravity model, which while hard to theorize, nevertheless added support to the idea that location relations could be generalized; that once one examined relative locations and their correlates, like flows, then indeed human geographies seemed predictable. In retrospect, a concept of space as absolute had been replaced by a concept of space as relative; one emphasizing particularity by one that stressed generality.
- 12 In his book *Theoretical Geography*, Bill Bunge imparted a more abstract sense to all this. Taking a firm stance against what he regarded as the particularizing tendencies of human geography hitherto – “Locations are not unique. The nearer the geographer to Chicago the more Chicago-like his location” (1962, p. 100) – he argued for a science of geography based on what he called spatial relations. These comprised spatial pattern or structure on the one hand and movements which generated those patterns on the other: location was both something to be explained and, in its alternative verb form, the explanation. Accordingly, the key to understanding human geography was what he called the nearness problem: finding that spatial arrangement of interacting objects that places them as near to each other as possible: “If interacting objects are placed as optimally near to each other as possible, then typically a pattern is formed... Thus, instead of movement and pattern being contradictory concepts, they are dual expressions... (and) can be designated *spatial process*, meaning movement over the earth's surface, and *spatial structure*, meaning the resulting arrangement of phenomena on the earth's surface – the distributions” (*Ibid.*, p. 211). This might suggest that Bunge is proposing something close to Harvey's ‘permanences.’ The problem is that the objects in Bunge's conception already exist; it is only their geographic relation to one another that can be considered as something fluid, appearing and then fading away: people get moved around, factories relocate, continents drift, colder water moves from

one part of the Pacific to another. The problem here is that Bunge did not engage with the substance of social and physical processes, and to do so would have been to make his project moot.

- 13 In consequence, movements could be anything: migration, advancing ice sheets, the diffusion of ideas, the circulation of the atmosphere. The same applied to patterns: the pattern formed by rivers in a drainage basin, the distribution of cities, of climatic zones, or whatever. He believed that his theoretical geography applied regardless; it could, therefore, embrace both human and physical geography and, although he did not dwell on it, resolve the division in the field. The nearness problem was manifest in both; air masses move from high pressure to the nearest low pressure, albeit structured in their directionality by the Coriolis force subsequent to the rotation of the earth; in economic geography there is a net migration from lower wage areas to higher wage areas, but so as to minimize movement (*Ibid.*, p. 211). Likewise in contemplating a uniform distribution of points along a line:

“One method of obtaining a grasp of the power of the pattern is to stare at the unlabeled pattern and ask yourself ‘Of what is this a map?’ Some possible answers include filling stations along a highway, major volcanic peaks along the Cascades and the distribution of ice cream vendors along a beach. Note that these suggested applications to the earth’s surface are more than shallow spatial coincidences. For instance the total travel cost along a beach for the consumer of ice cream is minimized by such a pattern. The volcanic pattern minimizes the movement of magma in the fissure, or put in another way, the uniform distribution marks points of the greatest internal pressure” (*Ibid.*, p. 254).

- 14 In other words: Highly imaginative and stimulating. Even so, the insistence on location suggested a human geography bias in his understanding. While rivers are located in the sense of having a geographic location, they do not choose to be where they are: unlike the agents in human geography, they do not reflect on the possibilities and then ‘locate’, as in human geography’s location theory. Not surprisingly, his assumptions about the world and those of spatial-quantitative geography had limited effect on physical geography.
- 15 There were some exceptions where spatial concepts originating in human geography were applied in physical geography. There was some interest at the University of Iowa: a major center of spatial-quantitative work at that time – topics like the geomorphic significance of the clustering of sink holes in karst topography. More common, while still remaining sparse, was traffic in the other direction. Peter Haggett (1967) wrote a highly imaginative piece which tried to transfer Horton’s notions of regularity in the geometry of drainage basins to transportation networks. John Rayner and Reg Golledge (1973) demonstrated the applicability of spectral analysis to human geography drawing on Rayner’s earlier (1971) work in climatology.
- 16 One of the problems was that, seemingly quite independent of these developments in human geography, relative concepts of space had been for a long time a necessary aspect of physical geography, if subordinate and as handmaiden to investigations drawing on more relational conceptions.² It was understood that certain features of the physical landscape went together in ensembles of related forms as in scarp and dip topography, the basin and range of the Western US, the knock and lochan³ features of the Canadian and Scandinavian shields. Later, in geomorphology, this interest in pattern would be given precision in Horton’s (1945) morphometric laws, work relating them to (e.g.) climate and vegetation, and Leopold and Maddock’s (1953) hydraulic

geometry of streams. There had also long been awareness of spatial pattern in climate as summarized in Köppen's hypothetical continent⁴, of specific features like rain shadows, and an orderliness in the patterns defined by ocean currents.

- 17 But, and quite crucially, relative concepts of space were a subordinate aspect in a more developed conceptual framing of process and form: subordinate because of a dedication to a relational concept of space in which the individual forms studied by physical geographers – depressions, heat islands, monsoon climates, alluvial fans, glacial deposits, were *in effect* seen as what Harvey has called 'permanences' to be understood as internalizing influences, conditions from elsewhere.⁵ They were to be understood in terms of broader transfers and transformations of materials and energy going from (e.g.) weathering and erosion, through transport to deposition as in some of the diagrams that W.M. Davis drew to illustrate his ideas of a cycle of erosion. Through tracing where particular deposits had come from in virtue of their geology, one could infer river captures. Storms were understood in terms of the circulation of the atmosphere, both in its horizontal and vertical dimensions, including the movement of air masses and the effect on their stability or otherwise of the surfaces over which they moved. As the attention of geomorphologists moved beyond the establishment of morphometric regularity so they would come to emphasize the explanatory significance of the hydrological cycle and its relationship to processes of creep, land slips, erosion and deposition.
- 18 In short, and notwithstanding the arguments of *Theoretical Geography*, the divide between human and physical geography would endure. One might even say that Bunge and the spatial-quantitative geography for which he provided metatheoretical justification, even deepened it. Spatial-quantitative geography was self-avowedly 'scientific' and in reaction to what was seen as the amateurism, lack of interest in method and theory, that had preceded it. Most notably it emphasized analysis against the vague synthesis of the earlier human geography. The synthetic approach was aimed at bringing together the findings of both human and physical geography in an understanding of the region. By rejecting synthesis, the spatial-quantitative geographers rejected regional geography. Regional geography, however, had been the only point where human and physical geographers had come together. Jean Mitchell's edited book *Great Britain: Geographical Essays* is exemplary. One can find there essays by physical geographers like J.A. Steers ('East Anglia') and B.W. Sparks ('South-East England') alongside ones by human geographers M.J. Wise ('The London Region') and A.A.L. Caesar ('The North-East Region'); but all of them trying to bring together both the physical and human geographies of their chosen regions. This particular book was published in 1962 and was possibly the last hurrah of that sort of geography. Henceforth, it would seem, physical and human geographers would go their separate ways.
- 19 Moreover, while human geographers have now discovered the virtues of relational space, by and large, and for reasons to be discussed, that does not seem to have made much difference to unifying the two fields of physical and human geography. What, therefore, is to be done? How might we understand the great divide and soften it? Doreen Massey tried to get a conversation going on this and in the second part of this paper I want to briefly review her contribution before making some arguments on how we can go beyond it.

Doreen Massey and human and physical geography as historical and complex sciences

20 For Massey (1999), what human and physical geography share, and despite the differences between human beings and other elements of the natural world, is that both are what she has called ‘complex, historical sciences’: something denied both by the spatial-quantitative work in human geography and the emergence in the 1960s of the dynamic geomorphology school of Strahler and his pupils⁶. Her points of departure are twofold, one explicit and the other less so. First, she focuses on what she calls a ‘physics envy’ that has affected the social sciences in general and both branches of geography, going back to the 1970s. This led to particular emphases that she found undesirable, and even physics itself could be, and has been, found at fault in pursuing them. We can summarize these emphases and their counterparts as follows:

- Immanent / Configurational
- Simple / Complex
- Equilibrium / Disequilibrium
- Timeless / Historical
- Closed systems / Open systems

21 With respect to the last binary, she wants to insist on the radical openness of time-space. Entities – or what, significantly, Harvey called ‘permanences’ – are constantly shifting, entering into new relations with each other. This particularity is part of the reason that both human geography and physical geography are historical and complex sciences. The constant reconfiguration of things means that equilibria are just as constantly disturbed. The fact that relations are often complex rather than simple – subject to threshold effects and non-linear relations – adds to that complexity. In conclusion, both human and physical geographic forms are ‘emergent’, though we have to be careful here. This is because, by inference, she seems to be invoking emergent *effects* of a non-predictable, non-reductive sort, rather than the emergence of new *causal powers* in virtue of the way entities combine one with another.

22 Her concern with time-space relations of entities then produces a very particular conception of space that she defines as relational. Space is constructed by the entities that make up the world and by their interrelations; to draw from the language of another of her papers (2004), they are mutually constitutive of one another: the local makes the global and vice versa. But exactly why they would be mutually constitutive remains obscure: an important omission, as I now want to argue.

Implications

23 The omission is what makes Massey’s conception different from Harvey’s, and less satisfactory. Harvey’s human agents and the ‘permanences’ that they create and through which they act – firms, governments, divisions of labor, labor unions, and so on – have an incentive to make connections and to internalize through them, other ‘permanences’ as part of their condition of being what they are. Something like a spatial division of labor is exemplary. In a spatial division of labor, the individual parts are necessary conditions for one another: component suppliers need assemblers and vice versa; they need a means of transport for getting the components to the

assemblers and a mode of governance to hold the division of labor together. Space enters in not as distance but as friction with underlying materials; as that friction is reduced through transport innovation, so the component suppliers can locate at a greater distance; but not too far or a necessary condition for the spatial division of labor is negated. What makes these internalizations necessary in the contemporary world is a more general process; that of capital accumulation and the logic of cost competition that it entails.

- 24 One can see how this sort of conceptualization of relational space has long applied in physical geography. It is not just that in glaciated highland landscapes, U-shaped valleys necessitate hanging valleys; or that the lake basins scooped out by the ice are a condition for the build up of deltaic deposits that will eventually eliminate the lakes; or the particular freeze-thaw weathering that can give, depending on rock type, a craggy, broken, rough aspect to the landscape. Rather, governing it all have been particular climatic conditions that then enjoined, again, very particular processes of weathering, erosion and deposition. One can extend this analysis to include, alongside dominant climates, past or present, particular sorts of underlying tectonics – scarplands, basin-and-range, the alpine forms of the Cascades or New Zealand's Southern Alps, or domes. So while Massey is correct to argue that landscapes are emergent; they are also relational in a sense that she did not grasp. The same applies to climates and *their* necessary conditions and internal relations and the conjunctions that they form with particular distributions of land and water.
- 25 These connections of a necessary sort are then maintained and reproduced by flows: flows of material and energy in the case of physical geography; flows of people, money, materials in human geography, but in a capitalist human geography, flows of value. Significantly in Massey's vision of relational space, these tend to go unremarked: an aspect of her preference for a language of thing-like entities as opposed to Harvey's 'permanences.' This in turn makes it possible for her to advocate her radical vision of the openness of the world to ongoing change. In the case of human geography, it is as if people are empty vessels and not already inducted into logics of value production and circulation of a necessary sort and locked in, so as to defy the sort of openness that she proposes.
- 26 In short, a unity of physical and human geography at an epistemological level is possible through the adoption of a shared vision of (relational) space. This then raises the question of why relational space has proved such a difficult concept for human geographers to adopt as part of their common practice. As it is, it has tended to be confined to work on identities – something Massey emphasized – and in particular, the critical interrogation of binaries, like the local/global and place/space (Cloeke, Johnston, 2005). For the most part, and instead, some version of space as relative, as in studies of metro-regionalism, gentrification or policy mobility, tends to prevail. Space is seen as something separate rather than an internally related aspect of social life in general. This would be, in Sayer's (1985) words, 'the difference that space makes': it is something contingent to other aspects of the social process and not a necessary aspect of them, except, as he averred, of the most general sort, and therefore of limited use in concrete studies.
- 27 The question is why that should be: why indeed space is seen as something apart. But then everything else is too: markets, the state, family, technology, the division of labor, and nature. The objects of interest of the human geographer tend to be understood in

the light of a plurality of conditions, forces, processes interacting one with another, and emphasizing plurality. This is certainly how the contemporary world seems in everyday experience. Marx, however, argued that it had not always been thus: that people had, at one time, related to each other and to nature, as necessary conditions of their existence, in direct, unmediated ways. One *had* to have land and one had it through the community of which one was an inseparable part. This was a world of social necessity and not of relations of a contingent sort.⁷

- 28 Capitalism, among other things, separates. It could not exist without separation. It destroyed hereditary rights of possession to land, evicting the peasants, and then brought them together again through markets in land and other means of production, and markets in labor power. People certainly now had to work for capital, so a relation of necessity underneath it all; but they also had a choice of whom to work for, and the fact that they might be unemployed underlined the seeming contingency of it all. Meanwhile, the urge to accumulate brought about by this change in the relations of production led to an increasing division of labor: the separation of mental from manual labor, suggesting that ideas could exist independently of the material; or the separation of the state from production, again suggesting some independence in which the state, as in the understanding of all eager reformists, could regulate and tax capital in accordance with popular desire.
- 29 More to our immediate point, space too seemed to be a contingent matter. The creation of a market in real property suggested that it was a matter of choice. The separation of workers from the means of production would then lead to the formation of a housing market and, once more, the spurious notion of choice, as if one could avoid finding somewhere to live altogether. As per Hägerstrand's time geography, people live in a world of fitting things into a pre-given space, and then calculating distance, albeit often calibrated in terms of time, in going about their daily lives, 'choosing' where to work and where to rent or buy a house. What has then enhanced this sense of space as something apart, is the elusiveness of laws of location. Like everything else under capitalism, its geography undergoes continual transformation and new sets of locational imperatives seem to take over: electricity and the second industrial revolution led to geographies quite other than those characterizing the first one, based on coal. Weber has long been of very limited applicability.
- 30 Capitalism is a hugely dynamic social process; it has to transform itself in all its aspects – the division of labor, technology, the relation to nature, class relations, geography, beliefs, albeit within the limits that they can be exploited to further the goal of accumulation. Change in all spheres of life is a constant, always upsetting what has gone before: a creative destruction applied in a much broader way than Schumpeter ever imagined. Novelty, to the extent that it seems to work, has to be internalized, made a necessary part of the capitalist social process: what Marx referred to as totalization. New spatial forms, with their own internal relations, emerge and become the flavor of the day in virtue of the way they facilitate accumulation: as a mode of organizing production, just-in-time with all its other, necessarily related aspects of low defect rates and on-the-job learning (Sayer, 1986), originated in Japan and then spread across all the advanced capitalist societies. The same applied to the stand-alone shopping center with its particular ensemble of retail outlets, its huge parking lots, and its car-enabled customers. But given the nature of the beast, these particular relational spaces are doomed to be replaced.

- 31 The fact is that geography, alongside the division of labor, the state, technology, and the like, is one more essential aspect of the capitalist social process. Just as a worker can choose an employer but cannot choose *not* to have an employer, so there are real estate markets, but choosing not to buy or rent space anywhere is clearly impossible. Moreover, the area of contingency is then narrowed further by the shifting limits to what is a cost minimizing location: shifting because of changes in technology, changes in product mix and in the spatial division of labor. In Harvey's words capital requires a spatial fix that will facilitate the accumulation process and not hinder it. Get it 'wrong' and the capitalist pays for it. The rapidity of change, however, the way one lives one's life in a relative space, makes all this hard to grasp in a relational sense. Physical geography provides a clarifying contrast, even if something of which physical geographers are unaware.
- 32 For while nature too is grasped as a thing apart, something to be exploited and discarded as the accumulation process rolls on, the way in which its space is conceived in the academic world of physical geography is different. This is because it is impossible to separate out in the mind the various physical processes and conditions from space. Space is internal to process in a way that it appears not to be in capitalist human geography. Novelty is the necessary way in which capitalism transforms itself and its social landscape, even as that novelty becomes standard procedure as a particular technology and/or spatial arrangement becomes the new frontier. In physical geography there is no novelty in that sense; no 'choice' of technology or real estate innovation. Water *has* to flow downhill. Above a certain threshold velocity, a stream has to dislodge and transport materials on its bed downstream. An airmass propelled from an area of high pressure to an area of low pressure on the other side of a range of mountains *has* to move over the mountains; it does not stop and ask if there might be alternatives. There is an inevitability about the relation of space to process in physical geography that seems to be absent in human geography. Physical geographers like to use the word 'driver' and it is an appropriate metaphor for the sorts of processes that they deal with. Space is grasped, assumed, not even announced explicitly, as a necessary aspect of those processes.
- 33 Massey was keen to emphasize openness: shifting configurations of forces and conditions as the condition for complex outcomes. Capitalist space economies are 'open' in the sense that continual novelty is being introduced – new products, new competitors, new institutional forms, new geographic arrangements of things – but, to the extent that they promise a new capacity to make money, they, along with all their own necessary conditions, get internalized as standard operating procedure: part of what makes a firm what it is. There is also an openness in physical geography, as Massey noted, though without much concrete elaboration. Geomorphic processes are subject to tectonic change, climate change and now human intervention on a vastly enhanced scale. The same applies to climate: the glacially slow movements of the land masses altering the distribution of water and land on the planet; and human intervention.
- 34 Space relations are a necessary aspect of substance. 'Permanences' internalize their relations with 'permanences' elsewhere as necessary conditions of what they are. In physical geography, this is obvious. The fact that fluvial processes occur on a glaciated landscape makes no difference to this conclusion: the universal laws of physics, chemistry and biology take over. The landscape might be glaciated but water will still

flow downhill, fill in lakes with alluvium, and the weathering of rock faces left by the glaciers will give rise to scree slopes of wonderfully constant angles. In human geography this sort of adjustment is delayed, giving rise to notions of a universal contingency. New configurations exist side by side with older ones, and in an antagonistic relation of competition, perhaps the object of struggle, as with the once unclear future in Western Europe of the so-called out-of-town shopping center, all secreting notions of choice and possibility rather than necessity. In physical geography there can be no arguments, no contestation to muddy the waters. Relational space rules. But so too does it rule in human geography, if we could see beyond how the world appears to how it is really structured. In physical geography things are transparent. In human geography, things are opaque which has, indeed, to do with the nature of the materials with which it deals: people are different in their essential properties from air, water or rocks. That means that there can never be a convergence between the two sub-fields at the ontological level. But at an epistemological one, we can be more hopeful.

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NOTES

1. See also Harvey (2006).
2. For example, Strahler (1980) was clear that the investigation of empirical regularities of the morphometric sort were merely preliminary to process-form accounts. Terjung (1976) argued along the same lines for climatology. But significantly, this is as far as their discussion of space relations of the relative sort goes. Their dedication to a relational concept remains implicit.
3. According to the *Blackwell Encyclopaedic Dictionary of Physical Geography*, "A landscape of ice-molded rock knobs with intervening lochans (small lakes - KRC) which had been eroded along lines of structural weakness" (A. Goudie *et al.* (eds.), 1985, p. 257).
4. An example cited approvingly by Bunge (1962, p. 200).
5. This framework is clear in both Terjung (1976) and Strahler (1980).
6. Massey's physical geography emphasis is confined to geomorphology. On Strahler's pupils and their significance, see Kennedy (2006, p. 109).
7. Hence Marx: "The more deeply we go back into history, the more does the individual, and hence also the producing individual, appear as dependent, as belonging to a greater whole: in a still quite natural way in the family and in the family expanded into the clan; then later in the various forms of communal society arising out of the antitheses and fusions of the clan. Only in the eighteenth century, in 'civil society', do the various forms of social connectedness confront

the individual as a mere means towards his private purposes, as external necessity” (1857-1858, p. 84). Likewise his remarks on the relation to nature, which is, incidentally a very different way of handling the binary than typical of critical human geography: “The individual relates simply to the objective conditions of labor as being his: [relates] to them as the inorganic nature of his subjectivity, in which the latter realizes itself ...” (1857-1858, p. 485); and: “It is not the *unity* of living and active humanity with the natural, inorganic conditions of their metabolic exchange with nature, and hence their appropriation of nature, which requires explanation or is the result of a historic process, but rather the *separation* between these inorganic conditions of human existence and this active existence, a separation which is completely posited only in the relation of wage labor and capital” (1857-1858, p. 489).

ABSTRACTS

Human and physical geography share a concern with the implications of spatial arrangement for process and hence for differentiation over the earth’s surface. In human geography, its explanatory role is crucial to (sub-) disciplinary awareness. In physical geography this is not the case. In the first place, this is a result of prevailing views of space: space as relative in human geography and as relational in physical geography. In human geography, space exists because objects exist and can exercise effects; in physical geography space is constitutive of objects, so that the idea of separate spatial effects is meaningless. This might seem to have to do with the fundamental nature of objects: people exercise choice in a way that packets of air cannot. What this fails to recognize is that choice is always exercised under particular social conditions; those of capitalism seem to impose a separation of objects from each other and from space that is wholly illusory.

Géographie humaine et géographie physique partagent un même intérêt pour l’agencement spatial et ses conséquences sur les processus sociaux et physiques dans la production de la différenciation géographique. Toutefois en géographie humaine c’est le rôle explicatif de l’agencement spatial qui est au centre de l’imaginaire. Il s’agit avant tout d’examiner la façon dont se conçoit l’espace : relatif ou relationnel. En géographie humaine, l’espace existe parce que les objets existent. Pour la géographie physique l’espace contribue à la constitution des objets : un objet intériorise ses rapports avec l’espace, ce qui signifie que l’espace ne peut avoir ses propres effets. Il semble que cela soit lié à la nature fondamentale des objets : les individus font des choix que ne peut faire l’air chauffé au sol, mais ceci ne tient pas compte du fait qu’un choix se fait toujours dans des conditions sociales spécifiques.

Le capitalisme semble imposer une séparation idéologique des objets les uns des autres et de l’espace qui est tout à fait illusoire.

INDEX

Mots-clés: espace relatif, espace relationnel, William Bunge, Doreen Massey, capitalisme

Keywords: relative space, relational space, William Bunge, Doreen Massey, capitalism

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