Exam #1

Q1: The Hartshorne-Schaefer Debate

In his monumental publication "The Nature of Geography", published in 1939, Richard Hartshorne laid down his views about the way how Geography should be conducted. He mainly drew his ideas from German geographers, such as Alfred Hettner, Immanuel Kant, and Alexander von Humboldt. In his view, the goal of Geography was areal differentiation, investigating the spatial distribution of physical and human phenomena (factors) as they relate to spatial units of differing granularity like places or regions (Hartshorne, 1939). He argued that, we ought to define and delineate unit areas in which the factors are assumed to be constant, and since no two finite areas on earth will ever exhibit the same combinations of factors, such areas are unique. A Geographer's task was to deliver a thorough description of these places, including all perceivable factors. According to Hartshorne, Geography was an idiographic discipline, describing the unique, as opposed to nomothetic disciplines, which search for universal laws. If all places are unique, there are either as many laws as there are places (which defeats the purpose of laws), or no laws at all, which was what Hartshorne advocated for. This methodological approach was what distinguished Geography from other sciences, such as Physics, Mathematics, or Chemistry, which were nomothetic - Geography was exceptional! Geographers collected facts from places around the globe and therefore, created an inventory of knowledge which could then be classified. Areal differentiation (or areal studies) was the modus operandi during that epoch, which remained unchallenged for a long time.

Fred Schaefer was the first person who challenged Hartshorne's views and who received a lot of attention for it. Born 1904 in Berlin, Germany, he fled from the Nazi regime, arriving in the United States in 1938, and taking a faculty position at the University of Iowa in 1946

(Martin, 1989). In his publication "Exceptionalism in Geography: A Methodological Examination" that came out one year after his death in 1953, he argued that Geography was not at all exceptional, which was one of the many points in which he disagreed with Hartshorne (Schaefer, 1953). This article is often seen as the beginning of the adoption of scientific methods in Geography, ultimately leading to the quantitative revolution (Kitchin, 2006). According to Schaefer, the process of scientific knowledge generation in Geography consists of two types of investigations: Regional ones aim for the gathering of facts about all aspects of a region which the author finds important enough to consider, and which can be subsequently grouped into classes. Systematic investigations relate regions to each other and aim for finding universal laws that govern spatial patterns of regional factor-combinations, which are realizations of these laws. Finding them enables us to formulate hypotheses which can be tested using statistical methods. Hartshorne, in Schaefer's view, was merely concerned with the regional type of investigation. Pure description is common in fields that are in an early stage of development, so Schaefer gives examples from other sciences like biology, which was also largely descriptive and taxonomic in its infancy. Schaefer was afraid that Hartshorne was contributing to a roadblock of geographic development towards a science, which he stated was one of the main reasons for publishing his article.

Schaefer further criticizes the "exceptionalist claims" by Hartshorne, his followers, and the people he drew from. The notion that Geography is exceptional because of its methodological dualism (regional and systematic), which was formulated by Hettner and Victor Kraft, and which was later picked up by Hartshorne, is simply refused by Schaefer with reference to other sciences that showed the same characteristic. It seems like much of the disagreement between Schaefer and Hartshorne was about one important statement by Kant,

which says that Geography and History are both purely descriptive with the only difference that Geography focuses on space, while History focuses on time and that it is the descriptive nature which distinguishes them from other sciences (Kant, 1802). Schaefer argues that this statement is wrong because other sciences, such as Astronomy make use of descriptions of space and time too, which disqualifies any exceptionalist claim. Furthermore, the text that contains it was compiled from Kant's notes in his early career, which Schaefer calls his "pre-critical period", while Kant's philosophical authority stems from his "critical period", later in his life (his major work, "Critique of Pure Reason" stems from that time, 1781). Since other sciences were in the stage of their infancy around that time (Biology), being purely descriptive seemed to be completely natural and so was writing the same about Geography. Lastly, Schaefer challenged the authenticity of the document, arguing that the handwriting was not Kant's, implying that one of his students could have written the majority of it.

Schaefer goes on and explains that Hartshorne has misunderstood the works of Hettner, and accuses the latter of supporting and spurring the exceptionalist claim. Hettner stated that Geography and History are chorologic, examining causal relationships between phenomena within regions, and integrating phenomena heterogeneous among themselves. Both fields aim for explaining the unique, which does not know any laws. According to Schaefer, Hartshorne misunderstood Hettner because of the German word "Wissenschaft", which has a much broader meaning than the English word "science", and denotes any organized body of knowledge, such as Rechtswissenschaft (law-"wissenschaft"). Schaefer also accused Hartshorne of citing Hettner very selectively, as some of his other work can be quoted as supporting the nomothetic position. This is a point that Hartshorne later accused Schafer of contradicting himself (first saying Hettner is wrong, and then saying he is partly right, Hartshorne, 1954).

Hartshorne was not amused, his response to Schaefer's article was fierce! As a first reaction, he immediately published a short comment about the matter (Hartshorne, 1954), discrediting Schaefer's work as non-scholarly due to a lack of evidence, omitted citations, and the misinterpretation of statements from other authors. He announced two publications that would clear things up that Schaefer had clouded: First, a line-by-line correction of all omitted citations and falsehoods in Schaefer's essay, like the summary of passages that contradict the meaning of their author. This would prove him wrong and re-establish the status within the Geographic community as if "Exceptionalism in Geography" was never published. Second, he would publish a statement on half a dozen questions about the character of Geography that should clarify what many Geographers obviously were confused about. Hartshorne's ""Exceptionalism in Geography" re-examined" was published in 1955, in which he comes to the conclusion that: "The title of the critique lead the reader to follow the theme of an apparent major issue, "exceptionalism", which proves to be non-existent." (Hartshorne, 1955). In other words, Schaefer accused Hartshorne of something he did not do. so is the debate a great misunderstanding? I did not read "The Nature", so my judgment lacks a base.

However, Schaefer's legacy is undeniable. Theoretical Geography emerged under the lead of William Garrison and his group, who were highly influenced by him and other Geographers who sought for laws governing spatial patterns like Walter Christaller, Johann Heinrich von Thuenen and August Loesch. William Bunge pointed out that "Hartshorne was highly pessimistic about our ability to produce geographic laws, especially regarding human behavior. Schaefer has done us a great service in sweeping away our excuses and thereby freeing us from self-defeat." (Martin, 1989).

Q2: The Quantitative Revolution and Spatial Science

Positivism is a set of approaches aiming for the application of scientific principles and methods drawn from the natural sciences to social phenomena in order to explain them (Kitchin, 2006). August Comte (1798 - 1857) postulated Positivism, which focuses on facts and truths that are empirically observable rather than on speculation, objective data collection through common methods of observation, the formulation of theories which can be tested, and the development of laws that explain and predict human behavior. Positivism has 6 assumptions: First, human decisions have a determinable cause that is identifiable and verifiable. Second, these decisions follow a set of laws to which individuals conform. Third, there is an objective world that compromises individual behavior that can be observed objectively on universally agreed criteria. Fourth, scientists are disinterested observers, standing outside their subject matter, taking a position of neutrality and reaching dispassionate conclusions. Fifth, there is a structure to human society. Sixth, the application of laws of positivist social science can be used to alter societies (Kitchin, 2006). Positivism follows a deductive approach for knowledge discovery: Theories are developed and hypotheses formulated in order to be tested empirically. If data do not support the hypotheses, the theory is modified and new hypotheses are formulated for testing. Objectivity through independence of scientists is preserved through conformity to five premises: Originality, communality, disinterestedness, universalism, and organized skepticism. This means that the goal of Positivism is the advancement of new knowledge, which is shared if its provenance is fully recognized. Scientists are interested in knowledge for its own sake and judge on academic grounds only. Knowledge is advanced by constructive criticism (Kitchin, 2006).

In the 1950s, geographers started to express the need for more scientific methods in their field, in order to find laws that govern spatial patterns and processes. Therefore, they started to

look for quantitative methods in fields like Mathematics or Physics in order to apply them to their problems (Burton, 1963). Up to that point, Geography had been an entirely descriptive discipline. Fred Schaefer drew his arguments from Positivism, and challenged the dominating view of Geography as an idiographic discipline (Kitchin, 2006). The quantitative revolution that followed, and that replaced description with explanation, individual understanding with general laws, and interpretation with prediction (Kitchin, 2006) is very well described by the following statement: "There was a sense of discovery and forging, of breaking out of the banal, factual boxes erected by the old men, and a sense of reaching out to scholars in fields which we had never been properly introduced…" (Gould, 1979). Quantitative Geography, also known as Spatial Science, is defined as Geography relying on accurate measurement for searching statistical regularities and associations. It focuses on what is observable and measurable, in order to formulate hypotheses which are testable. It's goal is to gather evidence as a basis of judgment about reality that most people would accept. Therefore, it has many commonalities with a positivist approach (Fotheringham, 2006).

Marxist geographers criticized that Spatial Science was able to answer a very limited scope of questions, and did little to solve real-world problems, whereas a radical Geography should aim for changing the world (Castree 2003). In addition, humanist geographers criticized that Spatial Science was peopleless and that it did not incorporate people's beliefs and emotions, while feminist geographers argued that it was underpinned by a masculinist rationality. They rejected the "man's quest for a godseye-view of the world", and advocated for focusing on power relations within the research process and more self-reflection with respect to personality, expertise and influence on the production of knowledge (Kitchin, 2006).

So, what about Positivism and Spatial Science today? Many of the methodologies that were developed during the quantitative revolution are still widely used today. Spatial analysis that makes use of Geographical Information Systems (GIS) are basically a direct legacy of that time (...). Looking at Loesch's hexagons I cannot help but making the connection to GIS. From my own experience I can tell that many studies in Biogeography utilize positivist approaches: First, theory is examined, hypotheses formulated, then, data collected during the field season. Trees are identified, counted and measured, disease symptoms documented, birds are spotted and all the information is then related to space. Next, variables such as temperature, humidity, slope, and topographic wetness index are extracted from readily available datasets at the sample locations in order to feed them into a regression model. Spatial autocorrelation is accounted for using methods which are adopted from Mathematics and Statistics and finally, the hypothesis is either rejected or confirmed which leads to another advancement in theory.

Predicting human behavior, which Auguste Comte stated as one of the goals of Positivism (Kitchin, 2006) is not possible nowadays, at least not at an individual level. Group behavior can be predicted to some degree for certain situations, which is shown by decision-making based on crowd simulations (Shendarkar, 2006), but extracting human thoughts and opinions still proves to be difficult. Therefore, I believe that many social phenomena cannot be explained to a satisfactory degree using a Positivist approach.

Q3: Critics of GIS

The emergence and dissemination of GIS has brought up questions and criticisms regarding its ethical and social ramifications. The central question is: Are developers of technology accountable for the eventual uses of it (Goodchild, 2006)? After the quantitative revolution and Spatial Science were condemned "peopleless" and "unable to solve real-world problems" by marxist and humanist geographers (Castree, 2003), GIS was denounced as the "positivists revenge", which would lead to naive empiricism and eventually to an "anti-Geography" (Harris and Weiner, 1998). The controversy was amplified by Openshaw's counterattack, calling the critics "technical cripples" that represented "squelchy-soft paradigms" (Openshaw, 1991).

GIS has been criticized of being a contradictory technology that simultaneously marginalizes and empowers people and communities (Harris and Weiner, 1998). Marginalization and empowerment occurred in three ways: First, through data access and the political economy of information. "GIS are neither objective nor value free. They are dependent upon human choices and constraints regarding the selection of coverages and attributes, scale, analytical procedures, the decisions and outcomes arising from these analyses." (Harris and Weiner, 1998). Furthermore, GIS favored top-down expert knowledge, usually reflecting the mandate of the agency that operated it and the views which GIS promoted were those of people in power (Goodchild, 2006). Second, GIS allowed for the linking of databases that have been separated before, which permitted the use of geodemographics for surveillance purposes, which could be exploited by corporations for marketing purposes (Goss, 1995), and which was criticized as an invasion of personal privacy (Goodchild, 2006). Third, GIS only captured one official version of reality which was heavily biased towards a scientific, agency, and expert data-driven

representation, which conformed to a western, first world science paradigm. Qualitative forms of knowledge like mental maps, oral histories and pictorial images were generally excluded from GIS (Harris and Weiner, 1998).

Goodchild (2006) raises another set of unanswered questions from a social critique point of view. Which types of geographic information (if there are any) can't be represented using GIS? Is it possible to rank geographic information according to its ease of representation and communication? He also identifies outstanding issues: First, GIS is increasingly replacing our presence in the real world. Why should someone go out and discover if he/she can see the entire world at home on the computer? This is especially disturbing if we think about the development of our children. Second, there is the uncertainty business: To what degree does the virtual world leave the user uncertain about the real world? Sources of uncertainty are measurement error, vagueness of definitions, generalizations, and approximations. However, the GIS community went ahead and wrote finding methods to handle uncertainty on every research agenda. Even though there is still much work that needs to be done, the quantification of uncertainty has become a major focus (Brown, 2004). Finally, GIS conveys a false sense of objectivity, which leads to the wrong belief in its accuracy: Class boundaries are usually displayed to the limits of the computer's precision, which in most cases does not reflect the true accuracy of the data.

The GIS community took the criticisms seriously and answered to the claims by hosting conference meetings and by publishing journal papers devoted to the social context and impacts of GIS. Today, the view of GIS as a value-neutral tool has largely disappeared and has been replaced by a more human-centered one. Users are increasingly aware of the problems of GIS (Goodchild, 2006). There have been many projects about community empowerment through GIS, e.g. in South Africa, where the potential for a participatory land reform in the Kiepersol

locality is explored (Harris and Weiner, 1998). Another example, the Eagle Project, aims for integrating traditional knowledge of indigenous communities at the Great Lakes Drainage Basin of Central Ontario. The project involves collecting indigenous spatial information like hunting areas and relates them to the impact of toxic chemical exposure. That way, local understanding was integrated with government agency data and traditional knowledge with conventional scientific methodologies (Bird, 1995). Similar projects were realized in Taiwan (Tsai et al., 2006), sub-saharan Africa (Kyem, 2000), and presumably elsewhere.

I will now present my personal opinion, as if I was asked to take a position in this debate. To me, GIS essentially is Mathematics, the capability to draw graphs, and some conventions about storing data. All other capabilities that have been named as contributing to the unethical use of GIS can be attributed either to computer science, communication technology or agreements between people about information handling standards. I disagree with people who criticize GIS without differentiating it from other developments. It is much harder to point your finger at Mathematics than pointing it at the latest release of ArcGIS and the evil people who sell it at unreal prices. Moreover, we don't need the shiny ESRI program for solving spatial problems, as we can do it in freely available software-environments like R, QGIS, or Python. Therefore, criticizing GIS for not being available to the powerless is not valid; all you need is a computer, knowledge and patience. Of course, the disadvantaged have decreased access to computers and knowledge, which I find a valid point. I think that is where critics should target their energies at and not on a series of geographical concepts.

References:

Brown, J. D. (2004). "Knowledge, uncertainty and physical geography: towards the development of methodologies for questioning belief." Transactions of the Institute of British Geographers 29(3): 367-381.

Burton, I. (1963). The Quantitative Revolution and Theoretical Geography. Canadian Geographer 7(4): 151-162.

Castree, N. (2006). Place: Connections and Boundaries in an Interdependent World. In S. Aitken, & G. Valentine (Eds.), Approaches to human geography. (pp. 237-251). London: SAGE Publications Ltd. doi: http://dx.doi.org/10.4135/9781446215432.n23

Fotheringham, A. (2006). Quantification, evidence and positivism. In S. Aitken, & G. Valentine (Eds.), Approaches to human geography. (pp. 237-251). London: SAGE Publications Ltd. doi: http://dx.doi.org/10.4135/9781446215432.n23

Goodchild, M. (2006). Geographic Information Systems. In S. Aitken, & G. Valentine (Eds.), Approaches to human geography. (pp. 237-251). London: SAGE Publications Ltd. doi: http://dx.doi.org/10.4135/9781446215432.n23

Goss, J. (1995). ""We Know Who You Are and We Know Where You Live": The Instrumental Rationality of Geodemographic Systems." Economic Geography 71(2): 171-198.

Gould, P. (1979). "GEOGRAPHY 1957–1977: THE AUGEAN PERIOD." Annals of the Association of American Geographers 69(1): 139-151.

Harris, T. and D. Weiner (1998). "Empowerment, Marginalization, and "Community-integrated" GIS." Cartography and Geographic Information Systems 25(2): 67-76.

Hartshorne, R. (1939). "H. THE CHARACTER OF REGIONAL GEOGRAPHY." Annals of the Association of American Geographers 29(4): 436-456.

Hartshorne, R. (1954). "Comment of “Exceptionalism in Geography," Annals of the Association of American Geographers, 44:108-109.

Hartshorne, R. (1955). ""Exceptionalism in Geography" Re-Examined." Annals of the Association of American Geographers 45(3): 205-244.

Kant, I. (1802). Physische Geographie. Ed. F. T. Rink, Koenigsberg.

Kitchin, R. (2006). Positivistic Geographies and the Spatial Science. In S. Aitken, & G. Valentine (Eds.), Approaches to human geography. (pp. 237-251). London: SAGE Publications Ltd. doi: http://dx.doi.org/10.4135/9781446215432.n23

Kyem, P. A. K. (2000). "Embedding GIS Applications into Resource Management and Planning Activities of Local and Indigenous Communities: A Desirable Innovation or a Destabilizing Enterprise?" Journal of Planning Education and Research 20(2): 176-186.

Martin, G. J. (1989). The nature of geography and the Schaefer-Hartshorne debate. Entrikin JN, Brunn S D. Reflections on Richard Hartshorne's the Nature of Geography. Occasional Publications of the Association of American Geographers. Washington DC, the Association of American Geographers, 69-90.

Openshaw, S. (1991). A view on the GIS crisis in geography, or, using GIS to put Humpty-Dumpty back together again. *Environment and Planning A*, *23*(5), 621-628.

Schaefer, F. K. (1953). "Exceptionalism in Geography: A Methodological Examination." Annals of the Association of American Geographers 43(3): 226-249.

Shendarkar, A., K. Vasudevan, et al. (2006). Crowd simulation for emergency response using BDI agent based on virtual reality. Proceedings of the 38th conference on Winter simulation. Monterey, California, Winter Simulation Conference: 545-553.

Tsai, B., Chang, C., Lin, C., & Lo, Y. (2006). Public Participation Geographic Information

System and Indigenous Society: New Partnership of Indigenous Peoples in Taiwan. In *Geography Research Forum* (Vol. 26, p. 152). BEN-GURION UNIVERSITY OF THE NEGEV PRESS.