

The *g* factor and the geographical law of place-induced cognitive emergence

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ABSTRACT: This paper introduces the metaphor of cognitive territory in order to a) explain the positive correlation between the *g* factor and creativity, and b) explain the role of place in the production of innovative ideas. Building on this geographical metaphor of cognition, I propose the law of place-induced cognitive emergence, which states that the collective intelligence of a group is a function of the interaction effect of the cognitive territories of the members of that group.

To some degree his independence of mind probably flows from the sheer power of his intellect. The radius of his sight seems much longer than most of ours, allowing him to scan and integrate far vaster *territories* of evidence. This would allow him to see emerging patterns of evidence sooner and more clearly, and to suggest hypotheses that startled or unsettled the less prepared but that eventually became mainstream. (Linda Gottfredson, 1998: 292-293; emph. added)

The essence of expertise is carving one's niche through deliberate practice (Ericsson, 2006). The metaphor of niche, however, has a misleading side to it, because it evokes a mental landscape in which the idea of narrow specialisation appears as the epitome of niche. And this is to a large extent wrong. If we evoke Howard Gardner's typology of extraordinariness (Gardner, 1997), the individual who carves for herself a narrow specialisation can aspire to become at most a master of that specialisation, but never a true innovator. When we speak of innovation we think about creativity and recent research of the creative process (Simonton, 2003, in press) found that a prerequisite to creativity is the priming of one's mind with extremely unrelated and diverse facts and ideas. But to prime one's mind in such as way, one needs to have vast cognitive resources. One needs not only to master one's field, but also to have the sheer mental

capacity and energy to venture in areas far away from one's specialism, to learn quickly about them, and to be able to use the new information to improve one's way of thinking and one's undertaking of one's niche.

At the beginning of this paper I quoted Linda Gottfredson's account of Arthur Jensen, the foremost expert in the study of human intelligence. But we need not go that far. If we look at the various lists with the most cited geographers in the last decades, and then read their papers, we can easily observe that Gottfredson's quote applies to them as well. They read widely outside geography and, within geography, it becomes cumbersome to try to stick a sub-specialism label to them. It is tempting to give names and go to specifics, but it is probably wiser to do this exercise in the privacy of our offices. The point I am trying to make is that one's level of creativity, as well as the significance of one's work are in direct proportion with the size of one's cognitive territory ('how many areas and how far away can she travel from her niche?'), but the size of one's cognitive territory is under the tight control of one's level of *g*. In a recent overview of advances in the study of the *g* factor, Douglas Detterman emphasised that (Detterman, 2005: 5):

It is...surprising how much a person high in general intelligence knows about even in areas outside those to which they have devoted themselves.

And he went on to quote a passage from Francis Galton's (1869) 'Hereditary Genius' that he takes to be the best description of what intelligence is all about (Galton, quoted in Detterman, 2005: 4-5; note the appalling sexism and elitism of the time):

People lay too much stress on apparent specialties, thinking over rashly that because a man is devoted to some pursuit, he could not possibly have succeeded in anything else...A gifted man is often capricious and fickle before he selects his occupation, but when it has been chosen he devotes himself to it with a truly passionate ardour. After a man of genius has selected his hobby, and so adapted himself to it as to seem unfitted for any other occupation in life and to be possessed of but one special aptitude, I often notice, with admiration, how well he bears himself when circumstances suddenly thrust him into a strange position. He will display an insight into new conditions, and a power of dealing with them, with which even his most intimate friends were unprepared to accredit him. Many a presumptuous fool has mistaken indifference and neglect for

incapacity; and in trying to throw a man of genius on ground where he was unprepared for attack, has himself received a most severe and unexpected fall. I am sure that no one who has had the privilege of mixing in the society of the abler men of any great capital...can doubt the existence of grand human animals, of nature's pre-eminently noble, of individuals born to be kings of men.

The quote alerts us to our underestimation of the role of intellect because the smartest persons that we each know seem so embedded in their particular area, that we ascribe their successes to their passion for that area, and not to the general intellect which has afforded them excellence in that area.

I have made the connection between creativity and intellect, by noticing how the impact of the latter on the former is mediated by the size of one's cognitive territory. But the connection can be made in an even more straightforward manner, by simply remembering that creativity is the production of novelty and pure, 'fluid', intelligence is defined as the ability to deal with novelty (Gottfredson, in press). I have also made the connection between the size of one's cognitive territory and the likely significance of one's work, and this connection is counter-intuitive. As PhD students, we have all been warned of the danger of spreading ourselves too thin. No one wants to be labeled a dilettante, with shallow and ever-changing research interests. The wise thing to do is to choose one or two areas of focus and to stick to one's turf. This mythology is built on ignorance about what intelligence can do. To be sure, PhD students are already a highly selected group for IQ (average 125; Gottfredson, 1997), but within every profession, despite the restriction of range for intelligence, the best individuals are still 3.29 to 10 times more productive and efficient than the mentally slowest individuals (Ree & Carretta, 2002, pp 17-18). What one learns in one year, another learns in ten years, and this happens within the same job. This means that the apparent dilettante might know everything that the specialist does and much more.

There are two distinct reasons for the correlation between the size of one's cognitive territory and the likely significance of one's work. The first reason is the enhanced likelihood of creativity: other things being equal, a work that brings something new is more likely to have significance over and above that of a rather redundant contribution. The second reason is the enhanced likelihood of having a correct reading of reality. If

Linda is born in Iceland and never leaves the country, and Rita is born in Iceland and visits every country in the world, Rita's mental map of the world will be much more accurate than Linda's. And the same goes for academic disciplines. Most PhD supervisors and most subdisciplines try, at least unconsciously and indirectly, to indoctrinate their students with the accepted paradigm in that corner of the scientific wood (Simandan, 2005a-b). From within human geography, the debate might be framed in terms of whether Marxism or poststructuralism are right. It does not occur to that student that outside geography there might be vast territories of knowledge where both of those discourses have long been discarded. She will laugh at lay people for being under the veil of indoctrination or maybe try to open their eyes, without the vaguest idea that an even thicker veil of indoctrination mediates her own access to the world.

The above observations dovetail with one of the most beautiful findings in the history of intelligence research. Thorndike (1924) seized the fact that, against intuitive wisdom, the altitude of one's intellect (i.e. the depth of one's cognitive penetration of a material) is in direct proportion with the breadth of intellect (i.e. the cognitive territory: how many and how widely apart things an individual knows). I often like to think of this finding by drawing a parallel with a quantitative analysis. The quality of a statistical finding is a function of both the size of the sample (i.e. the breadth of intellect; how many items are processed determines the reliability and significance of that analysis) and the power of the methodology applied to the analysis of data (i.e. the altitude of intellect; the inferential statistics operating on the descriptive statistics).

With these thoughts in mind, we can now move on, to produce the argument that the truly interesting things appear when we look at the concept of cognitive territory from a relational, *place*-based perspective. Geography is essential to the formation of expertise and excellence in several ways (Thrift, 2006). Thus, from the point of view of place, how much one learns and how much output one produces depend on the geographical proximity of people who can profit from learning (cf. Hudson, 1999). A recent study published in *Intelligence* (Day et al, 2005) has clarified the interactions between the place of one's learning and working and the level of performance attained by those involved.

The researchers have created three types of dyadic teams: HH (composed of two highly intelligent individuals), HL (composed of one highly intelligent person and one person of relatively low intelligence), and LL (composed of two persons of relatively low intelligence). The teams had to work on a project the outcome of which could be easily quantified. As expected, there was a substantive additive effect to collective performance induced by the level of intelligence of each team member. HH teams scored on average 2925.17 points, HL teams scored 1905.28 points, whereas LL teams scored only 1243.80 points. But the significant finding was that HH teams produced a non-negligible nonadditive effect, i.e. the total score obtained exceeded the score that could have been predicted from the sum of the intelligences of the two team members. There was no additive effect whatsoever for HL teams and the LL teams showed a negligible nonadditive effect. I propose to name these nonadditive effects *place-induced cognitive emergence*.

Following closely Day et al's (2005) empirical findings, let me draw together the threads that make this research so symptomatic of the geographical determination of outstanding performance. Let us think cognition spatially and for the sake of clarity let us imagine the cognitive capacity of an H individual as being a circular area of 2 sq.m, and that of an L individual as being a circular area of 1 sq.m. When two L individuals are working together they can hardly benefit from each other's company because their two circular areas tend to extensively overlap, i.e. they both know the same elementary things (how to open a computer or how to send an email or how to save a document). Because of the overlap, the sum total of their cognitive surface barely exceeds 1 sq.m (small additive effect). When two H individuals are put together, their cognitive areas will only partly overlap, and, more specifically, they will tend to overlap on those elementary things that everybody (i.e. L individuals) knows. Because they are highly intelligent, they will know a great deal more than elementary things and because each of them was driven to learn those issues relevant to their highly specific passions and interests, those non-elementary things they each know will rarely overlap. The sum total of their cognitive area will be 5 sq.m: 1 sq.m overlap, plus 1 sq.m non-overlapped cognition from each of them, plus 2 sq.m of place-induced cognitive emergence. The latter component can easily be

understood by grasping the fact that when two individuals have both shared knowledge and unique knowledge, they will develop through interaction in place additional knowledge at the intersection of their two “unique knowledge” components. Through dialogue and exchange of ideas and skills, they will not only learn from each other but they will also figure out together new knowledge emerging from the bits and pieces that each of them brings to the debate. To exemplify, if you put together on a project a highly gifted economic geographer and a highly gifted cultural geographer, they will not only learn from each other non-elementary things (they would both know from the beginning how to open the computer and how to save a document), but they will probably produce some new knowledge as they draw the connections between hitherto disconnected bodies of information.

When we put together a L individual and a H individual, the sum total of their cognitive areas will tend to be 2 sq.m and not 3 sq.m, because the highly intelligent individual will already know the elementary things that the L individual can contribute. Place-induced cognitive emergence is a function of the cognitive ability of those who interact in a particular place. Day et al’s observations of their research subjects fully support the spatial metaphor of cognitive surfaces I introduced in the preceding discussion.

It remains important to underline not only the place-related performance of the teams, but also how differently L and H individuals can learn from being a part of different places of interaction. H individuals learn only when paired with other H individuals. When they are paired with L individuals, there is nothing they can seize from their less gifted partners, and the total score of the LH team is determined almost completely by the intellectual level of the H individual. As far as L individuals are concerned, Day et al found that they learn almost nothing, regardless of whom they are partnering with. If she is in a LL team, both individuals tend to know the same basic things. If she is in a LH team, she cannot learn much from the H individual because she does not understand her sophisticated way of thinking.

In terms of consequentialist ethics, the greatest good for the greatest number at the general level of analysis would be achieved if societies, professions, and institutions

would find ways to segregate the highly gifted from the rest and to put them to work together. This strategy would be not only undamaging for the learning of L individuals, but it would also be very favourable for the cognitive growth of the H individuals (who could profit from learning from one another) and would increase the overall level of new knowledge in that society, profession, or institution. The historical effect of these laws of place-based cognitive interactions has become manifest in distinctive geographies of excellence that anybody can perceive: the appeal of the Ivy League universities for both faculty and students in North America, the RAE-induced migration of faculty in the UK (with the best of the best seeking or being sought by the 5* departments), the quick promotion of intelligent people within multinational corporations, and so on and so forth. Cognitive excellence generates places of excellence (because, as Leo Rosten noted, ‘First-rate people hire first-rate people; second-rate people hire third-rate people.’), which in turn enhance the cognitive excellence of their privileged inhabitants (through what I called ‘place-induced cognitive emergence’).

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