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The Gribbin Syndrome and the Entities of Knowledge Integration

The purpose of this introductory article is to discuss the diehard assumption that the increasing specialization of science acts counter to the need for understanding complex systems. Or, in the context of this booklet: Is specialized basic research the antithesis of integrated science?

In the twentieth century, disciplinary science has been so successful that outsiders sometimes picture it as a kind of monolithic corporate organization, like IBM or Microsoft. This imagery has nourished the popular belief that "scientists look alike, act alike, think alike and speak the same jargon (Weiner, p. 198)". No imagery could be more wrong. Science has become the very opposite – a 'Tower of Babel', where few, if any, speak the language of the others, and no one seems eager to learn more languages than their own disciplinary mother tongue. The accumulation of scientific knowledge has been so overwhelming that no one can hold it within "the horizon of a single mind (Weiner, p.198)". The truth of the matter is that even the brightest of scientists no longer manage to keep abreast of the total knowledge accumulation within their own discipline, not to mention the crossing of disciplinary boundaries. The burden of disciplinary knowledge has grown overwhelmingly and it has been doing so for a long time. More than a hundred years ago, Professor Karl Pearson at the University of London pinpointed the situation with this heartfelt sigh: "Scarcely any specialist of to-day is really master of all the work which has been done in his own comparatively small field. Facts and their classifications have been accumulating at such a rate, that nobody seems to have leisure to recognize the relations of sub-groups to the whole (Pearson, p. 17)."

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Units of topical Specialization

Since this utterance, the process has picked up more than exponential pace. In order to cope, the scientific community has deliberately divided disciplines into smaller and more manageable entities, and the smaller disciplines into sub-disciplines, which have been further broken down into *units of topical specialization*, which are continuously getting lighter in weight, thinner in scope and deeper in penetration. Although, the disciplinary organization of science still persists, the professional frame of reference and identity is more with the smaller units of topical specialization than with the traditional disciplines. Today a discipline is composed of clusters of specialties – units of topical specializations – that form the micro-environments where research and communication take place. For the sake of illustration: By the year 1987, there were 8,530 definable fields

of knowledge in the sciences, and three years later, roughly 8000 research topics were sustained by specialized networks within the natural sciences alone (Thompson Klein (96), p. 42).

The Gribbin Syndrome

According to the noted science writer, John Gribbin, the educated elite has become *overspecialized*, and he anticipates great dangers: "The habit of specialists in any one area of science is to focus more and more narrowly on their special topic, learning more and more about less and less, until eventually they end up knowing everything about nothing. It was in order to avoid such a fate that, many years ago, I chose to become writer of science rather than scientific researcher (Gribbin, p.1)." Gribbin's concern is that modern science, if the present course is not corrected, will ultimately leave society with a breed of scientists who are so specialized that they have no one to speak to, no one to discuss with, no one to talk to, no one to learn from and no one to report to. They may end up in a state of secluded professionalism – as isolated islands of knowledge without bridges erected between them. This situation has been vilified in the public discourse as a negative force that only promotes fragmentation and specialization *in absurdum*. There are two basic reasons to doubt the validity of such an assumption.

Gribbin and his critics

The first has been aptly depicted by Bruno Latour who argues that an isolated specialist is a contradiction in terms because no one can specialize without the concurrent autonomization of a small group of peers. By the term autonomization he means the corrections/directions provided by the way in which a discipline, a profession, a clique or an 'invisible college' becomes independent and forms its own criteria of evaluation and relevance. To make individual progress, specialists depend on the critique provided by this process. In substantiating his point, Latour refers to the observation that scientists who are totally on their own doing field research in isolated parts of the world, never stop "speaking in a virtual arena of colleagues with whom they constantly argue in absentia as if the wooded landscape had been transformed into the wooden panelling of a conference room (Latour, p. 102)." Physicists, in particular, are singled out as having the habit of constantly talking to each other at the blackboards with no one else present (Weinberg, p.19). In other words: A specialist needs other specialists to talk to, to disagree with, to convince, to argue with, to be stimulated by, to quarrel with, to despise and look up to. This virtual arguing seems to be the dialectic of scientific progress. Thus, the likelihood is that specialists will never specialize in absurdum because that will deprive them of someone to relate to. The human psyche will see to it that specialization stops short of seclusion.

The second reason to doubt the Gribbin syndrome relates to an observation made by the Norwegian biologist Johan Hjort in the 1920s stating that the deeper we go into a problem, "the more do we feel that it is really itself part of a whole great structure which science and thought has erected (Hjort, p. 4)." The assumption is that units of topical specialization of one disciplinary origin may have significant features in common with component entities in other disciplines, and accordingly may have the potential to promote greater interdisciplinary understanding. Recently,

Barnes et al. argued that detailed work in science is never intelligible purely by reference to the esoteric conventions and concerns of the specialty in which it is performed. It always has significance for allied or opposed specialities, and is always liable to evaluation as an element of science generally and an instance of what is conventionally accepted as science (Barnes, Bloor and Henry, p.155)." What is said here is that increasingly, specializations overlap and transcend disciplinary boundaries. And the observation is that specializations have fostered a number of interactions as disciplinarians approach one another's borders, and that most border crossings occur at the level of specialties and not at the boundaries between *entire* disciplines (Thompson Klein-96, p.42). Here interdisciplinarity seems to depend on specialization, and the deeper and narrower it gets, the better the conditions for synthesis become. In this perspective, the units of topical specialization turn out to be the number one scientific integrator, challenging the artificial integrity of disciplinary borders. The corollary is that specialized basic research is not the antithesis of complex system science, but its foremost precondition.

Specialization and integration

The implication is that the Gribbin syndrome, *knowing everything about nothing*, may give rise to a new kind of scientific attitude in terms of *interdisciplinary curiosity* and *skill* in terms of *interdisciplinary practice*. The reasoning goes like this: No discipline is engaged with the entirety of another discipline. Disciplines actually interact at the trading zones to be found in many locations between units of topical specialization. At these zones disciplines either overlap, touch, mix or merge, easing interdisciplinary exchanges and interactions when it comes to concepts, methodological tools, insights and theories. As the units of topical specializations become deeper, smaller and narrower, the mental/intellectual distance between the units of topical specialization of other disciplines pertinent to the object of study becomes less and less. The smaller the unit, the greater the likelihood that disciplinary boundaries will be transcended to highlight the complexity of a particular unit of specialization. In this vein of thought, the emergence of complexity leads to the gradual erosion of boundaries of the special branch (Pilet, p. 634). The specialities have become vital sites for cross-fertilization between disciplines – for interdisciplinary exchange and integration.

By the time a scientist knows "everything about nothing" he or she has actually exhausted the possibilities within his/her own discipline to learn more. The only way to expand one's own understanding is to prey and harvest on the turfs of adjacent disciplines pertinent to one's own specialization. Specialization in basic research thus holds a definite potential for fostering interdisciplinary research on the tiniest topics. The cross-fertilization between disciplinary units of topical specialization may, in due time, spill over to broader areas of expertise and gradually provide more favourable prerequisites for interdisciplinary research on grander scales. As was the case at the time of Galileo, generalizations were possible because the amount of knowledge was comprehensible within 'the horizon of one mind.' To a certain extent, the same may apply to the units of topical specialization where the amount of multidisciplinary knowledge is comprehensible within the horizon of at least teams of

specialists. Here science may have come full circle. Thus, the Gribbin syndrome may prove to be an effective medication for modern science to foster wholeness from particulars.

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