Chapter 12

TOWARDS A HEURISTICS FOR DISCOVERY

Since his youth, Leibniz conceived of ‘logic’ as comprising not only proof but also discovery. When he later developed the idea of a ‘general science’, he consistently included in it two subdivisions, namely, the ‘art of judging’ and the ‘art of inventing’, and associated with them, respectively, ‘analysis’ and ‘synthesis’ (see Chapter 38). While the guiding idea of the general science was to ground both its components upon a rigorous ‘universal mathematics’, Leibniz was aware of the fact that this was not sufficient for discovery, which requires also heuristic methods, capable of complementing their deductive counterparts. Such methods range from the exploitation of mathematical and logical tools such as the \textit{ars combinatoria} (see B), the calculus of probabilities (see Chapter 13), and the \textit{characteristica universalis} (FC VII 103), through the appropriate compilation, organization, and presentation of extant knowledge with a view to its inventive use (see Chapters 15, 22, 40), up to the use of traditional as well as new \textit{topoi} – including standard ways of reasoning and arguing such as \textit{diaeresis} (see B) and ‘rules of thumb’ for reaching results sought in one’s investigation (see C and D). A small sample of these methods is assembled in the present Chapter – other examples being scattered throughout the book. Text A discusses the project of an art of invention ‘in general’ suggesting that it implies a particular combination of analysis and synthesis; it also exemplifies the different types of heuristics mentioned above. Taken together, what emerges is a plurality of methods necessary for the progress of human knowledge, and thus part and parcel of the eminently rational nature of such a process, in spite of the fact that they are not reducible to formal devices. Furthermore, unlike for Descartes, it becomes apparent that method does not consist, for Leibniz, in a single, linear order of proceeding uniformly. No doubt to proceed methodically – in invention as elsewhere – means, for him, to proceed orderly, but order is intrinsically plural. In this sense, methodological plurality is itself the most important ‘principle of invention’.
A. THE ART OF INVENTION

This is one of the most marginally annotated manuscripts of Leibniz – which suggests the importance he assigned to the art of discovery. Indeed, this is an important text due to its attempt to generalize the very concept of a method of invention, as well as of a method of investigation. As in other texts on this subject, Leibniz surveys all sorts of methods that are useful for discovery. And in most of them he mentions analysis and synthesis, referring the first to the *ars judicandi* and the latter to the *ars inveniendi*. What is peculiar in the present text is that both analysis and synthesis are treated as types of the “method of investigation” (*methodus quaerendi*). The distinction he points out between the two is, thus, not functional, but rather pragmatic in nature: whereas analysis is said to be more difficult, synthesis is said to be more time consuming; furthermore, whereas the former is said to be impossible to achieve in some cases, the latter is said to always lead to a solution. In spite of such differences, or perhaps because of them, Leibniz considers an “admirable invention” the combination of the two methods, which he labels “analytical synthesis”.

The present text culminates and is abruptly interrupted with a revealing mathematical example, which may well be an instantiation of that “admirable invention”. For, the proposed “perfect” method of enumeration and classification of transcendental curves is in fact based upon the analysis of such curves as derivable or composed from simpler curves. Without this analytic component no ‘reason’ or ‘law’ for the proper progressive enumeration could be given. At the same time, the proposed method can only achieve perfection – according to Leibniz – by employing the art of combinations – which he always mentions as the paradigmatic example of synthesis. Leibniz’s failure to achieve his attempted enumeration may be seen perhaps as a limitation of the purely *a priori* approach in yielding the desired ‘general formula’, which eventually paves the way for the consideration of the other kinds of heuristics of invention, not necessarily combinatorial in nature.

Date: 1678?
Edition: A VI 4 A 79-83
Language: Latin

On the art of discovery in general

One should make sure that, when investigating, one does not work in vain, which can be achieved if we take care that we always discover something, even if we do not find what we are looking for. One should also make sure that, in the process of investigation, we are aware that we are always and ever more approaching that which [the investigation] is all about, for if we know the art of continuously progressing, we will necessarily reach that which [the investigation] is all about. Hence, we should act like someone looking for a needle who does not disperse his gaze here and there