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Salient phases of mathematical problem-solving

Recent philosophical discussions concerning the application of mathematics focus on the correspondence between empirical and mathematical structures (since Field (1980)) or on the issue of explanation (since Baker (2005)).

As a result, the analysis of applications has been persistently subjected to a counterproductive focus. In particular, the problem-solving character of applications has been concealed. Little attention has been paid to the fact that, in scientific enquiry, interrelated problems, rather than structured settings, present themselves first. Settings arise from after successful problem-solving techniques have been crystallised. Moreover, only after systematic work to bring problems under control has been carried out is it possible to consider certain facts as results of formal analysis, i.e. it is only after the construction of a problem-solving methodology by mathematical means that explanations arise as, possibly significant, byproducts.

My goal on this presentation is to refocus the study of applications around problem-solving and away from mirroring and explanation. I offer some reflections on what important phases of mathematised enquiry should be given prominence as a subject of closer analysis. In order to keep contact with mathematical practice, I develop my reflections in connection with the development of mathematical voting theory (especially Saari (1994)).

References: Baker, A. (2005) 'Are there genuine mathematical explanations of physical phenomena?', Mind 114, pp.223–238. Field, H. (1980) Science without numbers. Oxford: Clarendon Press. Saari, D.G. (1994) Geometry of Voting. New York: Springer.