

Naturalness as a Value of Theory Preference

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The principle of naturalness seems to be a mysterious dweller in the edifice of contemporary particle physics. It has been given different formulations that were aptly dissected by philosophers. But the community itself seems to consider the naturalness problem as a largely coherent guide for model builders. As such, naturalness has come under pressure through the observation of the Higgs boson and the dramatically reduced parameter space for all physics beyond the Standard Model that could be a candidate to solve the naturalness problem. But naturalness is too closely connected to other key concepts and principles of particle physics to go away like a worn-out story, a narrative that keeps together what has long fallen apart. The era of post-naturalness that Giudice has recently proclaimed is still chiefly shaped by the naturalness and, accordingly, far away from the incommensurability required for a Kuhnian revolution.

My paper intends to provide a basis for discussing naturalness by interpreting it as a complex value of model preference. Such cognitive values or criteria can be epistemic or pragmatic; default examples are empirical adequacy or simplicity respectively. In a field as complex and parameter-rich as contemporary particle physics, empirical values usually leave wiggle room until a model can be considered confirmed and its competitors are squeezed out from the parameter space. In the Higgs sector, naturalness starts out as an empirical value of preference –from the specific problem a scalar particle presents for the theory’s consistency –that prompts a pragmatic value, the amount of fine-tuning one is willing to accept. If one abandons the idea to pit rational justification against historical happenstance –that still lingers in some discussions on values of preference – there is nothing problematic about such complex values.

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