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# Leaping from Waddington's landscape: premature theorizing in stem cell biology

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## Abstract

*Session: Asking the Hidden Questions Raised by Stem Cells: History, Philosophy, and Biology (Jane Maienschein, Melinda Fagan, Lucie Laplane, Michel Vervoort)* Several scientists have recently argued that stem cells should be understood, not as a kind of cell with stable traits, but in terms of dynamical systems models and concepts such as state, attractor, noise, and oscillation (e.g., Huang 2012, Furusawa and Kaneko 2012, Selvarajoo and Tomita 2013). This argument begins with the idea that stem cell experiments have out-run our understanding of stem cell capacities and behavior. The point is well-taken. But dynamical-systems theorists fail to consider what kind of understanding is needed – i.e., the kind of explanation sought by stem cell biologists. Instead, they assume a mathematical theory will suffice. I argue that, according to prevailing standards in stem cell research, the dynamical-systems account does not offer an explanation, but merely re-describes the familiar stem cell concept. This description, however, can play an explanatory role. To see this, a more measured approach is needed, which considers (i) results of stem cell experiments, (ii) their relation to explanatory models of cell development, and (iii) identifies deficiencies in those models. I conclude by discussing general implications of this result for ideas about theory and explanation in experimental sciences.

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