

Originally applied to preserve a materialist worldview that extends beyond physics and chemistry, the notion of levels of organization is one of the most recognizable ideas in biology. Although sometimes (erroneously) used interchangeably, the relationship between ‘levels’ and ‘scale’ presents an exciting (and relatively unexplored) area in theoretical biology and the history and philosophy of science. Here, Brooks will address this lacuna by clarifying how the two notions can inform and enhance one another. To this effect, he links up the idea of levels of organization with the insight that putative levels (e.g., cells, tissue, and ecosystems) exhibit distributed clustering that extends across scale ranges rather than particular part-whole demarcations. This ‘local maxima’ approach suggests that levels should be seen as a spectrum, where attributing discrete identity (as a particular type of, e.g., cell, tissue, ecosystem) is distributed across distinct and moderately localized or regional resolutions in time and space.

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# Daniel S. Brooks

## Scale Ranges

### The Variety of Matter’s Forms, and Levels of Organization as Local Maxima

**Lecture Series Scale** Scales are used to quantify properties such as length and temperature, or also to measure popularity and affect. But as Alice discovers in Wonderland, a change of scale can also have dramatic qualitative consequences. It disrupts customary ways of perceiving, acting, and being — to the point of feeling as ‘queer’ to her as a caterpillar’s metamorphoses. Helped by the arguably inextricable intertwinement of different meanings and aspects of scale, Alice’s experiences continue to provide apt metaphors for the disorienting importance and effects of scale and scaling at a time of hyperglobalization and the so-called anthropocene.

Scale is indeed a highly ambiguous notion, even when one only considers the meanings deriving from the Latin or Italian *scala*, ladder. It simultaneously denotes the whole ladder, one of its steps, and the relation between two steps: The scale of a cartographic map is the ratio between a distance on the map and a distance on the ground, but any particular length also defines a scale, and the range of scales from the subatomic to the planetary scale is part of the spatial scale. Paradoxically recursive, scale combines and helps mediate quantity and quality, as well as subjective perception, objective material properties, and contingent construction.

If different disciplines, discourses, and dispositives each have their privileged scales to which they tend to reduce others, what may be gained by thinking them together, acknowledging both the relative autonomy of particular scales — each with their own affordances, limitations, rules, even laws and ontologies — and their interdependence — each affecting and being affected by other scales? What is the critical purchase of developing multiscale architectures or patchworks of scale-specific, mutually inconsistent and irreducible descriptions, theories, and models? How might the tensions be made productive where they overlap or come into contact? The ICI’s Lecture Series ‘Scale’ will address such questions by reflecting upon the critical role of scale within and across a wide range of different fields.