**Scaffolding: Articulating Process in Scientific Explanations**

**Abstract**

Perhaps the central challenge for any scientific account of origins is to explain how novel phenomena can emerge from something else. This fundamental puzzle can be seen in a wide variety of sciences. Even within the life sciences, it captures questions that range from “how does a child develop a distinct new skill or capacity?” to “how did multicellularity arise?” In this presentation, we will argue that what we call *scaffolding explanations* provide a distinctive form of explanation that is well-suited to answering questions about how novel phenomena can emerge from other quite different phenomena.

While scaffolding explanations have been employed in the sciences for some decades, how exactly they work is far from clear. They first became prominent in development psychology, where it describes a process in which agents use elements of their environment to accomplish a task that would be difficult to attain otherwise (Wood et al. 1976). More recently, scholars have applied this idea to various evolutionary contexts, ranging from cultural evolution (Wimsatt and Griesemer 2007; Carporael et al. 2014) to the emergence of multicellular life (Black et al. 2020; Doulcier et al. 2020). While these uses of scaffolding are certainly evocative, it is not clear how they are different from other evolutionary explanations that do not employ the term.

In our presentation we will explicate the notion of scaffolding by identifying a generic explanatory strategy shared by developmental psychologists and evolutionists. Our hope is that by clearly articulating this distinct explanatory strategy we might not only clarify what scientists mean when they talk about various phenomena “being scaffolded” or “scaffolding” various other phenomena, but we might also lay bare its tacit structure and relation to other types of explanation (Calcott 2008; Godfrey-Smith 2009; Brown 2014). Clearly articulating the essential structure of scaffolding explanations appears like a necessary first step for developing criteria by which to judge them significant, useful, or sound.

The basic thread of scaffolding explanations is that an object or system is transformed through interaction with an independent set of (typically) environmental resources in a specific concatenation—a scaffold—that initiates and maintains a scaffolding process, which redirects the object or system toward an outcome that otherwise it would have been unlikely or unable to achieve. Such an outcome is often transformative, providing the object or system with novel features or capacities; permanent, when the new state of the object or system can be endogenously maintained once the scaffold is removed; and facilitative, when it provides causal opportunities that may include further transformations by the imposition of new scaffolding resources. In some areas, such as organic development, cascades of scaffolded transformations are ubiquitous. However, the full scope of this explanatory strategy in biology is yet to be seen. We are particularly interested in evolutionary explanations, where scaffolds might be used to explain the emergence of new levels of selection or major transitions in evolution.