

題目 : The Emergence of Technological Structure: The Effects of Learnability and
Functionality in the Evolution of Technology 和訳 : 技術における構造の創発 : 学
習可能性と機能性の淘汰圧が技術の進化に及ぼす影響の検討

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What is unique about human beings is their ability to cumulatively increase the complexity of their culture (Tomasello, 1993). For humans to accomplish such feats, however, the culture being transmitted is thought to go through two types of selective pressures. One of them is called functionality. Functionality selects cultures that are efficient enough to produce a better outcome than the previous. The other pressure is learnability. Learnability selects those cultures that are easier to acquire. When the two types of selective pressures are present in the evolution of language, they create a systematic structure that makes the language contain multitude of words that are easier to learn (Kirby et al., 2004). In this research, I adapted this theory to the evolution of technology and investigated if the two pressures that constitute the unique structure for natural language also create unique structure for technology. Takezawa & Suyama (2013) have already found in their research that the 2 pressures may have created a simplistic structure in the evolution of technology. In 2 experiments, I further investigated this hypothesis based on the findings by Takezawa & Suyama (2013) using the same spaghetti tower task.

In experiment 1, the 2 pressures were controlled separately to see if the 2 pressures are necessary to create the simplicity found in Takezawa & Suyama (2013). The spaghetti tower task was used to test how the structure of the towers change whether by passing along the technique from one person to the next or by 2 participants

continuously creating the tower (control learnability) and whether by asking the participants to make a structure as high as possible or just asking them to make a structure (control functionality). As a result, the simplicity found in Takezawa & Suyama (2013) was not replicated. The 2 pressures did not create simple structure just like in the previous research but that result may have been caused by the lack of variation in the first generation of the chain, all creating a simple tower in the first place and kept using that structure.

Taking experiment 1 into account, in experiment 2 the structure of the first generation was controlled by showing them a video of either a complex and difficult tower model or a simple and easy tower model. In this experiment, both the results of Takezawa & Suyama (2013) and experiment 1 was replicated. In the conditions that saw the complex tower model, the towers' structure became simpler in the condition that had both pressures for learnability and functionality compared to the condition that controlled the pressure for learnability. In the other hand, in the conditions that saw the simple tower model, the simplicity of the towers stayed relatively constant.

Using 2 experiments, I was able to determine when the simplicity in the evolution of technologies can be observed. It was found that the 2 selective pressures do influence how the technologies will be formed. The next objective will be to figure out what kind of unique structure is actually being made to simplify the structure of the technology just like compositionality in the evolution of natural languages.