Spatial structure in the cultural ecosystem of number

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Abstract

Cognition and culture shape each other. Private thinking is externalized in public artifacts, which can shape habits of thought. Within individual minds, for instance, numbers are associated with space. Do similar regularities exist within the cultural ecosystem of written numbers? We analyzed three contexts: English books, childrens picture books, and algebraic expressions created during mathematical activity. Within individual numbers, digits were ordered spatially from left-to-right, with lower-value digits appearing more often to the left and greater-value digits to the right (e.g., 179). On a larger scale, lesser-valued numbers were more likely to appear first in phrases and algebraic expressions (e.g., 19 dogs and 32 cats, 19x+32). The cultural ecosystem of number thus exhibits spatial regularities at multiple scales. We discuss implications for the development and dissemination of individual mental associations (mental number lines) and defend an ecological perspective in which cognition reflects mutual constraints between artifacts, practices, and individual thought.