

# Catalyzing Natural Pattern Innovation and Gaian Collective Creativity

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Portions of this work sourced from and described in detail in Chapter 4, Section B and C in [Hauk, 2014b, *Gaia E/mergent*] which appears in part in [Hauk, 2014a, pp. 97-121].

## 1. INTRODUCTION

Interest in the phenomena of collective creativity is increasing, including along the dimensions of emergent and complex collective creativity. Of particular relevance, inter- and transdisciplinary challenges in the field of sustainability might benefit from just such forms of collective creative intelligence. This research was designed to optimize and assess the effectiveness of educational interventions using ecological patterns to catalyze collective creativity for sustainability solutions.

Positioned at the vital intersection of collective intelligence, systems thinking, fractals, creativity, and regeneration, this research describes emergent, complex, regenerative collective creativity. Creative emergence and earth regeneration are both autopoietic. Connection with the regenerating patterns of living planetary systems seem to serve as a catalyst for complex creativity. Process-patterns from nature and bioculture catalyze regenerative creativity and fruit in ethical and educative engagement and innovation, enhancing life-giving diversity and reducing dogmatism. In particular, the transdisciplinary quality of ecofractal-activated regenerative creativity is consonant with the terrain of sustainability challenges. During this daunting epoch of the Anthropocene, complex regenerative creativity offers to crystallize the deep paradigm shifts required for planetary and local flourishing.

### 1.1 Context – Emergent Creativity and Sustaining Nature-Catalyzed Collective Creativity

There is a significant body of research regarding emergent phenomena around collective human creativity. Creativity and innovation scholars confirm the connection between generativity, creativity, complexity, and sustaining gyres of innovation. The conditions that spark regenerative creativity are cultures of innovation. [Barron 1995] emphasizes a complexity and systems approach to the ecology of creativity, which he considers as emergent (pp. 300, 315). [Goldstein, Hazy, and Lichtenstein 2010] name these “ecologies of innovation,” a “system-wide set of processes and interactions” that are characterized by systems of difference, adaptability, interaction resonance (feedback amplification), and using cooperative strategies and symbiosis (pp. 27-33). [Wood 2013] advocates meta-design for creatives to realize “synergies of synergies” in ecomimetic sustainability design systems (p. 442). [Csikszentmihalyi 1999]’s multiscale systems perspective of creativity notices that support and understanding of the cultural domain and contexting field are required to nurture and proliferate individual creativity and give it meaning and persistence. [R. Keith Sawyer 2010]’s research with improvisational groups generates insights into another complexity-informed theory regarding creativity beyond the individual, theorized as collaborative emergence. Collaborative emergence focuses on improvisation and action in group creative productivity, noticing the parallels between complex emergence and collaborative creativity. Another creativity researcher noticing correspondence between emergence and creativity cultures, [Runco 2007] describes nonlinear cascades of inventions that lead to subsequent inventions as creative emergence via trigger effects (from Burke) and “emergence” (pp. 237-238). These level-hopping, chaotic emergence cultures of creativity, including ecologies of innovation, domain and field feedback, collaborative emergence, and emergence, all indicate polyscale interactions for creativity and begin to describe the rich, emergent “edge of chaos” at which collective creativity can be continuously self-emerging, replenishing and regenerative.

Strands of attention to what might be termed ecological creativity also inform the field of research, including in collectives that involve nonhuman collectives and ecosocial (human and nonhuman) symbiotic collectives.

Complexity and creativity inspired by natural patterns are sourcing system-level innovation in an increasing number of arenas, including biomimetic invention [Bar-Cohen 2006, 2012; Benyus 2002], resilient social-ecological governance [Berkes et al. 2003; Waltner-Towes et al. 2008], ecological design [Van Der Ryn and Cowan 2007], regenerative design [Lyle 1994], ecological integrity and collaborative transformation [Manuel-Navarrete et al. 2004], living buildings, biophilic design, and architectures of renewal [Cumberlidge and Musgrave 2007; Kellert 2005], and living systems education [Ambrose 2009; Bache 2008; Cohen et al. 2011; Davis and Sumara, 2006; Doll, et al. 2005; Mason 2008; Widhalm 2011]. Other cultural forces also affirm the need for attending to complex creativity: technological amplification requires radically adaptive modes of creativity [Thomas and Brown 2011, pp. 86-88] and increasing organizational and problem complexity requires greater creative capacities [Maubossin 2011]. As [Richards 2001b] emphasizes, “Clearly, this is an important time for creativity” (p. 249).

Collective beings are, as expressed by mathematicians [Minati and Pessa 2006], a linguistic construct for emergent (complex) beings, “a Multiple System established by processes of emergence and self-organization of the same agents simultaneously and dynamically interacting in different ways.” [Bowers 2011, 2012] emphasizes emergentist, collective forms of ecological intelligence, confirming the complexity education model focusing on the locus of the learning in the group [Davis and Sumara 2008] and the human-nature collective rather than (and/or in addition to) the individual. [Sterling 2009] suggests times require this type of connective eco-cultural consciousness. Cultivating educational and collaborative processes for ecological intelligence requires attending to hidden patterns and relationships [Goleman et al. 2012]. These movements amongst a larger literature invite study of how to optimize emergent regenerative qualities in collective creativity through engagement with patterns from nature.

## 1.2 Research Design

This research is part of a larger complexity-informed, mixed methods body of research spanning multiple years and eighty participants at four scales [Hauk, 2014b]. Research involving brief and long-term interventions with ecological fractal patterns (hereafter ecofractals) seemed warranted to assess individual and group effects on creativity. This paper will focus on the group effects for one long-term participant-group. Within the third scale of the research, collaborative creativity in small groups, five groups were studied [Hauk, 2013b, 2014b] and the results reported here reflect the findings from the longest term intervention of the five.

## 1.3 Intervention

During two day-long regenerative ecofractal creativity intensives spanning a period of over one year, the participants worked in a small group using a variety of earth-pattern informed and ecofractal creativity interventions to enhance their innovation. They were undertaking their own purpose – to design an ethical review process for a college institutional review (IRB) process that would include living systems ethical considerations. Both quantitative and qualitative instruments were used to assess the effectiveness of the interventions.

## 1.4 Scoring

I prototyped a tool for group process/system emergence and work product assessment, the Transdisciplinary Regenerativity Index (TRI) [Hauk 2013a]. The TRI Index represented an initial metasynthesis [Thorne et al, 2013, 1,356] of a set of thirteen transdisciplinary sources describing attributes or qualities of regenerativity, including from regenerative design, ecological design, life science, permaculture, and living systems thinking [Hauk 2014b, p. 209]. Rather than using raw count of ideas produced in brainstorming as a metric of divergent production [Paulus and Brown 2003], or only their fluidity (count) and flexibility (different categories generated) [Larey 1994], complex and living systems approaches might suggest that the regenerativity of the ideas is more important. The Transdisciplinary Regenerativity Index looked within and across disciplines for factors, conditions, indications, and descriptions of regenerativity. Regenerativity is conceived here as a type of emergent creativity, a kind of self-organizing autopoiesis beyond sustainability, particularly appropriate for group and systems scales. A prototype of the TRI sourced from transdisciplinary sources and constituting fifty-one factors clustered in fourteen themes was utilized to assess group work products.

## 1.5 Findings – Long Term Training Effect from Earth Pattern-Catalyzed Regenerative Collective Creativity

*Sustained long-term training effect.* The most significant finding from Group 1 research and Transdisciplinary Regenerativity Index scoring at the group level was the cumulative score increases from repeated encounters with the ecofractals. Fitting a linear model to the regenerativity scores (Group 1, across Sessions 1 and 2) versus the

number of activities [using a regression of an ordinary least squares model (OLS)], found a slope of  $+6.6 \pm 0.9$  points per activity. In other words, over seven activities, over the more than twelve months of the study, the Group 1 team experienced a significant cumulative increase of six and half regenerativity points per activity that built upon the gains of the previous activities. The p value of this coefficient is  $p = .000592$ . This means that it is 99.94% likely that this training effect is not 0. The effect is very long-lasting, as these experiments took place across a period of more than twelve months.

Potential limitations and caveats include that the events were not evenly spaced (seven activities across two encounters, twelve months apart). It is unclear if the results are generalizable, due to small sample size, small number of experiments, and high level of education of Group 1 participants. Also, the scoring using the Transdisciplinary Regenerativity Index is an interpretive activity. Finally, the usual caveats of ordinary least squares (OLS) models apply. Nevertheless, the activity upon activity gain in regenerativity scores is significant and merits further study.

The final team design to catalyze online, self-organizing research communities via a “research nest” design benefited from their earlier brainstorming and processes, so there are potential successive learning effects present and more study is needed. To note, complexity research does not seek to reductionistically isolate variables, so these types of synergistic effects are actually desirable and demonstrate the emergent properties present in living systems research and can reflect effective collaborative emergence. Table 1 highlights the findings related to the regenerativity scores for these collaborative creations.

Table 1

*Group Creative Collaborations Raw Scores for Regenerativity in Design – Number of Total Points and Number of Factors Present – Cumulative Learning Effect*

*(Using the Transdisciplinary Regenerativity Index, Version 1)*

Research Context	Year 1				Year 2		
	Total Raw Regenerativity Score (of 102)	49	50	68	74	72	81
% out of 102 Points	48%	49%	67%	73%	71%	79%	87%
Raw Number of Factors Present (51 factors)	36	32	41	46	46	48	49
% of 51 Factors Present	71%	63%	80%	90%	90%	94%	96%
Activity Number for Regression	1	2	3	4	5	6	7

*Note.* For the total score of activities 1-7, there is an increase for the long-term team of  $+6.6 \pm 0.9$  points for each activity. T statistic is 7.691. Given the degrees of freedom and the T statistic, the  $p = .000592$ . This means it is 99.94% likely that these results are not zero. Tested via linear regression, looking for a training effect using R 3.0.0 software.

Educators and ecopsychologists notice the diminishing nature languages of human-nature interaction [Kahn et al. 2010] and the subsequent losses to students, cultures, systems, and psyche. Earth system decoherence as a result of industrial extraction and pollution threaten peoples and ecosystemic integrities. Catalyzing alternatives to anthropogenic degeneration, ecosocial collective creativity, which might generally be understood as Gaian collective creativity, holds promise to inspire holistic, regenerative patterns of congruence and restoration. In a world of increasing industrial grid, this research suggests that collective intelligence for sustainability solutions includes sustaining earth regenerative ecologies of innovation through ecofractal geometries and Earth patterns in collective creativity processes.

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Innovation and creativity are fundamental to all academic disciplines and educational activities, not just the arts. The creative process, as with reflection considered in the previous chapter, is a critical component of making sense of learning experiences. A number of approaches to teaching and learning are considered in this chapter that help to nurture creativity and innovation. See Figure 6 for a visual overview (page 58). What are innovation and creativity? Innovation can be broadly thought of as new ideas, new ways of looking at things, new methods or products that have value. Innovatio... Daniel Christian Wahl â€” Catalyzing transformative innovation in the face of converging crises, advising on regenerative whole systems design, regenerative leadership, and education for regenerative development and bioregional regeneration. Author of the internationally acclaimed book *Designing Regenerative Cultures*.