

ENVISIONING CONVERGENCE RESEARCH WITH PRINCIPLES OF **LLIFE** AND BIOPSYCHOSOCIAL ECOLOGY

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Concept

LLIFE: A transdisciplinary ecological heuristic to guide convergence research

LLIFE Principles:

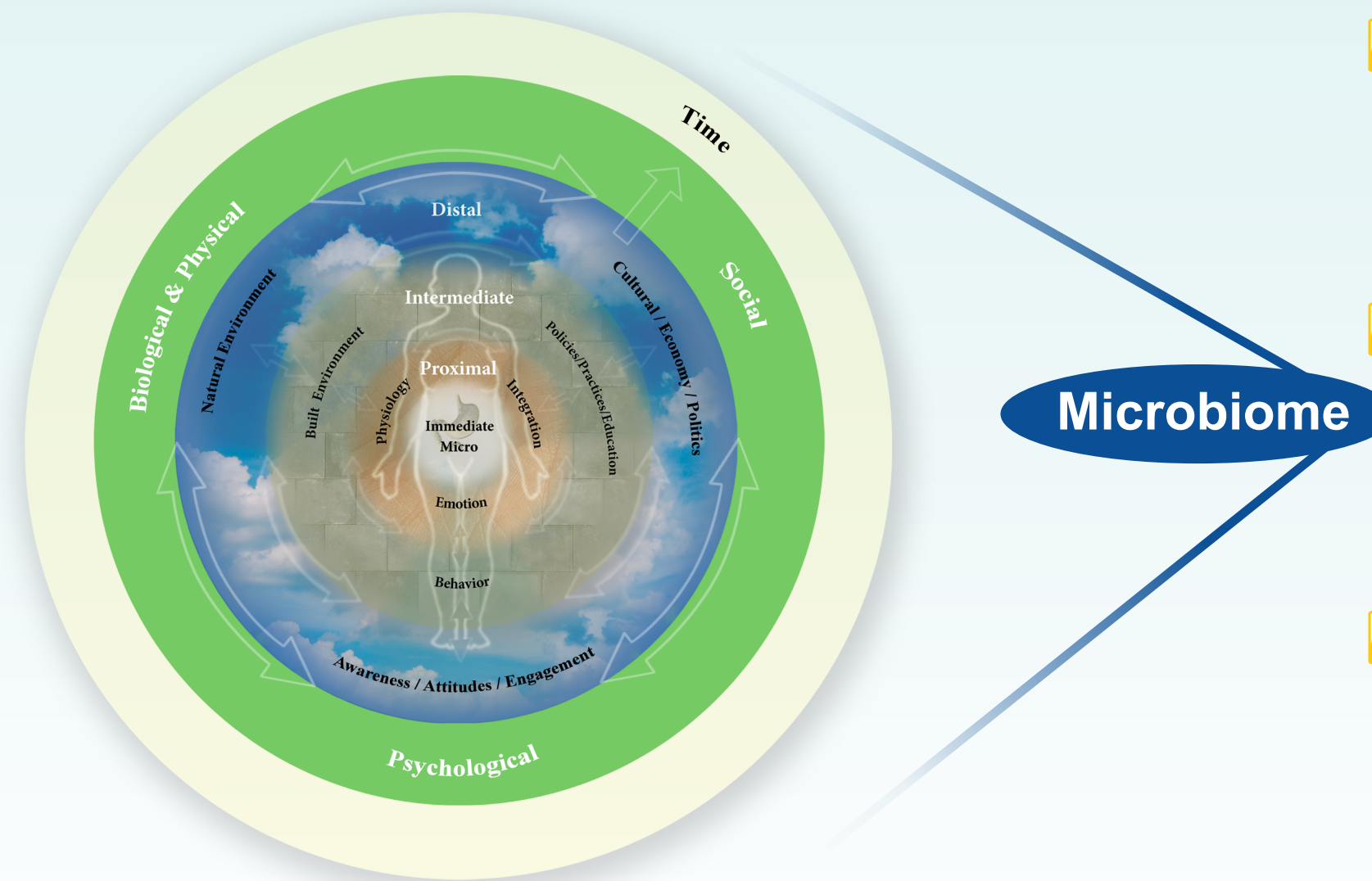
- LARGE:** In scope
- LEVELED:** All scales of analysis
- INTEGRATIVE:** Interconnected levels & domains
- FRAMEWORK:** Explicit, dynamic structure
- ECOLOGY:** Interaction of all living & non-living things

Convergence Research

“Thinking ecologically means synthesizing the many fields of human knowledge into a coherent world view”
(Keller & Golley, 2000)

Operationalized

Biopsychosocial Ecological (BPSE) Framework of Health



Applied

Biopsychosocial Index of Microbiome Ecologies on Zotero (BIOME-z)

- Biological Factors**
 - Micro
 - Proximal
 - Intermediate
 - Distal
- Psychological Factors**
 - Micro
 - Proximal
 - Intermediate
 - Distal
- Social Factors**
 - Micro
 - Proximal
 - Intermediate
 - Distal

	Biological/Physical	Psychological/Behavioral	Social
Distal	natural environment	awareness, attitudes, engagement	culture, economy, politics
Intermediate	built environment	behavior	education, policies, practices
Proximal	physiology	emotion & cognition	social support & relationships
Micro	genes, metabolism, microbiome		

Importance of LLIFE:

	Not important	Important	Essential
LARGE	8%	47%	25%
LEVELED	7%	51%	31%
INTEGRATIVE	8%	42%	44%
FRAMEWORK	10%	49%	27%
ECOLOGY	7%	33%	53%

LLIFE represented by BPSE:

	Not represented	Somewhat	Represented
LARGE	12%	37%	39%
LEVELED	18%	40%	30%
INTEGRATIVE	18%	46%	26%
FRAMEWORK	32%	36%	21%
ECOLOGY	18%	32%	40%

LLIFE represented by BIOME-z:

	Not represented	Somewhat	Represented
LARGE	10%	35%	40%
LEVELED	18%	35%	38%
INTEGRATIVE	18%	33%	35%
FRAMEWORK	23%	38%	26%
ECOLOGY	7%	39%	39%

Value of BPSE:

	Not valuable	Somewhat	Valuable
CONCEPTUALIZING INTERDISCIPLINARY RESEARCH	28%	34%	24%
IDENTIFYING RESEARCH AREAS IN NEED	40%	20%	24%

Value of BIOME-z:

	Not valuable	Somewhat	Valuable
CONCEPTUALIZING INTERDISCIPLINARY RESEARCH	10%	43%	36%
IDENTIFYING RESEARCH AREAS IN NEED	12%	31%	29%

Methods: Online survey in 2019 via AAAS Community Discussion groups, with 94 responses.

12% Women 90% USA
M=21 (SD=2.7) yrs education
35% Academic or research

Conclusion: Findings suggest that LLIFE principles may support convergence research, are represented in the BPSE framework and BIOMEz application, and may have practical benefit for convergence research conceptualization and funding allocation. A more representative sample of the scientific community is needed.

Questions? Feedback?
Suggestions?
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Abstract

Background: Convergence research (CR) addresses complex problems through intentional, deep integration of knowledge and methods from the disciplines, developing frameworks to advance science, and merging these efforts holistically. This study assessed the concept, operationalization, and application of Large, Leveled, Integrative Framework Ecology (LLIFE) as a set of aspirational guiding principles for CR. The principles identify CR as: **Large** in scope, spanning relevant domains/disciplines; **Leveled** with scales of analysis; **Integrative** of concepts and research findings across levels and domains; with an explicit **Framework** identifying associations and mechanisms that suggest points of collaboration and context for research findings across levels and domains; and **Ecological**, reflecting the superordinate principle that all living things interact with physical and social environments in complex ways over space and time. Proof of concept was examined with the human microbiome for its complexity and potential for CR across the sciences. LLIFE was operationalized with the Biopsychosocial Ecological (BPSE) framework that outlines bio-physical, psychological/behavioral, and social domains that are integrated across multiple levels of analysis relevant to the microbiome. The BPSE framework was then applied to construct the Biopsychosocial Index of Microbiome Ecologies on Zotero (BIOMEz), an interdisciplinary microbiome literature database.

Method: A convenience sample [$M=20.2$ (2.5) yrs education] was obtained via professional science networking sites. Respondents rated the LLIFE principles on importance for guiding CR, the extent that BPSE and BIOMEz represented LLIFE principles, and the value of BPSE and BIOMEz for conceptualizing interdisciplinary research and for funding agencies to identify needed areas of research.

Results: Respondents (68-90%) indicated across the 5 LLIFE principles that they are “important” or “essential” to guide CR; 65-81% of respondents across the principles judged them to be either “somewhat represented” or “represented” by the BPSE framework, and 70-81% by BIOMEz. Respondents viewed BPSE (62%) and BIOMEz (77%) to be “somewhat valuable” or “valuable” for conceptualizing interdisciplinary research, and BPSE (50%) and BIOMEz (64%) to be “somewhat valuable” or “valuable” for funding agencies to identify areas of research need.

Conclusion: Findings suggest that LLIFE principles may support CR, are represented in the BPSE framework and BIOMEz application, and may have practical benefit for CR conceptualization and funding allocation.

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BIOME-z: https://www.zotero.org/groups/2286110/biome-z_biopsychosocial_index_of_microbiome_ecologies/library