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What is Interdisciplinarity? The RP Mechanisms (Rhoten & Pfirman)

Early Twentieth Century --> Mid-Century

- **Education:** general education and core curriculum (heritage vs. contemporary problems)
- **Social Sciences:** SSRC (purposive, empirical social problem-oriented applied research in problem fields: e.g., social security & public administration), reform social science

Field Creation: e.g., American studies, area studies, social psychology, biochemistry, radio astronomy, cognitive science, materials science

“Instrumental” Problem-Oriented IDR: agriculture, Manhattan project, operations research

Crossfertilization: Adapting tools, concepts, data, methods, and results (RP)

- Crosses all domains and other RP Mechanisms
- Borrowing (e.g., quantitative methods, lasers, microscopy, statistics)
- New paradigms and syntheses (e.g., plate tectonics, “man-land” perspective in geography, general systems theory, structuralism, chaos theory & non-linear dynamics)

Escalation in 1960s & 1970s

- **Education:** general education, new fields, new experimental structures

Field Creation

- “High-Context” Fields: “Critical IDs” of Black studies, women's studies, ethnic studies
- Other “Context” and “Problem” fields: environmental studies, STS
- Darden & Maull’s “interfield theory”: Science defined as a network of relations focused on a central problem, domain of entities or phenomena, general explanatory factors and goals, techniques, methods, and related concepts, laws, theories: chromosome theory, operon theory, theory of allosteric regulation

Crossfertilization

- Post 1950s turn from insularity in disciplines: borrowing methods + Concept Interdisciplinarity (systems/game/information theories, cybernetics, synergetics, semiotics, structuralism)
- Social history, man-land relationship in geography, historical-social-economic explanation in literary studies
- New paradigms: sustainability, health & wellness, chaos theory

Problem Orientation: Cross-disciplinary topics, broad mission, multiple stakeholders (RP)

- Prioritizing of Instrumental/Opportunistic IDR> Product Innovation & Discovery
- Political Economy of Interdisciplinarity Shifting from Endogenous ID to Exogenous ID
- *Exogenous:* “real problems“ of community and pragmatic social mission of the university
- IDR Prioritizing in internationally competitive science-based fields of high technology: e.g., engineering & manufacturing, computers, biotechnology, biomedicine & health
- Inter-institutional alliances with government & industry for commercial knowledge production: offices of technology transfer, industrial liaisons, entrepreneurial firms
- ID as short-term solution to economic and technological problems foregrounds pragmatic questions of reliability, efficiency, commercial value, and knowledge policy. In social medicine and sociology of health, epistemological goal foregrounded, focusing on complex causality of illness and disease that factors in psychological, social, and ethical factors missing from hierarchical biomedical model (BryanTurner)

New Plurality and Complexity 1980s --> 2007

- **Education:** general education, plurality of fields, heightened problem-focus across curriculum

Field Creation

Expanding Fields: e.g., cultural studies, media & communication studies, information science
NRC Taxonomy: global area studies; feminist, gender, & sexuality studies; nanoscience, bioinformatics, and computational biology. Biology > Life Sciences and includes agricultural sciences. Also: emergence of Clinical & Translational Science

Crossfertilization

- **Generative Technologies:** e.g., spectroscopies, magnetic resonance imaging, new instrumentation and informational analysis, new quantitative methods and advanced computing power that facilitates data sharing
- **ID Knowledge Production Spillover:** conferences and symposia, journals)

Team-Collaboration + Problem-Oriented (RP)

- **Team & Network Exchange and/or Creation of new tools, concepts, data, method, results**
- NAS Drivers of Complexity and Societal Problems
- Escalation of Transector TDR on Problems of the *Lebenswelt*
- Mode 2 Knowledge Production, Gibbons, et al.: synthetic reconfiguration and recontextualization of knowledge (complexity, hybridity, non-linearity, reflexivity, heterogeneity, and transdisciplinarity)
- Academic, Strategic, & Target Knowledge and stakeholder “participation”
- Shift from solely “reliable scientific knowledge” to “socially robust knowledge”

The Unravelling Dichotomy of Disciplinarity and Interdisciplinarity

- Disciplinary plurality and heterogeneity
- Relationship a productive tension characterized by complexity and hybridity (Weingart)
- Genre Blurring (Geertz) & Ontological Gerrymandering (Woolgar & Pawluch, Fuller)
- Sometimes borrowing assimilated so completely not “foreign”: physical techniques <> biology
- Increased Hybridization: innovation & recombinations at margins (Dogan & Pahre)

Disciplinary Redescription

- “Federated discipline” of Physics in 1990s (NRC): Fundamental Research: biological physics, materials science, physics-chemistry interface, geophysics, mathematical physics & computational physics. Technical Applications: microelectronics, optical technology, new instrumentation, energy & environment, national security, & medical applications.

Rethinking Institutionalization and “Space” of IDR

- The White Space Factor: familiar catalysts of specialty migration & shared problem domain
- Current unpredictability, complexity, quickening pace, projects, and teamwork
- Expanding Shadow Structure of IDR: matrix structures & invisible colleges > virtual networks
- Changes in organization of science have weakened monolithic control of departments

Thinking, Learning, and Working Styles

- Individualistic vs. Collaborative/Cooperative
- Mutual Learning, Creativity, and Risk-Taking
- Holistic, Global, Systems, Complexity Thinking