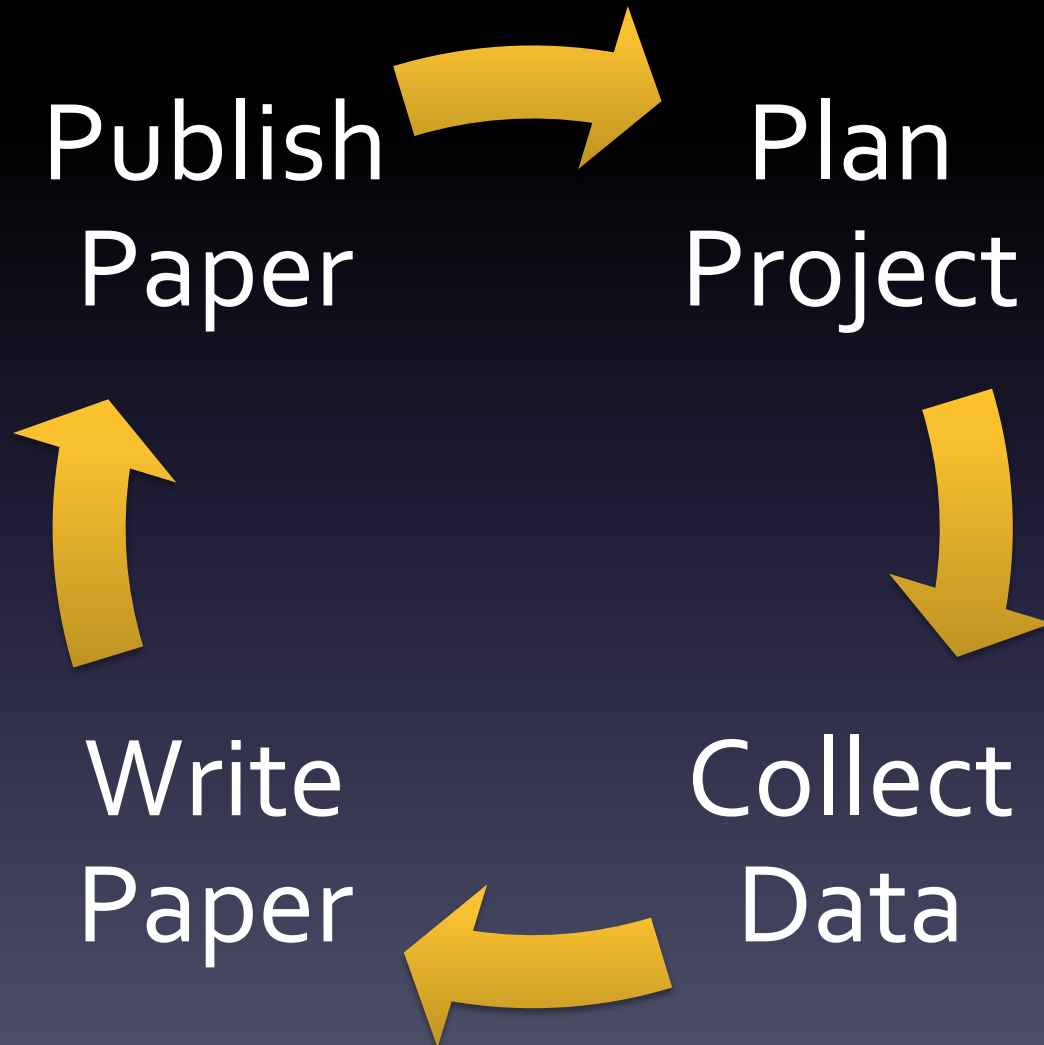


Strategic Communication for High Impact Research

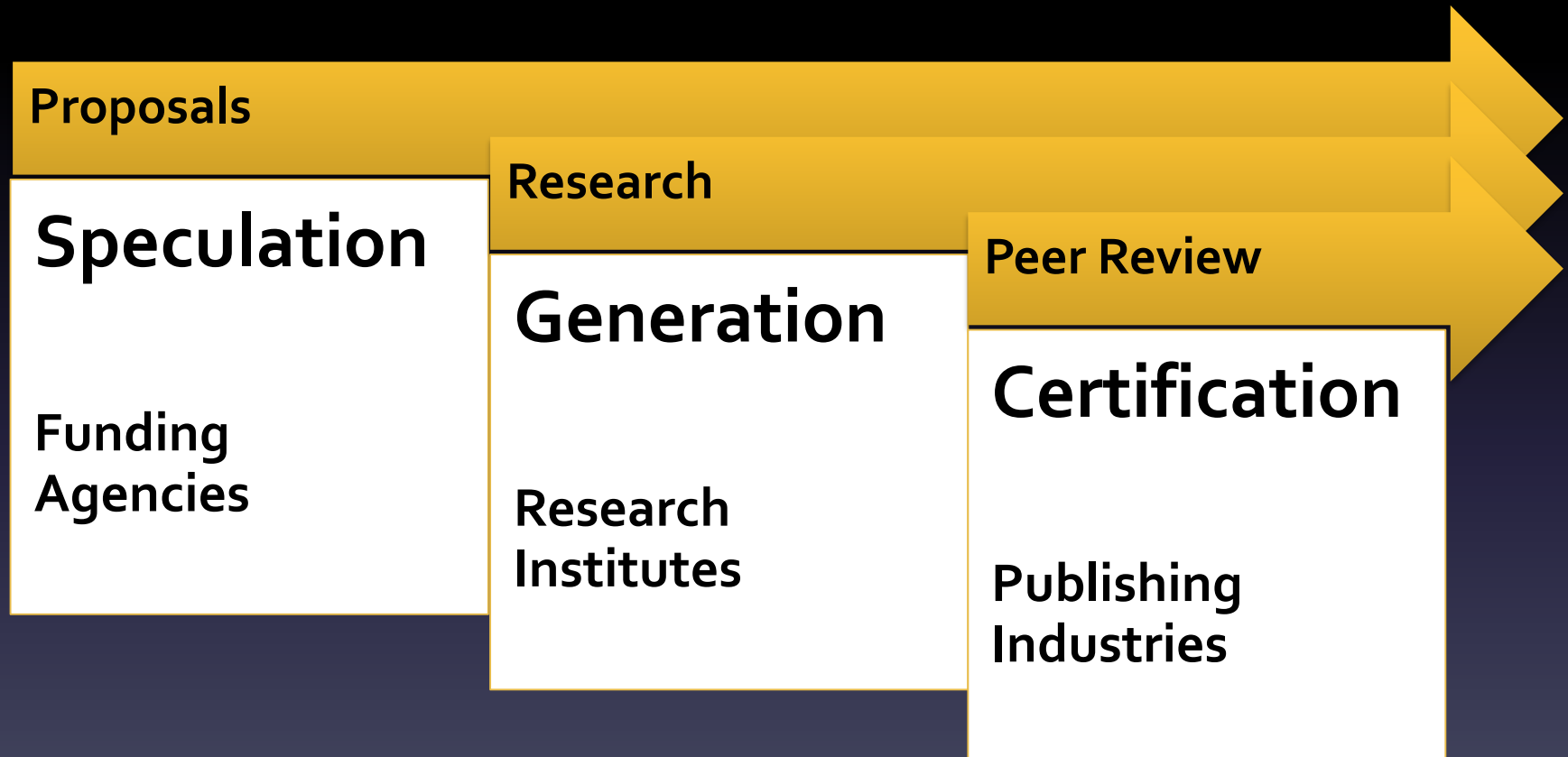
Charles Yokoyama Ph.D.

RIKEN Brain Science Institute

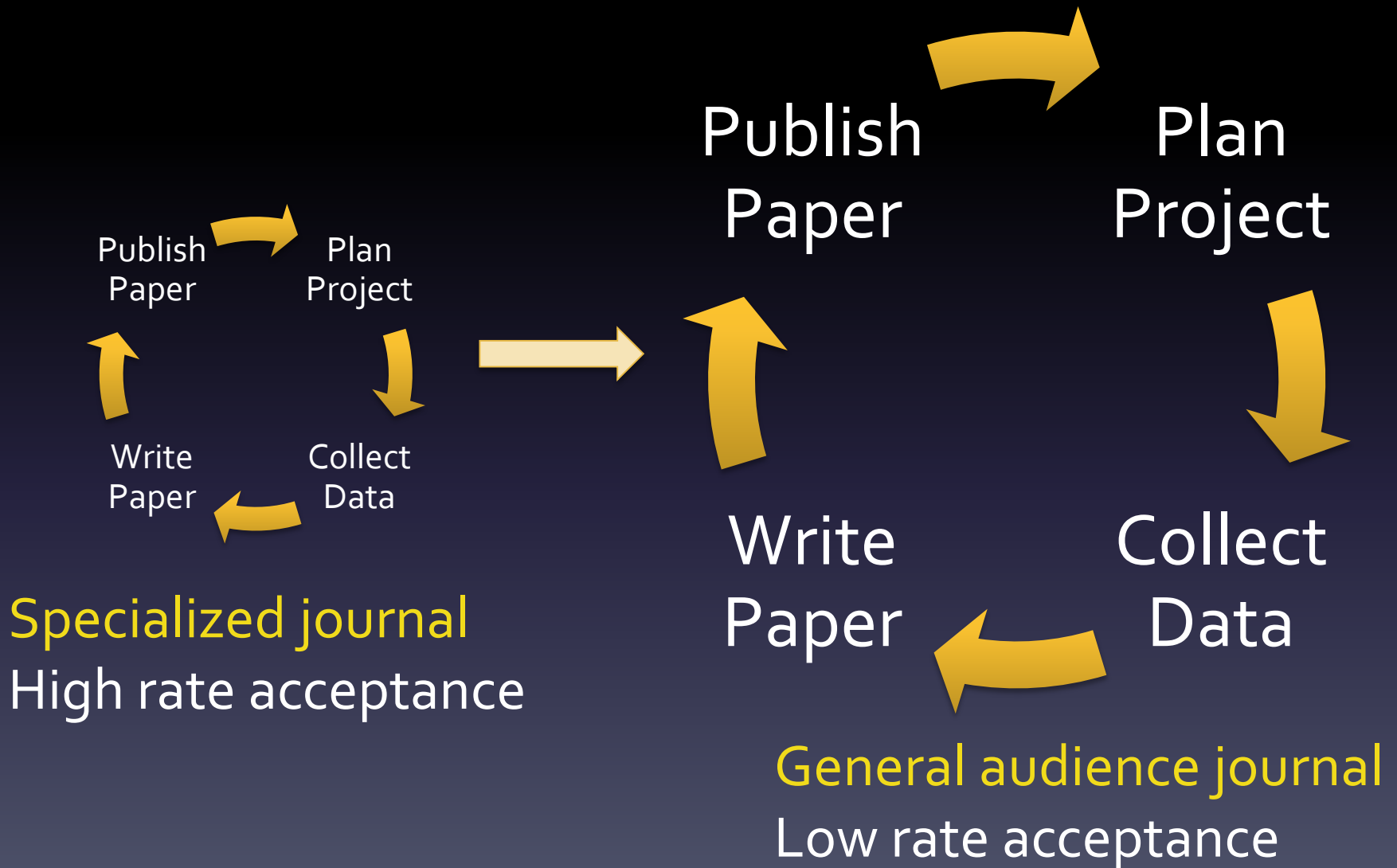
Publication Cycle



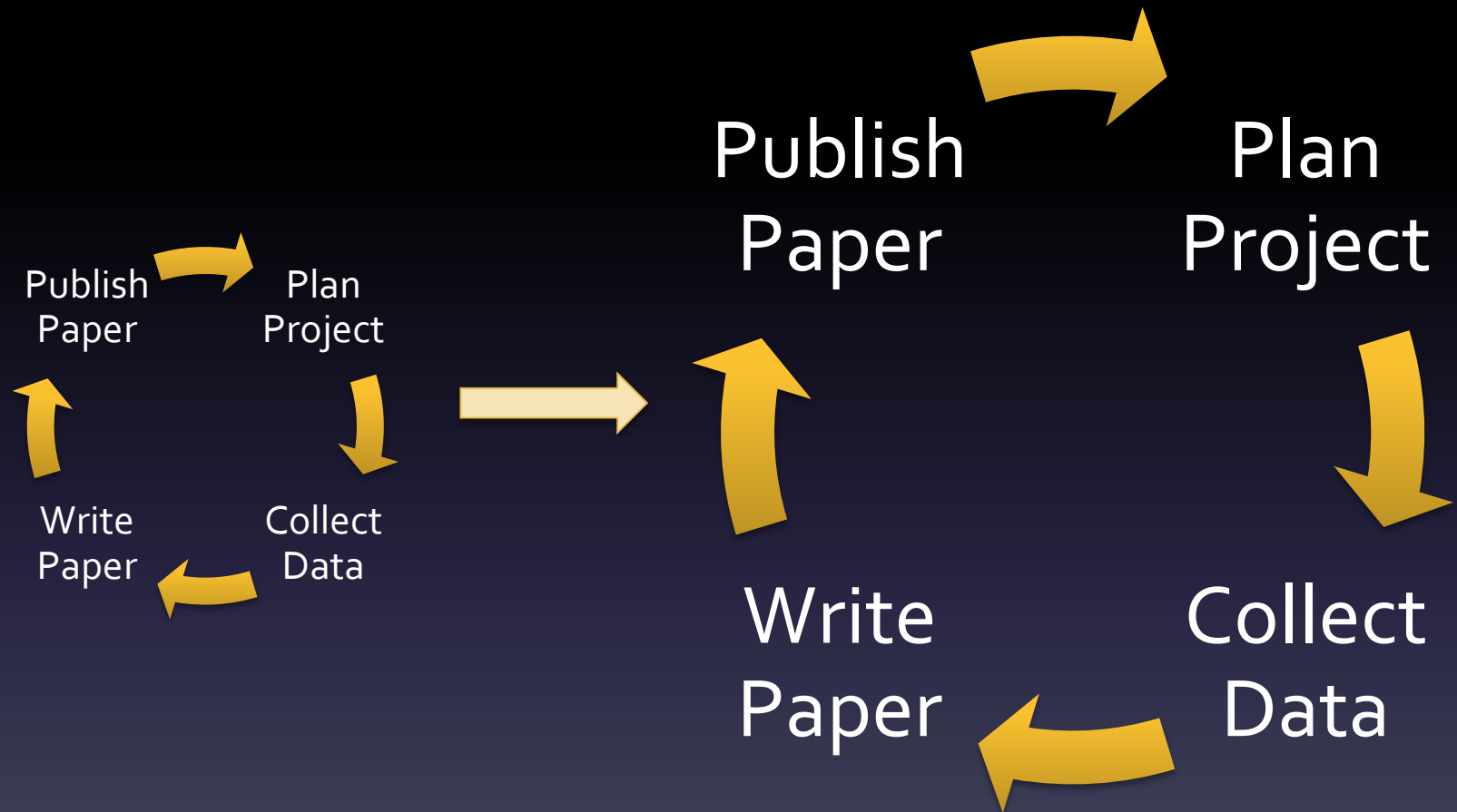
Stakeholders that Define High Impact Research



Two Models of Scientific Impact in Journal Publication



Two Models of Scientific Impact in Journal Publication



Changed: Competition for ideas, funding, jobs, journals

Unchanged: Academic incentive system and lab structure

Optimizing the Cycle for High Impact Publication

- The publication cycle is gated by HP journal standards
- High profile journal editors create and apply standards
- Apply HP journal standards to pre-submission research
 - Use high profile journal standards to assess and reverse engineer the cycle for better performance
 - Use superior science communication to bridge between low- and high-profile journal publication

Nature Journal Rejection Letter

- Dear Dr. XXX,
- Thank you for submitting your manuscript, "XXX," to Nature Neuroscience. After careful consideration, however, we have regretfully concluded that this paper is not suitable for publication in our journal.
- Manuscripts submitted to Nature Neuroscience are evaluated by the editorial staff for their potential general interest before a decision is made as to whether they should be sent out for peer review. We receive many more manuscripts than we can publish each month, and it is therefore our policy to review only those that seem likely to be of greatest interest to our

broad multidisciplinary readership . Manuscripts may be rejected because they are too specialized and are likely to be of limited appeal to those outside the immediate field, or because they represent a relatively small conceptual advance on our present state of knowledge, or because their subject matter is felt to be less appropriate for a journal whose main focus is on fundamental advances in our understanding of the functioning of the nervous system.

- While we are in no way questioning the validity of your work or its interest to others in the field, I am afraid that neither we nor our adviser were persuaded that the strength of the novel conclusions that can be drawn from this work is sufficient to justify publication in Nature Neuroscience rather than a more specialized journal. Thank you in any case for the opportunity to consider this work; we hope that you will soon receive a more encouraging response elsewhere.
- Yours sincerely,
- XXX XXX, PhD
- XXX Editor
- Nature Neuroscience

Conceptual Advance

“Under normal conditions the research scientist is not an innovator but a solver of puzzles, and the puzzles upon which he concentrates are just those which he believes can be both stated and solved within the existing scientific tradition.”

- Thomas Kuhn (1962) The Structure of Scientific Revolutions

Conceptual Advance is the Major Determinant of Research Impact

- Term often seen in editorial rejection letters
- The currency of science - not papers or data
- Basis of most scientific evaluation systems
- Determines thought leaders and followers

→ The term for scientific success is understood at an intuitive but not explicit level by a small group of editors, reviewers, and authors

→ A much larger group of authors do not understand the term

Journal Decisions Reveal a Mismatch in Expectations

Average manuscript rejection rates at high profile journals:

Editor review: 60% rejected on conceptual advance

Peer review: 20% rejected on conceptual advance

10% rejected on technical concerns

10% ultimately accepted for publication

- ➔ Most papers rejected on insufficient conceptual advance
- ➔ A large-scale misunderstanding of conceptual advance

Conceptual Advance is Absent from the Education System

- Graduate education system does not teach or train
 - ↳ learned by informal observation in the lab
- Completely missing from scholarly discussion
- Not explicitly considered in project planning
 - ↳ Contributes to waste at funding agencies
- Controls the outcome of all careers and fields

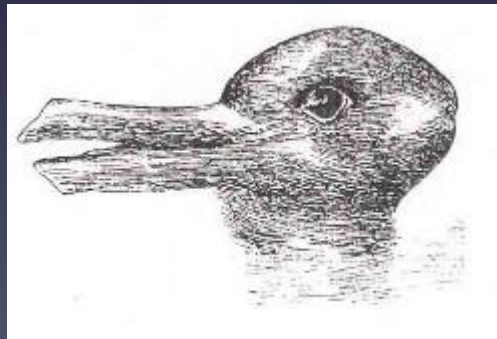
What is a Concept?

- Concept: cognitive unit of knowledge or meaning
- Concepts exist in a poorly understood information geometry *-space, map, cloud, network, ontology*
- Conceptual advances likely expand this geometry
- Concepts require a Gestalt language representation

What is a Concept?

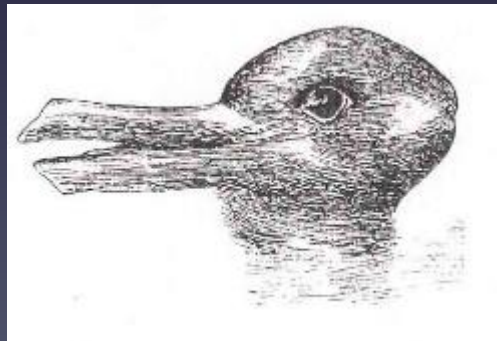
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DUCK



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RABBIT

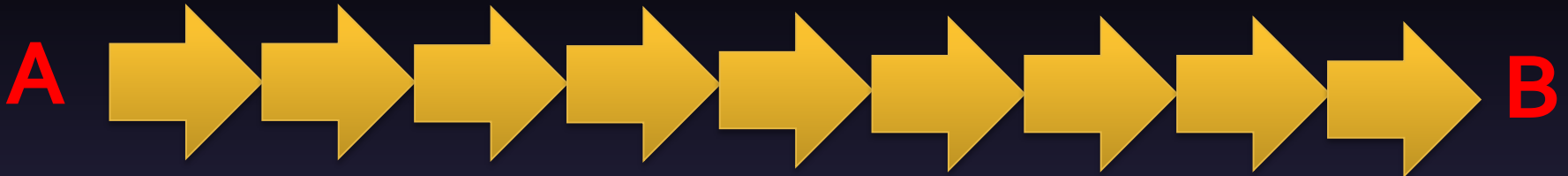
Properties of Scientific Concepts

- **Lineage** – genealogy of concepts or papers that precede
- **Coherence** – the reproducibility/reliability of the concept
- **Projection** – the new questions/areas that concept opens
- **Translation** – the potential for applications to society

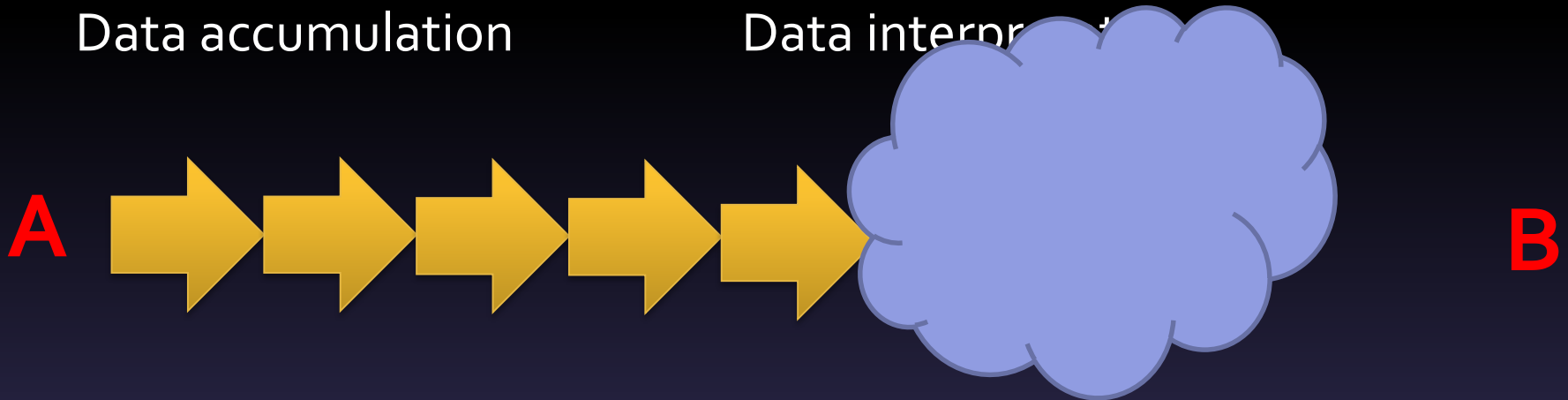
Conceptual Advance is Novel Information within a Lineage

Data accumulation

Data interpretation



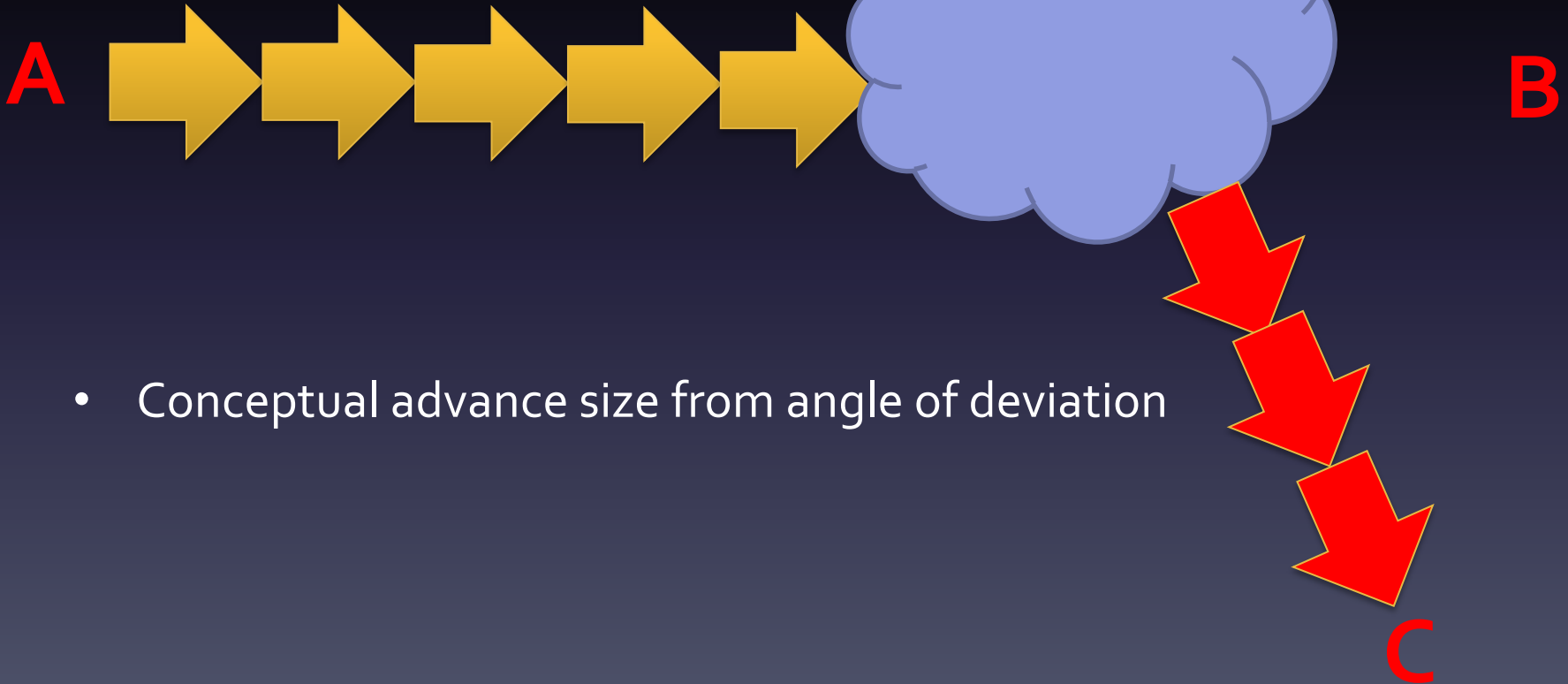
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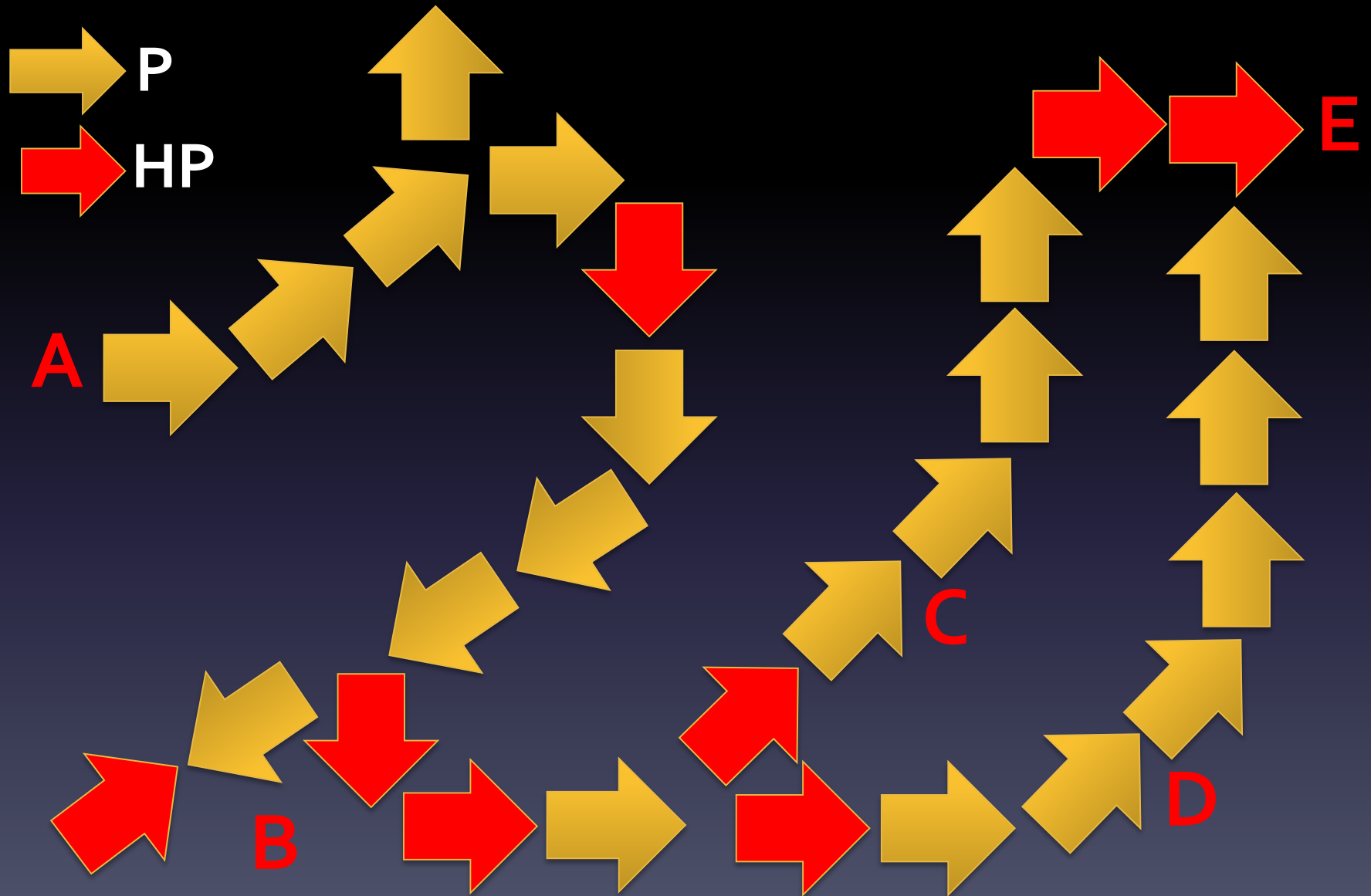
Data accumulation

Data interpretation



Conceptual Lineages Form an Ontology

Growth of a causal chain of papers



Conceptual Advances are the Building Blocks of Ontologies

- Conceptual advance defines stages of a scientific field's evolution



- ➔ Research in each stage tracks different approaches to science
- ➔ Each stage defines the publication cycle for individual scientists

The Epistemological Dilemma: Science is Empirical and Linguistic

- **Empiricism:** knowledge gained from sensory experience
- **Linguistic, Semantic, Rhetoric:** techniques to describe and contextualize empirical findings as a knowledge domain
- **Empirical approach** to science depends on pure observation
- **Epistemological approach to science** depends on meaning

Diversification of Scientific Method

- **Physics:** empirical, observational methods
First scientific method is discovery science
- **Biology:** empirical plus epistemological methods
Second method is hypothesis, model-based
- **Big data:** data mining via computation and statistical methods
Third method beyond empiricism and epistemology?

Research Impact at the Interface of Data Space & Conceptual Space

- **Data** are observation-dependent empirical “facts”
- **Concepts** are observation semi-dependent “ideas”
- **Concept building**: data necessary but not sufficient
- **Communication**: empirical data are necessary but not sufficient. Need a semantic writing toolbox.

Semantic Techniques to Concept Building in Manuscript Writing

- **Semantics**: the study of meaning and specification of meaning in words, symbols, sentences, paragraphs, (manuscripts)
- Requires strong communication: sender to receiver/interpreter
 1. **Conceptual advances are semantic linguistic constructs**
 - semantic linguistic methods build conceptual advances
 2. **Conceptual advance build field-specific knowledge domains**
 3. **Field-specific knowledge domains build scientific theories**

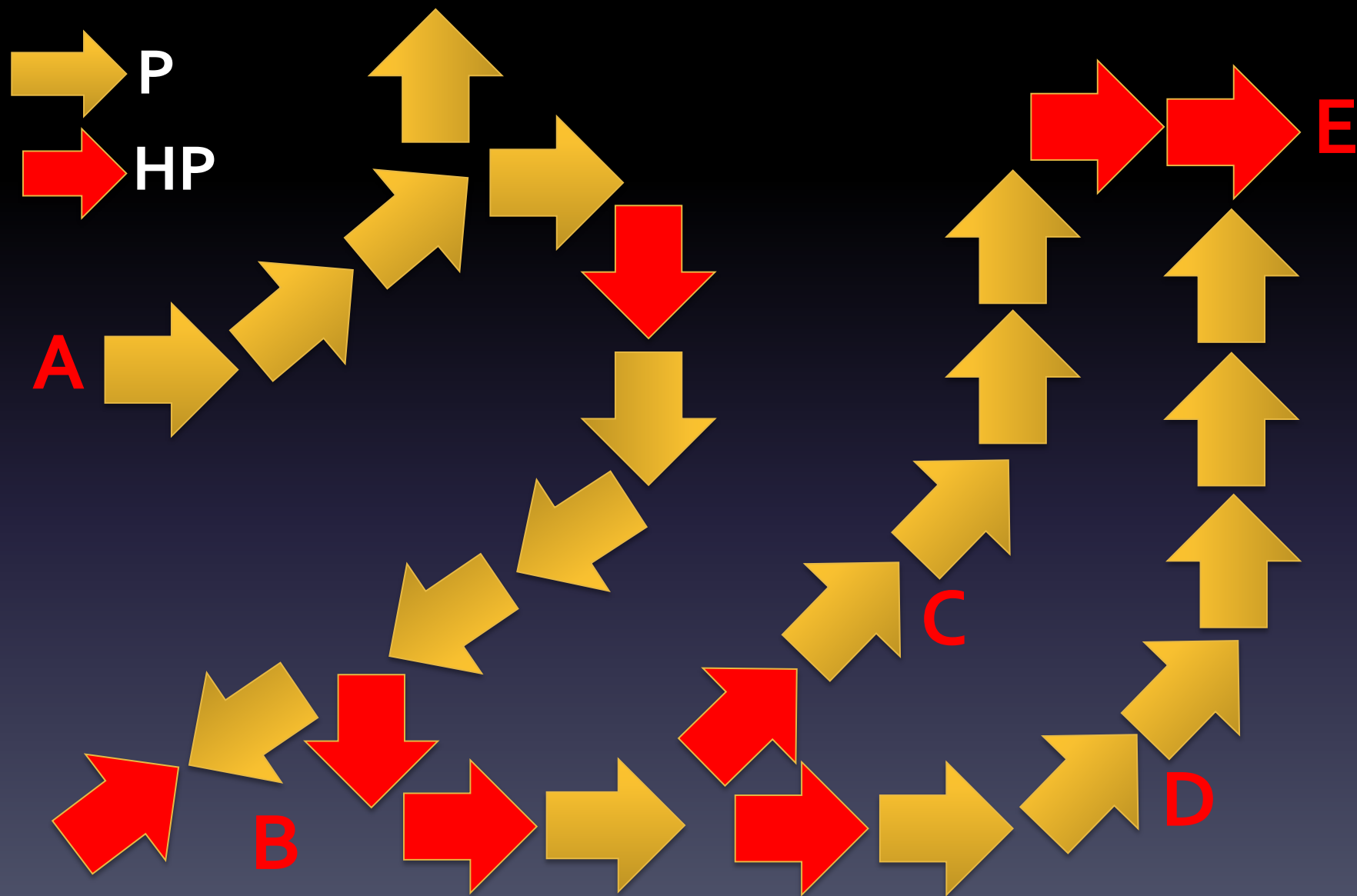
Semantic Proficiency Improves Conceptual Advance and Impact

- **Expand scope** of study with broader question or conclusion
- **Reframe question** or conclusions to more exciting/novel idea
- **Make new interpretation** from combining additional datasets
- **Expand conceptual scope** from combining additional datasets
 - opposite of “salami-slicing” of small papers
- **Create new term** to more precisely/accurately describe data
- **Deductive and inductive reasoning** Creating logic and rhetoric

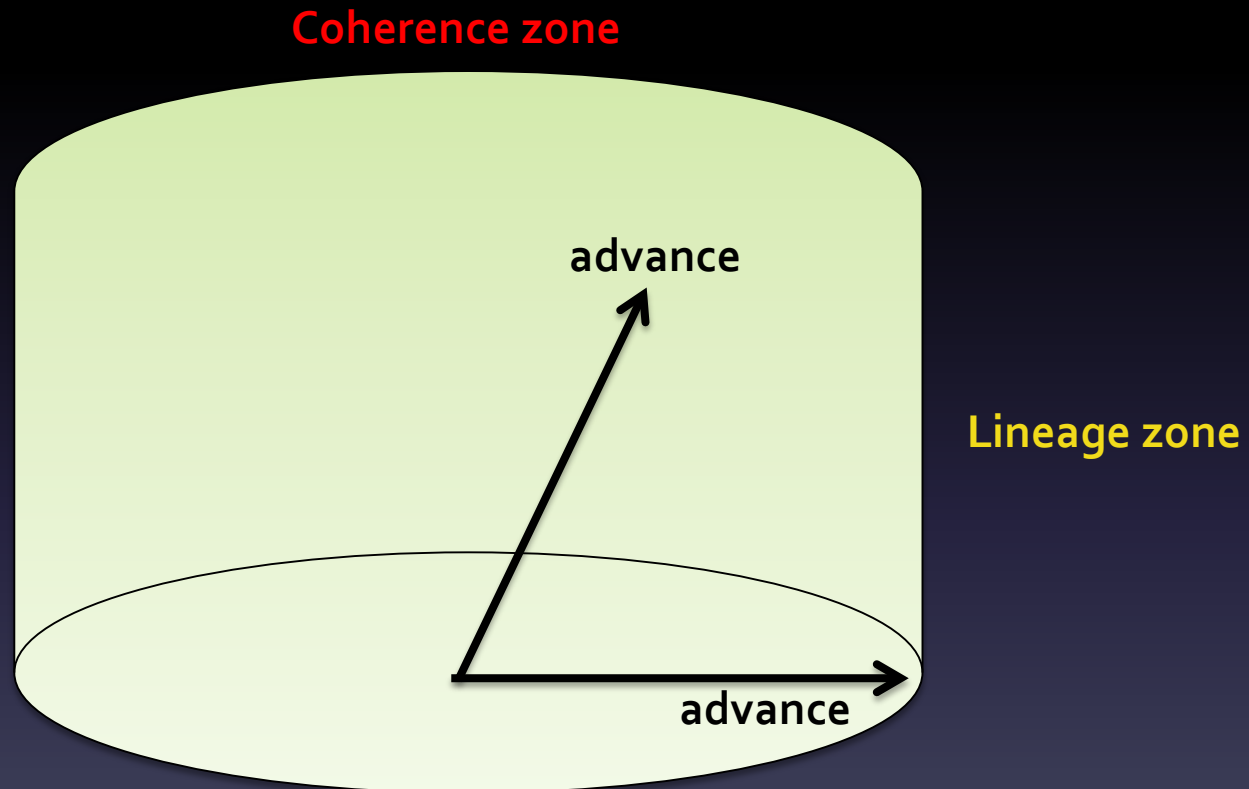
Current Challenges in Scientific Publishing

- Overemphasis on publishing in high impact journals
 - Turns discovery into a commodity instead of a shared resource
- Open access, peer review, and certification system
- Credit and authorship issues driven by competition
- High value science: both high impact and replicable
- Preprint servers and data sharing prior to publication

High impact paper lineages create irregular concepts and skew knowledge domains



Ontology Systems May Organize Scientific Knowledge Better than Journal Systems

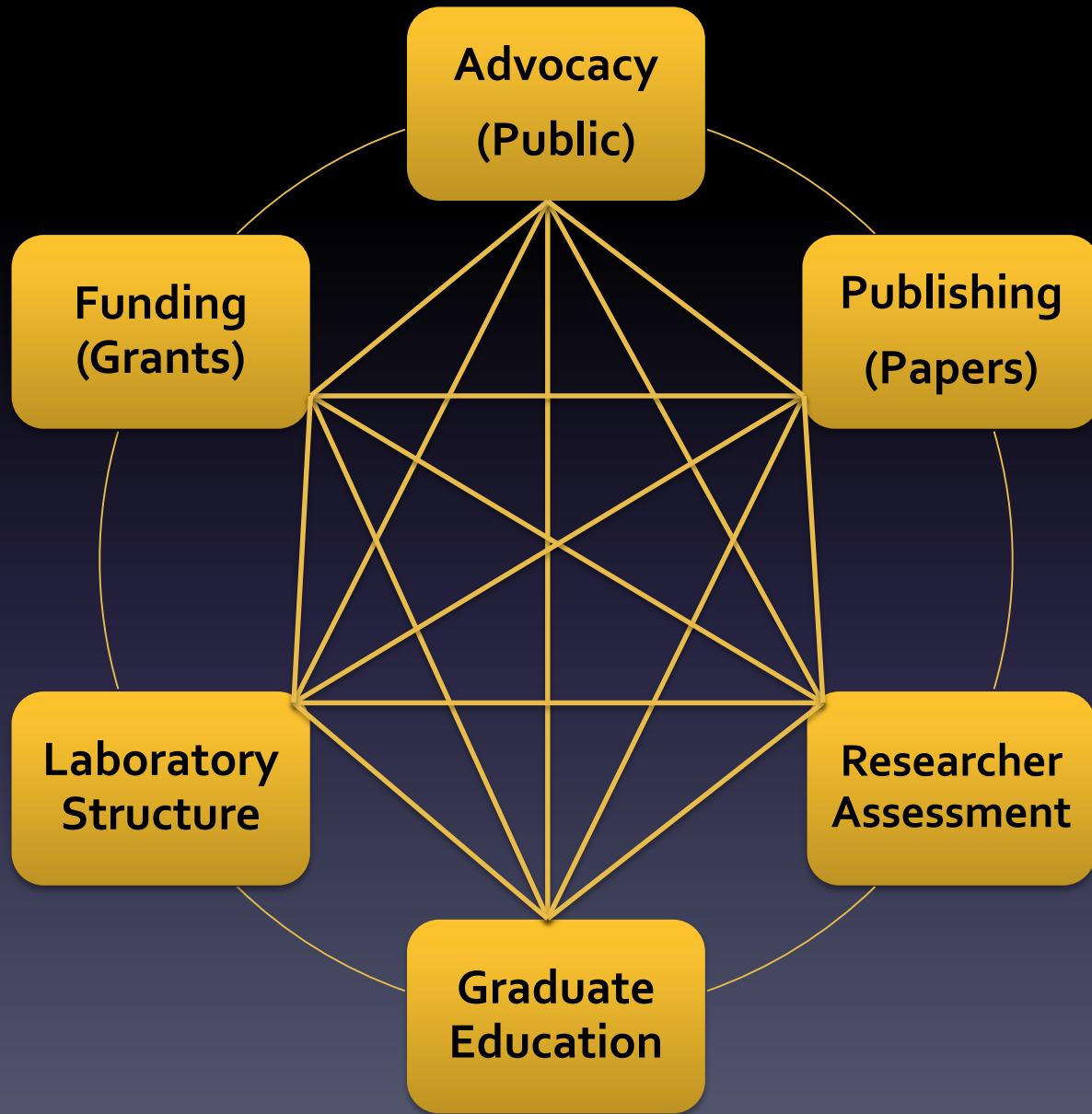


- Lineage moves outward toward frontier (*lineage zone*)
- Coherence moves up toward z axis (*coherence zone*)

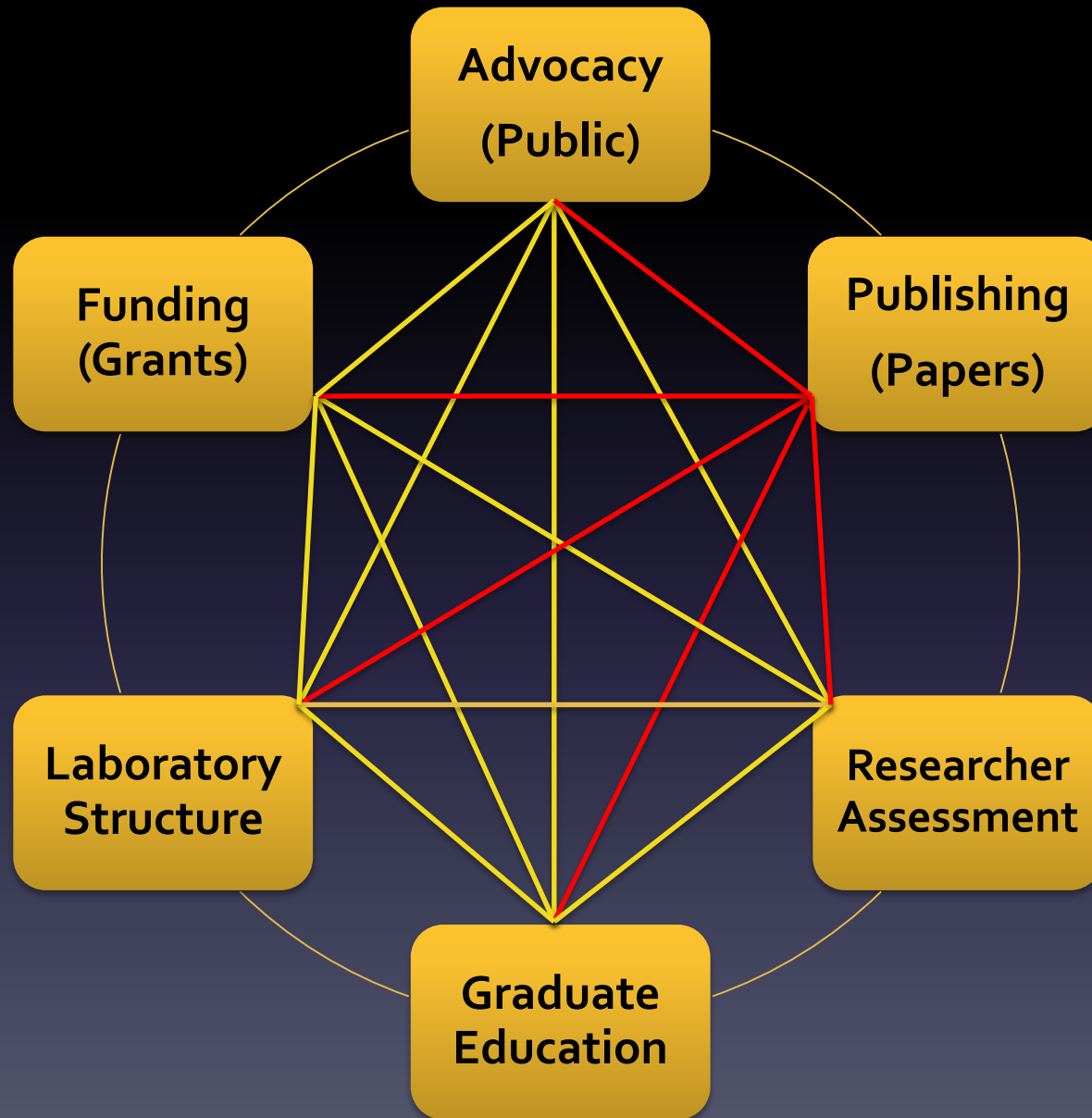
Building a Sustainable High Impact Scientific Community

- Need a global publishing and data/knowledge system
- Attractive and sustainable human resources system
- Lab structure enabling effective collaborative output
- Funding and education systems for career sustainability
- Public communication that makes society a partner

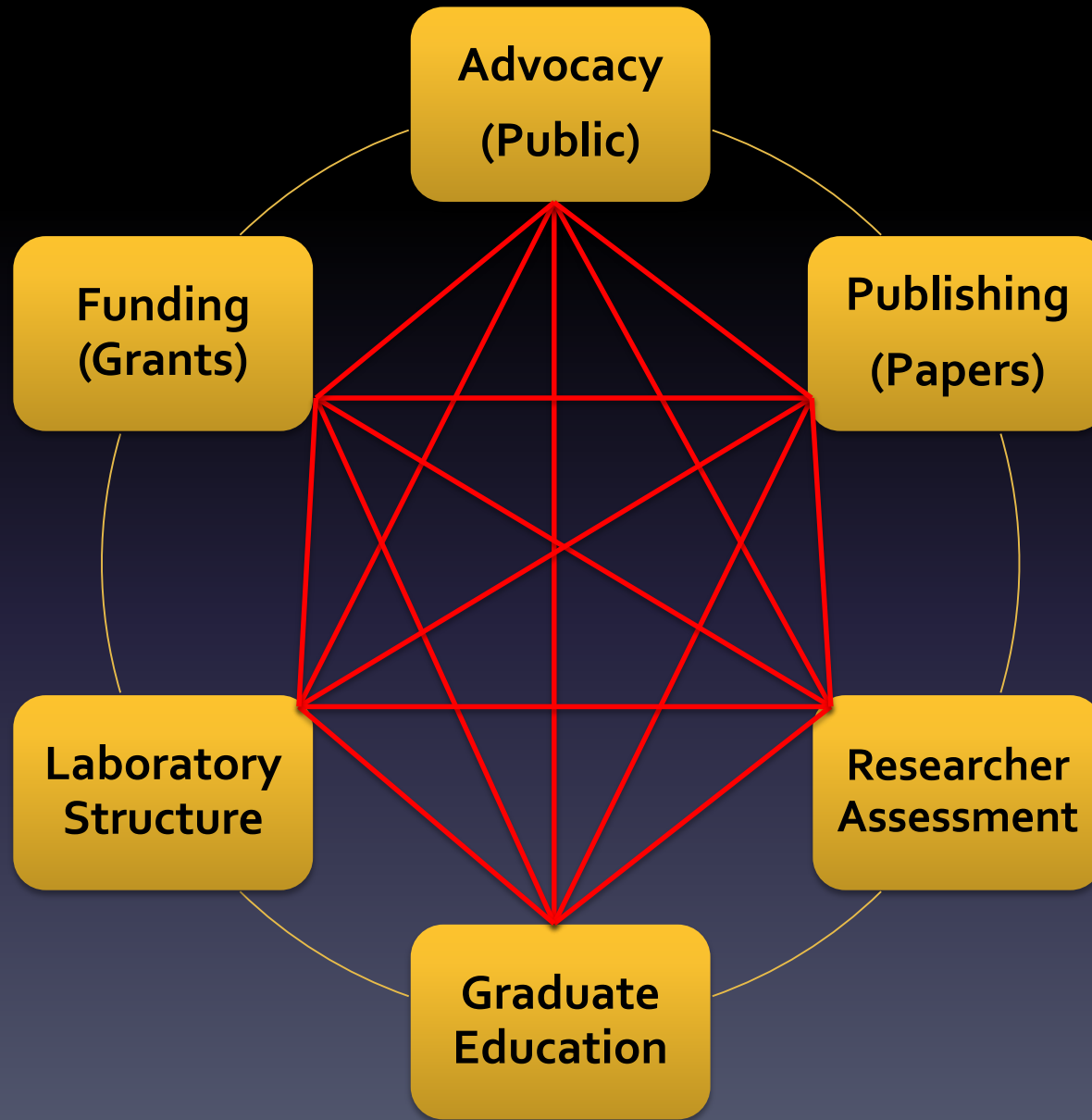
The Scientific Ecosphere



Ecosystem: Publishing



The Scientific Ecosphere



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