

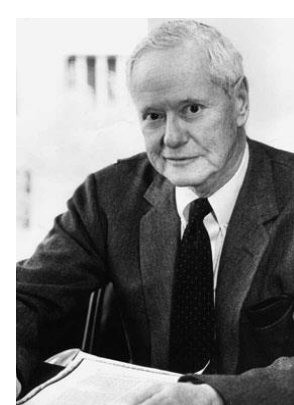
Creativity “in the air”

Simultaneous Discoveries and their Implications

Michaël Bikard, LBS, mbikard@london.edu

Theory

- Traditional approaches of creativity emphasize individuals, teams and their strategies
- Alternative view: Frequency of simultaneous discoveries indicate that the context (rather than individuals) might play an important role



“Discoveries become virtually inevitable when prerequisite kinds of knowledge and tools accumulate in man’s cultural store and when the attention of an appreciable number of investigators becomes focused on a problem, by emerging social needs, by developments internal to science, or by both”

(Merton 1963, 237)

Historical Cases

- Calculus. By Newton (1671) and Leibnitz (1676)
- Oxygen. By Scheele (1774) and Priestley (1774)
- Discovery of the planet Neptune. By Adams (1845) and Leverrier (1845)
- Evolution by natural selection. By Darwin (1858) and Wallace (1858)

More recently

- Gene targeting. By Capecchi (1987) and Smithies (1987)
- Giant magnetoresistance. By Fert (1988) and Grünberg (1988)
- Accelerating expansion of the universe. By Perlmutter (1998) and Schmidt/Riess (1998)
- Reprogramming of mouse fibroblasts into induced pluripotent stem cells. Yamanaka (2007), Jaenisch (2007), and Hochedlinger (2007)

Implications



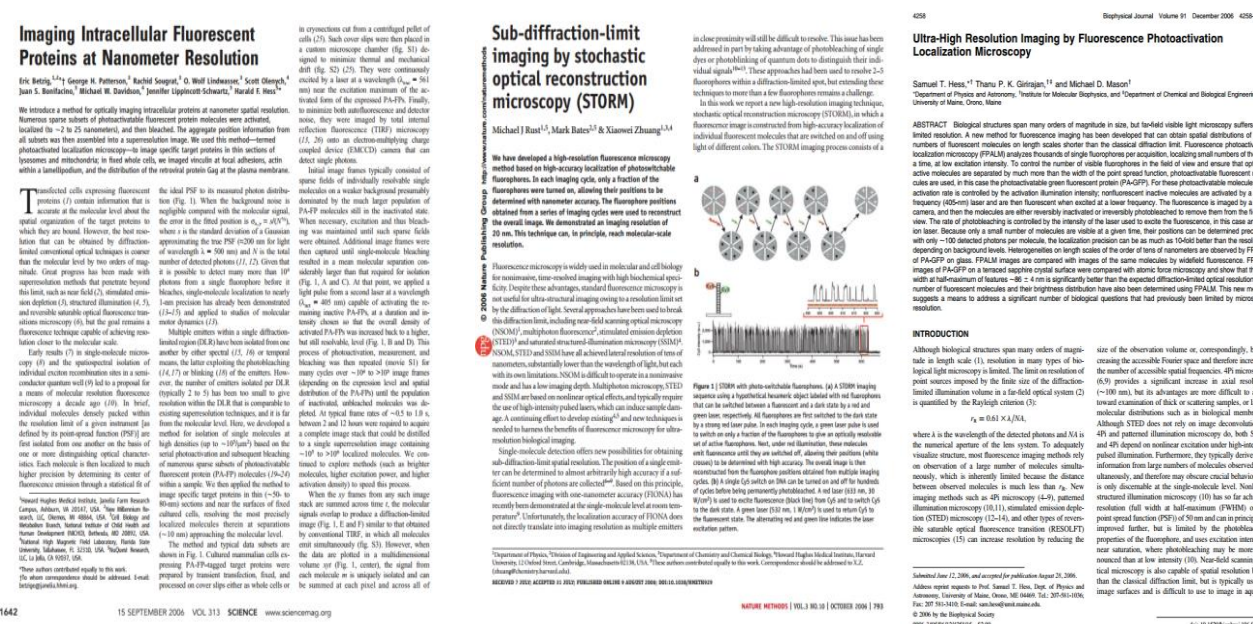
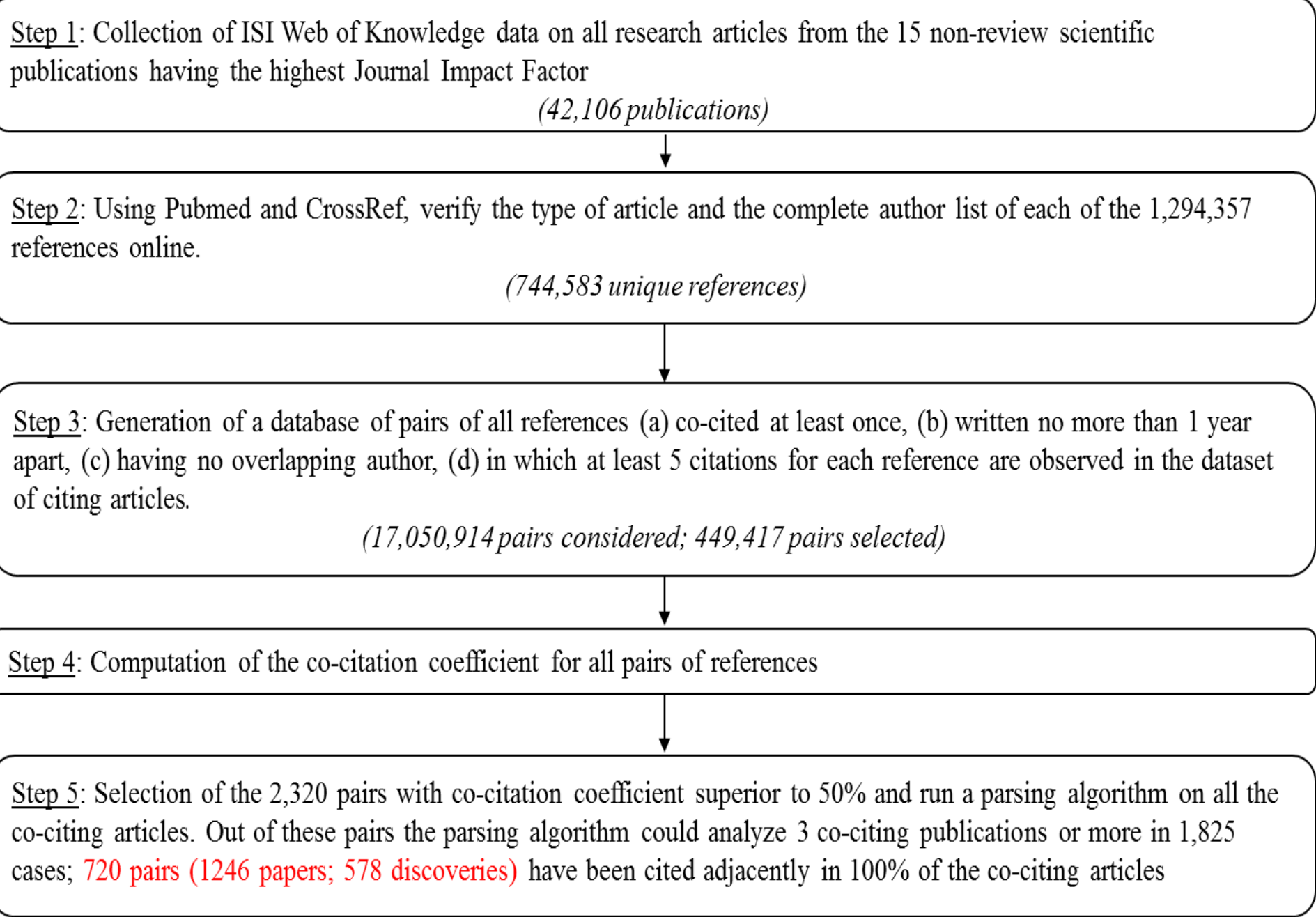
- Determinant of creative performance: individual vs. context
- Reward to creative performance
 - Are prizes, patents, eponymy too individual-centric?

Example: CRISPR-Cas9

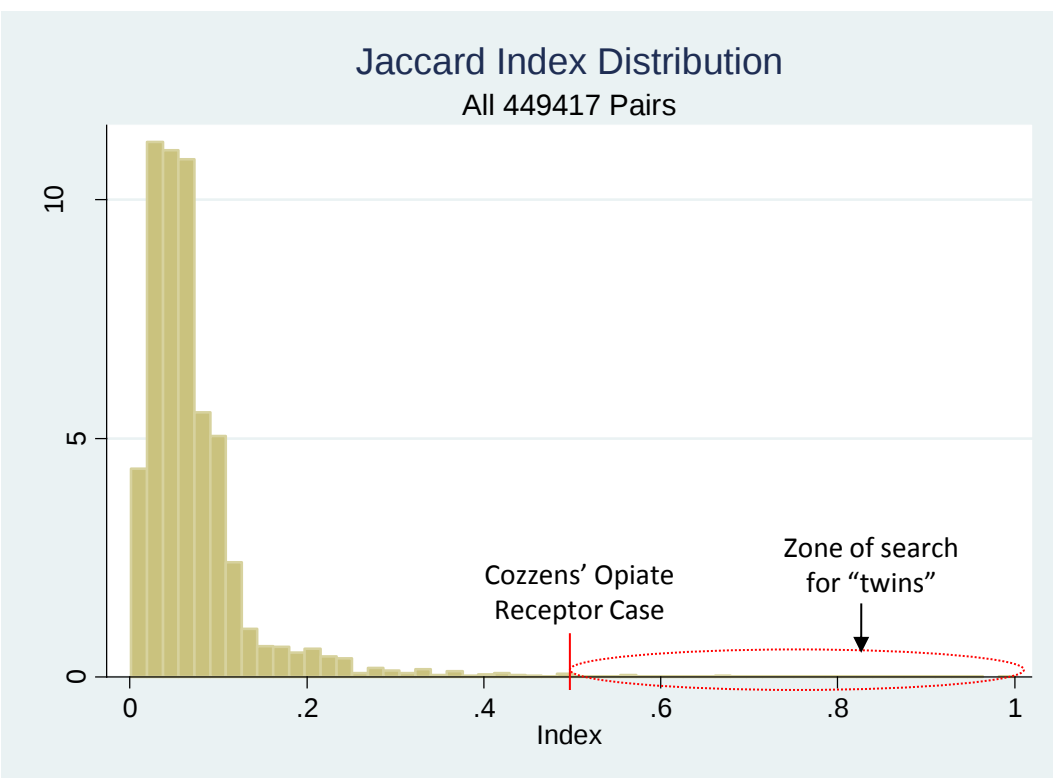
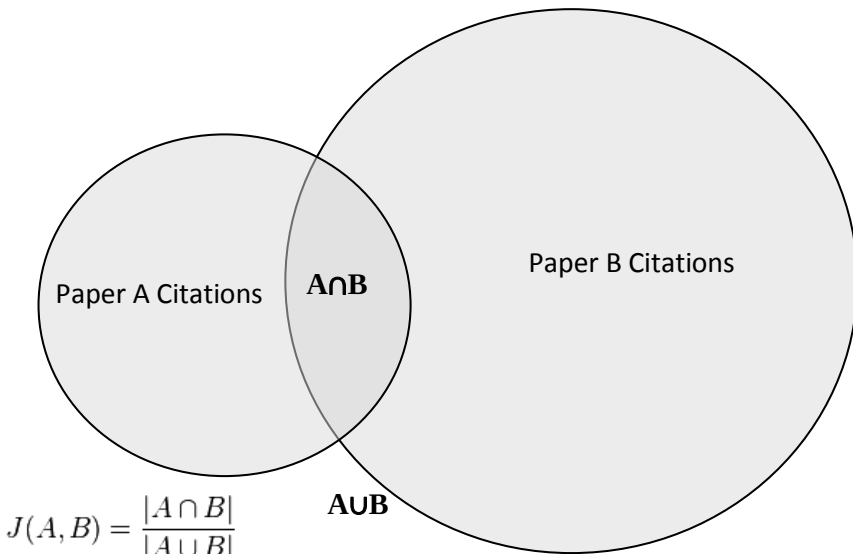
Criticism

- Lists of simultaneous discoveries are based on historical records; they are subjective, unsystematic and unreproducible
- In-depth studies find differences between alleged multiples (e.g., Schmookler 1966; Patinkin 1983)
- Fundamental measurement challenge: what constitutes a “simultaneous discovery”?

A New Method



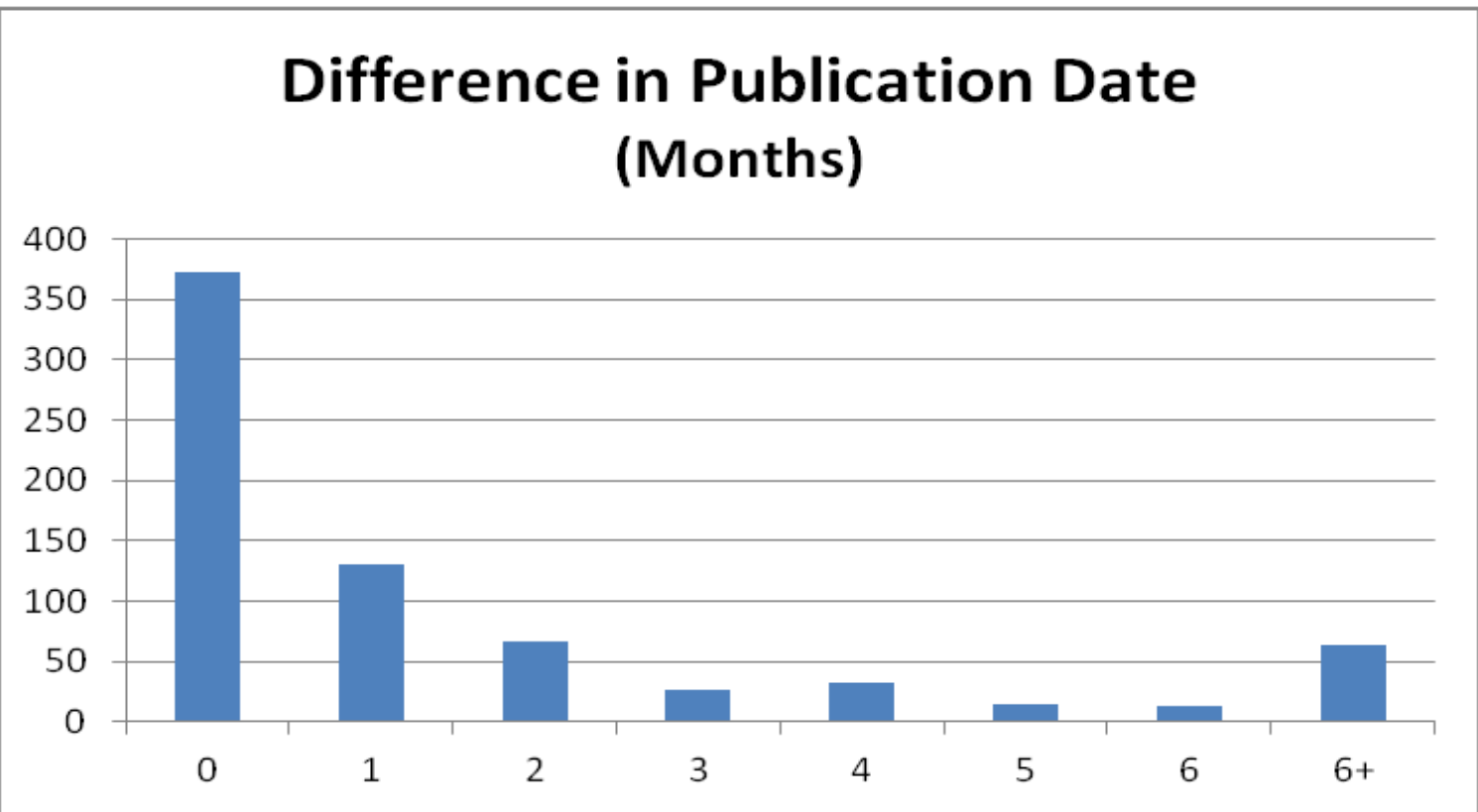
Paper co-citation: Jaccard Index



Example: Triple discovery of a new method for optically imaging intracellular proteins at ultra-high resolution in 2006 by labs at HHMI Janelia Farm, VA; at Harvard; and at the University of Maine at Orono

Robustness

- Most pairs were published in the exact same month (Av. Month difference is 1.8)
- 267 twins were published in the same issue of the same journal
- Pubmed related citations algorithm (based on word similarity) rank them next to each other 42% of the time; Rank difference <10 for 90% of the twins
- Out of 28 interviewees, not one denied that these were sharing credit for the same discovery



Note Added in Proof. While this manuscript was in press, two other papers describing the phenotype of p38α knockout mice were published (53, 54); also see commentary by J. Ihle (55).

In Sum

- Context as important determinant of creative performance
 - Simultaneous discoveries are common: 578 recent major instances identified (i.e., 44.2 per year between 1996-2005)
- Important theoretical/practical implications:
 - Creative performance through context changes
 - Are individual-centric rewards to creativity misplaced?
- First systematic and automated method to generate a list of simultaneous discoveries