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## **Generation and Impact of Novelty in Physics**

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**Abstract:** Scientific discovery is becoming more and more a collective effort. Researchers with different skills and specializations team-up to contribute to scientific progress. The aim of this paper is twofold. First, it investigates what are the team characteristics relating to the probability of generating a breakthrough idea or novelty. Second, it assesses the impact of an article embedding a novelty, or novel article, in terms of forward citations received and impact factor of the journals where it is published. We consider in our analysis all teams of physicists publishing at least one article in 273 reputed physics journals between 2005 to 2009. We end up after cleaning for homonymy with a study sample of 42,493 teams of researchers publishing a corresponding number of articles. We identified scientific novelty as an unprecedented combination of existing sources of knowledge represented by the journals referenced in these articles, and consider only the successful novelty in the sense that they are used at least in ten articles in the five years after their first appearance. We define respectively as novel and non-novel articles those embedding or not a successful novelty. We find that team experience and team specialization are negatively associated with the probability of generating a novel article. On the contrary, having already written novel articles in the past is positively associated with the probability of generating a novel article. When analyzing the impact of novel articles, we find that a novel article published by an experienced team receives fewer citations than a novel article published by a team without experience and is published in a lower impact factor journal. We also find that a novel article published by a large established team of researchers receives more citations than a novel article published by a small newly formed team.

**Keywords:** Novelty in science, Scientists' teams, Knowledge recombination, Citation impact, Journal impact factor.

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