



## Scientific celebrity, competition, and knowledge creation: The case of stem cell research in South Korea



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### ABSTRACT

To better understand the mechanisms by which a scientist influences the knowledge creation of other scientists, we investigate the distinct role of a scientific celebrity who gains celebrity status from his outstanding scientific achievement and intense public attention. Using the case of a South Korean stem cell biologist, we find that a scientific celebrity helps to attract aspiring scientists into his field and to enhance government funding in related research, thereby contributing to the knowledge production of other scientists in the field. These positive influences persist for an extended period of time despite sudden shifts in the celebrity's status.

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### 1. Introduction

Over the past two centuries, celebrities have become an increasingly prevalent socioeconomic phenomenon, ranging from media personalities to sports icons and pop musicians (Van Krieken, 2012). Celebrity is thus now an essential characteristic and dynamic of contemporary cultures and societies and, in particular, a valuable resource for attaining economic and political power (Driessens, 2013). At its core, celebrity reflects social ordering. A central perspective in the management literature is that social devices are often invented at a collective level as a means to assess the abilities of individuals by creating a competency ordering among them (Deephouse, 2000; Fombrun and Shanley, 1990; Rao, 1994). The mass media often plays an important role in constructing such an ordering by publicizing and interpreting performance information (Johnson et al., 2005; Pollock and Rindova, 2003). For example, celebrity CEOs actively embrace and cultivate their celebrity status by taking credit for their success and attempting to capture greater control of their firms (Hayward et al., 2004). By embracing their celebrity status, star CEOs often publicly reinforce the perceived cause-and-effect relationship between their actions and firm performance (Wade et al., 2006). From an organizational standpoint, the celebrity phenomenon itself can provide a setting that regulates the relationships between social actors (Sorenson and Stuart, 2008). The popularity of settings can also change over time, with occasional shifts in fads and fashions, thereby

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influencing and being influenced by the attainment of individual celebrity status. These dynamics then reformulate the process by which individuals and their actions are organized. As such, celebrity is an important social phenomenon that has broad implications for societies as well as for individuals.

The field of science is not an exception to this phenomenon. Indeed, throughout history a number of scientists have gained celebrity status, some at the global scale<sup>1</sup>. But scientific celebrities seem to be gaining popularity more recently, particularly as science and technology take an increasingly central role in advancing the economy and social welfare. The ever-expanding penetration of mass media into our daily lives also facilitates the growing popularity of scientific celebrities. While depicting various aspects of scientific celebrities, mass media outlets have tended to focus almost exclusively on the “greatness” of these scientists in the traditional formulation of virtue, genius, and character (Browne, 2003). On the academic side, extant research has advanced our understanding of the role of extremely productive scientists (often called “star scientists”) in creating new knowledge, both directly and indirectly, and even giving rise to the birth of new industries (Azoulay et al., 2010; Jones, 2009; Oettl, 2012; Rothaermel and Hess, 2007; Zucker et al., 1998). The focus in this literature has, however, been on the individual level of scientific achievements measured along the dimensions that are largely recognized only within the scientific community (e.g., publications and citations in scholarly journals), ignoring broader social contexts such as the interface with the public. This framework fails to capture the unique aspect of scientific celebrities because, when reinforced with public recognition, these star scientists can exert influence that extends considerably beyond the scientific community through changes in public policy and resource allocation, and ultimately the direction or process of knowledge creation. We aim to fill this gap in the conversation by proposing scientific celebrity as a new taxonomy of scientists and substantiating the impacts they create at a broader level, particularly on the allocation of public resources and the dynamics of the “invisible college” (De Solla Price and Beaver, 1966). Specifically, we address two closely related questions: (1) Do scientific celebrities promote the knowledge creation of other scientists? (2) What mechanisms account for their impact on the knowledge creation of other scientists?

Prior studies on star scientists have generally documented their positive role in increasing the productivity of other scientists, through various channels such as collaboration (e.g., Azoulay et al., 2010), feedback (e.g., Oettl, 2012), and spillovers (e.g., Owen-Smith and Powell, 2004). However, the effect is less straightforward in the case of scientific celebrity. On the positive side, scientific celebrities may increase the legitimacy of their field and help attract greater resource allocation to their field, thereby facilitating the knowledge creation of other scientists. On the negative side, given that the field of science fundamentally operates on the norm of contest and competition for recognition (Hagstrom, 1974; Merton, 1969), scientific celebrities can potentially magnify the degree of such competition (in terms of resource acquisition and publication) and turn it to their advantage, thereby constraining the knowledge creation of their “competitors” (i.e., other scientists). Hence, an assessment of the net impact that scientific celebrities generate for resource allocation and knowledge progress in their field requires a rigorous examination of the mechanisms that underlie these potentially conflicting forces.

Note that this issue fundamentally concerns how, boosted by public recognition, scientific celebrities contribute to society, particularly through total knowledge production in the scientific field. If there is a zero-sum or a partial crowd-out relationship between the knowledge creation of scientific celebrities and that of their competitors, the net impact of their celebrity status will be largely limited to their own scientific discoveries. In an extreme case in which the constraining effect dominates their scientific achievements, the emergence of scientific celebrities may in fact reduce total knowledge creation. In contrast, if the relationship proves to be complementary, the total impact of scientific celebrities can go far beyond their own scientific achievements. In this case of a positive net effect, the distinctive contribution of scientific celebrities to their scientific field, and hence to society, is likely to come primarily through social spillovers from the public sphere to the scientific domain. Thus, properly understanding this process is important for policy makers and managers in order to proactively respond to environmental changes with the emergence of scientific celebrities and optimize their resource allocations across different domains of activities.

To empirically examine this issue, we study how Dr. Woo-Suk Hwang, a famed South Korean stem cell biologist, influenced the patenting performance of his “competitors” in the stem cell field between 1996 and 2009. We broadly define Hwang’s competitor as any individual scientist – excluding the collaborators on Hwang’s patents – who patented with the South Korean patent office at least once on stem cells during the period of our investigation. Beginning as a humble veterinary scientist, Hwang gained “national hero” status over time for his scientific breakthroughs in animal cloning and stem cells. However, he quickly lost his reputation following the disclosure of his fraud in research published in the journal *Science*. We chose Woo-Suk Hwang for several reasons. First, Hwang’s case vividly illustrates the critical role of public recognition (inspired by mass media) in morphing a high-achieving scientist into a scientific celebrity. Second, his rise to celebrity status is closely related to shifts in national-level science policy and public funding in stem cell research. Third, it is Hwang’s potential competitors who played a crucial role in uncovering his scientific fraud. Finally, both the rise and fall of his fame occurred during the period of our study, offering a nice pseudo-natural experiment we can exploit to examine the dynamic effect of scientific celebrity.

We find that Hwang’s celebrity status was positively correlated with the knowledge creation of his competitors. Further, this effect seems to have occurred primarily through two channels: by promoting new entries of scientists into the field, and by increasing overall public funding in stem cell research. Intriguingly, this positive net effect was maintained for a

<sup>1</sup> Examples of scientific celebrities include Benjamin Franklin (1706–1790), Charles R. Darwin (1809–1882), Gregor Mendel (1822–1884), Alfred Nobel (1833–1896), Alexander G. Bell (1847–1922), Thomas Edison (1847–1931), Marie Curie (1867–1934), Albert Einstein (1879–1955), Carl Sagan (1934–1996), James Watson (1928–present), and Stephen Hawking (1942–present).

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