Robert K. Merton and Innovation-Related Topics: Three Theoretical Ideas

Tor Helge Pedersen
Inland University College of Applied Sciences, Lillehammer, Norway

Tor.Helge.Pedersen@inn.no

Abstract: As in other disciplines, such as organization science, sociology, and economics, there are good reasons for scholars in innovation and entrepreneurship research to revisit the classics within and outside their own research fields. Robert K. Merton (1910–2003) is not usually explicitly connected to innovation research, but to fields such as the sociology of science and knowledge. However, his scholarly productions include texts relevant to innovation and entrepreneurship. In 1935, he published on invention and innovation in American industry, and in 1938, he put forward the idea of innovation as deviant behavior or nonconformist adaptive behavior (Merton 1938a). In 1945, he began writing about the concept of serendipity, which he later discussed several times. This paper discusses how theoretical insights from Merton may inspire entrepreneurship, creativity, and innovation research. The discussion is framed around Merton's innovation-related ideas and their relevance today, based on 20–25 Merton publications from 1934 to 2004 drawn from his larger scholarly production. The paper extracts three main examples of Merton's theoretical ideas and insights. The first is his interest in simultaneous independent discoveries (Merton 1961a; 1961b), which has later been seen as a zeitgeist perspective on (scientific) creativity. The second is his view of innovation as deviant behavior and an adaptive response (Merton 1938), which is relevant to, among others, discussion of the dark side of innovation. The third is his interest in the idea of serendipity in scientific discovery (Merton 1945; 1948a), which is relevant today in relation to entrepreneurial opportunity and accidental innovation.

Keywords: Robert K. Merton, Accidental innovation, Invention, Discovery, Scientific creativity, Deviant behavior

1. Introduction

Robert K. Merton, the founder of the field of sociology of science, contributed to several fields, and the literature on his contributions is extensive. As in other disciplines, such as organization science, sociology, and economics (e.g., Becker, Knudsen, and March 2006; Adler 2009; Swedberg 2009), exploring classics within or outside the innovation field may be useful. Good reasons exist for exploring Merton's scholarly production in relation to entrepreneurship and innovation research. As will be shown, he made several contributions that can be connected to innovation-related topics. To the examples above (e.g., serendipity, deviant behavior, invention), several can be added, such as the role of sociological factors in the rise of science and inventions (Merton 1935b; 1938b), which he addressed in his doctoral dissertation, which "dealt, in part with the sources of innovation in science and technology" (Zuckerman 2010, p. 260). His publications are not much explored within such a frame of innovation-related topics. However, in the contemporary literature on different innovation-related topics, at least three have a possible connection back to Merton: serendipity in entrepreneurship and innovation (Austin, Davin, and Sullivan 2012; Dew 2009; Murayama, Nirei, and Shimizu 2015; Garud, Gehman, and Giuliani 2018; Busch 2022; Busch and Barkema 2022; Busch and Grimes 2023; Fultz and Hmieleski, 2021), zeitgeist in relation to the selection of new ideas (Simonton 2004; Czarniawska 2009), and discussions on the dark side of innovation (e.g., Coad et al. 2021; Biggi and Guiliani 2021). Motivated by these observations, this paper explores and discusses some of Merton's innovation-related ideas by asking: What are his innovation-related ideas about—and to what relevance today?

Methodologically, the theoretical discussion is based on 20–25 Merton publications selected from his large scholarly production. His scholarly production between 1934 and 2004 comprised 20 books, more than 150 articles, and numerous introductions and prefaces. One book was written in 1958 and published posthumously in 2004 (Merton and Barber 2004). The search process comprised of exploring and reading his publications, especially those that are connected to his sociology of deviance and sociology of science. In addition, secondary literature was explored to check for alternative interpretations and to be sure that important and early publications were included in the theoretical discussion. The selection process was about selecting ideas to focus on and of selecting early Merton-publications on these theoretical ideas. In some cases (e.g., serendipity), Merton developed his thinking on that idea. Therefore, several later publications were included in the discussion. In other cases, Merton revised, elaborated on, and revisited earlier publications (e.g., Merton 1938a). Since some publications are later reformulations (e.g., his ideas regarding deviance), the publication list is reduced during the process. The references to contemporary literature that illustrate the relevance of his ideas are also kept to a minimum. The number of publications, in other words, could be seen as a limitation of this discussion—but they are examples.

Further, the paper is based on the argument that science and sociology of science are relevant for understanding creativity and innovation and that analogical reasoning between these two domains is relevant (Simon 1985). Discoveries can be seen as a type of innovation or scientific innovation per se (Mulkay 1972). Interestingly, though mentioned in the context of the antecedent conditions of innovations, Merton (1961a) cited Bacon, who said, "All innovations, social or scientific, 'are the births of time'" (Merton 1961a, p. 473), which also illustrates this view. Discoveries can be seen as equivalent to inventions and new theoretical formulations (Merton 1967). A scientific law can thus be compared to a new business idea, organizational idea, or piece of technical equipment. Though there are other views on the innovation process (e.g., Schumpeter 1939), several emphasize a connection between scientific discoveries, basic research, inventions, and innovation (e.g., Dosi 1988, p. 1136), for example, that science was the origin of synthetic chemistry, the transistor, and bioengineering. Others use the term science-based innovation (Garud et al. 2018, p. 125), which implies the science–innovation connection. Finally, there are subfields concerned with the commercialization of academic research, technology transfer, and academic spin-offs.

The paper is organized as follows: The next section briefly surveys Merton's ideas that are relevant to this theoretical discussion. Then, the three selected ideas are presented and discussed. Finally, the paper concludes and suggests future studies.

2. Merton on Invention, Innovation, and Scientific Discoveries

Merton (1935a), in one of his first articles, investigated the causes of variation in the rate of industrial invention, for example, the sociocultural factors influencing the rate of invention within specific industrial fields: "It is with … the rate of invention within specific fields of industry and the rate of adoption of inventions – that this paper is most directly concerned" (Merton 1935a, p. 455). He referred to Schumpeter (1926) when he discussed the individuals in control of a given industry and attitudes to introducing innovations/inventions (1935a, p. 468). Merton (1935a) used patent data to study the rise and fall of innovation by industry.

In 1938, Merton published both his doctoral thesis (Merton 1938b), originally dated 1935 (Merton, 1935b), and an article entitled "Social structure and anomie" (Merton 1938a). In the latter, he used the term "innovation as deviant behavior." His doctoral thesis was on science as a social institution. In this study of the rise of science in 17th-century England and how ascetic Protestantism (unanticipated) contributed to the rise of scientific thought, he set out to analyze the scientific revolution of the 17th century. He dismissed the Carlylean heroic explanation that this arose from "the simultaneous appearance of geniuses" (Merton 1938b, p. 364) and wrote that the "more plausible explanation is to be found in the combination of sociological circumstances" (p. 364). In his analysis of science and military technology, he used words such as entrepreneur, innovation, intellectual genius, scientific genius, and century of genius. He found that need is important as a source of invention only if it appears in a "cultural context … which places a high value upon innovation, which has a tradition of successful invention and which customarily meets such needs through technological invention rather than through other expedients" (1938b, p. 517). He concluded that the growth of science was not due to the chance concentration of a handful of geniuses, but that "the cultural soil of seventeenth century England was peculiarly fertile for the growth and spread of science" (1938b, p. 597).

Merton's interest in the concept of serendipity came out of his exploration since 1934 of how and why intentional social actions often had unintended consequences (Shulman 2004). In 1936, Merton (1936) published an article in which he discussed unanticipated and unintended consequences, a topic he followed up in 1940 in relation to bureaucratic structures (Merton 1940) and in several other publications (Merton 1998). This led him back to study science as a social institution and to an interest in the role of the unanticipated in scientific discovery (Shulman 2004). Serendipity became related to this problem (Merton and Barber 2004, p. 141). In 1945, Merton described the serendipitous component of research as "the discovery, by chance or sagacity, of valid results which were not sought for" (Merton 1945, p. 469n). He noted that fruitful empirical research may also originate new hypotheses, and three years later, he wrote that under certain conditions, a research finding gives rise to social theory. He said that the "serendipity pattern refers to the fairly common experience of observing *an unanticipated, anomalous and strategic* datum which becomes the occasion for developing a new theory or for extending an existing theory" (1948a, p. 506, italics in original). Each element of the pattern is explained by Merton (1948a), and he wrote that "Serendipity is here connected to unanticipated consequences" (p. 506). Merton and Barber wrote a book on serendipity in 1958 that was published posthumously (Merton and Barber 2004). It was a study of the travels and adventures of the serendipity concept since Horace Walpole first used it in a letter in 1754, spread through time and domains, such as science, over the following 200 years. With the pursuit of serendipity came the book *On the Shoulders*

of Giants (Merton 1965/1993), which traced the use and reception of an aphorism across fields and centuries. Serendipity is an aphorism that is about discovery, invention, and accumulation of knowledge (Merton 1965/1993). Both books represent studies of sociological semantics (Zuckerman 2010).

Merton was interested in discoveries, inventions, and theoretical ideas. In 1967, Merton (1967) discussed the early and later formulation of ideas, continuities, and discontinuities in theoretical ideas, which he compared somewhat to multiples (discoveries) in physical and biological sciences (p. 20). He also used a vocabulary to designate varying degrees of resemblance between early and later formulations of scientific ideas and findings. He was interested in multiple discoveries in science by scientists working independently of one another (Merton 1961a, 1961b; 1963), as well as the role of genius in science (1961a; 1961b), which will be discussed in Section Three. This interest also included priority disputes among scientists (Merton 1957) (i.e., disagreements among scientists involved in multiple discoveries over who deserved priority). For example, Isaac Newton raised charges of plagiarism against Leibniz regarding who should get credit for inventing calculus. Furthermore, the theory of natural selection was developed practically identically by Alfred Russel Wallace and by Charles Darwin (Ogburn and Thomas 1922, p. 83), a dispute that "stabilized at that point, with due credit to both" (Merton 1957, p. 653). Later, Merton (1968) proposed a Matthew effect in science (i.e., that the more eminent scientist in a collaboration [paper or project] or cases of independent multiple discoveries tends to get most credit).

Merton had many more ideas and concepts than included here. These include the theorem of functional alternatives (equivalents or substitutes): "just as the same item may have multiple functions, so may the same function be diversely fulfilled by alternative items" (Merton 1949c, p. 34, italics in the original). He later noted that "it has often been suggested that the functional equivalent of a patent office be established in science to adjudicate rival claims to priority" (Merton 1957, p. 654), which he also raised in discussing scientific genius (1961a; 1961b). Finally, in discussing the innovative organization, Merton (1965) pointed to the importance of context. In the same publication, he defined the "*act* of innovation" as a "socially valued departure from past practice or thought" (p. 50).

3. Three Relevant Theoretical Ideas

This section discusses three theoretical ideas extracted from Merton's work in relation to this paper's topic.

From multiple discoveries to a zeitgeist perspective

The writer and politician Victor Hugo, who lived parts of his life in Paris, is often attributed with a quote that underlines the power of ideas when they resonate with the zeitgeist. One variant of this quote is that nothing is so powerful as an idea whose time has come. The term and the meaning of zeitgeist can be traced to Goethe in 1827 (Boring 1955), and Campbell (1960) used the term "simultaneous independent invention" early on (p. 386n). Illustrating this phenomenon in relation to theoretical thought, Penrose (1959) noted indirectly that "after having laboriously worked out for myself what I took to be an important and 'original' idea, I have often had the disconcerting experience of subsequently finding the same idea better expressed by some other writer" (p. 2n). She pointed implicitly at a common problem of multiple discovery—several people can come up with the same discovery or formulation independently, which is something noted by others (e.g., Kroeber 1917): "[a] phenomenon that many inventions have been made two or more times by different inventors, each working without knowledge of the other's research" (Ogburn and Thomas 1922, p. 83). Famous examples of multiples are Newton/Leibniz, Darwin/Wallace, the discovery of the law of genetic inheritance by Gregor Mendel, Hugo de Vries, Carl Correns, and Erich von Tschermak (Simonton 2004), and the inventions of the airplane and the telephone (Ogburn and Thomas 1922).

Merton (1961a) further developed the cultural view of discovery from Ogburn and Thomas (1922) in particular and referred to their compilation of some 150 cases of independent discovery and invention, where "they concluded that the innovations [!] became virtually inevitable as certain kinds of knowledge accumulated in the cultural heritage" (Merton 1961a, p. 475). Merton used the word multiple for the "multiple and independent appearance of the same scientific discovery" (1961a, p. 475) when he (Merton and Barber, in Merton 1961s) studied 264 such multiples. He (1961a, p. 477) argued that "all scientific discoveries are in principle multiples, including those that on the surface appear to be singletons" and "such occurrences suggest that discoveries become virtually inevitable when prerequisite kinds of knowledge and tools accumulate in man's cultural store" (Merton 1961a; 1961b; 1963, p. 237).

Merton also discussed the conception of scientific genius (Merton 1961a; 1961b), which he first addressed in his doctoral dissertation (1938b). He observed that those of "great scientific genius will have been repeatedly

involved in multiples … because the genius will have made many discoveries altogether" (Merton 1961a, p. 484). Indeed, the "men of scientific genius are precisely those … whose work in the end would be eventually rediscovered. These rediscoveries would be made, not by a single scientist, but an entire corps of scientists" (p. 484). The single scientific genius thus becomes, according to Merton, "the functional equivalent of a considerable array of other scientists of varying degrees of talent" (1961a, p. 484; 1963, p. 249). Merton thus had a functional interpretation of genius and constrained/defined the genius sociologically rather than psychologically. He argued in another publication that discoveries have been duplicated by less prominent scientists and thus that the "genius is superfluous to a sociological concept of scientific progress" (1961b, p. 306). Further, he wrote that "discoveries and inventions become virtually inevitable (1) as prerequisite kinds of knowledge accumulate in man's cultural store; (2) as the attention of a sufficient number of investigators is focused on a problem – by emerging social needs, or by developments internal to the particular science, or by both" (1961b, p. 306; see also 1963, p. 237).

The argument on multiples was later called "the *zeitgeist* theory of creativity" (Simonton 1979, p. 1603, italics in the original), the zeitgeist perspective on scientific creativity, and a social deterministic interpretation of multiple discoveries (Simonton 2004), in which the individual creator is reduced to being a mere agent of zeitgeist, precluding both the role of chance and genius (Simonton 2004, pp. 10–11). The individual creator is downplayed: "it is the sociocultural system as a whole, embodied as the spirit of the times, which is ultimately responsible for any given technoscientific advance" (Simonton 1979, p. 1603). Conversely, if the perspective has some relevance to the demanding task of scientific discovery, then it could also be relevant for technological solutions, organizational ideas, and business ideas in a time of high availability of prior knowledge and AI-based tools. Attempts to do something new or original may in retrospect just be following an idea whose time has come because the zeitgeist may be more effective than any leader or interest group who attempts to select ideas (Czarniawska and Joerges 1996), similar to cultural heritage (accumulated knowledge) and social developments that may direct "the attention of investigators to particular problems" (Ogburn and Thomas 1922; Merton 1961a, p. 475). The term zeitgeist has therefore been discussed in relation to such a selection of ideas, so-called master ideas, organizational fashion (Czarniawska and Joerges 1996, pp. 36–37), and institutional entrepreneurship and the emergence of institutions (Czarniawska 2009, pp. 427, 438). Certain similarities can also be observed in relation to organizational-level technological innovation. Cohen and Levinthal (1990) talked about accumulated prior knowledge and noted that the accumulation of knowledge enhances organizations' ability to convert this knowledge into further innovations.

Innovation as deviant behavior

The second extracted idea is innovation seen as deviant behavior. Merton (1938a) outlined a typology of deviant behavior that included four modes of adaptation—innovation, ritualism, retreatism, and rebellion—as alternatives to the fifth category of conformity. He perceived innovation as a mode of adaptation—a response or type of behavior (a nonconformist innovative type of behavior) to strains/tensions within social structures. For example, innovation is more likely when the dominant cultural goal is accepted but the avenues for employing legitimate means are blocked, thus exerting pressure or strain toward deviant behavior (p. 678). Merton discussed innovation in relation to business crime and crime (1938a; 1949a), but he did not see it exclusively through the lens of negative deviance. He later stressed that he saw innovation as a "neutral term" (1955, p. 45). Merton can be connected to both innovation with negative connotations (i.e., a negative form of deviance) and innovation with positive connotations or a positive form of deviance (e.g., Mainemelis 2010). For example, Vaughan (1982) argued that that the idea of deviant behavior can be used in relation to unlawful organizational behavior (pp. 1378-1379) and Mainemelis (2010) showed that creative deviance may be important in developing successful ideas.

A contemporary example is research on the dark side of innovation, in which keywords constitute perverse effects, the noxious consequences of innovation (Biggi and Guiliani 2021), and negative and unintended consequences (Coad et al. 2021). While Merton mostly paid attention to behavior (e.g., response, mode of adaptation, and innovative act), this new research is more impact-oriented, even though Merton also indicated that it is not easy to decide whether the outcome is legal, illegal, good, or bad (Merton 1949a). Biggi and Giuliani (2021) referred to Merton (1936) regarding the view that innovations might have unintended direct effects and negative side effects on society and the environment. They identified five strands of scholarly research on the noxious impacts of innovation. One strand was concerned with the dark side of technology acceptance (p. 26), the work-related consequences of telework, and social media. Merton can enrich this discourse through a greater focus on behavior or response than on outcome. Merton's theory focuses on the emergence of patterns of deviant behavior. Finally, Merton can also be an important

contribution to studies of the effect side or outcomes of innovation (unintended consequences). In relation to the topic of dark side of innovation, a couple of contemporary examples can be found in digital platform companies (e.g., Facebook and Uber). Several of these companies have introduced new employment arrangements where much of their workforce is defined as independent contractors rather than employees. The result is new working conditions, and not in favor of the employees-contractors. Another example is Facebook's innovative business model, based on data as resource, which is an element in this company's success. On the other hand, data on user activities may also be used in inappropriate ways. One recent example is Meta's controversial plans to use their users' public posts and images on Facebook and Instagram to train AI tools belonging to the parent company Meta.

Serendipity in science, entrepreneurship, and innovation

As noted in the introduction, recent literature has discussed serendipity in entrepreneurship and innovation (e.g., accidental innovation). For example, Swedberg (2021) referred to Merton's version of serendipity as an alternative approach when he advocated Schumpeter (1934/2021) in relation to creative behavior: "Merton's idea that scientists sometimes stumble on a discovery by mistake (serendipity)" (Swedberg 2021, p. xii). Although Merton was not the first to discover this phenomenon and word (see Merton and Barber 2004), as mentioned, it was a recurring topic during his scholarly production (1945; 1948a; 1965/1993, 1998; 2004), and he devoted a whole book to it (Merton and Barber 2004). Merton's version was that scientists sometimes make discoveries as a result of chance combined with wisdom—what he called serendipity or the serendipity pattern (Merton 1945, p. 469n; 1948a, pp. 506-7), and it was about unanticipated consequences: "Serendipity, which refers to the search for one thing that turns up another, is obviously related to the problem of unanticipated consequences, and was intimately connected with the discovery's absorbing interest" (Merton and Barber 2004, p. 141). Two cited and famous examples of serendipity are Columbus's discovery of America and Fleming's discovery of penicillin in 1928 (Dew 2009), and early mentions of serendipity included Cannon (1940). When Campbell (1960) included the idea of serendipity in his evolutionary model of creative thought, he referred, among others, to Merton. As seen earlier, several later studies referred to serendipity (e.g., Austin et al. 2012; Busch 2022). In relation to scientific creativity, Simonton (2004) favored a chance viewpoint, which includes the phenomenon of serendipity (Simonton 1979, p. 1604). When Dew (2009) wrote about serendipity in entrepreneurship, he referred to Merton and Barber (2004) and said that the "vast majority of research on serendipity involves scientific discoveries" (p. 736). He defined it as "search leading to unintended discovery" (Dew 2009, p. 753), or "some combination of search (directed effort), contingency (favorable accidents), and prior knowledge (sagacity)" (pp. 736). Dew (2009) argued that serendipity plays an important role in entrepreneurship and is a quite prevalent feature of entrepreneurship (e.g., the discovery of opportunities) and that entrepreneurs and entrepreneurship scholars intuitively "conceptualize entrepreneurial opportunity in terms of serendipity" (pp. 735–736). In the contemporary literature on innovation and entrepreneurship, examples are mentioned in relation to new market (Denrell, Fang & Winter 2003; Dew 2009), contexts of high uncertainty such emerging markets (Busch & Grimes 2023), tackling environmental challenges (Busch & Barkema 2019; Busch & Grimes 2023) as well as coming up with list of examples of serendipity in invention and discoveries (Roberts 1989; Austin et al. 2012).

4. Conclusion

As described, Merton was not the first to define all three extracted ideas, but he further developed them. The three extracted ideas are about the role of the spirit of the times (the zeitgeist), deviant behavior (the dark side and unintended consequences), and accidental innovation. These insights could be of interest for scholars interested in the emergence of new ideas, the bright and dark sides of innovation (avoiding pro-innovation bias), and entrepreneurial opportunities (entrepreneurship and opportunity recognition). This relevance can further be seen in Simonton's (2004) presentation of four perspectives or viewpoints on scientific creativity (logic, genius, zeitgeist and chance). He saw Merton as an important representative of the so-called zeitgeist perspective. In fact, Merton early on also discussed genius viewpoints (1938b; 1961a; 1961b) and even chance viewpoints (1945; 1948a; 1965/1993; 1998; 2004). Many of the cited contemporary studies have benefited from Merton, for example, from Merton and Barber (2004). Future studies could explore Merton as a classic source to understand accidental innovation, how the accumulated knowledge store (zeitgeist) may affect new solutions in an age of information availability and AI, and the bright/dark side of innovation in different contexts.

References

Adler, P.S. (2009). Introduction: A social science which forgets its founder is lost. In P.S. Adler (Ed.), *The Oxford handbook of sociology and organization studies: Classical Foundations*. Oxford: Oxford University Press, pp. 3–20.

Austin, R.D., Devin, L., & Sullivan, E.E. (2012). Accidental innovation: Supporting valuable unpredictability in the creative process. *Organization Science*, 23(5), 1505–1522.

Becker, M.C., Knudsen, T., & March, J.G. (2006). Schumpeter, Winter, and the sources of novelty. *Industrial and Corporate Change*, 15(2), 353–371.

Biggi, G., & Guiliani, E. (2021). The noxious consequences of innovation: What do we know? *Industry & Innovation*, 28(1), 19–41.

Boring, E.G. (1955). Dual role of the zeitgeist in scientific discovery. *The Scientific Monthly*, 80(2), 101–106.

Busch, C. (2022). Towards a theory of serendipity: A systematic review and conceptualization. *Journal of Management Studies*, 61(3), 1110-1151.

Busch, C., & Barkema, H. (2022). Planned luck: How incubators can facilitate serendipity for nascent entrepreneurs through fostering network embeddedness. *Entrepreneurship Theory and Practice*, 46(4), 884–919.

Busch, C., & Grimes, M. (2023). Serendipity in entrepreneurship, strategy and innovation – A review and conceptualization. In S. Copeland et al. (Eds.), *Serendipity science*. Cham: Springer, pp. 69–99.

Campbell, D.T. (1960). Blind variation and selective retention in creative thought as in other knowledge processes. *Psychological Review*, 67(6), 380–400.

Cannon, W.B. (1940). The role of chance in discovery. *The Scientific Monthly*, 50(3), 204–209.

Coad, A., Nightingale, P., Stilgoe, J., & Vezzani, A. (2021). Editorial: The dark side of innovation. *Industry and Innovation*, *28*(1), 102–112.

Cohen, W.M., & Levinthal, D.A. (1990). Absorptive capacity: A new perspective on learning and innovation. *Administrative Science Quarterly*, 35(1), 128–152.

Czarniawska, B. (2009). Emerging institutions: Pyramids or anthills? *Organization Studies*, 30(4), 423–441.

Czarniawska, B., & Joerges, B. (1996). The travel of ideas. In B. Czarniawska & G. Sevon (Eds.), *Translating organizational change*. Berlin: De Gruyter, pp. 13–48.

Denrell, J., Fang, C., & Winter, S.G. (2003). The economics of strategic opportunity. *Strategic Management Journal*, 24(10), 977-990.

Dew, N. (2009). Serendipity in entrepreneurship. *Organization Studies*, 30(7), 735–753.

Dosi, G. (1988). Sources, procedures, and microeconomic effects of innovation. *Journal of Economic Literature*, 26(3), 1120–1171.

Fultz, A.E.F., & Hmieleski, K.M. (2021). The art of discovering and exploiting unexpected opportunities: The roles of organizational improvisation and serendipity in new venture performance. *Journal of Business Venturing*, 36(4), 106121.

Garud, R.J., Gehman, J., & Giuliani, A.P. (2018). Serendipity arrangements for exapting science-based innovation. *Academy of Management Perspectives*, 32(1), 125–140.

Kroeber, A.L. (1917). The superorganic. *American Anthropologist*, 19(2), 163–213.

Mainemelis, C. (2010). Stealing fire: Creative deviance in the evolution of new ideas. *Academy of Management Review*, 35(4), 558–578.

Merton, R.K. (1935a). Fluctuations in the rate of industrial invention. *The Quarterly Journal of Economics*, 49(3), 454–474.

Merton, R.K. (1935b). Sociological aspects of scientific development in seventeenth-century England. *PhD dissertation*. Harvard University.

Merton, R.K. (1936). Unanticipated consequences of purposive social action. *American Sociological Review*, 1(6), 894–904.

Merton, R.K. (1938a). Social structure and anomie. *American Sociological Review*, 3(5), 672–682.

Merton, R.K. (1938b). Science, technology and society in seventeenth century England. *Osiris: Studies in the History and Philosophy of Science*, 4, 360–632.

Merton, R.K. (1940). Bureaucratic structure and personality. *Social Forces*, 18(4), 560–568.

Merton, R.K. (1945). Sociological theory. *American Journal of Sociology*, 50(6), 462–473.

Merton, R.K. (1948a). The bearing of empirical research upon the development of social theory. *American Sociological Review*, 13(5), 505–515.

Merton, R.K. (1948b). The self-fulfilling prophesy. *The Antioch Review*, 8(2), 193–210.

Merton, R.K. (1949a). Social structure and anomie: Revisions and extensions. In R.N. Anshen (Ed.), *The family: Its function and destiny*. New York: Harper, pp. 226–257.

Merton, R.K. (1949b). Introduction: Studies in social and cultural structure. In R.K. Merton (Ed.), *Social theory and social structure*. Glencoe, Il.: The Free Press, pp. 115–123.

Merton, R.K. (1949c). Manifest and latent function. In R.K. Merton (Ed.), *Social theory and social structure*. Glencoe, Il.: The Free Press, pp. 21–81.

Merton, R.K. (1955). The socio-cultural environment and anomie. In H.L. Witmer & R. Kotinsky (Eds.), *Perspectives on juvenile delinquency*. Washington, DC: US Government Printing Office, pp. 24–50.

Merton, R.K. (1957). Priorities in scientific discovery: A chapter in the sociology of science. *American Sociological Review*, 22(6), 635–657.

Merton, R.K. (1961a). Singletons and multiples in scientific discovery: A chapter in the sociology of science. *Proceedings of the American Philosophical Society*, 105(5), 470–486.
Merton, R.K. (1961b). The role of genius in scientific advance. *New Scientist*, 259, 306–308.
Merton, R.K. (1963). Resistance to the systematic study of multiple discoveries in science. *European Journal of Sociology*, 4(2), 237–282.
Merton, R.K. (1964). Anomie, anomia, and social interaction: Contents of deviant behavior. In R.M. Clinard (Ed.), *Anomie and deviant behavior*. Glencoe, Il.: The Free Press, pp. 213–242.
Merton, R.K. (1965). The environment of the innovating organization: Some conjectures and proposals. In G.A. Steiner (Ed.), *The creative organization*. Chicago: University of Chicago Press, pp. 50–65.
Merton, R.K. (1965/1993). *On the shoulders of giants*. Chicago: University of Chicago Press.
Merton, R.K. (1967). On the history and systematics of sociological theory. In R.K. Merton (Ed.), *On theoretical sociology: Five essays, old and new*. New York: The Free Press, pp. 1–37.
Merton, R.K. (1968). The Matthew effect in science: The reward and communication systems of science are considered. *Science, New Series*, 159(3810), 56–63.
Merton, R.K. (1998). Afterword: Unanticipated consequences and kindred sociological ideas: A personal gloss. In C. Mongardini & S. Tabboni (eds.), *Robert K. Merton and contemporary sociology*. New Brunswick: Transaction, pp. 295–318.
Merton, R.K., & Barber, E. (2004). *The travels and adventures of serendipity: A study in sociological semantics and the sociology of science*. Princeton, NJ: Princeton University Press.
Mulkay, M.J. (1972). *The social process of innovation: A study of the sociology of science*. London & Basingstoke: Macmillan.
Murayama, K., Nirei, M., & Shimizu, H. (2015). Management of science, serendipity, and research performance: Evidence from a survey of scientists in Japan and the U.S. *Research Policy*, 44, 862-873.
Ogburn, W.F., & Thomas, D. (1922). Are inventions inevitable? A note on social evolution. *Political Science Quarterly*, 37(1), 83–98.
Penrose, E. (1959). *The theory of the growth of the firm*. Oxford: Oxford University Press.
Roberts, R.M. (1980). *Serendipity: Accidental discoveries in science.* New York: Wiley.
Schumpeter, J.A. (1926). *Theorie der wirtschaftlichen Entwicklung*. München & Leipzig: Duncker & Humblot.
Schumpeter, J.A. (1934/2021). *Theory of economic development*. New York: Routledge.
Schumpeter, J.A. (1939). *Business cycles*. New York: McGraw Hill.
Shulman, J.L. (2004). Introduction. In R.K. Merton, & E. Barber, *The travels and Adventures of serendipity: A study in sociological semantics and the sociology of science*. Princeton, NJ: Princeton University Press, pp. xiii–xxv.
Simon, H.A. (1985). What we know about the creative process. In R.L. Kuhn (Ed.), *Frontiers in creative and innovative management*. Cambridge, MA: Ballinger, pp. 3–22.
Simonton, D.K. (1979). Multiple discovery and invention: Zeitgeist, genius, or chance? *Journal of Personality and Social Psychology*, 37(9), 1603–1616.
Simonton, D.K. (2004). *Creativity in science: Chance, logic, genius, and zeitgeist*. Cambridge: Cambridge University Press.
Swedberg, R. (2009). Tocqueville as a pioneer in organization theory. In P.S. Adler (Ed.), *The Oxford handbook of sociology and organization studies: Classical Foundations*. Oxford: Oxford University Press, pp. 39–61.
Swedberg, R. (2021). Introduction to the Routledge Classic Edition. In J.A. Schumpeter (1934/2021), *Theory of economic development*. New York: Routledge, pp. viii–xv.
Vaughan, E. (1982). Toward understanding unlawful organizational behavior. *Michigan Law Review*, 80(7), 1377-1402.
Zuckerman, H. (2010). On sociological semantics as an evolving research program. In C. Calhoun (Ed.), *Robert K. Merton: Sociology of science and sociology as science*. New York: Columbia University Press, pp. 253–272.