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By World War I, the public (and later, many historians) had come to believe that teams of anonymous scientists in corporate research and development (R&D) laboratories had displaced "heroic" individual inventors like Thomas Edison and Alexander Graham Bell as the wellspring of innovation. However, the first half of the twentieth century was actually a long transitional period when lesser known independents like Chester Carlson (Xerox copier), Earl Tupper (Tupperware), Samuel Ruben (Duracell batteries), and Edwin Land (Polaroid camera) continued to make notable contributions to the overall context of innovation. Accordingly, my dissertation considers the changing fortunes of American independent inventors from approximately 1900 to

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1950, a period of expanding corporate R&D, the Great Depression, and two world wars. Contrary to most interpretations of this period, I argue that individual, "post-heroic" inventors remained an important, though less visible, source of inventions in the early twentieth century.

On December 11, 1927, the *New York Times* ran an article describing a luncheon speech held at the American Institute, a New York City organization founded in 1828 to promote science, invention, and industrial progress. The speaker, Mr. Maurice Holland, was the director of the Division of Engineering and Industrial Research of the National Research Council (NRC), an organization representing America's elite academic and industrial scientists. In the speech, Holland suggested that "the independent inventor of today has little chance against the 'formidable' research organizations of modern industry" and that the days of the "genius in the garret" had past. Instead, Holland suggested that inventors now typically worked as salaried employees in one of a thousand industrial laboratories across the United States.[1]

Holland's speech initiated a month-long exchange of follow-up articles, editorials, and impassioned letters to the editor of the *Times*. For example, on December 18, 1927, Assistant Patent Commissioner William A. Kinnan protested that the "day of the independent inventor has not passed . . .. Nothing could be further from the truth. [. . . This] fallacy grows from a vague realization of the increasingly important part organized scientific research is playing and the natural tendency is toward overemphasis." [2]

This exchange captures many of the historical themes and tensions that animate my research. My dissertation, entitled "The Post-Heroic Generation: American Independent Inventors, 1900-1950," considers the changing fortunes of American independent inventors following the emergence of science-based industrial research among the largest U.S. firms.

Historiography, Research Questions, Sources, and Methodology

My dissertation challenges several long-held assumptions about the sources of invention during an important transitional period in the first

1. "Says Garret Genius Has Disappeared."
2. "Asserts Inventors Have Good Chance."

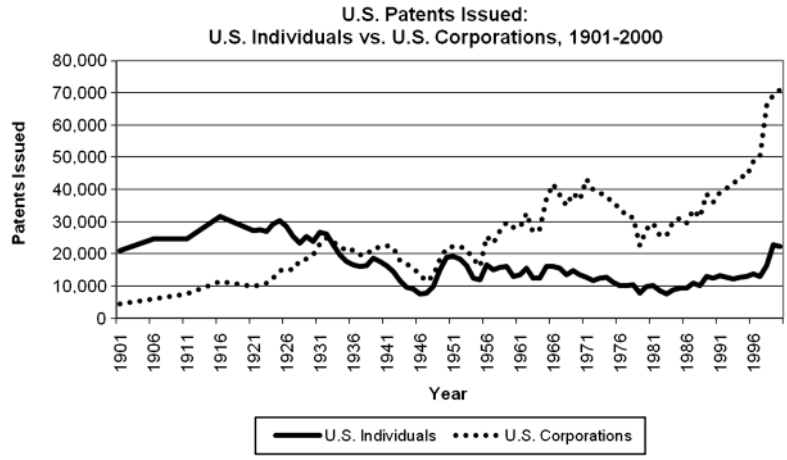

Figure 1 The number of U.S. patents issued to individual inventors outnumbered those issued to corporations until 1933 and still represented nearly 50 percent of total patents throughout the 1950s. Source: Patent applications filed and patents issued.

half of the twentieth century. The earlier, nineteenth century had witnessed the so-called "heroic" era of invention, when mythic individuals like Thomas Edison and Alexander Graham Bell were credited with creating entirely new industries while achieving widespread fame. However, beginning in 1900, several large firms like General Electric (GE), Du Pont, and American Telephone & Telegraph (AT&T) established the first research and development (R&D) laboratories, in which teams of anonymous PhD scientists developed new products and processes with all resulting patents assigned to the company. By World War I, the public (and later, many historians) had come to believe that corporate R&D laboratories had displaced individual inventors as the wellspring of innovation. For example, historian Thomas P. Hughes has suggested that, after World War I, "the independents never again regained their status as the pre-eminent source of invention and development . . . Industrial scientists, well publicized by the corporations that hired them, steadily displaced, in practice and in the public mind, the figure of the heroic inventor as the source of change in the material world."[3]

However, a close look at the historical patent data tells a different story. Figure 1 shows American patenting activity in the twentieth century. The solid line represents patents granted to U.S. individuals; the dotted line represents patents granted to U.S. corporations. We can see that patents granted to individual inventors outnumbered

3. Hughes, *American Genesis*, 138–9.

corporate patents until 1933 and still represented nearly 50 percent of total patents throughout the 1950s. It is only after about 1955 that we start to see a sharp divergence and the dominance of corporate patenting.[4]

So, while corporations did eventually come to dominate patenting after 1955, it is clear that independent inventors were not dispatched so quickly and easily by R&D laboratories. In fact, the first half of the twentieth century was a long transitional period when lesser known independents like Chester Carlson (Xerox copier), Earl Tupper (Tupperware), Samuel Ruben (Duracell batteries), and Edwin Land (Polaroid camera) continued to make notable contributions to the overall context of innovation. Thus, contrary to most interpretations of this period, I argue that individual, "post-heroic" inventors remained an important, though less visible, source of inventions in the early twentieth century.

My dissertation draws upon three historical literatures—the history of science and technology, business history, and economic history—and fills an important interpretive gap in our understanding of American innovation. First, historians of science and technology have developed a sophisticated approach for studying invention as a social process while producing several outstanding biographies of individual inventors.[5] However, only a few historians of technology have extended their studies beyond the "heroic" era of the late nineteenth and early twentieth centuries.[6] Meanwhile, business historians—inspired by the organizational framework of Alfred D. Chandler, Jr.[7]—have described how twentieth-century firms established R&D laboratories, bringing invention under corporate control as part of a larger project of vertical integration.[8] However, as several revisionists have noted, the Chandlerian emphasis on the large, vertically integrated firm as the unit of

4. While this data set supports my overall thesis, I do acknowledge the methodological difficulties associated with counting patents as a proxy for inventive activity. For an overview, see Schmookler, "Inventors Past and Present" and Jaffe and Trajtenberg, *Patents, Citations, and Innovations*.

5. For example, see Hughes, *Elmer Sperry*; Israel, *Edison*; and Carlson, *Innovation as a Social Process*.

6. Some notable exceptions include Owen, *Copies in Seconds*; Godfrey, *Philo T. Farnsworth*; and Lewis, *Empire of the Air*.

7. Chandler, *Visible Hand*; also see Galambos, "Emerging Organizational Synthesis."

8. On GE, see Wise, *Willis R. Whitney*; on GE and AT&T, see Reich, *The Making of American Industrial Research*; on Du Pont, see Hounshell and Smith, *Science and Corporate Strategy*; on Kodak and its competitors, see Jenkins, *Images and Enterprise*; on the Radio Corporation of America, see Graham, *The Business of Research*. For a terrific overview of this literature, see Hounshell, "The Evolution of Industrial Research in the United States."

analysis has made business historians somewhat blind to the continuing and contemporaneous contributions of independent inventors and other outside entities.[9] Finally, several economic historians have empirically established the continuing contributions of independent inventors from 1900 to 1950.[10] However, this aggregate, statistical view can be relatively sterile in terms of descriptive or narrative detail. Thus, historians know comparatively little about the professional and political activities of post-heroic independent inventors relative to their heroic forefathers or corporate contemporaries, a shortcoming my project will redress.

Indeed, the world was changing rapidly for the independents, so I am curious about their collective experience. How did independent inventors react to industrial research as a competitive threat? How did individual inventors—once revered as heroes—gradually lose their cultural primacy while corporate brands became increasingly associated with high-tech innovation? Finally, how did this post-heroic generation of inventors navigate the evolving business practices and political–economic crises of the early twentieth century, a period of expanding corporate R&D, the Great Depression, and two world wars? In general, *what was it like* to be an independent inventor during this crucial transitional period?

To interrogate these questions, I have engaged primarily in archival research, drawing upon the records of nearly twenty independent inventors, half a dozen firms, and selected industry groups and government agencies. By researching individual cases, I can add some narrative details to flesh out the statistical picture and say something more about who these inventors were and the kinds of professional challenges they faced. Thus, rather than writing a biography of a single inventor from this period (which could be discounted as an exceptional case), I have tried to discern the *general characteristics* of post-heroic inventors by examining their *collective experiences* across the cohort.[11]

9. For example, see Carlson, "Innovation and the Modern Corporation"; also, Lamoreaux, Raff, and Temin, "Beyond Markets and Hierarchies."

10. For example, see Schmookler, "Inventors Past and Present"; Jewkes, Sawers, and Stillerman, *The Sources of Invention*; Lamoreaux and Sokoloff, "Inventors, Firms, and the Market for Technology"; and Nicholas, "The Role of Independent Invention."

11. In *American Genesis*, Hughes assembled a collective biography of twelve notable inventors from the heroic period, circa 1870–1920. Similarly, in "The Social Practice of Independent Inventing," sociologist Peter Whalley discerned the sociocultural practices of modern-day independents by studying the members of several Chicago-area inventors' clubs during the 1980s. My dissertation applies a similar, collective analysis of independent inventors from approximately 1900–1950, a period only partially covered by Hughes and not at all by Whalley.

In addition, the dissertation draws on various published primary sources, including historical patent statistics, newspapers and inventor-oriented trade journals like *Scientific American*, the autobiographies and memoirs of several inventors from this period,[12] and published government reports and Congressional testimony. When viewed synthetically, this diverse accumulation of sources provides a sufficiently large sample of material to say something concrete and meaningful about the collective experiences of post-heroic, independent inventors.

Chapter Summaries

The dissertation is organized thematically, stepping through five (roughly) chronological chapters, each of which considers an important aspect of inventors' experiences during the period from 1900 to 1950. In Chapter 1, I argue that the ostensible disappearance of independent inventors in the early twentieth century was really a common misperception that resulted from tendentious rhetoric and sophisticated public relations. As they tried to carve out a niche within industry, industrial researchers had to convince their executive patrons (and the general public) that their new team-based, scientific approach to invention was a more reliable and profitable mode of invention than the traditional reliance on individual geniuses. Thus, individual firms and pro-research associations like the American Chemical Society and NRC marshaled persuasive rhetoric and huge advertising budgets to extol the virtues of corporate R&D. Not surprisingly, independent inventors resisted this encroachment on their professional turf. This led to some impassioned ideological debates regarding the merits of these competing modes of invention.[13]

Typically, industrial researchers liked to characterize their methods as rigorous and highly scientific, while denigrating independents as antiquated, unsophisticated "tinkerers." Meanwhile, independent inventors celebrated their ineffable "genius," creativity, and autonomy. Inspired by William Whyte's trenchant critique of corporate conformity, they characterized industrial scientists as unimaginative, subservient "organization men."[14] Overall, corporate researchers

12. For example, see De Forest, *Father of Radio*; Eisler, *Million-Dollar Bend*; and Ruben, *Necessity's Children*.

13. In this chapter, I draw on Thomas Gieryn's concept of "boundary work," in which "two or more rival epistemic authorities square off for jurisdictional control over a contested ontological domain." See Gieryn, *Cultural Boundaries of Science*, 16.

14. Whyte, *Organization Man*.

could afford far more ink than the independents, and the public was left with only one side of the story. The net effect was a growing misperception that industrial research represented a superior form of invention and that independents had become obsolete.

In Chapter 2, I examine several inventors' professional associations and suggest why independents failed to maintain durable organizations that might have provided support for an increasingly troubled profession. The National Institute of Inventors (NII) provides an interesting case study. In 1914, the NII emerged as a cooperative organization in which dues-paying members would receive impartial advice on their new ideas, legal aid for taking out and defending patents, and financial assistance for marketing their new inventions. The organization also promised to protect independent inventors from unscrupulous patent agents and predatory scams. Unfortunately, the NII was a charade. Founder Thomas Howard and the other officers simply pocketed the membership dues, embezzling thousands of dollars from America's unsuspecting inventors. Eventually, investigations by the Department of Justice and the Postal Service Inspector uncovered the fraud and shut down the Institute in 1925.[15]

Like the NII (1914–1925), other contemporary inventors' organizations like the American Association of Inventors and Manufacturers (1891–1902), the Inventors Guild (1910–1920), and the National Inventors Congress (1928–1940) were extremely short lived, especially when compared with the long-standing professional organizations formed by scientists and engineers.[16] This had two consequences. First, without a durable, unified organization to lobby for their concerns, independent inventors were politically weak and unable to achieve the reforms they sought. Second, without a flagship organization to speak on behalf of the profession, independent inventors were at a disadvantage in their rhetorical and discursive battles with industrial researchers.

In Chapter 3, I consider the various economic strategies employed by post-heroic, independent inventors, concentrating on their relationships with firms. I show that, despite any rhetoric to the contrary, independent inventors had not been vanquished by corporate R&D laboratories. In fact, independent inventors often survived economically by partnering with firms that continued

15. Hintz, "'A Swindling Concern.'"

16. For example, two of the earliest scientific and engineering societies, the American Association for the Advancement of Science (founded 1848) and the American Society of Civil Engineers (founded 1852), are still going strong more than 150 years after their establishment.

Table 1 Innovation strategies of independent inventors and firms

Strategy	Independent inventors	Flow of patents and technical information	Firms
Make	Inventor–entrepreneur	Not applicable	Industrial research
Sell/buy	Assign (sell) patents	→	Buy patents, outsourcing
Ally	License patents, alliance/consulting	↔	Pay royalties, alliance/retainers
Mixed/hybrid	Both independents and firms can pursue multiple strategies simultaneously		

to "outsource" for inventions. Thus, the dissertation sheds light on current practices by describing the historical antecedents of present-day business strategies like "open innovation" and "crowdsourcing."[17]

Table 1 provides a convenient way to represent the various economic strategies employed by independents and firms. The "make" strategies represent a self-contained, do-it-yourself approach to innovation. Here, an inventor holds onto his patent and engages in entrepreneurial activity to manufacture the invention and make a profit. Likewise, a corporation and its executives can build an R&D laboratory and hire a team of salaried inventors to "make" inventions within the confines of the firm. In the next two strategies, inventors and firms work together, but at different levels of cooperation. Under the "buy/sell" strategy, an independent inventor can "assign," or sell, his patents to a firm that outsources for inventions. Often, these were "arm's length" transactions—the firm would pay the inventor a lump sum, the inventor would transfer title to his invention, and the parties would go their separate ways.[18] In contrast, inventor-firm relations under the "ally" model were much more cooperative and enduring. Here, independent inventors would enter into contracts with firms and license their patents on a royalty basis. Often these licensing deals contained provisions in which the independents would work on a "fee for service" basis, offering technical assistance under a retainer agreement or consulting contract. Finally, inventors and firms could pursue a "mixed" or "hybrid" approach to innovation, in which they pursued several of these strategies simultaneously.

The "make" strategies are the most familiar to business historians, so I will provide only a few brief examples. On the corporate side, the "make" strategy has been well-documented in several accounts of vertically integrated R&D laboratories—from GE's development of an

17. For example, see Chesbrough, *Open Innovation*.
18. Carlson, "At Arm's Length or Close to the Vest?"

improved tungsten light bulb filament to Du Pont's invention of nylon and other synthetic fibers.[19] As for the independents, I found plenty of inventor–entrepreneurs in the post-heroic period, from Joseph Friedman, inventor of the flexible drinking straw, to Charles Brannock, the Syracuse shoe store proprietor who developed his eponymous foot-measuring device.[20] However, I discovered that, unlike their heroic forefathers, most post-heroic independents were *reluctant* entrepreneurs who exploited their own inventions only after trying—and failing—to find corporate buyers for their patents.

Indeed, as Lamoreaux and Sokoloff have noted, around the turn of the twentieth century, independent inventors increasingly abandoned the practice of manufacturing and marketing their own inventions as inventor–entrepreneurs and instead turned to selling their patents on the open invention market.[21] As I show in the dissertation, this "buy/sell" model of innovation could be remunerative, but did entail certain consequences. For example, in 1914, independent inventor Henry J. Gaisman invented the so-called "Autographic Kodak," a camera attachment that allowed a photographer to expose a portion of the negative and make notations with a stylus. Gaisman negotiated with President George Eastman and assigned Kodak the full rights to his invention for the handsome sum of $300,000. *Scientific American* reported the story on August 5, 1914;[22] one month later, the magazine ran its first advertisement for the "Autographic Kodak."[23]

There are two things to notice here. First, recall that the promoters of corporate R&D liked to characterize their team-based, scientific approach to invention as superior to the unsophisticated "tinkering" of the independents. Nevertheless, Kodak—owner of one of the most sophisticated R&D laboratories in the world—paid $300,000 to an outside inventor to acquire a core technology. Second, in the subsequent advertisement, Kodak's name was on the autographic attachment, not Gaisman's. Though the earlier *Scientific American* article had clearly established Gaisman as the inventor, his connection with the invention slowly eroded over time. In general, these kinds of arm's length purchases and advertising practices served to obscure the contributions of independent inventors, rendering them invisible

19. On GE, see Wise, *Willis Whitney*; on Du Pont, see Hounshell and Smith, *Science and Corporate Strategy*.

20. Joseph B. Friedman Papers; Brannock Device Company Records.

21. Lamoreaux and Sokoloff, "Inventors, Firms, and the Market for Technology."

22. Gaisman, "How I Came to Invent the Autographic Kodak"; "A Fortune for a Simple Invention."

23. Eastman Kodak, "The Autographic Kodak" (advertisement).

to the public, while perpetuating the false impression that corporate laboratories had become the sole source of most new inventions.

One of the most interesting findings of the dissertation is the extent to which independent inventors entered into more enduring partnerships with firms. This "ally" model is quite interesting because, when independents and firms worked together, the locus of innovation resided both inside and outside the firm and spanned its permeable organizational boundaries. For example, in 1955, inventor Wadsworth Mount entered into a development contract on retainer with the Barium Steel Corporation. Essentially, Mount provided the research while Barium provided the development. Mount agreed to generate some new ideas, and if they were good, Barium would pay for all the associated patenting costs and material expenses. Mount agreed to assign all patent rights to Barium and to work with the firm to develop and sell any resulting products. Mount would earn a 5 percent royalty on any future sales, plus $100 per day in consulting fees for any technical services rendered. Either party could dissolve the contract with sixty days written notice, with all patent rights re-assigned back to Mount.[24]

This alliance model held several advantages for independent inventors. First, independents like Mount could gain legal and financial assistance by aligning themselves with firms; for example, Barium paid for all patenting costs and material expenses associated with new product development. Second, Mount was not just selling his inventions but also his *services*—his technical expertise. Invention was a risky business, but the Barium contract provided Mount with a relatively steady income of $100 per day. Third, this deal allowed Mount to specialize in the act of invention and leave many of the bureaucratic hassles to Barium. Finally, this deal was not exclusive. Mount could—and did—strike similar deals with dozens of firms over the course of his career, often working with multiple clients simultaneously.

Firms like Barium Steel also reaped several advantages from this alliance model. By outsourcing certain inventions, firms avoided some of the fixed capital costs of staffing and maintaining an industrial laboratory. Essentially, the alliance model made R&D a variable, rather than a fixed cost. With a vertically integrated laboratory, firms had to continually pay the salaries of their staff researchers and the overhead associated with the laboratory itself, even if their ideas flopped. However, under retainer agreements, firms could pay inventor–consultants only for the inventions and services they

24. Eberstadt to Mount.

needed, on a per diem basis. Plus, with licensing agreements, firms only paid inventors if the new product succeeded, since royalties were typically computed as a percentage of actual sales. Also, these payments were amortized over the life of the patent and ceased altogether when the patent expired. Finally, these contracts gave firms maximum flexibility—if the arrangement did not work out, Barium could dissolve Mount's agreement with only sixty days notice.

Finally, in order to maximize their chances for success, inventors and firms often pursued multiple strategies simultaneously in a "mixed" or "hybrid" approach to innovation. Recall that Mount often worked with several different clients, sometimes selling his patents outright, and sometimes forging more enduring alliances, as with Barium Steel. Analogously, even the pioneers of vertically integrated R&D sometimes found it necessary to build alliances with independents or otherwise outsource for inventions. As noted earlier, Kodak—owner of one of the world's most respected R&D laboratories—turned to Henry J. Gaisman for his autographic camera attachment in 1914. Later, in the 1930s, the firm allied with independents Leopold Godowsky, Jr. and Leopold Mannes to develop its signature "Kodachrome" color film, the firm's best-selling product.[25] Similarly, AT&T's Bell Laboratories purchased Michael Pupin's loading coil and Lee de Forest's audion amplifier—two key technologies for achieving reliable long distance service.[26] Thus, while there is no denying the importance of science-based R&D at big firms like Kodak and AT&T, vertically integrated industrial research was not the only path to successful innovation—in general, and even within those archetypal firms. This fact also makes any ideological pronouncements about the inherent superiority of R&D untenable and even somewhat ironic.

But not all was copacetic for independent inventors in their relations with firms. In Chapter 4, I examine the Depression era, the New Deal antitrust movement, and inventors' calls for reform. The Great Depression laid bare many of the inequities of the American free enterprise system and in 1938, President Franklin D. Roosevelt called upon Congress to make "a thorough study of the concentration of economic power in American industry" and its impact on the economy.[27] The resulting Temporary National Economic Committee (TNEC) hearings, examined a wide range of industries and business practices, including the use and abuse of patents in the maintenance of corporate monopolies. In 1938–1939, the Committee convened two

25. Hodges, "Color It Kodachrome."
26. See Reich, *The Making of American Industrial Research*, 148, 155–62.
27. Roosevelt, "Message from the President of the United States," 189.

hearings to investigate injustices in the patent system, soliciting testimony from witnesses such as Patent Commissioner Conway Coe, independent television inventor Philo Farnsworth, and Frank B. Jewett, the president of AT&T's Bell Laboratories. As such, the Committee considered the sources of invention and debated whether the patents laws should be modified to level the playing field for independent inventors.

The Committee found that control over large patent pools had been crucial for the formation of large, technologically based corporate monopolies. Often, giants like GE, AT&T, and the "Big Three" automakers used their impenetrable patent positions and superior finances to bully independent inventors. For example, large technical firms and their industrial labs often took out "blocking" patents on ideas they never intended to develop in order to forestall would-be competitors. Deep-pocketed firms also entangled individual inventors in prolonged and expensive lawsuits, hampering their ability to develop or profit from new innovations.[28]

Progressive New Dealers worried that these practices would eventually bring all technologies under the control of the largest corporations, effectively crowding out independent inventors. Meanwhile, the corporate community feared that the hearings would generate radical reforms to the patent laws that had worked so well to their advantage; accordingly, big-business lobbying groups like the National Association of Manufacturers developed sophisticated public relations campaigns to "preserve" the status quo. However, by 1940, the federal government dialed back its anti-trust pressure because it urgently needed the industrial muscle of R&D stalwarts like AT&T and Du Pont to mobilize for the looming war. Plus, as I argue in Chapter 2, the independents lacked any strong professional organizations to represent their interests before Congress, so patent reforms never came to pass.

Finally, Chapter 5 considers the mobilization of independent inventors during World War II, in the context of their earlier efforts during World War I. In *American Genesis*, historian Thomas Hughes marked World War I as the swan song for independent inventors, citing the failure of the Naval Consulting Board. Chaired by an aging Thomas Edison, the Board evaluated the military devices sent to Washington by America's grassroots inventors, but only one idea out the 110,000 submitted was implemented by the war's end. In contrast, university and academic scientists mobilized by the NRC thrived

28. See TNEC, *Investigation of Concentration of Economic Power*, Parts 2 and 3.

during the war effort, using physics to detect enemy submarines and advanced chemistry to synthesize explosives and chemical weapons.[29]

Similarly, when considering World War II, historians have typically ignored independent inventors and emphasized the contributions of academic and industrial scientists who developed the atomic bomb, radar, and proximity fuses during the so-called "Physicists' War."[30] But institutionally based research scientists were not the sole sources of weaponry and technology during World War II. In 1940, the Department of Commerce established the National Inventors Council (NIC) to mobilize America's citizen–inventors to "Invent for Victory!" Like the earlier Naval Consulting Board, the NIC was essentially a clearinghouse. From 1940 to 1945, the NIC's staff of engineers and clerks sifted through some 208,000 war-related submissions from the general public and forwarded the most promising ideas to the military.[31]

As you can imagine, much of what the NIC received was unsophisticated, even outlandish. However, the NIC's inventors did manage to develop several essential wartime technologies. For example, Miami beach-comber Charles Hedden adapted his treasure-hunting equipment to develop improved mine detectors; these devices saved countless Allied lives in amphibious landings conducted in North Africa, Europe, and all over the Pacific.[32] Likewise, inventor Samuel Ruben developed the so-called "tropical" battery for use in walkie–talkies that performed better in the heat and humidity of the Pacific theatre. Following the war, Ruben worked with the P. R. Mallory Company to commercialize the miniature mercury cell for use in hearing aids, pacemakers, and electric watches. In the process, P. R. Mallory evolved into the multi-billion dollar company we know today as Duracell.[33] Thus, while historians like Hughes might mark World War I as the final curtain for independent inventors, it is clear that they were still making valuable and patriotic contributions, even as late as World War II.

29. Hughes, *American Genesis*, Chapter 3.

30. For example, see Kevles, *The Physicists*; Rhodes, *The Making of the Atomic Bomb*; Miller, *Men and Volts at War*; and Ndiaye, *Nylon and Bombs*.

31. NIC, *Administrative History*. The National Archives and Records Administration only recently declassified the NIC's administrative records in 2002. Thus, prior to my research, scholars have been largely unaware of this organization and the military contributions of independent inventors during World War II.

32. Ibid, 16.

33. Hintz, "Portable Power."

Conclusions

Now, in conclusion, let us return to the original "Big Question" I posed earlier. Generally, what was it like to be an American independent inventor from 1900 to 1950? In many ways it was difficult. Independent inventors **s**truggled to form durable professional groups. This rendered them politically impotent and unable to push through certain legislative reforms. Also, without a flagship organization to speak on behalf of the profession, independent inventors were at a disadvantage in their rhetorical battles with industrial researchers, who characterized them as unsophisticated and obsolete. In the commercial realm, independents were at a definite disadvantage in terms of money and resources, and the contributions they did make were often rendered invisible to the public once they sold or licensed them to firms.

However, independent inventors still made many important contributions to the overall context of innovation in the early twentieth century. Industrial research laboratories were still maturing during this period and were often unable to fulfill all of a firm's technology needs. Thus, many firms—even the pioneers of industrial R&D—frequently enlisted the help of outside inventors through outsourcing or cooperative alliances. And after a poor showing in World War I, independents rebounded in World War II and developed several key military innovations through the auspices of the NIC.

In short, industrial research was a growing source of innovations during the early twentieth century, but not the *only* source. Clearly, individual, post-heroic inventors remained an important, though less visible, source of inventions in the first half of the twentieth century.

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