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Knowledge Held in Common: Tales of Luther Burbank and Science in the American Vernacular

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Knowledge Held in Common

Tales of Luther Burbank and Science in the American Vernacular

*By Katherine Pandora**

ABSTRACT

During the first half of the twentieth century, the horticulturist Luther Burbank was largely considered an irrelevant figure by the scientific community, despite winning acclaim from the public as an eminent scientist. In examining the intellectual, social, and political claims embedded in texts by and about Burbank, this essay argues that consideration of the Burbank stories as they circulated in the vernacular realm can aid historians in understanding the dynamics of science in American life. Among the themes it addresses are how the Burbank stories directly engaged the question of who should legitimately count as a student of nature; the varied philosophical perspectives that derived from siting science within the domestic sphere; and how these stories played with the possibility of a philosophy of nature based on the concept of "living matter," as opposed to one grounded on mechanistic principles. The essay also discusses how Burbank's views on evolution were mediated by the image of the child and the way in which his convictions regarding the power of the environment to release latent characteristics in physiological material presented a view of the future of the American "race" that was at odds with conventional eugenic thinking and assigned a central role to women in the drama of American evolution.

THE TALE OF THE HORTICULTURIST LUTHER BURBANK (1849–1926), acclaimed as one of America's most eminent scientists, was oft told during the first half of the twentieth century. Burbank's words, deeds, and image were broadcast in the pages of the nation's newspapers and popular periodicals, in books for adults and books for

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children, and on Pathé newsreel footage—for example, when Thomas Alva Edison and Henry Ford journeyed to his Santa Rosa, California, home in 1915. Burbank's residence and experimental grounds were a frequent stop both for the general public and for famous figures such as Helen Keller, William Jennings Bryan, Jack London, William Howard Taft, John Muir, and Ignace Paderewski. As the author of a Burbank biography explained to his young readers in 1961, in the quarter-century after 1900, Burbank's "gardens became almost a shrine, and to shake hands with him a benediction. . . . Millions of Americans had found a new hero."[1] Burbank personified the ideal of the American man of science for many of the nation's citizens.

The catalyst for this public attention was Burbank's experimentation with the cross-fertilization and artificial selection of plants, conducted on a massive scale. The horticulturist produced a torrent of new varieties that, in his view, demonstrated "that the evolution of species is by more modes than some are inclined to admit." Burbank's fame commenced in 1893 with the publication of his fifty-two-page catalogue, *New Creations in Fruits and Flowers,* which stimulated widespread comment at home and abroad.[2] The press, dubbing Burbank a "plant wizard"—and often pairing him in influence with Thomas Edison, the "wizard of Menlo Park"—emphasized the ubiquity of the Burbank potato and trumpeted news of his most dramatic feats, such as the white blackberry, the stoneless prune, the plumcot, and the spineless cactus.[3] Writers conveyed Burbank's philosophical musings on the nature of the universe, evolution, "the training of the human plant," religion, and a score of other topics. As the University of California scientist Walter Howard stated in his exhaustive assessment of Burbank's life in 1945, "Few men of his time, in private life at least, were more sought after or more talked about. . . . His name was known to the reading public in foreign lands and at the height of his career even to the illiterate."[4]

[1] Paul Bacon, *Creating New and Better Plants: Luther Burbank* (Chicago: Britannica, 1961), p. 105. This book is part of the "Britannica Bookshelf—Great Lives for Young Americans" series. Other children's biographies include Lillian J. Bragdon, *Luther Burbank: Nature's Helper* (New York: Abingdon, 1959); and Doris Faber, *Luther Burbank: Partner of Nature* (Champaign, Ill.: Garrard, 1963). For a judicious biography treating Burbank's life and work see Peter Dreyer, *A Gardener Touched with Genius: The Life of Luther Burbank* (Berkeley: Univ. California Press, 1985) (hereafter cited as **Dreyer, *Gardener Touched with Genius***); the list of visitors appears on p. 14. In the generation after Burbank's death, Walter L. Howard produced an impressive consideration of "the real Burbank" by surveying the range of opinion about his work in "Luther Burbank: A Victim of Hero Worship?" *Chronica Botanica,* 1945–1946, *9*(5–6):299–506. Both Dreyer and Howard present excellent introductions to Burbank's life and work. For a brief biographical essay see Katherine Pandora, "Luther Burbank," in *American National Biography,* ed. John A. Garraty and Mark C. Carnes, Vol. 3 (New York: Oxford Univ. Press, 1999), pp. 926–927.

[2] Luther Burbank, "Another Mode of Species Forming," *Popular Science Monthly,* 1909, *75*:264–266, on p. 266. This is a reprint of a paper read by Burbank at the 1909 annual meeting of the American Breeders' Association, reporting on his development of a true-breeding species hybrid. As one of Burbank's biographers noted, the horticulturist had "become 'good newspaper copy'" before the turn of the century: Luther Burbank, *Partner of Nature,* ed. and transcribed by Wilbur Hall (New York: Appleton-Century, 1939), p. 11. This book was essentially ghostwritten by Wilbur Hall, who, through a "boiling down" process, produced "a transcription of Mr. Burbank's voluminous material rather than literal, word-for-word quotations" (p. vi). Burbank preferred to dictate his thoughts to others, which is how his "autobiographies" appear to have been produced.

[3] Marcel C. LaFollette, in *Making Science Our Own: Public Images of Science, 1910–1955* (Chicago: Univ. Chicago Press, 1990), indicates that, among scientists who were prominent in popular American magazines from 1910 to 1955, Burbank—who died in 1926—ranked sixth, in the company of such men as the inventor Thomas Edison (first) and the physicist Robert Millikan (fourth); see the table on p. 51. On "Edison the wizard" see Wyn Wachhorst, *Thomas Edison: An American Myth* (Cambridge, Mass.: MIT Press, 1981); see also LaFollette's discussion of the genius as a scientific stereotype: *Making Science Our Own,* pp. 98–100. A fascinating consideration of the many facets of Edison's work as part of a cultural system of meanings is Charles Bazerman, *The Languages of Edison's Light* (Cambridge, Mass.: MIT Press, 1999).

[4] Howard, "Luther Burbank" (cit. n. 1), p. 460. In this time period Burbank's fame was approached perhaps only by that of Newton, Darwin, Edison, and Einstein. A contemporary American figure with enormous public

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As the decades progressed, however, it would be nearly impossible to find this public enthusiasm for Burbank seconded within the precincts of professional science. Despite the ringing endorsement of such leaders as the biologist and Stanford president David Starr Jordan, who declared in 1905 that if Burbank's "place is outside the temple of science, there are not many of the rest of us who will be found fit to enter," academic scientists increasingly dismissed Burbank as a glorified gardener. Where Jordan saw a "scientific man" who "belongs in the class of Faraday and the long array of self-taught great men," others saw only a presumptuous nurseryman.[5] Donald Jones, head of the Department of Genetics at the Connecticut Agricultural Experiment Station, spoke for many of his peers in arguing that Burbank lacked the characteristics of a true scientist and was best thought of as "a doer, not a thinker," whose approach to problem solving was "emotional" and "inspirational" rather than objective and systematic.[6] Similar evaluations occurred upon Burbank's death in 1926, with scientists weighing in on the value of his lifework. A typical summary stated that "Mr. Burbank's real service was not as a scientist or as a plant breeder, but as a *popularizer* of plant breeding," and observed that much good had come of the fact that he had caught the public's imagination and thus publicized scientific horticulture, much "as Lindbergh dramatized aviation." Burbank himself, however, had been equaled or surpassed by others "in the production of useful varieties" and had contributed virtually nothing "to the science of genetics or plant breeding." Indeed, in reflecting on the division between public acclaim and professional disdain for Burbank at midcentury, Howard re-

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recognition who is as understudied by historians of science as Burbank is the agricultural researcher George Washington Carver (ca. 1849–1943). For a recent biography see Linda O. McMurry, *George Washington Carver: Scientist and Symbol* (New York: Oxford Univ. Press, 1981). An interesting starting point for delving into Carver's vernacular status would be to look at evaluations of his life and work from different periods. Among many titles see Rackham Holt, *George Washington Carver: An American Biography* (Garden City, N.Y.: Doubleday Doran, 1943); Shirley Graham and George D. Lipscomb, *Dr. George Washington Carver, Scientist* (New York: Messner, 1944); Henry Thomas, *George Washington Carver* (New York: Putnam, 1958); Lawrence Elliot, *George Washington Carver: The Man Who Overcame* (Englewood Cliffs, N.J.: Prentice-Hall, 1966); and David Manber, *Wizard of Tuskegee: The Life of George Washington Carver* (New York: Crowell-Collier, 1967).

[5] David Starr Jordan, "Some Experiments of Luther Burbank," in Jordan and Vernon Kellogg, *The Scientific Aspects of Luther Burbank's Work* (San Francisco: Robertson, 1909), pp. 1–81, on pp. 81, 79; see also Kellogg, "Scientific Aspects of Luther Burbank's Work," *ibid.*, pp. 85–115. Jordan's and Kellogg's pieces first appeared in slightly different form—though with the same titles—in *Popular Science Monthly,* Jordan's in January 1905 (*66:*201–225) and Kellogg's in October 1906 (*69:*363–374). Kellogg was a Stanford colleague of Jordan. Other key scientific figures who took notice of Burbank's work were Hugo de Vries, one of the codiscoverers of Mendel's laws, who journeyed from Holland to visit Burbank in Santa Rosa in 1904, accompanied by the Nobelist Svante Arrhenius and the biologist Jacques Loeb; the noted botanist Liberty Hyde Bailey; and Edward J. Wickson, who together with his colleagues attempted to hire Burbank at the University of California. See Dreyer, *Gardener Touched with Genius,* p. 126. De Vries, who also seems to have visited in 1906 and 1909 (*ibid.*, p. 256, Ch. 1, n. 2), presented his view of Burbank in Hugo de Vries, "A Visit to Luther Burbank," *Pop. Sci. Monthly,* 1905, *67:*329–347; de Vries, "Luther Burbank's Ideas on Scientific Horticulture," *Century,* 1907, *73:*674–681; and de Vries, *Plant-Breeding: Comments on the Experiments of Nilsson and Burbank* (Chicago: Open Court, 1907). On de Vries see Ida H. Stamhuis, Onno G. Eijer, and Erik J. A. Zevenhuizen, "Hugo de Vries on Heredity, 1889–1903: Statistics, Mendelian Laws, Pangenes, Mutations," *Isis,* 1999, *90:*238–267. Among others within the biological community who encountered Burbank was the naturalist David Fairchild, who was taken aback at the scale of his operations. Fairchild later came to hold a jaundiced view of Burbank owing to the overhyping of Burbank's plants, especially in regard to issues of credit in the case of the spineless cactus. See David Fairchild, *The World Was My Garden: Travels of a Plant Explorer* (New York: Scribner's, 1941).

[6] Donald F. Jones, "The Life and Work of Luther Burbank," unpublished manuscript, ca. 1920s, pp. 188, 189, in Walter L. Howard Papers, Bancroft Library, Univ. California, Berkeley (hereafter cited as **Howard Papers**). Jones's book-length manuscript was unpublished in his lifetime; for a brief look at the thrust of his remarks see Jones, "Destroyed by His Friends," *Scientific Monthly,* 1946, *63:*238–239; a further portion was published in *Spragg Memorial Lectures on Plant Breeding* (East Lansing: Michigan State College, 1937), pp. 57–76.

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marked that "to the Brahmans of science Burbank was an Untouchable. They almost dreaded his shadow. . . . Extremists regarded him as a parody—an imitation scientist—and his bid for recognition ridiculous." Such arbiters, no doubt, went out of their way to avoid affixing the United States Postal Service's 1940 stamp honoring Burbank as a "great scientist" on letters to their colleagues.[7] Nor would they have been pleased to open the 1941 edition of Sarah Bolton's *Famous Men of Science* and find that the story of modern science begins with a chapter on Copernicus—and concludes with one on Burbank.[8]

In large part, historians of science have taken their cue from the demarcationist verdict rendered by the scientific community and have found little reason to include Burbank in their accounts of the history of the life sciences or of science during the Progressive Era. With only a few exceptions, in reading histories of modern American science it would be hard to discern that Burbank had achieved national celebrity and international notice as a scientific figure—or even that he had existed at all.[9] Nevertheless, the disconcerting fact remains that Burbank was a central figure in popular discourse about intellectual authority, natural knowledge, and the relationship of the scientific enterprise to the larger polity. Exploring the tales of Luther Burbank grants historians of American science a passport beyond the confines of the official scientific world of twentieth-century America, into the relatively unknown ground of natural knowledge as generated, expressed, interpreted, and disseminated in the vernacular.

This essay uses the popular literature on Burbank as a strategic entry point for displaying dimensions of cultural debates on the place of science in American life that are obscured when historians of science find themselves, in Paul Forman's words, to be in substantial agreement with what the scientific community has decided "is great science, what is of great significance, and thus what is to be chosen for historical study." To be sure, to find something of value in the Burbank tales is to work against the grain of how they have been interpreted. In 1946, one author pithily remarked that the public's interest in Burbank was simply evidence of its "enormous capacity to swallow bunk" and that "it would be easy to say, and it has been said by many scientists, that our greatest exponent of delusion and imposture was Luther Burbank." Howard suggested that Burbank's celebrity derived from the need for "space-writers" to fill up column inches for an audience of "parlor naturalists and lovers of the wonderful in nature . . . garden enthusiasts and sentimental folk." In the end, however, he found analyzing the public reaction to Burbank's image a bewildering task. At the conclusion of his study he conceded defeat, admitting that "to the

[7] "Burbank's Farm Leased," *Outlook,* 29 June 1927, *146:*273 (emphasis added); and Howard, "Luther Burbank" (cit. n. 1), p. 402 (on the postage stamp see pp. 412–413). Howard's opinion was that "Burbank possessed the talent and attributes of a conventional scientist" and would have been accepted as such if he had been given "the proper training demanded by the code," which would have taught him how to follow expected experimental and reporting procedures. Howard also noted, however, that Burbank did not display "the attitude or spirit of the true scientist"—that is, "there is no evidence he was ever stimulated by criticism" (p. 357). Interestingly, Howard himself was somewhat critical of the fact that Americans had transported "the German caste system" into the academy when they adopted the benefits of German graduate training, for this system created "aristocrats of knowledge" who enforced unwritten rules that could be "as exacting or inexorable as the military code" (p. 355).

[8] Sarah K. Bolton, *Famous Men of Science* (New York: Crowell, 1941). There are editions of this work reaching back to 1889; new chapters were added to keep it current. Burbank also appeared in the two subsequent editions published ca. 1946 and 1960.

[9] A recent exception is Philip J. Pauly, *Biologists and the Promise of American Life: From Meriwether Lewis to Alfred Kinsey* (Princeton, N.J.: Princeton Univ. Press, 2000). Pauly allows that Burbank should be included within "the contours of the landscape of American biological science" (p. xiii) and provides some brief references to him.

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popular mind Burbank was a fetish—an object of unreasoning devotion. In the last analysis, his fame was based on intangibles."[10]

The discussion that follows takes the opposite view, arguing that among the reasons for the long-standing appeal of the Burbank tales is the fact that they contained tangible and consequential challenges to scientific convention: in signifying, through recitations of Burbank's life story, that the search for scientific knowledge need not be restricted to an elite few; by expressing dissatisfaction with frameworks premised on the belief that mechanistic principles exhaust descriptions of the natural world; in rebutting biological determinism; and in sanctioning a vision of evolutionary change that gave primacy to the idea that environment matters more than heredity, allowing women—as cultivators of the nation's potential through their work as mothers and teachers of children—to assume a central role in the biological and sociological drama of American evolution.

PLACING THE SEEMINGLY OUT OF PLACE: BOUNDARY-WORK, POPULAR CULTURE, AND SCIENCE IN THE VERNACULAR

When Burbank has caught the attention of historians of science, it has usually been in regard to how scientists responded to the incursion of this improbable figure within their midst. With the rediscovery of Mendel's laws and the debates that soon ensued over hereditary mechanisms, various combatants believed that Burbank's experiments might contain evidence supporting their views, even if he himself lacked knowledge of the emerging field of genetics. Indeed, the award of a multiyear grant to the nonacademic entrepreneur by the newly established Carnegie Institute of Washington (CIW) in 1905—in the significant sum of $10,000 per annum—contributed to this expectation, accompanied as it was by the assignment of the biologist George Harrison Shull to study Burbank's experiments and write a report. Nathan Reingold, for example, has detailed the tension generated within the scientific community during the five-year period when the CIW backed Burbank's work, and Bentley Glass has examined aspects of this episode in recounting "the strange encounter" between Shull and Burbank. More recently, Sharon Kingsland has deftly described the ways in which American biologists during this period sought to capitalize on Burbank's celebrity in their disputes over whether evolutionary biology should be defined primarily as an experimental science, while Paolo Palladino has compared the development of scientific disaffection with Burbank in the United States to the much more positive and productive relationship with his scientific community enjoyed by the British plant breeder Edwin Sloper Beaven at about the same time.[11]

[10] Paul Forman, "Independence, Not Transcendence, for the Historian of Science," *Isis,* 1991, *82:*71–86, on p. 78; Norman Taylor, "With Feet of Clay," *Saturday Review of Literature,* 18 May 1946, *29:*28 (this is a review of Howard, "Luther Burbank"); and Howard, "Luther Burbank," pp. 377, 460.

[11] Nathan Reingold, "National Science Policy in a Private Foundation: The Carnegie Institution of Washington," in *The Sciences in the American Context: New Perspectives,* ed. Reingold (Washington, D.C.: Smithsonian Institution Press, 1979); Bentley Glass, "The Strange Encounter of Luther Burbank and George Harrison Shull," *Proceedings of the American Philosophical Society,* 1980, *124:*133–153; Sharon Kingsland, "The Battling Botanist: Daniel Trembly MacDougal, Mutation Theory, and the Rise of Experimental Evolutionary Biology in America, 1900–1912," *Isis,* 1991, *82:*479–509; and Paolo Palladino, "Wizards and Devotees: On the Mendelian Theory of Inheritance and the Professionalization of Agricultural Science in Great Britain and the United States, 1880–1930," *History of Science,* 1994, *32:*409–444, on p. 433. Also critical for understanding the issues about professionalism raised in these treatments, although Burbank is not a key focus, is Diane Paul and Barbara Kimmelman's work on the reception of Mendel in the United States among botanists and breeders. See Diane B. Paul and Barbara A. Kimmelman, "Mendel in America; Theory and Practice, 1900–1919," in *The American Development of Biology,* ed. Ronald Rainger, Keith R. Benson, and Jane Maienschein (Philadelphia: Univ.

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The skirmishing among members of the scientific community about whether to acknowledge Burbank as a member of the genus *Homo scientius* is an especially apt example of the kind of "boundary-work" that the sociologist Thomas Gieryn argues scientists pursue in the attempt to secure intellectual authority and material advantages. Gieryn contends, for example, that when the goal of scientists is the monopolization of "professional authority and resources, boundary-work excludes rivals from within by defining them as outsiders with labels such as 'pseudo,' 'deviant,' or 'amateur.'"[12] Attending to the eruption of boundary engagements can reveal much about the ways in which scientists construct their disciplinary identities and the terms in which they negotiate their relationships with each other and with the general public. But as interesting as the response of scientists to Burbank is as an example of boundary-work, my intention here is a different one: it is to ask, instead, if there are aspects of the Burbank tales that can give historians of science insight into social, cognitive, and political claims about the nature of scientific knowledge alive in the public sphere that are a significant part of science's past. Steven Shapin makes the cogent point that even when professionals are successful at authorizing who can count as an expert on nature, this demarcationist achievement "does not mean that natural knowledge is solely located in the minds and texts of accredited scientists, nor is it necessarily accurate to assume that 'what the public think' about natural processes and objects is merely a simplification or dilution of scientists' expert knowledge."[13] Making sense of "what the public think" by considering this question from the vantage point of established science can be a perplexing matter, as one scientist reported in 1938 about the effect of Burbank's name on the general populace:

> When I explain to people that I am a geneticist, it means nothing to most of them outside of a very small scientific group. If I tell them I am a follower of Mendel, the group is only slightly increased. But if I explain to them that I am crossing plants such as Burbank did, *their faces light up, and many of them begin to feel quite at home and in a position to talk intelligently about a world that they know very little concerning.*[14]

This observation gets at the heart of the historical conundrum of Burbank's legacy: despite the successful boundary-work of scientists in regard to the science of genetics, the mention

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Pennsylvania Press, 1988); and Kimmelman, "A Progressive Era Discipline: Genetics at American Agricultural Colleges and Experiment Stations, 1900–1920" (Ph.D. diss., Univ. Pennsylvania, 1992). Of further importance is Deborah Fitzgerald's intensive analysis of the dynamics of the relations between those who produced plant innovations and those who cultivated them in *The Business of Breeding: Hybrid Corn in Illinois, 1890–1940* (Ithaca, N.Y.: Cornell Univ. Press, 1990); and Fitzgerald, "Farmers Deskilled: Hybrid Corn and Farmers' Work," *Technology and Culture,* 1993, *34:*324–343.

[12] Thomas Gieryn, "Boundary-Work and the Demarcation of Science from Non-Science: Strains and Interests in Professional Ideologies of Scientists," *American Sociological Review,* 1983, *48:*781–795, on pp. 791–792; and Gieryn, "Introduction: Contesting Credibility Cartographically," in *Cultural Boundaries of Science: Credibility on the Line* (Chicago: Univ. Chicago Press, 1999).

[13] Steven Shapin, "Science and the Public," in *Companion to the History of Modern Science,* ed. R. C. Olby, G. N. Cantor, J. R. R. Christie, and M. J. S. Hodge (London: Routledge, 1990), pp. 990–1007, on p. 994. Shapin argues that even granting recognition of the "historical submergence of lay beliefs about nature as a problem and as a legitimate topic of inquiry," scholars are very far from understanding what might be termed the "ethnoscience" of modern Western societies (*ibid.*). Similarly, Roger Cooter and Stephen Pumfrey note that an interest in social studies of science has resulted in an "anthropology of the lab" but has failed to stimulate "the study of the ethnoscience of our world" and that the task of assaying "the social history of everyday scientific knowledge" remains problematic: Roger Cooter and Stephen Pumfrey, "Separate Spheres and Public Places: Reflections on the History of Science Popularization and Science in Popular Culture," *Hist. Sci.,* 1994, *32:*237–267, on pp. 242, 243. Cooter and Pumfrey's exemplary and thought-provoking survey of the literature regarding science and popular culture is the most thorough to date.

[14] Orland E. White (professor of agricultural biology and director of the University of Virginia's Blandy Experimental Farm) to W. L. Howard, 21 Dec. 1938, Howard Papers (emphasis added).

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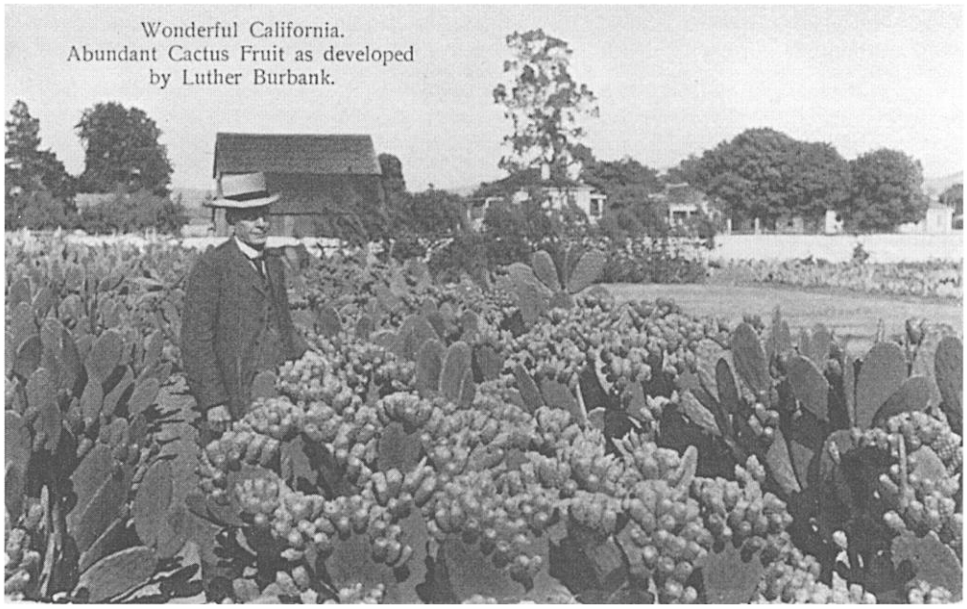


Figure 1. *Burbank's catalogues promoting his "new creations" included such striking products as white blackberries, plumcots, and—most famously—the "spineless" cactus. Such horticultural feats received widespread, often inflated, coverage in the press. Courtesy of the Luther Burbank Home & Gardens, Santa Rosa, California.*

of Burbank's name reset the terms of engagement, allowing ordinary folk to speak with authority. (See Figure 1.)

As a general issue, the world of those perceived to exist "outside" of science's official precincts has tended to be classified as belonging to "popular culture"—that is, as existing in a sphere beyond science, properly understood, whether as derivative, tangential, peripheral, or superfluous. The strong association of the term "popular culture" with a presumption that the world presents itself to us divided into separate realms of the serious and the trivial is a difficult one to dispel. It is important to remember, however, as George Lipsitz observes, that "the creators of popular culture do not think of themselves as operating within an endeavor called 'popular culture'; they see themselves merely creating signs and symbols appropriate to their audiences and themselves."[15] Equally important is the fact that identifying a particular set of beliefs, objects, or activities as belonging to either "high" culture or "popular" culture is often a retrospective process. Anne Secord's point that "we need to dispel the notion that 'popular' and 'learned,' or 'high' and 'low,'

[15] George Lipsitz, *Time Passages: Collective Memory and American Popular Culture* (Minneapolis: Univ. Minnesota Press, 1990), p. 13. For recent bibliography on science and popular culture see Cooter and Pumfrey, "Separate Spheres" (cit. n. 13). See also Alan Irwin and Brian Wynne, *Misunderstanding Science? The Public Reconstruction of Science and Technology* (Cambridge: Cambridge Univ. Press, 1996); and Jane Gregory and Steve Miller, *Science in Public: Communication, Culture, and Credibility* (New York: Plenum, 1998). The intersection of amateurs and professionals in fields related to natural history is explored in Elizabeth Keeney, *The Botanizers: Amateur Scientists in Nineteenth-Century America* (Chapel Hill: Univ. North Carolina Press, 1992); and Mark V. Barrow, Jr., *A Passion for Birds: American Ornithology after Audubon* (Princeton, N.J.: Princeton Univ. Press, 1998).

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culture are fixed categories defined by their content, and see them instead as emergent social constructs," is well-taken. Although the last decade has seen a new awareness of these issues, it is still the case that, as Roger Cooter and Stephen Pumfrey phrase it in their review essay on science and popularization, "once we leave the well-charted areas of learned science for popular science we are without a map."[16]

Even so, the last decade or so has at least been noteworthy for an increasing number of guides pointing out promising ways forward. In looking at the formative dynamics of science in nineteenth-century America, Sally Gregory Kohlstedt memorably argued for the relevance of "parlors, primers, and public schooling" in underwriting private and public responses to "cultural initiatives in the history of science in America, past and present." Kohlstedt points to the need for "frameworks that involve multiple points of view," helping us to remain cognizant of the fact "that the introduction, practice, sponsorship, and even critique of science are dynamic phenomena intimately connected with other dimensions of culture." In *Making Science Our Own: Public Images of Science, 1910–1955,* Marcel C. LaFollette has observed that most social studies of science first analyze "the forces at work in science" and then extrapolate out to the wider culture; her excellent examination of mass-market magazines demonstrates the benefits of reversing this process. And Maureen McNeil, in her perceptive study of Isaac Newton as a national hero, has also challenged the logic of presuming that an understanding of science is satisfied by starting from within the scientific community and then looking outward, for "the contemporary meaning of science is not restricted to the domain of its practitioners, but rather is constructed across a range of disparate sites." Her analysis of the cultural dimensions of science through the prism of Newton's image entails asking how a noted scientist "is used as a symbol or lodges as a folk-memory" and seeks to identify the "active creative process" by which members of the wider public infuse a scientific life with cultural significance.[17]

The ability to render a closer historical reading of science *in* culture that begins to loosen the rigidity that conceiving of science *and* culture can foster requires some of the imaginative shifts in perspective suggested by such scholars as Kohlstedt, LaFollette, and McNeil. Such perspectives help guard against an overreliance on thinking in dichotomous terms that make it difficult to conceptualize the creation of scientific knowledge as played out over a shared terrain where the mixing and overlapping and interfering of different forms of thought and actions from within the vernacular contribute to its character and shape.

The term "vernacular" can be helpful in providing a broader sense of the history of "everyday scientific knowledge" than is currently signified by the terms "popular culture" and "popularization."[18] Although still retaining a sense of real-world efforts to construct

[16] Anne Secord, "Science in the Pub: Artisan Botanists in Early Nineteenth-Century Lancashire," *Hist. Sci.,* 1994, *32:*269–315, on pp. 270–271; and Cooter and Pumfrey, "Separate Spheres," p. 248. See also Shapin, "Science and the Public" (cit. n. 13). Morag Shiach is particularly persuasive in arguing for the retrospective nature of judgments about culture; see her *Discourse on Popular Culture: Class, Gender, and History in Cultural Analysis, 1730 to the Present* (Cambridge: Polity, 1989). For an overview of American intellectuals' classificatory responses to the popular see Andrew Ross, *No Respect: Intellectuals and Popular Culture* (New York: Routledge, 1989). On the formation of cultural boundaries in the United States see Lawrence Levine, *Highbrow/Lowbrow: The Emergence of Cultural Hierarchy in America* (Cambridge, Mass.: Harvard Univ. Press, 1988).

[17] Sally Gregory Kohlstedt, "Parlors, Primers, and Public Schooling: Education for Science in Nineteenth-Century America," *Isis,* 1990, *81:*425–455, on p. 425; LaFollette, *Making Science Our Own* (cit. n. 3), p. 2; and Maureen McNeil, "Newton as National Hero," in *Let Newton Be!* ed. John Fauvel, Raymond Flood, Michael Shortland, and Robin Wilson (Oxford: Oxford Univ. Press, 1988), pp. 223–239, on p. 238.

[18] The term "everyday scientific knowledge" is Cooter and Pumfrey's: "Separate Spheres" (cit. n. 13), p. 243. My initial thinking about the vernacular owes a great deal to encounters with the work of Henry Glassie,

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two spheres of discourse—a learned one accessible only to an elite and a common one that does not require special skills—at the same time "vernacular" refers to the language that each of us regularly speaks and represents the group to which we all belong, no matter what our other specialized memberships might be. Moves to distinguish different spheres of thought and action do not completely sever individuals and groups from the everyday world where knowledge is held in common. For the fullest possible understanding of what science means during a particular era, it is necessary to recognize that "science" is simultaneously a set of activities pursued by individuals who can be located within sociological aggregates and a source of symbolic representations that carry various meanings within the larger culture and are used as resources in constructing and debating shared and contested realities. At the same time, vernacularity carries with it a sense of words and actions embedded within particular locations in space and time; in any era, there will be important differences among, for example, the American vernacular, the British vernacular, the German vernacular, and so on.

Because vernacular culture is more accessible than professional discourse, it constitutes a kind of "intellectual commons" where social and theoretical comment can circulate without regard for scientific propriety. Furthermore, as unauthorized discourse, vernacular discursive forms make possible modes of communication that professional strictures inhibit, permitting, for example, the open acknowledgment of political or metaphysical issues and providing opportunities to engage in speculation at odds with the rhetorical norms of academic science. What the vernacular mode gains in flexibility and expansiveness it loses in terms of organizational structure; arguments and propositions are not communicated in a systematic fashion. The heterogeneity, dispersion, and impermanence that mark vernacular culture should not be taken, however, as signifying that no intellectual work occurs within its sphere. Vernacular public discourse, as Gerard Hauser argues, is not only expressive but is also constantly "creating, regulating, and fine tuning public opinion through a process in which we cultivate and maintain a sense of ourselves in dialogue." This form of making knowledge is not limited to institutional forums but, most typically, emerges when "a public's members converse through the everyday dialogue of symbolic interactions by which they share and contest attitudes, beliefs, values, and opinions."[19]

Vernacular performances may not command the status, resources, and legitimacy that mark the performances of expert authority—but it would be wrong to assume that because they commence from a less privileged position within the polity the consequences are therefore marginal. The narrative form that typifies vernacular rhetoric generates powerful effects, both in terms of its ability to create memorable images infused with emotion that persist across social space and generational time and in the speed with which it can travel and proliferate across diverse venues. Even if ordinary people are discouraged from participating in specialized discourses, the intellectual commons of the vernacular sphere

particularly his article "Meaningful Things and Appropriate Myths: The Artifact's Place in American Studies," *Prospects,* 1977, *3*:1–49, and John Brinckerhoff Jackson, *Discovering the Vernacular Landscape* (New Haven, Conn.: Yale Univ. 1984); see also Jackson, *A Sense of Place, a Sense of Time* (New Haven, Conn.: Yale Univ. Press, 1994). I am using "vernacular" to refer to the common, everyday forms of communication and activities that mark a culture; I am not opposing vernacular culture to commercial culture, as does, e.g., Ivan Illich in *Shadow Work* (Boston: Boyars, 1981). To explore some recent uses of the idea of the vernacular see Gerard A. Hauser, *Vernacular Voices: The Rhetoric of Publics and Public Spheres* (Columbia: Univ. South Carolina Press, 1999), which provides a more real-world depiction of public discussion than is contained within Jürgen Habermas's vision of the ideal public sphere; and Thomas McLaughlin, *Street Smarts and Critical Theory: Listening to the Vernacular* (Madison: Univ. Wisconsin Press, 1996).

[19] Thomas W. Benton, "Preface," in Hauser, *Vernacular Voices,* p. ix; and Hauser, *Vernacular Voices,* p. 36.

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provides a noisy and animated environment where diverse visions of the world can encounter each other, with consequential outcomes. The tales of Luther Burbank are a case in point.

ASPECTS OF THE BURBANK TALES: BACKGROUND

The extensive publicity that emerged about Burbank at the turn of the century was intertwined with a new sensibility permeating mass-market magazines in this era. In one sense, it was difficult for contemporaries to assess the Burbank phenomenon because it occurred in an unfamiliar media context. Editorial control had shifted from northeastern literary elites, a gentry who had regarded culture as an alternative to anarchy, to men who fell outside this circle—first-generation Dutch and Irish immigrants, for example, and southerners and midwesterners. The new editorial directors of these magazines struck the stance of individuals from the "'outside looking in' on power and status—in gossip columns, in celebrity profiles, even in muckraking." Such magazines promoted the romance of progress and cultivated an air of being "'practical,' worldly, and up-to-date."[20] This tone is succinctly caught in a 1901 article on Burbank, published by the noted horticulturist Liberty Hyde Bailey in *World's Work,* that ends with the lines: "His place is an experiment station of the best type. His work makes for progress." Burbank's status as a captivating modern hero held good for decades, as is witnessed by the grateful letter sent to him by Henry Henson, the winner of a gold watch awarded for "Best in Public Speaking" at the Kemper Military School in 1925. The senior, who had bested six others, reported that he had been right to choose Burbank as the topic of his oration rather than such well-trod and outmoded classics as Washington or Lincoln.[21]

It was not simply the fact that scientists at the turn of the century were curious about Burbank's work that led magazine editors to assume that readers would find the plant grower interesting: botany and horticulture were topics with ready-made popular appeal. Elizabeth Keeney's study of amateur botanizers in the nineteenth century demonstrates the vibrant culture of horticultural enthusiasts that survived into the twentieth century, meeting the new era "on its own terms as a thriving hobby outside the view of science (and, unfortunately, of many of its historians)" in the elaboration of the nature-study movement.[22] Nature-study enthusiasts emphasized that children should explore the objects of

[20] Christopher Wilson, "The Rhetoric of Consumption: Mass-Market Magazines and the Demise of the Gentle Reader, 1880–1920," in *The Culture of Consumption: Critical Essays in American History, 1880–1920,* ed. Richard Wightman Fox and T. J. Jackson Lears (New York: Pantheon, 1983), pp. 39–64, on pp. 45, 51; on the shifting editorial control see pp. 44–45. More specifically see Marcel LaFollette, "Mass-Circulation Magazines and the Popularization of Science," in *Making Science Our Own* (cit. n. 3), pp. 18–44; for a general survey see Richard Ohmann, *Selling Culture: Magazines, Markets, and Class at the Turn of the Century* (London: Verso, 1996).

[21] Liberty Hyde Bailey, "A Maker of New Fruits and Flowers," *World's Work,* 1901, *2:*1209–1214, on p. 1214; and Henry B. Henson (a student at the Kemper Military School, Mount Vernon, Missouri) to Luther Burbank, 8 June 1925, Luther Burbank Papers, Library of Congress, Washington, D.C. (hereafter cited as **Burbank Papers**), Box 6. Bailey (1858–1954), who was both a major scientific figure and a social philosopher, has been overlooked by historians of science and American historians. On his life see Andrew Denny Rodgers, *Liberty Hyde Bailey: A Story of American Plant Sciences* (Princeton, N.J.: Princeton Univ. Press, 1949).

[22] Keeney, *Botanizers* (cit. n. 15), p. 134. On the interplay between botanical science, aesthetics, and gardening in the British context see A. J. Lustig, "Cultivating Knowledge in Nineteenth-Century English Gardens," *Science in Context,* 2000, *13:*155–181. On the nature-study movement, in addition to Keeney, *Botanizers,* see Tyree Goodwin Minton, "The History of the Nature-Study Movement and Its Role in the Development of Environmental Education" (Ph.D. diss., Univ. Massachusetts, 1980); Richard R. Olmsted, "The Nature-Study Movement in American Education" (Ph.D. diss., Indiana Univ., 1967); Peter J. Schmitt, *Back to Nature: The Arcadian Myth*

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nature that were immediately to hand, and formal lessons were discouraged in favor of spontaneous discovery. These Progressive Era educators sought to put grade-school children directly in touch with natural objects and "to open the pupil's mind by direct observation to a knowledge and love of the common things in the child's environment"; one of the key components of the nature-study movement was the establishment of school gardens.[23] The rallying cry, which went back to Louis Agassiz, was the injunction to "study nature, not books."

Although Burbank was not directly involved in the nature-study movement, his views and those of its adherents converged on many points.[24] Writing in the March 1925 California Teachers' Association journal, the *Sierra Educational News,* Executive Secretary Arthur H. Chamberlain reported on an interview he had just been granted by Burbank. When asked what texts he would recommend "as a guide and inspiration for the youth to interest them in nature study," Chamberlain related that, "with a twinkle in his eye," Burbank declared: "I thank my lucky stars that I was never taught the old-fashioned form of botany in school." Teachers were informed that it is "nature, rather than the book, that has been the guiding influence in Burbank's life and work." Indeed, in his 1906 essay on child nurture, Burbank remarked that "a fragrant beehive or a plump, healthy hornet's nest in good running order often become object lessons of some importance" and rhapsodized that "every child should have mud pies, grasshoppers, water-bugs, tadpoles, frogs, mud-turtles, elderberries, wild strawberries, acorns, chestnuts, trees to climb, brooks to wade in . . . and any child who has been deprived of these has been deprived of the best part of his education," the one that would put him or her into "most intimate harmony with nature." Such ideas were in keeping with nature-study beliefs; Edward Bigelow suggested in *How Nature Study Should Be Taught* (1904) that "the ingredients of child-life are fresh air, sunshine, trees, flowers, birds, and all the other happy life of the fields and forests."[25] In

in Urban America (New York: Oxford Univ. Press, 1969); Sally Gregory Kohlstedt, "Nature Study in North America and Australasia, 1890–1945: International Connections and Local Implementations," *Historical Records of Australian Science,* 1997, *11:*439–454; and Pamela N. Henson, "'Through Books to Nature': Anna Botsford Comstock and the Nature Study Movement," in *Natural Eloquence: Women Reinscribe Science,* ed. Barbara T. Gates and Ann B. Shteir (Madison: Univ. Wisconsin Press, 1997). To sample primary texts see Wilbur Jackman, *Nature Study for the Common Schools* (New York: Holt, 1891); Clifton F. Hodge, *Nature Study and Life* (Boston: Ginn, 1902); Liberty Hyde Bailey, *The Nature-Study Idea: Being an Interpretation of the New School-Movement to Put the Child in Sympathy with Nature* (New York: Doubleday, Page, 1903); Edward F. Bigelow, *How Nature Study Should Be Taught: Inspiring Talks to Teachers* (New York: Hinds, Noble & Eldredge, 1904); and Anna Comstock, *Handbook of Nature Study* (Ithaca, N.Y.: Cornell Univ. Press, 1911). Bigelow, a professor at Columbia University Teachers' College, also initiated the *Nature-Study Review,* a monthly periodical that ran from 1905 to 1923.

[23] Bailey, *Nature-Study Idea,* p. 4; on the school garden component see Minton, "History of the Nature-Study Movement," p. 128. The school garden movement also received impetus from World War I, when President Woodrow Wilson allocated $150,000 for a "U.S. School Garden Army" in which five hundred thousand children served as enlistees, under the command of fifty thousand teachers, occupying sixty thousand acres of land (*ibid.*) See also Schmitt, *Back to Nature,* pp. 90–93.

[24] One such convergence relates to a poem by Tennyson, "Flower in the Crannied Wall": "Flower in the crannied wall,/I pluck you out of the crannies,/I hold you here, root and all, in my hand,/Little flower, but if I could understand/What you are, root and all, and all in all,/I should know what God and man is." Bigelow cites the poem on p. 116 of *How Nature Study Should Be Taught* (cit. n. 22), stating that such is "the right spirit for nature study in teacher or pupil" (pp. 116–117). This same poem was cited by Lavina Nelson in her self-published work *A Sketch: Luther Burbank and the Human Flower and Some Child Verse* (1923); Burbank's admirer ended her essay by quoting the Tennyson poem and then declaring: "Luther Burbank knows what the little flower in the crannied wall is" (p. 6).

[25] Arthur Chamberlain, "Luther Burbank—The Man of Tomorrow," *Sierra Educational News,* Mar. 1925, *21:*152–161, on p. 156. The journal's subtitle is "The Official Organ of the California Teachers' Association." Chamberlain's piece is followed on pp. 162–164 by James A. Barr, "Burbank: A Reading Lesson for Children."

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addition, then, to the multitude of amateur botanizers who would be immediately interested in reports on Burbank's work, teachers and parents formed another potential audience.

Although periodicals and newspapers were the most congenial habitat for articles on Burbank, other media also played a role in circulating his story. Burbank found his way into E. Haldeman-Julius's "Little Blue Books"—small booklets aimed at "Mr. Average Man" that were enormously popular at the price of a nickel apiece—in a 1923 essay in which Haldeman-Julius confided to his audience that Burbank, "known romantically as the plant wizard, [is] really one of the great scientists of this age." He could be seen on the nation's motion picture screens circa 1917 in the quarter-hour film *A Visit with Luther Burbank: The Great American Naturalist,* one of the Ford Education Weekly's titles that played in four thousand theaters to an audience of five million people. He was featured in radio plays, broadcast in the *Cavalcade of America* series sponsored by the Du Pont Company, at least twice, in 1937 ("Luther Burbank, the Plant Wizard") and 1947 ("The Man with Green Fingers"); the latter production starred Lionel Barrymore as Burbank. Other radio fare included "Garden Walks" with Mrs. Burbank in the 1930s and Christmas memorials broadcast by NBC radio from the Burbank home in 1947 and 1948.[26] Whatever the changing views of academic scientists about Burbank's life and the merit of his work, he received sustained attention in a wide variety of vernacular venues over a considerable span of time.

There is, to be sure, no one "tale" of which Burbank is the subject; there are, rather, many tales, and this discourse is various, complex, and at times contradictory. The core stories occupy a period of nearly fifty years (approximately 1901–1949, from the first major series of articles on Burbank to the centenary of his birth), but the years before and after this era figure in as well, making for a considerable body of literature that intersects with Burbank's life at very different moments in his career. The wealth of citations in the *Reader's Guide to Periodical Literature* from this period bear witness to this fact (and these do not even cover the multitude of daily newspaper articles and Sunday supplements that featured Burbank over the years). It would be inaccurate to claim that all spinners of Burbank lore shared a core set of presumptions, nor would it make sense to maintain that all readers of the Burbank tales drew the same inferences from them. But there are, nevertheless, certain recurring claims that are deeply embedded within the narratives con-

For Burbank's "rhapsody" see Luther Burbank, *The Training of the Human Plant* (New York: Century, 1907), p. 91. The list of natural objects continues with "water-lilies, woodchucks, bats, bees, butterflies, various animals to pet, hay-fields, pine-cones, rocks to roll, sand, snakes, huckleberries and hornets" (*ibid.*). For Bigelow's suggestion see Bigelow, *How Nature Study Should Be Taught,* p. 178.

[26] E. Haldeman-Julius, "Luther Burbank," in *Miscellaneous Essays* (Girard, Kans.: Haldeman-Julius, 1923), p. 5. For background on Haldeman-Julius and the Little Blue Books see Albert Mordell, *The World of Haldeman-Julius* (New York: Twayne, 1960). On the Ford film see David L. Lewis, *The Public Image of Henry Ford* (Detroit, Mich.: Wayne State Univ. Press, 1976), p. 115. Ford established a moving-picture department in 1914 that produced newsreels that were distributed free to theaters until 1919, when they were charged a nominal fee; Lewis indicates that Ford's education films "proved to be as big drawing cards as the regular features" (*ibid.*). The *Cavalcade of America* radio plays, sponsored by the Du Pont Company, were "Luther Burbank, the Plant Wizard," broadcast 30 June 1937, and "The Man with Green Fingers," broadcast 17 March 1947; I thank Rob Olmsted for bringing these radio plays to my attention. The other radio offerings—"Luther Burbank Christmas Memorial, Saturday December 13, 1947," and "Luther Burbank Christmas Memorial, Saturday, December 11, 1948"—were from the National Broadcasting Company: Burbank Papers. Burbank also appeared in nostalgia-tinged advertising well after his death. See, e.g., a John Hancock life insurance ad, featuring a woodcut and an essay, entitled "He Found a Secret in the Flowering Earth," *Reader's Digest,* June 1950, p. 50; and a full-page ad for Budweiser beer with a half-page color illustration of Burbank at home in his garden, entitled "He Gave Nature 100,000 New Ideas," *Life Magazine,* 19 Apr. 1948, p. 137. (See Figure 2.) I thank Mark Largent for bringing this advertisement to my attention.

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Figure 2. *Burbank's celebrity was still strong enough two decades after his death for a succinct retelling of the tale to serve as an eye-catching advertisement for a national consumer product in* Life Magazine. *Published with permission; copyright 1948 Anheuser-Busch, Incorporated. All rights reserved.*

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structed about—as one series of articles put it—"Luther Burbank: The Man, His Methods, and His Achievements," and they speak to the social and intellectual relations of science.[27] In the discussion that follows I draw on selected texts by Burbank—for they form a crucial part of the dialogue that ensued—as well as representative articles by others that focus on him.

ASPECTS OF THE BURBANK TALES: THEMES

At Home with Mother Nature: Burbank as an Uncommon Common Man

The life of Luther Burbank—as conveyed in the popular press and endorsed by its middle-class readership—affirmed that the pursuit of scientific knowledge need not be restricted to a special class of thinkers. As Burbank is heard to say in his 1927 autobiography, except for his early schooling his only education had been at the "University of Nature," where he "matriculated in the College of Horticulture, Department of Market Gardening," and found his way to "the laboratory where Nature teaches Plant Breeding." In the "University of Nature," Burbank declared, the "ambitious and interested student can enroll for life"; and unlike professional science, nature had a policy of open admissions.[28] It was difficult, however, to receive credit in American academia for courses offered at the University of Nature, and an intriguing aspect of the Burbank tales is how they served to keep alive a vision of natural knowledge as rooted in the common public realm.

This theme originated in a set of articles in 1901 and 1902 in which E. J. Wickson noted that not all scientists hailed Burbank as the "Columbus" he truly was, a circumstance Wickson attributed to Burbank's working "through a country not yet officially surveyed, above the pathway of the contemporaneous scientists, and it is not wonderful, then, that they should fail to recognize him for a time." Naysayers, Wickson stated darkly, "almost claimed that he was making a travesty of science for the amazement of the horticultural gallery." Wickson maintained that Burbank's "sensitive spirit" had been hurt by the comments of "recognized authorities which seemed to charge that he was holding to fallacies in recognizing principles which he had fully demonstrated in his own researches and experiments." In being cast as a latter-day Columbus rebuffed by the "flat-earth thinking"

[27] Edward J. Wickson, "Luther Burbank: The Man, His Methods, and His Achievements," *Sunset,* 1901, *8:*56–68 (Pt. 1); 1902, *8:*145–156 (Pt. 2); 1902, *8:*277–285 (Pt. 3); 1902, *9:*101–112 (Pt. 4). These articles were published as a book with the same title by the Southern Pacific Company in San Francisco in 1902. This series appears to have served as the background for many subsequent pieces on Burbank. It was appropriate that the first detailed essay on Burbank, an adopted son of the Golden West, appeared in *Sunset,* a newly founded magazine whose mission was to cover the Western states so as to present the "rich and inexhaustible field over which the dawn of future commercial and industrial importance is just breaking": *Sunset,* May 1898, *1:*1. In this initial issue the magazine announced that its creed was "publicity for the attractions and advantages of the Western Empire" (*ibid.*). California's promoters were deeply appreciative of Burbank's value as an "attraction." As Governor George Pardee noted at a "Complimentary Banquet Given by the California State Board of Trade" in honor of Burbank in 1905, "our sun is more genial, our winters and summers more pleasant, our Yosemite deeper, our trees taller, our women handsomer, our men braver, our acres more fertile than those of any other country in the world. . . . Yet I doubt if California has been more widely heralded by any one of these than it has been by the fame of him in whose honor we are met here to-night" (p. 16): copy in Pamphlet Box of Materials Relating to Luther Burbank, Bancroft Library, Univ. California, Berkeley (hereafter cited as **Pamphlet Box of Burbank Materials**).

[28] Luther Burbank with Wilbur Hall, *The Harvest of the Years* (Boston: Houghton Mifflin, 1927), p. 167; on Hall's participation see Dreyer, *Gardener Touched with Genius,* p. 206. LaFollette, in her survey of mass-market magazines, found "a persistent assertion that science should be open to amateurs" in their pages, with inventors in particular being regarded as "acceptable rebels": La Follette, "Mass-Circulation Magazines" (cit. n. 20), pp. 120, 121.

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of the twentieth century's "recognized authorities," Burbank personified the assertion of intellectual independence based on real-world experience in the face of ivory-tower pedantry. He maintained that the acquisition of natural knowledge required that "preconceived notions, dogmas and all personal prejudice and bias must be laid aside; listen patiently, quietly and reverently to the lessons, one by one, which Mother Nature has to teach." The crucial qualifications for practicing Burbankian science owed nothing to the expertise that higher learning bestowed. This is why, as one author has Burbank say, he had "never been able to make use of a college graduate. . . . Those who aid me must come with receptive rather than schooled minds. They must bring sympathetic, as distinct from reluctant or doubting hands."[29]

One of the hallmarks of the Burbank stories is their emphasis on the fact that Burbank was a scientist who worked at home, a fact that spoke as loudly of his separation from the scientific community as did his lack of academic degrees. For Burbank, unlike institutionally affiliated scientists, crossing the threshold of knowledge meant opening the door to his home and stepping out into his garden.[30] As W. S. Harwood remarked of Burbank's domestic location, "You will see nothing wonderful in this man's surroundings. You will find no vast conservatories, no splendidly furnished laboratories, no costly equipment; all you will find is the earth and the man." Burbank's knowledge was seen as emerging from the elemental relationship he had forged with nature in a setting of familial intimacy. Wickson, in fact, argued that the key to Burbank—the man and the scientist—was to be found "in his modest home and in the very simple arrangements with which he carries on his notable work." The relationship between Burbank's domestic surroundings and his scientific practices was presented as more than metaphorical, for the "modest home" and the "simple arrangements" constituted the proper meeting ground between the intellectual searcher and the natural world. Burbank, Wickson related, is "utterly regardless of the furniture and bric-a-brac of his profession," and therefore he "indulges in no display of instruments . . . shows no library, no laboratory, no case of medals and certificates." Calling on biblical imagery, Wickson stated that Burbank, "like David of old, . . . could do his work with smooth pebbles from the brook; and he cast aside the elaborate armament of his scientific brethren lest it should impede his movement."[31] And if Burbank could have scientific revelations in his backyard, why not other scientific Davids as well?

Although Burbank operated on a massive scale—raising thousands of seedlings to ob-

[29] Wickson, "Luther Burbank, Pt. 1" (cit. n. 27), p. 66; and Bacon, *Creating New and Better Plants* (cit. n. 1), p. 117. Interestingly, a similar sentiment with regard to recognition was expressed by the British naturalist Eliza Brightwen at about this time, as related in Barbara T. Gates, *Kindred Nature: Victorian and Edwardian Women Embrace the Living World* (Chicago: Univ. Chicago Press, 1998). Brightwen writes that she was educated at "the shrine of Nature by no end of clever teachers" (p. 5). W. S. Harwood wrote in *Scribner's* in 1904 that, lack of university training notwithstanding, Burbank "yet leads in one of the most subtle and elusive, one of the most complex and baffling departments of modern research": W. S. Harwood, "A Maker of New Plants and Fruits," *Scribner's,* 1904, *36:*49–55, on p. 49.

[30] For a discussion of the siting of scientific knowledge see Crosbie Smith and Jon Agar, eds., *Making Space for Science: Territorial Themes in the Shaping of Scientific Knowledge* (New York: St. Martin's, 1998); Adi Ophir and Steven Shapin, "The Place of Knowledge: A Methodological Survey," *Sci. Context,* 1991, *4:*3–21; Shapin, "'The Mind Is Its Own Place': Science and Solitude in Seventeenth-Century England," *ibid.,* 1990, *4:*191–218; and Peter Galison and Emily Thompson, eds., *The Architecture of Science* (Cambridge, Mass.: MIT Press, 1999).

[31] Harwood, "Maker of New Plants and Fruits" (cit. n. 29), p. 54; and Wickson, "Luther Burbank, Pt. 1" (cit. n. 27), pp. 60, 62. While the Santa Rosa home had been the location of Burbank's scientific labors since 1875, he also acquired a larger tract of land in Sebastopol. Most of Burbank's experiments were begun at his residential grounds in Santa Rosa, with those plants not requiring continuous attention then being transferred to the Sebastopol plot, which Burbank visited weekly; see Dreyer, *Gardener Touched by Genius,* p. 164.

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tain a single improved variety—his "experimental laboratory" was one that was, in principle, within the reach of any householder. As one author explained to her child readers, "'Look!' the people said, 'a man like ourselves has changed the nature of plants.'" Henry Smith Williams, in a book on Burbank's life and work, assured his readers that they too could experiment and produce new plant varieties "different from anything that ever existed before," for "Mr. Burbank has shown the way, and the succeeding chapters will relate his methods clearly and explicitly." "Amateur botanists" would find, explained Williams, that "theoretical botany and practical plant development go hand in hand, and the flower garden is the ideal place to make initial studies of one and practical tests of the other." A 1907 article in the *Ladies' Home Journal* carried a section title stating "He Urges Others to Experiment in Their Gardens," and the author reported that Burbank insisted on the "importance of a wide expansion of plant breeding among all classes of people who love flowers and fruits."[32] One of the home truths of the Burbank tales was that tending one's own garden could lead to natural knowledge, and in such texts the grounds of the middle-class household were offered as an appropriate venue for scientific investigation. In later years authors did not need to emphasize Burbank's anomalous relationship to the world of professional science, for the recurring image of his domestic worksite that accompanied magazine and newspaper articles became a symbolic shorthand for this fact. (See Figure 3.)

Of course, "burbanking" in one's own yard would never have the immense impact of the horticulturist's operation: he was not only nature's student but, thanks to his years of diligent application, had become "nature's partner," an image with several connotations. One key feature of this theme is that Burbank's dedication had led him to produce results on a scale that was held to be unprecedented, especially for a "one-man" research station. But—almost in fairy tale fashion—the fact that Burbank had put himself at the service of larger forces so as to render a benefit to the world had given him the strength of legions. Such an image seemed apt to Mary H. Wade, who wrote that Burbank was "a quiet man . . . who has found a magic wand and uses it for the good of others. If he were selfish and thought only of what he could gain for himself, it might become useless." Or, as Burbank expressed himself in one speech: "there are too few who exploit the inexhaustible forces of nature, and far too many who exploit their fellow beings."[33]

Like many family partnerships in the age of industrialization, Burbank's alliance with nature was a joint venture, with each season bringing new market risks, production problems, and returns on investment. As Burbank stated near the end of his life: "What a joy

[32] Mary H. Wade, *The Wonder-Workers* (1912; Boston: Little, Brown, 1927), p. viii; Henry Smith Williams, *Luther Burbank: His Life and Work* (New York: Hearst's International Library, 1915), pp. 45, 155; and W. S. Harwood, "How Luther Burbank Creates New Flowers: The Story of One of the Most Wonderful Men in America," *Ladies' Home Journal,* May 1907, pp. 11–13, on p. 12. See also Wilbur Hall, "Burbank in Your Back Garden," *Saturday Evening Post,* 17 Apr. 1926, *198:*30–31, 66, 71–72, 74; Hall, "Burbank in Your Orchard," *ibid.,* 24 Apr. 1926, *198:*28–29, 184, 189–190; Hall, "Burbank in Your Grounds," *ibid.,* 1 May 1926, *198:*36, 196, 199; Hall, "Burbank in Your Garden," *ibid.,* 3 Apr. 1926, *198:*10–11, 125–126; Hall, "Amateur Plant Breeding," *ibid.,* 16 May 1931, *203:*141–142; and John Y. Beaty, "Treasure Hunt in Your Garden," *Science Digest,* 1 Apr. 1949, *25:*25–29.

[33] Wade, *Wonder-Workers,* p. 1 (it was not a fairy godmother who gifted him with the wand, but "Dame Nature" [*ibid.*]); and Luther Burbank, "Science and Life—What I Believe," *Independent,* 13 Mar. 1926, *116:*301–302, 312, on p. 302. The verb "to burbank" was actually in vogue during this era and made it into editions of *Webster's Dictionary:* "to modify and improve (plants or animals), esp. by selective breeding. Also, to cross or graft (a plant). Hence, figuratively, to improve (anything, as a process or institution) by selecting good features and rejecting bad, or by adding good features." Quoted in Dreyer, *Gardener Touched with Genius,* p. 13.

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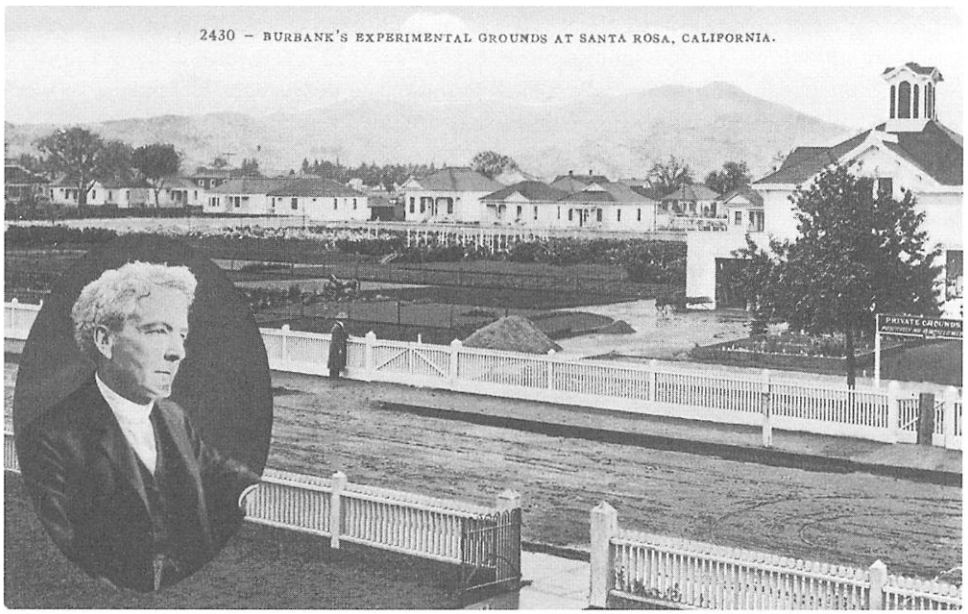


Figure 3. *Burbank's modest Santa Rosa, California, home was the site of his experimental labors as well as a noted tourist destination. Images of the Burbank grounds were reproduced in a wide array of media, including postcards, Sunday supplement spreads, and motion picture newsreels. Courtesy of the Luther Burbank Home & Gardens, Santa Rosa, California.*

it is, when you have made a close working copartnership with Nature, helping her to produce, for the benefit of mankind . . . new Food for all the World's untold Millions for all time to come." Hermann Hagedorn explained in 1946 that Burbank was not seeking to defy or improve on nature but "only to cooperate with her, to see how Nature did things, and by hard work, study, and enthusiasm help her to do them more quickly and more thriftily." This was an economic partnership of a curious sort, however, as was frequently enunciated: in H. H. Dunn's striking image, Burbank was a "plant philanthropist," making millions of dollars for others while he willingly "sought the satisfaction of the sower, rather than the remuneration of the reaper."[34]

Although he dealt with plant forms, Burbank was considered to be an inventor of a kind, prodigiously creating new varieties of plant life, sometimes to order, working on a massive scale, his organic inventions increasing the profitability of the agricultural industry.[35] The Burbank tales repeatedly emphasized his "striking fondness for mechanics" as

[34] Luther Burbank, "In Tune with the Infinite," in *My Beliefs* (New York: Avondale, n.d. [probably ca. 1927]), pp. 47–62, on pp. 48–49 (this is a memorial edition, assembled by Charles F. Rideal, containing two addresses by Burbank); Hermann Hagedorn, "Luther Burbank," in *Americans: A Book of Lives* (New York: Day, 1946), p. 74; and H. H. Dunn, "Luther Burbank, the 'Plant Wizard,' Is Still Poor after Making Others Wealthy," *Popular Mechanics,* 1924, *41:*176–180, on p. 176.

[35] On the question of science, technology, and agriculture see Fitzgerald, "Farmers Deskilled" (cit. n. 11); Paolo Palladino, "Between Craft and Science: Plant Breeding, Mendelian Genetics, and British Universities, 1900–1920," *Technol. Cult.,* 1993, *34:*300–323; John R. Stilgoe, "Plugging Past Reform: Small-Scale Farming Innovation and Big-Scale Farming Research," in *Scientific Authority and Twentieth-Century America,* ed. Ronald G. Walters (Baltimore: Johns Hopkins Univ. Press, 1997); and Thomas Gieryn, "Hybridizing Credibilities: Albert and Gabrielle Howard Compost Organic Waste, Science, and the Rest of Society," in *Cultural Boundaries of Science* (cit. n. 12).

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a boy and asserted that the lad's "inventive bent" led him to devise "many mechanisms, including a home-made steam engine, which he used to propel a boat, producing thus a prototype of the modern motor boat half a century before that craft gained popularity." References to Edison were frequent as well. The author of a 1929 book for children has folks remarking that Burbank was "crazy as a loon!" until "Mr. Edison came to visit Mr. Burbank's Santa Rosa field and gardens because both he and Luther Burbank believed in patient, years-long experimenting." Another author illustrated his point by remarking that "Burbank has been classed with Thomas Edison, two years his senior, and with his younger contemporary, Henry Ford, as among the greatest inventive geniuses America has yet produced."[36] Although Burbank lacked large-scale organizations of the sort built up by Edison and Ford, his constant experimentation on a massive scale was seen as comparable to their endeavors.[37]

The symbolic joining of these three figures was made flesh in 1915, when Edison and Ford made a pilgrimage to Santa Rosa to meet Burbank in person after visiting San Francisco's Panama-Pacific International Exhibition. The exhibition honored all three men in the course of its run. Ford automobiles were manufactured on the spot at the rate of one every ten minutes, and the thirty-sixth anniversary of Edison's invention of the incandescent lamp was celebrated. As for horticultural innovation, the *Official Souvenir View Book* directed visitors to the Palace of Agriculture, where "the results obtained by Burbank, the wizard of plant life, delight and amaze the multitudes." The conjunction was immortalized at "Greenfield Village," which Ford constructed outside of Dearborn, Michigan, in the late 1920s. Ford imported Burbank's birthplace and his Garden Office to Greenfield, along with Edison's home and his Menlo Park laboratory.[38] Edison set the cornerstone to Greenfield Village's Ford Museum in 1928. The shovel he wielded, reported a story in the *National Geographic* in 1958, "belonged to the plant geneticist Luther Burbank; its use symbolized the union of science and agriculture." Edison left his "footprints of genius," his signature, and Burbank's spade in commemorative cement for posterity to contemplate.[39]

[36] Williams, *Luther Burbank* (cit. n. 32), p. 4; Carolyn Sherwin Bailey, "The Boy Who Found a Buttercup in the Winter: Luther Burbank Works Plant Wonders," in *Boys and Girls of Modern Days* (Chicago: Flanagan, 1929), pp. 181–192, on p. 190; and Henry H. Meyer, "Luther Burbank—Creative Naturalist," in *Vocations and Professions: Creative Personalities,* ed. Philip Henry Lotz, Vol. 1 (New York: International Committee of Young Men's Christian Assoc., 1940), pp. 1–12, on p. 2. The other figures included are the Mayo brothers, Julius Rosenwald, Jacob Riis, Eugene V. Debs, Johann Sebastian Bach, John Dewey, David Livingstone, Charles A. Lindbergh, Thomas Alva Edison, Robert Andrews Millikan, E. Stanley Jones, and Harry Emerson Fosdick.

[37] An amusing example of the mass scale of Burbank's work is given in a humorous piece by E. T. Brewster, "'Burbanking' the Pure Food Law," *Outing Magazine,* 1908, *52:*717–720, which relates the tall tale of a man inspired by Burbank to create hens who could lay eggs twice as fast as usual because they lacked yolks. I thank Gary Kroll for bringing this to my attention.

[38] Frank Morton Todd, *The Story of the Exposition* (New York: Putnam's, 1921), Vol. 4, p. 247 (on Ford), Vol. 3, p. 151 (on Edison); Robert Allen Reid, publisher, *Official Souvenir View Book of the Panama-Pacific International Exposition at San Francisco, 1915* (San Francisco: Panama Pacific International Exposition, 1915), p. 15; and Martin Melosi, *Thomas A. Edison and the Modernization of America* (Glenview, Ill.: Scott, Foresman/Little Brown, 1990), pp. 189–190 (Greenfield Village). To create his "village," Ford dislodged historical objects and buildings from their original sites or built recreations, then juxtaposed them in a tribute to American life, industry, and invention. See Beverley Bowie, "The Past Is Present in Greenfield Village," *National Geographic,* July 1958, *114:*96–127, on pp. 102, 104–105. Greenfield's plethora of Americana also included blacksmith shops and tintype studios, Wilbur and Orville Wright's bicycle shop, Independence Hall, and the bloodstained rocking chair in which President Lincoln was shot.

[39] Bowie, "Past Is Present," p. 115. Like Burbank, Edison was interchangeably described as "scientist" and "inventor"; his status as a scientist also diminished after midcentury. In 1929, for example, the *San Francisco Chronicle* reported that "no one disputes Thomas A. Edison's right to the title 'King of Science'": quoted in

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In accounts of his work, Burbank was interchangeably described as both a scientist and an inventor. That the public has persisted in making the category mistake of "conflating" science and technology is well known to science's publicists, who have determinedly tried to educate the laity on this distinction for more than a century.[40] One reason for the persisting identification of technology as science in the public world is a decided preference that science be put to work producing tangible benefits, a view that is often dismissed as stemming from "anti-intellectualism." But for those citizens who expected a closer relationship to obtain between scientific "experts" and the laity than many in the scientific leadership were willing to accept, the familiar visages of men such as Edison and Burbank, along with the ubiquity and daily use of products like the light bulb and the potato, made their work seem accessible and open to public view—even if the situation was more complicated than this. The egalitarian aspects of the image of Burbank as a scientist who resided in the everyday realm were underscored by his depiction as an empirical tinkerer.

"Nature's Partner": The Burbankian Philosophy of "Living Matter" in a "Kinetic Universe"

The possibility of achieving a partnership with nature depends, in some measure, on how nature is conceptualized: a universe of stable, inert, atomized matter can be manipulated but not partnered. Unless nature is conceived of as a dynamic, vivified, substantial presence, the language of companionship and relationality has little meaning. The coherence of the Burbank tales depended on thinking of nature in this second sense, a perspective that drew much of its resonance from the natural history tradition, with Burbank being cast as an Emersonian sage. Burbank's widow pointed to this reading of his work in 1939, when she introduced a popular distillation of his ideas and practices in a volume entitled *Partner of Nature.* The book, Elizabeth Waters Burbank hoped, would arouse interest not only in her late husband's "experiences and methods, but in Luther Burbank as a naturalist—a true 'Partner of Nature.'"[41]

The Burbank stories presented a vernacular epistemology that was based on direct experience and required that individuals approach nature with the proper attitude: the central tenet of this epistemology derived from the fact that, as Burbank phrased it, "to become one of Nature's interpreters," one first must realize that "she conveys her truths only to those who are passive and receptive." As expressed in the reasoning of the Burbank tales,

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Wachhorst, *Thomas Edison* (cit. n. 3), p. 35. By 1947, however, a writer in the *New York Times* could conclude that Edison had not been able to keep up with theoretical science, which had been "too much for the empirical inventor": *ibid.,* p. 182. LaFollette, in *Making Science Our Own* (cit. n. 3), also finds the terms "scientist," "inventor," and "naturalist" used interchangeably at the turn of the century (see p. 212 n 31).

[40] On selling science see Robert Rydell, "The Fan Dance of Science: America's World's Fairs in the Great Depression," *Isis,* 1985, *76:*525–542; Ronald C. Tobey, *The American Ideology of Science, 1919–1930* (Pittsburgh: Univ. Pittsburgh Press, 1971); and George Daniels, "The Pure-Science Ideal and Democratic Culture," *Science,* 1967, *156:*1699–1705. On nineteenth-century tensions relating to the idea of "science" and "technology" see Robert Post, "Science, Public Policy, and Popular Precepts: Alexander Dallas Bache and Alfred Beach as Symbolic Adversaries," in *Sciences in the American Context,* ed. Reingold (cit. n. 11), pp. 77–98.

[41] Burbank, *Partner of Nature,* ed. Hall (cit. n. 2), p. vi. Not that being cast as an Emersonian sage always redounded to Burbank's credit; Jones, for example, remarked that "in his writings there is much more of the influence of the Philosopher of Concord [Emerson] than the eager observer on the *Beagle* . . . many of his statements have the appearance of a profundity that is lacking when they are analyzed": Jones, "Life and Work of Luther Burbank" (cit. n. 6), p. 179. For an overview of American naturalist thought see David Worster, *Nature's Economy: The Roots of Ecology* (Garden City, N.Y.: Anchor, 1979). Michael L. Smith's *Pacific Visions: California Scientists and the Environment, 1850–1915* (New Haven, Conn.: Yale Univ. Press, 1987), provides a regional context for Burbank's career, although he does not mention Burbank.

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it was the adoption of this attitude that allowed Burbank to see "principles and laws revealing themselves so clearly that he could reach their demonstration with the naked eye and hand." For Hagedorn, the equation was simple: Burbank "took Nature's mind and added it to his own." If nature was thus a companion to be communed with rather than a territory to be conquered, then the proper scientific attitude toward it was one of kinship rather than the estrangement marked by the gaze of an observer who stood apart as if a stranger.[42]

In his telling of the Burbank tale in a volume entitled *Modern Great Americans,* for example, Frederick Houk Law proclaimed that Burbank was much more than a "mere grower of plants." Law argued that Burbank "wrote with the spirit of a poet and a philosopher" and that an Emersonian spirit appeared in his "work and in his writings." This Emersonian vision derived from the fact that "no one can work with living matter, as Luther Burbank did, without gaining full reverence for the Spirit that animates every living thing, be it plant or animal or man." Henry Meyer, in a similar essay, also plied this theme, stating that equal to Burbank's scientific achievements as a "creative naturalist" were his "modesty, kindliness, and reverence for life in all its forms." It is to such an icon that schoolchildren paid tribute on Arbor Day, vowing, "in honor of one who is, we know, a sincere friend of birds and trees, [to] pledge ourselves to befriend all of God's creatures, to protect the birds, and not to destroy maliciously trees or any of the other beauties of Nature." What more fitting end to one who worked with "living matter" could there be than to be buried with only a tree as a marker? As readers of *Partner of Nature* were told, Burbank "was laid to rest under a Cedar of Lebanon in his gardens because he once said: 'I should like to feel that my strength was going into the strength of a tree.'"[43]

When Burbank published his inaugural catalogue of "new creations" in 1893, after twenty years of work modifying plant material, he believed that his experience had not only resulted in new agricultural products of immense value but had provided him with insights into important philosophical truths about nature. The ornate and self-assured manner in which he expressed his metaphysical meditations would result in frustrating intellectual exchanges with such new-found scientific friends as David Starr Jordan.[44] It is

[42] Wickson, "Luther Burbank, Pt. 2" (cit. n. 27), p. 145; Wickson, "Luther Burbank, Pt. 1" (cit. n. 27), p. 62; and Hagedorn, "Luther Burbank" (cit. n. 34), p. 74. Liberty Hyde Bailey expressed a similar attitude in *The Holy Earth* (New York: Scribner's, 1915): "Science but increases the mystery of the unknown and enlarges the boundaries of the spiritual vision. To feel that one is a useful and co-operating part in nature is to give one kinship, and to open the mind to the great resources and the high enthusiasms" (p. 3).

[43] Frederick Houk Law, *Modern Great Americans: Short Biographies of Twenty-One Great Americans of Modern Times Who Won Wide Recognition for Achievements in Various Types of Activities* (New York: Century, 1926), p. 34; Meyer, "Luther Burbank—Creative Naturalist" (cit. n. 36), p. 6; Olive Woolley Burt, *Luther Burbank: Boy Wizard* (Indianapolis: Bobbs-Merrill, 1948), p. 178; and Burbank, *Partner of Nature,* ed. Hall (cit. n. 2), p. 12. The intersection of Arbor Day, religious thought, and cultural values needs to be studied further. By 1900 Arbor Day was celebrated in nearly every state; see Leigh Eric Schmidt's fine article, "From Arbor Day to the Environmental Sabbath: Nature, Liturgy, and American Protestantism," *Harvard Theological Review,* 1991, *84*:299–323, esp. p. 302. California's State Board of Education designated Burbank's birthday, 7 March, as Conservation, Bird, and Arbor Day. For a representative primary source text see Robert Haven Schauffler, *Arbor Day: Its History, Observance, Spirit, and Significance, with Practical Selections on Tree-Planting and Conservation, and a Nature Anthology* (New York: Dodd, Mead, 1926).

[44] Jordan, who began cultivating Burbank in the century's first decade, made numerous visits to Santa Rosa from Palo Alto and also arranged for Burbank to travel to the university to discuss his work with the Stanford biological community, under an arrangement in which the Board of Trustees had voted to offer Burbank the title of either "Lecturer on Plant Breeding" or "Lecturer on Plant Evolution"; Burbank opted for the latter. See David Starr Jordan to Burbank, 1 Dec. 1904; and Burbank to Jordan, 4 Dec. 1904, Burbank Papers. What Jordan was asking Burbank to do was to "give one or two talks around a table on your work and on your views of evolution. I should not ask you to give a public lecture, because the formality is worrying to a man who does not make it

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likely that it was the negative response that Burbank received from figures such as Jordan that encouraged him to turn to the vernacular rather than the professional sphere in order to communicate his views.

A short set of letters between the two men indicate the complicated pas de deux being conducted: Jordan wished to have first crack at extracting any information from Burbank's plant breeding that could shed light on evolutionary questions currently at issue in professional circles (particularly de Vries's mutation theory, which Jordan opposed), while Burbank was appraising Jordan as a conduit for his theoretical views on the question "What is life?" No doubt Burbank was encouraged in this effort by the fact that Jordan was preparing an essay for *Popular Science Monthly* in which he would assess Burbank's work in the light of professional science; he predicted to Burbank that this paper would "give our scientific men a good deal of food for thought."[45]

In a letter from 1904, Burbank discussed an anticipated visit from Jordan and his Stanford colleague in the Department of Bionomics, Vernon Kellogg, stating that it would be his pleasure to share any of his extensive "experiences and observations . . . on the so-called practical side of evolution" with the two men. Recognizing where their interests lay, he urged them to "come well loaded with questions, for many of them may touch directly on some points along which I have been working in plant life"—or, as he tellingly phrased it somewhat later, on his work in "experimental evolution." For his part, Burbank used the letter as an opportunity to inform Jordan and Kellogg that for many years he had been developing in his mind "a theory of my own of the evolution of the universe and its various manifestations, perhaps as original as Darwin's, Spencer's, Kepler's or Dalton's in a line with and including all of those, making the whole view more comprehensive and harmonious." Imagining that he would be conducting a colloquium with his two learned guests, he stated that "having full confidence in the correctness of my views, and also having the living proofs, I fear no questions on the subject by any one, for if I am wrong in this generalization I wish to know it."[46]

Some sense of the ideas to which Burbank was referring can be gathered from an unpublished manuscript titled "A Kinetic Creation: A Universe of Organized Lightning," which carries the handwritten notation that it was prepared in February 1899 "for my own benefit." In "Kinetic Creation" Burbank argued against doctrines that presumed that the universe consists of "discrete particles of hapless, helpless, dead material which possessed no power of its own, being forever tossed about by various forms of force." He went on to suggest that the complexity of life is built up step by step from the atom, "a convenient unit to build upon, but no one has ever seen, weighed, measured or proved its material existence." Burbank insisted that matter was equivalent to force, and thus the "so-called atom" could best be thought of as "a unit of force which has a fixed polarity and valence"; aggregates of these units of polarized force that are "combined in definite geometrical arrangements and in definite numbers form the so-called 'Molecule' which is the first form of force that can in any way become appreciable to our senses." The reader can almost feel Burbank's pleasure, as he moved from point to point, at being able to capture the

his profession, but seated around a table, I and others will ask questions to which you can give answers": Jordan to Burbank, 3 Oct. 1904, Burbank Papers.

[45] Jordan to Burbank, 18 Oct. 1904, Burbank Papers. On Jordan's use of Burbank in the midst of the various positions being struck, as well as other biologists' appropriations of Burbank, see Kingsland, "Battling Botanist" (cit. n. 11), esp. pp. 494–500.

[46] Burbank to Jordan, 7 Mar. 1904 ("experiences and observations," "theory reference"); and Burbank to Jordan, 7 Oct. 1904 ("experimental evolution"), Burbank Papers.

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universe and describe its physical manifestations as all being resolved by reference to questions of force, as if he were a member of a lost tribe of *Naturphilosophen.* He concludes with the following summation: "Only three elements are needed to produce the universe—Energy, Time and Space. Rhythmical vibrations in space—measured by time—produced by energy. And as Inertia may be supposed to be the union of time and space in polar opposition to force, we may fairly conclude that our Universe is not half dead—but all alive—a Kinetic universe." The lifelong appeal of these formulations can be seen in the fact that Burbank would continue to make reference to aspects of this philosophy in various forums even into old age, as with the 1926 address "Science and Life—What I Believe," in which he asserted that "science is proving that the world is not half dead, but that every atom is all life and motion."[47]

Early in 1905, handling Burbank with delicacy and tact, Jordan wrote that "as to the article on 'the relations of matter and force' I might as well confess fairly that I have absolutely no way myself of judging its value. I do not feel at home in the region of Monism, and I do not know whether matter and force are one, or which is the one, or whether there is any difference which one it is if they are one." Rather than engaging Burbank on the themes he had raised, Jordan instead offered to ask the advice of "certain mathematicians and physicists" regarding the acceptability of Burbank's framework and gently sought to dissuade him from seeking to publish his essay. Burbank took the point but, refusing to yield to Jordan, countered by apologizing for having troubled the biologist with his paper and insisting nevertheless that "it seems to me that a speculative generalization *in its place* is as legitimate and important in leading to valuable truths and the discovery of facts as is the discovery of individual facts." Jordan's next tack was to assure his correspondent that "I should be glad to see your 'confession of scientific faith' published, and I think that it might well have as a sub-title that phrase." Burbank pressed him yet again, for his views on force lay at the heart of his conception of how environment influenced heredity, with the splitting of cells made possible by "definite lines of force" that varied owing to the influence of differing "external conditions." In reply, Jordan firmly assured Burbank that he would continue to hold to a "'material' view of physiological phenomena until we can bring the other, the 'kinetic' view, into concrete form"; following August Weismann, Jordan informed the horticulturist that the material fact of germ cells, uninfluenced by "external sources," was the true explanation for hereditary transmission. Bringing the whole line of discussion to a close, Jordan sought to smooth over his dismissal of Burbank's view with the remark that "either the material or the kinetic view is largely made up of figures of speech, and the idea eludes definition . . . you will notice that when we pass the standpoint of what we can see our speculations in these matters become very elusive."[48] He did include a paragraph of Burbank's thoughts on a "kinetic theory of

[47] Luther Burbank, "A Kinetic Creation: A Universe of Organized Lightning," Burbank Papers; and Burbank, "Science and Life—What I Believe" (cit. n. 33), p. 301. It is not known what (if any) sources, formal or informal, Burbank may have been drawing on in composing "A Kinetic Creation." Certainly there was a great deal of debate within physics at this time over how to conceive of the constitution of the universe; a popular account of Wilhelm Ostwald's theory of "energetics" and his antimaterialist stance is something that someone like Burbank might have found appealing as a launching pad for theorizing. For an overview of fin-de-siècle controversies see Helge Kragh, *Quantum Generations: A History of Physics in the Twentieth Century* (Princeton, N.J.: Princeton Univ. Press, 1999), Ch. 1.

[48] Jordan to Burbank, 28 Jan. 1905; Burbank to Jordan, 2 Feb. 1905; Jordan to Burbank, 7 Feb. 1905; Burbank to Jordan, undated (but from sequence and subject references, appears to be ca. early July 1906); and Jordan to Burbank, 6 July 1906, Burbank Papers. In 1908 and 1909 Jordan pressed Burbank to accompany him to Boston for the American Association for the Advancement of Science meeting, over which he would preside as that

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evolution" in his *Popular Science Monthly* article, noting that it could be suggestive of "new avenues of experimentation"—but in the same sentence he made it clear that he neither accepted Burbank's argument nor found it comprehensible.[49]

The tepid response to his intellectual framework in scientific circles, as represented by Jordan, gave Burbank a clear indication that his speculative forms of expression were ill-fitted to the restrained norms of conventional academic discourse. It was during this same period that Burbank would compose and publish *The Training of the Human Plant,* which directly circulated his theoretical views within the vernacular, bypassing the arbiters of scientific decorum.[50] The tract generated widespread public discussion of the kind that Jordan was reluctant to sanction within the "temple of science."

Within the vernacular context, it was taken for granted that Burbank's science was one in which a search for empirical knowledge was joined with a quest for spiritual insight, and a key dimension of his popular appeal was underwritten by his championing the belief that "the universe is not half dead—but all alive."[51] When questioned by interviewers, Burbank affirmed that, unlike the "materialists," he believed in a higher power, for "all my investigations have led me away from the idea of a dead, material universe, tossed about by various forces, to that of a universe which is absolutely all force, life, soul, or thought, or whatever name we may choose to call it." Pervading Burbank's vision of nature was the idea of barely contained power, where "every atom, molecule, plant, animal, or planet is only an aggregation of organized unit forces held in place by stronger forces, thus holding them for a time latent, though teeming with inconceivable power. All life on our planet is, so to speak, just on the outer fringe of this infinite ocean of force."[52]

Professionals were interested in Burbank's work to the extent that it might serve as a repository of data that they could bring to bear on their intramural debates over such matters as mutation theory; they ignored his philosophical musings. What they brushed aside as naive, irrelevant, and mystical in Burbank's pronouncements, however, was precisely what interested the public: his emphasis on the dynamic nature of the universe and on the "latent power" that awaited release was in striking contrast to deterministic theories of inert matter

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year's president. He wrote that there Burbank "would meet a great body of our scientific men," and he may have hoped that Burbank could come to a more reasonable understanding of where his ideas fit within the larger community if he would permit himself to leave the vernacular scientific world to venture onto the ceremonial turf of the tribe of professional scientists. As he had done in nearly every other such circumstance, Burbank declined; see, e.g., Jordan to Burbank, 21 Sept. 1909, Burbank Papers.

[49] Jordan, "Some Experiments of Luther Burbank" (cit. n. 5), p. 77.

[50] *The Training of the Human Plant* was first published as a magazine article in 1906. The essay received so much attention that it was reproduced in book form and sold to the public for sixty-five cents. See Luther Burbank, "The Training of the Human Plant," *Century,* May 1906, *72:*127–138; and Burbank, *Training of the Human Plant* (cit. n. 25).

[51] Burbank, "Kinetic Creation" (cit. n. 47). Accompanying one photograph of a white-haired Burbank peering off into the distance is a caption that reads, simply, "The Seer"; see Barr, "Burbank" (cit. n. 25), p. 162.

[52] William S. Harwood, "A Wonder-Worker of Science: An Authoritative Account of Luther Burbank's Unique Work in Creating New Forms of Plant Life," Pt. 2, *Century,* Apr. 1905, *69:*821–837, on p. 837. Toward the end of his life, however, Burbank raised a storm of controversy over his statement that he was an "infidel." See "In Tune with the Infinite" (cit. n. 34), where he states: "The idea that a good God would send people to a Burning Hell is utterly damnable to me. The ravings of insanity! superstition gone to seed! I don't want to have anything to do with such a God. I am a lover of man and Christ, as a man and his work, and all things that help humanity; but nevertheless, just as he was an Infidel then, I am an Infidel today. I prefer and claim the right to worship the Infinite, Everlasting, Almighty God of His Vast Universe as revealed to us gradually step by step by the demonstrable truths of our Savior Science" (pp. 57–59). See also Frederick W. Clampett, *Luther Burbank, "Our Beloved Infidel"* (New York: Macmillan, 1926). I discuss this episode in greater detail in a manuscript under preparation, entitled "Science in the American Vernacular: Improvisations in Natural History across the Twentieth Century," which discusses Burbank as well as other figures from biology, sociology, psychology, and anthropology.

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in motion, freeing nature from the dispiriting image of a mechanistic universe. During this era there was a great public interest as well in the philosopher Henri Bergson, following upon the translation of *Creative Evolution* into English in 1911 and his sold-out American lecture tour in 1913. As Tom Quirk notes, much of the philosophical literature of this period was first delivered as public lectures; thus challenges to scientific materialism commonly appeared within the vernacular. Burbank's admirers would have found the discussions of Bergson's views to echo familiar themes—for example, his contention that "reality was forever remaking itself afresh" and that it was time that outmoded deterministic views of reality yielded to the recognition of "a world of immanence, a world of incessant and unforeseeable change and possibility."[53] This, in fact, was what Burbank had to say in *The Training of the Human Plant*; his antideterminist views intersected with current eugenic efforts in unorthodox and unsettling ways, forming an important aspect of public conceptions of evolution in this period.[54]

The "Power to Vary" and Burbank's Theory of American Evolution

Given Burbank's renown as a practical breeder whose success rested on his firsthand knowledge of nature's laws, there was intense interest in his views as to where America's "experiment" in human "crossing" would lead. Although not typically thought of as a scientific document, *The Training of the Human Plant* is one of the pillars that supported public recognition of Burbank as a scientific authority. If academic biologists in the latter part of this decade were beginning to suspect that Shull's fraught inquiry into Burbank's cryptic and unsystematic horticultural record keeping would fail to provide anything concrete in the way of scientific data—and thus cause his star to fade from the heavens—Burbank's visibility as a scientific commentator was just entering a new phase within the vernacular sphere thanks to *The Training of the Human Plant,* a lay sermon that countered the gospel of materialist determinism.

One of the puzzling aspects of Burbank's evolutionary views is that he was perceived as a modernist—an avowed and devoted Darwinian—and yet he was insistent on the reality of the inheritance of acquired characteristics. Burbank was obsessed by a belief that the manifest characteristics of plants were but a small percentage of what lay dormant within their physiology. This emphasis on the lability of plant life was something that recurred in descriptions of Burbank's method, from early articles to late. In 1901 Liberty Hyde Bailey explained to readers that Burbank, in crossing his plants, upset their "customary characters." A 1925 article by Noah Gause noted that Burbank "sets himself the task of breaking up the life habits of the plant that have been fixed by the centuries of its persistent life history; then he contributes different habits, builds new forms, directs de-

[53] For professionals' interest in Burbank's "data" see Kingsland, "Battling Botanist" (cit. n. 11), pp. 494–501. Regarding Bergson see Tom Quirk, *Bergson and American Culture: The Worlds of Willa Cather and Wallace Stevens* (Chapel Hill: Univ. North Carolina Press, 1990), pp. 30, 2. The vogue for Bergson in the American context has been left largely unstudied by historians of science. For an introduction to a cohort of philosophers who shared similar views see David Ray Griffin, ed., *Founders of Constructive Postmodern Philosophy: Peirce, James, Bergson, Whitehead, and Hartshorne* (Albany: State Univ. New York Press, 1993).

[54] For overviews of eugenics in the United States see Hamilton Cravens, *The Triumph of Evolution: The Heredity-Environment Controversy, 1900–1941* (1978; Baltimore: Johns Hopkins Univ. Press, 1988); Daniel Kevles, *In the Name of Eugenics: Genetics and the Uses of Human Heredity* (Cambridge, Mass.: Harvard Univ. Press, 1995); and Diane B. Paul, *The Politics of Heredity: Essays on Eugenics, Biomedicine, and the Nature-Nurture Debate* (Albany: State Univ. New York Press, 1998). An excellent contextual history of this issue and time period is given in Leila Zenderland, *Measuring Minds: Henry Herbert Goddard and the Origins of American Intelligence Testing* (Cambridge: Cambridge Univ. Press, 1998).

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termining energies, changes the old characteristics of the plant or creates a distinctly new variety." Twenty years later these themes were still being delineated: Hagedorn described Burbank's "process of crossing cells of divers heredity" as "explosive." Citing Burbank, he related that "the atoms fly in every direction; everything is broken up at once and millions of tiny constituent particles are blown entirely out of the record. Some few unite, and from these come the new individuals, having something of both heredities and yet new characteristics and characters and tendencies and potentialities."[55]

Burbank's emphasis on the equivalency of force and matter was central to the logic behind his belief that upsetting "the equilibrium that has been established in the plant" led to the "release of latent characteristics." The point of crossing different species, Burbank explained, was "to secure a wealth of variation. By this means we get the species into a state of perturbation or 'wabble,' and take advantage of the 'wabbling' to guide the life forces into the desired habits or channels." New environmental conditions elicited latent traits, which were then available to be transferred to subsequent generations. As Burbank was fond of stating over and over again, "heredity is only the sum of all past environment." Burbank offered "the cactus slab" as an example of how a plant could "keep step with environmental changes." The cactus displayed "a life-force that is incredible for strength and vitality . . . a cactus plant pulled from the soil and tied in a tree remained there for six years and eight months, and at the end of that time was planted and grew." Burbank explained that "the cactus did not 'foresee' the vicissitudes and arm itself against them, but Nature had stored in the plant, as she did in all living things, the *power to vary.*" The power to vary, he inferred, is "wide enough so that the whole life-story of the cactus was changed."[56]

Burbank's philosophizing on how the dormant forces in living matter, given the proper environmental inducements, could unleash latent potential struck familiar chords within an American vernacular that resonated with Horatio Alger's optimistic tales of individuals who were bound to rise, thriving in the face of adversity by overcoming obstacles that elicited their true character. Burbank, as nature's partner, became a guardian for plant lives that had lacked the proper opportunities, and his methods literally plucked individuals from what seemed an undifferentiated mass (at least to those who lacked the requisite

[55] Bailey, "Maker of New Fruits and Flowers" (cit. n. 21), p. 1212; Noah C. Gause, "The Methods and Miracles of Luther Burbank," *Psychology: Health, Happiness, Success,* 1925, *4*:24–25, 69–70, on p. 25 (I thank Benjamin Harris for bringing this article to my attention); and Hagedorn, "Luther Burbank" (cit. n. 34), pp. 74, 74–75. Burbank would be cited as an authority on evolution by the inheritance of acquired characteristics by T. D. Lysenko; this infamous association was one of the events that would hurt Burbank's reputation among scientists, although it occurred after his death. See Dreyer, *Gardener Touched with Genius,* pp. 207, 221–223.

[56] Wickson, "Luther Burbank, Pt. 2" (cit. n. 27), p. 150; Jordan, "Some Experiments of Luther Burbank" (cit. n. 5), pp. 9–10 (on "wabbling"; Jordan is presumably quoting Burbank from conversation); Burbank, "Science and Life—What I Believe" (cit. n. 33), p. 301 ("sum of all past environment"); and Burbank, *Partner of Nature,* ed. Hall (cit. n. 2), pp. 27, 28 (the cactus). It is interesting to compare Burbank's discussions of plant responses to the environment with those of Barbara McClintock, not because he approached questions as she did (he didn't), but because it indicates the existence of wider views on plant modification than were available during the early scientific encounter with Burbank. McClintock, for example, states that "species crosses are [a] potent source of genomic modification," that the genome can respond "in a discernible but initially unforeseen manner" to environmental shocks, and that such responses can "lead to new and irreversible genomic modifications." See Barbara McClintock, "The Significance of Responses of the Genome to Challenge," in *The Dynamic Genome: Barbara McClintock's Ideas in the Century of Genetics,* ed. Nina Federoff and David Botstein (Cold Spring Harbor, N.Y.: Cold Spring Harbor Laboratory Press, 1992), pp. 361–380. This article, her 1984 Nobel address, originally appeared in *Science.* For discussions of McClintock that use terms similar to those used to describe Burbank see Evelyn Fox Keller, *A Feeling for the Organism: The Life and Work of Barbara McClintock* (New York: Freeman, 1983); and Guenter Albrecht-Buehler, "The Revenge of the Mayans," in *Dynamic Genome,* ed. Federoff and Botstein, pp. 273–276.

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powers of discernment) and then allowed them, with luck, to achieve useful and productive lives. But as with the individual, so with the larger society: America itself was destined for great things because of the power to vary that it possessed owing to the diverse strands of its immigrant heritage. Indeed, Burbank had demonstrated what was possible by bringing plants from around the globe to cross with native species and take root in California soil, demonstrating that in heterogeneity lay renewed vigor. Burbank's evolutionary schema contained a relevant message for Progressive Era Americans, one with unusual ramifications for those engaged in eugenic planning: in Burbank's universe, variation was emphasized as an asset, not a liability. In language that startled many, he asserted: "Heredity means much, but what is heredity? Not some hideous ancestral specter forever crossing the path of a human being. Heredity is simply the sum of all the effects of all the environments of all past generations on the responsive, ever-moving life forces."[57]

Burbank's optimism regarding the force of the environment applied as well to society. In *The Training of the Human Plant* he noted that Americans "are more crossed than any other nation in the history of the world," resulting, he claimed, in the extremes of good and bad having been "brought out in their fullest intensities." Given current eugenic thinking, it would not have been surprising had Burbank focused on the presumed deleterious effects of this crossing and advocated rigorous measures to safeguard the purity of "native American stock." Indeed, one can find statements in his writings that foreground the importance of genetic inheritance, such as the sentiments that "a good heredity from a clean upright ancestry is more to be desired than all the titles, honors and wealth that earth can ever bestow" and that heredity "is the great factor, and often makes environment almost powerless." But proportionately more significant was his expansive view, enunciated repeatedly, of the power of the environment. Burbank argued that "all that has been done for plants and flowers by crossing, nature has already accomplished for the American people. By the crossings of types, strength has in one instance been secured; in another, intellectuality; in still another, moral force." He then went on to state that "when nature has already done its duty, and the crossing leaves a product which in the rough displays the best human attributes, all that is left to be done falls to *selective environment.*"[58]

In contrast to eugenic rhetoric about "race suicide," Burbank took a much more benign view of these trends, pointing out that even more crossing was in store, as second-generation immigrants began to move outside the confines of their immediate neighborhoods: "wait until two decades have passed, until there are children of age to wed, and then see, under the changed conditions, how widespread will be the mingling. So from the first the foreign nations have been pouring into this country and taking their part in this vast blending." Burbank believed that the United States had before it "the grandest opportunity

[57] Burbank, *Training of the Human Plant* (cit. n. 25), p. 68. On Alger's tales see Richard Weiss, *The American Myth of Success: From Horatio Alger to Norman Vincent Peale* (New York: Basic, 1969); and Carol Nackenoff, *The Fictional Republic: Horatio Alger and American Political Discourse* (New York: Oxford Univ. Press, 1994). The element of chance in Alger's stories is sometimes forgotten: as Nackenoff notes, "*every* Alger story relies in some measure on luck—the lucky accident that links the hero and a benefactor; lucky escapes; lucky meetings." The key to these accidental events, however, is that "benefactors offer assistance *after* discovering something in the character of the young hero that merits their interest" (p. 139). Both points fit well with descriptions of Burbank's methods.

[58] Burbank, *Training of the Human Plant,* p. 11 (Americans "more crossed"); Luther Burbank, speech given at the "Metropolitan Banquet," 21 Sept. 1922, at the Fairmont Hotel in San Francisco, Burbank Papers, Box 17 ("good heredity"); and Burbank, *Training of the Human Plant,* pp. 52–53 (heredity the "great factor"), 12–13 ("*selective environment*"; emphasis added).

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ever presented of developing the finest race the world has ever known out of the vast mingling of races brought here by immigration."[59]

Reviewers and summarizers in the popular press were quick to pick up on the plant breeder's championing of the power of environment after the publication of *The Training of the Human Plant* in book form in 1907. One Chicago paper titled its article "Environment versus Heredity," noting that Burbank's work had put a "crimp in theory of heredity . . . horticulturist Burbank says environment has most to do with progress." In Cleveland, an article reported that Burbank "predicts great future for America/Now 'most crossed nation in the world.'" *Sunset* applauded "his optimism on the mingling of races, which, if thoughtfully aided by intelligent men and women today, will make the race, [and] comes as a tonic in contrast to the usual wail against a future nation of mongrels." A passage from *Western World* reported that Burbank's message should be given heed, for in his years of work he had "been able to learn first-hand how environment struggles with heredity and which is more oft the victor, and when and why." Praising Burbank as one of a new company of scientists "now emerging from the dark woods of Materialism," they applauded his correcting the mistake of attaching "too much importance to heredity; for to do so is to lose faith in effort and to yield in cowardly fashion to the domination of past things." An editorial in the *Omaha News* from 1914 made this same point, noting with regret that a young man had killed himself because "he had convinced himself that he had no show at all because he knew that his ancestors had not been successful." Lamenting that the man had been swayed "by the theories and dreams of eugenist faddists," they wished that he had instead followed the lessons of Luther Burbank, who had shown that beneficial latent inheritances could emerge even in an individual born of a deficient parentage: "all that is needed to develop them and to enable this generation, for instance, to put them to good use, is to provide for the proper housing and nourishment of the young men and women of the present day; the payment of sufficient wages for work done by them; and the opportunity to get an education, in even the common schools, for which all taxpayers pay." Making reference to one of Burbank's best-known creations, they asserted that "then the white blackberries of humanity can be developed without the aid of loveless eugenic marriages and young folks will not be discouraged by the thought that because their ancestors were failures they, too, must fail."[60]

The Training of the Human Plant drew notice for its views on American evolution writ large, but also for its teachings on child nurture. In Burbankian thought, the shift of the argument regarding the transformative power of the environment from the horticultural to the human world was mediated by the image of the child. Burbank asserted that "of all living things the child is the most sensitive" to the effects of the environment, for "surroundings act upon it as the outside world acts upon the plate of the camera . . . a child absorbs environment."[61] By virtue of this porosity, this instability in form, children are

[59] Burbank, *Training of the Human Plant,* p. 8.

[60] The clippings from the Chicago and Cleveland papers are in Luther Burbank Scrapbook 33, Burbank Papers. Many of the clippings lack dates, but it is probable that these are ca. 1907. The quotations from *Sunset* and *Western World* appear in an advertising circular for *Training of the Human Plant,* Pamphlet Box of Burbank Materials. Many of the quotations lack dates, but it is probable that these are ca. 1907. For the editorial see "An Editorial: From 'Way Back," *Omaha News,* 2 Feb. 1914, copy in Pamphlet Box of Burbank Materials (this copy is a reprint of the article made by the Luther Burbank Society). The extent to which the image of "white blackberries"—and the instability of nature's "color line"—caught wider attention in an age concerned with race mixing is an interesting question for further study.

[61] Burbank, *Training of the Human Plant,* p. 14. Stephen Jay Gould, "Does the Stoneless Plum Instruct the Thinking Reed?" *Natural History,* Apr. 1992, pp. 16–25, discusses this treatise, but he focuses on Burbank's "Lamarckism" and does not address his philosophical assumptions regarding environmental force.

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Figure 4. *Tales of Luther Burbank repeatedly emphasized the horticulturist's affection for children as well as his own childlike qualities. Among his most influential public texts was his treatise on child rearing,* The Training of the Human Plant *(1907). He is shown here with his niece. Courtesy of the Luther Burbank Home & Gardens, Santa Rosa, California.*

threshold creatures. Burbank's analysis infused poetic evocations of child life with scientific significance. The child in Walt Whitman's well-known poem "went forth every day/And the first object he look'd upon, that object he became"; the surrounding environment, from Burbank's perspective, merged with the child "for the day or a certain part of the day/Or for many years or stretching cycles of years."[62] Children represented the apotheosis of the principle that the constituent element of nature is "living matter."

Burbank as "The Friend of All Growing Things"

The future of the United States would be written in the life histories of its children; Burbank thus urged that the environments of all children should be the best that the citizenry could provide, "in order that the nation may rise to its full powers and accomplish its destiny." (See Figure 4.) Urging that all private or sectarian aid be banished, Burbank insisted that human beings were worth "as much care as the orchards, the farms, [and] the cattle-ranges"

[62] Walt Whitman, "There Was a Child Went Forth," in *Walt Whitman: Complete Poetry and Collected Prose* (New York: Literary Classics of the United States, 1982), p. 491. Liberty Hyde Bailey also cited this poem; see Bailey, *The Outlook to Nature* (New York: Macmillan, 1905), p. 223. Burbank was married twice but had no children of his own. His first marriage, to Helen Coleman when he was forty-one, ended in divorce six years later; he married Elizabeth Waters in 1916, ten years before his death. See Dreyer, *Gardener Touched with Genius,* pp. 91–95, 112, 203.

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and that "the nation, or the commonwealth, should take care of the unfortunate. It must do this in a broad and liberal and sane manner." Americans had it within their power to provide each child in their greatly crossed nation with "all that is implied in healthful environmental influences" and thus cultivate in these plant-children the traits that would make them "a blessing to the race"—or, in leaving them in neglect to unwholesome environments of "foul air . . . a dusty factory . . . a crowded tenement . . . [and] vicious associates in [their] hours out of school," instead send these weed-blighted lives on their "way to the gallows." To those who argued that in his own work he destroyed much of what he regarded as "unfit," he insisted that he had been "constantly on the lookout for what has been called the abnormal, that which springs apart in new lines," and that things that are weak "may possess other qualities of superlative value." What often made the difference in such cases was "the influence of cultivation, of selection, of surroundings, [and] of environment," which could transform what was at first seen as a "sport" into an object of value. Those who did not yet know how to appreciate deviations from the "normal" should rethink their premises, he stated, for from "the children we are led to call abnormal may come, under wise cultivation and training, splendid normal natures."[63]

Responses in the century's first decade to Burbank's essay included a Philadelphia piece, entitled "Burbanking Children," that reported on a "new child culture rule": "Luther Burbank would treat infants as flowers/Dissents from heredity idea/Believes the betterment of the race must be brought about by general improvement of child environment." The famed columnist Ella Wheeler Wilcox advocated that Burbank's original article be "sent by the Government to every woman" and that it be "read from pulpits and discussed at women's clubs and talked to young women in seminaries and colleges." She was especially struck that Burbank had offered "scientific proofs" for the views she had been advocating about "the power of Mothers and Teachers to develop in children under their charge whatever qualities they desire them to possess." The secretary of a Georgia garden club agreed, writing in 1921 that her group had read *The Training of the Human Plant* and that she had been inspired to share it with her Girl Scout troop: "I think it is the most beautiful book I ever read. . . . We could train our girls to be just as we would have them if we could get them to feel the meaning of the Human Plant Life."[64]

In *The Training of the Human Plant* Burbank was sharply critical of what he saw as the institutional regimentation of schooling, arguing against the "absurdity, not to call it by a harsher term, of running children through the same mill in a lot, with absolutely no real reference to their individuality," and he thus found many enthusiasts for his views among progressive educators. The *Indianapolis Star* stated that Burbank's text "sets forth the essence and principles of the most advanced and enlightened pedagogics, and it is the more remarkable in that it is written, not by a teacher for teachers, but by a lover of Nature and a scientist who yearns to see the human plant cultivated and developed with as much pains as he cultivates flowers." An excerpt from the book published in the *Elementary School Teacher* journal was titled "Cultivate Children Like Flowers." In fact, when writing about Burbank's pleas to allow children to develop to their full potential by providing

[63] Burbank, *Training of the Human Plant* (cit. n. 25), pp. 41–42, 42–43, 44, 48, 47, 49, 51. Burbank even argued that for those "human beings in whom the light of reason does not burn," advances in medicine and surgical techniques could mean that these seemingly doomed individuals might someday be helped, and they should be spared from eugenic dictates (*ibid.*, pp. 51, 56).

[64] Luther Burbank Scrapbook 33, Burbank Papers ("Burbanking Children"); advertising circular for *Training of the Human Plant,* Pamphlet Box of Burbank Materials (Wilcox quotation); and Mrs. G.S.C., quoted on p. 21 of Luther Burbank, *Burbank Seeds—1922,* Bulletin No. 61, Burbank Papers.

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supportive settings, Henry Meyer equated Burbank's thoughts with those of John Dewey, the icon of progressive education: "Mr. Burbank calls it the way of selective environment. Professor John Dewey might call it the way of democracy." But Meyer went further yet, ending his essay by stating that it was also "the way of the Master, who, more than any other of the world's great teachers, understood the significance and value of the little child: Forbid them not, For to such belongs the Kingdom of Heaven."[65]

It is an intriguing aspect of the Burbank tales that the "man of tomorrow" was so closely identified with such female considerations as a mother's influence in rearing her children and a teacher's work with grade-schoolers; indeed, for a male scientist, the degree to which Burbank was closely identified with children is striking.[66] Writers never tired of sketching scenes such as the one that appeared in a 1948 children's book by Olive Burt, entitled *Luther Burbank: Boy Wizard,* in which a group of schoolchildren visit the aging Burbank, who spends the afternoon showing his young guests the wonders of his garden. As the youngsters take their leave, Burt writes, they "laughed up at the great scientist, standing on his porch. He was their friend, just as he was the friend of all growing things."[67] In a similar vein, in 1906 de Vries described a visit during which Burbank took down from the wall pictures of his various plant creations, relating the facts of their life histories from memory, "his eyes . . . glowing with the love of his plants, many of which he remembers, individually, even from remote years. He treats them like children." Meyer, like many others, found it "only natural" that Burbank, "as a plant grower, . . . should think of children as human plants, subject in their development to environmental conditions and influences even as were the plants in his garden." One reviewer of *The Training of the Human Plant* characterized Burbank's authority as stemming from the fact that "mother nature" refused to speak to "men of mere intellect," freeing herself to converse only when she identified an individual with "brain and heart working in perfect co-ordination"—someone like Burbank, "who admits he loves the plant he trains." This intimate relationship had rendered Burbank's thinking especially fertile: a writer in the *Arena* found the text "pregnant with suggestions of the gravest importance," and the *Pasadena Star* commended it for elucidating "a mighty idea, simple, yet as significant and even more pregnant with possibilities for the weal of mankind, than the masterful ideas of Darwin, Huxley and Spencer. His theory of humaniculture may yet transform the race." In 1926 the *Albany Knickerbocker*

[65] Burbank, *Training of the Human Plant,* p. 19; advertising circular for *Training of the Human Plant,* Pamphlet Box of Burbank Materials (*Indianapolis Star*); Luther Burbank, "Cultivate Children Like Flowers," *Elementary School Teacher,* 1906, *6*:457–460; and Meyer, "Luther Burbank—Creative Naturalist" (cit. n. 36), pp. 10, 11. To the "little child" might also belong the highest office in the land. One author states that Burbank "believed that plants . . . were like people, particularly like children. . . . If one could but find their best qualities and then give them just the help that they needed, there was no telling but that they might get as far as the White House": Bailey, *Boys and Girls of Modern Days* (cit. n. 36), p. 187. For a representative sampling of progressive education thought see, e.g., William Kilpatrick, ed., *The Educational Frontier* (New York: Century, 1933), and the journal *Progressive Education.*

[66] The phrase "man of tomorrow" is from Chamberlain, "Luther Burbank—The Man of Tomorrow" (cit. n. 25). Burbank himself played with child images in the pages of his catalogues, which advertised *The Training of the Human Plant* in addition to his plant creations. The cover for the 1919 catalogue displayed a young girl next to a luxuriant flower bed with the caption "Two Shasta Daisies," and a 1920 catalogue cover showed a toddler hovering over a young seedling: Luther Burbank, "Burbank's 1919 New Creations and Special New Selections in Seeds"; and Burbank, "Burbank's 1920 New Creations and Special New Selections in Seeds," Burbank Papers.

[67] Burt, *Luther Burbank: Boy Wizard* (cit. n. 43), pp. 178, 187. Other children's books with chapters on Burbank not cited in this essay are Mary Stoyell Stimpson, *The Child's Book of American Biography* (1915; Boston: Little, Brown, 1928); Elsie Egermeier, *Boy's Stories of Great Men* (1931; Anderson, Ind.: Warner, 1951); Irving Melbo, *Our America* (Indianapolis: Bobbs-Merrill, 1937); J. A. Harley, *Distinguished Americans for Young Americans* (Chicago: Laurel, 1935); and Bennett Wayne, ed., *They Loved the Land* (Champaign, Ill.: Garrard, 1974).

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Press claimed that Burbank had drawn from "rare vials of life undiscernible to other eyes, mated beauty to beauty, utility to utility, and brought forth new children of nature."[68]

Indeed, Burbank himself was often depicted as full of "boyish enthusiasm" or as "child-like," as in this description by Jordan: "As sweet, straightforward, and as unspoiled as a child, always interested in the phenomena of Nature, and never seeking fame or money or anything else for himself." A 1929 essay stated that "as is the case with all truly great men, Burbank was at all times as simple, direct, and as enthusiastic as a child . . . he never really grew old, because he was always hurrying to finish some wonderful experiment which he had lately begun." Burbank's image as a scientist was not as a stern and remote figure ensconced in an ivory tower; he was a scientist of a very different kind, more like a kindly St. Nicholas of the fields. His gospel of child-rearing was a gospel of love: "love must be at the basis of all our work for the race; not gush, not mere sentimentality, but abiding love, that which outlasts death . . . you can never bring up a child to its best estate without love." Such sentiments made traditionalists uneasy. A Catholic educator from this same period upbraided Burbank for insisting "that the love principle alone can educate" and for increasing "the evil of 'soft pedagogy,' the sugar-coated pill pedagogy, where everything must be made easy, interesting and pleasant for the child like play."[69]

Burbank's appeal to elementary school teachers was powerful. Howard, writing in 1940, argued that the source of Burbank's "undying fame" could be "found in the public schools, where a whole tribe of earnest teachers, mostly women," were passing on the Burbank tales "to the rising generation by picturing him as the hero of his time." Howard contended that Burbank's appeal was gendered, offering as an example an argument that had erupted in 1931 "in the public schools of a large city on the Atlantic seaboard" over the legitimacy of Burbank's place in lesson plans: "For the most part it was the men versus the women teachers. The arguments of the former were based upon rationalism while the latter defended their position on sentimental grounds."[70] Indeed, one of his correspondents, Frank A. Waught of the Massachusetts State College at Amherst, put the matter quite vividly in a 1938 report of an address on the topic of plant breeding he had been invited to give to a small botanical club, attended by "about a dozen schoolmarms." Because he had made no reference to Burbank, "one of the maiden ladies" questioned him on this presumed oversight. Waught informed her that he did not "consider Burbank's work of great importance in the general field of plant breeding." To his discomfort, he later discovered that "the old girl reported the meeting in the local paper," with his remarks on Burbank being held up to scrutiny.[71]

[68] Hugo de Vries, "Personal Impression of Luther Burbank," *Independent,* 17 May 1906, p. 4 of an unpaginated reprint, Burbank Papers; Meyer, "Luther Burbank—Creative Naturalist" (cit. n. 36), p. 7; advertising circular for *Training of the Human Plant,* Pamphlet Box of Burbank Materials ("perfect co-ordination," *Arena, Pasadena Star*); and "Nature Is Lovelier Because Burbank Lived," *Literary Digest,* 1926, *89:*44–52, on pp. 44, 48 (quoting *Knickerbocker Press*).

[69] Jordan, "Some Experiments of Luther Burbank" (cit. n. 5), pp. 80–81; James Speed, "Luther Burbank," in *Ten Outdoor Men* (Boston: Heath, 1929), pp. 29–41, on p. 41; Burbank, *Training of the Human Plant,* pp. 22–23; and Brother Cornelius, "Luther Burbank," *Catholic World,* Apr. 1928, *127:*23–33, on p. 28.

[70] Howard, "Luther Burbank" (cit. n. 1), pp. 412, 313. On teachers' moves to consider themselves observational scientists see Leila Zenderland, "Education, Evangelism, and the Origins of Clinical Psychology: The Child-Study Legacy," *Journal of the History of the Behavioral Sciences,* 1988, *24:*152–165. Also important here is the nature-study movement. See Keeney, *Botanizers* (cit. n. 15), Ch. 10; and Henson, "'Through Books to Nature'" (cit. n. 22).

[71] Frank A. Waught to Howard, 24 May 1938, Howard Papers. Liberty Hyde Bailey recounts a similar episode in *The Nature-Study Idea* (cit. n. 22); his chapter "Science for Science's Sake" concerns a teacher's convention, where he delighted in the presentation of "a demure little woman" who reported on the enthusiasm with which

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Howard asked his college students to recall when they had first heard about Burbank and found that most of them had learned about the horticulturist when they were eleven or twelve years of age; he then sent out letters surveying elementary school teachers about their views on Burbank. These responses, and notes sent to Burbank when he was alive, testify to the esteem in which he was held within the schoolroom walls. Teachers wrote that they had sought to impress their students "with the greatness of the man and his love for nature," stressing his role "as a benefactor of mankind—for his spirit of research and curiosity"—and holding him up "as an outstanding example of what a man with purpose, intelligence and patience can accomplish." Lasting tributes were awarded him, as when a Tulsa public school science club and a South Dakota elementary school named themselves in his honor. One teacher, Camille Chenoweth of Baltimore, even included samples of student writing on Burbank in her reply to Howard's survey and confided that "the very name of Luther Burbank, with that of Helen Keller, has held the greatest fascination. Just to see their names in print they seemed to loom up and take on a heavier type and I eagerly devoured everything that was written." She admitted that she considered Burbank to be a hero and "placed a halo around and about the things we love and enjoy because of him."[72]

The identification of Burbank as a scientist at home in the world of the everyday, bringing his hard-won knowledge of nature's ways to bear on the improvement of the human race, is one of the most powerful themes in the Burbank stories—and one that professional scientists seem not to have understood as underwriting the longevity of his appeal. Perhaps this was because Burbank's metaphysical and ethical lessons proved to be too awkward a fit with either conventional eugenic thinking or the norms that governed the exploration of the new biology. But the public that consumed these tales appeared to find something compelling about the image of a scientist who approached the natural and the social worlds in terms of their potentialities and their diversity, especially one who embodied what orthodox scientists disregarded as "feminine," "sentimental," and "humanistic."[73]

CONCLUSION

Given Burbank's celebrity and the unconventional contours of his life and work, it is not surprising that whether to characterize his vocation as scientific became a highly charged issue within the academic community: Burbank conducted research, but not at a scientific institution; he claimed to have knowledge of nature's laws, but did not possess a university degree; he produced experimental results, but they were offered for sale rather than for scholarly publication. Scientific authorities treated Burbank as a liminal figure, a hybrid creature who straddled both the scientific and the public realms and was thus in need of

her students had created collections. "But there was a man in the audience who squelched the little woman," Bailey reported with displeasure: "Her methods were all wrong . . . the children must unlearn what she had taught them" (pp. 92, 93).

[72] Howard reports his survey idea in "Luther Burbank" (cit. n. 1), p. 310. The first response is from elementary science teacher Esther J. Enochson of Fresno, California; the second from Mary E. Caton of Seattle, Washington; the third from Rosalie Ray of Minneapolis, Minnesota. The quotations are from a summary page prepared by Howard from letters he received, in the Howard Papers. See also Camille Chenoweth to Howard, 8 July 1938, Howard Papers. On the Tulsa science club see Roseline Nadel to Burbank, 2 Apr. 1925; on the South Dakota school see Mr. E. W. Gehring and Mrs. E. W. Gehring to Burbank, 22 Feb. 1917, Burbank Papers.

[73] Howard, "Luther Burbank," p. 383. This is especially striking in light of LaFollette's finding that "most magazine descriptions of scientists implied that success in scientific research required certain 'masculine' attributes such as intellectual objectivity, physical strength, and emotional detachment": LaFollette, *Making Science Our Own* (cit. n. 3), p. 79.

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proper classification. Within the vernacular sphere, however, Burbank was accepted as a legitimate, if unorthodox, scientist and was presented as an ideal figure whose image ran counter to some of the basic conventions of early twentieth-century professionalized science: he was homely rather than sophisticated, romantic rather than materialist, open-ended rather than deterministic, maternal rather than manly. The iconography of the Burbank tales represents a form of social commentary that points to struggles over how best to characterize American science and can be seen as a counternarrative to the standards that the scientific establishment considered appropriate and held out as normative. In trying to understand why "the hoi polloi loved [Burbank] during his lifetime and cherished his memory after he was gone," we can gain insight into cultural representations of science at odds with those promoted by the scientific elite.[74]

Burbank's iconic status as a symbolic representation of publicly accessible science was nourished, in part, by the fact that he was a graduate of the University of Nature rather than of the Ivy League. One of the social claims embedded within the Burbank tales was that science could exist within the vernacular sphere. But public interest was caught as well by what the horticulturist claimed to have learned as nature's student, and among the intellectual claims of the Burbank literature is the assertion that mechanism, materialism, and determinism should be reconsidered as the basis for natural knowledge. And, ultimately, the very existence of a vibrant public commentary on science, as articulated through the Burbank lore, makes the political claim that ordinary citizens have the right to voice their views about the nature of science.

As a form of vernacular discourse, the Burbank tales do not come to a conclusive end in which either the established scientific community or Burbank "wins" or "loses" in posterity's sweepstakes. The question is whether the social, intellectual, and political claims that are threaded through the Burbank tales find further expression and elaboration, even if he himself is no longer the vehicle for them. The answer to this question lies in continued exploration of science in the American vernacular.

[74] Howard, "Luther Burbank," p. 457.

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