

The Smithsonian Bequest, Congress, and nineteenth-century efforts to increase and diffuse agricultural knowledge in the United States*

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Abstract

James Smithson's bequest to the United States in 1829 to establish an institution in Washington to increase and diffuse knowledge initiated an extended debate in Congress about the use of his legacy. The new nation was largely agricultural and it is not surprising that one of the major proposals was to use a large portion of the funds to establish an agricultural institute along German lines. This led to a broader proposal in Congress, of a more scientific nature, which would have encompassed agriculture. Neither proposal was adopted, but both stimulated and helped shape mid-century debate about the need to improve agricultural education and research. This culminated in federal legislation in 1862 and 1887 as well as complementary state actions. By the turn of the century, a substantial institutional structure was in place at both federal and state levels, which was beginning to have a measurable impact on agricultural productivity and serve as an example for other nations.

[A]lthough, both in point of time, and of importance, [agriculture] stands at the head of all branches of industry, it has derived less direct advantage from discovery and invention, than almost any other.
Abraham Lincoln, 1858¹

The nineteenth century stands at the overlap between two great sources of [agricultural] productivity increase ... the end of the great expansionary movement and the ... beginning of ... accelerated technological change.
William Parker, 1967²

* Pamela Scott, a Washington architectural historian, initially drew my attention to what is now Figure 1 and provided several key figures and references. Marc Rothenberg, former editor of *The papers of Joseph Henry*, was of particular help on matters relating the Smithsonian Institution. I benefited from correspondence with Nina Burleigh, Jonathan Harwood and Robert Post, and review comments by Louis Ferleger, Richard Nelson, Alan Olmstead, Margaret Rossiter, and two anonymous reviewers. I am also indebted to numerous librarians, particularly those in the Agency for International Development, the National Agricultural Library, and the Library of Congress.

¹ A. Lincoln, 'First lecture on discoveries and innovations', Bloomington, Illinois, 6 Apr., 1858, in R. P. Basler (ed.), *The collected works of Abraham Lincoln* (1953), p. 440.

² W. N. Parker, 'Sources of agricultural productivity in the nineteenth century', *J. Farm Economics* 49 (1967), p. 1466.

The nineteenth century was a period of significant institutional development and change for science and technology generally and agriculture in particular. As Parker put it, the century 'contains the prehistory of ... modern agricultural research'.³ The concept of integrating science with practice in order to develop more productive technologies was beginning to emerge in Europe and was finding adherents in the United States.

Both dimensions were well reflected in an extended debate about the utilization of Smithsonian's bequest to found in Washington 'an establishment for the increase and diffusion of knowledge among men'. This was a logical combination of functions, but one that was relatively novel at the time. One of the earliest and most persistent proposals for the use of the grant related to agriculture: first for a large 'agricultural institute' modeled along German lines, and then for a more modest and more general programme of applied research and education to be located on the Mall between the Capitol and the Washington Monument.

Neither was directly realized but the associated debates highlighted important public needs and formed the first steps in a procession of related efforts that led to a significant increase in public support of agricultural science, technology and education in the United States, particularly the establishment of the United States Department of Agriculture and the passage of the Morrill Act in 1862 which greatly stimulated the development of state colleges of agriculture. It was followed in 1887 by the Hatch Act, which provided funding for state agricultural experiment stations.

These actions were quite appropriate since the nation was primarily agricultural. More than 80 per cent of the population 'wrestled their living from the soil' early in the century, but the character of agriculture was beginning to change. There was an 'accelerated emergence and firm establishment of a new agricultural economy and technology'.⁴ This was stimulated by a concern about, and a need to increase, agricultural productivity and led to increased interest in applied science, particularly agricultural chemistry.⁵

While production expanded significantly during the century, crop yields – as measured nationally – did not increase markedly until late in the century. This was because the western expansion of farming was often into more arid lands or faced a plethora of new pests and pathogens. Biological innovations, such as the long-practised introduction of new varieties, helped to cope with these and other challenges. But their initial impact was more to maintain, rather than increase, yield levels.⁶

³ Id., 'From the colonies: a tempered tribute', *AgHR* 25 (1977), p. 10.

⁴ A. L. Demaree, *The American agricultural press, 1819–1860* (1941), p. xi; C. C. Danhof, *Change in agriculture: the northern United States* (1969), pp. vii, ix. For further background and detail on this period, see P. W. Gates, *The farmer's age: agriculture, 1820–1860* (1960).

⁵ M. W. Rossiter, 'The organization of agricultural improvement in the United States', in A. Oleson and S. C. Brown (eds), *The pursuit of knowledge in the early American republic: American scientific and learned societies from colonial times to the Civil War* (1976), pp. 279–97.

Also see G. H. Daniels, 'The process of professionalization in American science: the emergent period, 1820–60', *Isis* 58 (1967), pp. 151–66.

⁶ A. L. Olmstead and P. W. Rhode, *Creating abundance: biological innovation and American agricultural development* (2008), pp. 40–59. The expansion to western wheat lands, by one calculation, reduced yield levels by nearly 30 per cent (*ibid.*, p. 20). Also see: R. E. Gallman, 'Changes in total U.S. agricultural factor productivity in the nineteenth century', *Agricultural Hist.* 46 (1972), pp. 206–10; Y. Mudlak, 'Economic growth: lessons from two centuries of American agriculture', *J. Economic Literature* 43 (2005), pp. 989–1024. For British comparisons,

While the mid-century debates surrounding the Smithsonian bequest helped set the stage for larger steps in the public sector and cast additional light on the role of Congress and the scientific and technological fabric of the era, they have been relatively overlooked and overshadowed by the legislation of 1862 and subsequent events.⁷ This paper attempts to define and analyse the developing role of the public sector in increasing and disseminating agricultural knowledge during this transformational century.

I

During the early half of the century, some observers – perhaps most notably Alexis de Tocqueville in 1840 – lamented a lack of emphasis on theoretical science in the United States.⁸ Dupree later referred to the years between 1829 and 1842 as the ‘age of the common man’ and viewed it in terms of ‘practical achievements.’⁹ Others agree that the nation ‘showed a remarkable indifference to basic science.’¹⁰ Margaret Rossiter has suggested, however, that ‘the study of applied science reveals far more of a society’s attitude toward science than does the study of the more abstracted pure science.’¹¹

In 1620 Francis Bacon argued in *The new organon* that science has a two-fold purpose: to produce ‘experimenta lucifera’ or ‘illuminatory experiments,’ and ‘experimenta fructifera’ or ‘fruit-bearing experiments.’ They might be thought of, respectively, as pure and applied science.¹² The latter provides the basis for the development of improved technologies and increases in productivity. This division was subsequently reflected in early institutional approaches, starting with the French *Académie des Sciences* (1668). The *Académie* was a highly centralized, government-funded organization, which carried out a variety of scientific tasks with an emphasis on weights and measures.¹³ The French academy was followed by two less centralized

Note 6 continued

see: J. R. Walton, ‘Varietal innovation and the competitiveness of the British cereals sector, 1760–1930’, *AgHR* 47 (1999), pp. 29–57; G. Clark, *A farewell to alms: a brief economic history of the world* (2007), pp. 193, 233, 238.

⁷ A notable exception is A. C. True, *A history of agricultural experimentation and research in the United States, 1607–1925, including a history of the United States Department of Agriculture* (USDA, Misc. Pub. 251, 1937), pp. 8–163.

⁸ A. De Tocqueville, ‘Why Americans are more attracted to practical rather than theoretical aspects of the sciences’, in De Tocqueville, *Democracy in America* (2 vols, 2003), II, pp. 529–36.

⁹ A. H. Dupree, *Science in the federal government: a history of politics and activities to 1940* (1957, repr. 1964), p. 46. One notable step was the establishment of the Rensselaer School in 1824 for the ‘sons and daughters of farmers and mechanics’ to further ‘the application of science to the common purposes of life’ (not a new phrase, see below) including agriculture: P. C. Ricketts, *History of Rensselaer Polytechnic Institute, 1824–1934* (1934, third

edn.), p. 9; S. Rezneck, *Education for a technological society: a sesquicentennial history of Rensselaer Polytechnic Institute* (1968), pp. 3–22.

¹⁰ W. E. Washburn, ‘Introduction’, in Washburn (ed.), *The great design: two lectures on the Smithsonian bequest by John Quincy Adams* (1965), p. 35.

¹¹ M. W. Rossiter, *The emergence of agricultural science: Justus Liebig and the Americans, 1840–1880* (1975), p. xi.

¹² A. Chapman, *England’s Leonardo: Robert Hooke and the seventeenth-century scientific revolution* (2005), p. 34; drawn from book I, aphorism XCIX in an 1860 translation, n. 3, p. 274. By comparison, a recent translation of the text into modern English refers only to ‘illuminating’ and ‘profitable’ experiments: Francis Bacon, *The new organon* (ed.) L. Jardine and M. Silverthorne (2000), p. 81.

¹³ See, for example, K. Adler, *The measure of all things* (2002). He states that: ‘For years the academicians had been attacked as self-appointed elitists who disparaged popular inventors and thinkers’, but that by 1793 ‘the creation of a metric system had become the main justification for the state-funding of science’ (p. 99).

and independent British groups: the Royal Society of London (1663), which mostly emphasized pure science, and the Royal Institution (1799), which initially focused on the application of science 'for the common purposes of life'.¹⁴ There was, however, some overlap in word and deed between the two.¹⁵ The Royal Society is thought by some to have served as the model for the American Philosophical Society (1743) founded by Benjamin Franklin, and the Royal Institution the model for the Smithsonian.¹⁶

Each approach had strengths and weaknesses. The *Académie des Sciences* was subject to the whims and vagaries of government funding; the Royal Society and Royal Institution had a broader base and focus but no one principal source of financial support.¹⁷ But none of these groups, nor others – such as the London Mechanics Institution (1825) and the Society for the Diffusion of Useful Knowledge (1825) – initially combined the increase and the diffusion of science under one national public organizational structure. Moreover, by the late 1830s strains had begun to develop between the objectives of increase and diffusion.¹⁸ The search for an appropriate structure for doing both is demonstrated in the varied proposals for the use of the Smithsonian bequest.

At that time, one of the areas where Europe was far ahead of the United States was agricultural science and education – as perhaps reflected in the motto of the Royal Agricultural Society of England (established in 1839–40): 'Practice with Science'.¹⁹ Hence it is not surprising that a German-born and agriculturally-trained employee of the United States Patent Office, Charles Fleischmann, was one of the first to develop a major proposal for the use of Smithson's bequest: the establishment in Washington of a large agricultural institute and farm on European lines. This was later followed by Congressional proposals to include agricultural research and

¹⁴ Chapman, 'Hooke', pp. 35–6; F. A. J. L. James, 'Introduction' in James (ed.), *The common purposes of life: science and society at the Royal Institution of Great Britain* (2002), pp. 1–7; H. Ewing, *The lost world of James Smithson: science, revolution and the birth of the Smithsonian* (2007), pp. 202–4; M. Berman, *Social change and scientific organization: the Royal Institution, 1799–1844* (1978), pp. 18–19; and W. J. Sparrow, *Count Rumford of Woburn, Mass.* (1964), pp. 107–41. (Rumford, born Benjamin Thompson, on a farm, proposed the Institute in 1799 and played a key role in its establishment).

¹⁵ In its early years, at least, the Royal Society was also interested in 'The application of scientific solutions to practical, everyday problems' (Chapman, *Hooke*, p. 47) and the Royal Institution soon moved toward pure science (Sparrow, *Rumford*, pp. 121, 139). Subsequently, Humphry Davy established scientific research as a crucial feature of the Royal Institution, 'something that was never envisaged, or indeed intended, by the founders' (James, 'Introduction', p. 8).

¹⁶ The Royal Society was well known, having served as the 'learned society of the British colonies in North America': G. F. Frick, 'The Royal Society in America', in A. Oleson and S. Brown (eds), *The pursuit of knowledge*

in the early American republic (1976), pp. 70–83, quotation from p. 70. James observed that 'it is difficult to believe that Smithson did not have the Royal Institution in mind as a model when he drafted his will' (James, 'Introduction', pp. 2–3). Similarly, Count Rumford may have served as 'something of a role model for Smithson' (Ewing, *Smithson*, p. 305).

¹⁷ Chapman, *Hooke*, pp. 35–6; Sparrow, *Rumford*, p. 137. At that time, 'There were no models, in England, of how scientific research and teaching should be supported other than by private initiative and subscription' (Berman, *Royal Institution*, p. 19).

¹⁸ W. L. Bird, Jr., 'A suggestion concerning James Smithson's concept of "increase and diffusion"', *Technology and Culture* 24 (1983), pp. 246–55.

¹⁹ E. J. Russell, *A history of agricultural science in Great Britain, 1620–1954* (1966), pp. 110–12. The Society's aim, viewed by an American visitor as 'to cheapen, and perfect, and multiply the prime necessities of life', was held up to be an example for the Agricultural Society of the United States (see Sections IV and VII), anonymous, 'Agricultural Tour in England, no. 1', *The American Agriculturalist*, 1/1 (1842), p. 13.

development as part of a broader programme of applied science in the proposed Smithsonian Institution on the Mall.

John Quincy Adams – former diplomat, Senator, and President – who was then a member of the House of Representatives, played a major – if sometimes seemingly quixotic – role, from the announcement of the bequest to the final Congressional decision.²⁰ In the end, and undoubtedly to his satisfaction, none of these proposals were adopted as such and the Smithsonian went on to develop essentially as we know it now. But, as Ewing states, ‘At dozens of points the story of the Smithsonian could have taken a markedly different turn’.²¹ The same could be said for the early development of agricultural education and research in the United States. But, even so, the Smithsonian discussions articulated the needs of a new period in agriculture and formed leading steps towards its realization.

While references are to be found to a projected Smithsonian ‘farm’ in histories of the Institution, they are brief or mentioned in passing.²² Similarly, curiously little is said in the related literature on agricultural history.²³ Hence we next turn to a more fully developed treatment of the early proposals and those that followed and attempt to weave them into a broader historical, geographical, technological, and cultural framework.

II

James Smithson was a wealthy English chemist and mineralogist, a member of the Royal Society and one of the early supporters of the Royal Institution, which is thought to have had a particular influence on his thinking. In 1829, for reasons that are not entirely clear, he willed his estate to a nephew with the condition that if he died intestate, it should be bequeathed to the United States, ‘to found at Washington, under the name of the Smithsonian Institution, an establishment for the increase and diffusion of knowledge among men’.²⁴

When this eventually came to pass in 1835, President Jackson notified Congress, explaining that he did not have the authority to handle it.²⁵ Congress was not immediately receptive, but former president John Quincy Adams, then serving in the House, had very clear views on its importance. In his remarkable first State of the Union address on 6 December 1825, he had stated that: ‘Among the first, perhaps the very first instrument for the improvement of the condition of men is knowledge’ and that ‘public institutions and seminaries of learning are

²⁰ Adams was a scholar and linguist with extensive diplomatic experience in Europe and as Secretary of State, and is rated as having had the highest IQ of American presidents: J. Shepherd, *The Adams chronicles: four generations of greatness* (1975), pp. 104, 139–40, 171–3, 215; ‘Presidential smarts,’ *Science*, 313 (2006), p. 419). He was, however, initially less experienced in domestic politics and took a national view rather than a party perspective: Shepherd, *Adams*, pp. 227, 229, 232–5; J. Wheelan, *Mr. Adams’s last crusade: John Quincy Adams’s extraordinary post-presidential life in Congress* (2008), pp. 18–20, 23.

²¹ Ewing, *Smithson*, p. 329.

²² This is exemplified by: Ewing, *Smithson*, pp. 325, 328;

Wheelan, *Adams*, p. 125; and N. Burleigh, *The stranger and the statesman: James Smithson, John Quincy Adams, and the making of America’s greatest museum: the Smithsonian* (2003), pp. 212, 243, 287.

²³ The two exceptions are: Gates, *Farmer’s age*, pp. 366–8; and A. C. True, *A history of agricultural education in the United States, 1785–1925* (U.S. Department of Agriculture, Misc. Pub. 36, 1929, repr. 1969), pp. 88–9.

²⁴ Burleigh, *Smithsonian*, pp. 168–9, 193; Ewing, *Smithson*, pp. 224–5, 317; P. H. Oehser, *The Smithsonian Institution* (1970), pp. 16–17.

²⁵ Burleigh, *Smithsonian*, p. 193; Ewing, *Smithson*, p. 317.

essential'. He spoke of the need for national involvement in 'those parts of knowledge which lie beyond the reach of individual acquisition' and applying 'our portion of energy to the common stock'.²⁶ In later years, these would be referred to as public goods.²⁷

But by 1835, as Burleigh puts it: 'No one in politics was still seriously talking about federal support for the arts and sciences ... Jackson saw not a gift but potential political trouble'. Adams, as might be expected, viewed it quite differently. On 7 December 1835, he was appointed to head a committee on the bequest and persuaded Congress to send an emissary to London to secure the funds. Richard Rush, an experienced diplomat, was assigned the task, which proved to be formidable.²⁸ Shortly thereafter, in his first major speech on the bequest to the House in January 1836, Adams reiterated some of the same prescient points he made in 1825, arguing that 'To furnish the means of acquiring knowledge is ... the greatest benefit that can be conferred upon mankind'.²⁹

In September 1838, Rush returned successfully with 105 sacks of gold worth \$508,318 (£104,960). President Van Buren officially notified Congress in December that the money had arrived and been invested in state stocks (where they drew 6 per cent interest) and urged them to 'formulate a plan for now to manifest the stranger's wishes in a timely fashion.' At that time, 'America was not known for its scientists, its intellectual life, or its diffusion of knowledge'.³⁰

Adams was again appointed to head a committee to consider what to do with the funds. Many ideas were offered but most were for educational institutions of various types. However, he wrote in his diary on 22 June 1838 after one such appeal: 'I did not think the Smithsonian Institution should be a college, or a university, or a school of education for children, but altogether of a different character'.³¹ His views were further developed in two letters to the Secretary of State in October 1838, in which he offered three suggestions: to keep the principal of the fund intact and spend only the interest; not to apply any of it to a school for the education of youth; and, as a first step, to use the interest to erect an astronomical observatory.³²

With respect to education, which might seem to have fitted Smithson's specification of 'diffusion', Adams stated in two lectures in November 1839 that: 'The express purpose declared

²⁶ From the text of the talk – which is to be found at <http://stateoftheunion.onetwothree.net/texts/18251206.html>. Dupree termed these views 'the clearest statement ever made by a president of the government's duty toward knowledge' (*Science*, p. 39). They were, however, much too visionary for the times: his cabinet reacted with 'shock and horror' and the political reaction was 'catastrophic' (pp. 39, 41).

²⁷ See D. G. Dalrymple, 'Scientific knowledge as a global public good: contributions to innovation and the economy', in J. Esanu and P. Uhler, *The role of scientific data and information in the public domain* (2003), pp. 35–51; id., 'Scientific knowledge as a public good', *The Scientist*, 19/12 (2005), p. 10; and id., 'International agricultural research as a global public good: concepts, the CGIAR experience and policy issues', *J. International Development* 20 (2008), pp. 347–79.

²⁸ Burleigh, *Smithsonian*, pp. 192–205 (quotations

from pp. 192–3). Also see Ewing, *Smithson*, pp. 319–24. Another account states that Rush requested that Dr. Henry Perrine, a physician turned horticulturalist from Florida, 'accompany him ... as an able scientist to convince England that ... Smithson's legacy would be ably handled for the purpose ... of introducing foreign plants and trees': S. R. W. Palmer, 'Henry Perrine, pioneer botanist and horticulturalist', *The Florida Historical Society Quarterly* 5 (1926), pp. 112–13.

²⁹ Burleigh, *Smithsonian*, p. 220. These points are elaborated in S. F. Bemis, *John Quincy Adams and the Union* (1956), pp. 504–5.

³⁰ Burleigh, *Smithsonian*, pp. 203, 206, 227, 238.

³¹ C. F. Adams (ed.), *Memoirs of John Quincy Adams, comprising portions of his diary from 1795 to 1848* (12 vols, 1874–77; repr. 1969), X, pp. 23, 89.

³² S. F. Bemis, *John Quincy Adams and the Union* (1956), pp. 507–9.

by the testator being not the education of children or of youth, but the *increase* and diffusion of knowledge among *men*' and that Smithson's aim 'was not learning but knowledge ... [for] the whole race of mankind'.³³ He had spoken favorably of government-sponsored research in his State of the Union address of 1825, but continued to think in terms of basic science in the form of astronomy.³⁴

Others, however, continued to think in more applied terms. After a college or school, 'the most persistent proposal ... was the creation of a capital-city agricultural college, including a farm where improvements to crops and livestock could be displayed. For many years, politicians seriously considered this idea'.³⁵ While this may not have been what Smithson had in mind, and certainly not one that Adams would have favored, it was probably the most fully defined and developed proposal at the time, and continued to be brought up until 1850 or later.

III

Two proposals (they were termed 'memorials' at the time) were made to the House of Representatives in 1838 by Charles Lewis Fleischmann, a native of Bavaria, where he had attended the newly established Royal Agricultural and Technical School at Schleissheim. Fleischmann was a naturalized citizen and a draftsman in the United States Patent Office.³⁶ The first proposal was entitled 'On the subject of improving the agriculture of this country',³⁷ and the second, 'In relation to the Smithsonian legacy'.³⁸

In his first submission, Fleischmann noted that agriculture had made very substantial progress in Europe and that in the process:

it was found necessary to erect schools, and educate the young men scientifically and practically. Such schools were established on large, properly conducted farms, where all the sciences were taught connected with agriculture, illustrating the practical applications ... Within the short period of six years, the influence of these institutions was felt throughout the whole country.

One of the first and best-known schools was founded, in 1806, by Albrecht Thaer – a famous German agricultural physician and agriculturalist – at Moeglin, outside Berlin. He emphasized

³³ Washburn, *Great design*, Lecture I, pp. 60–1, and Lecture II, p. 69. Comments on the lectures and Adam's subsequent involvement with the Congressional process are provided in Washburn's 'Introduction,' pp. 13–38.

³⁴ M. Portolano, 'John Quincy Adam's rhetorical crusade for astronomy,' *Isis* 91 (2000), pp. 480–503.

³⁵ Burleigh, *Smithsonian*, p. 243.

³⁶ P. W. Gates, 'Charles Lewis Fleischmann: German-American agricultural authority,' *Agricultural Hist.* 35 (1961), pp. 14–15; Gates, *Farmer's age*, pp. 367–8. He was not the first to propose government involvement: following correspondence with George Washington in 1789, Baron Pöllnitz, a German nobleman who was conducting experiments on a farm in what is now lower Manhattan,

suggested the 'establishment of an experimental farm under government patronage' (True, *Research*, p. 18).

³⁷ 'Memorial of Charles Lewis Fleischmann on the subject of improving the agriculture of this country,' April 16, 1838, House Docs., 25th Cong., 2nd Sess., vol. 10, doc. 334, 1838.

³⁸ 'Memorial of Charles Lewis Fleischmann in relation to the Smithsonian legacy,' December 14, 1838, House Docs. 25th Cong., 3rd Sess., vol. 3, doc. 70, 9 Jan. 1839. Ordered repr. by the House of 5 March 1840, House Docs., 26th Cong., 1st Sess., vol. 3, doc. 129. The text is reproduced, without drawings, in W. J. Rhees, *The Smithsonian Institution: documents relative to its origin and history, 1835–1899* (2 vols, 1901), I, pp. 155–63.

the necessity of both science and practice. 'It became the most influential model for agricultural education during the first half of the century.'³⁹ As described by an English visitor in 1820: 'It comprised ... 1200 acres, and a college for instruction. The education was partly theoretical and partly of a practical description.' Three professors lived on the premises and 'practical instruction was communicated by an experienced agriculturalist'.⁴⁰ By 1858, eleven such academies had been established in Germany.⁴¹

Fleischman went on to observe that America 'is at length making every possible effort to improve her agriculture' but that:

as long as agriculture is a mere mechanical or practical imitation, unaided by science, it will never so far succeed as to answer the expectation of American enterprise ... The next step is to establish agricultural schools, where that science can be taught theoretically as well as practically.

They would be 'the nursery of valuable citizens for a republic'. To do this, there would be three levels of instruction and:

a pattern farm of about one thousand acres ... All of this would be effected through our federal government, with a small sum of money – an appropriation much smaller than is made annually for the Military Academy.

Should federal support not be possible, he proposed the establishment of an agricultural botanical garden:

The land unoccupied west of the Capital, bounding of the canal, would be the proper place; ... it would improve the desolate appearance of the metropolis, and procure every visitor and instructive and pleasant promenade.

The arrival of the Smithsonian funds provided an opportunity for federal participation. Fleischmann responded quickly and prepared a second detailed memorial to the House. It was 'presented' by Adams, referred to his select committee, and, on a motion by him on 9 January, ordered to be printed with the instruction that 'the drawings accompanying the same be lithographed'. The entry characterizes it as 'showing the importance of and the benefits which may arise from the establishment of a national agricultural school as a branch of the Smithsonian'.⁴²

Fleischmann referred to his earlier proposal in terms of showing 'the utility and importance of establishing an agricultural school at the seat of government'. He also stated, elaborating on an earlier theme, that 'such an institution, being the first in the United States, would be the nursery of scientific agriculturalists for the whole Union; their education should therefore be as perfect as possible, to enable them to qualify themselves as directors, professors, and superintendents

³⁹ J. Harwood, *Technology's dilemma: agricultural colleges between science and practice in Germany, 1860–1934* (2005), pp. 78–9.

⁴⁰ As cited in *The Agricultural College of Pennsylvania: embracing a succinct history of agricultural education in Europe and America ... Drawn up by a committee*

appointed for the purpose by the Board of Trustees (Philadelphia: 1862), pp. 6–7.

⁴¹ True, *Education*, pp. 3–4; Harwood, *Technology's dilemma*, p. 79.

⁴² Rhees, *Smithsonian documents*, p. 146.

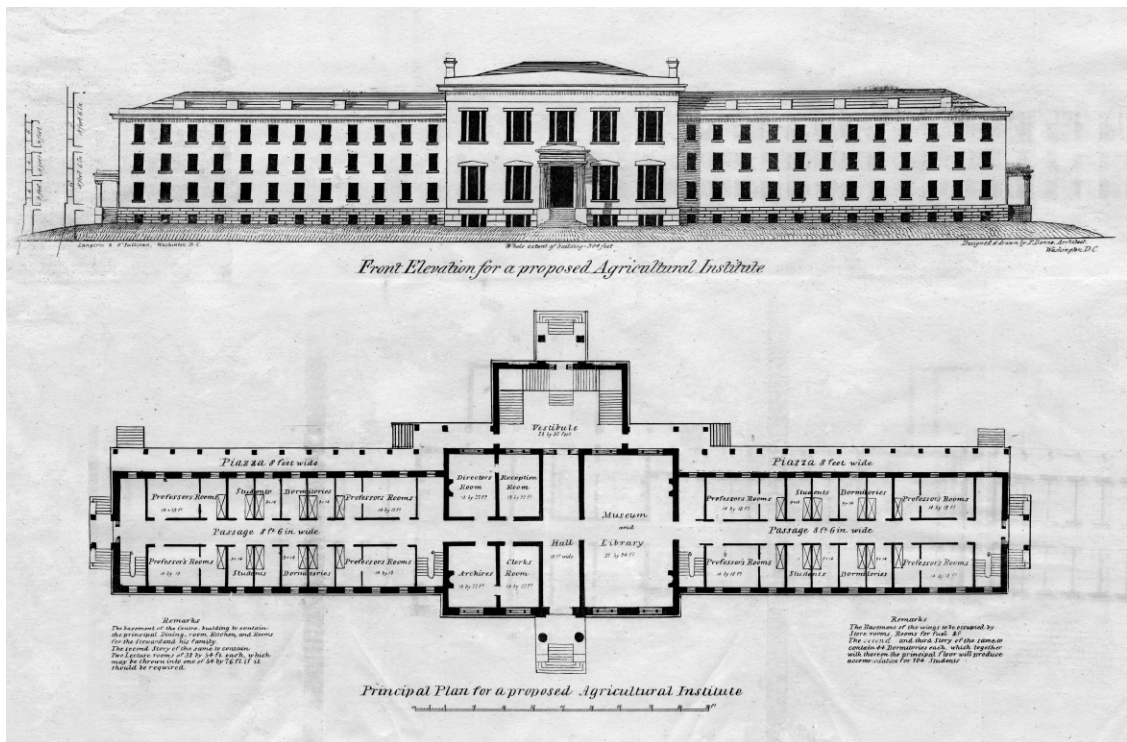


FIGURE 1. Architectural drawings of the proposed main building of the Agricultural Institute, December 1838. The first floor included professors' rooms, student dormitories, a museum and library, and administrative offices.

Source: Pamela Scott; also in 'Memorial of Charles Lewis Fleischmann in relation to the Smithsonian legacy,' 14 Dec. 1838, House Docs. 25th Cong., 3rd Sess., vol. 3, doc. 70, 9 Jan. 1839.

for similar establishments'. It was planned for 100 students and would, in accordance with the specifications the Smithsonian grant, 'be located within the boundary of the city of Washington'.

Three levels of instruction, as outlined in his first presentation, would be offered: one was to be practical (two years); the second, and largest group, a combination of practical and theoretical (also two years); and the third, for graduates of the second programme, who 'desire to perfect themselves as professors for similar establishments'. (The need for this group became very evident later in the century.) Applicants would require a certificate of moral character and be examined for 'an ordinary English education' and to determine whether they would be capable of 'comprehending a popular course of lectures'. Physical strength would be required to work on the farm and 'they should be at least of the age of 14 years', which now seems low but was not uncommon at that time. A strict 'order of the day' was outlined.

One of the most striking characteristics of the new institute would have been, echoing European precedents, its size. The proposed area totaled 1360 acres (3360 ha.), of which 640 were for cultivation, 100 for meadows, 80 for pasture, 40 for experimental fields, 20 for an orchard and nursery, 6 each for a vegetable garden and mulberry plantation, 4 each for a vineyard and hop garden, and 3 for a botanical garden. A substantial main building (Figure 1) and a number of auxiliary buildings (Figure 2) were proposed. The main structure and layout

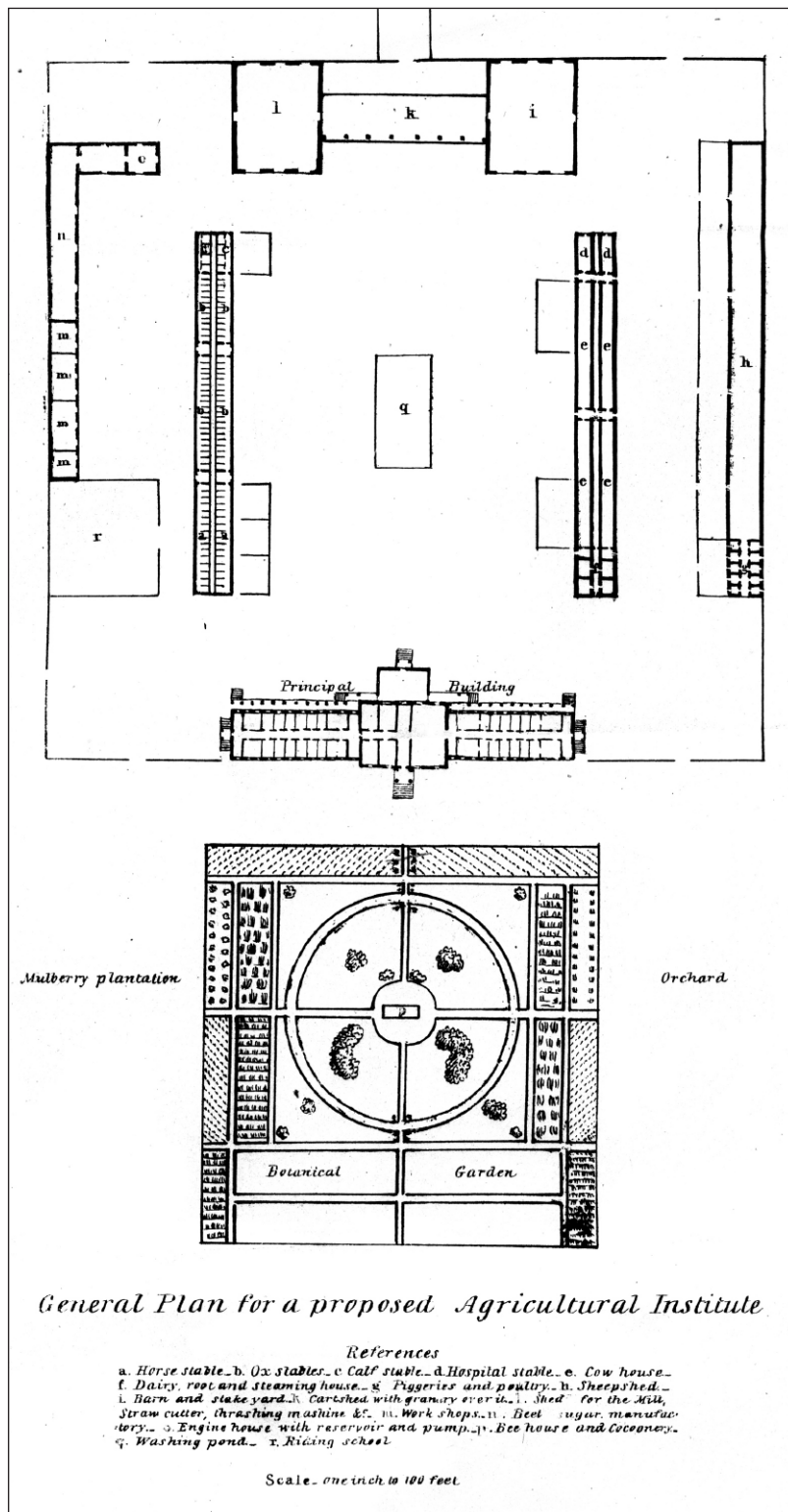


FIGURE 2. Architectural drawings of proposed building layout and gardens of the Agricultural Institute, December 1838. The outlying structures included stables, pig and poultry sheds, a barn, a workshop, engine room, etc.

Source: 'Memorial of Charles Lewis Fleischmann in relation to the Smithsonian legacy,' December 14, 1838, House Docs. 25th Cong., 3rd Sess., vol. 3, doc. 70, 9 Jan. 1839.

were designed and drawn by Francis Benne, a Washington architect who had close ties to the Patent Office, and Fleischmann.

The total capital investment for land, buildings, animals, and equipment would have also been substantial for the times: \$158,700. Of this, \$40,800 would have gone for the land, \$60,000 for the buildings and furniture, and \$20,000 for livestock. The remainder was spent on equipment of various forms (\$17,999) or kept as 'floating capital' (\$20,000). It appeared that an endowment for paying the salaries of the principal, professors and teachers would be set up at a 'capital' cost of \$140,000; the salaries of the other staff would be paid from fees and revenue of the farm. Thus, the 'total sum required for the institution would amount to \$298,700', 58.8 per cent of the total Smithson bequest. The proposal could have been reduced in size, but it never got to that stage of discussion.⁴³

According to Paul Gates, the memorial caught the fancy of spokesmen for agriculture and aroused commendation and discussion. He notes that: 'The New York State Agricultural Convention meeting in Albany in 1840 approved a petition to Congress praying for use of part of plans proposed in Congress for the use of the funds.' He also cites the New York *Herald* and some other publications.⁴⁴ A closer look at them provides further insights.

The proposal was first mentioned in the *Morning Herald* on 18 December 1838. In noting various proposals, their correspondent stated that:

there is one which has been submitted by a gentleman of this city, a German by birth, which deserves serious consideration ... It is an Agricultural Institute to be established in the borders of the city ... It is an important subject and should be carefully digested by Congress.

On 20 December, the same correspondent provided further details from the proposal, noting that it is intended to 'serve as a nursery of scientific agriculturalists for the United States', adding that:

If this should be adopted, it will be the only institution of the kind in the United States, and the first attempt ever by Congress to promote the most valuable and important branch of our national industry and wealth.⁴⁵

The *Herald's* report of 20 December was reproduced in *The New England Farmer and Grower's Journal*, Boston, on 2 January 1839 with the following comment:

[T]he plan proposed ... appears very well on paper; but we apprehend the difficulty of executing it will be very great. Perhaps it will prove too cumbrous, and proposes too much. We, will not, however, decide prematurely. The danger to be feared is that the money will fall into the hands of theoretical instead of practical men, and prove in the end of little utility.⁴⁶

⁴³ Rhees, *Smithsonian documents*, p. 163.

⁴⁴ Gates, 'Fleischmann', p. 15.

⁴⁵ Horace, 'From Washington' (dated 15 Dec.), *Morning Herald* (New York), 18 Dec. 1838. Horace, 'Private Correspondence: the Smithson bequest', dated 17 Dec. 1838), *Morning Herald* (New York), 20 Dec. 1838.

⁴⁶ *The New England Farmer and Gardner's J.* (2 Jan. 1839), XVII, no. 26, p. 203; 'Smithsonian legacy' (*NEF&GJ*, editorial comment, 2 Jan. 1839), p. 203; C. L. Fleischmann, 'To the editor of the *N.E. Farmer*' (*NEF&GJ*, 2 Jan. 1839), p. 202.

The text of Fleischmann's December memorial was reproduced without comment in the *Silk Grower and Farmer's Manual* for April 1839.⁴⁷ And reference to the New York petition was made in the *Cultivator* (Albany), one of the leading agricultural publications of its time, in March 1840.⁴⁸ The degree to which the proposals were published and discussed more widely, however, cannot be assessed from the available documentation.

Additional support was provided by the Agricultural Society of the United States, organized in 1841. A key purpose of the society as expressed in a petition to the House of Representatives of 27 August 1842, was to support 'the establishment of a school and farm in this district, with a course of lectures for instruction and experiments to advance the condition of agriculture throughout the Union, and thus diffuse wider among men that knowledge so essential to the improvement of this most important pursuit'. Its article of constitution added:

and, appurtenant thereto, a course of public lectures of agriculture, chemistry, botany, mineralogy, geology, and entomology as appropriate sciences to the great business of agriculture, and experimental farm, which, with the buildings and improvements thereon, shall be set apart forever as an establishment for the increase and diffusion of knowledge among men.⁴⁹

A more oblique endorsement came from the United States Patent Office (then arguably the most scientifically-oriented federal agency and locus of such agricultural work as was carried out).⁵⁰ In the report of the Commissioner of Patents on 1 February 1843, Commissioner Ellsworth stated that:

I can confidently say, that the agricultural class look forward with bright anticipations to some benefit from the Smithsonian bequest, and to the time when the sons of agriculturists, after years of toil at the plough, can attend a course of lectures at the seat of government, and there learn not only the forms of legislation, but acquire such a knowledge of chymistry [sic] and the arts as will enable them to analyze the different soils, and apply agricultural chymistry to the greatest effect ... Little indeed has been done for husbandry by the general government, and since 80 per cent of the population are more or less engaged in this pursuit, the claim on this most beneficent bequest will not, it is hoped, be disregarded.⁵¹

IV

Proposals for the use of the funds continued to flow into the House committee of nine headed by Adams, some of which resulted in Congressional actions.

⁴⁷ 'Statistical: Smithsonian legacy', *The Silk Grower and Farmer's Manual* (1839), I, no. 10, pp. 232–6; repr. of 'Memorial' of 14 Dec. 1838.

⁴⁸ Demaree, *Press*, pp. 340–4. Also see Rossiter, 'Organization', p. 290.

⁴⁹ Rhees, *Smithsonian documents*, pp. 238–39.

⁵⁰ True, *Research*, pp. 22–4; Dupree, *Science*, pp. 46–7, 111–13. 'The antebellum Patent Office constituted one of

the few places outside academia that employed men on the basis of their scientific competence': R. C. Post, *Physics, patents, and politics: a biography of Charles Grafton Page* (1976), p. 11.

⁵¹ 'Report from the Commissioner of Patents, showing the operations of the Patent Office during the Year 1842', 27th Cong., 3rd Sess., Senate doc. 129, 1843, pp. 1–3.

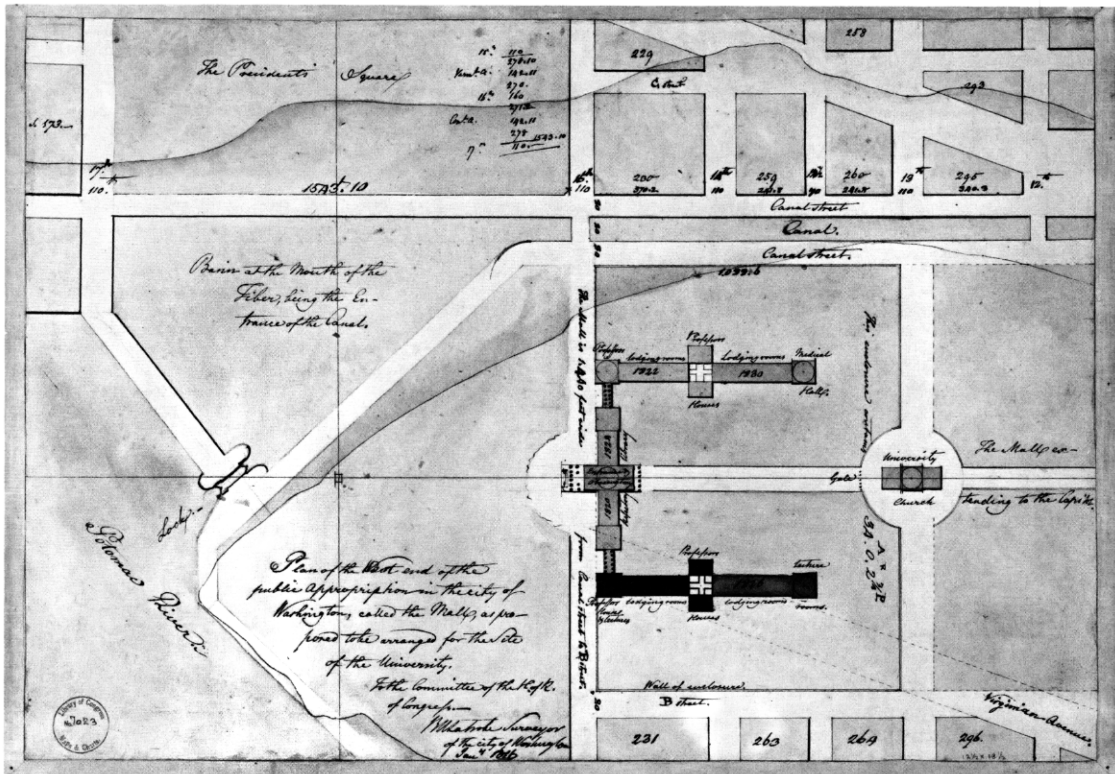


FIGURE 3. Proposed buildings and site layout for the proposed National University at the west end of the Mall by Benjamin Henry Latrobe, January 1816. It would be built in sections, starting in 1818 with the wing that is shaded darker in the plan, and finishing in 1830. Student lodging is interspersed among faculty houses and there are lecture rooms, a library, a refectory, an observatory and a church.

Source: Geography and Map Division, Library of Congress (G3852.M3G45 1816.D5 Vault).

One of the more venerable proposals, dating back to 1775 and mentioned by Washington in 1790, was for a national university. As developed by Joel Barlow in 1806, and discussed with Jefferson, it called for both ‘research and instruction’, combining advancement of knowledge with the ‘dissemination of its rudiments’ and would have included a veterinary college. President James Madison proposed its establishment in his last message to Congress in 1817; a site plan by Benjamin Latrobe, a friend of Barlow, would have placed it at the west end of the Mall (Figure 3).⁵²

While the Senate would have preferred a national university, Adams – as mentioned earlier – was opposed to the use of the funds for school or university purposes, but instead, favoured

⁵² D. Madsen, *The National University: enduring dream of the USA* (1966), 15–56; A. Castel, ‘The founding fathers and the vision of a National University’, *Hist. of Education Quarterly* 4 (1964), pp. 280–302; Dupree, *Science*, pp. 14–15, 23–4, 33; F. Gutheim and A. J. Lee, *Worthy of the Nation: Washington DC, from L’Enfant to the National Planning Commission* (2006), p. 33; and C. B. Todd, *Life and letters of Joel Barlow, LL.D., poet, statesman, philosopher* (1886), pp. 208–9.

a national observatory.⁵³ Richard Rush advocated an organization that would cooperate with the government in its scientific work, provide lectures, receive and exhibit collections, publish scientific documents.⁵⁴ Others proposed using the funds for the National Institute, a scientific society founded in 1840 (to be discussed later). Further suggestions included a national library, an art gallery, and the founding of a journal of useful information.⁵⁵

But as late as 1842 little sign appeared that opinion had gelled in any one mould.⁵⁶ Congressional efforts evidently began to focus on the issue in 1844. Curiously, Adams did not play a highly visible leadership role at this stage:

His part in the work of establishing the Smithsonian lay rather in preventing Congress from entering into too hastily considered schemes than in developing the finally adopted plans himself.⁵⁷

Fleischmann, still at the Patent Office, was neither mentioned nor heard from, but soon was to reappear on several fronts.⁵⁸

Senator Tappan of Ohio presented a bill, S.188, on 6 July 1844, reintroduced on 12 December as S.18, to establish the Smithsonian Institution. Section 2 of the bill called for the 'erection of suitable buildings, the inclusion of suitable grounds, and for the purchase of books and instruments'. Among the provisions was one for:

suitable ground for horticultural and agricultural experiments, which ground may be taken and appropriated out of that part of the public ground in the city of Washington called the Mall, lying west of Seventh street.

Section 3 suggested, further, that:

the grounds selected for these purposes would be enclosed and secured, and a suitable building erected to preserve such plants as will not bear exposure to the weather at all seasons; and the sum of \$20,000 is hereby appropriated for such a building and enclosure.⁵⁹

In terms of staff, Section 5 authorized the board of managers to appoint a superintendent who 'shall also discharge the duties of professor of agriculture, horticulture, and rural economy in said institution'. In Section 7, provision was made for professors of natural history, chemistry, geology, astronomy 'and other professors as the wants of science may require'. They were to:

direct experiments to be made by the professor of agriculture ... to determine the utility

⁵³ Adams also considered the 'education of youth ... a sacred obligation, binding upon the people of the Union themselves, at their own expense and charge, for which it would be unworthy of them to accept an eleemosynary [sic] donation from any foreigner whomsoever' (Dupree, *Science*, p. 69).

⁵⁴ W. P. True, *The Smithsonian Institution* (Smithsonian Institution Series, Inc., 1929), pp. 239–40.

⁵⁵ R. W. Leopold, *Robert Dale Owen: a biography* (1940), pp. 219–220 (repr. 1968). The library proposals are discussed in a larger context by C. Ostrowski in

Books, maps, and politics: a cultural history of the Library of Congress (2004), pp. 145–78.

⁵⁶ Dupree, *Science*, p. 70.

⁵⁷ True, *Smithsonian*, p. 239.

⁵⁸ In 1853 he joined forces with two Patent Office colleagues to establish the *American Polytechnic Journal*, devoted to 'Science, the mechanic arts, and agriculture'; it was published for two years (Post, *Page*, pp. 128–39, plate 23) and is cited in n. 84.

⁵⁹ Rhees, *Smithsonian documents*, pp. 266–80.

and advantage of new modes and instruments of culture, to determine whether new fruits, plants and vegetables may be cultivated to advantage in the United States; and they shall direct the distribution of all ... as shall be found useful and adapted to any of our soils and climates, so that the people in every part of the Union may enjoy the benefit and advantage of the experiments made by the Institution ... They shall also direct a professor of chemistry to institute a chemical analysis of soils from different sections of the United States, to make experiments on the various modes of improving and enriching the several kinds of soil found within the United States, and at all times to include in his course of lectures the subject of agricultural chemistry'.⁶⁰

The chief opponent of the Tappan proposal in the Senate was Rufus Choate of Massachusetts who proposed using nearly all of the interest of the bequest to build a national library, feeling that it would 'not only increase knowledge effectively but also wipe away the stigma of [national] inferiority'. It won 'immediate and widespread approval' despite the fact that it was not specifically oriented to science or the diffusion of knowledge.

Representative Robert Dale Owen of Indiana, who shared Tappan's interest in the more active diffusion of knowledge, drew up an amended bill in the House (10 February). It reduced expenditure on books and included provisions from Tappan's bill, including 'provisions for scientific cabinets and horticultural experiments'. While evidently approved by both Choate and Tappan, it was strongly opposed by Adams, whose stand proved quite unpopular.⁶¹ Thereafter, leadership fell to Owen. He introduced what seems to have been essentially the same bill on 19 December 1845. It included provision to 'enclose grounds suitable for agricultural and horticultural experiments and to erect a plain building capable of housing laboratories, lecture rooms, scientific cabinets [collections of specimens], and a library'. The expenditure on books for a library was further reduced. Adams strongly opposed the section dealing with agricultural experiments, noting in his diary that he considered it 'a cumbersome, expensive and useless burden upon the Institution'.⁶² A substitute bill by Representative Hough of New York eliminated the 'provisions for professorships, experimental research, and the publication of cheap tracts', and the amount to be spent on books was set at \$25,000. The bill went on to be passed by the Senate. Thus Choate's library proposal appeared to have triumphed.⁶³

But there was still one more step. As a reward for other duties that he had carried out, Owen was appointed as one of the three House representatives on the Board of Regents of the Institution. He was made chairman of a sub-committee 'to digest a plan to carry out the provisions of the act'. When his committee's report was presented on 1 December 1846, it fulfilled 'every specific requirement of the statute, it reintroduced certain items previously eliminated by Congress, such as the permanent professorships, the experimental farms, and the conservatories'. It met the same fate in the board of Regents and all these provisions were

⁶⁰ Ibid., pp. 67–79. Other professors would have been natural history (useful animals and injurious insects), geology, architecture and domestic science, and astronomy.

⁶¹ Leopold, *Owen*, pp. 220–2; Rhees, *Smithsonian documents*, p. 276.

⁶² Adams, *Memoirs*, XII, pp. 239–40, 245–6.

⁶³ Leopold, *Owen*, pp. 223–7; Rhees, *Smithsonian documents*, pp. 280–319. While the amount appears modest by current standards, it would have represented over 80 per cent of the operating funds of the Smithsonian, which were to be derived from interest on the bequest.

eliminated, though the 'scientific cabinets' were retained. This ended the proposed agricultural dimension of the Smithsonian, except for one unexpected proposal that was to come later.⁶⁴

Clearly, Tappan's emphasis was on applied science and would have been similar in outlook to the initial focus of the Royal Institution.⁶⁵ However, according to Leopold, his 'highly utilitarian scheme proved very unpopular, at least among those who could register their views in Congress or had access to the columns of the leading newspapers'.⁶⁶ But some 120 years later, it was termed 'the most thoughtful legislative reflection of a museum-cum-university conception of the Smithsonian'.⁶⁷

The Fleischmann and Tappan-Owen proposals were quite different in nature and resource requirements. Fleischmann's essentially followed the European example of the time. It was built around a large model farm and a course of instruction; research would presumably play a role but was secondary. Its basic elements were proposed before the Smithson bequest had been received; they were quickly developed a few months later in response to the bequest and before much thought had been given to its use.

Little of what Fleischmann proposed – beyond the general notion of improving agriculture – was reflected in the Tappan-Owen proposal. Adams was acquainted with his proposal, had some familiarity with agriculture, was interested in science, and had earlier spoken eloquently of the role of knowledge, but showed little or no interest in applied science or agricultural matters at this point.⁶⁸

Although the Fleischmann proposal was never embodied in the form of a prospective legislative bill, the Tappan-Owen proposal clearly was, and the agricultural components survived to nearly the end of the legislative process. It provided for a rather different organization: a more general scientific group of modest size which would have included agriculture as one component, and one that was oriented to research and dissemination of information, but not formal instruction.

In conceptual terms, the Fleischman proposal would have combined theory with practice, while the Tappan-Owen proposal focused more on the combination of theory with experiment, not altogether a new concept.⁶⁹ Both contained many of the research and outreach characteristics of the subsequent United States Department of Agriculture and land grant college system.

⁶⁴ Leopold, *Owen*, p. 231.

⁶⁵ The early work of Humphry Davy was heavily focused on agricultural matters, principally agricultural chemistry (Berman, *Royal Institution*, pp. 45–61; Ros-siter, *Leibig*, pp. 11–19; David Knight, 'Establishing the Royal Institution: Rumford, Banks and Davey' in James, 'Common purpose', p. 111; Russell, *Agricultural science*, pp. 67–76). His *Elements of agricultural chemistry in a course of lectures for the Board of Agriculture* was published in 1814 in London (Longman) and in the U.S. in 1815 (Fredericksburg, Va.: William Gray) and 1821 (Philadelphia: John Conrad & Co.).

⁶⁶ Leopold, *Owen*, p. 220.

⁶⁷ G. T. Hellman, *The Smithsonian: octopus on the Mall* (1966), p. 50.

⁶⁸ Adams's contributions to science are well reviewed in A. H. Dupree, 'Science policy in the United States: the legacy of John Quincy Adams,' *Minerva* 28 (1990), pp. 259–271, and noted in Wheelan, *Adams*, pp. 111–28. He was perhaps more at home discussing Cicero's views on agriculture or the role of tillers of the soil as the third stage of civilization (Adams, Quincy Lecture II, Supplementary Address; in Washburn, *Great design*, pp. 89–91).

⁶⁹ 'By 1800 the educated recognized that the revolution in science had been due the development of a scientific method: the combination of theory ... and experiment': D. Goodman, 'Conclusion' in D. Goodman and C. A. Russell (eds), *The rise of scientific Europe, 1500–1800* (1991), p. 423.

If combined, they could have provided the vital four-way linkage between theory, experiment, practice, and education that was to come later.

V

One observer of research and education in American agriculture has termed the mid-nineteenth century the 'American Renaissance'.⁷⁰ Another commented that 'Some progressive farmers ... believed they had passed from a dark age into one of agricultural development'.⁷¹ The mid-century is taken as the period from roughly 1840 to 1865, but neither assessment was altogether evident before about 1860. However, important seeds were planted during this period that led to landmark Congressional legislation in 1862 and the substantial changes that followed.

During the first decade, key and parallel roles were played by the Patent Office, the National Institute for the Promotion of Science, and the Agricultural Society of the United States. Concurrently, individual and then group steps were taken to improve the status of agricultural education within the country. Let us consider each in turn.

The United States Patent Office was established in 1836 and Henry L. Ellsworth was appointed its first commissioner. The son of a chief justice, he was an individual of large ideas and saw the possibilities of establishing 'a great scientific bureau'. This vision included the natural sciences and he attempted to make his office a clearing house for seeds and plants. In 1839, \$1,000 was appropriated for statistics and other agricultural services. Particular attention was given to agricultural statistics and the application of chemistry to agriculture.⁷² Hence, it is not surprising that he supported Fleischmann in his efforts concerning the Institute and Ellsworth later commissioned Fleischmann (who retired in 1845) to study agricultural conditions in Europe. One report included a section entitled 'On agricultural schools' and involved a visit to Thae's school (then run by Thae's son) in Moegelin.⁷³

The National Institute was established in Washington in 1840, as an heir to the old Columbian Institute (which had played a key role in establishing an embryonic botanic garden on the Mall in 1818).⁷⁴ Once organized, 'the leaders began to work toward acquisition of the Smithsonian grant ... The name was selected to reassert its superiority over the proposed Smithsonian Institution'. Membership was divided into eight classes, one of which was agriculture. In 1844, along with an unsuccessful attempt to get an appropriation, it held a grand annual meeting along with some other professional societies, but was little heard of it thereafter.⁷⁵ Still, one

⁷⁰ P. E. Waggoner, 'Research and education in American agriculture,' *Agricultural Hist.* 50 (1976), pp. 230-47.

⁷¹ G. P. Colman, *Education and agriculture: a history of the New York State College of Agriculture at Cornell University* (1963), p. 18.

⁷² Dupree, *Science*, pp. 47 (source of quotations), pp. 110-12. Also see: Gates, *Farmer's age*, pp. 299-301, 329-36.

⁷³ 'Result of observations made during a visit to Germany in 1844-5, by Charles L. Fleischmann, Esq., formerly draughtsman in the Patent Office and furnished by him at the request of the Commissioner of Patents

for the Agricultural Report on 1847,' 'Annual Report of the Commissioner of Patents for the Year 1847,' House of Representatives, 30th Cong., 1st Sess., Ex. Doc. 54, 1848, App. 1, pp. 310-25.

⁷⁴ Dupree, *Science*, pp. 70-6.

⁷⁵ S. G. Kohlstedt, 'A step toward scientific self-identity in the United States: the failure of the National Institute,' in N. Reingold (ed.), *Science in America since 1820* (1971), pp. 79-103, quotation from p. 85, repr. from *Isis* 62 (1971), pp. 339-62. Also see Leopold, *Owen*, pp. 217-18. Fleischmann was a member (repr. in *Post, Page*, p. 45).

historian suggests that it helped to set the stage for 'a general agency for the advancement of scientific interests of all kinds'.⁷⁶

More to the point, the Agricultural Society of the United States was organized in 1841 with the principal objective of securing the Smithsonian fund to 'establish a great school and library of agricultural science and experiment, with a garden, that should bear and be worthy of the name of Smithsonian'. But failure to achieve this purpose perhaps dampened the enthusiasm of its founders and its seal and records were turned over to the United States Agricultural Society in 1859.⁷⁷

The 'renaissance' also moved slowly in terms of agricultural education. A number of agricultural schools and academies were established early in the 1800s.⁷⁸ Their purpose was generally to combine theory with practice, and in this respect they were no different from the agricultural institute proposed for Washington. But in True's view:

They were premature developments, because there was not yet a body of knowledge relating to agriculture which could be successfully used in secondary schools. As experimental ventures in education they served, however, to stimulate the movement that was to result in the establishment of agricultural colleges and experiment stations.⁷⁹

The experience of one such school may be illustrative. The Mount Airy Agricultural College was established in Germantown, Pa. in 1847 (Figure 4). 'The response from the public was not enthusiastic ... The school operated for eight years with very small enrolment' and was discontinued in March 1853. In looking back, the principal commented that 'I have ... had under my tuition in that time 217 pupils. Among these but four were sons of farmers ... A large majority of my pupils have engaged in agriculture'.⁸⁰ Whether a national institute located in Washington would have had the same experience is uncertain.

A more promising start on a renaissance had its roots in Europe. During the 1840s, besides Fleischmann, other Americans reported on agricultural conditions in Europe. They included Henry Coleman, a prolific writer, who was impressed with European agricultural education. The same decade saw a number of Americans travel to Europe to seek graduate-level scientific training relating to agriculture, particularly in chemistry, and in the laboratory of Justus Liebig in Giessen, Germany.⁸¹

⁷⁶ M. E. Pickard, 'Government and science in the United States: historical backgrounds', I. The Columbian Institute, II, The National Institute, *J. Hist. of Medicine and Allied Sciences*, 1 (1946), p. 289. In doing so, in her view, it helped save the Smithsonian from being 'a school, an observatory or an agricultural experiment station'.

⁷⁷ True, *Education*, p. 89; L. Carrier, 'The United States Agricultural Society, 1852-1860,' *Agricultural Hist.* 11 (1937), p. 279.

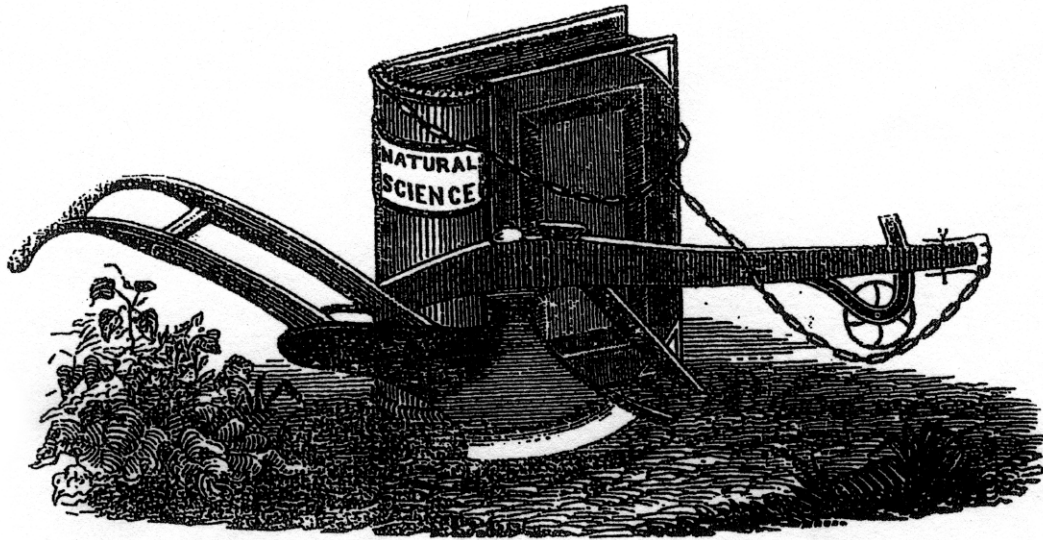
⁷⁸ These included the Gardner Lyceum in Maine, the Agricultural Seminary at Derby, Connecticut, the Cream Hill Agricultural School in Connecticut, and the Boston Asylum and Farm School (True, *Education*, pp. 33-9; W. Stemmons, *Connecticut Agricultural College - a his-*

tory (1931), pp. 5, 20-1. Others in New York State are noted in Colman, *Cornell*, pp. 12-13.

⁷⁹ True, *Education*, p. 35.

⁸⁰ S. Fletcher, *Pennsylvania agriculture and country life, 1840-1940* (1955), pp. 480-1; *Catalogue of the Mount Airy Agricultural Institute, Germantown, Pa., Designed for instruction in scientific and practical agriculture, mathematics and the natural sciences* (Philadelphia: T. K. and P. G. Collins, Printers, 1849). For the experience of a similar French school, see A. R. H. Baker, 'Farm schools in nineteenth-century France and the case of La Char-moise, 1847-65,' *AgHR* 44 (1996), pp. 47-62.

⁸¹ C. H. Danhof, 'American evaluations of European agriculture,' *J. Economic Hist.*, Supplement 9 (1949), pp. 66-7; Gates, *Farmer's age*, p. 355; Rossiter, *Liebig*, pp. 49-67.



**Science must combine with practice to constitute enlightened
and skillful Agriculture.**

FIGURE 4. Emblem and motto of the Mount Airy Agricultural Institute, Germantown, Pa., 1849.

Source: *Catalogue of the Mount Airy Agricultural Institute, Germantown, Pa., Designed for instruction in scientific and practical agriculture, mathematics and the natural sciences* (1849).

Interest in establishing agricultural schools and training continued in these years. In February 1850 George Watterston wrote to the *National Intelligencer* (Washington), observing that other countries had established agricultural schools, and suggested one of 600 acres (1480 ha.):

The fittest and most suitable locality for the proposed college would be the District of Columbia, the seat of the general government, where land can be easily obtained, and the Institution would be immediately under the eye of Congress. To this college youths of different ages and from all parts of the Union, may be sent, and go through a complete course of scientific agricultural education ... by diffusing this knowledge every where among their countrymen, they will be able to call out, to an unlimited extent, the agricultural resources of the country.⁸²

Similarly, Charles Fleischman reemerged in 1853 with an article on 'Agricultural Education' in the short-lived *American Polytechnic Journal*.⁸³ As before, he emphasized agricultural schools and included a copy of his 1838 proposal, noting that 'we thought it would form a

Note 81 *continued*

A similar pattern was followed in veterinary medicine: A. L. Olmstead, 'The first line of defense: inventing the infrastructure to combat animal diseases', *J. Economic Hist.* 69 (2009), p. 333.

⁸² G. Watterston, 'Agricultural College - No. III',

National Intelligencer (19 Feb. 1850), p. 3. In Apr. 1850, a letter to the editor of the *Intelligencer* supported a memorial presented to the Agricultural Committee of the Senate 'praying' for such a college (letter to the editor from 'A friend to agriculture,' 4 Apr. 1850, p. 3).

⁸³ See n. 58.

central agricultural institute, from which hundreds would have gone forth and built up new institutions'. This time his emphasis was on the southern states: 'instead of making their sons military or professional men, let them be sent to agricultural schools where practical, theoretical agriculture is properly taught'.⁸⁴

Qualified teachers, however, were in short supply. In an article in the *Cultivator* in March 1852, John P. Norton, a noted professor of agricultural chemistry at Yale – which by 1860 was a leader in agricultural science – expressed his concern about the lack of properly qualified teachers and scientists:⁸⁵

I consider this lack of first rate instructors, one of the most pressing and urgent; it is useless for him to establish schools, unless he can find proper teachers, and he ought not to be driven, by their premature establishment, into any dependence on those who can only mislead and disappoint him ... If but fifty or one hundred intelligent young men, would for the coming few years, devote their efforts to the acquisition of the various branches of science connected with agriculture, they would control the whole field, and be able to sweep away the glaring errors which are now so prevalent.⁸⁶

This didn't immediately come to pass, but interest in establishing state agricultural colleges of agriculture and research stations continued to grow, though with some dissident voices.⁸⁷

Among the national groups, the United States Agricultural Society (a successor to the Agricultural Society of the United States) made the most effort. An inaugural meeting was held in Washington in June 1851. The group, which flourished from 1852 to 1860, established its headquarters in Washington and held all of its meetings at the Smithsonian. The principal item of business at its June 1852 meeting was consideration of a recommendation for the establishment of 'a Department or Bureau of Agriculture by Congress'.

At the June 1852 meeting of the Society, Senator Stephen Douglas and Secretary Joseph Henry of the Smithsonian crossed philosophical swords, creating what was later viewed as a 'pivotal

⁸⁴ C. L. Fleischmann, 'Agricultural education', *American Polytechnic J.* II (1853), pp. 166–77, quotations from pp. 169–70. Gates later wrote: 'Had the men in charge of the new institutions that were created in the sixties and seventies carefully examined Fleischmann's treatise, they might have avoided some of the blunders into which they fell' (*Farmer's age*, p. 370).

⁸⁵ Norton was appointed to a newly created chair of agricultural chemistry and animal and vegetable physiology in 1846, 'it being the understanding that [his support] ... is in no case to be chargeable to the existing funds or revenue of the college': D. J. Struik, *Yankee science in the making: science and engineering in New England from colonial times to the present* (1991), pp. 430–1. Short courses later provided one source of income and according to one account drew more than 125 students from 'a great number of different states': L. Bartlett, 'Agricultural lectures at New Haven,' *The Country Gentleman* (16 Feb.

1860), p. 105).

⁸⁶ J. P. Norton, 'The necessity for a proper system of agricultural instruction in agricultural science' *Cultivator* IX (Mar. 1852), pp. 107–8 (repr. in Demaree, *Press*, pp. 245–9); Gates, *Farmer's age*, p. 366. The shortage of qualified teachers continued to at least 1889: W. H. Shepardson, *Agricultural education in the United States* (1929), pp. 49–50.

⁸⁷ One farmer from Massachusetts, for instance, wrote that such schools would confer 'upon a few men a rich and lucrative office, which they never were by experience calculated to fill, and an attempt to educate a few of the sons of certain families in an art which they are entirely unfitted by nature and habit to follow, and one which they rarely would adopt as an occupation', W. A., 'Agricultural colleges', *New England Farmer*, IV (1852), pp. 267–8 (repr. in Demaree, *Press*, pp. 250–2).

moment' for the Institution. On the first evening, according to an account of the time, Douglas proposed that 'a department of agriculture should be attached to the Smithsonian Institute and believed that this would be more in accordance with the views of Smithson than the course pursued at present by those in charge of the Institution.' He went on to observe that 'There were now no practical results' and that 'the Institution must make itself useful and not waste its investigations upon the stars and heavenly planets and other matters which had no practical bearing'.

Secretary Henry, provoked, responded that the proposal 'was sprung on him now for the first time' and: 'As for the plan ... to make the Institution an agricultural society, he would rather blow it up, and send the funds back to the Chancery of England'. He went on to say: 'For the *diffusion* of knowledge there were thousands of institutions where there was *one* for its increase' and felt that 'agriculture is to be more advanced by the microscope than the plough and harrow'. Douglas, replying, asked 'why did it not devote itself to corn instead of sea weed' and stated that last year when he had 'privately stated his views on the subject to Prof. Henry', the latter had taunted him and said that it would be turning the Institution into a 'cow pasture'. The next day, things cooled down considerably. Henry apologized 'for anything objectionable in his speech or manner' and promised that the Institution would do all that it could 'for the cause and interests of agriculture'. Douglas said that he had misunderstood Henry's comments of a year before and that 'what the professor had spoken in joke he had supposed to have been seriously said'.⁸⁸

Joseph Henry was a prominent physicist who had become Secretary of the Smithsonian in 1846. His 1847 'Program of Organization' laid out activities that he felt were in accordance with Smithson's will and were shaped by the legislation establishing the Institution. He advocated support of original scientific research and its publication (to increase knowledge) and included popular publications, lectures, a museum, and a library (to diffuse knowledge; largely in response to the legislation). While the 'Program' did not specifically include agriculture under original research, it did appear under the types of more general reports that might be issued.⁸⁹

One of Henry's guiding principals was that the Smithsonian would not fund activities that could be funded by other government agencies or the private sector. Taking advantage of the opportunity offered by the Patent Office, he later provided detailed reports on 'Meteorology in Connection with Agriculture' in the annual 'Report of the Commissioner of Patents' from 1855 to 1859. He also used funds appropriated to the Patent Office to support the Institution's meteorological and climatological research.⁹⁰ Perhaps he might have been receptive to proposals

⁸⁸ 'National agricultural convention,' *National Intelligencer* (26 June 1852), p. 3; M. Rothenberg (ed.), *The papers of Joseph Henry* (12 vols, 1972–2008), VIII, pp. xviii–xx, 344–5, 351–2; pers. com. from Rothenberg, Nov. 2006.

⁸⁹ Washburn, *Great design*, unnumbered annex after p. 95, 4pp.; pers. com. from Marc Rothenberg, April 2009. The 'Program' and its early implementation is discussed in Rothenberg (ed.), *Papers*, VIII, pp. xiii–xxv. Henry viewed the provision that up to \$25,000 be used for a library as a particular threat. He was not interested

in this function and in 1847 the Board agreed to use half of the income from the bequest (which totaled about \$30,000), for science and half for the museum and the library. Thereafter, Henry shed the library function to the Library of Congress whenever he could: Ostrowski, *Books*, pp. 151–170; Dupree, *Science*, pp. 80–5; C. A. Goodrum and H. W. Dalrymple, *The Library of Congress* (1982), pp. 22–3.

⁹⁰ This link is briefly discussed in J. R. Fleming, *Meteorology in America, 1800–1870* (1990), pp. 125–8.

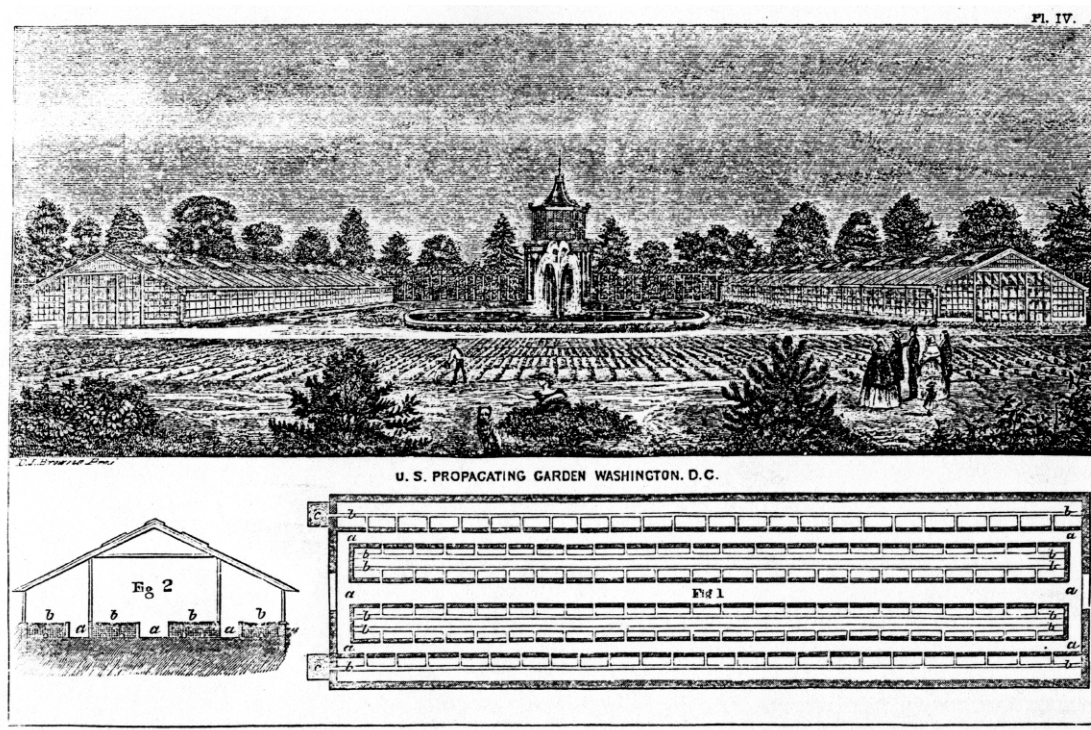


FIGURE 5. Proposed design of the Propagating Garden on the Mall between 4½ and 6th Streets, presently part of the area occupied by the National Gallery of Art, 1858 (the central structure evidently was not built).

Source: 'Report of the Commissioner of Patents for the Year 1858, Agriculture', House of Rep., 35th Congress, 2nd Session, Exec. Doc. No 105, 1859, frontispiece.

for scientific research of some type in agriculture (he was the keynote speaker at the opening ceremonies of Maryland Agricultural College in 1859).⁹¹ But none of this came to pass and his comments marked the end of Smithsonian involvement in agriculture at the time, although some linkages emerged later.⁹²

Beyond this, other federal agencies continued their agricultural work or were established. In 1856, the Commissioner of Patents requested a tract of land where work on 'cultivating and propagating seeds and cuttings' might be undertaken. He was allocated six acres on the Mall, north of the canal and fronting on Missouri Avenue, and between 4½ Street (no longer extant) and 6th Street. In 1858, this was designated as the Propagating Garden and the erection of

⁹¹ 'Maryland Agricultural College', *Daily National Intelligencer* (6 Oct. 1859), issue 14, p. 719. Also mentioned in a longer article on 10 Oct., p. 722.

⁹² These involved the biological sciences. In 1869, Henry initiated the transfer of the embryonic herbarium to the Department: True, *Research* (1937), pp. 48–9; Ewing, *Smithson*, p. 332; P. J. Pauly, *Biologists and the promise of American life: from Meriwether Lewis to Alfred*

Kinsey (2000), p. 62. In 1876, interactions involving the USDA insect collections began: in 1886 they were transferred to the Smithsonian and in 1895 several USDA staff members were designated as custodians: J. M. Aldrich, 'The division of insects in the United States National Museum', *Annual Report of the Smithsonian Institution for 1919* (1921), pp. 367–8; W. C. Sorensen, *Brethren of the net: American entomology, 1840–1880* (1995), pp. 57–8.

buildings and greenhouses followed (see Figure 5). Responsibility was later transferred to the new Department of Agriculture.⁹³

During the 1850s, the Agricultural Society had focused its efforts on securing two key pieces of legislation: the Morrill Land Grant Act for the establishment and support of state colleges of agriculture and mechanic arts, and the law creating the United States Department of Agriculture. With the onset of the Civil War in April 1861, the Southern opposition to these efforts literally seceded and, with the ascendancy of the agricultural states in the west stimulated by the Homestead Act, increased educational and scientific support for agriculture became possible. The two acts, both signed into law by Lincoln in 1862, were indeed 'the culmination of campaigns begun during the American Renaissance'.⁹⁴

While neither law was explicit about research, the House Committee on Agriculture, in its report on the Department bill, noted the establishment of agricultural experiment stations in England and France and stated that accurate knowledge of the processes of nature 'can be obtained only by experiment, and by such and so long continued experiments as to place it beyond the power of individuals or ordinary voluntary associations to make them'.⁹⁵

But as we will see, the realization of both the educational and research goals proved to be a difficult and protracted process. In retrospect, one might wonder if – had the Smithsonian grant arrived later, during the period of the 'agricultural renaissance' – some of the proposals put forward by Fleischman and others might have received wider and more effective support and the Institution itself might have been involved in the generation and diffusion of agricultural knowledge.

VI

During the last third of the century, the groundwork that had been laid in the public sector during the first two thirds began to bear fruit, although not quickly or easily. But by the turn of the century a solid base had been laid in the state colleges of agriculture and agricultural experiment stations and in the United States Department of Agriculture for the increase and diffusion of agricultural knowledge in the nation.

In the case of the colleges, the period from 1860 to 1890 has been termed as one of 'slow beginnings' by Rossiter and 'a very dull childhood' by Waggoner.⁹⁶ It exemplified some of the earlier concerns

⁹³ V. Wiser and W. D. Rasmussen, 'Background for plenty: a national center for Agricultural research', *Maryland Historical Magazine* 61 (1966), pp. 284–6.

⁹⁴ Dupree, *Science*, pp. 149–51; L. Carrier, 'The United States Agricultural Society, 1852–1860', *Agricultural Hist.* 11 (1937), pp. 278–88; True, *Education*, pp. 89–90; Rhees, *Smithsonian documents*, pp. 238–9; Waggoner, 'Research', p. 234 (source of quotation).

⁹⁵ 'U.S. Department of Agriculture', *The Congressional Globe* 33 (17 Feb. 1862), pp. 885–6; see also E. W. Hilgard, 'Progress in agriculture by education and government aid', *Atlantic Monthly* (Apr. and May 1882), p. 659. In the summer of 1862, American agriculturalists, including

Ezra Cornell, visited Rothamsted and agricultural trials in Grignon, France: R. O. Cummings, 'American interest in world agriculture, 1861–1865', *Agricultural Hist.* 23 (1949), p. 118). Cornell and President White also 'visited British and other European agricultural colleges in 1868 in the hope of bringing home some useful ideas': Colman, *Cornell*, p. 53.

⁹⁶ M. W. Rossiter, 'The organization of the agricultural sciences,' in A. Oleson and J. Voss (eds), *The organization of knowledge in modern America, 1860–1920* (1979), pp. 213–16; Waggoner, 'Research and education', pp. 243–4. Also see: Hilgard, 'Progress in Agriculture', pp. 531–41, 651–2; D. B. Danbom, 'Publicly sponsored agricultural

of Norton. By 1872, eleven new colleges had been started and another fifteen added to state universities.⁹⁷ The first group included Michigan Agricultural College in 1855 and Maryland Agricultural College in 1858.⁹⁸ In the latter case, the President of the Board of Trustees, Charles Calvert, stated that: 'This was not to be only an American edition of a European Manual Labor School – its aims and its destiny, he trusted, were to be far higher, and its results would be felt, if not immediately, yet ultimately [by] ... the great, but not sufficiently co-operating agricultural class.'⁹⁹

Such aspirations, however, faced two challenges that had emerged in earlier efforts in agricultural education or were forecast by Norton. First there was difficulty in identifying suitable agricultural teachers and, second, a shortage of students. These problems were typified by the College of Agriculture at Cornell University, established in 1868. Finding staff proved difficult and involved recruiting from the existing agricultural colleges, 'which had recently gone through the same difficult process'. Scientific staff proved considerably easier to obtain than qualified professors of agriculture who were definitely 'scarce'. In the latter case, after several missteps, the first successful appointee (who did not even have a college degree) was not in place until 1874.¹⁰⁰ Student numbers at Cornell and elsewhere were initially disappointing. In Cornell's case, enrolment totalled only 30 in 1868–9 and was composed largely of 'city boys'. Numbers dropped to seven in 1873, creating a crisis, but subsequently increased to an average of 35 from 1876–7 to 1880–1. Many students, however, only stayed for relatively short periods, resulting in fewer actual graduates.¹⁰¹ A similar situation existed at Michigan Agricultural College.¹⁰² Enrolment levels were initially even lower at some other land grant institutions – the Universities of Wisconsin, Minnesota and California, for instance – throughout the early 1880s. Thereafter, enrolments generally expanded.¹⁰³

Under these conditions, relatively little research was initially done by the colleges. Moreover, there were widespread differences in opinion concerning the appropriate balance between science and practice.¹⁰⁴ But there was keen interest in state agricultural experiment stations and

Note 96 *continued*

research in the United States from an historical perspective', in K. A. Dahlberg (ed.), *New directions for agriculture and agricultural research* (1986), pp. 110–14.

⁹⁷ L. Ferleger and W. Lazonick, 'Higher education for an innovative economy: land-grant colleges and the managerial revolution in America', *Business and Economic Hist.* 23 (1994), pp. 118, 123. Some colleges included mechanic arts.

⁹⁸ W. J. Beal, *History of the Michigan Agricultural College and biographical sketches of trustees and professors* (1915), pp. 14–15; Madison Kuhn, *Michigan State: the first hundred years* (1955), pp. 9–17; True, *Research*, pp. 71–2, 74–5.

⁹⁹ 'Maryland Agricultural College – laying the corner stone', *The American Farmer* XIV, No. 3 (Sept. 1858), pp. 65–66. The college was established on 428-acre farm sold by Calvert: M. Callcott (ed.), *Mistress of Riversdale* (1991), p. 393. He, with others, 'initially aspired to make that institution, with its experimental farm, national in

scope" (Wiser and Rasmussen, 'National center', p. 285) and was also a leader in efforts to establish the U.S. Department of Agriculture (True, *Research*, pp. 37–9).

¹⁰⁰ Colman, *Cornell*, pp. 45–56.

¹⁰¹ Colman, *Cornell*, pp. 49, 57–8, 61, 69.

¹⁰² Beal, *Michigan*, pp. 287–94.

¹⁰³ Colman, *Cornell*, p. 79; Waggoner, 'Research and Agriculture', p. 243; Ferleger and Lazonick, 'Land Grant', p. 118.

¹⁰⁴ These differences were also found in Europe. The German case has been explored in depth, and other nations briefly noted, by Harwood, *Technology's dilemma*, pp. 77–234. In England, the South-Eastern Agricultural College (Wye, Kent) gave initial emphasis to the science, was fortunate in the calibre of its staffing, and was quickly well received by the agricultural community: S. Richards, 'The South-Eastern Agricultural College and public support for technical education, 1894–1914', *AgHR* 36 (1988), pp. 172–87).

15 were established between 1875 and 1887.¹⁰⁵ In 1887 the Hatch Act was passed, providing each state with \$15,000 annually to fund an agricultural experiment station. They in turn experienced growth problems stemming in part from a lack of trained personnel.¹⁰⁶

Up to this point, the German agricultural experiment stations – which gave considerable attention to laboratory-based and longer-term research – were widely venerated. According to Finlay: ‘Rhetoric praising [of] German stations accelerated in the 1870s, appearing in countless discussions on the future of American agricultural science. Several federal and state organizations sent delegations to the German states for reports on the stations.’ But with the passage of the Hatch Act, ‘German stations’ importance suddenly diminished’ and ‘foreign governments sent delegates to tours of the United States ... to inform plans for future stations.’¹⁰⁷

Still, there was substantial interest in international developments. In 1902 the Department of Agriculture issued an extraordinarily detailed bulletin on ‘Agricultural experiment stations in foreign countries,’ with a revision in 1904.¹⁰⁸ It also published three lectures sponsored by the Lawes Agricultural Trust on its work at Rothamsted, which were delivered in the United States from 1891 to 1901.¹⁰⁹

The Department experienced a mixed pattern in its early growth.¹¹⁰ In physical terms, it faced limitations. It initially inherited the Propagating Garden from the Patent Office. In April 1863 it was assigned Reservation #2, 40 acres on the Mall between 12th and 14th streets and the

¹⁰⁵ H. C. Knoblauch, E. M. Law and W. P. Meyer, *State experiment stations: a history of research policy and procedure*, (Washington: U.S. Department of Agriculture, Misc. Pub. 904, 1962), pp. 19–28; True, *Research*, pp. v, 82–106.

¹⁰⁶ See: True, *Research*, 34–164; C. E. Rosenberg, ‘Science, technology, and economic growth: the case of the agricultural experiment station scientist, 1875–1914,’ *Agricultural Hist.* 45 (1971), pp. 1–20; Rosenberg, ‘Rationalization and reality in the shaping of American agricultural research, 1875–1914,’ *Social Studies of Science* 7 (1977), pp. 401–22; Rossiter, ‘Organization of science,’ pp. 211–48; ‘The role and development of public agricultural research’ in *An assessment of the United States food and agricultural system* (Congress of the United States, Office of Technology Assessment, December 1981), pp. 28–43; and L. Ferleger, ‘Uplifting American agriculture: experiment station scientists and the Office of Experiment Stations in the early years after the Hatch Act,’ *Agricultural Hist.* 64 (1990), pp. 5–23. A. I. Marcus, *Agricultural science and the quest for legitimacy: farmers, agricultural colleges, and experiment stations, 1870–1890* (1985), provides a particularly detailed history of the background and enactment of the Hatch Act.

¹⁰⁷ M. R. Finlay, ‘Science, practice and politics: German agricultural experiment stations in the nineteenth century’ (Unpublished Ph.D. diss., Iowa State University, 1992), pp. 351, 367–8 (further details are provided on pp. 352–67). Also see L. A. Ferleger: ‘Transatlantic

travails: German experiment stations and the transformation of American agriculture,’ in T. Summerhill and J. C. Scott (eds), *Transatlantic rebels: agrarian radicalism in comparative context* (2004), pp. 245–63; L. A. Ferleger, ‘European agricultural development and institutional change: German experiment stations, 1870–1920,’ *J. Hist. Soc.* 3 (2005), pp. 417–28.

¹⁰⁸ A. C. True and D. J. Crosby, *Agricultural experiment stations in foreign countries* (U.S. Department of Agriculture, Office of Experiment Stations, Bulletin 112, 1902), pp. 1–230. This now little-known survey was a response to ‘considerable demand for information of this type’ (p. 3). Altogether, 45 nations and 720 programmes were included. The introduction (pp. 21–7) and country information provide a remarkable overview of the state of global agricultural research at the turn of the century. A revised and expanded version (Bulletin 112 Rev.) was issued in 1904; it included 51 nations and 798 activities.

¹⁰⁹ These were Bulletins 8, 22, and 106. The latter was titled ‘Results of investigations on the Rothamsted soils’ and was delivered by Dr. Bernard Dyer to the Association of American Agricultural Colleges and Experiment Stations at New Haven and Middletown, Connecticut in November 1901 and was issued in 1902. The first two lectures were published in editions of 5,000 and 6,000 and were out of print by that time.

¹¹⁰ Hilgard, ‘Progress in agriculture,’ pp. 654–61; Danbom, ‘Agricultural research,’ p. 114.

Washington Canal (now Constitution Avenue) and B street (now Independence Avenue), just west of the Smithsonian. Trials of various crops were carried out in 1866 and 1867, but the area was both limited and inappropriate and trials were discontinued in 1868. The Department then requested a large farm of 200 acres 'contiguous to the city'. Its Mall site was increasingly used for buildings and greenhouses, though some field trials were continued to a diminishing extent. The first structure of consequence was a three-story brick structure (Figure 6), not notably different in size from Fleischman's proposed building (Figure 1), constructed on the south side of the Mall in 1867–8.¹¹¹

Meanwhile, the hunt for land for experimental purposes continued. In 1878, the Commissioner of Agriculture requested 1000 acres in the vicinity of the city. Subsequently, in 1890, another Commissioner requested use of 400 neglected acres of the Arlington tract near the river (the former Lee estate and subsequently Arlington Cemetery). There was no immediate action and the Department was permitted temporary use of up to 75 acres on the Potomac flats (reclaimed land now known as Potomac Park and south of the Jefferson Memorial). Approval for transfer of the Arlington tract came in 1900 and land preparation began.¹¹²

The Department, paradoxically, was able to move more quickly and with greater effect on the scientific side. While, as Dupree put it, the evolution of its organization was 'somewhat halting and painful ... scientific excellence, thriving in unexpected places, became increasingly prominent'. Although 'the dirt farmer ... did not look to science for his salvation, possibilities of research producing relevant answers to the urgent problems confronting agriculture were apparent to pressure groups responding to the farmer's plight'. They could reach the federal government through Congress and between 1880 and 1897 the Department 'answered the call'.¹¹³ It was able to recruit some outstanding scientists and by 1890 had evolved into what one scholar said, perhaps arguably, was 'the strongest voice for scientific policymaking in the federal government'.¹¹⁴ The overall effect was that by 1900, the 'USDA had in place a managerial organization to enhance the nation's capability to promote agricultural science' and that, 'despite myriad problems, agricultural science was firmly footed'.¹¹⁵ Moreover, it had established a reputation 'as the principal scientific agency of American government'.¹¹⁶ During

¹¹¹ Some of the early story is recounted in D. G. Dalrymple, 'Agriculture, architects and the Mall, 1902–1905: the plan is tested', in S. Kohler and P. Scott (eds), *Designing the nation's capital: the 1901 plan for Washington, D.C.* (2006), pp. 206–43. A more comprehensive review is provided in Wiser and Rasmussen, 'National center', pp. 286–92.

¹¹² It became known as the Arlington Experimental Farm and was operated until 1941 when it was taken over for military use (the Pentagon was built just south of the farm and some of its land became the north parking lot) and the research programme and some other activities in the area, including department greenhouses on the Mall, moved to new facilities in Beltsville (Wiser and Rasmussen, 'National center', pp. 291–7).

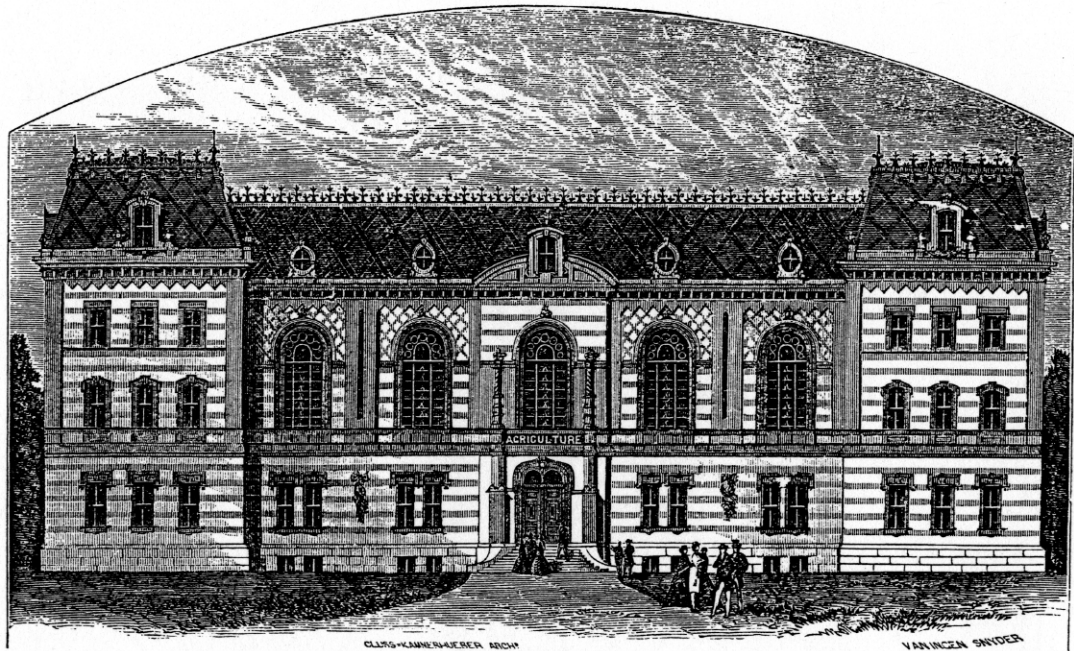
¹¹³ Dupree, *Science*, p. 158.

¹¹⁴ D. P. Carpenter, *The forging of bureaucratic*

autonomy: reputations, networks, and policy innovation in executive agencies, 1862–1928 (2001), pp. 179, 212.

¹¹⁵ L. Ferleger and W. Lazolick, 'The managerial revolution and the developmental state: the case of U.S. agriculture', *Business and Economic Hist.* 22 (1993), p. 85; L. Busch and W. B. Lacy, *Science, agriculture, and the politics of research* (1983), p. 12; Olmstead, 'First line', pp. 327, 333, 349.

¹¹⁶ Carpenter, *Forging*, p. 212. Marcus states that USDA and state experiment station scientists 'dominated life sciences research from 1870 to 1950 when the National Science Foundation and the National Institutes began a "meteoric rise": A. I. Marcus, 'The wisdom of the body politic: the changing nature of publicly sponsored American agricultural research since the 1830s', *Agricultural Hist.* 62 (1988), p. 4.



DEPARTMENT OF AGRICULTURE, WASHINGTON, D. C.
J. W. STOKES, *Acting Commissioner*.

FIGURE 6. Artistic depiction of the first, and long the principal, Department of Agriculture Building, designed by Adolph Cluss, and constructed on the Mall in 1867–68.

Source: *Report of the Commissioner of Agriculture for the Year 1866* (1867), frontispiece.

the twentieth century, the United States increasingly became a role model in agricultural research and a source of scientific assistance for other nations.¹¹⁷

VII

The nineteenth century was a formative period for science generally and for the development of improved technologies for agriculture in particular. In the United States, the period between the influence of the founding fathers and the era of Lincoln was one when scientific and technological advances in agriculture were only beginning to find their place. Although there was scattered interest in combining scientific theory and practice in agriculture, particularly among more progressive farmers, virtually their only forms of assistance were agricultural societies and the agricultural press. The need was to increase agricultural knowledge – both scientific and technological – and this required institutions tailored for the task.

¹¹⁷ See, for example, D. G. Dalrymple: 'Global agricultural research organization', *World food and nutrition study: supporting papers* (Washington, The National Research Council, 5 vols, 1977), V, pp. 91–110; 'Joseph A. Rosen and early Russian studies of American agriculture', *Agricultural Hist.* 38 (1964), pp. 157–60; and 'American technology and Soviet agricultural development, 1924–33', *Agricultural Hist.* 40 (1966), pp. 187–206.

The appropriate role of government and the public sector in this process, however, was far from certain. As Washburn put it: 'The sources of support for basic science and the conditions of its pursuit, which had existed in the eighteenth century, had disappeared by the 1830s'. Or in Danbom's words: 'What the statesmen of the young republic failed to do was to provide systematic support for agricultural science'.¹¹⁸

The announcement of the Smithsonian bequest in 1835 for the increase and diffusion of knowledge not only provided the means for the federal government to engage but also stimulated a prolonged debate on what was called for. Adams, initially almost alone, continued to press for the increase of basic knowledge. The majority of the proposals, however, were of a more applied nature. One of the basic questions was clearly the balance to be struck for the Smithsonian bequest and more generally.

Agriculture, by far the leading business of the nation, played a significant but hitherto little-known role in those discussions. In the context of the bequest, the proposal by Fleischmann was too narrowly focused and much too expensive. It ran completely counter to the views of Adams, who also opposed the use of the bequest for educational institutions and who favoured the generation of new scientific knowledge, as did Henry later. Moreover, other groups and Congress had widely different interests.

While the Tappan-Owen proposal came closer to meeting the purposes of the bequest and two of Adams' concerns (that it would have used only interest on the bequest and that it had a scientific orientation, particularly in the designation of 'professors' in half a dozen or more areas), its orientation was clearly towards applied science and technology and some of its other provisions were more of an educational nature. In the end, the nineteenth-century Smithsonian came to reflect more of a mixed pattern with respect to science and education, but with emphasis on a museum function embracing technology.¹¹⁹

Had either proposal actually come to fruition, possibly in modified form, subsequent developments in agricultural science and technology might have been facilitated and accelerated. One of the three educational steps of the Fleischmann submission could have provided an early start on the training of agricultural teachers and scientists that were to be needed by new public institutions later in the century. Similarly, the Tappan-Owen proposals for research and outreach could have provided a nationally oriented start in these areas and could have been furthered by the later Douglas-Rush proposals.

The extended debates, however, provided an opportunity to voice the need for improvements in agricultural education, research, and outreach to Congress and a national audience. They served as catalysts at the time and formed the leading edge of a broader movement that subsequently led to the establishment of the United States Department of Agriculture and the Land Grant Colleges. In looking back on this period, Shepardson observed in 1929 that 'The Land Grant Colleges did not spring, like Athene, full-armed from the brain of Zeus: they grew out of experience'.¹²⁰

¹¹⁸ Washburn, 'Introduction', p. 35; Danbom, 'Agricultural research', p. 108.

¹¹⁹ Bemis, *Adams*, p. 522, suggests that it 'took the shape rather of a national museum or treasure house for the federal government's scientific curiosities ... than of

a carefully organized research institution ... There still remained a need for advanced research institutions in Washington ...'

¹²⁰ Shepardson, *Agricultural education*, p. 23.

Part of this experience was European and initially stemmed from Fleischmann's proposals, reports and articles. Shepardson referred in part to 'A thorough study of European agricultural teaching and research training made by a government agent [and that] had twice been reprinted with the authorization of Congress.'¹²¹ This was almost certainly one of Fleischman's papers. He also gave numerous talks, which 'stimulated interest in state agricultural colleges'.¹²²

During that earlier period the Smithsonian bequest looms as perhaps the most significant individual action. The debates that it initially stimulated were the prelude to a period of significant institutional change in the organization and conduct of science and technology. And with the founding of the Smithsonian Institution, in Pickard's words, 'the first truly comprehensive national scientific agency, the interrelation of science and the national government was firmly established'.¹²³ But the policy issue that hovered over its creation – the balance to be struck between 'increasing' and 'diffusing' knowledge and between science and technology – continues, both for it and many other public educational and scientific institutions.¹²⁴

These events reflected the interplay of science and the need for appropriate technologies, public wishes and Congressional actions, and local, national and international influences. Agriculture was at or near the centre of these issues and discussions. Hence the debates and issues of the time may both help shed new light on a relatively neglected period in agricultural history and provide historical perspective on some broader and continuing public policy issues in applied science and technology. They may be both postscript and prelude.

¹²¹ Ibid.

¹²² Gates, 'Fleischman', p. 16.

¹²³ M. E. Pickard, 'Government and science in the United States: historical backgrounds, III. The Smithsonian Institution', *J. Hist. of Medicine and Allied Sciences* 1 (1946), p. 481.

¹²⁴ See: J. Giles, 'Smithsonian looks beyond ousted boss', *Nature* 446 (2007) p. 594; E. Pennisi, 'Turnover at the top, but problems persist at the Smithsonian', *Science*

316 (2007), pp. 30–1; R. Moe, 'What is the Smithsonian?' *Washington Post* (4 Apr. 2007), p. B7. For other examples, see: D. G. Dalrymple, 'Setting the agenda for science and technology in the public sector: the case of international agricultural research', *Science and Public Policy* 33 (2006), pp. 277–90; and D. Sarewitz, 'Does science policy matter?' *Issues in Science and Technology* 23 (2007), pp. 31–8.