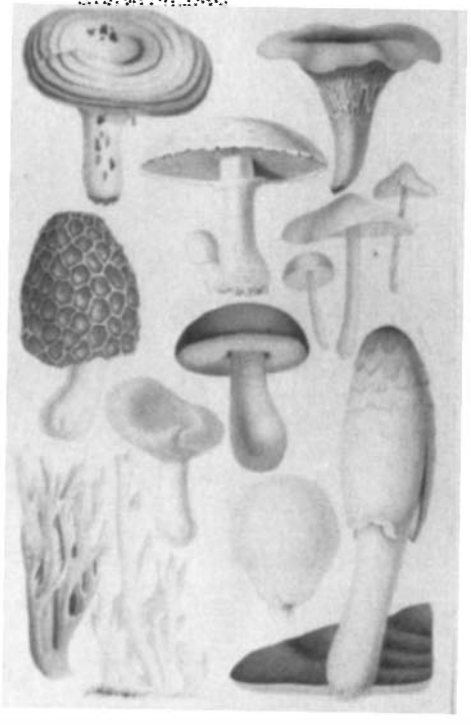

U. S. DEPARTMENT OF AGRICULTURE.
DIVISION OF MICROSCOPY.

FOOD PRODUCTS. I.

TWELVE EDIBLE MUSHROOMS OF THE UNITED STATES,
WITH
DIRECTIONS FOR THEIR IDENTIFICATION AND
THEIR PREPARATION AS FOOD.

BY
THOMAS TAYLOR, M. D.,
CHIEF OF THE DIVISION OF MICROSCOPY.

REPRINTED BY AUTHORITY OF THE COMMISSIONER OF AGRICULTURE,
WITH NEW TITLE.

WASHINGTON:
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1894.

No photograph of Thomas Taylor could be found. The editor of the Annual Review of Phytopathology wishes to thank Kenneth Hobson, of the Department of Entomological Sciences, University of California at Berkeley, for his assistance in obtaining a photograph of Thomas Taylor's pamphlet.

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THE ROLE OF THOMAS TAYLOR IN THE HISTORY OF AMERICAN PHYTOPATHOLOGY

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Thomas Taylor (1820–1910) occupies a unique position in the history of American plant pathology. Appointed Microscopist to the United States Department of Agriculture in 1871, Taylor was responsible for the first USDA publications on microscopic plant pathogens. From 1871 until 1885, when the Section of Mycology was organized under F. Lamson Scribner, Taylor and his Division of Microscopy performed all systematic work within the USDA on plant pathogens and the causes of disease. Yet Taylor rarely receives more than a footnote in historical accounts, and his work has been almost universally ignored. Stevenson (7) has called Thomas Taylor the "forgotten man of phytopathology."

The silence surrounding Taylor is no historical accident. Ainsworth (1) refers to it as a tradition. Apparently, Taylor's colleagues and successors in studying plant disease within the USDA purposely omitted any reference to his work (6, 7). It is significant that in reviewing the history of plant pathology within the USDA, B. T. Galloway (3), influential Director of the Section of Vegetable Pathology and contemporary of Taylor, made no mention at all of the latter.

What brief mention is made of Taylor by scientific historians is almost entirely unfavorable. They refer to his lack of botanical training, obtuseness, and tendency to dabble in many disjunct areas of research (5, 6, 7). His work has been labeled derivative (5) and of indifferent quality (1). His writings were described by Stevenson (7) as "rambling, discursive, full of high-sounding words and phrases which meant nothing on analysis, replete with irrelevant material, and successful only in obscuring the few items of interest which could have been noted to his credit."

The harsh tone of this criticism derives in part from Taylor's inability to

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become a scientific presence equal to his historical position. However, it is more reasonable to judge his accomplishments in relation to his background and assigned duties. Taking this point of view, Harding (4) offered a uniquely positive appraisal of Taylor as "a remarkable scientist for his day. He investigated and made interesting discoveries about cranberry rot, mushroom culture, grape mildew, peach yellows, and plum diseases, and in every instance gave growers assistance which benefited them financially."

The facts of Taylor's life, as outlined by True (25), indicate that he was an educated man with broad scientific interests. Born in Perthshire, Scotland, he studied physics and chemistry at Glasgow University, and art and drawing at the British School of Design. At the request of President Lincoln, Taylor came to the United States in 1851 to conduct experiments concerning faulty artillery shells, a project compatible with his background in the physical sciences (6). In 1871, he was brought into the young Department of Agriculture, organized only nine years earlier in 1862 out of the small Agricultural Division of the Patent Office. Initially the sole microscopist in the department, with a single microscope, Taylor later became Chief of his own Division of Microscopy. During his years in Washington, he also studied medicine at Georgetown University, receiving his M.D. degree in 1882 and practicing medicine outside of his hours at the USDA. His association with the USDA ended when the Division of Microscopy was discontinued in 1895.

All of Taylor's writings on plant disease appeared in the monthly and annual reports of the Department of Agriculture for the years 1871–1885. These frequently included lengthy discussions of theories proposed by European pathologists and botanists. His experimental work was small in scale, usually consisting of a comparison of the microscopic appearance of healthy and diseased plant tissues and of the fungi found in plants exposed to different environmental conditions. Taylor also frequently commented on the apparent susceptibility or resistance of different varieties. Unfortunately, he rarely pursued any problem beyond a single unreplicated experiment. By comparing his results to more extensive observations and theories of others, however, Taylor was able to suggest or corroborate methods of disease control.

To a great extent, Taylor investigated everything that came his way. During his first year as Microscopist, 1871, he reported on mildews of grape leaves, fungi and nematodes found in pears, peach yellows, and *Erysiphe* on lilac (8). The report for his second year contains observations on pear blight and smut and on potato late blight and a more extensive article on peach yellows (9). Detailed illustrations accompanied Taylor's reports, but whether these were the work of Taylor personally, or that of a nameless departmental illustrator, is difficult to determine. In a number of instances he acknowledged the assistance of Dr. M. C. Cooke, of London, and Stevenson (6) mentions that the colored plates appearing in Taylor's later publications were taken in part from the early paintings of the botanical artist L. C. C. Krieger.

Taylor took his responsibility to the agricultural public quite seriously. He recommended such control measures as hot lye washes for pear blight and tannic acid washes for *Oidium* on grape vines (8), and was particularly interested in modification of edaphic conditions. Observing that acidic soil was associated with peach yellows, grape mildew, and cranberry rot, he recommended incorporation of lime into the soil. Taylor also developed a process for delinting cotton seed with sulfuric acid, but apparently overlooked the potential usefulness of this process for disease control (5).

At the request of the Commissioner of Agriculture, Taylor devoted much of his time as acting pathologist to problems of cranberry culture, including representing the USDA at the convention of the New Jersey Cranberry Association. In his reports on this project, Taylor (11, 15) commented on the inadequacy of sulfur dusts in controlling cranberry rot, recommended liming the soil and the use of guano fertilizer, and described the chemical composition of pine ash, which was considered by some growers to prevent disease. The New Jersey State Board of Agriculture apparently disagreed with his recommendations concerning lime (12).

Even during his early years with the USDA, Taylor did not confine himself solely to problems of phytopathology. He also investigated techniques of sectioning, staining, and mounting tissue samples (13); illustrated the microscopic appearance of numerous natural fibers; and pursued an interest in both edible and poisonous mushrooms (14). Although his involvement with pathogenic fungi ceased in 1885, Taylor continued to publish descriptions of edible mushrooms, with recipes. Three of these reports were re-issued as separate pamphlets (22, 23, 24), and in 1897 he published the Students' Handbook of Edible and Poisonous Mushrooms (25).

After 1885, Taylor became heavily involved in the detection of contaminants and adulterants in food products. He produced a series of plates illustrating the microscopic appearance of various unadulterated spices (21) and spent much of his time examining the microscopic structure of various fats and oils. Based upon their appearance under polarized light, Taylor claimed to be able to differentiate butter from oleomargarine (16, 17, 19) and lard (23), and to be able to identify oils and fats from different animal species and breeds of cattle (18, 20). These results were hotly disputed before the American Society of Microscopists. Weber (26) considered Taylor's techniques to be "of no practical value in the examination of butter for adulteration," and considered his conclusions "fallacious and opposed to all law and reason." Subsequently, a special committee concluded diplomatically that Taylor's method was "a valuable one, but cannot, with safety, be relied upon under all circumstances as a sole test, independent of other methods" (2).

It was Taylor's misfortune to be a self-taught amateur in a period of growing professionalism in phytopathology. At a time when American pathologists were becoming more specialized in their training and outlook,

Taylor's appointment to the Department of Agriculture must have been seen as a step backward in their quest for independent professional status. His convoluted prose and the fact that he made no earth shaking discoveries concerning plant pathogens certainly explain the lack of attention to his work. However, these demerits do not justify ignoring Thomas Taylor's unusual life and incredibly varied scientific career, or obscuring his seminal historical role in the introduction of plant pathology into federal agricultural research.

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Literature Cited

1. Ainsworth, G. C. 1981. *Introduction to the History of Plant Pathology*. London: Cambridge Univ. Press. p. 207
2. Detmers, H. J., Fell, G. E., Vorce, C. M. 1886. Minutes of the ninth annual meeting. *Proc. Am. Soc. Microscopists* 9:217
3. Galloway, B. T. 1928. Plant pathology; a review of the development of the science in the United States. *Agric. Hist.* 2:49–60
4. Harding, T. S. 1947. *Two Blades of Grass*, p. 30. Norman: Univ. Oklahoma Press
5. Parris, G. K. 1968. *A Chronology of Plant Pathology*. Starkville, Miss.: Johnson & Sons. 167 pp.
6. Stevenson, J. A. 1954. Plants, problems and personalities: the genesis of the Bureau of Plant Industry. *Agric. Hist.* 28:155–62
7. Stevenson, J. A. 1959. The beginnings of plant pathology in North America. In *Plant Pathology: Problems and Progress 1908–1955*, ed. C. S. Holton, G. W. Fischer, R. W. Fulton, H. Hart, S. E. A. McCallan. Madison: Univ. Wis. Press, pp. 14–23
8. Taylor, T. 1872. Report on fungoid diseases of plants. *Rep. Comm. Agric.* 1871:110–22
9. Taylor, T. 1874. Microscopic investigation. *Rep. Comm. Agric.* 1872:188–203
10. Taylor, T. 1874. Microscopic investigation. *Rep. Comm. Agric.* 1873:183–210
11. Taylor, T. 1876. Microscopic observations. *Rep. Comm. Agric.* 1875:187–206
12. Taylor, T. 1876. Microscopic observations. *Mon. Rep. Dep. Agric.* Aug.–Sept. 1876:350–53
13. Taylor, T. 1876. Microscopic observations. *Mon. Rep. Dep. Agric.* May–June 1876:196–98
14. Taylor, T. 1877. Microscopic observations. *Rep. Comm. Agric.* 1876:74–86
15. Taylor, T. 1878. Cranberry culture in New Jersey. *Rep. Comm. Agric.* 1877:569–76
16. Taylor, T. 1879. Oleomargarine and butter. *Am. Q. Microsc. J.* 1:294–95
17. Taylor, T. 1885. Report of the microscopist. *Rep. Comm. Agric.* 1885:89–108
18. Taylor, T. 1886. Butter and fats. *Proc. Am. Soc. Microscopists* 9:128–38
19. Taylor, T. 1887. Report of the microscopist. *Rep. Comm. Agric.* 1886:139–47
20. Taylor, T. 1888. Report of the microscopist. *Rep. Comm. Agric.* 1887:617–25
21. Taylor, T. 1889. Report of the microscopist. *Rep. Comm. Agric.* 1888:559–64
22. Taylor, T. 1893. *Food products. II. Eight edible and twelve poisonous mushrooms of the United States, with directions for the culture and culinary preparation of the edible species*. US Dep. Agric., Div. Microscopy. 23 pp.
23. Taylor, T. 1893. *Food products III. I. Improved methods of distinguishing between pure and ficticious lard. II. Four edible mushrooms of the United States*. US Dep. Agric., Div. Microscopy. 22 pp.
24. Taylor, T. 1894. *Food products I. Twelve edible mushrooms of the United States, with directions for their identification and preparation as food*. US Dep. Agric., Div. Microscopy. 23 pp.
25. True, A. C. 1937. *A history of agricultural experimentation and research in the United States, 1607–1925*. US Dep. Agric. Misc. Publ. 251
26. Weber, H. A. 1886. Microscopic examination of butter and its adulterations. *Proc. Am. Soc. Microscopists* 9:103–15