AN ABSTRACT OF THE THESIS OF

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From 1925 to 1930, Ernest H. Wiegand, a professor of Horticultural Products at Oregon State Agricultural College, developed an improved brining process for cherries. Brined cherries are used in the production of maraschino and glacé cherries, which already had a sizable market in the United States by the 1920s. This thesis examines the scientific, economic, and geographic circumstances that played a role in the development of the new process.

The institutionalization of agricultural science in the Land-Grant Colleges and experiment stations in the United States created a favorable context for the development of a new brining process. The scientists associated with these institutions were "service-oriented," both in ideology and practice. They generally tailored their research programs to meet the needs of their agricultural lay-constituency. This service-orientation has been present in agricultural science since its origins in the eighteenth century. Oregon State Agricultural College and its associated experiment station exemplified this dedication to

service. In developing a brining process more suitable to large-scale commercial production, Wiegand was responding to the needs of local cherry growers, whose needs were determined by the demands and problems inherent in specialized agriculture. As a result of the improved brining process and tariff protection, Northwest cherry growers were able to successfully compete in the brined cherry market, a market previously closed to them.

Science, Service, and Specialized Agriculture: The Re-Invention of the Maraschino Cherry

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J. Christopher Jolly, Author

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Table of Contents

Table of Contents, Continued

Science, Service, and Specialized Agriculture: The Re-Invention of the Maraschino Cherry

Introduction

This thesis is about the development of the modern brining process used in the manufacture of maraschino and glacé cherries. Two to three centuries ago, the first maraschino cherries were made in the Dalmatian region of the Balkans. They were named for the liqueur by which they were preserved and flavored. Maraschino liqueur is a semi-dry, high-proof distillate of the crushed fruit, pits, and leaves of the marasca cherry, a variety thats growing region was confined almost exclusively to Dalmatia. The cherries were often "brined,"or preserved by exposure to sulfur fumes before final processing as maraschino cherries. Today's maraschino cherry is preserved by a different method--a method more suitable for large-scale commercial processing and the use of artificial dyes and flavors.

The modern incarnation of the maraschino cherry was a product of scientific, economic, and geographic circumstances. The brining process that lies at the heart of today's maraschino was developed by Ernest Wiegand (1886-1973) at Oregon State Agricultural College (now Oregon State University) from 1925 to 1931. Much of the research was done using funds provided to the Agricultural Experiment Station at Oregon State under the Purnell Act of 1925. In response to pressure from agricultural-college and experiment-station administrators for more research funding, the Purnell Act provided funds for:

> ...the necessary expenses of conducting investigations or making experiments bearing directly on the production, manufacture, preparation, use, distribution, and marketing of agricultural products and including such scientific researches as have for their purpose the establishment and maintenance of a permanent and efficient agricultural industry, and such economic and sociological investigations as have for their purpose the development and improvement of the rural home and rural life.[1]

One impetus for the passage of the Purnell Act was a general concern with the economic and social problems of agriculture and rural life.[2] Of the three major Acts that provided funding for agricultural research--the Hatch (1887), Adams (1906), and Purnell (1925)--the latter was the first to specifically provide funds for economic and sociological investigations. The agricultural depression that followed World War I refocused agriculturalists and agricultural scientists on the problems involved in integrating the rural populace with an increasingly industrial, capitalistic society.[3] At least as far back as the middle of the eighteenth century, agriculturalists and agricultural scientists had been concerned with educating farmers in rational and scientific methods that would bring them into step with the modern world.

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[1]Alfred Charles True, A History of Agricultural Experimentation and Research in the United States, 1607-1925 (Washington: United States Government Printing Office, 1937), p. 277.

[2]Ibid, pp. 275-276

[3]Among the recommendations of the 1921 Joint Commission of Agricultural Inquiry were several related to increased and better coordinated agricultural research through the agricultural colleges, as well as improving rural community life. The Joint Committee was formed in response to the post-war farm depression. For a brief overview, see Willard W. Cochrane, The Development of American Agriculture: A Historical Analysis (Minneapolis: University of Minnesota Press, 1993), pp. 116-121.

The Purnell Act also addressed another concern of agricultural scientists. Like the Adams Act, it restricted the use of the funds it provided to "the necessary expenses of conducting investigations or making experiments." The Hatch Act, the first Act to provide funding for agricultural research, had been so vague that frequently the funds it provided were used by university administrators to pay for general upkeep and instructors' salaries instead of research. The restrictions on the use of funds in the Adams and Purnell Acts aided scientists in pursuing basic research. The Purnell Act also specified the general purposes that this research should have–not knowledge for knowledge's sake, but knowledge in the service of the agricultural industry and rural life. This "service-orientation" has been a characteristic of agricultural science since its origins in the eighteenth century. It is a science that has largely escaped the influence of the conception of "pure" research that became embedded in the ideology of modern science during the scientific revolution.

The development of the "modern" maraschino cherry, which can be linked to the Purnell Act's provision for research aimed at improving agricultural products, occurred in a scientific institution--the agricultural experiment station/land-grant college–that was particularly responsive to the economic needs (or desires) of the farmers in its region. The farmers' needs were largely determined by the demands of specialized agriculture in an increasingly global marketplace and by geographic concerns affecting the selection and growth of particular plant and animal varieties. The development of the cherry brining process at Oregon State Agricultural College provides a case study of the interaction of scientific, economic, and political interests in the 1920s. It also serves to highlight some of the historical problems of institutionalizing agricultural science and, to some degree, the common problems attending the growth of any science in an increasingly industrial society. This thesis examines the historical development of key characteristics of agricultural science that created a favorable context for the scientific improvement of something as apparently minor as the maraschino cherry. It situates Oregon State Agricultural College and its experiment station within the agricultural science tradition and examines the local interests to which this scientific institution responded.

Chapter 1: The Institutionalization of Agricultural Science

Pure, Basic, or Applied? The Aim of Agricultural Science

Much of the history of the formation of agricultural science institutions centers around conflicts over the purposes and extent of scientific research. From its beginnings in the eighteenth century up until the present day, agricultural science has had a large lay constituency that it has served-- the farmers. Agricultural scientists themselves, at least up through the early decades of the twentieth century, have generally been an amalgam of university scientists from "pure" science fields and farmers or agriculturalists who developed an interest in science for the sake of agriculture. This mix of motivations and interests led to numerous debates over the proportion of basic versus applied research that the agricultural institutions should carry out, or if they should carry out research at all.

Perhaps the question of basic versus applied science and their relative importance is moot. Nathan Reingold suggests that most research situations exhibit a mix of basic and applied science and that, "...the significant presence of mixed situations renders analysis in terms of basic and applied science increasingly sterile."[4] However, he goes on to note, based on volume of publications, that "in the modern period applied research has always outbulked pure or basic research."[5] Attempts to draw sharp distinctions between

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[4]Nathan Reingold, "American Indifference to Basic Research: A Reappraisal" in Nineteenth-Century American Science: A Reappraisal, ed. George H. Daniels (Northwest University Press, Evanston: 1972), 38-62, on p. 46.

[5]Ibid, p. 51.

basic and applied research seem to over-simplify real-world research situations. It is, perhaps, one of the chicken-or-the-egg questions of the history of science. Scientists such as Robert Millikan (1868-1953) have placed emphasis on pure science as the primogenitor of applied science (usually when attempting to secure no-strings funding from industrialists). Other scientists, like Eugene Hilgard (1833-1916), were comfortable in asserting that applied science gave rise to basic science.[6] During the institutionalization of agricultural science, the question was not so much one of basic versus applied research, but rather whether the institutions should conduct scientific research at all.

Of more interest and use is the distinction between "basic" and "pure" science. As Reingold points out, the two words are often used interchangeably to refer to the opposite of applied science. However, the terms have different implications. Reingold offers concise definitions of both that highlight this difference: "Basic refers to intrinsic merit, usually scientific activities involved in formulating and verifying hypotheses and general theories. Pure, in contrast, refers to a psychological motivation unsullied by concerns other than the growth of scientific knowledge."[7] The ideal of the disinterested scientist seeking knowledge for its own sake was imbedded in modern scientific ideology during the seventeenth century.[8] Such purity of motive would be difficult to prove in all

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[6]Steven Stoll, The Fruits of Natural Advantage: Horticulture and the Industrial Countryside in California (Ph.D. Dissertation, Yale University, 1994), p. 200.

[7]Ibid, p. 45.

[8]See Steven Shapin, A Social History of Truth: Civility and Science in Seventeenth-Century England (Chicago: University of Chicago Press, 1994).

but the most abstract or theoretical scientist, but it has often been used in scientific rhetoric. While this ideal still exists in science, it apparently never had a strong presence in agricultural science. However much they have held scientific values, agricultural scientists have not often reached for the scientific ideal of "purity." Since the 1800s , they have allowed interests outside "science" to influence their research agendas--not merely on a practical, "real-world" level, which is probably inevitable no matter what one's rhetoric--but they have also allowed these outside interests to become part of their ideology.

Agricultural science is different than other, older disciplines such as physics and chemistry in that it studies nature in relation to a particular human practice. From the outset, its aim was to study plant or animal life--natural historians and botanists were already doing that--but to improve agriculture. In this sense, perhaps agricultural science represents a median between the scientific disciplines, such as physics, and the technological disciplines, such as engineering. Hierarchies aside, the absence of a strong pure science ideal in agricultural science has helped to create a branch of science that was very responsive to farmers' interests. Agricultural science developed a service-oriented ideology--an ideology that eventually focused upon the maraschino cherry. This chapter will briefly examine the institutionalization of agricultural science, particularly in the United States, in light of this key ideal.

The Seeds of Agricultural Science

Given the historical origins of agricultural science, its lack of emphasis on pure research is unsurprising. Increased productivity was one of the primary goals of most early agriculturalists and agricultural "scientists." Jethro Tull (1674-1741), Duhamel du Monceau (1700-1782), Antoine-Augustin Parmentier (1737-1813), and Thomas Jefferson (1743-1826) all sought to use science in the service of agriculture. In addition, the general lack of effective theoretical knowledge in the biological sciences provided a poor basis for attempting to understand the complex processes of plant and animal growth which lay at the heart of the fundamental problems of agricultural science. It seems unlikely that pure research was an issue at all among eighteenth -century agricultural scientists.

The work of Jethro Tull was one early impetus to the growth of agricultural science. Around 1701, Tull began to use non-traditional agricultural practices at his Howberry Farm in Oxfordshire. These new methods primarily concerned frequency of tillage and the spacing of crops. Towards this end (and supposedly because his workers refused to plant the widely spaced rows that Tull required), Tull invented a seed drill that would facilitate the more widely spaced and regular style of planting that he advocated. Tull's new agricultural practices had little effect on the majority of farmers, who were quite resistant to new methods. Some, like those of the Private Society of Husbandmen and Planters (founded in the early eighteenth century) violently disagreed with Tull, preferring to rely on Classical authors such as Virgil. Others, like those of the Society of

Improvers in the Knowledge of Agriculture in Scotland (founded in 1723) adopted the Tullian system and attempted to spread it to the general farming populace–to little effect, however. The Society sought to "induce all Men to embrace every opportunity of being instructed....But the Truth is, the far greatest part of Land Labourers never trouble their Heads about Principles, but work more like Tools or Machines than Men of Reason, going on blindly, as led by Custom in the often unaccountable Ways of their Forefathers."[9]

Though eventually widely adopted in some form, Tull's new practices had little immediate effect on farming. Even less successful were Tull's scientific explanations of his practices. The first edition of his magnum opus, The New Horse-Houghing Husbandry, or an Essay on the Principles of Tillage and Vegetation, was published in 1731--a full thirty years after he had developed his new farming methods. According to Fussell, Tull wrote this "after-the-fact" book due to "the demands of some of the influential people who were taking an interest in the financial exploitation of their estates"[10]. In the book Tull put forth a theory of plant feeding that relied on nitre, as a food-preparation mechanism, and the four classical elements--earth, air, fire, and water. Scientific understandings of chemistry and the mechanisms of plant life were not advanced enough to allow Tull to formulate successful theoretical principles regarding plant nutrition and agriculture. Moreover, the book was, by all estimations, nearly

[9]G. E. Fussell, Jethro Tull: His Influence on Mechanized Agriculture (Reading, Berkshire: Osprey Publishing Ltd., 1973), p. 64.

[10]Ibid, p. 50.

impossible to read. Nonetheless, Tull's attempt to give a scientific basis for his agricultural practices and his dismissive attitude towards classical agricultural writers such as Virgil touched off a firestorm of controversy and interest in scientific agriculture. Stephen Switzer (1682?-1745), of the Private Society, quickly launched an attack against Tull in his 1733 book, The Practical Husbandman & Planter; or Observations on the Ancient and Modern Husbandry–Deduced Chiefly from Practice rather than Books. In this book, Switzer and his Society members derided Tull's theories as "palpable nonsense." Others had a more positive view of the Tullian system. Several French natural philosophers, including Buffon (1707-1788), attempted to translate Tull's work, but were unable to overcome the Englishman's obtuse writing style.[11] Finally, Duhamel du Monceau (1700-1782) succeeded in the mid-eighteenth century.

Duhamel extracted and reorganized Tull's book into a more readable form, publishing it as Traité de la culture des terres suivant les principes de M. Tull anglais (Paris, 6 vols, 1753-1761). John Mills and Philip Miller (1691-1771) translated Duhamel's translation of Tull back into English in 1759 and 1764, respectively, giving some hint of how inaccessible Tull's original work was. In his preface to his translation of Duhamel, Mills states that:

> M. Du Hamel and his correspondents have set the world an example that has long been wanted and greatly desired by all who have the good of their country at heart and are in the least sensible of the importance of agriculture. They have given us a series of experiments in this most useful art, continued for several years altogether, with accuracy and judgement

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[11]Ibid.

> and related in a clear distinct manner. Theory can avail but little in agriculture.[12]

This passage reveals something of the state of agricultural science in the second half of the eighteenth century. It was still in a descriptive, experimental stage. The science of the day was not capable of providing a useful theoretical basis for agricultural processes. Duhamel wrote and edited encyclopedic works on the arts and trades, including agriculture, that attempted to analyze existing methods and standardize the best of them to create a more efficient peasant-based agriculture. He carried out some agricultural experimentation, or comparative cultivation, testing traditional farming methods against those espoused by Tull in particular. His works were not directed towards scientists. Indeed, many articles in his encyclopedic works were not written by scientists, but by amateurs, tradesmen, and enthusiasts. Rather, Duhamel's target was a more general public--wealthy land proprietors. Motivated by Tull and other British agricultural writers, Duhamel performed a key role in the encyclopedic, nascent stage of agricultural science. By 1762, when he published his textbook, the Elements d'agriculture, Duhamel had analyzed and drawn together much of the best agricultural science to date, and his works stood as a model for the experimental approach in agriculture.[13]

The increased interest in agricultural reform, spurred by the work of people like Tull and Duhamel, led to attempts to institutionalize agricultural science. Agricultural societies had been formed in England as early as 1723. On the initiative of the marquis

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[12]Ibid, p. 52.

[13]Charles Coulston Gillispie, Science and Polity in France at the End of the Old Regime (Princeton: Princeton University Press, 1980), p. 365.

de Turbilly and Henri Bertin, a Parisian-based Society of Agriculture was formed in 1761. At the same time, provincial societies of agriculture began to appear. These societies, whose purpose was to reform, or enlighten French agriculture, were largely unsuccessful. Lavoisier (1743-1794), who was a member of the Committee of Agriculture (a creation of the finance ministry) placed the burden of this failure to reform French agriculture on French institutions and laws.[14] Responsibility also rested with underdeveloped theoretical answers to the problems of agriculture. New practices described by writers such as Tull were effective, but the scientific theories grafted to them had little explanatory or predictive power.

Some scientists attempted to improve the scientific understanding of agriculture by moving beyond comparative cultivation experiments and the cataloging of agricultural practices. Following close on the heels of Duhamel, was Antoine-Augustin Parmentier (1737-1813), who introduced the potato into the French diet. Parmentier moved agricultural science from the field into the laboratory, analyzing the gross chemical properties of gluten and starch and the chemistry and fractionation of milk, all of which helped to directly improve the French economy. He was also an avid promoter of science, once commenting that: "It is only by means of popularizing science that it can be made useful".[15] Parmentier revitalized the Society of Agriculture when he became a member in 1773. By 1785, the Society had developed a constituency which took on the standard character of an eighteenth-century learned scientific society. The Society's

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[14]Ibid, p. 387.

[15]Ibid, p. 374.

constituency and audience were, of course, the "wealthy, well-disposed landowners who could afford to set an example" in agricultural reform.[16] The Society and Committee of Agriculture did make some attempts to reach out to the more general rural populace--the Society through farm shows, and the Committee with a failed plan to institute a system of parish agricultural agents.[17] Still, by 1789, agricultural science in France had made little impact beyond promulgating its own literature. As Lavoisier implied, the social context was wrong for agricultural reform and the institutionalization of agricultural science in eighteenth-century France.

These early French attempts to institutionalize agricultural science were directed towards the goal of increased productivity. Encyclopedists like Duhamel sought to standardize and promote the most efficient agricultural practices. Laboratory scientists like Parmentier provided little in the way of a useful theoretical structure for agricultural science. Their research led primarily to practical applications of science. Parmentier's work led to improvements in the French cheese, dairy and baking industries. By his own admission he wanted to be of service to his "fellow-beings."[18] Even Lavoisier, who made his scientific name through his "pure" scientific investigations in chemistry, approached the scientific study of agriculture with practical, economic aims in mind. His agricultural experiments at the Fréchines estate in the Loire Valley were also directed towards improved productivity. Gillispie notes that: "The conclusions that he generalized

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[16]Ibid, p. 379.

[17]Ibid, p. 385.

[18]Ibid, p. 374.

from his experience [with the Frechines experiments] were predictably physiocratic, and other of his agricultural pieces bespeak the fiscal expert more evidently than they do the laboratory analyst."[19] Limited by an impoverished theoretical understanding of plant and animal growth and driven by physiocratic ideas of agriculture as the basis of the country's economic health, agricultural science in eighteenth-century Europe was service-oriented, on both a practical and ideological level.

Agricultural science in the United States at the end of the eighteenth-century and the beginning of the nineteenth-century took its cue from the continental agricultural investigators. Thomas Jefferson (1743-1826), one of the primary proponents of agricultural science in the United States during this time period, was well acquainted with the agricultural studies being done in Europe. His library contained the works of Duhamel, Parmentier, and Tull as well as works by English popularizers of agricultural science such as Arthur Young (1741-1820), John Mills, and Philip Miller. Throughout his life, he performed experiments to determine the best agricultural practices. He also designed an improved moldboard for ploughs, which not only offered less resistance, but due to his careful scientific/mathematical study, was easy for farmers to replicate.[20]

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[19]Ibid, pp. 380-381.

[20]Everett E. Edwards, "Jefferson and Agriculture" in Thomas Jefferson and the Sciences, ed. I. Bernard Cohen (New York: Arno Press, 1980), pp. 37-43, 79-81.

Jefferson's agrarian ideals are well-documented.[21] He believed that agriculture and the yeomen farmers who practiced it were the foundation of American democracy, both ideologically and economically. In a letter to David Williams dated November 14, 1803, Jefferson called for professorships of agriculture in universities and colleges. Regarding agricultural science, Jefferson wrote that: "It is a science of the very first order. It counts among its handmaids the most respectable sciences, such as Chemistry, Natural Philosophy, Mechanics, Mathematics generally, Natural History, Botany. In every College and University, a professorship of agriculture, and the class of its students, might be honored as the first".[22] He ranked agriculture as first among the sciences, not because of the fundamental nature of its investigations by scientific standards, but because he perceived it as fundamental to a democratic society. Though Jefferson's forays into agricultural science were almost wholly applied science, one suspects that no matter how "basic" his researches had been, they would not have been regarded as "pure."

An even stronger statement of Jefferson's ideas on the purpose of agricultural science came in a letter to Thomas Cooper[23] (1759-1839) in 1812:

> You know the just esteem which attached itself to Dr. Franklin's science, because he always endeavored to direct it to something useful in private life. The chemists have not been attentive enough to this. I have wished to see their science applied to domestic objects, to malting, for instance,

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[21]See, for example, Edwards, "Jefferson and Agriculture," and Richard S. Kirkendall, "The Agricultural Colleges: Between Tradition and Modernization," Agricultural History, 60, no.2 (1986), 3-21, on pp. 4-6.

[22]Ibid, p. 82.

[23]Thomas Cooper, the son-in-law of Joseph Priestley, was the first professor chosen for the University of Virginia.

> brewing, making cider, to fermentation and distillation generally, to the making of bread, butter, cheese, soap, to the incubation of eggs, &c. And I am happy to observe some of these titles in the syllabus of your lecture. I hope you will make the chemistry of these subjects intelligible to our good house-wives....[24]

Clearly, Jefferson based the esteem he accorded to a science on its utility to society, not on its ability to maintain a standard of pure research or hold to an ideology of disinterestedness. He also showed a concern with popularizing, or democratizing, scientific knowledge. Despite the revelation that the application of chemistry to agriculture and agricultural products was present to some small degree in the early 1800s at the University of Virginia, agricultural science did not yet exist as an academic discipline in the United States. Jefferson had sought to create a professorship of agriculture at the University of Virginia, but his plans were thwarted due to a lack of funds. Though Jefferson was a careful experimenter who used the scientific method in his researches, he also had a strong science-in-service ideology by which he pursued scientific research for extra-scientific purposes.[25]

Justus Liebig: Chemist and Catalyst

The growth and institutionalization of agricultural science in America are heavily indebted to Justus Liebig (1803-1873) and the example of the German experiment stations. In the first half of the nineteenth century, the German states moved into the

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[24]Edwards, pp. 82-83.

[25]Ibid, p. 81.

forefront of agricultural science. Even before his researches in agricultural chemistry, Liebig was one of the leading European chemists, who helped establish the sub-field of organic chemistry. In 1832, he jointly discovered the benzoyl radical with Friedrich Wohler (1800-1882) which helped provide a basis for theories of organic structure.[26] With the publication of his book, Organic Chemistry and its Applications to Agriculture and Physiology, he became one of the leading agricultural chemists in the world and helped define agricultural chemistry as another sub-field of chemistry. Despite the "Applications" mentioned in the title, Liebig represents the basic science strain of agricultural chemistry. Liebig's book was written more for chemists than for farmers, as he theorized about the interactions between soils, fertilizers and crops and couched his discussions in chemical terminology not easily deciphered by laymen. Though he incorporated discussions of many farm practices, Rossiter notes that "He asserted so much that it was hard to derive a clear-cut program for improved farming from it all."[27]

Thus, Liebig's work in agricultural chemistry was both important and problematic. His book had numerous logical flaws and inconsistencies and often reached general conclusions by going several steps beyond the available evidence. The flaws in his work do not imply that Liebig was a poor chemist, nor are the problems with the book solely attributable to his personal scientific style and polemical writing. Many short-comings of the work simply reflect the primitive state of agricultural chemistry at

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[26]Margaret W. Rossiter, The Emergence of Agricultural Science: Justus Liebig and the Americans, 1840-1880 (New Haven: Yale University Press, 1975), p. 26.

[27]Ibid, p. 30.

the time. Agricultural chemists still lacked sufficient empirical scientific data on which to base general theories and principles. In addition, scientific disciplines related to agricultural science, such as natural history and botany, had not acquired enough knowledge to allow for the fruitful study of many fundamental agricultural questions. A full understanding of humus, for example, was not possible until knowledge of microbial life was attained at the end of the nineteenth century.[28]

The importance of Liebig's work rested largely on its synthesis of investigations in agricultural chemistry and its identification of key problems in the field. It provided a starting point for many areas of scientific research as well as ideas for "home grown" experimentation by farmers. Another book of Liebig's, Familiar Letters on Chemistry and Its Relations to Commerce, Physiology, and Agriculture, was also quite popular and helped to launch a soil analysis craze. The book called for the government (and an enlightened public) to support the establishment of schools of chemistry and the study of science in general. One of his strongest arguments for such support was the recent progress of agricultural chemistry.[29] Liebig's influence began to wane in the 1850s as many of his ideas, such as soil analysis and his nitrogen theory were discredited or disproved. Clearly Liebig's work and his students were crucial to the introduction of agricultural chemistry to America and to the invigoration of agricultural science.

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[28]Indeed, the modern conception of humus was not developed until the mid-1920s by Selman A. Waksman (1888-1973) of the New Jersey Agricultural Experiment Station.

[29]Rossiter, Emergence, p. 45.

However, the institutionalization of agricultural science owed more to the model of the German experiment stations, which Liebig did not initially support.[30]

The Influence of the German Experiment Stations

The first German experiment station, the Möckern station, was founded in 1850 near Leipzig. Though historians have often assumed that the German experiment stations were inspired and modeled after the laboratory-based pure research of Liebig, Mark Finlay has shown that this assumption is not historically accurate. He writes that "Fundamental scientific and agricultural chemistry research did not appear to be the station's primary goal," and that "the practitioners were at least as influential as the theorists during the early history of the Möckern station.[31] Two of the three primary founders of the Möckern station, Julius Adolf Stockhardt (1809-1886) and Wilhelm Crusius, had conceptions of scientific agriculture that emphasized its practical and popular characteristics. Stockhardt, a professor of agricultural chemistry at the Tharandt Academy of Agriculture and Forestry, had a decidedly populist view of what scientific agriculture could and should be. As early as 1843, he had established a lecture program for farmers in order to educate them about scientific agriculture. He wanted to make

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[30]Mark R. Finlay, Science, Practice and Politics: German Agricultural Experiment Stations in the Nineteenth Century (Ph.D. Dissertation, Iowa State University, 1992), p. 355 n.

[31]Mark R. Finlay, "The German Agricultural Experiment Stations and the Beginnings of American Agricultural Research," Agricultural History, 62, no. 2 (1988), 41-50, pp. 42-43.

agricultural science understandable, available, and hence useful to the rural populace. Finlay notes that "Stockhardt's attitudes were typical of the excited German agricultural scientists and educators..."[32]

Wilhelm Crusius, a wealthy estate owner, also had a conception of the experiment station that differed from the more traditional laboratory-based independent research programs favored by scientists like Liebig. Crusius placed great importance on the economic value of scientific agriculture and, like Stockhardt, he felt that experiments in the field held more practical value than laboratory research. Crusius donated the land for the Möckern station and was its primary benefactor in the early 1850s. He had a great deal of influence on the methods and directions that station research took. Theodore Reuning, the kingdom of Saxony's leading agricultural minister, was the third prime founder of the experiment station and the most committed to basic research. However, the station did not receive permanent state funding until 1853, and, at least in the early stages, the interests of Stockhardt and Crusius carried the day.[33]

Initially, the fundamental and applied sections of the Experiment Station were of nearly equal importance. Publication credits in the station's annual reports, supplies and equipment budgets, and salaries were comparable. However, the Station's research agenda was determined by a board of trustees that was controlled by agricultural interests. From 1852 until approximately 1857, the research conducted at the Station revealed a

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[32]Ibid, p. 44.

[33]Ibid, pp. 44-45.

strong bias towards questions of practical and economic importance to farmers.[34] This division of the Station into fundamental and applied research sections, though not always successful in maintaining a balance between pure and applied research, was typical of German scientific institutes. The Physikalisch-Technische Reichsanstalt was also divided into pure and applied sections. Like the Möckern Station, early research at the Institute tended to cater to the interests of industry. [35]

Fundamental research did begin to gain more ground in the late 1850s as government funding and control of research began to increase. This pattern of institutionalization--strong emphasis on practical research in the early stages with limited basic research, a lack gradually ameliorated through government intervention--repeated itself on a grander and more extreme scale in the United States. One characteristic of German experiment stations that did not transfer to their U.S. counterparts was the official division of the experiment station into agricultural and scientific sections.

If anything, American agricultural science was more practical and more oriented towards agricultural interests than German agricultural science. One of the major figures in promoting agricultural science in America after 1850 and the leader of the movement to create experiment stations was Samuel Johnson (1830-1909), a professor at Yale University. Johnson spent time studying in Leipzig and visited the nearby Möckern Station, which greatly impressed him. He also studied for a short time with Liebig, who

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[34]Finlay, "The German Agricultural Experiment Stations," pp. 47-49.

[35]David Cahan, An Institute for an Empire: The Physikalisch-Technische Reichsanstalt 1871-1918 (Cambridge: Cambridge University Press, 1989), pp. 43-92.

had moved his laboratory from Giessen to Munich. By the time he returned to America, Johnson was determined to see through the creation of experiment stations in his home country.[36]

When Johnson returned to America in 1854, he was faced with the task of rehabilitating the image of agricultural science. The Liebig-inspired enthusiasm had waned. Liebig's penchant for overstatement and theorizing helped create a backlash against agricultural science and by 1854, many of Liebig's generalizations were being seriously undercut by experimentation. For example, soil analysis, which he had heartily recommended as a foundation for greater achievements in agricultural science in his Familiar Letters, had been discredited by a paper by David A. Wells(1828-1898?) of the Lawrence Scientific School. The failures of the scientific theories and the discrediting of soil analysis led to renewed skepticism, particularly among farmers, about all but the most empirical aspects of scientific agriculture.

Johnson himself had a strong desire to promote basic research in agricultural science. In his visits to the Möckern station he seems to have focused on the basic science aspects of the work done there. Finlay notes that though the Möckern station had a strong commitment to practical research, Johnson's account of what he saw there stressed the pure research ideal advocated by scientists such as Liebig. According to Finlay, "He [Johnson] reported in an American Farmers' journal that the station's workers were conducting basic scientific research. He did not mention the investigations

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[36]Rossiter, Emergence, pp. 127-131.

answering farmers' specific questions about crops and fertilizers."[37] This approach, of emphasizing pure science aspects of agricultural science, failed miserably with American farmers. Margaret Rossiter quotes an 1853 article, "The Quackery of Agricultural Science," that was representative of many farmers' views: "Devoted as I am, and always have been to science, I would not give one practical experiment for all the 'scientific' theories of Liebig and other chemists put together, for practical farmers' use."[38] Johnson tried to counter these attitudes with articles such as "What is Science?" (1853) and "Theory and Practice" (1855) but his philosophical treatises on the value of basic science were largely ignored. In order to win support for agricultural science, he had to bridge the gap between theory and practice, not philosophically, but in a more practical way, oriented toward issues that farmers cared about.

Dissatisfied with his salary at Yale and still seeking broader support for agricultural chemistry, Johnson sought a paid position as an agricultural chemist for the Connecticut State Agricultural Society. He changed his tactics, forsaking his polemics for pure research, and instead began waging a hard-nosed campaign against fertilizer fraud in the Society's journal, Connecticut Homestead. Johnson computed the commercial value of the numerous fertilizers on the market, comparing the actual value of the amounts of ammonia and phosphoric acid in the fertilizer with the retail cost. The results were dramatic, with one fertilizer, or "superphosphate," priced at $45 a ton only

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[37]Finlay, "The German Agricultural Experiment Stations," p. 50.

[38]Rossiter, Emergence, p. 133.

actually worth $3.80 a ton. Johnson got his job with the Connecticut Agricultural Society, but still faced difficulty in securing funds for basic science research projects.[39]

Learning To Lobby: The Formation of State Experiment Stations

In 1852, the United States Agricultural Society was formed and began to lobby the Federal government to create a department of agriculture that would protect and advance agricultural interests. Though obviously the members of the Society were acting in their own self-interest, they were also acting out of a widely held belief that agriculture was the cornerstone of the country's prosperity, both economic and moral.

The various agrarian movements in the first half of the nineteenth century arose out of a belief that access to and ownership of land was a universal right. The democracy, independence, and general well-being of the country was integrally tied to the state of the independent farmer. In addition, despite the growth of industrial manufacturing, against which the agrarians were reacting, most of the population was still involved in agriculture. In a December 2, 1850 message, President Fillmore favored the creation of an agricultural bureau, stating that: "More than three-fourths of our population are engaged in the cultivation of the soil. The commercial, manufacturing, and navigating interests are all to a great extent dependent on the agricultural. It is therefore the most important interest of the nation, and has just claim to the fostering care and protection of

[39]Ibid, pp. 152-157.

the Government..."[40] Charles B. Calvert, president of the Maryland State Agricultural Society, referred to farming as a "noble calling" and called upon the Government to "regard agriculture as its chief bulwark."[41] Eventually, in 1862, a department of agriculture was formed. That same year, Congress not only passed the Morrill Land Grant College Act but the Homestead Act as well.

The Morrill Land Grant Act established a system of agricultural colleges, but these were, by and large, ineffective in their agricultural research. Many schools did not have the proper facilities, and when they did, administrators lacked the know-how to set up worthwhile experiments. According to Rossiter, "they readily admitted that their results were frustrating and useless." The agricultural colleges also embodied the pure/practical tensions of agricultural science. Some agricultural science advocates thought that the role of the Colleges should be the "enlightenment" of farmers, so that farmers would learn to apply scientific principles to farming. Another contingent of agricultural science supporters wanted to emphasize the training of scientific investigators in laboratory experimentation so that they might "develop and elucidate science, which the masses may apply."[42]

The agricultural colleges were not successful in either of these endeavors in their first few decades. Despite the availability of two excellent textbooks on agricultural

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[40]True, p. 36.

[41]Ibid, p. 38.

[42]Alan I. Marcus, "The Ivory Silo: Farmer-Agricultural College Tensions in the 1870s and 1880s," Agricultural History, 60, no. 2 (1986), 22-36, on pp. 29-31.

science, Johnson's How Crops Grow and How Crops Feed, agricultural science was not sufficiently institutionalized in the agricultural colleges to be effective. There were few trained agricultural scientists available (indeed, only agricultural chemistry really had any kind of tradition as a discipline, however underdeveloped), low enrollment in agricultural courses, and a very thin curriculum with which to work.

By the 1870s, it was obvious that the agricultural colleges were not getting the job done. Johnson and other agricultural science enthusiasts redoubled their efforts for the creation of experiment stations, which they felt would be more effective in promoting agricultural science.

By 1872, 51 Americans had studied with Liebig in Giessen and Munich.[43] Perhaps the most influential of these students outside of Samuel Johnson, was Wilbur Olin Atwater (1844-1907), a former student of Johnson. Atwater toured several German experiment stations between 1869 and 1871 and returned to join Johnson in his efforts to promote their formation in the United States. Unlike Johnson, Atwater did not emphasize the basic research carried out by the German stations, but touted their practical value to farmers. Chiefly, he emphasized the fertilizer control activities practiced by the German stations--the value of which Johnson had already demonstrated in the 1850s. He also noted that the true value of the experiment stations lay in increasing the erudition of farmers.[44]

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[43]Rossiter, Emergence, pp. 184-195.

[44]Finlay, Science, Practice, and Politics, pp. 360-362.

In 1873, Johnson, Atwater, and other agriculturalists in Connecticut began attempts to gain the support of agricultural societies across the state and to lobby the legislature for the creation of an experiment station. In July of 1875, the state legislature granted $700 per quarter for two years towards the creation of an agricultural experiment station to be associated with Wesleyan College in Middletown, where Atwater taught. Orange Judd (1822-1892), a New York agricultural editor who had retired to Connecticut and had been among the lobbyists, contributed $1000. He had a very utilitarian view of the role of the experiment station. In 1877, the state appropriated $5,000 annually and took over full support of the station.

The success of Johnson, Atwater, and others in lobbying for the station proved to be double-edged. The emphasis on fertilizer control had been instrumental in winning the support of farmers and legislators. However, it now proved quite difficult (as Johnson had found in the State Agricultural Society) for experiment station scientists to move beyond fertilizer control and into more basic research. As quoted by Rossiter, Johnson complained that, "as usual...the greater part of the time and labor of the operating force of this station has been expended...in work connected with the collection and analysis of Commercial Fertilizers."[45]

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[45]Rossiter, Emergence, p. 170.

The Hatch Act: A Double-edged Sword

By 1886, fourteen other states had established experiment stations, all of a predominantly practical character. Dissatisfied with state funding, which allowed only severely limited to non-existent basic research, agriculturalists and agricultural scientists began to lobby at the national level for federal funding for experiment station research.[46] Their efforts culminated in the passage of the Hatch Act in 1887, which provided each station with $15,000 annually to "conduct original researches or verify experiments" as well as "to acquire and diffuse among the people of the United States useful information on subjects connected with agriculture in the most general sense of that word."[47]

The Hatch Act did little to enable station scientists to pursue more original research. In 1888, the Office of Experiment Stations (OES) was created to oversee and coordinate station activities and the allocation of the Hatch funds. Unfortunately, the OES only advised stations and facilitated communication between them; it did not have the power to direct their research.[48] Alfred C. True (1853-1929), the first director of the OES, was committed to moving station work back to more traditional scientific research. Throughout the 1890s, his office berated the stations for their lack of original research.

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[46]Early research supported by the Hatch Act included "the chemistry and biology of milk, cheese, butter and soils; utility of insecticides; protein content of wheat grown at different altitudes; silage; and methods to extend lactation periods." Alan I. Marcus, "The Wisdom of the Body Politic: The Changing Nature of Publicly Sponsored American Agricultural Research Since the 1830s," Agricultural History, 62, no. 2 (1988), 4-26, p. 18.

[47]True, pp. 121-122.

[48]Marcus, "The Wisdom of the Body Politic," p. 16.

He wanted more focused, unified research programs, more laboratory-based research and stricter experimental protocols.

The OES was particularly harsh toward field tests that, in addition to often not being corroborated by adequate lab work, were sometimes conducted on limited numbers of plants for an insufficient duration. The OES asked station scientists to "make a wise selection of the few [questions] which ought to engage the serious attention of any one station. There is a danger that in yielding to a local demand for the testing of new crops or the improvement of old ones the real interests of even that locality may be sacrificed." The OES statement also complained that "field experiments seem [to be] so barren of useful results."[49] True believed that station scientists should pursue research that was fundamental and abstract in character and that basic science would eventually yield the fruits of application.

Many factors conspired to thwart True's attempts to rectify the lack of original research. The use of station scientists to teach college courses diverted time and money away from station science. Almost all experiment stations were associated with land-grant colleges. The administrators of these colleges had oversight over the allocation of station funds. Because the colleges were often beset by funding difficulties and the disillusionment of farmers about the colleges' programs, station funds were often siphoned into salaries for instructors, general upkeep, and farmer-friendly practical

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[49]Lou Ferleger, "Uplifting American Agriculture: Experiment Station Scientists and the Office of Experiment Stations in the Early Years After the Hatch Act," Agricultural History, 64, no. 2 (1990), 5-23, on p. 6.

advice. In 1896, 266 out of 584 station workers taught; in 1905, 423 out of 845 taught.[50] True believed that teaching duties contributed to making station work "too diffuse" with "too many relatively small and superficial projects."[51] In addition, research was not considered a part of a college professor's expected duties in late nineteenth-century American academia.[52]

Station scientists were also still under a heavy burden to disseminate information to the farmers. Regular publication of Station bulletins and reports was required, even if there were no original findings to report. An editorialist in the March, 1887 edition of Agricultural Science complained that experiment station bulletins were published "ostensibly to report progress, [but] practically to propitiate a constituency who unreasonably expect the most important problems settled as though by sleight of hand."[53] Along these same lines was the continued assumption that Station scientists were responsible for answering all farmers' inquiries. One scientist complained that "I am a

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[50]From the turn of the century until the beginning of the First World War, U.S. college chemistry enrollments, including agricultural chemistry (which was one of the first and primary sub-disciplines of agricultural science) increased rapidly. Graduate work in the agricultural sciences began at the turn of the century as well, and agricultural colleges had difficulty in finding qualified personnel to fill the vacancies. See John W. Servos, Physical Chemistry from Ostwald to Pauling: The Making of a Science in America (Princeton: Princeton University Press, 1990), pp. 96-97, and Margaret W. Rossiter, "Graduate Work in the Agricultural Sciences, 1900-1970," Agricultural History, 60, no. 2 (1986), 37-57.

[51]True, p. 136.

[52]Charles E. Rosenberg, No Other Gods: On Science and American Social Thought (Baltimore: The Johns Hopkins University Press, 1997), p. 156.

[53]Ibid, p. 157.

public man, and belong to the people & the people are relentless and exacting in their demands." According to Rosenberg, station scientists attempted to mediate conflicts between scientific and agricultural demands by refusing to accept the possibility "that an irreconcilable conflict might indeed exist between the scientist's needs and those of his agricultural constituency."[54] Increased funding and "direction" by the OES did not substantially alleviate these competing demands, but it did improve the scientific character of station research. Ferleger states that "the quality of the bulletins and reports with regard to emphasizing original investigations is far greater in the 1900s compared to the 1890s."[55]

Important examples of this "unification" of scientific and agricultural interests are the "research-entrepreneurs." These men were usually station directors. Most prominent experiment stations, such as the ones in Wisconson, Illinois, and California, had such men at their helm. "The successful research-entrepreneur," says Rosenberg "had not only to tailor a research policy to the needs of his lay constituency, but still remain aware of professional values and realities," maintaining a commitment to both science and agriculture.[56]

One such research-entrepreneur was Eugene W. Hilgard of the California experiment station who had an international reputation as a geologist. Hilgard was keenly aware of the taxing and sometimes frustrating demands of responding to the

[54]Ibid, p. 158.

[55]Ferleger, p. 21.

[56]Rosenberg, p. 159.

numerous inquiries from farmers, stating in 1886 that "There is no rest here for anyone, wicked or otherwise."[57] Yet much of his station's research was directed toward immediate economic goals. Responding to the OES desire for pure science and new lines of research, he said: "I have found in my practical experience that the 'new lines' are most usefully and abundantly suggested by the very work which I defend, viz., encouraging the farmers to submit their practical problems to the station for solutions."[58] Charles W. Woodworth (1865-1940), an economic entomologist who joined the station in 1891, echoed Hilgard's view. He made no distinction between pure and applied science. Stoll reports him as saying that "The only true measure of valuable research... was whether or not it could produce results on a commercial scale."[59] Though certainly not all station scientists adhered to this extreme view, the pressures of their dual constituencies began to create a "new ideal"--the service-oriented scientist.

Another possible factor in the creation of the service-oriented scientist was the concern among many agricultural scientists with improving rural life. For some, such as Liberty Hyde Bailey (1858-1954), this concern was informed by agrarian ideas. While embracing science and technological advance, Bailey placed equal, if not greater, emphasis on maintaining the quality of rural life. Those who fell within the spectrum of agrarian ideology viewed farmers and their community as the mainstay of the character and values that underpinned American democracy. Faced with an increasingly urban and

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[57]Ibid, p. 164.

[58]Stoll, The Fruits of Natural Advantage, p. 200.

[59]Ibid, p. 217.

industrialized society, those with agrarian inclinations wanted to introduce scientific education and solutions into agriculture, but within a framework that maintained the perceived values of traditional rural life.[60] This attitude is reminiscent of the attempts to "enlighten" the rural populace in eighteenth century France and probably contributed to the directive in the Hatch Act calling for the stations to disseminate information to the farmers. The 1925 Purnell Act, which created funding for agricultural economics and sociology, is another example of this attitude--one oriented not only to the physical science of agriculture, but to the people of agriculture as well.

Other agriculturalists, such as agricultural economist Edwin G. Nourse (1883-1974), also sought to change rural life, but under a less romantic vision of the farming community. According to Stoll, Nourse "did not want farmers who insisted on a definitive 'rural life' but those who would lend their land and capital to the industrialization of agriculture."[61] For Nourse, agriculture did not hold a privileged or "special" position in the American economic system. The key to successfully competing in the rapidly industrializing and expanding marketplace was productivity, not the quality of peoples' relationship to the land. It was this need to join the new economy that drove farmers to turn to science. One of Bailey's professors, George F. Warren (1874-1938?), held views similar to Nourse's. Warren rose to prominence in the 1920s due in large part to his success in swaying farmers away from Bailey's agrarian conception of agricultural

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[60]Kirkendall, pp. 11-13.

[61]Stoll, The Fruits of Natural Advantage, p. 17.

science towards a view that emphasized agriculture-as-industry.[62] Despite different ends and means, both positions represent an interest in serving the needs of the people as well as the plants.

Professionalization and Institutionalization

There were other trends and events that boosted the pure science component of agricultural science. The gradual "professionalization" of agricultural science in America, beginning in the 1890s, strengthened traditional scientific values. Despite the efforts of the OES to facilitate communication between the experiment stations and colleges, agricultural scientists were often frustrated by their inability to keep in close contact with current work being done in their fields. These scientists began to form societies for their disciplines and publish journals. Indeed, many of the sub-disciplines of agricultural science, such as economic entomology and plant pathology, were formed during the 1890s. The formation of professional societies improved communication between scientists, contributed to more focused and discipline-oriented research, and provided a forum that recognized scientists' work for the scientific values it exhibited. By rewarding the scientist for advancing scientific interests, professionalization helped to counterbalance the pull of agricultural interests.[63]

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[62]Kirkendall, p. 14.

[63]Margaret W. Rossiter, "The Organization of Knowledge in the Agricultural Sciences," in The Organization of Knowledge in Modern America, 1860-1929, ed. Alexandra Oleson and John Voss (Baltimore: The Johns Hopkins University Press, 1979), pp. 218-220.

The rediscovery of Mendel's work and the development of the Mendelian theory of heredity at the turn of the century was also a factor in increasing the independence of American agricultural research. The Mendelian theory provided a fundamental scientific basis for plant and animal breeding, inaugurating a shift away from the "empirical tinkering" of successful, but not particularly scientific horticulturalists like Luther Burbank (1849-1926). Now with a theoretical platform to stand on, some scientists began to attack the lack of scientific method of the "empiricists." According to Paolo Palladino of the University of Manchester, "From about 1910 onward, geneticists such as Donald Jones from the agricultural experiment station at Storrs, Connecticut, and George Shull, both of whom would soon 'prove' the importance of genetic research for plant breeding by inventing the method for the production of 'hybrid' corn, began to publicly dismiss Burbank's work as lacking experimental and mathematical rigor, and even began to discount his practical contributions to horticulture."[64] Mendelian theory was enthusiastically accepted by agricultural scientists in the United States. By contrasting its American reception with its more subdued reception in Great Britain, where agricultural scientists had a great deal more independence from agricultural interests than their American counterparts, Palladino suggests that Mendelian theory provided American agricultural scientists with much sought after status and a way to place their work in a more fundamental scientific context.[65]

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[64]Paolo Palladino, "Wizards and Devotees: On the Mendelian Theory of Inheritance and the Professionalization of Agricultural Science in Great Britain and the United States, 1880-1930, History of Science, 32 (1994), 409-444, on p. 418.

[65]Ibid, pp. 415-432.

Research support for genetics came in part from the Adams Act of 1906. A. C. True, the avid supporter of fundamental research, drafted the original version of the Act. It was designed to increase funding for original research at the experiment stations and to close the loopholes that had allowed abuses of the Hatch Act.[66] The Act provided $30,000 annually to the experiment stations, and spelled out restrictions on the use of funds, stating that:

> Expenses for administration, care of buildings and grounds, insurance, office furniture and fittings, general maintenance of the station farm and animals, verification and demonstration experiments, compilations, farmers' institute work, traveling, except as is immediately connected with original researches in progress under this act, and other general expenses for the maintenance of the experiment stations, are not to be charged to this fund. The act makes no provision for printing or for the distribution of publications, which should be charged to other funds.[67]

In addition, the act did not provide for the payment of instructors' salaries. The OES had more control over the expenditure of funds provided by the Adams Act than it had had over the Hatch Act funds. Specific, definite proposals had to be submitted to the OES for approval prior to the allocation of funds.[68] The passage of the Adams Act signaled a renewed attempt by agricultural scientists to increase pure research and "adherence to the value system of the scientific disciplines."[69] The Act indirectly aided professionalization by allowing scientists to pursue original research essential to the establishment of their

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[66]Rosenberg, pp. 175-184.

[67]True, p. 171.

[68]Ibid.

[69]Rosenberg, p. 178.

disciplines. It also indirectly helped to provide the material for a better curriculum. By 1917, ten colleges offered doctorates in agricultural science fields.[70]

The American institutionalization of agricultural science through the land-grant colleges and experiment stations helped to form a "persona" for the agricultural scientist that was significantly different from that maintained by traditional scientific ideology. Though traditional scientific values maintained a presence in agricultural science that grew stronger after the initial stages of institutionalization, scientific values always co-existed with strong agricultural interests and values. A service-oriented scientist was the result of these competing forces. Most agricultural science fields had a lay constituency that they were concerned with serving, either for ideological or practical reasons. These constituencies, despite the romantic agrarian leanings of some scientists, such as Liberty Hyde Bailey, were primarily composed of the large-scale farmers and growers, who could invest in research and its application.[71] Forced to compete in an expanding, capitalist market, agriculture was becoming agribusiness--specialized and large-scale.[72] It was this constituency that helped to support the expansion of agricultural science. Reciprocally, agricultural science generally tailored its research programs to their interests.[73] Two

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[70]Rossiter, "Graduate Work in the Agricultural Sciences," p. 44.

[71]Rosenberg, pp. 176-177.

[72]See Steven Stoll, The Fruits of Natural Advantage.

[73]The efforts of Robert A. Millikan and other scientists in traditional disciplines to secure industry support for pure research in the 1920s and 1930s makes an interesting comparison with agricultural science--particularly, perhaps, with regard to ideological struggles. See, for example, Ronald C. Tobey, The American Ideology of National Science, 1919-1930 (University of Pittsburgh Press, 1971).

aspects of agricultural science, the willingness to popularize, or communicate with a non-scientific constituency; and the emphasis on practical, mission-oriented research that often dovetailed with economic needs--are the key to the context within which the maraschino cherry was re-created.

Chapter 2: Re-Inventing the Cherry, Agricultural Science in Oregon

The first chapter briefly traced the development of agricultural science in order to highlight its commitment to practical, "populist" scientific work. In the 1920s and 1930s in the United States, despite the efforts of "fundamentalists" like A.C. True, agricultural science remained a "practical-minded" science. The dual commitment to science and agriculture had created service-oriented scientists--who, though they respected scientific methodology, did not subscribe to the ideology of disinterest. Ernest Wiegand was one of these scientists. A research-entrepreneur, he founded the Department of Horticultural Products (eventually to become the Department of Food Science and Technology) at Oregon State Agricultural College[1] (OSAC) and built it into one of the foremost departments in its field.

Into this receptive scientific atmosphere came the cherry. By the 1920s, the cherry was a major economic crop in Oregon, and it had already been studied by Station scientists--most notably with regard to pollination. In 1925, Wiegand began

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[1]Oregon State University, originally named "Corvallis College," has undergone numerous name changes–occasionally shifting between names quite rapidly, seemingly at the whim of College presidents, newspapermen and legislators. It has been called "Corvallis State Agricultural College," "Corvallis Agricultural College," "Oregon State Agricultural College," "Oregon Agricultural College," "Agricultural College of the State of Oregon," and "Oregon State College." For a brief history of its convoluted nomenclature, see John E. Smith, "Corvallis College," in <u>Early State Colleges of Oregon</u> (Corvallis: Benton County Pioneer-Historical Society, 1953), p. 43. President William Jasper Kerr changed the name to "Oregon State Agricultural College" in 1927-28. As the primary work done on the cherry brining process occurred while the College was under this name, it is the name that will generally be used in this paper, regardless of the time period under discussion.

investigations that would culminate in an improved brining process by 1930. Why Wiegand chose to study the brining of cherries for maraschino (and other) use may already be guessed by considering the service ideology of agricultural science--it was good for the region, most certainly economically. This chapter will examine the economic, social, and geographic conditions that interacted with the scientific context to create favorable conditions for the re-invention of the maraschino cherry. It will also show that agricultural science at OSAC in the 1920s exemplified the service ethic of agricultural science.

The Growth of the Cherry in Oregon

Horticulture is said to have begun in Oregon when employees of the Hudson Bay Company brought the first cultivated fruits to the State in 1824. By 1848, the first nursery in Oregon was started by Henderson Luelling, who in 1847 brought several hundred young grafted saplings of many fruits, including the cherry, from Iowa to Oregon. Luelling settled in the Willamette Valley near Milwaukie, in Clackamas County. The opening of his nursery sparked the first orchard plantings in the State. Seth Lewelling[2], Henderson Luelling's brother, developed the Lewelling, Black Republican,

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[2]Though Henderson and Seth were brothers, the difference in the spelling of their surnames is not an error. The family, upon immigrating from Wales to North Carolina in the latter part of the eighteenth century, changed from the Welsh spelling, Llewellyn, to Luelling in order to simplify it. Sometime after 1875, Seth adopted the spelling "Lewelling." The remainder of the family retained the spelling "Luelling." J.R. Cardwell, Brief History of Early Horticulture in Oregon (Portland: Oregon State Horticultural Society, 1906), p. 9.

and Bing[3] cherry varieties in the 1860s. By 1853, Oregon had exported a "few boxes" of apples. By 1856, its exports had increased to twenty thousand boxes. Fruit cultivation had become profitable. For example, one 1856 box of Esopus Spitzenberg apples made a net profit of $60 for a shipper. However, the fruit industry in Oregon declined from 1860-1870, largely as a result of the success of the California fruit industry.[4]

The California fruit growers came to dominate the market because of their adoption of specialized agriculture, which entailed intensive cultivation of a few varieties and treating farming as a business rather than a way of life. J. R. Cardwell (?-1916),[5] a former president of the Oregon State Horticultural Society, recognized the shift in agricultural practices that was occurring in California and realized that Oregon must follow suit if its fruit growing industry was to prosper. According to Cardwell, the revitalization of Oregon fruit growing occurred because:

> The press of the Golden State, the common carriers, the far-sighted men who saw what the possibilities were in this direction, came to the

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[3]According to Cardwell, the Bing cherry variety was named for a "faithful old Chinaman" associated with Seth Lewelling. Cardwell, p. 6. According to Seth Lewelling's stepdaughter, the name of the Black Republican cherry carried political implications. Seth (and his father and brothers as well) was an abolitionist and helped organize the Republican party in Clackamas County. Supposedly, when his anti-abolitionist friends called him a "Black Republican," he replied that "before I am through with it I will make it a term of honor, and I'll make you relish Black Republicans." He named a new cherry variety of his invention "Black Republican" and many of his critics literally "ate their words." Thomas C. McClintock, "Henderson Luelling, Seth Lewelling and the Birth of the Pacific Coast Fruit Industry," Oregon Historical Quarterly, 68, no. 2 (1967), 153-174, on p. 167.

[4]Cardwell, pp. 3-16.

[5]Dr. J. R. Cardwell was also a member of the original board of trustees of Corvallis College.

> rescue with well-considered presentations of the true facts in the premises. They discussed the subject at issue in the light of well-established and fully-recognized business principles.
>
> The geographical position of the country, its peculiar climatic surroundings, its adaptability to the production of certain fruits, and the lack of similar climatic conditions in vast areas certain to be the homes of vast populations were pointed out and dwelt upon and the certainty that these vastt populations in the nature of things, would require immense supplies of our fruits, green, dried, canned, and preserved, was made apparent.[6]

Writing in 1906, well in advance of more theoretical works, like those by USDA economist Oliver E. Baker, Cardwell summed up, in a basic way, the rationale for specialized agriculture. For him, certain climates favored certain fruits. Choosing the fruits that grew best in a region and applying business principles to growing and distribution practices would maximize profits. Specialized agriculture basically meant "growing the right crop in the right region to realize the highest possible yield for the least amount of capital and labor."[7] California, with its "far-sighted men" and the popularizers of their ideas (the press and "the common carriers," or growers) had already provided a working example to economic success in fruit growing. The salvation of the Oregon agriculture industry lay in accepting specialized agriculture.

One of the "far-sighted" men referred to by Cardwell might have been William H. Mills, who in an 1889 address to the California State Agricultural Society, stated that, "In every market there are immediately present the effects of the systems of labor, the methods of production, the favoring conditions of soil and climate; they meet face to face;

[6]Ibid, pp, 15-16.

[7]Stoll, p. 30.

distance no longer divides them. The economic presence has become the equivalent of physical contiguity."[8] Oregon farmers and growers took the message to heart. The expansion of the railroads had begun to quiet the traditionalists who believed that farming must remain localized and diverse. The Oregon soil and climate, particularly in the most fertile areas in the Willamette Valley, favored fruit--a highly perishable, but profitable commodity.

Specifically, the Oregon climate favored temperate fruits such as Italian prunes, Bartlett pears, and Royal Ann (also known as Napoleon) and Black Republican cherries. It could grow these varieties well enough to attract "favorable attention abroad."[9] In 1872 Cardwell planted a six-hundred-acre orchard, half Royal Ann and half Black Republican, later adding four-hundred Bing cherry trees. He noted that cherries were "fairly remunerative, but of late, on account of fungi, the Royal Ann has not carried well in the long haul."[10] He went on to mention the cherries' perishability, especially when shipped, but, due to the rescue by the canning industry, he concluded that they are still "fairly remunerative." If you wanted to make money in agriculture in Oregon, fruit was a good way to go and the cherry was a good fruit to plant.

The cherry, particularly the sweet cherry, has a limited growing range. As of 1930, no cherries were grown on a commercial scale below the Mason-Dixon line. The hot, humid weather of the Southern states encourages several diseases and harmful insects

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[8]Ibid, p. 41.

[9]Cardwell, p. 16.

[10]Ibid, p. 25.

such as brown rot, leaf spot disease, and curculio attack.[11] Though pesticide use began to increase in the 1910s as a result of the advent of more reliable and scientific pesticide companies like ORTHO, the inhospitable southern climate demanded extremely thorough spraying for satisfactory crops.[12] Sweet cherries also have a limited northern range, succeeding in Northern states such as Michigan and New York "due to the moderating effects of nearby bodies of water."[13] They are at high risk from late winter freezes and early spring frosts. Relatively early bloomers, cherry buds are susceptible to frost injury long before flowering.[14] Commercial growing of sweet cherries has been confined almost entirely to Western states, primarily California, Oregon, Washington, Idaho, and Utah, in order of importance as of 1933. A few commercial orchards of sweet cherries exist in Michigan and New York, but these are minimal and of relatively little commercial importance.[15]

In 1890, Oregon had 16.1% of all cherry trees of bearing age (primarily sweets) in the five Western states. By 1920, the percentage had increased to 24.5% of all trees of bearing age. The three dominant varieties of cherry in Oregon were the Royal Ann

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[11]Victor R. Gardner, The Cherry and Its Culture (New York: Orange Judd Publishing Company, Inc., 1946), pp. 16-17.

[12]Stoll, p. 233, Gardner, p. 16.

[13]Gardner, p. 16.

[14]Gardner, pp. 25-27.

[15]Milton N. Nelson and George L. Sulerud, An Economic Study of the Cherry Industry with Special Reference to Oregon, Oregon Agricultural Experiment Station Bulletin no. 310, (Corvallis, OR: 1933), p. 8, p. 16.

(Napoleon)[16], Bing, and Lambert. All of these varieties are sweet cherries. The Royal Ann was the primary variety used for maraschino and glacé cherries. In 1930, the Royal Ann comprised 52.5% of trees of bearing age in Oregon and 48.6% of all cherry trees.[17] Of the total Royal Anns in Oregon (147,721 as of 1930), 75.2% of trees of bearing age and 72.5% of all ages were grown in the Willamette Valley district.[18] Though these percentages are for 1930, the Willamette Valley district grew a percentage of Oregon's cherry crop that stayed between 62.8% and 69% between 1900 and 1930. Oregon sweet cherry production, in particular the Royal Ann, was concentrated in the Willamette Valley area before and after the development of the brining process at OSAC, which is in Benton county, in the south Willamette Valley district.[19] Oregon State Agricultural College was a natural place to undertake research on cherries, particularly the Royal Ann, as it was located in one of the major regions in the United States for the production of that variety.

In the spirit of specialized agriculture, Oregon growers had found one of the fruits most suited to their region. They began to plant. According to a 1903-1904 report by the American Pomological Society, from 1890-1900, Oregon was not even considered one of

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[16]When Henderson Luelling brought the first cultivated cherry grafted trees to Oregon in 1847, the label of one variety was lost. He renamed it the Royal Ann. It had been cultivated for three centuries. Since 1820, it has been called the Napoleon, but "Royal Ann" in still commonly used on the Pacific Coast.

[17]Nelson, "An Economic Study," pp. 12-13.

[18]The Willamette Valley district, as defined in this report, consists of Clackamas, Multnomah, Washington, Columbia, Marion, Polk, Yamhill, Lane, Linn, and Benton counties.

[19]Nelson, "An Economic Study," pp. 23-26.

the top ten cherry producing states in the country.[20] By 1910, Oregon had 223,456 cherry trees of bearing age; by 1920, that had increased to 395,073 trees; and by 1930, 446,106 trees.[21] The boom in agricultural produce prices caused by World War I sparked increased plantings. In 1904, W.T. Macoun, chairman of the American Pomological Society's Committee on The Cherry, had advocated much wider planting of the cherry, stating that "It is always in demand and the market is rarely glutted."[22] Depressed agricultural prices in the 1920s, however, coupled with the acreage now coming into bearing, caused Oregon growers to look for new markets and new ways to utilize their growing cherry harvests.[23]

There were several market outlets for sweet cherries--fresh shipping, canning, freezing, and brining. Most of these did not promise to be fruitful for the expanding sweet cherry crop. The two primary markets for sweet cherries prior to 1926 were fresh and canned.[24] Cherries, as a highly perishable and fragile fruit, had always presented growers with problems in expanding the fresh market. They did not stand shipment well and "particularly when produced in localities where rains are prevalent at harvest time,

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[20]W. T. Macoun, E.E. Little, and T. A. Farrand, "The Cherry in North America," in The Cherry, Together with Reports and Papers on Pear, Plum, Peach, Grape, and Small Fruit, ed. John Craig (Ithaca: American Pomological Society, 1905), 14-60, on p. 48.

[21]Gardner, p. 19.

[22]Macoun, p. 14.

[23]Ernest H. Wiegand, "The Brined Cherry Industry," Western Canner and Packer, 38, no. 3 (1946), 60-63, on p. 60.

[24]Roy E. Marshall, Cherries and Cherry Products (New York: Interscience Publishers, Inc., 1954), p. 23.

they [were] subject to heavy loss in grading and dockage."[25] Shipping was even more of a problem with the Royal Ann cherry. As a white cherry, its flesh showed bruises much more readily than dark cherries, which were the principal types of cherry in demand for the fresh market.[26]

Diseases provided a problem for fresh cherry shipment, too. C. J. Hurd, marketing specialist for the Oregon Agricultural College Extension Service, identified the cherry maggot and brown rot as "serious menace[s]" to the industry in his paper "Marketing Oregon Cherries, 1924."[27] In attempting to improve standards, grading procedures, and packing methods, growers were often regaled with horror stories of misbegotten shipments to the East Coast that arrived in unsaleable condition. Adding to transportation woes, before 1939, refrigerated shipping was not in widespread use.[28] Looking at all these factors--perishability, disease, and a fresh market demand for black, not white, cherries--Oregon growers could not reasonably expect to substantially increase their share of the fresh cherry market.

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[25]Milton N. Nelson, "The Market Situation and Outlook for Cherries in Oregon," Twenty-third Annual Report of the Oregon Horticultural Society (Hood River, OR: The Hood River Glacier, 1932), 101-112, on p. 106.

[26]Gardner, p. 125.

[27]C. J. Hurd, "Marketing Oregon Cherries, 1924," Sixteenth Annual Report of the Oregon Horticultural Society (Salem, OR: The Pacific Homestead, 1924), 72-76, on p. 72.

[28]Richard L. Hall, "Pioneers in Food Science and Technology: 'Giants of the Earth'," Food Technology, 43, no. 9 (1989), 186-195, on p. 188.

Increasing the market for canned Oregon cherries posed problems as well. Both sweet and sour cherries were canned in roughly equal amounts, though their respective percentages of the canned pack varied over the years.[29] Sour cherries were easy to can. However, sweet cherries, particularly blacks, had a higher direct cost than sours. Nelson said that: "A factor in the case of the sweet cherry is also the danger of spoilage, because tin cans cannot withstand the corrosive tendencies of the product as successfully as most other fruits."[30] Black cherries were most susceptible to this kind of "in-can" spoilage, but Royal Anns were also a victim. Nelson also reported the claim that "Royal Ann cherries changed their flavor from the fresh fruit to the canned form to a greater extent than most other fruits."[31] For these and other reasons, the canned cherry market lost ground to the canned fruit market as a whole. Canned cherries made up 11.3% of the total canned fruit pack in 1919-1922, but fell to 8.6% of the total by 1927-1930. These factors led "many to believe that the volume of Royal Ann cherries that can be absorbed by the canning industry has definite limitations."[32]

Other methods of preservation for marketing were unsuitable for the cherry. According to all sources consulted, dehydration was never a viable market for the cherry--there was simply no demand. The frozen pack for the cherry would eventually become a sizable market. But this method, too, was not a viable option in the 1920s. Clarence

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[29]Nelson, "An Economic Study," pp. 41-45.

[30]Ibid, p. 56.

[31]Nelson, "Marketing Situation," p. 109.

[32]Ibid, pp. 109-110.

Birdseye did not begin developing his quick freezing method until 1923. Before then, "cold storage foods" were slow frozen and had a deservedly poor reputation for quality.[33] According to published figures, no Royal Anns were put up in a frozen pack in the Pacific Northwest from 1925 to 1929.[34] Writing in 1933, Nelson stated that "disposition of Royal Anns in the frozen form does not now appear to be practicable on any considerable scale, although hope is held out that further research will solve the difficulties that now act as a barrier."[35] Basically, as alluded to in the Nelson quote, freezing technology was not good enough to package a quality product. Freezing technology was in its infancy in the 1920s and would not lead to a widespread market until 1939.

As Oregon farmers and growers began to adopt specialized agriculture in the late nineteenth century, they discovered that fruit growing--particularly apples, prunes, pears and cherries--was a "maximum use" of their land. They could grow these fruits well enough to succeed in an increasingly global agricultural market. However, long-standing problems with cherry production, including diseases, pests, processing problems, and a growing surplus, created economic pressures. Farmers had geared their production to high levels to support the war effort during World War I, but an economic depression in 1920 made their economic position more tenuous. As the mid-twenties approached, farmers and growers were faced with increasing problems in marketing their crops. Farmers turned for solutions to Oregon State Agricultural College and its Experiment

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[33]Hall, p. 190.

[34]Ibid.

[35]Nelson, p. 108.

Station. By 1923, "Both the Experiment Station and the Extension Service stepped into the breach, finding new crops and markets, and vowing to learn more about marketing."[36] One of the most important new markets found was the brined cherry market. The creation of this market is representative of the "service science" that became institutionalized with agricultural science.

Corvallis College: Under-Funded, Infertile

Most major agricultural research in Oregon has taken place at the Oregon State Agricultural College and its associated experiment station. These two institutions have been closely related since the Station's inception. Founded by the Methodist church in 1858, Corvallis College was designated "the agricultural college of the state of Oregon" in 1868 so it could receive a land grant under the provisions of the Morrill Act of 1862. Under the Administration of President William A. Finley (1839-1912) the College offered an agricultural course of study beginning in 1869-1870 school year.[37] The

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[36]Oregon State Agricultural Experiment Station, 100 Years of Progress: The Oregon Agricultural Experiment Station, Oregon State University, 1888-1898, (Corvallis, OR: College of Agricultural Sciences, Oregon State University, 1990), p. 44.

[37]The agricultural course of study at the time was as follows:
First Year

First Term	Chemical Physics, Inorganic Chemistry, Structural and Physiological Botany, First Five Books of Davies' Legendre
Second Term	Organic Chemistry, How Crops Grow; English Language
Third Term	Qualitative Analysis, Detection of Alkalies, Alkali Earth, Systematic Botany Excursions and Collections, English Language

College had limited supplies of scientific apparatus and reagents (President Benjamin L. Arnold (1839-1892) stated that "there was no chemical apparatus" when he succeeded Finley in 1872), but students did manage to undertake some work in qualitative analysis, testing for alkalies and alkaline earths, and the study of injurious insects. The College was in constant financial trouble in its early years.[38] In 1872, President Finley resigned, in part due to the mounting financial difficulties.[39] Concerning the monetary woes faced by the agricultural program, the 1872 Second Biennial Report stated that:

> To carry on the Agricultural College, and meet its imperative needs (more funds should be provided). The instruction of the classroom in this department (agriculture) has required the labor of two teachers, while the amount received from the State was not sufficient to pay the salary of one,

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Second Year

First Term	Qualitative Analysis, Detection and Separation of Elements, Chain Surveying, Mensuration, Geometrical Drawing, General Principles of Geology, or German
Second Term	General Principles of Geology, Vegetable Economy, How Plants Feed, Typographical Drawing, Animal Physiology, or German
Third Term	Geology of Oregon, Vegetable Economy, Entomology, or German

Smith, p. 11.

[38]In 1873, G. W. Atherton of Rutgers College sent a questionnaire to the Land-Grant Colleges "For the purpose of ascertaining as far as possible the fruits up to the present time of the Congressional land grants in aid of Agricultural and Scientific education." In his response, President Arnold noted that, though the school had received 90,000 acres valued at $225,000, the funds were "not yet available"–a full five years after Corvallis College received the designation as the State Agricultural College. The College was only receiving "$5,000 annually for two years." Rutgers College, Letter and Form for the Purpose of Ascertaining as Far as Possible the Fruits up to the Present Time of the Congressional Land Grants in Aid of Agricultural and Scientific Education: signed by G.W. Atherton. July 10, 1873 (1873), Special Collections, Oregon State University.

[39]Smith, pp. 5-18.

> being less than $1000 a year. We have greatly needed a professor of practical agriculture to take charge of the students while at work on the farm, etc. This has been done, however, by the teachers after school hours, they receiving no remuneration for their extra labors.[40]

This shortage of funding for agricultural instruction was not uncommon among the land-grant schools and would prove to be a major reason for the Hatch Act's failure to substantially increase the quantity and quality of agricultural research. The experimental farm at the College (the Morrill Act required that each land-grant institution own at least thirty-five acres for use as an experimental farm) was purchased with contributions from local citizens. In April of 1871, the farm was purchased and some farm work and agricultural instruction was begun by Professor William W. Moreland. However, in the Fall of 1871, this work was discontinued. There were inadequate funds to support both the farm work and the preparatory department of the College. The funding decision shows which of the two was considered the most important at that time.[41]

As with most land-grant schools in this period, fundamental scientific research on agriculture was slight to non-existent. However, some experimental work was conducted at Oregon State Agricultural College before the creation of the Experiment Station in 1888. From 1872 to 1880, professors and students in the agricultural course performed limited practical experiments. Often, the experiments were exercises in comparative cultivation. Tests were done to determine the most effective fertilizers on white soil. (Sulphate of lime came out on top.) Comparative cultivation experiments were also

[40]Ibid, p. 16.

[41]Ibid, pp. 13-14.

performed with various grains to determine, for instance, how much grain each pound of seed would produce. Agricultural chemistry students worked on subjects such as the "origin of various soils, their physical characteristics, methods of preparation for crops; means for preventing the deterioration of soils; means to restore worn-out soils, management and actions of fertilizers; and meteorology in its relation to crops."[42] From 1878-1880, mention was made of some work done on stock raising and fruit culture.

From this brief overview, it is apparent that little, if any, fundamental scientific work was undertaken in the early years of agricultural science at OSAC. In large part, the paucity of fundamental research during this period was due to limited faculty and resources. Arnold stated that "So limited have been our means and so uncertain the amount of money we should receive, that it has been impossible to do anything beyond giving the results of experiments conducted by Lawes and Gilbert."[43] Even as late as the 1885-86 school year, experimental work occasionally had to be discontinued for lack of funds. One early report noted the lack of scientific work and suggested a reason:

> This decided lack of interest in scientific agriculture and insufficient appropriations for work, other than the work of instruction in the classroom , has been no doubt due to the newness of the country; its great fertility; exceptionally fine climate, in the farming portion of the state, giving certainty to crops; freedom from insect pests and extensive tracts of grain and grazing lands to be occupied practically without cost.[44]

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[42]Ibid, pp. 23-24.

[43]Ibid, p. 24. Sir John Bennet Lawes (1814-1900) and Sir Joseph Henry Gilbert (1817-1901) founded the Rothamsted Experiment Station in England–one of the foremost experiment stations of the nineteenth century.

[44]E. Grimm, History and Organization, Oregon Agricultural Experiment Station, Bulletin No. 1 (Corvallis, OR: "Bob's Print," The Times Office, 1888), pp. 3-4.

In the 1860s and 1870s, Oregon farmers and growers had not yet felt the need for intensive, specialized agriculture. The quoted passage links "lack of interest" (presumably by farmers), insufficient appropriations for work, and the absence of a need for specialized agriculture in a way that suggests there was to emerge a direct link between the economic interests of farmers with the support and progress of research in agricultural science.[45]

Putting Down Roots: Agricultural Science and the Experiment Station

In 1884, citing the work of European experiment stations, Arnold asked the Oregon Legislature to send a memorial[46] to the U. S. Congress supporting the passage of an early version of the Hatch Act. The legislature declined to do so. After passage of the Hatch Act in 1887, the legislature took another two years, until February 1889, to pass legislation enabling the creation of the Experiment Station. In part, this was due to debates over "coordinating experiment station research with resident instruction."[47] The use of Hatch funds for instruction and other expenses unconnected with original research had one advantage--it strengthened the College. Relations between the College and the

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[45] 100 Years, pp. 1-2.

[46] The definition of "memorial" as used here is, as per Merriam Webster's Collegiate Dictionary, "a statement of facts addressed to a government and often accompanied by a petition or remonstrance."

[47] 100 Years, pp. 2-11.

Station were quite close. One Hundred Years of Progress describes agriculture as "the guide and major building block for the institution [OSAC]. Without the land grant designation and the funds that went with it, and the later passage of the Hatch Act, Corvallis College probably would have continued to exist in a precarious state and, eventually, died."[48] All early station research was actually conducted in the academic departments of OSAC. The first Station scientists also taught in the Department of Chemistry at the College.[49]

The Experiment Station at OSAC was organized on July 2, 1888 [50](though Governor Sylvester Pennoyer did not sign the legislation officially establishing the Station until February 25, 1889[51]). The initial Station council consisted of three OSAC professors: Edgar E. Grimm, director and agriculturist; E. R. Lake, botanist and horticulturist; and P. H. Irish, chemist. The original Experiment Station was located in Benton Hall and the experimental farm encompassed what is now the lower campus of Oregon State University. In 1891-92, President Arnold was the Station director (the College president would continue to assume the role of Station director until 1907). George W. Shaw was the Station chemist and George Coote, its horticulturist. All were members of the OSAC faculty.

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[48]Ibid., p. 13.

[49]These were P. H. Irish, W. D. Bigelow, E. W. Shaw, Durmont Lotz and John Fulton. Ibid, pp. 13-16.

[50]Smith, p. 34.

[51]100 Years, p. 11.

Early experimental work at the Experiment Station continued the practical orientation of previous agricultural studies at the College–though with more funding and a larger experimental farm, allowing for more systematic experimentation. Station research in this early period included work on the chemistry and physics of alkali soils and methods for improving them, chemical evaluation of cattle feeds, and composition of some fruits with reference to the composition of the soils in which they were grown.[52] A brief overview of the subjects of early research, gleaned from the Station bulletins, was summarized by Smith as: "wheat and its production, numbers 4, 5 and 16; vegetables, 4, 7, 11 and 15; shrubs and small fruits, 4, 7 and 12; sugar beets, 17; stock feeds and feeding, 6, 9, 19 and 20; chemical analyses, 4, 6, 13 and 17; farm pests both plant and animal, and their control, 3, 10, 14, 18 and 19."[53] The demand for responses to farmers' immediate practical problems and for analytic services dominated the work agenda at the Experiment Station. John Fulton, the Station chemist, remarked, in a statement that echoed those of many other station scientists nationwide, that "considering the amount of miscellaneous work continually received at the laboratory...we have ample employment for nearly all the ensuing year."[54]

In addition to their experimental work, in 1888, Station scientists began to conduct Farmers' Institutes, which provided information on scientific agriculture to people involved in various types of grain, stock, and fruit growing. According to Smith,

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[52]Ibid, p. 16.

[53]Smith, p. 34.

[54]100 Years, p. 16.

by the end of 1890-91, "nearly all of the county seat towns and some others in western Oregon and the more important ones east of the Cascades had been reached."[55] Despite the already heavy burden of classroom and Station work, scientists made a concerted effort to educate the rural populace on the practical aspects of agricultural science. The Farmers' Institutes not only aided regional farmers and growers–they benefitted the Station and College as well. In 1896, the Station Council asked the State legislature for increased funding for Farmer's Institutes, noting "the great good done to the station by bringing its workers directly in contact with the farmers and fruit growers themselves."[56] Though the "great good" referred to is left unspecified, there is little doubt that practical contact with the rural populace tended to increase support for Station work.

By the turn of the century, Station scientists were still inundated with short-term, practical work geared mostly toward local agricultural interests. A 1901 report stated that: "The Station staff for the past year has worked mainly on practical subjects which were of immediate pecuniary interest to the agricultural classes."[57] The Hatch Act had freed station scientists somewhat from the demands of teaching, if not "extension" work, and allowed them to pursue agricultural research. This influenced the College, since research was still in the process of being accepted as an ordinary function of American colleges and universities. President Thomas Gatch (1833-1913) was representative of a faction that wished to continue to emphasize the instructional role of the College, and

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[55]Smith, p. 35.

[56]100 Years, p. 14.

[57]Ibid, p. 24.

stated that "Our college should forever remain as it is--emphatically the farmers' school."[58] William Jasper Kerr (1863-1947), who succeeded Gatch as president of OSAC, encouraged the emphasis of research at the College, forming four new schools in his first year as president--agriculture, engineering, home economics, and commerce.

Though Kerr supported the growth of research as a function of the College, he had a very utilitarian vision of the role and purpose of that research. In a 1931 speech at a meeting of Land-Grant institution presidents, he said that: "That Land-Grant institution... that most fully surrenders itself to the state and nation in a spirit of service, that institution shall truly be greatest among us." And though the Morrill Act asked the Land-Grant Colleges to provide for "liberal and practical education," Kerr thought that the ultimate goal of the College was to teach how "to apply science in the industries of life."[59] In an effort to increase time for research, however practical, Kerr established an extension service to absorb some of the routine duties of Station scientists in 1911, three years before the Smith-Lever Act created a national extension service. Kerr, with his belief in practical, service-oriented research, was president of OSAC during the development of the cherry brining process.

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[58]Ibid, p. 25.

[59]Ibid, p. 28.

Bearing Fruit: Early Research on the Cherry

Research related to the cherry conducted by the Experiment Station in the first two decades of the twentieth century focused almost entirely on diseases and insects that were injurious to the cherry and on breeding and pollination of cherry varieties. In 1904, it was reported that "Horticultural work is practically nil...The station suffers a serious embarrassment for the want of a scientific and practical horticulturist."[60] In 1905, C. I. Lewis (1880-1922) became the Station horticulturist. Station director James Withycombe (1854-1919), in a 1906-07 report to President Kerr, stated that "Without a doubt fruit growing is the most rapidly developing branch of agriculture at the present time.... There should be a special representative of the station at Hood River."[61] Withycombe's report reflects an early awareness of the needs of the expanding fruit growing industry.

As early as 1910, Oregon fruit growers were becoming alarmed at the problems of orchard management, production, and control of injurious insects and diseases. Several leading growers hired technical assistants trained in horticulture and entomology to cope with these problems. It soon became evident to growers that a more substantial research program needed to be implemented in order to satisfactorily solve the problems related to commercial fruit growing. At the "urgent request of fruit growers," the Oregon legislature passed House Bill 276 in 1913, which provided $3000 annually "for

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[60]John C. Burtner, "A Half Century of Agricultural Research," in The First Fifty Years of the Oregon Agricultural Experiment Station, 1887-1937, Oregon State Agricultural Experiment Station Circular 125 (Corvallis, OR: 1937).

[61]Ibid.

establishing and maintaining an Agricultural Experiment Station in Hood River County."[62]

The branch station at Hood River did not conduct much, if any, fundamental research, but it played an important role in aiding the fruit growing industry and increasing public support for Station work. The role of the Hood River Station was summed up by Station director J. T. Jardine (1881-1953?) in a September 21, 1920 memorandum, in which he stated that "The work of the Station at Hood River more than I realized is investigational for the purpose of adapting fundamental results to commercial practice under Hood River conditions." He ended the memorandum with the statement: "The Station apparently is serving the public in a very satisfactory manner. In the way of research, however, not much can be expected."[63]

Public support for continued legislative appropriations for the Hood River Station bolstered Jardine's claim that the Station provided a worthwhile public service. A comment on continued Experiment Station appropriations in the December 9, 1922 Pacific Coast Packer stated that "Businessmen and orchardists in commenting to the budget board on the work of the Station declared it made the investment one of the best in

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[62]W. M. Mellenthin, Gordon G. Brown, and R. S. Besse, The Mid-Columbia Branch Experiment Station: Its Development, Program and Accomplishments, 1913 to 1964, Oregon State University Archives, Agricultural Experiment Station Records, 1889-1994 (RG25), Branch Station Records (SG2), Mid-Columbia, 1912-1964 (VIII), History and Records, 1945-1964, reel 25, pp. 2-3. The Hood River Branch Experiment Station was renamed the Mid-Columbia Branch Experiment Station in 1953.

[63]J. T. Jardine, "Memorandum for Office," Oregon State University Archives, Agricultural Experiment Station Records, 1889-1994 (RG25), Branch Station Records (SG2), Hood River, miscellaneous, 1913-1950 (V), reel 24.

the county."[64] This declaration is supported by a January 4, 1923 resolution passed by the Apple Grower's Association, which noted that the fruit industry received benefits "many times the value of the expenditures for the Hood River Experiment Station."[65] The formation and continuation of the Hood River Station provides an example of the similarity between the interests of Station scientists and their lay constituency–in this case, the fruit growers.

Despite the growing recognition of the importance of the fruit growing industry in Oregon by Station scientists and legislators alike, research specifically related to the cherry was occasional throughout most of the 1910s. In 1911, the legislature passed Senate Bill 31, "An Act to appropriate Fifteen Thousand Dollars for the expense of investigations by the State Agricultural College at Corvallis, Oregon, for crop and fruit pests and diseases and horticultural problems in the State of Oregon." The brief introduction to the Biennial Crop Pest and Horticulture Report1911-12, which summarized the work done with funds provided by the Act, went on to state that "This law was enacted at the urgent solicitation of prominent horticulturists throughout the state, and the report unquestionably indicates the wisdom of the movement." Of the thirty-one papers included in the 1911-12 report, two were specifically related to the

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[64]"Continue Experiment Station Appropriation," Oregon State University Archives, Agricultural Experiment Station Records, 1889-1994 (RG25), Branch Station Records (SG2), Hood River, miscellaneous, 1913-1950 (V), reel 24.

[65]Resolution passed by Apple Grower's Association, 4 January 1923, Oregon State University Archives, Agricultural Experiment Station Records, 1889-1994 (RG25), Branch Station Records (SG2), Hood River, miscellaneous, 1913-1950 (V), reel 24.

cherry–"The Cherry and Pear Slug," and "Cherry Gummosis, a Preliminary Report."[66] The 1913-14 report included papers on "A New Cherry Pest" (Simplemphytus pacificus) and a follow up report on cherry gummosis, "Bacterial Gummosis or Bacterial Canker of Cherries." The next report, which covered the years 1915-20, contained only one paper specifically focused on the cherry, "Cherry Breeding."

These investigations, though not numerous, were important to the cherry-growing industry in Oregon. Serious attacks of cherry gummosis–the abnormal development of gummy or mucilaginous substances in the cherry–had been a problem in Oregon at least as early as 1853. Sweet cherries–the primary type of cherry grown in the state–were much more susceptible to gummosis than sour cherries. The scientific investigation at OSAC into this disease began in 1909 and continued until at least 1914.[67] Cherry gummosis was, at the time of the report, considered "the greatest drawback to the culture of our most favored varieties of sweet cherries" (particularly the Royal Anne and Bing varieties). In 1909, a graduate student at OSAC, F. L. Griffin, working under A. B. Cordley (1864-1936). Cordley was the Station entomologist and eventually Station director.) "made an interesting discovery regarding a certain type of the disease" and pursued research on cherry gummosis for his master's thesis. His thesis provided the

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[66]Oregon State Agricultural Experiment Station, Biennial Crop Pest and Horticultural Report, 1911-1912 (Corvallis, OR: 1912).

[67]Most work that had been done on gummosis before this time had occurred in Europe, beginning in the middle of the nineteenth century. Little thorough scientific investigation had been done outside of Europe with the exception of O. R. Butler, who published a paper on the subject in 1911. H. P. Barss, "Cherry Gummosis, A Preliminary Report," Biennial Crop Pest and Horticulture Report, 1911-12, p. 199.

basis for subsequent work on the disease by Station scientists. The solution to the problem of cherry gummosis not only reveals the close interaction between the College and the Experiment Station, but indicates the increased attention paid to the cherry-growing industry by the Station. Though a problem for cherry growers as early as 1853, a systematic study was not undertaken until the expansion of cherry growing as a commercial industry at the beginning of the twentieth century.[68]

Experiment Station investigations of cherry pollination were also of importance to the growers. The pollination studies were listed with "Oregon Station results of outstanding importance" in J. T. Jardine's paper, "The Rise, Development, and Value of the Agricultural Experiment Station." From 1911-1913, Station experiments showed that Oregon's three leading cherry varieties (the Royal Anne, Bing, and Lambert) were not only self-sterile, but inter-sterile. This news, according to Jardine, was "a startling fact, according to general knowledge at that time."[69] The burst of increased research on the cherry, from roughly 1910-1914, coincided with the increasing importance of the cherry-growing and fruit-growing industry in general in Oregon. Long standing problems of disease and breeding were finally being addressed in a systematic, scientific manner. The next burst of cherry research came in the 1920s, and occurred under the auspices of a newly created department, Horticultural Products.

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[68]Ibid.

[69]J. T. Jardine, The Rise, Development, and Value of the Agricultural Experiment Station, Oregon Agricultural College Experiment Station Circular 26 (Corvallis, OR: 1922). Pp. 21-22.

Branching Out: The Growth and Specialization of the Horticulture Department

Horticulture had existed as a department at OAC since 1888. George Coote (1842-1908), an instructor in horticulture during these early years, described the purpose of the department: it was "...to instruct the student in the most practical manner in the science of horticulture and floriculture."[70] "Extension" work was integrated into the normal working routine of the department. Professor Moses Craig, in the 1897 Annual Report of the Oregon Agricultural College and Experiment Station, mentioned that "I attended and read papers at four [farmers'] institutes, one in Benton and three in Linn counties. I read a paper on Plant Hygiene before the Northwest Fruit Growers' Association. I gave ten lectures on Structural and Economic Botany at the Chautauqua in July and twenty-four on Botanical and Horticultural subjects before the short courses in January and February."[71] Most early Horticultural work was directed toward the needs and education of regional growers.

In 1906, Horticulture began to strengthen itself as an academic department. C.I. Lewis, appointed head of the Horticulture Department in that year, brought new initiative and energy to the department. In his first year, he made the statement that "Since so little has been done in the Horticulture Department of the station for a number of years, the time is exceedingly opportune to launch immediately upon a vigorous campaign of

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[70]Spencer Butler Apple, Chronological History of Horticulture at Oregon State University, 1872-1967 (Corvallis, OR: 1967), p. 4.

[71]Ibid, p. 6.

investigation and cooperative extension work."[72] One reason why the expansion of horticultural research was "exceedingly opportune" at this time was that Oregon was in the middle of a boom in the planting of tree fruit orchards. It is interesting to note that though Lewis was speaking as the head of the Horticulture Department at OSAC, he refers to "the horticultural department of the station" in his statement. Despite the growth of the academic aspects of the department, it was still seemingly one and the same with the Station. From 1906-1920, the Department greatly expanded the curriculum and trained many men who would become leaders in horticultural research, particularly relating to the cherry.

The stated aim of the department in 1906-07 was to give the students an understanding not only of the principles underlying the study of fruit growing, "but their direct application to the conditions on the Pacific Coast" as well. In the first course of their senior year, students were required to be able to put up a commercial pack of fruit. The number of courses offered expanded from 33 in 1908-09 to 56 course offerings in 1911-12. In 1911-12, horticultural students spent roughly one third of their time studying basic science related to agriculture, one third on technical agricultural subjects, and one third on non-technical scientific subjects such as English, Mathematics, History, and Economics. From 1910-11 to 1912-13, the number of students taking horticulture courses increased from 245 to 381. The Department's academic functions were rapidly expanding and "outside" influences affected the direction of this expansion.[73]

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[72]Ibid, p. 7.

[73]Apple, pp. 14-18.

A 1910-1912 Biennial Report of the Board of Regents noted a strong interest in "Horticultural By-Products." The report mentioned "heavy correspondence" from " students requesting courses of instruction in this field, and from industries in Oregon interested in the utilization of culls and other waste products."[74] Culls and waste had always been a problem for fruit growers because of the perishable nature of their product. Oregon State Agricultural College responded to the desires of the students and the fruit growing industry. In 1913-14, the Department offered courses in Horticultural By-Products for the first time. Courses specifically geared toward research, such as "Methods of Research" and "Advanced Thesis and Research Work" were also offered for the first time during the 1913-14 academic year. By 1919, courses were offered in Horticultural Products and Ernest H. Wiegand was hired to build this new department.

The 1919-20 year marked several changes in the make-up and direction of the Horticulture Department. In the years immediately preceding 1920, the department lost several key faculty members[75]. C. I. Lewis, who had energized the Department in 1906, retired in 1919 to become the Organization and Publicity Manager for the Oregon Growers' Cooperative Association, and later became managing editor for the national trade journal, the American Fruit Grower. E.J. Kraus, highly decorated in academia, also left the department in 1919. His Ph.D. thesis, completed at the University of Chicago while on sabbatical leave from OSAC, was published in the Oregon Agricultural College

[74]Ibid, p. 18.

[75]"Thirteen faculty members became department heads at other institutions, and three went on to high administrative posts at the USDA." 100 Years, p. 62.

Experiment Station Bulletin 149. Entitled Vegetation and Reproduction with Special Reference to the Tomato, his thesis related "the internal biochemistry of plants to their vegetative growth and reproductive development" and "was, and is, the foundation and basis of much of the basic and applied research in the field of plant (crop) physiology from that time until today."[76]

Two notable faculty losses that relate to the cherry were V. R. Gardner (1885-?) and R.E. Marshall (1890-1966). Gardner left in 1918, eventually becoming the head of the Horticulture Department at Michigan State and director of the Michigan Agricultural Experiment Station (positions he held concurrently). While at Michigan State University, he authored one of the few monographs on the cherry, The Cherry and Its Culture. R.E. Marshall left OSAC in 1916. He also became a member of the Horticulture Department at Michigan State (Michigan is one of the primary eastern cherry producing states). While there he wrote one of the other few monographs on the cherry, Cherries and Cherry Products, part of the Interscience Economic Crops series.

These brief sketches of "defections" from the OSAC Horticultural Department reveal something of the character of agricultural science at OSAC. C. I. Lewis fits the model of the research-entrepreneur. His energetic and expansive vision (and industry contacts, no doubt) helped to expand the instructional and research functions of the Horticulture Department. His movement into the fruit industry upon retirement indicates his strong industry ties and an interest in using science to directly serve a non-scientific constituency. Kraus, who seems to have evinced an interest in basic agricultural science

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[76] Apple, p. 9.

with his study of the "internal biochemistry" of plants, nonetheless published his work on the subject in an Experiment Station bulletin and accepted a position in applied botany at the University of Wisconsin after leaving OSAC. Gardner and Marshall both maintained close ties with experiment station and cherry-oriented work. Both their monographs deal largely with the commercial cultivation, harvesting, processing, and marketing of cherries. The careers of these four men reveal a commitment to science, instruction and research, yet still within a context of service to commercial fruit-growing and related industries.

After the exodus of talent that had helped firmly establish the Horticulture Department in the first two decades of the twentieth century, overall enrollment in agricultural science sharply declined from 928 degree students in agriculture in 1920 to 389 students in 1923. In addition to faculty losses, this downward turn may also have been influenced by the general agricultural depression following World War I. The Horticultural Products Department, however, proved to be an exception. Apple, in his Chronological History of Horticulture at Oregon State, reported "a pronounced increase in research and teaching activities of that section of horticulture called Horticultural Products under Professor Wiegand."[77] From 1919-20 to 1922-23, a time when overall enrollment in agricultural and horticultural classes was rapidly dropping, the number of Horticultural Products classes offered almost doubled, from six to eleven. In the 1924-26 Biennial Report of the Board of Regents, W.S. Brown (1878-1942), head of the Department of Horticulture, outlined the land needs of the department. Of 151 acres

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[77]Ibid, p. 23.

requested for Resident Instruction, 145 were for fruit trees and nuts. Of the 76 acres requested for Experiment Station purposes, 70 acres were for small fruits, tree fruits, and nuts. Fruit growing was becoming one of the main commercial industries in Oregon, and the Horticulture Department and the Experiment Station show a shift in direction and emphasis toward the needs of commercial fruit growers.[78]

The early history of agricultural science and horticultural science, in particular at OSAC, show that it was characterized by the practical, service-oriented values found in the history of agricultural science in general. The agricultural science departments and the experiment station were so closely connected, they were almost identical at times. They maintained a mutually beneficial relationship that helped enable an expansion of teaching and research within the Horticultural Department. Station publications were a primary outlet for much departmental work. In addition, the history reveals the influence of local commercial agricultural interests on the direction of the Department and the Station. The needs of the agriculture industry led to rapid specialization of agricultural science. One example was the creation of the Horticultural Products Department. As industry needs (and funding) grew, agricultural science began to specialize into disciplines that were typically more applied than their parent disciplines. Horticultural products, by its very name, promised to help apply science in the service of the regional fruit growing industry. Ernest H. Wiegand, a research-entrepreneur, made certain that the Department lived up to its promise.

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[78]Ibid, pp. 23-25.

Products, Promise, and "Prof"

In 1919, Dean Cordley hired Ernest "Prof" Wiegand[79] to head up a new section of the Horticulture Department, Horticultural Products. Wiegand was hired in part, at least, because he seemed to share the enthusiasm and vision of C. I. Lewis. Remembering his first few weeks at OSAC, Wiegand wrote that "In getting acquainted with Professor Lewis, Head of the Department of Horticulture, I was impressed by his enthusiasm for the work. He had tried several times to get the proper type of individual to undertake this work."[80] Wiegand maintained a commitment to fundamental science, but, like Lewis, had a desire to expand the science of horticulture in ways that would serve the region's agricultural industry. By all measures, he was the right man for the job.

Ernest H. Wiegand was born in Danville, Illinois in 1886 and raised on a farm where he got his first experience producing fruits and vegetables. His father "devoted his entire life to the manufacture of Glucose, Corn, and Potato Starch." Through his father, he gained experience in production, shipping, and laboratory work in a cornstarch plant in Traverse City, Michigan. While in Michigan, he also had experience in the production and canning of fruits and vegetables and in brewing technology. Wiegand took breaks from his work in the food processing industry from 1906-08 and from 1911-14, to get a

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[79]During his tenure at OSAC, Ernest Wiegand was known as "Prof" by students and collegues alike.

[80]Ernest H. Wiegand, From a letter to Pauline E. Allen, Secretary, Chancellor's Office, Oregon State System of Higher Education, Eugene, Oregon, January 22, 1952; Oregon State University Department of Food Science and Technology Archive Room, p. 1.

B.S.A. degree from the University of Missouri. His major subjects were medicine and Horticulture, his minor subjects were General Agriculture and Arts and Letters. After graduation, he ran a seven acre citrus farm in Southern California from 1915-1917. From 1917-1919, Wiegand worked as a production specialist for the USDA Bureau of Animal Industry and where he was in charge of poultry production in Kansas.[81] By the time he came to OSAC, Wiegand had received a broad, practical background in the food products industry, working as grower, processor, lab worker, and supervisor. Besides extensive experience in industry, he had also worked for a government agricultural agency. Wiegand's schooling and work experience trained him to be not just a scientist, but a research-entrepreneur.

Dr. Robert F. Cain came to Oregon State in 1947 for graduate work in Food Science and Technology and subsequently returned, at Wiegand's invitation, to become a member of the faculty. While at Oregon State, he did research on further refining and understanding the cherry brining process. His descriptions of Wiegand closely match that of the research-entrepreneur. Cain describes Wiegand as a "front man" or "primary care giver." If there was a problem, he could diagnose it and find the "specialists" needed to solve it. His research on the cherry brining process was done with D. E. Bullis, a chemist who could provide the necessary chemical knowledge.

Cain also mentioned Wiegand's strong ties to the fruit growing industry, saying that "He [Wiegand] was one for industrial contact. We were in the field all the time--by

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[81]Ernest H. Wiegand, miscellaneous biographical writings, Oregon State University Department of Food Science and Technology Archive Room.

field I mean out in the canning factories...My first experience with Prof Wiegand was that I had been here about two weeks and he sent me out into the industry." Cain remembered one particular industry connection in which Dr. H. Y. Yang, a Food Science and Technology faculty member, would supply briners with a method to check the sulphur dioxide levels of their brine formulations. "You see there was a relationship between Prof [Wiegand] and the industry and the department on the department supplying them with a gallon jug of known strength iodine so they could make their titration." This arrangement occurred before the commercial manufacture of iodine ampules now used for such testing. Wiegand's aid to the industry was reciprocated. Cain said "I remember back in '47, we were the only department that had our own car."[82]

Though funding for agricultural science had been greatly increased since the early days of its institutionalization, Wiegand's skills in working with the industry were necessary to get the new Horticultural Products section established. These skills were probably a large part of the reason that he was hired. A short time after he arrived in Corvallis, C.I. Lewis retired and moved to a job in the industry with the Oregon Growers' Association. Wiegand remembered asking him: "Well, what's going to happen in this particular case? Between you and Dean Cordley you got me to come out here. I find no money available. I find a building that is merely a shell with no equipment, although the catalog had glowingly illustrated a building with tile walls completely equipped to carry on work in this field." Lewis replied, "I am sorry the situation is as it is but I have confidence in you and therefore I am turning over this whole problem to you and you can

[82]Interview with Dr. Robert Cain, Corvallis, OR (13 May 1998).

take this matter up directly with Dean Cordley, to see what can be done to obtain finances and the necessary equipment to develop the work which you have discussed with me."[83] Wiegand got some funding from sources that he did not specify in his memoir, but did mention receiving help from William S. Dirker of the American Can Company in Portland in obtaining canning machinery for sealing cans and all the empty cans they needed. By the time he retired in 1952, he had no trouble raising money for a new building to house the Food Science and Technology Department--he simply had to ask.[84]

Wiegand's relationship with the food processing industry in the Northwest was directed toward serving the growers of the region and building up the Horticultural Products Department--not self-interest in his own personal financial gain. Though responsible for millions of dollars in industry profits during his tenure at Oregon State, a 1943 article entitled "Food Industries Call the Doctor" noted that "Wiegand receives no royalties for his processes; makes them available to all who can use them. Although he is paid less than $5000 a year, he could have a dozen jobs at triple the salary."[85] He did receive the admiration of practically everyone in the Northwest food industry. Cain said that "He was really venerated."[86] Other articles in trade publications and newspapers call

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[83]Wiegand, Letter to Pauline E. Allen, p. 2.

[84]Cain interview.

[85]Victoria Case, "Wiegand...He's Oregon's Food Wizard," The Oregonian, 7 March 1943, II, p. 23.

[86]Cain interview.

him everything from an "all-around savior" to a "wizard."[87] Through his close ties with the industry, he built up one of the foremost Food Science and Technology Departments in the country. In his work over the years there is a peculiar kind of "disinterestedness"--a lack of self-interest shown by his giving away millions of dollars worth of patentable processes. His "unscientific" interests were in the growth of his department and the economic growth of his region.

Further indications of Wiegand's view of the role of science in society may be found in an address he gave to the Northern California Section of the Institute of Food Technologists on December 6, 1945. It clearly shows that he thought scientists had an obligation to apply science to society. Since his subject in the address was the education of students, Wiegand began with a commentary on the role of the university. He stated that "the university flourishes when it deals with those questions and issues that are vital to the society of the times. That the university must serve the public good is a truism as old as the university itself. When the university loses itself in the fine points of research of interest only to the schools and not toward the solution of problems for the good of the people, then it may expect to experience decline."[88] In a section entitled "Educating the Man and the Citizen," he wrote that "The modern university must dig deep into

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[87]Victoria Case, "Food Industries Call the Doctor," Liberty, 6 March 1943, pp. 22-23; "How They Got There," The Food Packer, November 1952, p. 66; "Chemurgic Personalities," The Chemurgic Digest, 4, no. 2 (1945), p. 42; Case, "Wiegand...He's Oregon's Food Wizard."

[88]Wiegand, "Training the Food Technologist," An Address before the Northern California Section of Institute of Food Technologists, 6 December 1945, Oregon State University Department of Food Science and Technology Archive Room, p. 4.

contemporary life, thereby not only transmitting culture, but also recreating it in accordance with the demands of a changing civilization."[89] Wiegand did not view the university as a place of pure science or an escape from social and economic influences. For him, the application of science to specific problems was more than a by-product of science, it was the primary product of science. He called for the recreation of contemporary life, as well as a vision of socially engaged science, that reflected the general "philosophy" of agricultural science from its inception.

Though Wiegand was at the vanguard of developing an applied specialization of agricultural science, his position did not lead him to reject the value of fundamental science, rather to place it in a different, and, for him, more realistic context. Besides aiding the food processing industry, Wiegand helped institutionalize food science in an academic context, "uniting" it with fundamental science. From the time he arrived at Oregon State, Wiegand began developing and refining a curriculum for his Horticultural Products section. By 1924, he had instituted a four-year curriculum for Horticultural Products--the first one in the country. He wrote that "As we developed these courses we found it very imperative that the men taking this work have a better grounding in the fundamental fields of science and also less work of a strictly agricultural nature." With the advent of the four-year curriculum, he stated that "From this year on we gradually dropped more and more of the agricultural slant in our curriculum, introducing more fundamental sciences as a background for Food Technology."[90] In the December 6, 1945

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[89]Ibid, p. 7.

[90]Wiegand, Letter to Pauline E. Allen, pp. 2-3.

address, he also stated that "The food technologist should be offered a strong foundation in the basic sciences."[91] In a sense, his application of science to industry allowed, or at least greatly aided, the formation of an academic department that would place food science on a context more beholden to basic, or fundamental, science. Wiegand and others, like Hilgard, were quite happy with research programs tailored to the needs of their lay constituency. They recognized that applied science stimulates, as well as relies on, basic science--a reversal of the position of scientists like Millikan, who sought support for basic science in the 1920s and 1930s because it inevitably yielded applications.

Full Harvest: The Development of the Brining Process

On March 27, 1929, W. S. Brown submitted a project proposal entitled "Processes of Preserving and Bleaching Cherries for Maraschino Manufacture" to J. T. Jardine. The reason given for undertaking the project were the "great losses" incurred by the method then used for brining. A fragile fruit, cherries suffered considerable damage from the then-current processing methods. The losses were estimated to vary between twenty-five to fifty percent. The object of the investigation was "to make a thorough study of solutions and hardening agents with a view of preventing losses caused by cracking."[92]

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[91]Wiegand, "Training the Food Technologist," p. 7.

[92]Horticulture Project Recommendation, 27 March 1929, Oregon State University Archives, Agricultural Experiment Station Records, 1889-1994 (RG25), Research Records (SG3), Research Products Records, 1907-1984 (V), Horticulture Department: Cherries for Maraschino, (Purnell 28), box 8/3/5/60.

Wiegand was to be in charge of the project, which would be carried out with assistance of D. E. Bullis, OSAC professor and assistant chemist at the Experiment Station, at the Horticultural Products Building Station Laboratory. The planned method of investigation was to study the effects of varying concentrations of hardening agents and H_2SO_3 solutions to determine which formulation gave the best results in both bleaching and prevention of cracking. Jardine added, in his cover letter to E. W. Allen, Chief of the Office of Experiment Stations, that "There is a real need for the investigation and a prospect of accomplishment toward the marketing of surplus crop."[93] He also noted that the project would be pursued vigorously and "pushed to concrete results within the next year."E. W. Allen approved the project on May 3, 1929, noting that the project was "in a relatively new field on which there seems to be little information."[94]

Wiegand had already done some work on the brining process. Though numerous sources refer to the development of the brining process beginning in 1925, no records have been found of brining experiments conducted at this time. Wiegand did publish an

[93]Letter to E. W. Allen from J. T. Jardine, 23 April 1929, Oregon State University Archives, Agricultural Experiment Station Records, 1889-1994 (RG25), Research Records (SG3), Research Products Records, 1907-1984 (V), Horticulture Department: Cherries for Maraschino, (Purnell 28), box 8/3/5/60.

[94]Letter to J. T. Jardine from E. W. Allen, 3 May 1929, Oregon State University Archives, Agricultural Experiment Station Records, 1889-1994 (RG25), Research Records (SG3), Research Products Records, 1907-1984 (V), Horticulture Department: Cherries for Maraschino, (Purnell 28), box 8/3/5/60.

article on the manufacture of maraschino cherries in a 1927 issue of The Canner.[95] The brine solution given in the article consists of sulphuric acid and sodium sulphite (6 quarts of sulphuric acid to 25 pounds of sodium sulphite to 100 gallons of water). He also mentions another method that was "quite commonly used," sulphur dioxide fumes.[96]

The use of sulphur as a bleaching and preserving agent had long been common knowledge and practice. Sulphuric acid and sulphites were extensively used as preservatives in wine, beer, cider, fruits, vegetables, meats, and in the sugar industry.[97] Sulphur fumes were already used in Italy (the major producer of brined cherries other than the United States) for brining cherries.[98] A 1912 book on commercial food processing, American Commercial Methods of Manufacturing Preserves, Pickles, Canned Foods, Etc., also mentions the use of sulphur dioxide for such purposes. Wiegand already knew that sulphuric acid and sulphites would be effective bleaching and preserving

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[95]Most maraschino cherries produced in the United States at this time were not "true" maraschino cherries preserved in maraschino liqueur (most likely due to the cost of genuine maraschino liqueur and the effects of Prohibition). The brined cherries were saturated in a sugar sirup (sugar was added in a gradual process until the density was between 45° to 50° Balling). Then 0.1 percent citric acid was added along with imitation maraschino flavor. Oil of bitter almonds, amyl acetate, orange flower water, and benzaldehyde were the most common flavoring materials used to replace maraschino liqueur. See, for example, Ernest H. Wiegand, "Method of Manufacture of Maraschino Cherries," The Canner, 65, no. 4 (1927), 29-30, on p. 30, and D. E. Bullis and E. H. Wiegand, Bleaching and Dyeing Royal Ann Cherries for Maraschino or Fruit Salad Use, Oregon State Agricultural Experiment Station Bulletin 275 (1931), p. 11.

[96]Wiegand, "Method of Manufacture of Maraschino Cherries," p. 29.

[97]C. E. Calm, Sulphurous Acid and Sulphites as Food Preservatives (Chicago: Hygeian Chemical and Research Laboratory, 1904), pp. 7-12.

[98]Cain Interview. "Italian Method of Brining Cherries," The Canner, 65, no. 4 (1927), p. 34.

agents. However, he was attempting to find the most effective concentration. The cherry had to be bleached as colorless as possible to properly take the dye[99] during final processing and yet the pH of the solution had to be carefully controlled or it would increase cherry cracking.[100]

The key to the brining process developed in the 1929-1930 experiments was the addition of an effective hardening agent. The Canner article of 1927 made no mention of the addition of a hardening agent, but simply gave an effective formulation of the bleaching/preservation method already in widespread use. The previous brine formulations, involving only sulphurous compounds not only tended to cause severe cracking of the cherry skin, but also often softened the fruit to such an extent that it often became "mushy" or broke up during the final processing when it was dyed and sugared. In the 1929-1930 experiments, Wiegand used various concentrations of hydrated lime, calcium sulphate, alum, tannic acid, magnesium sulphate and calcium carbonate to harden the cherries. His experiments showed that hydrated lime or calcium carbonate was the most effective hardening agent.[101] Though his recommended brine formulations as late as 1939 allowed for the use of hydrated lime or calcium carbonate, he preferred the latter.[102]

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[99]The dye most commonly used was erythrosine, although Ponceau was also sometimes used.

[100]Cain Interview.

[101]Bullis and Wiegand, "Bleaching and Dyeing Royal Ann Cherries for Maraschino or Fruit Salad Use," pp. 10-13.

[102]E. H. Wiegand and D. E. Bullis, Preservation of Cherries with Sulphur Dioxide, Oregon State Agricultural Experiment Station Circular of Information No. 209 (Corvallis, OR: 1939), p. 10.

In the 1929-1930 experiments, it had proved superior to the hydrated lime because "there was less cracking, the color of the bleached fruit was better, an excess of calcium carbonate did not darken the fruit as did an excess of lime, and there was less bacterial spoilage."[103] In addition, calcium carbonate was easy and cheap to procure–it could be purchased in the form of whiting from most plaster supply houses.[104]

Though the firming properties of calcium salts were commonly known and it was also known to combine with pectin, Wiegand may have been the first to have used calcium in a commercial fruit process. Z. I. Kertesz (1903-?), of the New York Agricultural experiment station, mentioned a similar use in a 1940 station publication. Kertesz recommended the use of calcium chloride in the home canning of tomatoes, as it caused "a much better retention of the firmness and shape of the tomatoes" (calcium chloride is now commonly used for cherry brines as well).[105] In a 1939 article, he discussed the calcium-pectin reaction, and noted that it was useful in firming commercially-preserved plant products such as tomatoes, apples, peaches, and strawberries. He did not mention cherries. Kertesz went on to say that "apparently the use of calcium as described here has not been applied in the food industries."[106] He also

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[103]Ibid.

[104]Bullis and Wiegand, "Bleaching and Dyeing Royal Ann Cherries for Maraschino or Friut Salad Use," p. 13.

[105]Z. I. Kertesz, "The Use of Calcium Chloride in the Home Canning of Whole Tomatoes," New York State Agricultural Experiment Station Circular No. 195 (1940).

[106]Z. I. Kertesz, "The Effect of Calcium on Plant Tissues," The Canner, vol. 88, no. 7 (1939), p. 26.

mentioned the "calcium treatment" in his 1952 monograph on pectin. He noted that the firming properties of calcium salts were commonly known, but that no "systematic development" of study of the treatment was done until 1937 (presumably when his own experiments with calcium began).[107]

At no point in his book or articles did Kertesz refer to or show an awareness of the use of calcium in the cherry brining process. Yet the process was not a secret. It was published in experiment station literature and trade literature as early as 1930. By 1937, the domestic cherry brining industry had made huge strides and the process involving calcium was in widespread use among briners. The closest Kertesz came to acknowledging the use of calcium in cherry brining was in briefly noting that it was used to prevent the "softening of sulphured fruit."[108]Though apparently unrecognized by other scientists, Wiegand had introduced the "calcium treatment" to commercial food processing nearly a decade before the East Coast "discovery" of its commercial importance in 1939.

Wiegand's development of the cherry brining process was empirical science at its most basic. Drawing on common and scientific knowledge of which chemicals might produce the bleaching and hardening effects that he sought, he conducted extensive, carefully controlled tests of their relative effectiveness. The end result was a brining process that gave the growers what they needed. The cherries could be put into the brine

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[107]Z. I. Kertesz, The Pectic Substances (New York: Interscience Publishers, Inc., 1951), p. 552.

[108]Ibid, p. 554.

immediately after picking, in the field. They bleached well, so they could properly absorb the dye. They were firm enough to resist cracking and commercial processing. Moreover, the brine was easy to manufacture and the ingredients were cheap. Despite the effectiveness of the brine and the widespread use of calcium in the fruit processing industry since the 1930s, as of 1951, the reaction between the calcium and pectin was still not well understood scientifically. Wiegand's exercise in applied science not only materially aided the cherry growers, it also helped bring to the foreground a problem for fundamental scientific investigation.

The development of the cherry brining process at OSAC in the 1920s exemplifies agricultural research in general during this time period. A series of research entrepreneurs, using industry ties, institutionalized the science of agriculture through the development of academic departments and experiment stations. Though basic science was viewed as important, the research-entrepreneurs and the faculty that they attracted were content to do science that served the interests of a non-scientific constituency. Rather than representing a rejection of basic science, their views and ideologies show an attempt to create a socially-engaged science that would make direct and immediate contributions to society. Basic science would follow--as in the case of the calcium-pectin reaction, which was scientifically developed for industry long before the theory behind it was known.

Chapter 3: The Maraschino Cherry Before and After the Modern Brining Process

The preceding chapters have traced the historical development of the context within which the modern brining process for cherries was developed. A service-oriented collection of scientific disciplines, the agricultural sciences, provided a solution to a problem created by the economic and geographic demands of specialized agriculture. However, the maraschino cherry was not created at Oregon State Agricultural College in the 1920s. In some form, the maraschino cherry had existed for nearly three centuries before Wiegand developed a brining process more suitable for large-scale commercial production. The new brining process simply made the maraschino cherry and other brined cherry products, such as glacé cherries, more economical for Northwest cherry growers to produce. Maraschino cherries already had a relatively substantial niche in the food market. The expansion of the cherry brining industry in the Northwest was not primarily due to an expansion of the maraschino or glacé cherry markets. Rather, the virtual "creation" of the Northwest brining industry was a result of tariff protection and lower processing costs. This chapter will briefly examine the history of the maraschino cherry before its modernization as well as analyze factors affecting the expansion of the market for Northwest brined cherries.

The Early History of the Maraschino Cherry

The maraschino cherry gets its name from a liqueur, or cordial, of the same name. Though sources ranging from 1915 to 1983 show uncertainty as to the exact recipe used in the manufacture of the liqueur, the basic methods of production are known. First, the leaves, fruit and pits of the marasca (Prunus cerasus marasca), or amarasca, cherry are crushed into a mash and left to ferment. The marasca cherry is quite sour, so sugar is added during the fermentation process. In some cases the distillate is perfumed with a flower-blossom extract. The resulting liqueur is clear, semi-dry, and ranges from 60 to 78 proof. This liqueur is the traditional flavoring ingredient of the maraschino cherry.[1]

All sources agree that maraschino liqueur originated in the town of Zadar (formerly known as Zara) in the region of Dalmatia in the Balkans. At the end of World War II, when the region was made part of Yugoslavia, the major maraschino manufacturers moved to Italy, taking marasca tree stock with them. Luxardo, the largest manufacturer of maraschino liqueur, moved to Padua. Drioli, another firm, moved to Venice.[2]

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[1]John F. Mariani, The Dictionary of American Food and Drink (New Haven: Ticknor and Fields, 1983), p. 245; Peter A. Hallgarten, Spirits and Liqueurs (London: Faber and Faber, 1983), pp. 112-113; U. P. Hendrick, The Cherries of New York (Albany: J. B. Lyon Company, State printers, 1915), pp. 4-5.

[2]Zadar was the former capital of Dalmatia. In 1409, it was sold to Venice (with which it had been at war intermittently since 1045). From 1797 to 1920, Zadar was an Austrian possession. By the 1920 Treaty of Rapallo, the city became Italian until becoming part of Yugoslavia at the close of the Second World War. "Zadar," Britannica Online. <http://www.eb.com:180/cgi-bin/g?DocF=micro/651/91.html> [Accessed 23 August 1998]; Hallgarten, p. 113.

There is little agreement among sources on when maraschino liqueur began to be produced in Dalmatia. Writing in 1915, U. P. Hendrick stated that "it [maraschino liqueur] has been made and exported for over 200 years." Another 1915 source, W. Carew Hazlitt's Venetian Republic: Its Rise, its Growth, and its Fall, A. D. 409-1797, seems to place the origins of the liqueur even earlier. While discussing early seventeenth-century Venice, he noted that "Liqueurs were already in vogue, and the cherries of Zara were thought to produce the finest maraschino." Hallgarten, in his 1983 book, also places the origins of the liqueur at "over two hundred years" ago. Yet another source places the origin of the liqueur in the nineteenth century. According to this version, in the early nineteenth century, a Genovese trader, Girolamo Luxardo was living in Zara. While there, he altered a traditional Dalmatian recipe for rosolio maraschino, a non-alcoholic drink. Then, "In 1829, the Austrian Emperor granted Girolamo permission to produce commercially both a cinnamon and a maraschino-flavored rosolio based on the Dalmatian recipe."[3] Hallgarten implies that Francesco Drioli was the first to manufacture the liqueur. It seems probable that some type of maraschino-flavored drink has existed in Dalmatia for several centuries, though perhaps the liqueur was not manufactured commercially until the early nineteenth century.[4]

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[3] Paul Harrington, The Alchemist <http://www.hotwired.com/cocktail/archive/alchemist _archive.html> [Accessed 25 August 1998].

[4] Hendrick, p. 4; W. Carew Hazlitt, The Venetian Republic: Its Rise, its Growth, and its Fall, A. D. 409-1797 (New York: AMS Press, Inc., 1966), p. 980, originally published in London by Adam and Charles Black, 1915; Hallgarten, p. 113; Paul Harrington, The Alchemist [Accessed 25 August 1998].

Early History of the Use of Maraschino and Candied Cherries

Brined cherries are used to manufacture glacé and other candied cherries as well as maraschino cherries. These other brined cherry products are used in the confectionary and baking industries. Though written and pictorial records of candy exist from the time of ancient Egypt, there is, according to the Encyclopedia Britannica, “little reference to the manufacturing of candy until the middle of the fourteenth century, when sugar shipped into Venice was used for making confections.”[5] Hazlitt offered indirect support for this statement, when he noted in his book that a “keen national taste for sweetmeats” was evident in fourteenth-century Venice. Confections soon came into vogue among the French elite, probably due to the influence of the Médici queens, Catherine de Médicis and Marie de Médicis, who brought their chefs with them from Italy to France[6]. By the

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[5]“Candy,” Britannica Online <http://www.eb.com:180/cgibin/g?DocF=micro/101/58.html> [Accessed 23 August 1998]

[6]Catherine married Henry, duc d’Orléans in 1533, and became Queen of France when he ascended to the throne as Henry II in 1547. Her arrival has been credited as the “crucial event” in the development of French grande cuisine. Marie married Henry IV and became queen of France in 1600. She also played a role in advancing the French culinary arts. La Varenne, who wrote the groundbreaking cookbook, Le Cuisinier françois, is believed to have learned to cook in Marie de Médicis’ kitchens. "Gastronomy: DEVELOPMENT OF FRENCH GRANDE CUISINE" Britannica Online. <http://www.eb.com:180/cgi-bin/g?DocF=macro/5002/55/4.html> [Accessed 27 August 1998].

twentieth century, France would be one of the major European producers of maraschino and other brined cherry products.[7]

The use of cherries in baking, candy and liqueur manufacture in the United States dates back to colonial times. The Compleat Housewife (1742) contains recipes for preserving cherries with sugar, making cherry brandy, and making cherry wine. The New Art of Cookery (1792) instructed housewives in how to preserve, dry, and candy cherries and gave recipes for cherry brandy and cherry water.[8] Most cherry brandy recipes called for the cherries to be mashed, then soaked in brandy. Shrubs and Bounces–drinks made with a fruit base and rum or brandy–were popular in colonial America–a recipe for an orange shrub can be found in Benjamin Franklin's papers. A recipe included in The American Heritage Cookbook goes a bit further than the previously mentioned recipes by explicitly stating that the cherry stones should be cracked and left in the mash mixture–quite similar to the method of manufacturing maraschino liqueur, though with a

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[7]"Candy," Britannica Online [Accessed 23 August 1998]; Hazlitt, p. 976; Magueloone Toussaint-Samat, A History of Food (Cambridge, MA: Blackwell Publishers, 1992), pp. 567-569. A summary report of the Tariff Act of 1922 stated that "France leads foreign countries in the production of maraschino and glacé cherries" and that "France supplies practically all of the United States imports of maraschino and glacé cherries." United States Tariff Commission, Summary of Tariff Information, 1929, on Tariff Act of 1922, Schedule 7: Agricultural Products and Provisions (Washington: United States Government Printing Office, 1929), p. 1245.

[8]E. Smith, The Compleat Housewife (Williamsburg: 1742), pp. 132, 137; Richard Briggs, The New Art of Cookery (Philadelphia: Spotswood, Campbell, and Johnson, 1792), pp. 440, 448-450, 530, and 533.

different variety of cherry.[9] There is no mention of maraschino cherries in these early cookbooks. That is not surprising, given that most Americans did not have access to or the habit of using processed foods.[10] Home preserving and candying were still the rule. These early cookbooks do show, however, that candied cherries and cherry liqueurs already had a place in American food habits.

Another use of maraschino and glacé cherries was as a garnish for ice cream. Ice cream was eaten by the American elite as early as 1744. Though some was homemade, it could also be bought from confectioners–who would often advertise a wide variety of luxury foods, as in one 1781 advertisement that offered "ice cream, sweetmeats, cakes, syrups, sugar candy, almonds...and liqueurs." The linking of the maraschino and candied cherries with ice cream is unsurprising–they were retailed within the same shops. In the early 1800s, ice cream recipes could be found in many cookbooks. By the second half of the century, the manufacture of ice cream had become a wholesale business reaching an increasingly broad cross-section of consumers.[11]

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[9] American Heritage, The American Heritage Cookbook and Illustrated History of American Eating and Drinking (American Heritage Publishing Co., Inc., 1964), pp. 622-623.

[10] Some sugar candies and comfits, or confections, were imported to the United States in the late 1700s, though no specific mention of cherries (or specific mention of any particular confection) was made in tariff lists. United States Congress, Customs Tariff of 1842 with Senate Debates Thereon Accompanied by Messages of the President, Treasury Reports and Bills, 62nd Congress, 1st Session, Senate Document 21 (Washington: United States Government Printing Office, 1911), pp. 330-368.

[11] Anne Cooper Funderburg, Chocolate, Strawberry, and Vanilla: A History of American Ice Cream (Bowling Green, OH: Bowling Green State University Popular Press, 1995), pp. 3-66.

The use of candied fruit and nuts to create decorative ice cream dishes had been imported into the United States with the arrival of French confectioners in the 1700s. Decorative ice cream dishes were still in vogue in the second half of the nineteenth century–primarily among the wealthier consumers, but also among the more "common" folk. Decorative molds could be purchased by housewives from local general stores and mail order catalogs, and cookbooks often contained instructions to aid housewives in using the molds.[12] Cherries were one of the many candied fruits used to enliven ice cream dishes. Maraschino also became an ice cream flavor. Charles Ranhofer, a renowned chef at Delmonico's in New York in the 1860s who was particularly innovative with his ice cream concoctions, made maraschino ice cream. From the time of its introduction into the United States, ice cream had been associated with the use of candied fruits and, eventually, maraschino.[13]

The Cherry in the Twentieth Century

By the first decade of the twentieth century, maraschino and glacé cherries were commonly used as drink garnishes and confection ingredients. Housewives were becoming more accustomed to using processed foods, and cookbooks called for the use of canned and other commercially preserved products. The Hostess of To-Day, a 1908

[12]This use of decorative molds with candied or liqueured fruits continued into the twentieth century. For example, see Cleva Peery, Desserts (Master's Thesis, Oregon State Agricultural College, 1909), pp. 1-9.

[13]Funderburg, pp. 66-70.

cookbook, called for the use of maraschino liqueur and maraschino cherries in numerous dessert and ice cream recipes, including a recipe for maraschino ice cream that called for four tablespoons of maraschino cordial and one cup of maraschino cherries. The book also contained a recipe for the Manhattan cocktail, which one should "serve with a brandied cherry."[14] A 1907 cookbook, Fruit Recipes, called for the use of maraschino products in everything from cherry sandwiches to cherry bavarian cream.[15] U. P. Hendrick's book also seems to provide evidence that the maraschino cherry had an established position in the American diet in the early years of the twentieth century. In The Cherries of New York, he noted that "considerable quantities of cherries are put up in maraschino, or its imitation and the manufacture of such products is a growing industry." Hendrick went on to quote from Food Inspection Decision 141 by the Board of Food and Drug Inspection of the USDA. The Decision regulates the labeling of maraschino cherries.[16] By 1915, maraschino cherries had a large enough presence in the marketplace to be noticed and regulated by the government.[17] In the early twentieth century, the

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[14]Linda Hull Larned, The Hostess of To-Day (New York: Charles Scribner's Sons, 1908), pp. 187-237.

[15]Riley M. Fletcher Berry, Fruit Recipes (New York: Doubleday, Page, and Company, 1907), pp. 81-92.

[16]Hendrick, p. 5.

[17]The Tariff Act of 1897 specifically mentioned both cherries "exposed to sulphur fumes for the purpose of bleaching and preserving" and "cherries in maraschino," suggesting that there were a substantial number imported into the United States by the end of the nineteenth century. Henry Morgenthau, Jr., Digest of Customs and Related Laws and of Decisions Thereunder (Washington: United States Government Printing Office, 1936), pp. 430-431.

maraschino cherry was a commonly known and used ingredient in confections, drinks and ice cream.

These traditional markets for maraschino products began to expand in the early twentieth century. In the late nineteenth century, the market outlets for ice cream expanded as it became a staple of soda fountains. Funderburg states that "By the end of the 19th century, customers expected soda fountains to serve ice cream sodas and sundaes, even though fountain operators complained that these new treats reduced their profits."[18] Soda fountains and ice cream sales continued to increase in the early twentieth century–in part, perhaps, because of the temperance movement.

Funderburg notes that many temperance advocates viewed the soda fountain as an alternative to the saloon, or bar–one that would eventually supplant it. She also links increased ice cream consumption in the early part of the twentieth century to the growing temperance movement and the eventual passage of the Volstead Act in 1920.[19] She is not alone in making this connection. In the first decades of the twentieth century, there was an apparently widespread belief that candy (and presumably other sweets, such as ice cream), was an effective replacement for alcohol in the American diet.[20] A 1907 editorial in the Independent suggested that just such a switch in habits could take place. The

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[18]Ibid, pp. 101-107.

[19]Ibid, pp. 98, 111.

[20]Even fresh fruit consumption was predicted to increase with Prohibition. An edititorial in the American Fruit Grower stated that: "It is well known that the free consumption of fruit allays the craving for liquor, so the man accustomed to alcoholic drinks will naturally turn to the use of fruit in largely increased quantities." "Making Prohibition Profitable," American Fruit Grower, May 1919, p. 11.

editorial reported that Dr. A. C. Abbott, Health Commissioner of Pennsylvania, suspected that "the appetite for alcohol and the appetite for candy are fundamentally the same..."[21] The editorial went on to raise the hope that candy would indeed replace alcohol as an indulgence because "The early prejudices against candy, that it ruined the teeth, that it was bad for children, that it was an effeminate luxury, etc., have been swept away or reduced to their residuum of reason."[22] The increase of candy consumption was often thought to go hand-in-hand with decreased alcohol consumption.

A 1910 New York Times article, "The Nation's Annual Candy Bill," noted that "Within a few years, and without an increase in population to account for it, the consumption of candy in the United States has doubled. All at once confectionery of all kinds has been selling as never before." It went on to support the theory linking candy consumption with temperance, stating that "Candy is coming to be recognized as the most successful of temperance advocates...it provides a substitute which removes the insistent desire for whiskey."[23] Later in the article, the writer mentioned an anecdotal story about the origin of a new type of candy–the milk chocolate maraschino cherry, which he stated

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[21]"Candy and Alcohol," The Independent, 63 (22 August 1907), 463-464, on p. 463.

[22]Ibid, p. 464..

[23] "The Nation's Annual Candy Bill," The New York Times, 2 January 1910, V, p. 8.

was "one favorite of the past few years."[24] As late as 1920, the theory that prohibition would increase candy consumption still existed. A 1920 article in The Literary Digest reported that "there will be a direct relation between prohibition and an increased consumption of sugar."[25] Regardless of the reason, all sources agree that there was a boom in candy, confectionery, and ice cream consumption in the first decades of the century.[26]

Ironically, though the temperance movement may have had some effect on increased candy consumption, it may also have helped to reduce the use of maraschino products in confections and ice creams. A September 24, 1908 article, "After Liquor in Candy," noted that the New York chapter of the Women's Christian Temperance Union would "go on the hunt for those who make and sell sweets that are alcoholic."[27] In 1912, a ban was placed on the use of maraschino cherries at soda fountains. The New York Times, quoting an article in the trade journal The Soda Fountain, reported that:

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[24]According to the story, a young woman checked into a hotel room and ordered a Manhattan cocktail. Almost immediately, she ordered another, and soon she was ordering them by the dozen. The management became concerned about her alcohol intake, as well as curious about how she was able to consume so many drinks in such a short period of time, and sent someone to her room. When he arrived, he found her surrounded by full cocktail glasses with only the maraschino cherry gone. Supposedly, a confectioner, upon hearing the story, decided to begin marketing a line of maraschino cherry candy. Ibid.

[25]"Alcohol and Candy," The Literary Digest, 67 (6 November 1920), p. 26.

[26]This boom was not necessarily for the reasons or to the extent predicted by the candy-temperance theorists. See "Denies Rush for Candy," The New York Times, 25 August 1920, 21:1 and "Candy Boom Fails," The New York Times, 11 July 1923, 2:4.

[27]"After Liquor in Candy," The New York Times, 24 September 1908, 3: 5.

> The Demon Rum has recalled his own. The seductive Maraschino cherry, stolen from the cocktail to give life and color to sundae and fountain dainty, and to nestle snugly amid the creamy content of luscious confection, can no longer legally add savor to the temperance beverages at the marble and onyx soda fountains of the land. The pure food authorities and the Internal Revenue officials have placed their ban upon it.
>
> To be a Maraschino cherry it must be a Marasca cherry preserved in Maraschino, an alcoholic liquor of high spirit content, and while this does not forbid their use as 'golden globules of delight' in cocktail glasses, it does banish them from soda confections.[28]

The article went on to note that cherries would still be used in soda fountain confections, but they would not be true maraschino cherries with their "foreign savor" and "entangling alliances." It seems reasonable to suspect that this ban may have played a role in the development of imitation maraschino cherries packed in sugar syrups, which are mentioned in the Food Inspection decision quoted by Hendrick. Regardless of its fate as a garnish on soda fountain sundaes, the maraschino cherry would continue to thrive as a cocktail garnish.

The Maraschino Cherry and the Cocktail

Currently, one may find hundreds of cocktail recipes that call for either maraschino liqueur or the use of a maraschino cherry as a garnish. One early example of the use of the maraschino cherry as a cocktail garnish in the United States is the Manhattan cocktail. The Manhattan Club, built on Madison Avenue in 1859, was originally the residence of Leonard Jerome, father of Jennie Jerome, who in 1874 married Lord Randolph Churchhill. In 1876, she gave birth to Winston Churchhill. She also

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[28]"Pure Food Ban on Sundaes," The New York Times, 26 January 1912, 12:3.

"gave birth" to the Manhattan cocktail at a party in honor of Samuel J. Tilden's election as state governor in 1874 at her father's former residence, which by then had become the Manhattan Club. Lady Churchhill persuaded a "reluctant bartender" to mix bourbon "with a lesser portion of sweet vermouth and aromatic bitters" to please the guest of honor. The drink was garnished with a maraschino cherry.[29] The maraschino cherry was widely used as a garnish for other cocktails as well--from perenially popular ones, such as the Old-Fashioned, to others of more fleeting fame. In the first decades of the twentieth century, the maraschino cherry and maraschino liqueur became a part of drinks like the Mary Pickford, the Hemingway Daiquiri, the Aviation, the Zombie, and the Angel's Tit.

The Eighteenth Amendment and the Volstead Act went into effect on January 17, 1920, beginning the era of Prohibition in the United States. However, cocktail drinking continued and, in some ways, expanded. The social elite could afford to go to nearby countries where alcohol was still legal, such as Cuba. The Mary Pickford and Hemingway Daiquiri were invented in Cuban bars circa 1920 and 1921, respectively. Drinking also continued in the States. The day after Prohibition went into effect, clubs like the 50-50 Club in New York began clandestinely serving alcohol. A new custom developed in clubs and speakeasies--the "setup" tray. The patron was provided with

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[29]This is the most widely accepted version of the origin of the Manhattan. Another version exists. A writer in the New Yorker in 1948 reported seeing Supreme Court justice Charles Henry Truax drinking the cocktail in a Washington bar in 1886. Reportedly, Truax had asked a Manhattan Club bartender to mix him a new drink because his doctor had told him to stop drinking martinis in order to lose weight. Most authors lend more credence to the first version. Mariani, p. 244; <http://www.hotwired.com/cocktail/97/38/nc drink o week.html> [Accessed 26 August 1998]; Robert A. and Kathleen A. Lipinski, The Complete Beverage Dictionary (New York: Van Nostrand Reinhold, 1992), pp. 222-223.

glasses, ice, garnishes, juices, syrups, and other condiments to go with the bottles of illicit alcohol that the patrons brought with them. The rise of speakeasies also coincided with a new custom of mixed-sex drinking. Prior to Prohibition, drinking in clubs, bars, and taverns had been a fraternal occupation. With Prohibition and the flapper era, however, the cocktail market was opened up to women as well.[30]

Several remarks from Joseph Lanza's book The Cocktail reveal the strong presence of cocktail drinks in American society even during Prohibition. Speaking of New York, F. Scott Fitzgerald stated that "in 1929 there was liquor in half the downtown offices, and liquor in half the large buildings."[31] In addition, Lanza states that "Prior to World War I, hosts rarely served drinks before dinner. By 1929, there were at least 120 cocktail recipes with an almost equal number of prescribed domestic occasions to go with them." During the twenties, the cocktail was also present in popular songs, such as Cole Porter's 1922 tune, "Cocktail Time" and the 1924 song "Two Little Babes in the Wood" in which he rhymed "fountain of youth" with "gin and vermouth."[32] Because of the glamorous "cocktail culture" that emerged with the advent of prohibition, cocktail drinking spread beyond the elite and Americans developed a taste for fancier and more exotic drinks–many of which involved the maraschino cherry and/or its liqueur. A 1927 New York Times article reported the comments of a bartender on a cruise liner who

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[30]Joseph Lanza, The Cocktail: The Influence of Spirits on the American Psyche (New York: St. Martin's Press, 1995), pp. 21-27.

[31]Ibid, p. 32.

[32]Ibid, p. 33.

claimed that "tourists were no longer satisfied with simple beverages" and that "if prohibition continued most members of his trade would end up in sanatoriums."[33] The cocktail was one market for the maraschino cherry that did not disappear with Prohibition, but gained a stronger presence in American culture.

The Maraschino Cherry and the Rise of Processed and Prepared Foods

In the early 1900s, the maraschino cherry began to acquire "new" uses tied to the growing use of processed foods of which, of course, it was one. Part of the impetus for the increase in consumption of processed foods came from growing urbanization. As of 1850, nearly eighty-five percent of the population was involved in farming or farm-related occupations. By 1900, only sixty percent of the population was rural.[34] The improved farming methods of specialized agriculture required fewer workers. In addition, there was, in the early part of the century, an influx of immigrants into the United States, most of whom chose to live in cities and industrial towns. The more affluent immigrants often used commercially canned fruits and vegetables, as it was a symbol of successful Americanization.

In these urban areas, the diets of skilled and semi-skilled workers included fruits and vegetables, "particularly the canned variety," and desserts. The middle classes began

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[33]Among the cocktails desired by customers, the bartender, Adolph Schmitt, specifically mentioned the Old-Fashioned as a popular drink."Americans Demand Variety in Drinks, Liner's Mixer Says," The New York Times, 23 February 1927, 3:5.

[34]Elaine N. McIntosh, American Food Habits in Historical Perspective (Westport, CT: Praeger, 1995), pp. 87 and 97.

to adopt more "scientific cooking" as nutritionists and home economists promoted healthier and more efficient cooking. Middle class cooking became simpler and middle class women embraced processed and "ready-to-serve" foods for their labor-saving qualities. In the late 1920s, the prices of basic foodstuffs such as flour, potatoes, and some meats dropped substantially or "stabilized at a relatively low level."[35] People were able to spend more of their food dollar on fruits and vegetables and did so, often using canned, or otherwise preserved varieties.

Many of the "new" uses for the maraschino cherry in the early twentieth century were tied to new desserts and salads. Varieties of fruit cocktails and fruit salads were developed from 1913-1927 and jellied, or "congealed" salads, which often used processed fruits appeared as early as 1905.[36]

William Cruess (1886-1968), who developed one of the first food science departments in the United States while at the University of California, Berkeley, invented canned fruit cocktail in an effort to aid the California fruit industry. An official standard was created for canned fruit cocktail that included the maraschino cherry (Though, for technical reasons, this "fruit cocktail" cherry went through slightly different processing with regard to dyeing and sugar content, it was brined the same as the bottled maraschino.). An article in the December 10, 1927 issue of The Canner entitled, "Sales of Fruit Salad Show Rapid Growth" touts the rise of fruit salad in the American diet.

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[35]Ibid, p. 97.

[36]Richard James Hooker, Food and Drink in America: A History (Indianapolis: Bobbs-Merrill, 1981), pp. 318 and 320.

Though not separately advertised as a product at this time, fruit salad in "the past few years...has shown a greater percent of growth than most of the canned fruit items in this line and is already a big success as an established food product."[37] According to a representative of the California Packing Corporation quoted in the article, fruit salad, or cocktail, consumption was increasing because: "American housewives are looking for shortcuts in their daily menus. The preparation of fruit cups and salads is no exception."[38] The variety of fruit salad mentioned in the article, a Del Monte product, contained "peaches, pineapples, apricots, pears and maraschino cherries."[39] The trend of increased consumption of fruit salads continued into the 1930s. From 1933-1937, "very striking increases occurred in per capita output of...fruit salads and cocktails."[40] Hence, by being an integral ingredient in most commercial fruit salad and fruit cocktail mixes, the maraschino cherry gained a larger market.

The rise of jellied and congealed salads, as well as other prepared desserts like instant puddings, also provided coattails for maraschino producers to grab hold. Jell-O, originally invented in 1897, was quite popular by the late 1920s. According to McIntosh, "Costing only pennies per package, Jell-O added welcome color and flavor to many an otherwise drab meal during the Depression. Mixed with canned fruits, it served as an

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[37]"Sales of Fruit for Salad Show Rapid Growth," The Canner, 66, no. 25 (1927), p. 21.

[38]Ibid.

[39]Ibid.

[40]Margaret G. Reid, Food for People (New York: J. Wiley and Sons, Inc., 1943), p. 30.

attractive dessert. Along with mayonnaise and canned fruit or vegetables, it became widely used in making quick and easy salads."[41] Products like Jell-O provided new and increasingly widespread uses for canned fruit salad mixes. Similarly, maraschino cherries were often pictured in ads for other commercial food products. Good Housekeeping ads for prepared puddings, Knox gelatin, marshmallow cream, and Jell-O all show or mention maraschino cherries.[42] Though maraschino cherries were seldom advertised separately as the main focus of an advertisement, they had a ubiquitous presence in the growing number of advertisements for prepared fruit salads and desserts.

One reason for the maraschino cherry's ubiquitous nature as a garnish may well be its bright color and strong flavor. The McIntosh quote mentioned a selling point of Jell-O as being its addition of color and flavor to meals. The maraschino cherry falls into the same category–a food product that adds psychological, or aesthetic, value to a meal rather than nutritional value. Margaret G. Reid, a professor of economics at Iowa State College, wrote in her 1943 book, Food For People, that "Some foods with pronounced flavors and high odors, such as pickles and sauces, high in acid, salt, or spice, seem to be a universal phenomenon."[43] She also stated that "Sensory stimuli and aesthetic satisfaction are

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[41]McIntosh, p. 113.

[42]See for example, the following Good Housekeeping issues: February 1921, p. 80; March 1921, pp. 128 and 191; April 1927, p. 182; November 1927, pp. 160, 177, and 291; June 1928, pp. 134 and 201. Also, there are discussions of fruit salads, the use of canned goods, and "patent gelatines such as Plymouth Rock or Knox" in two theses on desserts done in the Home Economics Department at Oregon State Agricultural College. Peery, Desserts, 1909 and Cleo L. Johnson and Carrie Buchanan, Desserts, (Master's Thesis, Oregon State Agricultural College,1908).

[43]Reid, p. 169.

important factors in the consumption of food."[44] More recent comments on the use of the maraschino cherry support this contention. For example, garnishes such as the maraschino cherry are often used in meals in retirement homes to help stimulate peoples' appetites.[45] The maraschino cherry provided American housewives and professional meal planners with a quick, easy way to make meals more appealing. Thus, even though little marketing seems to have been done specifically for the maraschino cherry, the markets for food products and beverages that used maraschino cherries as a garnish or ingredient increased in the first half of the century, particularly in the 1920s and 1930s.

Tariff Protection and the Creation of a Domestic Brining Industry

During these early decades of the twentieth century, however, the American market for maraschino and glacé cherries was almost entirely separate from the market for brined cherries produced in the United States. Of the six major domestic centers of production listed in the Summary or Tariff Information, 1929, on Tariff Act of 1922, only one, San Francisco, was located on the west coast. The other five production centers were New York, Cincinnati, Boston, Philadelphia, and Baltimore. Up until 1930, eastern manufacturers imported nearly all of their brined cherries. Italy was designated the principal competing country in the 1928 United States Tariff Commission report on

[44]Ibid, p. 168.

[45]Class notes, Food Science and Technology 102: Maraschino Cherry, Oregon State University, 2-27-97.

cherries, sulphured or in brine.[46] Western brined cherry production was limited to meeting the needs of the few regional manufacturers. In 1925, 925 tons of cherries, fresh fruit weight, were packed in brine in the Pacific Northwest. From 1926 to 1930, the tonnage of cherries packed in brine, fresh fruit weight, fluctuated between 1,085 and 1,450 tons. No commercial tonnage of cherries was packed in brine in California from 1925-1927. In 1928, 1929, and 1930, California packed 1170, 1322, and 2170 tons of cherries in brine, respectively. Imports into the United States for consumption during this period, 80 to 85 percent of which were brined cherries, ranged between 7,546 tons in 1925 to 11,830 tons in 1929. The passage of the Smoot-Hawley Tariff Act of 1930 sharply reduced imports and allowed the development of a much larger domestic brined cherry industry.[47]

The Smoot-Hawley Tariff Act was a product of a general concern for agriculture, which had never fully recovered from a post-war depression, and intense lobbying by numerous groups within the agriculture industry. Pacific Coast cherry growers, unsatisfied with previous tariff acts–particularly the Tariff Act of 1922, had begun lobbying for increased duties on sulphured and brined cherries as early as 1925-1926.

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[46]Mr. George McGowan, who represented the National Preservers Association at a 1929 hearing on tariffs before a Subcommittee of the Senate Committee on Finance, stated that "about a hundred percent" of brined cherries used by his industry where imported from Italy. United States Congress, Tariff Act of 1929. Hearings before a Subcommittee of the Committee on Finance, United States Senate, Seventy-first Congress, First Session on H.R. 2667, an Act to Provide Revenue, to Regulate Commerce with Foreign Countries, to Encourage the Industries of the United States, to Protect American Labor, and for Other Purposes (Washington: United States Government Printing Office, 1929), p. 298.

[47]Nelson, "An Economic Study," pp. 69-71.

They received a small measure of satisfaction in 1927, when President Coolidge approved a slight raise in the duty on cherries, sulphured or in brine, stemmed or pitted from two to three cents per pound. Still, the duty increase was not large enough to allow Pacific Coast growers to gain a substantial share of the domestic brined market. Their continued lobbying efforts culminated in a duty increase of six and one half cents per pound for cherries, sulphured or in brine, stemmed or pitted under the Smoot-Hawley Act of 1930. The responsiveness of politicians to agricultural interests was as important to the growth of the domestic brined cherry industry as was the responsiveness of scientists like Wiegand.

Prelude to the Smoot-Hawley Tariff Act

Though the American economy soon recovered from the post-war depression and the 1920s were boom years for the country as a whole, American agriculture remained mired in a recession. Real net farm income averaged $11,004 a year throughout the 1920s, compared with $12,769 from 1910-1914 and $14,972 from 1914-1918. In 1926, a relatively good year for farmers, the prices of farm products were 42 percent above their 1913 levels. In comparison, average wholesale prices were 51 percent above 1913 levels. The agricultural depression of the 1920s provoked farmers and politicians alike to seek remedies. Farmers and growers began to organize into cooperative associations and lobbying groups in an effort to improve business practices and push for farm relief legislation. In 1929, one of Herbert Hoover's initial acts in office was to call a special session of Congress to deal with the agricultural depression. The combined efforts of farmers and politicians culminated in the passage of the Smoot-Hawley Tariff Act.[48]

Efforts to relieve the farm crisis had begun soon after the War. The 1920 elections put Republican protectionists back into power. In 1921, an emergency tariff act was passed. This act placed a three cents per pound duty on "cherries in a raw state, preserved in brine or otherwise."[49] The Fordney-McCumber Tariff Act of 1922 reduced this rate to two cents per pound. The 1922 Tariff Act also gave the President the power to "raise or lower tariffs as much as 50 percent upon recommendations of the tariff commission, which was supposed to base its findings on the comparative costs of production in the United States and those various foreign countries."[50] It was under this provision that the 1928 report by the Tariff Commission on cherries, sulphured or in brine was prepared.

The Tariff Commission investigation began on March 22, 1927 at the instigation of western growers and the western-most eastern producer of brined cherry products. The Liberty Cherry and Fruit Company of Cincinnati, Ohio filed an application for

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[48]Marc Hayford and Carl A. Pasurka, Jr., "The Political Economy of the Fordney-McCumber and Smoot-Hawley Tariff Acts," Explorations in Economic History, 29 (1992), 30-50, on pp. 30-32. Barry Eichengreen, "The Political Economy of the Smoot-Hawley Tariff," Research in Economic History, 12 (1989), 1-43, on pp. 1-8.

[49]United States Tariff Commission, Cherries: Sulphured or in Brine: Differences in Costs of Production of Cherries in Their Natural State, Sulphured, or in Brine, in the United States and in the Principal Competing Country (Washington: United States Government Printing Office, 1928), p. 1.

[50]Arthur C. Bunce, Economic Nationalism and the Farmer (Ames, IA: Collegiate Press, 1938), pp. 15-16.

investigation for the purpose of "an increase in the duty on pitted cherries, sulphured, or in brine, and glacé cherries and assorted glace fruits" on June 13, 1925. On February 16, 1926, cherry growers in California, Washington, Oregon, and Idaho, represented by Egbert A. Smith, vice president of the California Cherry Growers' Association, filed a similar application. The report noted that Royal Anns were practically the only kind of cherry sulphured or brined domestically and that the brined market was a key outlet for growers of Royal Ann cherries. It stated that "Royal Ann cherries are not marketed extensively as fresh fruit, because they do not stand shipping, and thus cannot be laid down in eastern markets in condition to compete with other varieties. The grower is thus practically limited to the sale of his product to canners and to briners who manufacture maraschino and glace cherries."[51] With eastern manufacturers happily dependent on imports and the canned market near saturation, the Commission's statement neatly summed up the motivation behind the growers' application for an increased duty.

Methods and Costs of Production: Why the Tariff was Needed

Several differences existed in the methods of cherry production in the United States and Italy. By the 1920s, almost all cherry production in the United States originated in commercial, specialized agriculture. In addition, larger surpluses in domestic cherry production were imminent. The Commission report predicted that: "In all these states [California, Oregon, Washington, and Idaho] there is a considerable

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[51] Cherries, Sulphured or in Brine, p. 3.

acreage of young Royal Ann orchards which will come into commercial bearing within the next three to eight years."[52] In contrast, cherry growing in Italy was not specialized. Most of the Italian cherry crop consisted of scattered groups of 5 to 10 trees along the borders of fields or interspersed with other fruit trees. Due at least in part to these different methods of cultivation, Italian cherries used for brining were smaller and firmer than the Royal Anns grown on commercial orchards in the United States.

The size and texture difference between the Italian and American brined cherries was a major point of contention in the debate over tariffs rates between the Pacific Coast growers and the eastern manufacturers of finished cherry products. The eastern manufacturers claimed that they needed the small, firm Italian cherry for at least fifty to sixty percent of their products. George McGowan, representing the National Preservers Association in the 1929 Senate Subcommittee hearings, stated that "Italy grows a cherry that is firm meated, and that is the kind we need for our particular purpose [making maraschino cherries]."[53] The American cherry was larger and softer than the Italian cherry primarily because American growers pruned their trees back further and supplied them with more water through their irrigation practices.[54] Modifying these practices,

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[52]Ibid, p. 8. Overproduction seems to have been a problem for Northwest cherry growers throughout the second half of the 1920s. A 1926 New York Times article called attention to the problem of fruit surpluses in the region. A 1929 article in the California Cultivator on Pacific Coast cherry production (primarily California) also noted large increases in bearing acreage and the subsequent need for expanding market outlets. "Northwest Hurt by Overproduction," The New York Times, 14 October 1926, 9:3; "Future Outlook for Cherries," California Cultivator, 13 April 1929, p. 440.

[53]Tariff Act of 1929, p. 301.

[54]Ibid, pp. 299-314.

which had become part of the culture of commercial, specialized fruit growing in the United States, would produce a cherry more to the liking of eastern manufacturers. Wiegand's brining process helped make the Pacific Coast cherries more palatable to eastern manufacturers–it produced a brined cherry that exceeded the firmness attainable simply by modifying growing practices.

There are two notable differences between the Italian and American production costs–the cost of growing cherries (at times the price paid for cherries by factories was used as an index of growing costs) and the labor costs involved in processing the cherries, particularly with regard to stemming and pitting. The farm cost of growing cherries in the United States was 7.140 cents per pound using 1926 costs and 8.810 cents per pound using the average cost from 1922-1926. No comparable figures were available for Italian growing costs. The cost of cherries, sulphured or brined, unstemmed and unpitted was 15.339 at the factory in the United States. The comparable Italian "at factory" cost was 8.390 cents per pound. Part of this wide discrepancy in "at factory" costs was probably due to differences in the method of cultivation. According to the report, Italian cherry growers seldom, if ever, used fertilizers and, in general, did little spraying to control diseases and pests, reducing their overall overhead. The Commission noted that "Insect pests and fungus diseases occasionally attack the trees, but on the whole these enemies give much less trouble than in the United States."[55] It is interesting that though the Italian growers were not practicing specialized agriculture, their edge in cherry growing costs seems to support one of the tenets of specialized agriculture–that certain crops grow best

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[55]Cherries, Sulphured or in Brine, p. 9.

in particular regions, and these regions compete globally. A better cherry growing climate allowed them to avoid capital-intensive specialized farming and still compete in the world market.

Harvesting costs may not have substantially affected the at factory cost differential. The Report made no direct comparison of harvesting costs in the two countries. It estimated that cherry pickers in the United States received between 1 ½ and 2 3/4 cents per pound, noting that harvesting was the "largest single item of cost" at this stage of production, making up 30 to 50 percent of the total cost of growing cherries. The report estimated harvesting costs in Italy at $2 to $6 per 100 kilos (220 pounds). If the estimated cost for picking in the United States is converted to cost-per-kilo so that the two costs can be directly compared, American cherry pickers were paid $3.30 to $6.05 per 100 kilos–not that different from Italian costs, though the American picker had a somewhat higher wage floor.[56]

Perhaps the most important difference in labor costs was the cost of stemming and pitting the brined cherries, especially pitting. Until the adoption of the new brining process, pitting cherries was done by hand.[57] It was done by skilled workers using small pitting knives to force the pit out in such a way that the cherry suffered minimal damage. The importance of pitting costs is referred to in the Report: "The arrival of stemmed and pitted cherries from Italy caused the eastern group [of manufacturers] to abandon stemming and pitting, the most expensive single operation of manufacture. This has

[56]Ibid, pp. 8-9.

[57]Tariff Act of 1929, p. 304.

placed the western group at a disadvantage, and they maintain that it will force them to import stemmed and pitted cherries from Italy instead of using the home-grown Royal Ann cherries."[58] The Commission determined that the cost of stemming and pitting in the United States was 2.844 cents per pound, compared with a cost of 1.237 cents per pound in Italy. One suspects that waste costs may also figure into the overall pitting costs, because the Italian cherries were firmer than the American Royal Anns and thus less susceptible to damage in the pitting process. The differences in these costs would be ameliorated not only by the Tariff Act, but also , to some degree, by the brining process itself.

At the recommendation of the Commission's Report, President Coolidge raised the duty on "cherries, sulphured, or in brine, stemmed or pitted" from 2 to 3 cents per pound, the maximum increase allowed under the provisions of the 1922 Tariff Act. Though the cost comparisons published in the report seem to more than justify the duty increase, these figures were called into question. Commissioners Dennis, Costigan, and Dixon published a dissenting view on the validity of the cost estimates. The "official" report concluded that the amount by which United States costs exceeded Italian costs at 7.684 cents per pound based on the price paid by manufacturers ("factory cost based on price paid"); 5.067 cents per pound based on United States growing and processing costs in 1926 and Italian factory costs for 1926; and 7.473 cents per pound using the five year average of United States growing costs from 1922-1926 and the 1926 Italian costs. The dissenting Commissioners arrived at a different figure based on their interpretation of the

[58]Cherries, Sulphured or in Brine, p. 11.

data–a cost differential of 3.527 cents per pound. Despite their strong disagreement with the official cost differential, they approved the duty increase because it still fell within their estimation of the cost disparity. Though not directly affecting the outcome of the Tariff Commission's report, the debate over the proper cost estimates may have had implications for the Tariff Act of 1930, and it certainly highlights political issues that exploded a few years later with the passage of the Smoot-Hawley Tariff Act of 1930.[59]

Politics: Why the Tariff Passed

The wide latitude for interpretation made possible by the limited amount of cost data available (especially with regard to Italian costs) placed a premium on lobbying efforts. Schattschneider's definitive study on the origins of the Smoot-Hawley Tariff, Politics, Pressures and the Tariff: A Study of Free Private Enterprise in Pressure Politics, as Shown in the 1929-1930 Revision of the Tariff, attributed the Act's passage to the infulence of special interest groups.[60] Alternative historical interpretations emphasized the influence of party politics. Barry Eichengreen notes that the partisan politics interpretation does not satifactorily explain the timing or the form of the Smoot-Hawley Tariff Act. He does agree that protectionist beliefs played a role in the passage of the Tariff, but downplays the role of party politics. In the 1928 elections, the issues of

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[59]Ibid, pp. 28-30.

[60]E. E., Schattschneider, Politics, Pressures and the Tariff: A Study of Free Private Enterprise in Pressure Politics, as Shown in the 1929-1930 Revision of the Tariff (New York: Prentice-Hall, Inc., 1935).

protection was not hotly disputed. By 1928, many Democrats who were usually strongly opposed to protectionist measures had "moderated their position and joined the Republicans in endorsing protection."[61] Eichengreen makes a persuasive case that the Smoot-Hawley Tariff was primarily a result of pressure from farmers' lobbying groups and the overrepresentation of agricultural interests in Congress.[62]

The Tariff Commission report on cherries, sulphured or in brine, exibits the influence of special interest groups and party politics, or protectionist beliefs. As mentioned above, the original impetus for the report came from petitions by cherry growers. Studies of the Tariff Commission, such as the one by Philip G. Wright of the Brookings Institution, examined the political and economic interests of the members of the Commission. Wright's study revealed that the Committee members who supported the interpretation of cost data in the main body of the report had strong protectionist and/or agricultural leanings. The high cost differential in production supported by the majority of the Tariff Commission that produced the report on cherries laid the groundwork for later successful lobbying efforts. No other Tariff Commission studies on brined cherries were completed before the Smoot-Hawley Act, so the 1928 Report provided much of the information for the 1930 decision to increase the duty.

The dissenting members of the Commission, Edward P. Costigan, Alfred P. Dennis, and Lincoln Dixon, all seemed to be moderate protectionists. Though originally elected as a Republican from Colorado, Costigan had at one point defined himself as a

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[61]Eichengreen, p. 6.

[62]Ibid, pp. 5-9.

"Progressive with Republican antecedents and Democratic consequences."[63] By the time of his appointment to the Tariff Commission, he had become a Progressive Democrat. He described himself as a "moderate" protectionist. Alfred P. Dennis, appointed to the Commission by President Coolidge, was also a protectionist Democrat. He had held faculty positions at three universities, written on economic subjects, and traveled extensively in Europe. He described himself as theoretically a free trader, but one living in an imperfect world. Lincoln Dixon was a Democratic congressman from Indiana. Nothing is said by Wright about his beliefs on tariff protection, but since Wright mentions such details in other characterizations, as if to show that protectionist democrats are a different breed than simple "democrats," it may be inferred that Dixon did not have strong protectionist leanings.[64]

The Commissioners who supported the findings of the report were Thomas O. Marvin, Edgar B. Broussard, and Sherman J. Lowell. Lowell had been head of the New York State Grange and a grape grower. According to Wright, "It is said that he was appointed as a 'dirt farmer' in recognition of the rising political power of 'organized agriculture'."[65] Marvin was chairman of the Commission at the time of the Report. He was also an ardent protectionist, having previously been secretary of the Home Market Club, an organization devoted to supporting protectionism, particularly with regard to the

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[63]Philip G. Wright, Tariff-Making by Commission (Washington: Rawleigh Tariff Bureau, 1930), p. 19.

[64]Ibid, pp. 16-24.

[65]Ibid, p. 22.

New England textile industry. Broussard was a graduate of Utah Agricultural College and a self-acknowledged protectionist. Wright also strongly implies that Broussard was in the pocket of the beet sugar industry.[66]

All the commissioners who were supportive of the cost estimates in the Report were not only of a similar political, protectionist ilk, they all had strong ties to industry and, in the cases of Lowell and Broussard, to the agricultural industry. Wright used their examples as support for his contention in his pamphlet, "Tariff-Making by Commission," that tariff-making, particularly the making of the Smoot-Hawley Tariff, was primarily a function of "lobbying and 'log-rolling' on a scale hitherto unknown."[67] He particularly noted the problems that insufficient (and even what constituted insufficient data) and wide latitude of interpretation of data that was permitted as problems that opened the door to political pressure by lobbying groups.

The Pacific Coast cherry growers found a very receptive political climate for their lobbying efforts on behalf of the brined cherry industry, and they took advantage of it. The cherry growers of California, Idaho, Washington, and Oregon combined to send a six page brief to the Senate Subcommittee conducting hearings on what would be the Smoot-Hawley Tariff Act. In addition, the Oregon Legislature sent a memorial to the Subcommittee supporting increased tariff rates on cherries, as did the Chamber of Commerce of Salem, Oregon.[68] Their efforts paid off. The duty on cherries, sulphured or

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[66]Ibid, pp. 22-24.

[67]Ibid, p. 3.

[68]Tariff Act of 1929, pp. 320-330.

in brine, stemmed or pitted was increased from 3 to 9 1/2 cents per pound–a six cent increase much closer to the original estimate of the cost differential than that of the dissenting Commissioners Though writers like Arthur C. Bunce, research assistant professor at Iowa State College, derided the Act because of its "utter futility," it had a positive effect on the Northwest cherry industry. Much of the futility mentioned by Bunce was related to agricultural products that were dependent on exports. This was not the case with the brined cherry industry which, far from exporting the product to another country, could not even "export" it across the United States.[69]

As we have seen, the maraschino cherry had found a niche in the American diet well before the invention of the new brining process. By the late 1920s, this market was expanding. The increase in cocktail drinking, use of prepared fruit salad mixes, and other commercial foods that were compatible with the maraschino cherry increased their use. However, in order to take advantage of this expanding market, Northwest growers first had to break the stranglehold of Italian importers on the eastern manufacturers of the finished maraschino product. Wiegand's process reduced the overhead involved in producing brined cherries by reducing waste in harvesting and processing. It also gave the Royal Anns added firmness, reducing pitting costs and making them more suitable for maraschino use.

The Tariff Acts, particularly the Smoot-Hawley Tariff Act, were key in creating a domestic brined cherry market so that the new brining process could actually be implemented by Northwest cherry growers. Wiegand, who helped found the Northwest

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[69]Bunce, pp. 17-18.

Briners' Association, also helped in the formation and strengthening of various cherry growers' cooperatives and associations. Indirectly, by helping form what would become effective lobbying groups, he aided the cherry industry politically as well as scientifically. Wiegand and other research-entrepreneurs worked within a complex web of scientific, economic and political interests. Their scientific work, whether fundamental or applied in nature, was often done within the context of agricultural and social interests. Though not pure science, it was good science and can be characterized as "service-science." The development of the modern brining process for the maraschino cherry provides an excellent case study of the scientific, political, and economic institutions and attitudes that characterized agricultural science in the first decades of the twentieth century.

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