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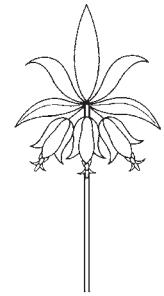

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Agricultural explorers of the USDA's Bureau of Plant Industry, 1897–1955

Walter H. Hodge and Angela L. Todd

Abstract

The United States Department of Agriculture (USDA) was initiated in 1862 as a presidential-level response to pressures from farmers, state-level agricultural societies, westward-moving settlers and agricultural merchandisers. Agronomist Carleton Ball (1873–1958) characterized four periods of USDA development (1862–1887, 1888–1912, 1913–1932 and 1933–1962) that correlate to the time period covered by the agricultural explorers named in former USDA employee Walter H. Hodge's lists, which are given in Tables 1 and 2.

At the turn of the last century B. T. Galloway (1863–1938) and E. F. Smith (1854–1927) helped draft the legislation that created the USDA's Bureau of Plant Industry (BPI), the department that covered plants and plant industry research activities, including pest control as well as cultivation and storage of plants and plant products. The BPI started operations in 1901 with an overall goal to unify the plant departments and to reduce duplications of efforts, competition for funds and administrative costs. The BPI's first decade was one of regular expansion with subsequent years focused on organizing and reorganizing explorations and national plant introductions. Sturdy pests, fragile seedlings and significant peril to people factored into the tenuousness of BPI successes, which at any rate could only be determined over successive plant generations. In 1943 the BPI was reorganized and renamed the Bureau of Plant Industry, Soils, and Agricultural Engineering (BPISAE). The BPISAE ceased to exist formally as a separate bureau in 1953 when it was combined with other bureaus to form the USDA's Agricultural Research Service (ARS). Nonetheless, the benefits gleaned from the BPI's early explorers and the plants they sent home continue to grow. This paper gives histories of the USDA's plant projects and government-sponsored plant exploration and features Hodge's lists of agricultural explorers employed in the foreign field by the USDA between 1897 and 1955. Following this paper is the first (Aaron Aaronsohn to William Basil Fox) in a series of biographies of the agricultural explorers, with accompanying photographs, named in Hodge's lists.

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Introduction

Biologist Walter H. Hodge worked for the National Science Foundation (NSF) from 1966 to 1970. During that time, George H. M. Lawrence (1910–1978), Hunt Botanical Library's founding director, surprised the plantsman when without warning he walked into Hodge's Tokyo office. Lawrence knew of Hodge's hobby of photographing plants for teaching purposes and proposed that Hodge take informal portraits of botanists since his regular job involved visiting NSF grantees at their places of work. Hodge was reticent at the offer and pointed out that plants never argued about being photographed. Lawrence proved to be convincing, and over the years Hodge, the well-traveled and widely employed biologist and photographer, has sold or donated thousands of photographs, as well as his own professional and personal correspondence and research, to the Archives of the now Hunt Institute for Botanical Documentation. When Hodge contacted the Hunt Institute in 2003 with his lists of USDA Bureau of Plant Industry foreign field explorers, it offered a great opportunity to showcase some of his portraits of botanists. The agricultural explorers listed in the tables that follow worked abroad for the

Bureau of Plant Industry's plant introduction program, which underwent various name changes that are discussed on page 34, during the years 1897–1955 or roughly the first half century of its operation. Table 1 is a list of the countries, arranged alphabetically, where they explored for plant material while Table 2 is a list of the explorers arranged chronologically by year of their USDA travels. Ever since their compilation in 1955 Hodge has felt that these lists should be made available. Publishing Hodge's lists in an updated format with modernized geographical names also affords the Hunt Institute Archives an opportunity to highlight our wide-ranging biographical assets. As a repository of alternate resort, the Hunt Institute Archives serves as a disciplinary safety net for archival collections that may not have an obvious home. Such collections include: a clutch of correspondence regarding the granting of an award or designing of a medal or stamp; files unclaimed by a surviving spouse, university archive or professional successor; or documents generated by someone so widely employed (like Hodge) that there simply is not *one* good place to keep the collection intact.

Walter H. Hodge's investment in seeing the culmination of his historical project on agricultural explorers spans decades and began while he was employed as senior botanist (1950–1952) for the BPI's Division of Plant Exploration and Introduction and then principal botanist and assistant head (1953–1955) for the Section of Plant Introduction (the Division was renamed in 1953) in Beltsville, Maryland. Carl Erlanson (1901–1975), head of the Section of Plant Introduction at the time, kept an informal list of explorations and explorers primarily used for internal office reference at the USDA. Hodge updated and separated this list and added the geographical locations where explorations were conducted. At the same time it was deemed worthwhile to alert plant scientists throughout the country to the USDA's current activity through updated historical accounts, which appeared in two publications, *Advances in Agronomy* (Hodge and Erlanson 1956b) and, a more general one for all economic botanists, *Economic Botany* (Hodge and Erlanson 1956a). Hodge's original thought as co-author with Erlanson was to have the lists published as appendices to their articles, but Erlanson indicated that there were inadequacies or errors that had to be corrected. However, Hodge still felt that they should be published along with an explanatory paragraph stating the problem and how the reader could verify whether any listed individual had actually collected plants on assignment. All plant introductions were inventoried at the time they were received by USDA staff and assigned a plant introduction number (P.I. No.) along with collecting data supplied by the collector and his name. In due course Plant Inventories were published as part of the *Bulletin, Bureau of Plant Industry, United States Department of Agriculture* through 1913 and then as a separate publication, *Inventory of Seeds and Plants Imported by the Office of Foreign Seed and Plant Introduction, United States Department of Agriculture*, through 1924 and then as *Inventory, United States Department of Agriculture* through 1937. Any listed USDA plant explorer's collections would have been published eventually in an inventory a year or two following his exploration; if no collections appeared, then he was incorrectly listed or was abroad for some other purpose, such as participating in an international scientific meeting. Hodge doubted that there were few, if any, of the latter listed and believed that there were no omissions during his time with Erlanson's office. Had Hodge remained with the office—and he was scheduled to move up as the next head of the Section of Plant Introduction—the project would have been developed further, but he was offered a position

(continued on p. 28)

Table 1. Countries in which agricultural exploration has been undertaken by explorers of the BPI's plant introduction program, 1897–1955

Note: All place names have been reformatted and updated to reflect contemporary names and politics from R. K. Brummitt's *World Geographical Scheme for Recording Plant Distributions*, ed. 2 (2001) and *Merriam Webster's Geographical Dictionary*, ed. 3 (1997) when possible. However, we have retained country names whereas Brummitt listed regions or provinces. Also, if Brummitt and the Geographical Dictionary used different names, we have included both. Names in parentheses are from Hodge's original lists but are no longer used.

Afghanistan
Gentry, H. S.
Smith, E. E.

Albania
Fairchild, D.

Algeria
Bessey, E. A.
Bioletti, F. T.
Fairchild, D.
Harlan, H. V.
Kearney, T. H.
Means, T. H.
Ryerson, K. A.
Scofield, C. S.
Swingle, W. T.
Tracey, J. E. W.
Westover, W. L.

Argentina
Archer, W. A.
Beetle, A. A.
Blood, H. L.
Fairchild, D.
Goodspeed, T. H.
Hartley, W.
Stephens, J. L.
Tremelling, L.

Austria
Bessey, E. A.
Bolley, H. L.
Carleton, M. A.
Mann, A.
Rock, J. F.
Swingle, W. T.
Westover, W. L.

Balearic Islands and Baleares
Fairchild, D.

Belgium
Bolley, H. L.
Carleton, M. A.
Fairchild, D.
Hougas, R. W.
Meyer, F. N.
Swingle, W. T.
Tracey, J. E. W.

Belize (British Honduras)
Cook, O. F.

Benin (Dahomey)
Baldwin, J. T. Jr.

Bioko (Fernando Po)
Fairchild, D.
Schultz, F. W.

Bolivia
Blood, H. L.
Erlanson, C. O.
Hartley, W.
MacMillan, H. G.
Popenoe, F. W.
Smith, E. E.
Stephens, J. L.
Tremelling, L.
Wight, W. F.

Brazil
Archer, W. A.
Beetle, A. A.
Dorsett, P. H.
Hartley, W.
Popenoe, F. W.
Shamel, A. D.
Stephens, J. L.

Bulgaria
Carleton, M. A.
Swingle, W. T.

Cameroon
Baldwin, J. T. Jr.
Fairchild, D.
Schultz, F. W.

Canada
Knapp, S. A.
Meyer, F. N.
Ryerson, K. A.

Canary Islands
Bioletti, F. T.
Fairchild, D.
Schultz, F. W.

Chile
Beetle, A. A.
Blood, H. L.
Erlanson, C. O.
Fairchild, D.
Goodspeed, T. H.
MacMillan, H. G.
Popenoe, F. W.
Smith, E. E.
Tremelling, L.
Wight, W. F.

China
Dorsett, P. H.
Fairchild, D.
Knapp, S. A.
Liu, P.
MacMillan, H. G.
McClure, F. A.
Meyer, F. N.
Morse, W. J.
Norton, J. B.
Piper, C. V.
Reimer, F. C.
Rock. J. F.
Roerich, G. N. de
Roerich, N. C. de
Stephens, J. L.

Colombia
Archer, W. A.
Blood, H. L.
Fairchild, D.
Popenoe, F. W.
Stadelman, R.
Tremelling, L.

Costa Rica
Collins, G. N.
Polhamus, L. G.
Popenoe, F. W.
Schubert, B. G.

Crete and Kriti
Fairchild, D.

Czechoslovakia
Carleton, M. A.
Mann, A.
Westover, W. L.

Denmark
Carleton, M. A.
Dorsett, P. H.
Erlanson, C. O.
Fairchild, D.
Hansen, N. E.
Hougas, R. W.
Mann, A.
Scofield, C. S.
Tracey, J. E. W.
Whitehouse, W. E.

Djibouti (French Somaliland)
Harlan, H. V.

Ecuador
Archer, W. A.
Blood, H. L.
Fairchild, D.
Mexia, Y.

Popenoe, F. W.
Stadelman, R.
Tremelling, L.

Egypt
Aaronsohn, A.
Fairchild, D.
Harlan, H. V.
Kearney, T. H.
Mason, S. C.
Means, T. H.
Piper, C. V.
Rock, J. F.
Shantz, H. L.
Swingle, C. F.

El Salvador
Collins, G. N.
Fairchild, D.
Gentry, H. S.
Kearney, T. H.
Kempton. J. H.
Norvell, O. W.
Popenoe, F. W.

England
Bioletti, F. T.
Bessey, E. A.
Bolley, H. L.
Boyle, H. H.
Carleton, M. A.
Erlanson, C. O.
Fairchild, D.
Hansen, N. E.
Harlan, H. V.
Hougas, R. W.
Keamey, T. H.
Kephart, L. W.
Lake, E. R.
Mann, A.
Means, T. H.
Meyer, F. N.
Morrison, B. Y.
Piemeisel, R. L.
Rock, J. F.
Ryerson, K. A.
Scofield, C. S.
Shantz, H. L.
Shear, C. L.
Swingle, C. F.
Tracey, J. E. W.
Westover, W. L.
Whitehouse, W. E.

Ethiopia
Archer, W. A.
Harlan, H. V.
Stephens, J. L.

Finland
Fairchild, D.
Hansen, N. E.
Tracey, J. E. W

France
Bolley, H. L.
Carleton, M. A.
Fairchild, D.
Harland, H. V.
Hougas, R. W.
Kearney, T. H.
Kephart, L. W.
Lake, E. R.
Means, T. H.
Meyer, F. N.
Morrison, B. Y.
Piemeisel, R. L.
Rock, J. F.
Ryerson, K. A.
Schultz, F. W.
Scofield, C. S.
Shantz, H. L.
Shear, C. L.
Swingle, C. F.
Swingle, W. T.
Tracey, J. E. W.
Westover, W. L.
Whitehouse, W. E.

Gambia
Fairchild, D.
Schultz, F. W.

Germany
Bessey, E. A.
Bolley, H. L.
Carleton, M. A.
Erlanson, C. O.
Fairchild, D.
Hansen, N. E.
Hougas, R. W.
Lake, E. R.
Mann, A.
Meyer, F. N.
Morrison, B. Y.
Scofield, C. S.
Swingle, W. T.
Tracey, J. E. W.
Westover, W. L.
Whitehouse, W. E.

Ghana (Gold Coast)
Baldwin, J. T. Jr.
Fairchild, D.
Schultz, F. W.

Guatemala
Collins, G. N.
Cook, O. F.
Fairchild, D.
Gentry, H. S.
Kearney, T. H.
Kempton, J. H.
Manning, C. W.
Norvell, O. W.
Popenoe, F. W.
Ware, J. O.

Greece
Fairchild, D.
Swingle, W. T.

Guinea (French Guinea)
Fairchild, D.
Schultz, F. W.

Guyana (British Guiana)
Archer, W. A.

Honduras
Collins, G. N.
Fairchild, D.
Gentry, H. S.
Kearney, T. H.
Norvell, O. W.
Popenoe, F. W.

Hungary
Bolley, H. L.
Carleton, M. A.
Swingle, W. T.
Westover, W. L.

India
Fairchild, D.
Gentry, H. S.
Harlan, H. V.
Knapp, S. A.
Koelz, W. N.
Piper, C. V.
Rock, J. F.

Iran (Persia)
Fairchild, D.
Gentry, H. S.
Smith, E. E.
Whitehouse, W. E.

Iraq
Whitehouse, W. E.

Ireland
Boyle, H. H.
Morrison, B. Y.

Italy
Carleton, M. A.
Fairchild, D.
Mason, S. C.
Piper, C. V.
Rock, J. F.
Ryerson, K. A.
Scofield, C. S.
Swingle, W. T.
Tracey, J. E. W.
Westover, W. L.

Ivory Coast
Baldwin, J. T. Jr.

Japan
Creech, J. L.
Dorsett, P. H.
Fairchild, D.
Hansen, N. E.
Knapp, S. A.
MacMillan, H. G.
McClure, F. A.
Meyer, F. N.
Morse, W. J.
Norton, J. B.
Reimer, F. C.
Rock, J. F.
Roerich, G. N. de
Roerich, N. C. de
Stephens, J. L.
Tull, J. H.

Java and Jawa
Dorsett, P. H.
Fairchild, D.
Piper, C. V.

Kenya
Kephart, L. W.
Piemeisel, R. L.
Shantz, H. L.
Stephens, J. L.

Korea
Dorsett, P. H.
Meyer, F. N.
Morse, W. J.
Reimer, F. C.

Liberia
Baldwin, J. T. Jr.
Fairchild, D.
Schultz, F. W.

Libya
Fairchild, D.

Madagascar
Swingle, C. F.

Malawi (Nyasaland)
Hodge, W. H.

Malaya
Dorsett, P. H.
Fairchild, D.
Knapp, S. A.
Piper, C. V.
Rock, J. F.

Manchuria
Dorsett, P. H.
MacMillan, H. G.
Meyer, F. N.
Morse, W. J.
Reimer, F. C.
Roerich, G. N. de
Roerich, N. C. de
Stephens, J. L.

Mexico
Archer, W. A.
Baldwin, J. T. Jr.
Collins, G. N.
Cook, O. F.
Correll, D. S.
Erlanson, C. O.
Fairchild, D.
Fox, W. B.
Gentry, H. S.
Gilly, C. L.
Kearney, T. H.
Kempton, J. H.
Knapp, S. A.
Manning, C. W.
Norvell, O. W.
Ogden, E. C.
Onderdonk, G.
Reddick, D.
Rolfs, P. H.
Russell, P.
Shamel, A. D.
Souviron, M. J.
Ware, J. O.

Morocco
Bioletti, F. T.
Fairchild, D.
Ryerson, K. A.
Westover, W. L.

Mozambique
Fairchild, D.
Kephart, L. W.
Piemeisel, R. L.
Shantz, H. L.

Myanmar (Burma)
Rock, J. F.

Nicaragua
Norvell, O. W.

Nigeria
Baldwin, J. T. Jr.

Netherlands
Bolley, H. L.
Fairchild, D.
Harlan, H. V.
Hougas, R. W.
Mann, A.
Meyer, F. N.
Morrison, B. Y.
Ryerson, K. A.
Scofield, C. S.
Tracey, J. E. W.

Norway
Dorsett, P. H.
Erlanson, C. O.
Hansen, N. E.
Tracey, J. E. W.
Whitehouse, W. E.

Pakistan (Pakistan West)
Gentry, H. S.
Smith, E. E.

Panama (Panama Canal Zone, Canal Zone)
Collins, G. N.
Erlanson, C. O.
Fairchild, D.
Kearney, T. H.
Kempton, J. H.
Polhamus, L. G.
Popenoe, F. W.
Schubert, B. G.

Panama
Collins, G. N.
Fairchild, D.
Kearney, T. H.
Kempton, J. H.

Paraguay
Archer, W. A.
Beetle, A. A.
Hartley, W.
Stephens, J. L.

Peru
Blood, H. L.
Erlanson, C. O.
Fairchild, D.
Goodspeed, T. H.
Mexia, Y.
Popenoe, F. W.
Smith, E. E.
Stadelman, R.
Tremelling, L.
Wight, W. F.

Philippines
Boyle, H. H.
Knapp, S. A.

Poland
Bessey, E. A.
Bolley, H. L.
Carleton, M. A.
Hansen, N. E.
Tracey, J. E. W.
Westover, W. L.

Portugal
Bioletti, F. T.
Fairchild, D.
Schulz, F. W.
Westover, W. L.

Romania
Carleton, M. A.

Russia (U. S. S. R.)
Bessey, E. A.
Bolley, H. L.
Carleton, M. A.
Enlow, C. R.
Hansen, N. E.
Meyer, F. N.
Tracey, J. E. W.
Westover, W. L.
Whitehouse, W. E.

Scotland
Boyle, H. H.
Hougas, R. W.
Morrison, B. Y.

Senegal
Fairchild, D.
Schultz, F. W.

Sicily and Sicilia
Fairchild, D.
Kearney, T. H.
Ryerson, K. A.
Swingle, W. T.

Sierra Leone
Fairchild, D.
Schultz, F. W.

South Africa (Union of South Africa)
Fairchild, D.
Godfrey, R. K.
Hodge, W. H.
Kephart, L. W.
Piemeisel, R. L.
Shantz, H. L.
Stephens, J. L.

Spain
Bioletti, F. T.
Fairchild, D.
Harlan, H. V.
Ryerson, K. A.
Westover, W. L.

Sri Lanka (Ceylon)
Dorsett, P. H.
Fairchild, D.
Knapp, S. A.
Koelz, W. N.
Piper, C. V.
Rock, J. F.

Sudan (Anglo-Egyptian Sudan)
Harlan, H. V.
Mason, S. C.
Shantz, H. L.

Sumatra and Sumatera
Dorsett, P. H.
Fairchild, D.

Suriname (Dutch Guiana)
Archer, W. A.

Swaziland
Hodge, W. H.

Sweden
Carleton, M. A.
Dorsett, P. H.
Erlanson, C. O.
Fairchild, D.
Hansen, N. E.
Hougas, R. W.
Mann, A.
Scofield, C. S.
Tracey, J. E. W.
Whitehouse, W. E.

Switzerland
Carleton, M. A.
Fairchild, D.
Lake, E. R.
Ryerson, K. A.
Scofield, C. S.
Tracey, J. E. W.
Westover, W. L.
Whitehouse, W. E.

Tanzania (Tanganyika)
Kephart, L. W.
Piemeisel, R. L.
Shantz, H. L.
Stephens, J. L.

Thailand (Siam)
Rock, J. F.
Boyle, H. H.

Togo
Baldwin, J. T. Jr.

Tunisia
Bioletti, F. T.
Fairchild, D.
Harlan, H. V.
Kearney, T. H.
Means, T. H.
Ryerson, K. A.
Swingle, W. T.
Tracey, J. E. W.
Westover, W. L.

Turkey
Carleton, M. A.
Enlow, C. R.
Fairchild, D.
Godfrey, R. K.
Harlan, J. R.
Swingle, W. T.
Wellman, F. L.
Westover, H. L.

Uruguay
Archer, W. A.
Beetle, A. A.
Hartley, W.
Stephens, J. L.

Venezuela
Archer, W. A.
Stadelman, R.

West Indies
Collins, G. N.
Cook, O. F.
Correll, D. S.
Fairchild, D.
Kearney, T. H.
Kempton, J. H.
Knapp, S. A.
Miller, J. C.
Popenoe, F. W.
Rolfs, P. H.
Schubert, B. G.
Shamel, A. D.

Yugoslavia
Carleton, M. A.
Fairchild, D.
Swingle, W. T.

Zambia (Northern Rhodesia)
Hodge, W. H.
Stephens, J. L.

Zimbabwe (Southern Rhodesia)
Hodge, W. H.
Stephens, J. L.

at Longwood Gardens that he could not turn down. Once at Longwood Gardens, where he was head of the education department from 1955 to 1961, Hodge no longer had access to the USDA's historic information to make corrections, and Carl Erlanson, on the brink of retirement, had far more important business about which to think.

It was difficult to find a concise history of the BPI that would provide background for Hodge's lists of early agricultural explorers. Pertinent information was embedded in either an enormous history of the USDA or in the history of plant pathology. The authors have constructed here a brief narrative overview of the history of the USDA and the BPI that serves to contextualize the explorers named in Hodge's lists. While biographical research has hopefully corrected any errors of inclusion and exclusion in Hodge's original lists or brought attention to some items that need more research, we acknowledge the possibility of error and welcome readers to contact Todd about any such errors of inclusion, omission or attribution.

Table 2. Chronological list of agricultural explorers of the BPI's plant introduction program, 1897–1955

1897
Hansen, N. E.

1898
Carleton, M. A.
Fairchild, D.
Hansen, N. E.
Knapp, S. A.
Swingle, W. T.

1899
Carleton, M. A.
Collins, G. N.
Cook, O. F.
Fairchild, D.
Knapp, S. A.
Swingle, W. T.

1900
Carleton, M. A.
Fairchild, D.
Lake, E. R.
Scofield, C. S.
Swingle, W. T.

1901
Collins, G. N.
Cook, O. F.
Fairchild, D.
Knapp, S. A.
Scofield, C. S.

1902
Bessey, E.
Collins, G. N.
Cook, O. F.
Fairchild, D.
Kearney, T. H.
Knapp, S. A.
Means, T. H.
Onderdonk, G.

1903
Bessey, E.
Bolley, H. L.
Fairchild, D.
Onderdonk, G.
Rolfs, P. H.
Tracey, J. E. W.

1904
Bessey, E. A.
Kearney, T. H.
Shamel, A. D.

1905
Kearney, T. H.
Meyer, F. N.
Rolfs, P. H.
Shear, C. L.

1906
Hansen, N. E.
Meyer, F. N.
Tull, J. H.

1907
Boyle, H. H.
Meyer, F. N.

1908
Hills, W. D.
Mann, A.
Meyer, F. N.

1909
Meyer, F. N.

1910
Meyer, F. N.

1911
Meyer, F. N.
Piper, C. V.

1912
Aaronsohn, A.
Meyer, F. N.

1913
Boyle, H. H.
Dorsett, P. H.
Mason, S. C.
Meyer, F. N.
Popenoe, F. W.
Shamel, A. D.
Wight, W. F.

1914
Cook, O. F.
Dorsett, P. H.
Mason, S. C.
Meyer, F. N.
Popenoe, F. W.
Shamel, A. D.

1915
Meyer, F. N.
Popenoe, F. W.

1916
Meyer, F. N.
Popenoe, F. W.

1917
Meyer, F. N.
Popenoe, F. W.
Reimer, F. C.

1918
Meyer, F. N.

1919
Norton, J. B.
Popenoe, F. W.
Shantz, H. L.

1920
Dorsett, P. H.

1921
Popenoe, F. W.
Rock, J. F.

1922
Rock, J. F.

1923
Harlan, H. V.
Rock, J. F.

1924
Dorsett, P. H.
Harlan, H. V.
McClure, F. A.

1925
Dorsett, P. H.
Fairchild, D.
McClure, F. A.

1926
Dorsett, P. H.
Fairchild, D.
McClure, F. A.
Schultz, F. W.

1927
Dorsett, P. H.
Fairchild, D.
Kephart, L. W.
McClure, F. A.
Piemeisel, R. L.
Schultz, F. W.

1928
Kephart, L. W.
Piemeisel, R. L.
Swingle, C. F.

1929
Dorsett, P. H.
Morse, W. J.
Ryerson, K. A.
Westover, W. L.
Whitehouse, W. E.

1930
Bioletti, F. T.
Dorsett, P. H.
Erlanson, C. O.
Fairchild, D.
Morse, W. J.
Reddick, D.
Russell, P.
Ryerson, K. A.
Souviron, M. J.
Westover, W. L.

1931
Collins, G. N.
Dorsett, P. H.
Erlanson, C. O.
Fairchild, D.
Kearney, T. H.
Kempton, J. H.
MacMillan, H. G.
Morrison, B. Y.
Morse, W. J.
Souviron, M. J.

1932
Dorsett, P. H.
Erlanson, C. O.
Liu, P.
MacMillan, H. G.
Whitehouse, W. E.

1933
Liu, P.

1934
Archer, W. A.
Enlow, C. R.
Liu, P.
MacMillan, H. G.
Mexia, Y.
Roerich, G. N. de
Roerich, N. C. de
Stephens, J. L.
Westover, H. L.

1935
Archer, W. A.
Goodspeed, T. H.
Liu, P.
Mexia, Y.
Stadelman, R.

1936
Archer, W. A.
Koelz, W. N.
Mexia, Y.
Stadelman, R.
Wellman, F. L.
Westover, H. L.

1937
Archer, W. A.
Blood, H. L.
Koelz, W. N.
Polhamus, L. G.
Tremelling, L.

1938
Blood, H. L.
Polhamus, L. G.
Tremelling, L.
Shamel, A. D.

1939
Polhamus, L. G.

1947
Correll, D. S.
Hartley, W.
Koelz, W. N.
Stephens, J. L.

1948
Correll, D. S.
Harlan, J. R.
Hartley, W.
Koelz, W. N.
Manning, C. W.
Stephens, J. L.
Ware, J. O.

1949
Baldwin, J. T. Jr.

1950
Archer, W. A.
Baldwin, J. T. Jr.
Gentry, H. S.
Ogden, E. C.

1951
Archer, W. A.
Gentry, H. S.
Gilly, C. L.
Hodge, W. H.
Nowell, O. W.
Ogden, E. C.

1952
Beetle, A. A.
Fox, W. B.
Gentry, H. S.
Godfrey, R. K.

1953
Correll, D. S.
Gentry, H. S.
Godfrey, R. K.
Miller, J. C.
Smith, E. E.

1954
Gentry, H. S.
Hougas, R. W.
Schubert, B. G.
Smith, E. E.

1955
Correll, D. S.
Creech, J. L.
Gentry, H. S.
Schubert, B. G.
Stephens, J. L.

A history of the USDA and the BPI

The USDA was officially written into being in 1862 by Abraham Lincoln's Congress. Previously, from 1836 to 1861, the Agricultural Section of the U.S. Patent Office, under Henry Leavitt Ellsworth (1791–1858), handled plant importation and other agricultural matters. Ellsworth collected what he thought would be new and valuable plants and seeds "from many sources, including consuls and Navy officers. The seeds and plants were then distributed through Congressmen and agricultural societies" (Baker 1963, p. 5).[1] Local and national groups had been sporadically but regularly agitating for formal agricultural representation in the government (Hodge and Erlanson 1956a, p. 302). The department was finally established in response to pressure from organized farmers through the grange organizations; from the United States Agricultural Society, established a decade earlier; and from various state agricultural societies. However, plant exploration was also becoming part of a larger trend of American movement and accumulation as the frontier was pushed westward. Eventually national agricultural issues brought on by land acquisition had to be addressed.

As the country's largely agrarian population ventured westward, problems of safe grazing, changing microclimates and plant adaptability came to the fore. Additional problems, such as dry land and irrigated farming, drought, wilt, infestations, unregulated introductions, the Civil War's effect on economic crops in the

South and growing public pressure, coalesced. Horticulturist Knowles Ryerson (1892–1990), successor to David Fairchild as head of the Office of Foreign Plant Introduction, noted:

> the period of 1850 to the outbreak of the Civil War [1861] was one of epoch-making events, national and international, which had a direct bearing on plant introduction. This was the period of western expansion of the United States to the Pacific Coast, the annexation of Texas and the Gadsden Purchase [by which part of Mexico became US territory], with problems of crop adaptation as settlement progressed (Ryerson 1967, p. 4).

In addition, there was a shift in regional ties to national leadership at this time:

> agricultural and congressional leaders from the northern States had long been favorable to the idea [of a government provision for agriculture]. With increasing numbers of men removed from agriculture for military service, they felt an increasing need for agencies to stimulate food production. Many southern agricultural and congressional leaders had opposed the plan as tending to expand the power of the Federal government. These leaders were no longer in the Congress (Ball ca.1936, p. 5).[2]

During Lincoln's presidency, the government responded to increasing numbers of agricultural problems and pressures from various interests by promoting the Agricultural Section of the U.S. Patent Office to the level of a department to officially become the USDA. Isaac Newton (1800–1867), then commissioner of patents, was sworn in as the first commissioner of Agriculture (Baker 1963, pp. 13–14, 452). In addition, in 1862 the government inaugurated a land-grant college system through the Morrill Act and implemented a system of public land settlement via the Homestead Act whereby the head of a family could obtain 160 acres of land for a low price and the commitment to farm it for five years (Alexander 1940, p. 882).

Agronomist Carleton Ball (1873–1958) offered an insider's perspective on the department in his history of the USDA written circa 1936 when he was chief agriculturist of the USDA's planning division. Ball divided the department's history into four periods. He characterized the early period of the USDA, 1862–1887, as one in which the department focused on improving crops, protecting agricultural products and streamlining methods of production. He summarized these goals as "make it better, make it safe, make it pay" (Ball ca.1936, p. 8). The 1887 Hatch Act provided a federal fund for establishing a system of Agricultural Experiment Stations in each state and marked a turning point in USDA history, "the culmination of a long battle by the proponents of agricultural science to bring the financial power of the federal government to the aid of the nation's farming interests at the state and local levels" (Campbell et al 1999, p. 183).[3] In addition to projects within its contiguous states, tropical surveying, cataloguing and plant introduction were happening in response to the United States officially acquiring such widely separated territories as Puerto Rico and Hawaii in the 1890s. Administrators, policy makers and the public wanted to know if these territories were economically viable and if they would be assets in terms of agricultural development. As Frederick Vernon Coville (1867–1937), chief botanist of the USDA and curator of the National Herbarium, wrote in the preface to O. F. Cook and G. N. Collins' *Economic Plants of Porto Rico*:

> One influence of the extension of American jurisdiction over Porto Rico and the Philippine Islands, in the year 1898, was to create a demand for information about the vegetation of those islands. The information demanded regarding the Porto Rican flora was largely of a popular and commercial character and was not at all to be satisfied by the existing and available technical works on the West Indian flora (Cook and Collins 1903, p. 53).

This accumulation of territories made the desire for agricultural knowledge and tropical crops research public and urgent.

The USDA was focused primarily on investigative projects, and Ball described the first period of the department as organized by individuals and their projects: "new lines of investigation were added from time to time as new problems developed" (Ball ca.1936, p. 9). The impetus of the department does seem to have come from outside, and this early period was subsequently one of increasing departments and units cropping up at irregular intervals, responding to public issues as they arose. The USDA's first director, Isaac Newton, defined his objectives as:

> 1) collecting, arranging, and publishing statistical and other useful agricultural information; 2) introducing valuable plants and animals; 3) answering inquiries of farmers regarding agriculture; 4) testing agricultural implements; 5) conducting chemical analyses of soils, grains, fruits, plants, vegetables, and manures; 6) establishing a professorship of botany and entomology; and 7) establishing an agricultural library and museum (Baker 1963, p. 14).

The department grew over the years to meet these objectives, spawning sections or units for forestry, soils, entomology, pathology and, of course, plant industry and exploration.

Ball characterized the second period of the USDA, 1888–1912, as primarily one of safety—protecting crops from pests and protecting producers and consumers from unfair trade practices through regulations, such as programs of quarantine, laws regarding international trade and interstate movement of pests and diseases, and laws regulating handling, exportation, storage and sales service. The numerous small units that had cropped up within the USDA were streamlined and organized as eight new bureaus. President Grover Cleveland elevated the Department of Agriculture to executive, cabinet-level status on 9 February 1889 in response to lobbying by the National Grange and the Farmer's Alliance, among others (Baker 1963, pp. 27–30). The position of Commissioner of Agriculture was thus also raised to a cabinet-level appointment since "the activities of the department had developed and so expanded, and the pressure from agricultural interests [was] so great" (Ryerson 1967, p. 6). That increase in status reflected and helped facilitate a general upswing in professionalism and organization within the USDA. C. Lee Campbell, Paul D. Peterson and Clay S. Griffith, contemporary historians of plant pathology in the United States, fleshed out some of the changes at this time:

> In the late 1890s, several factors contributed to a new climate that was receptive to [a centralized and coordinated system of plant research equal in status to the Bureau of Animal Industry] in the USDA. . . . First, the science of plant pathology was able to point to a growing record of successes. The USDA Division of Vegetable Physiology and Pathology, though barely fifteen years old, had made notable strides in fundamental research. This research had led to the control of a number of America's most destructive crop diseases through the use of chemical sprays and improved cultural practices. . . . Second, James 'Tama Jim' Wilson [1835–1920] was installed in 1897 as secretary of agriculture. Unlike his predecessor . . . Wilson favored the expansion of scientific activity in the department" (Campbell et al. 1999, pp. 251–252).

The third factor that Campbell, Peterson and Griffith charged with leading to a new social and professional climate around the USDA was a personnel change. With the death of William Saunders (1822–1900), chief of the USDA Division of Gardens and Grounds,

> Beverly Galloway saw a way not only to gain experimental facilities for plant pathology and physiology but also to expand his own sphere of influence in the USDA. He proposed to Secretary Wilson that he take control of the Division of Gardens and Grounds and that his deputy, A. F. Woods [1866–1948], become head of the Division of Vegetable Physiology and Pathology. Thus, two men with strong interests in plant disease came to control the operations of two major divisions of the USDA. Galloway recognized that the existing, decentralized structure among the divisions concerned with the plant sciences resulted in harsh and, at times,

> acrimonious competition for funds, duplication of efforts, and discord among researchers. He encouraged cooperation between federal bureaus and their state counterparts and believed that a unified Bureau of Plant Industry, which would centralize administration and coordinate research, could solve many of these problems (Campbell et al. 1999, p. 252).

This centralizing move was opposed by scientists such as chief botanist F. V. Coville, who was uneasy about increasing specialization in late-19th-century botany. In spite of such dissent, Galloway and Erwin Smith (1954–1927, Fig. 1) helped draft legislation that created the Bureau of Plant Industry (BPI), which officially coalesced in 1900 and started operations in 1901.

All of the USDA's plant activities (except those of forestry) were aggregated under the BPI's first chief, Beverly T. Galloway, including the offices of: Fiber Investigations, Botany, Experimental Gardens and Grounds, Vegetable Physiology and Pathology, Agrostology, Farm Management, and Pomology.

Figure 1. Division of Plant Pathology, USDA, 1902. Staff: Albert Fred Woods, Erwin Frink Smith *(second row from top, second person from left, with beard)*, Herbert John Webber, Merton Benway Waite, Cornelius Lott Shear, Charles Pickney Hartley, C. Pierce, George Thomas Moore, Thomas Henry Kearney, Charles Orrin Townsend, Mark Alfred Carleton, Joseph Scudder Chamberlain, Benjamin Minge Duggar, Deane Bret Swingle, F. L. Goll, John Bitting Smith Norton, William Allen Orton, H. H. McKenney, Karl Frederic Kellerman, Mr. Raison, Mr. Brown, Ernst Athearn Bessey, N. E. Fealey, Thomas Romney Robinson, Flora Wambaugh Patterson, L. Wheeler, D. E. Ingram. Hunt Institute for Botanical Documentation Archives group portrait no. 0028.

> The activities of the Bureau of Plant Industry coincided with a period of general growth in funding for agricultural science and a continuation of work begun in the last decades of the previous century, particularly in the area of the chemical control of fungal diseases and the understanding of diseases caused by bacteria. In time, the bureau added skilled scientists and created numerous new administrative divisions devoted to specific commodities or types of research (Campbell et al. 1999, p. 279).

During the BPI's first year, its scope expanded to include seed and plant introductions, and its first decade was one of regular expansion and increased lines of both research and funding.

David Fairchild wrote in *The World Was My Garden* of his return to Washington and the ideas preceding a formal plant exploration program around 1897:

> The idea of plant introduction as a government activity was germinating in other minds besides Mr. [Barbour] Lathrop's [1847–1927] and mine. Secretary Wilson's first act after taking office had been to send N[iels] E. Hansen [1866–1950] to Russia in search of cold-resistant fruits and cereals for our great plains. Also … [Walter T.] Swingle [1871–1952] had read a scholarly paper before the horticulturists of Florida, giving a list of subtropical plants which should be introduced into that State. There existed, as a special service of the Department of Agriculture, a branch known as the Congressional Seed Distribution. It was spending several hundred thousand dollars a year, and each Congressman had a quota of several thousand packages of seed which he distributed to his constituents. The farming papers were full of jokes about the Congressional Seed Distribution. Packets of pansy seed were reported to yield foxgloves, and petunias grew as hollyhocks. Also, many thoughtful folk felt that it was not a proper function of the government. … It seemed logical to Swingle and me that a portion of this seed fund should be diverted and spent for the introduction of new and carefully selected crops. We therefore drew up tentative plans for a clause in the Appropriation Act which would set aside $20,000 for this purpose (Fairchild 1938, p. 106).

Alfred Charles True (1853–1929), then head of the Office of Experiment Stations, took Fairchild and his plan to Secretary Wilson, and the new section of the Department of Agriculture was approved and added to the Appropriation Bill. Fairchild headed the new Section of Seed and Plant Introduction for a few months but stepped down to embark on a long collecting trip. Orator Fuller Cook headed the section until Fairchild resumed the position in 1903 and remained there until 1928.

Hodge and Erlanson's history of federal plant introduction recounted the multiple names of the plant introduction program, which would become a major project of the Bureau of Plant Industry:

> The original "Section of Seed and Plant Introduction" of 1898–1903 has been known under variants of the same name, including "Office of Seed and Plant Introduction" (1904–1907), "Office of Foreign Seed and Plant Introduction" (1908–1925), "Office of Foreign Plant Introduction" (1926–1930), "Division of Foreign Plant Introduction" (1931–1933), "Division of Plant Exploration and Introduction" (1934–1953), and finally, dating from late 1953, the present name, "Section of Plant Introduction," which today essentially brings the nomenclature back to the original form created in 1898 (Hodge and Erlanson 1956a, pp. 301–302).

The rapidity with which the department changed names was indicative of the increasing importance of plant introductions to the overarching BPI, the fine tuning of the department's goals, and the speed at which relations between such parties as state and national agricultural and legislative bodies, scientists, explorers and consumers coalesced around important problems.

In addition, the regular publication of the *Bulletin, Bureau of Plant Industry, United States Department of Agriculture* became that vehicle by which USDA plant discoveries were made public. The BPI Bulletin originally served a wide array of purposes by helping to increase knowledge across departments within the BPI, to compile the latest plant news from the

new government experiment stations and to disseminate details about plant investigations and introductions to scientists, farmers and nurseryfolk. The early issues of the Plant Inventories discussed earlier were published as complete issues of the BPI Bulletin. For example, Plant Inventory no. 16, published in 1909, was also Bulletin no. 148; Plant Inventory no. 17, published in 1909, was also Bulletin no. 153. Around 1914 the Plant Inventories were published on their own, no longer constituting an issue of the BPI Bulletin, as *Inventory of Seeds and Plants Imported by the Office of Foreign Seed and Plant Introduction, United States Department of Agriculture*. This no doubt was due to a concerted effort by USDA Secretary David Franklin Houston (1866–1940), who felt that the USDA was not adequately marketing itself. Thus in 1913 Houston had Galloway organize a committee that studied the issues of publicity and publications and eventually recommended "greater centralization of the technical phases of the editorial work and closer consultation with the authors; the utilization of the agricultural press to take useful information to the farmer; … and the advice that the Bulletins of the Department be limited to technical scientific material, while the circulars and farmers' bulletins should contain more popular information" (Baker 1963, p. 70). With an overall plan to separate popular from scientific information, the USDA's Office of Information began in 1913 to supply weekly articles on practical matters to two of the nation's news syndicates. As the department clarified its multiple audiences and crafted its publications to accommodate those various groups, the published Plant Inventories were extracted from the Bulletins and were published on their own.

The BPI improved disease control and methods for growing, processing and storing plant products; it also worked to introduce plants of potential economic benefit to the United States. The bureau battled the tenuousness of its success on several fronts, including plant viability and plant purity. As BPI employee Donovan S. Correll (1908–1983) wrote, the bureau's goals were "to obtain an abundance of genetic diversity to be properly maintained and used in improving all phases of the cultivated plant" (Correll 1967, p. 87). However, as the prolific agricultural explorer and USDA botanist David Fairchild wrote in 1928, tabulating whether or not these goals were met could be difficult:

> Ordinarily the results of botanical trips can be measured by the numbers of specimens collected and the number of new species discovered among these specimens. These latter represent new scientific data. Such a yardstick as this, however, is in no way applicable to plant introduction work, for here we deal with a transferring of plants from one country to another, not with the discovery of new species of plants. Furthermore, numbers of plants collected do not tell the story, for those which arrive dead represent futile attempts. A more reasonable measure of the results would be through an account of the successful growth of the species of plants introduced. But here again enters another difficulty—the time element. Plants grow so slowly that years must pass before one can know whether seeds transplanted from one region will grow and produce in another. In 1876 *Hevea* seeds were sent from Brazil *via* Kew to Ceylon. A year after this introduction was made there were only tiny seedlings to show that the Brazilian immigrant would grow in its new environment. Twenty years later only a few men like [Sir Henry Nicholas] Ridley [1855–1956], of Singapore, believed that this Brazilian rubber tree was to be a commercial success in the Orient, and although to-day [1928] billions of dollars are invested there in the rubber plantations which grew from the seeds of those trees—half a century of time has passed and the actors in the drama are most of them dead. … As a result then of our expeditions [funded by Allison Armour,] we have brought in as experimental material some 1,400 species of plants and made about 2,500 photographs of plant industries, and nothing short of a two-volume book could adequately

> describe these results of two and a half years of plant collecting in Europe, Africa and Asia (Fairchild 1928, p. 103).

Specimen viability and then crop viability in their new environs were questions only answered in the long term, as well as the even slower revelations of plants' uses. In addition to long-term industrial uses and pharmaceutical developments, plant disease resistances also continue to be discovered from plants collected by these early USDA plant explorers. For example, a 1952 specimen of a Brazilian peanut collected by Alan Beetle (1913–2003) has, since 1987, been crucial to breeding resistance to tomato spotted wilt virus, but the success of Beetle's trip was 35 years in the making.

Along with the time needed to be able to tell success stories, Fairchild's above quote suggests the tenuousness of even determining successes, the complexity of the obstacles and the probability of failure, particularly in the early years. As another example, Correll wrote: "Many of the early collections of potatoes, including those assembled by expeditions from the United States during 1930–1932, were eventually lost or absorbed by research. There was no efficient organization for the maintenance and increase of large numbers of collections" (Correll 1967, pp. 86–87). Departmental reorganizations and institutional changes, such as the inauguration of the National Seed Bank at Fort Collins, Colorado, in 1957 and the founding of a National Plant Germplasm System (NPGS) in the mid-1980s, partly in response to a sweeping corn blight in the 1970s, have increased organizational rigor and alleviated these losses over time (Whittemore, pers. comm., 2007; USDA, ARS 1990, p. 1).[4]

Another early risk was the problem of international pathogens being introduced along with foreign plants. Campbell, Peterson and Griffith wrote of the early USDA that "Unlike many European countries, America had no quarantine system, relying instead on a loosely organized and haphazardly maintained practice of inspection after importation. . . . Compounding the problem were the difficulties inherent in the actual detection of diseases such as white pine blister rust and potato wart by inspection" (Campbell et al 1999, p. 277). While farmers and scientists alike proposed national quarantine laws,

> Legal exclusion of plants suspected of harboring dangerous pests was a fairly recent concept. In the absence of federal quarantine legislation regarding plant pathogens, the Bureau of Plant Industry, probably the largest importer of new plants in the United States, was maintaining its own strict inspection of all of its imports and either fumigated or destroyed suspect plant material. But USDA scientists promoted stronger legal restrictions, arguing that inspections alone were insufficient to prevent the importation of plant pests. Bureau of Plant Industry plant pathologists played a significant role in encouraging lawmakers to consider quarantine legislation (Campbell et al. 1999, p. 278).

Indeed, state laws came first with the obvious shortcoming of pests crossing state borders more easily than legislation. In 1905 the Insect Pests Act and quarantine legislation relating to livestock were passed, important first steps in organizing crop security at the national level.

For agricultural explorers in the field, on the other hand, individuals' compliance with institutional guidelines or pest legislation could be difficult, and the results of any unavoidable noncompliance could be frustrating. This excerpt from a biography of explorer Frank N. Meyer (1875–1918) illustrates the difficulty involved in adhering to the new regulations:

> [Palemon] Dorsett [1862–1943] and Fairchild had planned an elaborate "quarantine hospital" in Washington, but Congress granted only five thousand dollars for this project. . . . Dorsett supervised construction of an inadequate structure to receive all plant material from abroad. Fairchild warned [Frank N.] Meyer [1875–1918] that the Federal Horticultural Board

> would destroy the seeds and nuts that he was sending if inspectors discovered fungus or insects in the shipment. Plant material must be free of even universally common pests such as aphids, red spiders, thrips, and mealy bugs. Meyer replied [from Peking] that the board was "throwing out the baby with the wash water." Without facilities for fumigation he could not be absolutely certain that no insects were lurking among seeds or on plants (Cunningham 1984, p. 221).

Not until the 1928 creation of the Plant Quarantine and Control Administration were the plant regulatory duties transferred from the BPI (Baker 1963, p. 481). There is no way to estimate what was lost in the mean time. In addition to pest problems, there were problems of changing climates adding to the tenuousness of successful plant introduction. Moving plants from their tropical homes could be dicey.

> The seeds of many tropical plants are very short-lived. If dried they die and if kept moist they germinate in a few days, so that the only way to send them is as seedlings in Wardian cases. From Singapore to Panama by the fastest mail route is to-day [1928] about two months and there are few things deadlier to tender young plants than salt spray. So that when a delicate seedling of some especially valuable Oriental plant starts on a journey towards South America it has rather poor chances as a rule of arriving alive (Fairchild 1928, p. 112).

Sometimes a species that did not survive shipping could be collected and shipped again, adding several months to any possible introduction, especially figuring in the time it took to notify the collector in the field. Sometimes the responsible explorer had moved on and re-collecting the specimen was not an option.

In addition to sturdy pests and fragile seeds or seedlings, there was also significant peril to people. Richard A. Howard's article on botanists during World War II recounted of the *Cinchona* projects that "The work was arduous and in isolated, uninhabited areas. The botanists suffered from the altitude, wetness, malnutrition, malaria, and amoebic dysentery" (Howard 1994, p. 216). Botanists also frequently had to dodge local unrest. Fairchild wrote of his time in Sumatra on the Allison V. Armour Expeditions: "This wonderful trip was made on foot by Mr. Dorsett and his son, and my son Graham without encountering any difficulty with the Atchenese even though the day before a massacre of Dutch troops had taken place on the West Coast some fifty miles from our line of march" (Fairchild 1928, p. 101). Later in his account of the Armour Expedition, Fairchild's Moroccan armed guards simply appear in a photo captioned

> Professor René Maire, authority on the Moroccan flora, and Mr. Durand, with armed guards, botanizing under the block houses which overlook the Riffian border near Ouezzan, Morocco. This territory had never been botanized over before by any European botanist. We found several new forms, distinct from the species, which occur in other parts of the Mediterranean basin. The rare *Narcissus elegans* was secured here and sent to America (Fairchild 1928, p. 108).

Although there is no discussion of armed guards in the main narrative, their photographic inclusion suggests a level of danger that remained unspoken or unrealized. Joseph Rock also needed a band of up to 50 men to maneuver the competing gangs of China in the early 1920s (Henry 1929). At one point he escaped only "after a fight in which three of the soldiers were killed" (Rogers 1930, p. 11). In spite of frequent needs for protectors and the risks to both people and plants, these were heady times for American botanical exploration.

The USDA's third period, one of education according to Ball, ran from 1913 to 1932 and focused on educating farm families about better materials, methods and living standards. Simultaneously, the USDA worked to educate consumers about agricultural problems and national concerns. Organization within the USDA was centralized around 1914 due to a "lack of power to coordinate

work, inelasticity under the existing system, and the incompatibility of regulatory and research work" (Baker 1963, p. 65). The USDA moved toward a departmental model "and an enormous increase in departmental inter-unit and Federal-State cooperation: the beginnings of the national program" (Ball ca.1936, p. 15). These early periods of the BPI paralleled the USDA and were marked by a kind of democratic input that led to streamlining goals and methodologies. In 1915 the cotton standardization project was moved from the jurisdiction of the BPI to the new Office of Markets and Rural Organization, the poisonous plant investigations relating to animals' reactions were moved to the Bureau of Animal Industry, and soil fertility investigations were moved to the BPI from the Bureau of Soils; the shifts were meant to allow the BPI to narrow its focus.

The onset of World War I certainly sharpened that focus. The war meant that some of the usual supplies of medicinal plants were cut off from the United States. In 1916 the BPI "undertook to supply some of these by establishment of two large camphor plantations in Florida which would supply thymol, oil of lemongrass, sesame, and belladonna" (Baker 1963, p. 84). From around 1917 the USDA "urged increased production of food for domestic consumption and export. It conducted special drives for increased output and the conservation of food supplies" (Baker 1963, p. 88). Increased government attention was given to wartime production of wheat and sugar; emergency demonstration agents were added to assist in executing food and feed conservation measures (including lessons in nutrition and home economics), to relieve acute farm labor shortages, and to organize children's work clubs; food and fertilizer surveys were conducted; "a special appropriation was made to procure seeds to be sold to farmers at cost . . . [and President Wilson authorized Secretary Houston] to utilize $5 million . . . for seed loans to producers in drought-stricken areas of the West" (Baker 1963, p. 91). At the Office of Foreign Seed and Plant Introduction, campaigns were waged to promote dried vegetables, proposals were made to grow sweet potatoes in France and Morocco for US troops, and researches were conducted into using palm and other seeds in gas masks to occlude poisonous gases (Fairchild 1938). The sudden end of the war, however, did not end the agricultural problems; it only changed them.

> Sources of supplies for the Allies, which had been cut off during hostilities, now became available. In this country, the incentive to produce increased quantities was viewed with concern, especially as oversea markets contracted. The expanded areas of production, the adoption of new scientific methods, and the utilization of power machinery had built up production potential without a permanent market potential (Baker 1963, pp. 91–92).

While the urgency of production of food and industrial plants was alleviated by the war's end, widespread droughts in the Mid-west and Northwest in the 1920s refocused USDA activity on drought resistance and seed loans. When Ryerson succeeded Fairchild as head of the Office of Foreign Plant Introduction in 1928, "A survey was conducted among the plant-workers of state and federal stations, colleges, universities, and botanic gardens to learn of projects for which introduced plant materials were needed. This gave an adequate and balanced base upon which to build a sound introduction program" (Ryerson 1967, p. 12). Ryerson also reported a new expansion in the field of ornamentals, chiefly under the guidance of USDA horticulturalist Benjamin Yoe Morrison (1891–1966) around this time.

To acknowledge BPI explorers' efforts on behalf of the USDA, the Frank N. Meyer Memorial Award was established in 1919 to recognize distinguished service in plant introduction "through a contribution left by Frank N. Meyer to his fellow workers in

what was then known as the Office of Foreign Seed and Plant Introduction. It is awarded for devoted service to plant introduction" (Phillips 1965, p. 203). Meyer's posthumous contribution was intended for an outing or a gift for his coworkers, but instead those coworkers organized the bequest to provide for a bronze medal originally awarded by the American Genetic Association (headed at the time by David Fairchild). In the mid-1960s the American Horticultural Society and the Fairchild Tropical Botanic Garden struggled over which organization would manage the medal. A small collection of correspondence in the Hunt Institute Archives documents this struggle and the sometimes heated politics around who was granted the Meyer Award. Now granted by the Crop Science Society of America, the medal has become a standing legacy to Frank Meyer, who lost his life in China under mysterious circumstances while on assignment there for the BPI, and to agricultural explorers in general. The first medal was awarded to Barbour Lathrop in 1920 (Figs. 2, 3). The award and its press helped to educate plant folk and the wider public about ongoing plant explorations.

Though the Great Depression is frequently dated from the large stock market crash in 1929, agricultural sectors felt economic strife much earlier. "In the depressions of 1920 and 1929 farm prices fell sooner and further

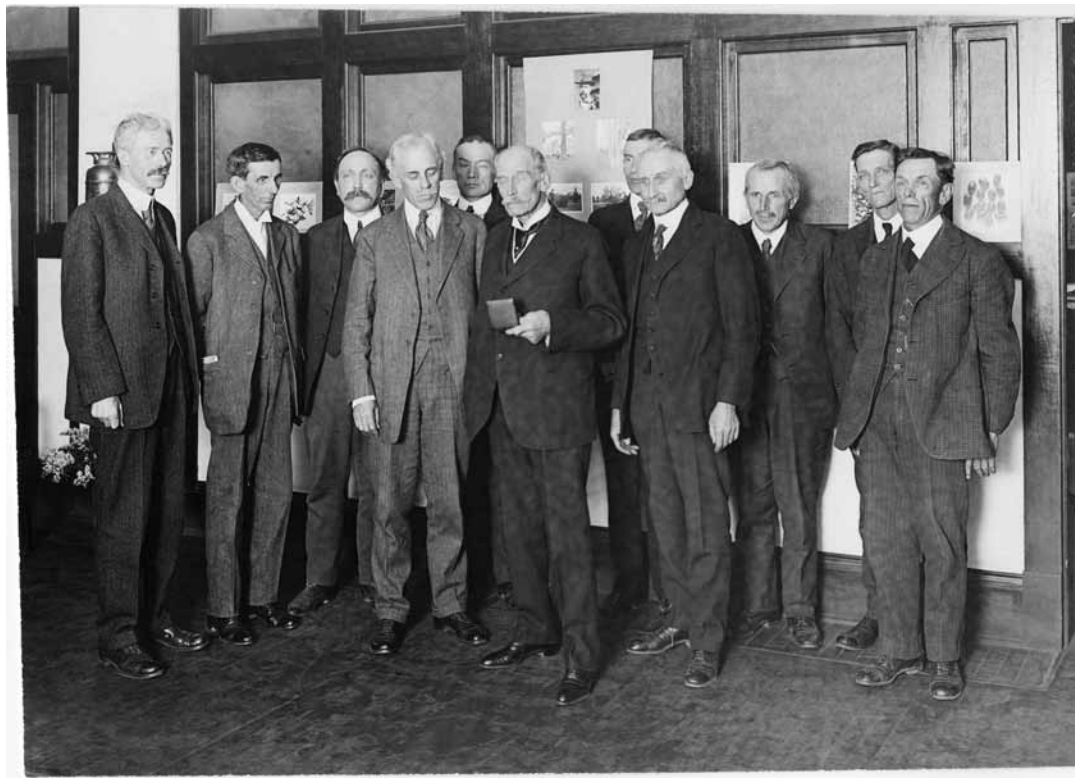
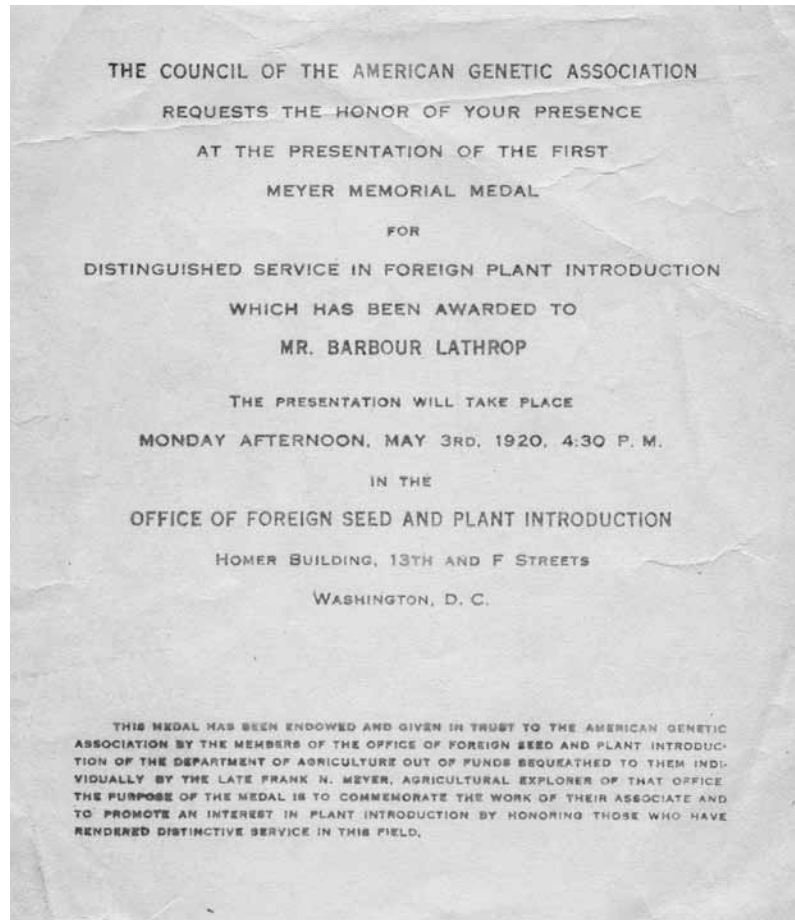


Figure 2. Presentation of the first Frank N. Meyer Medal to Barbour Lathrop, USDA, Washington, D.C., 1 May 1920. Walter T. Swingle, Beverly T. Galloway, Mark A. Carleton, David G. Fairchild, Peter Bisset, Barbour Lathrop *(eyes closed)*, Thomas H. Kearney, William A. Taylor, Orator F. Cook, Edward Goucher, Palemon H. Dorsett. Hunt Institute for Botanical Documentation Archives group portrait no. 0131.



THE COUNCIL OF THE AMERICAN GENETIC ASSOCIATION
REQUESTS THE HONOR OF YOUR PRESENCE
AT THE PRESENTATION OF THE FIRST
MEYER MEMORIAL MEDAL
FOR
DISTINGUISHED SERVICE IN FOREIGN PLANT INTRODUCTION
WHICH HAS BEEN AWARDED TO
MR. BARBOUR LATHROP

THE PRESENTATION WILL TAKE PLACE
MONDAY AFTERNOON, MAY 3RD, 1920, 4:30 P. M.
IN THE
OFFICE OF FOREIGN SEED AND PLANT INTRODUCTION
HOMER BUILDING, 13TH AND F STREETS
WASHINGTON, D. C.

THIS MEDAL HAS BEEN ENDOWED AND GIVEN IN TRUST TO THE AMERICAN GENETIC ASSOCIATION BY THE MEMBERS OF THE OFFICE OF FOREIGN SEED AND PLANT INTRODUCTION OF THE DEPARTMENT OF AGRICULTURE OUT OF FUNDS BEQUEATHED TO THEM INDIVIDUALLY BY THE LATE FRANK N. MEYER, AGRICULTURAL EXPLORER OF THAT OFFICE. THE PURPOSE OF THE MEDAL IS TO COMMEMORATE THE WORK OF THEIR ASSOCIATE AND TO PROMOTE AN INTEREST IN PLANT INTRODUCTION BY HONORING THOSE WHO HAVE RENDERED DISTINCTIVE SERVICE IN THIS FIELD.

Figure 3. An original invitation to the first presentation of the Frank N. Meyer Medal. Hunt Institute for Botanical Documentation Archives Meyer Medal Collection no. 158.

and stayed down longer than nonagricultural prices" (Hambridge 1940, p. 30).[5] In 1928 the USDA's bureaus were shifted around again "to separate research from regulatory functions," which led to the establishment of the Plant Quarantine and Control Administration. This new regulatory body "was responsible for plant regulatory work formerly carried on by the Bureaus of Entomology and Plant Industry" (Baker 1963, p. 127). In the pre-crash moment, though, there was hope that the agricultural downturn could and would be reversed: "When Secretary [Arthur M.] Hyde took office [in 1929], many people hoped that the prevalent general prosperity would, with minimum help by the Government, soon lift the farmers out of their economic slump" (Baker 1963, p. 131).

Instead the autumn of 1929 saw the beginning of the business sector's Great Depression during which the entire national economy was to be gravely affected and the agricultural sector carried close to disaster. As Secretary Hyde said in his annual report for 1932: "The current depression has caused greater shrinkage in demand for farm commodities, in farm-commodity prices, and in farm incomes than has any similar decline in the last 70 years" (Baker 1963, p. 131). The USDA's goals for research were

of course influenced by the depression, though the secretary's goals could apply at any time. Hyde's 1932 annual report promised to: "(1) Reduce costs of production (2) widen markets and reduce wastes in distribution (3) discover new uses for farm products and by-products (4) adjust production to demand, and (5) improve the quality of farm products" (Baker 1963, p. 131). The confluence of a national economic crisis and several regional natural disasters put the USDA back on high alert, but with the lessons of the war behind them, administrators realized that planning for the future had to be factored into budgets and long-term planning.

> Even while the Department was looking toward the future in long-range soil and timber conservation and land use planning programs, it was engaged in emergency activities resulting from the Great Depression and from natural disasters that struck the country. The Secretary noted that nearly all of the increase in departmental expenditures had resulted from putting more men to work on roads and making direct loans to farmers suffering from drought, flood, and economic distress (Baker 1963, pp. 140–141).

The USDA focused on drought and flood relief, irrigations, western forage plants, soil conservation and land use (Ryerson 1933; Baker 1963). The BPI, newly relieved of its plant quarantine and other regulatory duties around this time, made great strides in bringing sugarcane mosaic disease under control. The aftershocks of the depression would nonetheless be felt for decades.

Not unexpectedly, Ball's fourth period of the USDA found the department focused on stabilizing from 1933 to 1962. If this report was indeed written in 1936, there is a fair amount of projection in his account, but it is worth mentioning here as documentation of the department's overall plans. Ball wrote that the department was concentrating on "a long-range national program of planned and stabilized development, production, and distribution" (ca.1936, p. 7). Baker corroborated Ball's interpretation of the USDA's new attention to the nation and its markets when she wrote that between the two world wars, USDA research took a three-pronged approach, focusing on "(1) increasing the quality and quantity of agricultural production through the development of improved varieties of plants and animals and improved methods of production, and by eliminating diseases and insect pests; (2) finding new uses for agricultural products, particularly those of which we had been producing unmarketable surpluses, and (3) improving and conserving the soil" (Baker 1963, p. 290). New emphasis on the nation as an agricultural whole, exacerbated by plunging national economies during the depression of the previous era, meant a new attempt at contextualizing farming and incorporating "the concept of the nation as an agricultural unit rather than as a collection of sections, States, counties, communities, or individual farms" (Ball ca.1936, p. 19).[6] The mark of the Great Depression could be seen in the research plans of the USDA, as well as in its attention to a major constituent, farmers.

In order to streamline national efforts, the USDA underwent a large-scale reorganization in 1938, wherein the BPI was assigned new, expanded responsibility for research functions such as plant mineral constituents derived from soil, crop production on irrigable lands, soil fertility, cereal diseases, cotton diseases, drug and related plants, nematology, and plant exploration. This USDA plan for conceptualizing the nation as a whole increased in its urgency with the outbreak of World War II; no doubt departmental planning anticipated the United States' 1942 entry in the war:

> The American people had all the manufactured goods they could afford to buy, and more food than they could afford to eat. The United

> States had in storage enough wheat and cotton to supply all its recognized needs for 2 years or more and enough corn to last over a year. Surpluses of these basic commodities were mounting with each succeeding crop. When the European war cut off export trade, large surpluses of other crops began accumulating. The assimilation of apples, citrus fruit, prunes, raisins and nuts became difficult. World supplies of most foodstuffs were at record levels, and it was felt that food rationing in the belligerent countries would reduce consumption, thus contracting markets (Baker 1963, p. 274).

Thus the USDA was again charged with managing the nation's growing agricultural surpluses. USDA economists puzzled over making price reductions through marketing, packaging or processing. They also studied converting surplus food into less expensive products or instigating "a 2-price system to enable low-income families to purchase more of the food they needed and to provide a wider market for surplus food" (Baker 1963, p. 183). In 1939 the Federal Surplus Commodities Corporation, under USDA leadership, was instructed to develop "a new surplus food disposal program" (Baker 1963, p. 184). The graduated pricing program for agricultural surpluses was named the food stamp plan and officially launched on 16 May 1939. This program aided the national school lunch program (begun in 1935) in funneling food surpluses to areas of need. The list of surplus commodities changed depending on supplies, and when the war economy increased food demand and employment, the food stamp program was suspended on 1 March 1943.[7]

During the build-up to war, the USDA was assigned to locate new defense-related industrial plants and provide emergency seed for important commodities, such as guayule rubber and castor beans. The world's economies were again in turmoil, and the botany community was not exempt from the consequent rationing and limitations. As early as February 1940, South American botanists reported that postal restrictions limited outgoing packages to 500 grams (Daniel 1940). In the United States, botanical studies generally slowed or stopped.[8] In a few professional circles, however, research in botany increased. Boris Alexander Krukoff (1898–1983) wrote to Ray Clarence Friesner (1894–1952) from the New York Botanical Garden on 7 March 1942:

> We are beginning work on a new project and would appreciate your suggestions as to plants that you think we should test. The project in question involves "repellents" for insects and it goes without saying that if we should find a good repellent for mosquitoes it would be useful to the Army operating in the tropics. The project is being handled by us on a newly approved schedule of research for 1942. Several specialists will be involved and two or three years doubtless will pass before we are through with it (Krukoff 1942).

Friesner suggested seven plants and later that month (20 March) agreed to collect *Hedeoma pulegioides* when it would be in season. Krukoff asked Friesner on 17 April to also collect *Cunila origanoides*, a plant that Friesner had suggested investigating. Within a single month, the insect repellant project took shape and resolved meticulous details in the face of wartime urgency.

After the December 1941 bombing of Pearl Harbor, the government reorganized for active engagement in the war, and the USDA focused again on boosting the nation's food supplies.

> The wartime reorganization of the Department, of necessity, stressed the short-term food production aims of the Government—food requirements, production capacity, allocations and controls, and the centralization of authority in a direct chain of command from the Office of the Secretary or Food Administrator to the individual producer. For the time being, long-range objectives were obscured (Baker 1963, p. 286).

Documentation of this frantic time in American history is scattered as responsibilities were

re-assigned and priorities were shifted. Much of this work appears to have been performed outside the boundaries of the USDA as suggested by Krukoff's correspondence about the New York Botanical Garden being assigned a project on insect repellants. Another example is Egbert Hamilton Walker's 1942 attempt "to quickly produce a pocket manual of food plants for stranded aviators in the South Pacific. He also organized the Servicemen's Collecting Program" (Levine 1976, p. 1).

In addition, at the height of the war Charles Fletcher Swingle (1899–1978) was assistant director of War Hemp Industries, Inc., Milkweed Floss Division, Petoskey, Michigan.[9] With the country's supply of Dutch East Indies kapok, a fiber from the tree *Ceiba pentandra*, cut off, Swingle supervised the nationwide collection of milkweed pods for stuffing servicemen's life jackets. A 1944 brochure entreating school children to pick milkweed pods and send them to War Hemp Industries notes that it was "Prepared by the Soil Conservation Service for War Hemp Industries, Inc., agents for Commodity Credit Corporation, United States Department of Agriculture" (USDA, War Food Administration, 1944). This suggests a new era wherein wartime agricultural projects had multiple sponsors. Further, from 1945 to 1947 Swingle was in Peru, serving as senior horticulturist for the Office of Foreign Agricultural Relations, USDA. There he ran an experiment station run jointly by the USDA and the Peruvian government investigating tropical plants, including rubber, cinchona and food plants. The USDA seems to have shared projects or had its duties disseminated during the war. However, plant exploration was slowed or stopped during the war. Indeed, in her history of the National Plant Germplasm System's Exploration Program, Karen Williams wrote that: "Plant explorations have been conducted under the Program every year since 1898, except from 1942 to 1945" (Williams 2005, p. 297). The BPI nonetheless "continued to acquire plants from nations not in war zones" (Tyler, pers. comm., 2008) as plants were delivered from a wealth of global contacts. Richard A. Howard (1917–2003) wrote about botanists at this time—about younger botanists drafted into armed service for both botanical and non-botanical employments and about older botanists who taught or did (sometimes classified) research during the war (Howard 1994, pp. 203–214).

In 1943 the BPI was reorganized and renamed the Bureau of Plant Industry, Soils, and Agricultural Engineering (BPISAE) (Baker 1963, p. 479). Although details about what happened at the BPISAE during this period are difficult to find condensed in historical accounts, some of the raw materials ended up being at Todd's very elbow. Correspondence in the Hodge Collection detailed the difference between the USDA and the wartime overseeing group, the Board of Economic Warfare, when Hodge wrote in July 1945 of some confusion about duplicate sets of specimens he collected on the *Cinchona* mission:

> As you know I was employed by the Board of Economic Warfare (now the Foreign Economic Administration), in 1943, as a botanist whose chief function was to search out stands of wild cinchona trees in the forests of Peru with the idea of active exploitation of all valuable trees found. Part of my job was to collect herbarium samples of all cinchonas found as well as closely related plants of the same family to which cinchona belongs. At the time of my employment with BEW there were few botanists available and so the Washington office readily agreed to my request that any duplicate herbarium specimens of cinchonas should be my property as long as the first and best set was given to the US Government. … FEA, realizing the temporary nature of their agency, decided to turn over all botanical collections of cinchona to the Department of Agriculture which has permanent facilities for storing and

> investigating such specimens. This transfer was the correct thing to do and the only trouble is that the FEA did not give their botanists the time to separate out their specimens (duplicates) or to warn them to take their specimens out before shipping them to the States. The result has been that all specimens, both the US Government owned originals and the privately-owned duplicates, have fallen into the clutches of the USDA people at Beltsville. They state that under the law they have the right to hold any or all collections made under government auspices. Whether they do or do not have this right I do not know. I do know however that I was employed by the FEA not by the USDA and all agreements whether right or wrong were made with FEA; one of these agreements pertained to the ownership of duplicate cinchona specimens (Hodge 1945).

The FEA "was the successor to the Board of Economic Warfare and its predecessor, the Office of Economic Warfare. The FEA was a government wartime agency which had the responsibility for the accumulation of strategic material" (Howard 1994, p. 214). Hodge's letter suggests that the wartime agencies' quick formation and the speed of events during the war made it difficult to imagine in advance some of the finer details of the missions. Hodge got his specimens back eventually, and his letter remains as a testament to the intricacies of wartime government response.

While food supplies topped the list of the USDA's priorities during World War II, two non-food USDA projects that coalesced at this time were those organized around *Cinchona*, the bark of which is the major source for the anti-malarial drug quinine, and *Hevea*, a source for rubber. The *Cinchona* mission, to which the above Hodge letter referred, was headed by Francis Raymond Fosberg (1908–1993) and William Campbell Steere (1907–1989) and was begun under the direction of the Board of Economic Warfare. The Dutch-controlled Pacific island of Java supplied 90–95% of the world's *Cinchona*, grown from stock originally imported from South America in the 19th century. Japanese invasion of the South Pacific islands during World War II blocked access to that supply at a crucial time when large supplies of quinine were urgently needed for American troops fighting in the region. Botanical crews were dispatched to the back country of South America, particularly the Andes Mountains, the native habitat of *Cinchona*, in search of concentrations sufficient for serving as a quinine source (Hodge 1948).[10] The development of Atabrine as a synthetic anti-malarial product "reduced or eliminated the need for more cinchona bark, and the South American exploration work was canceled in late 1944 and the missions closed in 1945. However, between 1 December 1941 and 1 August 1945, the United States imported 34,418,548 pounds of cinchona bark and approximately 700,000 ounces of cinchona alkaloids from hemisphere sources" (Howard 1994, p. 216).

Hevea studies were implemented when the United States lost 90% if its Pacific sources of natural rubber due to Japanese invasions. The USDA quickly organized a Rubber Plant Investigations Office and incorporated its Plant Introduction Station near Miami, Florida, as "a transfer station for clones of *Hevea* to make certain that leaf blight and other diseases were not introduced to seed plantations" (Howard 1994, p. 217). USDA botanists were sent with accompanying field teams to Cuba, Haiti, the Dominican Republic, Panama, Costa Rica, Venezuela, Colombia, Brazil and the Amazon Basin. Many *Hevea*-heavy tropical locations were not populated by native people, so the field team would locate the rubber plants, build a camp site and then hire and transport native workers to assist with the rubber tapping. *Hevea* breeding programs were developed in Haiti and Costa Rica (Howard 1994, p. 219).

The impact of the wartime rubber shortage was intense as we have seen earlier in archived personal correspondence. In addition to

the major *Hevea* project, the USDA tested "almost every rubber-producing species in temperate as well as tropical America … for rubber possibilities" (Howard 1994, p. 217). The USDA also researched *Cryptostegia* and *Parthenium argentatum*, or guayule, as possible alternate rubber sources. *Cryptostegia* is a vine that was largely propagated at the USDA Plant Introduction Station near Miami, Florida. The largest plantations were established in Haiti, disrupting that nation's sugar and vegetable crop productions. Additional plantations were started in Mexico, Australia and India (Howard 1994, p. 218). Guayule is a shrub that was planted in great quantities in California, but "the war ended before the harvest of large-scale farming could be realized and the project was scrapped, as it was cheaper to import tree-derived latex than to crush the Guayule shrubs for a smaller amount of latex" (Damania, pers. comm., 2008). The USDA also cultured *Cannabis sativa* as a viable source of linen fiber to replace the interrupted supply of abaca from the Philippines. "Two harvests in 1943 and 1944 produced sufficient fiber to meet the current needs. In 1945 the project was terminated" (Howard 1994, p. 223). Indeed, most of the war-generated plant projects were closed when the war ended or earlier.

The end of World War II did not put an end to the widespread sense of agricultural urgency. After the close of the war, "prospective world famine was the most acute problem" the USDA faced, but "many people feared that an agricultural depression would follow the end of the war just as it did in 1920–21. Thus, policy was aimed to avert famine and avert depression at the same time" (Baker 1963, p. 331). The fears of peacetime did not reign for long. On 25 June 1950 North Korea invaded the Republic of Korea, and the United Nations immediately mobilized to assist the Republic of Korea though "the major fighting force and its supplies came from the United States" (Baker 1963, p. 357). Unable to forecast the course of the war in its early stages, the "secretary of Agriculture was made responsible for priorities, allocations, and requisitions respecting food and the domestic distribution of farm equipment and commercial fertilizer" (Baker 1963, p. 358). The BPISAE was reorganized once again in 1951 so that all of its research "was organized under four directors: Agricultural engineering, field crops, horticultural crops, and soils" (Baker 1963, p. 479). By order of Secretary's Memo 1320 of 2 November 1953, the BPISAE "was abolished and its functions were transferred to the Agricultural Research Service. In December of that year, the functions of the former BPISAE were assigned to the Director, Crops Research, and the Director, Farm and Land Management Research" (Baker 1963, p. 478). The Agricultural Research Service continues to this day as the plant research oversight body.

A modern national agricultural focus looked to a more comprehensive plan to collect, organize and preserve plants. Energies were and are now focused on collecting germplasm, rather than transporting the whole plant, and storing those essential samples in banks. Ryerson noted: "During the period immediately preceding World War II and the period since, the development of germplasm banks for the preservation of breeding stock materials, and the greatly expanded plant introduction activities in the interest of new crops and resistant strains of older well-established crop industries resulted in new introduction centers" (Ryerson 1967, p. 9). The USDA streamlined operations again in the 1970s: "The USDA terminated all branch chiefs in 1972. Some branch chiefs moved directly to field positions but others and assistant branch chiefs remained at Beltsville and became a part of the National Program staff" (Creech, pers. comm., 2007). Currently, the functions

of the BPISAE's plant exploration program have been subsumed within the National Plant Germplasm System (NPGS). The organization and funding of USDA-sponsored germplasm trips is now handled by the Plant Exchange Office under the National Plant Germplasm Resources Lab in Beltsville, Maryland.

Sturdy pests, fragile plants and human dangers factored into the tenuousness of early BPI plant introduction successes, which at any rate could only be determined over successive plant generations, but they were successful. In fact, pleas for such exploration and germplasm collection seem to be increasingly urgent. James S. Miller, dean and vice president for science at New York Botanical Garden, wrote in 2006 that

> Another renaissance of plant exploration is desperately needed to comprehensively inventory the plant species in these tropical forests that will be degraded or disappear in the next few decades. While protection of wild populations is clearly the ideal solution for protecting biological diversity, it is also abundantly evident that at current rates of habitat loss, botanical gardens must play a key role in protecting threatened plant species (Miller 2006, p. 6).

Immersed in the projects of the New York Botanical Garden, Miller sees his line of work as a potential force for preservation, one that should be a core of our agricultural future, and certainly he is right.

However, there may need to be more than one answer. Adi B. Damania, recently of the Genetic Resources Conservation Program at the University of California at Davis, also writes forcefully of the need for plant exploration and conservation. He finds the situation dire:

> The disappearance of old varieties, the landraces of crop plants, and their wild progenitors could eventually be recognized as the great sleeper issue in the last decades of the 20th century. It is difficult for us to visualize a scenario more profound in its implications, yet less appreciated by funding institutions, governments, and the general public, than that entailed in the mass elimination of a large number of plant species that has taken place and continues to take place in the centers of their diversity (Damania 2008, p. S-27).

Damania calls for collecting diversity within geographic areas as well as across different geographies. Damania warns that crop domestication has increased loss of plants' natural dispersal mechanisms, while humans' plant selections have increasingly meant plants with rapid germination, larger seeds, simultaneous ripening, loss of mechanical means of protection (such as thorns), and loss of bitter or toxic qualities. Damania warns that "Once this landrace diversity is replaced by modern crop varieties of any kind, their natural gene pool is gone forever" (Damania 2008, p. S-28). He tells of inbred, introduced, high-yield varieties pushing out wild wheat and rice in Mexico and the Philippines in the 1960s and 1970s. He also tells of more recent losses of Italian wheat and South African sorghum crops; fortunately, though, "as a result of germplasm collection missions by the Food and Agriculture Organization of the United Nations and later by the national germplasm conservation programs such as the USDA, most of this material is now conserved in gene banks and available to breeders for crop improvement programs" (Damania 2008, p. S-28). He points out that plant collection is "an urgent problem especially in cases where the plant population may not be there if the collector returns" (Damania 2008, p. S-32). For example, in 1991 he retraced the route that geneticist Nikolai I. Vavilov (1887–1943) took through Syria in 1926 and could not find the villages Vavilov named nor even people who could recognize the photos taken on his journey. Damania explains the two basic methods of plant genetic conservation:

> in situ (or on site) in nature without any human major disturbances, and ex situ (off site) in gene banks at subzero temperatures and low seed moisture content. … However, some biologists are of the opinion that further evolution of the germplasm ceases once it is preserved in gene banks. To counter this, in situ methods have been proposed where evolutionary processes continue to operate in nature, allowing the germplasm to adapt itself to the changing environment (Damania 2008, p. S-32).

Damania notes that in situ measures are gaining acceptance as they conserve both germplasm and habitat. He proposes that plant exploration and germplasm collection "have a dual role of (i) making available for utilization the greatest possible amount of genetic variability in cultivated and wild crop species, and (ii) showing us the range of variability that a species is capable of and its ecological as well as geographical range of distribution" (Damania 2008, p. S-34).

Though the BPISAE ceased to exist formally as a department in 1953, the benefits gleaned from early agricultural explorers and the plants they sent home continue to grow as Damania suggests. The mission of the Plant Exchange Office is preserving the genetic diversity of economic plants by "developing methods to prioritize US germplasm needs, procuring plant germplasm through international and domestic exchanges, arranging for and participating in international and domestic plant explorations, and developing in situ maintenance programs for crop plants and their wild relatives" (USDA, ARS 2008). Current introduction programs operate largely through international agreements of exchange in addition to sending teams out collecting.[11] The USDA with its early recognition of the need for conservation and its enduring record of plant introduction successes has a history of responding to the urgency voiced in agricultural and scientific communities.

Acknowledgments

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Notes

1. Directives from England shaped agricultural exploration and introduction during the colonial period. However, this government support was lost when the American colonies declared independence in 1776. The need to replace colonial-era plant introduction programs was recognized and stressed in America throughout the late 18th and early to mid-19th centuries (for more see True 1937, pp. 18–22, 34–40; Ryerson 1933, pp. 110–113). Thomas Jefferson even collected seeds during his travels in Italy in 1787 (Baker 1963, p. 4).
2. Ball noted that the development of public schools eased a rift in educational levels and farmers' prejudices against "book learning" around this time (ca.1936, p. 5). R. W. Howard also made a convincing argument for the force of urbanization in favor of formulating a national department of agriculture: "Every president up to and including Lincoln had an agricultural background and personal familiarity with farm problems. A preponderance of congressmen, senators, governors, and state legislators were farm-born; most of them operated farms during the years they were in office. The Civil War marked a turning point. The census of 1870 showed that only 47.4 percent of all Americans gainfully employed were engaged in agriculture. For the first time in history the farmer was in the minority in the nation he had built up. … The sons of tradesmen and industrialists showed up in public office. The United States Senate became a sort of House of Lords for 'industrial barons' rather than the ruddy, swaggering club of wealthy farmers and plantation owners that it had been. And now the industrial forces turned to government for stabilization of the

distributive system they had set up between farm and city. Rural movements, such as the Grange and Populism, turned to the same source for protection and advice. The evolution of a Federal department for farming was inevitable" (Howard 1945, p. 160).

3. See True (1937, pp. 130–164) for intricate details about the experiment stations, their organization and relation to the federal government, their equipment and their lines of experimentation.
4. The USDA Plant Inventory database is a perfect example of the modern level of organization and of the ways that such organized information is made available to an ever broader public audience.
5. Baker's detailed history of the USDA corroborates Hambridge's claim: "The stock market closed firm on March 5 [1925]. The American Locomotive Co. reached a new high on the New York Stock Exchange. Yet the same page of the Washington, D.C., newspaper which carried the stock market story carried a headline, 'General Setback in Wheat Market,' and a subhead that prices took a 'sharp tumble.' Cotton was also down. Symbolically, weather was sunny for business but cloudy for the farmer" (Baker 1963, p. 125).
6. "Under the Agricultural Adjustment Act [of 1933] millions of farmers entered into contracts to reduce acreage in specified surplus crops in return for benefit payments, financed chiefly by processing taxes. In January 1936 the program was halted by the Supreme Court, declaring that the power to regulate and control production resided in the States, not Congress. Late in 1937 the need for acreage control again became apparent and resulted in the enactment of the Agricultural Adjustment act of 1938" (Hambridge 1940, p. 23).
7. The National School Lunch Act, establishing the school lunch program on a continuing basis, was approved in June 1946. Food stamps were re-introduced by President John F. Kennedy in 1960 when agricultural surpluses again mounted.
8. Botany professors filled other academic posts left vacant by men enlisting; they also received regular outside requests for lists of students to be considered for graduate study, for placement as teachers, even for employment in the rapidly growing canning industry (see the Friesner Collection no. 135, boxes 1 and 2, in the Hunt Institute Archives). Much of Ray Clarence Friesner's correspondence is on the backs of other documents, such as memoranda, student papers or departmental forms, in order to cut costs. Print communications and plant collecting were subject to global restrictions, too. Elizabeth Ann Bartholomew (1912–1985), then a herbarium clerk from West Virginia, wrote Friesner in June 1941 that "Due to the fact that our printer has been obliged to do a considerable amount of printing for the Government, our April issue of *Castanea* has been delayed. We hope to get it out by July" (Bartholomew 1941). Friesner wrote to longtime correspondent Charles M. Ek (b. 1873) on 22 February 1942, "The situation still looks bad for the coming season. My retreaded tires have not been delivered and cannot be under the present set-up. I hope there will be a possibility of getting some by the time my others are gone but there is no promise that I can. I guess we will just have to make the best of the situation" (Friesner 1942). He wrote something similar to Delzie Demaree the following month. Lewis S. Rose (1893–1973) of the California Academy of Sciences wrote to Friesner in 1941: "I shall continue to put other specimens aside for you, as I collect them, but do not expect to be in the field very much this coming year, as there are more important things ahead. Hope it will be a short war, so that we can get down to botanizing again;" and again in April 1942 "On account of the war conditions I do not expect to be able to make very extensive collections until victory is here" (Rose 1941–1942).
9. C. F. Swingle worked for the BPI on vegetable propagation and fruit tree understocks from 1922 to 1935. In that capacity he went to Madagascar in 1927 to collect *Euphorbia intisy* as a possible rubber source. In a March 1939 memorandum to his half-brother, Walter T. Swingle (1871–1952), working on rubber alternatives at the BPI, C. F. Swingle noted "remarkable developments during the past few years on the use of synthetic growth substances" and wrote that "it would seem desirable to run preliminary experiments with various concentrations of the root promoting substances" (Swingle 1939).
10. Walter Hodge's letter of employment from the Board of Economic Warfare: Office of Imports delineates: "As an employee of the Government your decorum must always be equal to your responsibility and your actions, both official and personal, must be above reproach" (Board of Economic Warfare 1943), suggesting that the government felt a need for a high level of personal credibility as they sent emissaries into foreign jungles during a period of world turmoil.
11. See Kaplan for the USDA's response when "donor countries feel they have not received a fair share of the benefits derived from the plant resources originating in their countries" (1998, p. 5). See

also Shakespear for botanists' commentaries on the new politics of collecting, how the international atmosphere has changed since the 1992 Convention on Biological Diversity in Rio de Janeiro, and the urgency of this fieldwork (2008, pp. 8–9, 10).

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