

George Washington Carver National Monument
National Park Service
United States Department of the Interior



George Washington Carver: For His Time and Ours

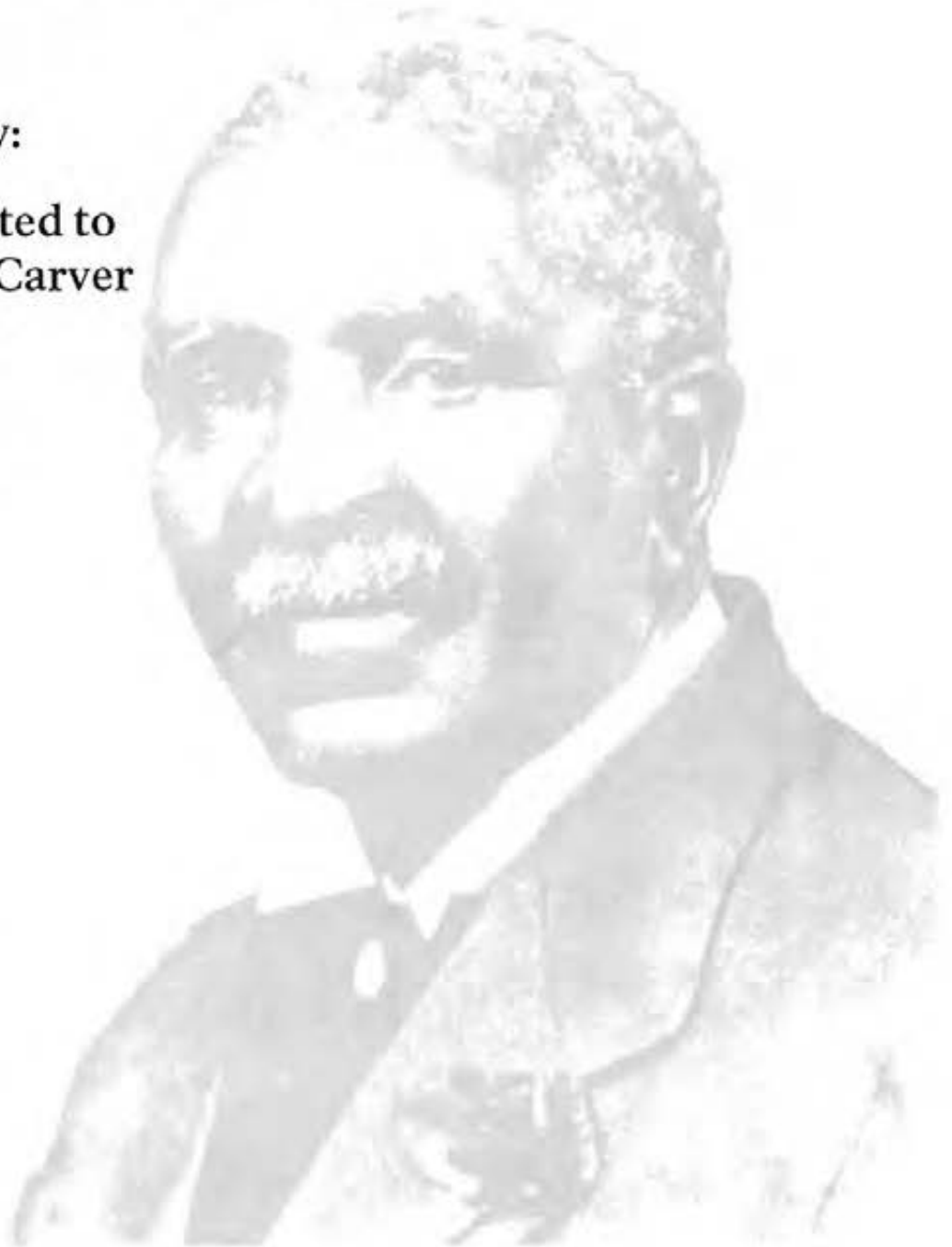
Special History Study:

Natural History Related to
George Washington Carver
National Monument

Diamond, Missouri

Peter Duncan Burchard,
Principal Investigator

2005



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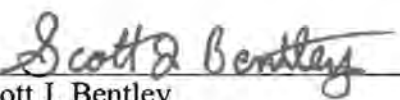
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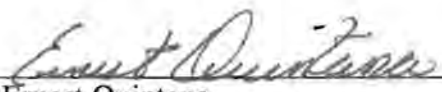
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Contents

	Title	Page
	Introduction	i
Part One	The Scientific Research of George Washington Carver	
1.	Carver's Scientific Research at Tuskegee	6
2.	Land Use Practices	16
3.	Research With Plant Disease and Mycology	43
4.	Carver's Work With Wild Plants As Food and Medicine	64
5.	Chemurgy	78
Part Two	The Effects of Carver's Scientific Research	
6.	The Effects of Carver's Scientific Research On Generations That Succeeded Him – Overview	99
7.	Land Use Practices Since Carver's Time and How His Suggestions Might Help Us Now	134
8.	Plant Disease and Mycology – Effects of Carver's Work	145
9.	Carver's Herbal Medicine and Dietary Suggestions – Present-Day Applications	148
10.	Chemurgy Today	177
11.	Conclusion	187
	Appendix A – An Attempt to Measure Carver's Effect	
	Appendix B – Tuskegee's Work With Sweet Potatoes for NASA	
	Appendix C – How Nature Works on a Farm With Cover Crops and Humans	
	Bibliography	

List of Figures

Figures for each chapter appear on a page or pages following the chapter.

Figure #	Figure Title and Credit
I-1	Richard Pilant George Washington Carver National Monument
I-2	Richard Pilant Presenting Pen to Agriculture Secretary Douglas MacKay, Carver Monument Dedication, 14 July 1953. George Washington Carver National Monument
1-1	Carver With His Young Men's Bible Class Tuskegee Institute Archives
2-1	Carver Holding a Clump of Soil, 1902. Library of Congress
2-2	Badly Washed Soils, Tuskegee Cardozo (See Bibliography)
2-3	Depths of Plowing GWC, <i>How To Make Cotton Growing Pay</i> , Bulletin no. 14, Tuskegee Institute, 1908.
2-4	Justus von Liebig Forest Ray Moulton, ed. <i>Liebig and After Liebig: A Century of Progress in Agricultural Chemistry</i> . Washington: American Association for the Advancement of Science, 1942.
2-5	Sweet Potato Diagram by Carver GWC, <i>Saving the Sweet Potato Crop</i> , Bulletin no. 10, Tuskegee Institute, 1906.
2-6	Booker T. Washington in his Garden Tuskegee Institute Archives
2-7	Nodules on Roots of Legume, By Carver GWC, <i>Some Possibilities of the Cowpea in Macon County, AL</i> , Bull. no. 19, T. I., 1910.
2-8	Working the Experiment Station, Tuskegee GWC, <i>Cotton Growing on Sandy Upland Soils</i> , Bulletin no. 7, Tuskegee Institute, 1905.
2-9	Carver Inspecting the Experiment Station, Tuskegee

- Tuskegee Institute Archives
- 2-10 Cotton Stalks Plowed Under
California (See Bibliography)
- 2-11 Carver's Improved Cotton
GWC, *Cotton Growing for Rural Schools*, Bulletin no. 36, Tuskegee Institute, 1911.
- 2-12 Depths of Plowing – Effect on Cotton Growth
GWC, *How to Make Cotton Growing Pay*, Bulletin no. 14, Tuskegee Institute, 1908
- 3-1 Carver Specimen for Iowa State – Fungus
Iowa State University
- 3-2 Carver Specimen for Iowa State – Hepatica
Iowa State University – Courtesy Deborah Lewis
- 3-3 Carver Specimen for Iowa State – Ambrosia
Iowa State University – Courtesy Deborah Lewis
- 3-4 Professor Louis Pammel, 1894
Iowa State University
- 3-5 Professor Louis Pammel in the Field
Iowa State University
- 3-6 Carver With His Field Specimen Case, 1937
J. Edward Rice
- 3-7 Carver in the Field Inspecting Leaves, Long Island Expressway, 1939.
Tuskegee Institute Archives
- 3-8 Carver at Rockefeller Center, New York, Inspecting a Tree With the Center's horticulturist, 1939.
Tuskegee Institute Archives
- 3-9 Carver Working With Sticks, Probably for Fungus Specimens
Tuskegee Institute Archives
- 3-10 Carver With Microscope, With Twigs for Inspection
Tuskegee Institute Archives
- 3-11 Carver Looking Into Microscope
Tuskegee Institute Archives
- 3-12 Job Bicknell Ellis
New York Botanical Garden, www.nybg.org/bsci/JobEllis.jpg
- 3-13 Franklin Summer Earle
New York Botanical Garden, www.nybg.org/bsci/EarEarle022.htm
- 4-1 Carver's Drawing of Dandelion (*Taraxacum officinale*)
3-1 through 3-9 are GWC, *Nature's Garden for Victory and Peace*, Bulletin # 11, 1947
- 4-2 Carver's Drawing of Curly Dock (*Rumex crispus*)
- 4-3 Carver's Drawing of Pepper Grass (*Lepidium apetalum*)
- 4-4 Carver's Drawing of Evening primrose (*Oenothera biennis*)

- 4-5 Carver's Drawing of Amaranth (*Amaranthus spinosus*)
- 4-6 Carver's Drawing of Lamb's Quarter (*Chenopodium album*)
- 4-7 Carver's Drawing of Oxalis (*Oxalis corniculata*)
- 4-8 Carver's Drawing of Pokeweed (*Phytolaca decandra*)
- 4-9 Carver's Drawing of Prickly Lettuce (*Lactuca scariola*)
- 5-1 Charles Kettering
Flint Public Library Collection,
http://www.flint.lib.mi.us/timeline/autohistory_0798/ketteringC.html
- 5-2 William Hale
Borth (See Bibliography)
- 5-3 Francis Patrick Garvan
Borth (See Bibliography)
- 5-4 Agrol Station
Schoffelmayer, Victor. *Here Comes Tomorrow*. Evanston, IL: Row, Peterson and Co., 1942.
- 5-5 Carver with Henry Ford
Tuskegee Institute Archives
- 6-1 Henry A. Wallace
Cannot at present recall where I have this from; may have to remove.
- 6-2 Carver with Henry Wallace at Tuskegee
Tuskegee Institute Archives
- 6-3 Carver Pictured as a Magician
Tuskegee Institute Archives
- 6-4 Carver with Jim Hardwick on Tour, 1933
Joyner Library, East Carolina University, Greenville, NC
- 8-1 George Washington Carver Seal at Carver Center
USDA, www.usda.gov/da/telework.htm
- 9-1 Carver with a Head of Cabbage for Study
Tuskegee Institute Archives
- 9-2 Sylvester Graham
Carson, Gerald. *Cornflake Crusade*. New York: Rinehart & Co., 1957.
- 9-3 Elmer Holmes Bobst
Bobst (See Bibliography)
- 9-4 John Harvey Kellogg
Library of Congress
- A-1-6 Glenn Anderson's Farm
Otis Wollan, "Glenn's Organic Almonds: Nuts to the Experts," *Organic Food Matters*, Fall/Winter 1989.

INTRODUCTION

The circumstances surrounding the establishment of the George Washington Carver National Monument testify to the unusual and quietly powerful nature of the man at honors. When the Monument was established in 1943, the United States was in the midst of the Second World War. The U. S. Congress had to justify any expense that was not directly war-related. Citizens were making voluntary sacrifices for the war, and they would not look favorably on any project that seemed unnecessary. It was extraordinary that the Congress established a birthplace Monument for *anyone* while the war raged; it was astounding that they did it for an African-American. This had not been done before.

The idea for the Monument had not sprung up overnight. One very persistent man, Richard Pilant (d. 1971), had been pushing the idea for a couple of years. Pilant had been born in Granby, Missouri, six miles southeast of Carver's birthplace in Diamond, in 1907. He was distantly related to Moses and Susan Carver, the couple who had owned George's mother and raised George after he lost her, from infancy to age eleven.¹ Pilant had a doctorate in political science² and worked at Washington University in St. Louis.³ In June of 1941, he visited Carver to speak with him of his campaign on behalf of the

¹ Of this Pilant wrote: "My family in Southwest Missouri is a distant kin to the white folks who owned Carver and his mother as slaves and who later brought up the boy Carver in the fower home after his father was killed in an accident and his mother was kidnapped during the Civil War Days." No more information is available of the specific blood relationships. From Pilant, Richard, *George Washington Carver: The Poor People's Scientist*, Park Leesport, Missouri: School of the Ozarks, 1971, foreword, 1st and 2nd pages (unnumbered).

² Pilant, 1st page (unnumbered).

³ George Washington Carver (hereafter cited as GWC) in Irving Dilant, editor, *St. Louis Post Dispatch*, 20 March 1917, Tusseyre Institute Archives (hereafter cited as TIA), 40, 628. Carver here says, "Dr. Richard Pilant of Washington University." Pilant is not in the University's records as having been a student or a tenured professor. It is probable that he taught one or two courses there on contract. Washington University archives, phone interview with author, 23 February 2004.

purchase of the birthplace by the Federal Government as a memorial.⁴ At that time, he was working on the campaign, as he recalled in a pamphlet which he self-published in 1971, “principally in the South, feeling that the rest of the nation would endorse anyway, but that if the North endorsed first the South might hesitate.”

When the United States declared war in December of 1941, the wily Pilant took a new angle on the promotion of the Monument. He wrote that “it became of necessity a war measure designed to show our allies against the Herrenvolk that this was a land of opportunity for all races.”⁵ Pilant visited Carver again, according to a letter of Carver’s dated 20 March 1942, “around the first of the year.” Carver wrote that this visit was in connection with a marker for the birthplace, a far more modest proposal, but he may have been mistaken, as it is unlikely that Pilant had backed off his original plan.⁶

Pilant’s campaign was extraordinary, in that, as he said, “There were no fund drives; no full page ads; no hoopla on the radio or in the newspapers... We did not even have official stationery or headquarters office.”⁷ Though he here uses the plural pronoun “we,” his help was minimal. Without his energies, the Monument would not exist. The tireless and selfless worker in the promotion of Carver’s legacy collected endorsements for the creation of the Monument from Florida educator Mary McLeod Bethune, then director of the Office of Negro Affairs in the National Youth Administration, theoretical physicist Dr. Albert Einstein, the Honorable Hugo L. Black of Alabama, Justice of the Supreme Court, painter Thomas Hart Benton, authors Ernest Hemingway and Pearl S. Buck, and many other notables from a broad variety of fields.

On January 5, 1943, Carver died. On February 5, Senator Harry Truman of Missouri made the case for the establishment of the Monument before a joint session of the Senate Committee on Public Lands and Surveys and the House Public Lands Committee. Pilant recollected, “Those who had not wished to support the bill could always excuse themselves by saying the President himself had issued an order banning such

⁴ Carver to Dr. W. F. Clark, Opelika, Alabama, 22 June 1941. TIA, 41, 884.

⁵ Pilant, 30.

⁶ Carver to Irving Dillard, editor, *St. Louis Post Dispatch*, 20 March 1942, TIA, 40, 658.

⁷ Pilant, 32.

expenditures for the duration of the war, and no expenditure was authorized [E] after the war."⁵

During the hearing, John P. Davis, representing Ira Lewis of the *Pittsburgh Courier*, a black paper, offered the Congressmen another political angle on the proposal before them, saying, "This bill is not simply a momentary pause on the part of busy men engaged in the conduct of the war, to do honor to one of the truly great Americans of this country, but it is in essence a blow against the Axis, it is in essence a war measure in the sense that it will further unleash and release the energies of roughly 15,000,000 Negro people in this country for full support of our war effort."⁶

Both houses of Congress approved the Monument bill, without a dissenting vote, despite the fact that the House of Representatives and Senate were controlled by different parties. President Franklin D. Roosevelt signed the bill into law on July 15, 1943.

The Monument was intended to commemorate and interpret the life and contributions of George Washington Carver, who was born and spent his formative years in Diamond, Missouri. William Jackson, Superintendent of the Monument from 1993 to 2003, speaking in 2000 at an event dedicating a new U. S. Department of Agriculture headquarters in Beltsville, Maryland which was named for Carver, pointed out that the Birthplace Monument in Missouri "represents many firsts. [It was] the first National Park established... to memorialize the life and scientific contributions [of] a man in agricultural science; the first to an African-American; the first to a man other than a president; and the first in world history to inter-racial understanding and peace."⁷

Pfann had accurately predicted to Carver during their first meeting that the establishment of the Monument would open doors for others of his people. He recalled of this visit: "One of the very first steps in working for the Carver Monument Bill was to make sure

⁵ Pfann, 3, 152.

⁶ *Id.*, 102; *Washington Carver National Monument: Missouri Joint Hearing Before the Committee on Public Land and Surveys, U. S. Senate, and the Committee on the Public Lands, House of Representatives*, S. 37, S. 312, and H. R. 607, 78th Cong., 1st Sess.; *Congressional Record* (Feb. 5 1943), 11A, 61, 515.

he did not kill it in his characteristic modesty by saying he did not want such an honor, . . . as he might well have done. First I wrote him. No answer. Then I telegraphed him. No answer. Then I went to see him at Tuskegee. I found him one morning on one of his early walks. After I explained to him that much as he deserved the honor that even much more was at stake; that he would be the foot in the door for every other black man who deserved recognition. With the idea that this honor for him might be opening doors for every other deserving black man he went along. In fact, with his usual clairvoyance he told me the movement would succeed.¹

Pilant's words to Carver were borne out by events. He wrote: "[t]he passage of the Carver Monument Bill showed that it was politically safe for Congress to honor Negroes. It was quickly followed by the issuance of a Carver Stamp, Carver and Booker T. Washington commemorative coins, naming of a naval vessel, and establishment of the Booker T. Washington National Monument."²

After the war ended, a number of factors – inflation increasing the price of the land, the National Park Service wanting more acreage, unwillingness of the owner to sell, electric lines over the farm, change of ownership – stalled the dedication until July 1953. Interior Secretary Douglas McKay came in person to dedicate it. (Fig. 1-2)

Carver's prophecy that Pilant's efforts would be crowned with success may have come from his perception that Pilant saw the whole picture of who he was and his significance. As Pilant says in his book, *George Washington Carver: The Poor People's Scientist*: "Most biographers seem to treat Carver simply as the successor to Booker T. Washington as a great Negro educator in the American South in a bygone era. But it is my purpose to suggest the universal aspects of his work not only for all people of his race everywhere, but also for all people of all races, both now and in times to come, especially in the developing countries."³ The year after the Monument was dedicated, Pilant circled the globe, stopping in Hawaii, Japan, Hong Kong, Manila, Singapore, Rangoon, Calcutta,

¹ Jackson, William, "Opening Statement, George Washington Carver National Monument," Symposium on the Life and Times of Dr. George Washington Carver, Jefferson Auditorium, U. S. Department of Agriculture, Washington, DC, October 7, 1909.

² Pilant, 46.

³ Pilant, 45.

New Delhi, Karachi, Baghdad, Beirut, Jerusalem, Cairo, Athens, Istanbul and Western Europe, to speak on Carver. He found, as he had thought he would, that Carver had universal appeal among the world's peoples.

The intent of this Study is to increase the National Park Service's and public's knowledge and understanding of several natural, cultural, and scientific elements of George Washington Carver's life work including its historical significance and integrity. It is divided into two sections: 1) Carver's scientific research and its applications during his lifetime; and 2) The impact and implications of his work since his death in 1943. It will attempt to give readers some concrete understanding of what made this extraordinary man so universally loved and admired.



I-1. Richard Pilant



I-2. Richard Pilant presenting pen to Agriculture Secretary Douglas McKay, Carver Monument Dedication, July 14, 1953

Carver's Scientific Research at Tuskegee

The Broad Scope of Carver's Scientific Work

The scope of this study reflects the multiplicity of George Washington Carver's activities throughout his life, at any period of his life, even on a single given day. Carver wrote to a friend in January of 1924, "You ask me now what I am doing? Well, it is hard to say. I have so many things going on." As a scientist, Carver was a generalist, not a specialist, so the "many things" he mentions were often very diverse. Thus this Study on his scientific research covers such broad-ranging topics as his land use practices, his research with plant disease and bacteriology, his work with medicinal herbs, dietary suggestions, and his promotion of the use of agricultural products in industry, known during the 1930s and 1940s as "chemurgy."

His generalism by no means indicated a scattered focus. Carver spoke of his capacity for focus when Professor Louis Pamme¹ of Iowa State, his former teacher, was visiting his laboratory at Tuskegee in 1921. Carver was reciting a story to his former professor when someone else called his attention to something in another part of the lab. Carver immediately said, "One thing at a time. Now Professor Pamme¹ knows as a student in botany at Ames. I had my mind trained to see one thing at a time. When I was looking for a *Cercospora* I found them everywhere in plants, hundreds of them. It is surprising, if you have the training, what you can find on an object, so in this work of mine I have my

¹ Lucy Cherry Crisp Papers, East Carolina Manuscript Collection, J. Y. Joyner Library, East Carolina University, Greenville, NC (hereafter cited as ECU Papers), 184, 66, 18, 27-28. Crisp, in a draft of her manuscript for her biography of Carver, provides this quote as addressed only to one of Carver's "Blue Ridge Boys," and the date as 28 January 1921, but does not specify the addressee.

mind fixed on one object and find it. I have the others in mind, but I do not look for them until I am ready."²

The establishment of an Agricultural Experiment Station at Tuskegee by the Alabama State Legislature through a bill passed on February 15, 1897, immediately insured that Carver's responsibilities would cover a broad spectrum. The station was the first of its kind at a Black institution. Carver's work as its Director consisted of conducting agricultural experiments on a ten-acre plot, laboratory analysis, producing bulletins, and activities in cooperation with other stations.³ Though the allotment for the Station was a meager \$1,500 annually,⁴ and though Carver was, as he complained to Booker Washington in 1898, "working with the smallest and most inexperienced staff of any station in the U. S."⁵ his focus, his encyclopedic knowledge, his genius for doing much on small funds, and his steady work from 4 a.m. to about 9 p.m. every day enabled him to make up for much of the deficit and run a highly productive Station.

While Carver always had many things going on simultaneously, different periods of his life did show different emphases. Speaking very broadly, the major divisions (arguably) sort out this way:

1896-1910: Carver's interests were the most exclusively **agricultural** between the time of his arrival at Tuskegee and the time of his change from the school's Director of Agriculture to the Director of the Department of Research in December of 1910. In 1904 he wrote: "The experiment station... is devoted to all kinds of experiments with a view to increasing the quantity and quality of our farm crops, by fertilizer experiments, test of varieties, cross-breeding of plants, the testing of new varieties etc. This plot contains 300 mulberry trees with which to feed silk worms."⁶ The silk worm project he mentions was supported by the USDA. Another USDA-supported activity was Carver's work as a weather observer, starting in 1899 when the government donated the rain gauge and

² "Covered Nurms Doing Great Work," *Tuskegee Daily Tribune*, June 17, 1927, T1A, 69, 263; GWC to Business Committee, 14 December 1928, T1A, 9, 117.

³ *Ibid.*, 55.

⁴ GWC to Booker T. Washington (hereafter cited as BTW), 30 May 1898, T1A, 1, 833-34.

⁵ GWC to BTW, 1905 or 1903?, T1A, 2, 1798.

maximum and minimum thermometer he needed. During this period, Carver gave much of his time to the problems of farmers, including many visits to their homes.

1910-1915: Between 1910 and Booker T. Washington's death in 1915, Carver was most exclusively focused on **laboratory analyses**. His activities in 1910, for example, included analyzing soils for their fertility; water, milk, canned sweet potatoes and feed grain for their purity; twigs, fruits, young trees and seeds for diseases and infestations; clay and rocks for potential uses; beef blood for possible chicken feed; and identifying insects which posed problems for farmers.⁵

1915-1923: This period, between the time of Washington's death and the YMCA conference in Blue Ridge, North Carolina in 1923 where he met his "Blue Ridge Boys," was that of Carver's ascent to fame. Due to the attention his **peanut work** was getting, he put much focus on finding numerous products from them and from sweet potatoes, pecans, and other farm crops.

1923-1933: The Blue Ridge Conference led to an increase in Carver's touring schedule due to his adding trips to all white Southern colleges to his activities. This "**interracial work**" is not in the scope of this study. Carver gave up the Experiment Station plot work in 1925,⁶ but continued with the other Station activities.

1933-1935: This period began with the bursting into the national press of news of Carver's remarkably successful use of **peanut oil massage** in treating patients afflicted with infantile paralysis. The news brought so much attention to Carver, including so many visits from the afflicted, that he put much lab time into working out properties of various oils and combinations.

1935-1937: In August of 1935, as the peanut massage work was beginning to wane a little, Carver was appointed a collaborator with the USDA Disease Survey. This led to an emphasis, or re-emphasis, on work in **mycology**. He had developed his expertise in this field at Iowa State and kept sharp at it in ways that are outlined in Chapter 3.

⁵ CWC to B.T.W., 10 October, 1899, 71A, 11, 986.

⁶ CWC Papers, various locations, 71A, 5, 600-269.

⁷ See note 3 above.

It would be well to point out here that all these roughly outlined phases of Carver's life were continually overlapping. For example, he reported in 1936 to Tuskegee's President Patterson that, in connection with the Experiment Station, "1800 samples of soils, fertilizers, and miscellaneous supplies have been tested out for farmers, manufacturers, and business men."¹⁰

1937-1943: This period begins with the year Carver was invited to two **chemurgy** conferences, one in Dearborn, Michigan in May and the other in Wilson Dam, Alabama in June. Later in this same year, Carver's health became very shaky and it remained delicate from then on until his death January 5, 1943. During this period he joined the chemurgy movement with articles on alcohol for motor fuel and other uses of farm products in industrial processes. His lab work diminished with his health, but Carver's experience and knowledge by this time were so vast that he was able to draw from them while he continued building them, just more slowly than before.

The Motive Behind Carver's Work

Possibly the factor that gave Carver the capacity to range so broadly in his work without becoming scattered was that his life had a single unifying theme—his motive of humanitarian service. He referred to this often. In late 1917, after Carver had given reporter Littell McClung of the *Montgomery Advertiser* a thorough tour of his lab, his visitor asked him: "What really is the motive behind this continuous, never-tiring work?" He answered, "Well, some day I will have to leave this world. And when that day comes, I want to feel that I have an excuse for having lived in it. I want to feel that my life has been of some service to my fellow man."¹¹ In a talk at Tuskegee in 1934, where he was giving an entertaining account of the origin of his famous peanut work in the form of a conversation with "Mr. Creator," he said: "'Mr. Creator, I have a humanitarian idea in my head.' He answers, 'That is a fine idea to get in anybody's head, because anything you do if it does not have a humanitarian aspect to it is not worth very much.'"¹²

¹⁰ GWC to Frederick Patterson, 5 August 1936, TIA, 19, 515.

¹¹ Littell McClung, "A Glimpse of the Remarkable Work of George Washington Carver, the Negro Scientist," *Montgomery Advertiser*, November 25, 1917, TIA, 60, 128 & 62, 876.

¹² GWC, "An Evening With the Creative Mind," *Tuskegee Messenger*, May, 1934, TIA 46, 830.

Carver's pursuit of his motive of service was remarkable in that it appeared to be sustained nonstop throughout his adult life without ever being subject to disillusionment or burnout. Considering the reason for this gives rise to the question: What was the driving force, or at least the principle, behind his humanitarian work that gave him such constancy?

Carver himself had no doubt that the source of his motivation was spiritual. Soon after the *New York Times* printed its famous criticism of Carver titled "Men of Science Never Talk That Way," Carver told the writer for a magazine in Brooklyn, New York: "I know that my Redeemer liveth. I know the source from whence my help comes. Inspiration, as I used the word in my New York lecture, means simply God speaking to man through the things He has created, permitting him to interpret correctly the purposes the Creator had in permitting them to come into existence. I am not interested in any science that leaves God out; in fact, I am not interested in anything that leaves out God."¹⁰ Carver's student John Sutton, who did some "unofficial" postgraduate chemistry work (his phrase) under Carver in 1917 and 1918, said that Carver "assured visiting prince and peasant alike that his discoveries were not his personal efforts because he was merely the creative instrument utilized by the Supreme Creator in an Infinite Plan."¹¹

Any deeper exposition of this theme of Carver's life will necessarily read as much like a theological treatise as a scholarly study. It is advisable that we include this, though, in light of his belief in the inseparability of real science and real religion. Let's look a little more deeply at Carver's spiritual beliefs.

In Alvin Smith's *George Washington Carver: Man of God*, from a chapter titled "Where Is Thy Creator?" Smith quotes Carver telling his Young Men's Bible Class (p. 117): "If we are to contact our Creator, we must know where He is — where to find Him. He is within you, me and everyone. He is everywhere at any time; we don't have to go away from where we are now seated to find Him. He is at the seat of our very being — in our

¹⁰ Charles Henry East, "An Unscientific 'I' Scientist," *The Golden Age*, 1924 or 1925 [JLA 62], 959.

¹¹ John Sutton, San Antonio, TX, to John W. Hutchens, *Lassenger*, 3, June 1975 [JLA 67 (3)], 690. Sutton is best known as the person Carver recommended to go to Russia when the Russian government asked him if he and some Black chemists would relocate there to help them with their farming problems.

hearts. He is in us and we are in Him. The Bible says, "In Him we move and have our being." Our hearts within beat at His command."¹⁵

For Carver it was axiomatic that the Creator's message to us is that we are to serve humanity and the world. This assumption is evident in this teaching from the Bible Class, recorded by Smith: "Our Creator, being Spirit, is Principle—Law—and by keeping His Laws, we get from Him good, for He is good. The things we go to the Creator for must be good things; He has nothing else to give us and through us for the benefit of all mankind—regardless of race—except good. Persons who attempt to contact Him with a selfish and mean motive in mind are defeated before they start and are driven from the Temple to failure."

In Smith's chapter called "How To Contact Thy Creator," he transmits Carver's answer to the question posed by the chapter title and his examples of the "good things" he mentioned in the above quote. Smith begins with Carver citing one of Jesus's sayings in the Sermon on the Mount:

The promise is that he who prayeth in secret is awarded openly... Pray in silence. Ask Him for guidance. Keep your thoughts pure. Forget yourself. Know that you are an instrument through which your Creator wishes to pour out some blessing for others. Be not overanxious. Keep your mind on Him after you have come out of your secret contact prayer, while alone. See the good in all things. See the good in your classmates, in your instructors, in your parents, in both colored and white people. The moment you fail to see the good in any situation which is seeming you bad—that moment you are out of contact. If, in any situation you find yourself, your mind strays from the fact that He—the Good—is in all things, wrestle with yourself and get back on the track. It behooves us to stay in contact with Him, because we know not the minute, hour, day or year when He is ready to reveal to us a wonder of His universe.

Having good wishes for others; doing good deeds for others; listening to good singing and instrumental music; studying to master some trade; saying words of

¹⁵Wain D. Smith *Message Washington Course, Manual of It* New York, Exposition Press, 1954: 20

cheer, and above all, doing to others as you wish to be done by—all are a part of how you contact and keep in tune with thy Creator.¹⁶

Thus Carver made it clear that he contacted God through action in the outer world as well as internally through prayer. Carver's testimony throughout his life made it clear that his main means of staying in contact with God was through natural objects. Smith provides us with more of his teaching on this in Carver's answer to this question from someone in the Bible Class: 'Since God, our Creator, is Spirit, we shall never be able to see Him, will we?' Smith writes: "Dr. Carver placed his hand on the beautiful flower he was wearing on his coal lapel and said, 'When you look at this flower, you see thy Creator. Students at Tuskegee who are studying to be electricians are not able to see electricity, but when they make the proper contact—fulfill the laws of their trade—a bulb lights the way, not only for them, but for all of us.' Professor Carver pointed to the one asking the question and smilingly said, 'As I look at you, I see our Creator just itching for you to contact Him.' This last sentiment, addressed to one of us, brought chuckles from the others. That is exactly what he wanted—the class to end in a happy mood."¹⁷

Carver's humanitarian work thus rested on his unshakeable certainty that he was the agent of an indwelling God who taught that service is the highest goal. In a conversation in his office during a showing of his lifetime production of artwork at Tuskegee in November of 1941, he spoke to one of the visitors of how this conviction unified his life. The visitor's name is not mentioned. It may have been the author of the article in which the conversation appeared, Bess Walcott. She wrote:

While the constant stream of visitors studied and admired the exhibit, the aged artist sat in his office on the other side of the glass door. A pile of mail was in front of him; letters and telegrams from friends congratulating him on the opening of the Art Gallery. A bunch of okra fiber, or maybe it was yucca, was nearby. On a chair were brown cotton stalks; close at hand was a bundle of herbs; lumps of clay and some curious stones peeped from under a pile of bulletins.

¹⁶ Smith, 25.

¹⁷ Smith, 22-23.

“How have you been able to do so many different things?” he was asked. His long brown fingers were busy untangling the shreds of okra fiber. This country must find a substitute for jute. Perhaps...

“Would it surprise you,” he replied gently, “if I say that I have not been doing many *different* things?” He reached across the table for a tiny green herb. The soil still clung to its threadlike roots. “All these years,” the artist continued, looking at the flower in his hand, “I have been doing one thing. The poet Tennyson was working at the same job. This is the way he expresses it:

‘Flower in the crannied wall,
I pluck you out of the crannies.
I hold you here root and all, in my hand.
Little flower; but if I could understand,
What you are, root and all, and all in all,
I should know what God and man is.’⁷

“Tennyson was seeking Truth. That is what the scientist is seeking. That is what the artist is seeking; his writings, his weaving, his music, his pictures are just the expressions of his soul in his search for Truth. My paintings are my soul’s expression of its yearnings and questions in its desire to understand the work of the Great Creator.”¹⁸

Perhaps the most terse summary of his motive that Carver ever provided was in his answer to a question from Faybert Martin, a friend Walter Nickell, one of his “boys” who lived in Michigan. Martin, with his wife and child, was visiting Carver at Tuskegee in the spring of 1932. He recalled the scene: “My sitting there watching you scrape the dead bark from a twig of one of the trees on the campus... Some disease had been bothering them and you were trying to find a cure... I asked what you were doing—and your reply,

¹⁸ Bess B., Walcott, “Meet George Washington Carver, American Artist,” *Service*, January, 1942.

thank God, was: "I'm trying to find God." Martin added, "You will never know how much the visit meant to me. I was sorely in need of such uplift at that time."¹⁹

The Non-technical Nature of the Work

Carver's humanitarian motive had much to do with his work's being "low-tech." Littell McClung, in the 1917 article quoted earlier, put it this way: "He is not searching for or working for ideal but costly combinations, either chemical or vegetable. He is working to discover and perfect products that are useful and economical—products that any home would be glad to use." Carver himself stated the matter more directly in a response to an inquiry from Tupelo, Mississippi in 1940: "My laboratory I fear is not technical in the sense you wish for your paper as all of my operations as nearly as possible are kept within the reach of the individual farthest down."²⁰ To another correspondent he wrote in that same year: "My work is that of keeping every operation down so that the farmer and the man farthest down can get a hold of it. I do not deal very much in extreme technical processes as it takes it out of and away from the thing that will help the farmer unless it can be simplified so that he can use it."²¹

Carver linked this theme of keeping his chemical processes simple to his reason for taking out so few patents when he had created so many products. He held three patents in his own name, all taken out within two years, from 1925 to 1927, on peanut cosmetics and on paints and stains.²² He told Vance Packard, then an Associated Press Feature Service writer, in 1939: "One reason I never patent my products is that if I did, it would take so much time I would get nothing else done. But mainly I don't want any discoveries to benefit specific favored persons. I think they should be available to all peoples."²³

In Chapter 6 we will discuss the significance of Carver's scientific attitude and methods. First we will take a survey of the various branches of his science. We will proceed in

¹⁹ Faybert Martin, Denver, CO, to GWC, 8 January 1939, TIA, 27, 216-7.

²⁰ GWC to Mrs. J. L. Riley, Tupelo, MS, 11 September 1940, TIA, 35, 120.

²¹ GWC to Leo F. Collier, Tuscaloosa, AL, 29 March 1940, TIA, 33, 460.

²² The patents are U. S. 1, 522, 176, *Cosmetics and Producing the Same*, 6 January 1925; U. S. 1, 541, 478, *Paint and Stain and Producing the Same*, 9 June 1925; and U. S. 1, 632,365, *Producing Paints and Stains*, 14 June 1927.

roughly chronological order. Carver's first responsibility on reaching Tuskegee was to teach, but his teachings on education are not in the scope of this report. His next job was to go to the farmers around Tuskegee and teach them intelligent farming. In the phase of his life in which he was most focused on this work, he addressed, albeit indirectly, the topic of land use. To this we will devote Chapter 2.

²³ Vance Packard, "A Candid Talk With—A Scientist", *Birmingham News*, November 12, 1939, TIA, 61, 1057.



1-1. Carver with his Young Men's Bible Class

2

Land Use Practices

Land Use

The term “land use” as used in this study concerns ways of treating land’s natural resources, especially its soil and specifically soil in which crops are grown. Thus it applies primarily to the use of land allocated for agriculture. This in many cases involves, not only the farmland itself, but more generally how people treat land in farming areas — forests and uplands above a farm, for instance—and how this impacts the health of farms. The two main divisions of the chapter – Soil Conservation and Rebuilding, and Crop Diversity –are primarily expositions of George Washington Carver’s views on the treatment of soil.

Carver’s Arrival in the South—Recognition of Poor Land Use Practices

The time it took Carver to identify the major problems caused by Southern agricultural practices was the length of his train journey south in early October of 1896 from his college town of Ames, Iowa to Tuskegee, Alabama to take up his new job. He was going South to serve his people, an aim that had formed in him gradually after he left Diamond, as he was pursuing his education in Kansas and Iowa. In a 1941 radio broadcast, he recalled: “When my train left the golden wheat fields and the tall green corn of Iowa for the acres of cotton, nothing but cotton, my heart sank a little... The scraggly cotton grew close up to the cabin doors; a few lonesome collards, the only sign of vegetables; stunted cattle, honey mules; fields and hill sides cracked and scarred with gullies and deep ruts... Not much evidence of scientific farming anywhere. Everything looked hungry; the land, the cotton, the cattle, and the people.”¹

¹ GWC, “Script for Dr. George W. Carver Broadcast: U. S. Office of Education.” 19 October 1941. TIA, 46, 989 & 62, 151.

The problems Carver identified on his first view of the South may be listed as these: 1) the system of monocrop farming, in this case the growing exclusively of cotton;² 2) the failure to grow enough vegetables 3) serious problems with erosion, and 4) the poverty resulting from all these practices. This chapter covers Carver's response to each of these subjects.

Tuskegee's Campus as a Microcosm of Southern Land Use Problems

Tuskegee's campus and the more than 2000 acres of surrounding land comprising the Institute's holdings³ turned out to be as good a place as any for him to observe the challenges he faced. The school had many people skilled in various industries, but no one there had been practicing intelligent land use. At the 1937 chemurgic conference in Dearborn, Michigan that was the occasion of Carver's first meeting with Henry Ford, he recalled: "Right on the school ground we could throw an ox into a ditch and we would have had to look down to see it."⁴ Our principal strawberry bed was so poor we got about a cupful of strawberries at a picking. We had three cows and we got a gallon and a half of milk from these three cows, and there was not a two-horse plow in the entire county."⁵

Carver once made the general statement, "Nothing is so damaging as ignorance,"⁶ and the state of the lands of the American South when he arrived there illustrated this saying as clearly as anything could. In an 1899 article in the *Southern Workman* magazine, he observed: "The virgin fertility of our southern soils and the vast amount of cheap and unskilled labor that has been put upon them, have been a curse rather than a blessing to

² Cotton had become the South's main, almost exclusive, crop since the 1793 patenting of the cotton gin by Eli Whitney. The gin separated the seeds from 600 to 700 pounds of fiber per day, ten times faster than it could be done by hand. The rise of the Industrial Revolution, first in England and then in the American North, created a huge demand for Southern cotton — more than a million tons annually by the Civil War — to supply textile mills. Cotton growing, unlike grain cultivation, requires much labor over much of the year, and thus made a better fit with slavery, where workers had to be kept busy year-round.

³ Bernard Weisberger, *Booker T. Washington* (New York, New American Library, 1972), 69, says 2300 acres in 1905. The Institute's total land holdings were much larger, since Booker T. Washington acquired 25000 acres of mineral lands in northeastern Alabama in 1899 through a land grant. This land was later sold to add to the Institute's endowment.

⁴ This was a comment on the depth to which the soil had eroded, not on the poorness of the ox.

⁵ CWC, "What Chemurgy Means to My People," *Farm Chemurgic Journal* 1, no. 1, September 1937, 31A, 46, 852-53. On filling the ditches, see also Carver's Bulletin no. 6 [1905].

⁶ Frank H. Leavell, "George Washington Carver: An Interview For Students," *Baptist Student*, November 1938, 11A, 59, 943.

agriculture; this exhaustive system of cultivation, the destruction of forests, the rapid and almost constant decomposition of organic matter, and the great number of noxious insects and fungi that appear every year, make our agricultural problem one requiring more brains than that of the North, East, or West.”⁷

Carver’s Motive of Service As It Extended to Treatment of Soil

His words, “cheap and unskilled labor” were an indirect reference to slavery and tenant farming as systems that inevitably involve poor land use. He recognized the connection between human injustice and soil depletion. In 1914, he wrote in the *Negro Farmer* magazine:

Unkindness to anything means an injustice done to that thing. If I am unkind to you I do you an injustice, or wrong you in some way. On the other hand, if I try to assist you in every way that I can to make a better citizen and in every way to do my very best for you, I am kind to you.

The above principles apply with equal force to the soil. The farmer whose soil produces less every year, is unkind to it in some way; that is, he is not doing by it what he should; he is robbing it of some substance it must have, and he becomes, therefore, a soil robber rather than a progressive farmer.”⁸

Restoring the Soil—Carver’s General Comments

The heart of Carver’s message to Southern farmers was that the type of farming they had been practicing had drained their soil, vampire-like, of its vitality, and that the soil’s fertility could be restored. The *Montgomery Advertiser* published this statement of his in 1938: “Whenever the soil is rich the people flourish, physically and economically. Wherever the soil is wasted the people are wasted. A poor soil produces only a poor people—poor economically, poor spiritually and intellectually, poor physically.”⁹ Speaking in 1940 at the dedication of the school Henry Ford built in Ways, Georgia to

⁷ GWC, *Southern Workman*, September 1899, TIA 46, 611. Also see TIA, 46, 875.

⁸ GWC, “Being Kind To the Soil,” *The Negro Farmer*, January 31, 1914, TIA, 46, 621.

⁹ GWC, “Top Soil and Civilization,” *Montgomery Advertiser*, June 21, 1938, TIA, 61, 863 and 46, 857

honor him, he said: "We must enrich our soil every year instead of merely depleting it... There is a distinct relationship between the soil and the person living on it. Show me a poor lot of land and I'll show you a poor farmer."¹⁰ (Fig. 2-1)

During his first growing season at Tuskegee, Carver wrote to Booker T. Washington: "We do not only believe, but know that these barren matted hills and deep furrowed valleys, may be made to produce not 50 or 60 but 100 fold, if the proper amount of brain and muscle is applied to them."¹¹ Carver's ways of applying his brain to unproductive Southern land could be labeled and arranged in various ways. Here, they are grouped into five steps and presented in order of their urgency at the time of his arrival.

Step One: Halting Erosion

In 1906, Carver reminded Washington of how he had begun his demonstration for Southern farmers: "The first experiment was on sweet potatoes made in 1897, its chief object being to show the value of deep plowing; the control of washing; the conservation of moisture; and to show its deepening and enriching effect upon the soil, all of which cause any crop to grow to be vigorous."¹²

Remembering Professor Henry C. Wallace's saying, "Nations endure only as long as their topsoil," he made it his first order of business to stop the erosion of that precious layer of vegetable matter on which all land creatures depend for our survival. The shallow plowing of one-horse plows allowed Alabama's abundant rainfall to soak in only an inch or two, when it reached a hard layer of clay, coarse sand and loam and began running along laterally, pulling soil with it, eventually gouging out those washes that could hide an ox. (Fig. 2-2) Speaking to an audience of farmers at Homer College, a Black school in Homer, Louisiana in 1908, he said:

¹⁰ James H. Cobb, Jr., "Ford and Carver Point South's Way," *Atlanta Journal*, March 17, 1940, T1A, 62, 35.

¹¹ GWC to BTW, {1897?}, original in BTW collection, Library of Congress, T1A, 1, 813. Carver's numerical references are to Jesus's parable of the sower, Matthew Chapter 13 and Mark Chapter 4.

¹² GWC to BTW, 30 March 1906, T1A, 3, 1041. From this paragraph to the section titled "The Small Farmer," much material is drawn from a draft by the present author for *Great Heart Of Love: George Washington Carver*.

Now, to prepare land well is of advantage not only in producing the largest yield, but also in saving the land. Those who live on the hills and break their land shallow, will find that the first big rain will wash much of their best soil away into their neighbor's field in the valley below. Not only that, but very much of the rain that should be taken into the earth and stored away for growing the crop will run off as soon as it strikes the ground, whereas, if the land is broken to a depth of seven to nine inches, these abundant seasons will be taken in.¹³ (Fig. 2-3)

Carver continued his story of the Experiment Station at the 1937 chemurgic conference:

Nobody had a two-horse plow. I asked for one and they thought I had lost every bit of gray matter that I had. Well, they rather questioned whether I had any or not. I don't need to discuss that. So I insisted upon a two-horse plow, and the people lined up to see the new professor that had come down from Iowa, and they didn't give him a very hearty reception because they looked at him with a good deal of suspicion. So they lined up on the fence to see what he was going to do.

Twenty acres of land were turned over to him for an experiment station and it wouldn't sprout peas. Well, cow peas would get just about a foot high and have one pea to the stalk, and cotton would have two bolls to the stalk. So we began working upon that piece of ground and they said "Well, now, he doesn't know what he is doing because he is putting in a two-horse plow," and so they began to give advice, and I said, "Now if you knew about this why didn't you do it? Now, you better let me alone, and if I fail why then you can give me some advice. You have tried your method and it failed."¹⁴

In Carver's 1898 bulletin titled *Experiments With Sweet Potatoes*, the second of forty-three he wrote for the Station, he spoke of the benefits of stirring and loosening soil using a two-horsepower plow: "Much fertility that had become useless to the plant from the impaction of the soil and the depth to which the fertilizers had sunk into it, was regained.

¹³ "Prof. Geo. W. Carver Visits Humer College - A Farmers' Conference Organized." *The Christian Index*, Jackson, TN, July 2, 1908, TIA, 60, 34.

¹⁴ See note 5 above. The Experiment Station was ten acres, not twenty as Carver says here. On this, see TIA, 2, 1198 and TIA 3, 1041-43.

These fertilizers were brought near the surface, where the action of the sun, wind, rain and the different climatic changes might readily fit them for plant food."¹⁵ In a 1908 Bulletin, *How to Make Cotton Growing Pay*, he added that fall plowing eight to nine inches deep "turns under cotton stalks, leaves, grass, to decay for plant food; destroys insects and eggs; increases water holding capacity; and permits wind, water, air, sunlight, earthworms, bacteria, moulds, ferments and other plant, animal and mineral agencies to better perform their work of soil building."¹⁶

While Carver, his five assistants in the Agriculture Department and his students worked to stop the erosion that scarred the land, they also set about healing the existing scars. In his 1905 Bulletin *How To Build Worn Out Soils*, he reported:

We... began to fill the ditches with pine tops, hay, bark, old cotton stalks, leaves, etc., in fact rubbish of any kind that would decay and ultimately make soil. An occasional load of earth was thrown in upon it to give it more weight and firmness. Upwards of one hundred stumps were removed from time to time, by digging around and setting fire to them, and being fat pine and set in a very dry time, but little trouble was experienced in getting them to burn.

The plowing was done at first with a two-horse plow, but desiring to bring it more closely in touch with the one-horse farmer, every operation has since been performed with a one-horse equipment, going twice in the same harrow when broadcasting the land, often plowing one piece of land three times before planting, running the rows up, down and diagonally, harrowing it the same number of times and in a similar manner.

The above method has seemed quite as satisfactory as one furrow with a two-horse plow...

¹⁵ GWC, *Experiments with Sweet Potatoes*, Bulletin no. 2 (Tuskegee Institute, 1898), TIA, 46, 10.

¹⁶ GWC, *How To Make Cotton Growing Pay*, Bulletin no. 14, (Tuskegee Institute, 1908), 6, TIA, 46, 98

For the last two years the injurious washing has been almost completely overcome."¹⁷

Carver's desire to bring his work "more closely in touch with the one-horse farmer" was a defining feature of his work and legacy. A woman writing to him from Tupelo, Mississippi in 1940 received this answer: "My laboratory I fear is not technical in the sense you wish for your paper as all of my operations as nearly as possible are kept within the reach of the individual farmer down."¹⁸

Another phase of soil erosion control that Carver hoped to see take hold in the South was the saving of forests. We will discuss this after covering the main features of his plan for rejuvenating the soil of Southern farms.

Step Two: Putting In Crops Easy on Soil

While it was fine to bring the soil's buried treasure in reach of plants' roots, each year's crop used up part of that treasure. This needed to be restored. Carver had studied chemical interactions between plants and soil at Ames. He recalled some of what he had learned in his 1936 bulletin, *How to Build Up and Maintain the Virgin Fertility of Our Soils*:

One is not only surprised but astonished to learn that less than a century and a half ago, agriculture was without a scientific working basis. Credit goes to the great German chemist, Justus von Liebig (Fig. 2-4) for starting this revolutionary movement. The following four laws which form the foundation of modern agricultural practice were fully established by Liebig and should be studied and mastered by everyone attempting to deal with the fertility of the soil:

1. A soil can be termed fertile only when it contains all materials requisite or necessary for the nutrition of plants in the required quantity and in the proper form.

¹⁷ GWC, *How To Build Worn Out Soils*, Bulletin no. 6 (Tuskegee Institute, 1905), T1A, 46, 43-44.

¹⁸ GWC to Mrs. J. L. Riley, Tupelo, MS, 11 September 1940, T1A, 35, 120.

2. With every crop a portion of these ingredients is removed. A part of this portion is again added from the inexhaustible store of the atmosphere; another part is lost forever if not restored by man.
3. The fertility of the soil remains unchanged if all the ingredients of a crop are given back to the land. Such a restitution is effected by fertilizers.
4. The fertilizers produced in the course of husbandry are not sufficient to maintain permanently the fertility of a farm; they lack the constituents which are annually exported in the shape of grain, hay, milk and live stock.¹⁹

Carver's grasp of Liebig's teachings led to his choice of sweet potatoes for his first experiment because, as he said, "More bushels of sweet potatoes can be raised per acre than any other farm crop, with less injury to soil."²⁰ In his talk at Homer College, he entertainingly illustrated the reason that sweet potatoes were so undemanding:

I hold in my hand a potato. Now listen while I talk with it. "Little potato, of what are you made up?" Potato: "Water, starch, sugar, cellular matter and mineral matter." "Now, little potato, where do you get these elements?" Potato: "I get water from the soil, and also mineral and cellular matter. I get sugar and starch from the air." "All right, thank you, little potato. I find then that you get more than eighty per cent of yourself from the air, hence I shall not need to put so much fertilizer in the ground in order to grow you."²¹ (Fig. 2-5)

Carver grew sixteen plots of sweet potatoes, amending the soil of each in a different way to test them under various conditions. He reported: "On plot 2, the one without nitrogen... the potatoes were of a fine, marketable size and remarkably uniform... This is of special importance, when we consider that many millions of pounds of fertilizer

¹⁹ GWC, *How To Build Up and Maintain the Virgin Fertility of Our Soils*, Bulletin no. 42, (Tuskegee Institute, 1936), TIA, 46, 444. See also GWC, *A Treatise On Fertilizers*, [n.d.], TIA, 62, 1025.

²⁰ GWC, "Chemistry Should Turn From War To New Fields— Carver," *Daily Worker*, 29 October 1939, TIA 61, 1051. This is the text of Carver's address before the Ninth Annual Herald Tribune Forum on 25 October 1939.

²¹ See note 13 above.

contain nitrogen, for which the purchaser must pay 17 cents per pound... Neither owner nor renter can afford to apply this expensive plant food where it is not needed.¹²²

When Carver wrote this, the idea of buying fertilizers was new. Farmers, with their varying degrees of success and failure, of fortune and misfortune, had gotten along for about 10,000 years without having to purchase any soil amendments. They simply mixed animal manure and rotted plant material into their soil. The inventor of commercial fertilizers was none other than the man whose agricultural science Carver gave so much credit, Justus von Liebig. Starting with the valid premises listed above by Carver, he veered to a false conclusion.

Liebig rightly taught that plants are fed from air as well as earth, and that they return to air the elements they have taken from it when they ferment and putrefy. In order to determine which elements his crops were taking up from the soil, he analyzed their ashes. He found that a crop that took even one of the substances essential to plant growth left soil barren.

Step Three: Crop Rotation

There were two ways to restore the soil's fertility. Animal manure, easily available on farms, had the necessary ingredients. The soil could also be restored by a fallow period. When tired land lies fallow, its minerals insoluble in water are eventually decomposed by atmospheric influence, returning it to vigor. Carver referred to this in a letter to Attorney General C. B. Griffith of Topeka, Kansas where he mentioned "the old Mosaic law where God commanded the farmers to allow the land to rest every seven years and every fifty years was the Jubilee year and nothing was to be taken from the land." He added: "We have violated this divine law which applies to us just as much as it did to those people. While, of course, we need not let the land lie out idle as they did, because they were not

²² See note 15 above. (46, 10 [or 11?]). Walter A. Hill, Dean and Director of Tuskegee's College of Agricultural, Environmental and Natural Sciences, had gathered evidence on the capacity of the sweet potato, not only to go easy on soil, but to ameliorate it through nitrogen fixing, as legumes do. He published his results in a series of papers during 1983-84 in connection with his work with the George Washington Carver Agricultural Experiment Station. See Mayberry, Appendix G, 196-97.

familiar with the various systems of rotation of crops which is equivalent to the resting of the land."²³

Observant farmers had noticed the benefit of crop rotation long before Liebig helped explain the reason for it by his discovery that different crops take elements they need from soil in varying proportions. A crop that doesn't require much of an element exhausted by the prior year's crop gives the land rest from supplying it, allowing time to regain it.

Carver's conclusion from Liebig's research was that farmers have, with occasional small exceptions, all they need to keep their soil healthy— manures and the action of air, which works if they rotate their crops. He wisely broadened his definition of "manure" to include any rotted material that returns nutrients to soil. Limiting the definition to the manure of cows, horses, sheep and chickens would have left out a great portion of the resources available to farmers, notably those who didn't own enough animals to produce the manure they needed.

Liebig himself, lacking Carver's innocent skill in drawing out the simple implications of his own work, concluded that farmers needed "artificial manures" and set out to concoct them in his laboratory. With this he started agriculture down a path where it became lost, with consequences terribly destructive to the soil and humanity. Applying his synthetic "manures" to sandy land near Giessen in the 1840s, he had disappointing results. He had taken great pains to make the alkalis, or salts, insoluble, so they would not be washed away. Eventually, another chemist named Way showed that soil is able to absorb the soluble saline material required by plants and hold on to it for the roots, so that it behaves as if it were already insoluble. Liebig tested these observations and confirmed his error. He concluded: "I had sinned against the wisdom of the Creator, and received my righteous punishment. I wished to improve His work and in my blindness believed that, in the marvelous chain of laws binding life on earth's surface and keeping it always new, a link had been forgotten, which I, weak and powerless worm, must supply."²⁴

²³ GWC to Hon. C. B. Griffith, Topeka, KS, 8 October 1923, TIA, 7, 635-6.

²⁴ *Encyclopædia Britannica*, 9th ed., s.v. "Liebig, Justus von."

By the time Liebig repented, it was too late to put his genie back into its bottle. People who stood to reap huge profits by convincing farmers that they did not already have all they needed to succeed were as indifferent to his repentance, if they ever heard of it, as he had been blind to nature's self-sufficient genius. After 1899, his statement of repentance, for whatever reason, was removed from people's main means of access to it, the *Encyclopedia Britannica* entry on him.

Step Four: Decayed Organic Matter—Compost, "Green Manure" and "Night Soil"

Long before the heyday of commercial fertilizers, from the 1950s through the 1970s, Carver not only discovered their drawbacks but in a way predicted the whole trajectory of the "artificial manure" industry. A bulletin by his assistant Frank Henry Cardozo transmits knowledge gained from his teacher: "Farmers as a whole do not appreciate the importance of humus as an improver of land, but instead use a short cut and lazy way of improving, not the fertility of their land, but the yield of the current season's crop, by an application of inferior ready mixed commercial fertilizers... They need... humus to decay in their soil."²⁵ The reference here, in 1908, to the short-sightedness of commercial fertilizer use was prophetic of its future. Carver's deep perception of the product's danger in the long term was even more evident in a 1911 letter to Booker T. Washington. (Fig. 2-6) He wrote:

Beginning just below the hospital and following the little ravines down as far as the Harry Johnson tract, there are hundreds of tons of the finest kind of manure, which consists of decayed leaves, dead animals, decayed night soil, animal manures that have washed from the hillsides, etc., etc. These deposits have been accumulating for years...

Let me quote from a circular on farm fertilizers recently issued by Dr. Knapp. He is thoroughly sound in principle, and every farmer should read it and strive to carry out its principles: "Commercial fertilizers are costly; their excessive use

²⁵ F. Henry Cardozo, *Relation of Weather and Soil Conditions to the Fruit Industries of Southern Alabama*, Bulletin no. 11, (Tuskegee Institute, 1908), 11A, 46, 77.

tends to hasten depletion of the soil, and they should never be considered a substitute for green crops or barnyard manure."²⁶

Carver's phrase "green crops" refers to another way farmers could enrich their land—by growing a crop in the fall, not for harvest, but to be plowed back into the soil as "green manure" that feeds the main crop in spring. He wrote to the Principal in 1910: "We have been struggling for years on these sand and clay hills trying to grow fruit, with very poor results. It does not take a philosopher to see the cause--the stimulus in the way of commercial fertilizers in the soil is not enough for the trees: they are starving for a better physical condition of the soil. Green crops turned under repeatedly will do it."²⁷

Continuing his letter to Washington on the hundreds of tons of manure on Tuskegee's grounds that only awaited their gathering, Carver wrote:

It is true that some of this manure does not contain as much fertilizing ingredients as if it had been composted, yet it will pay to save it. We should look to the permanent building up of our soils. We know that commercial fertilizers will stimulate and for a while produce good results in the way of vegetables, but by and by a collapse will come, as the soil will be reduced to practically clay and sand. The crying need of nearly every foot of land we have in cultivation is vegetable matter (humus), and every possible means at our command should be exercised to supply this need.²⁸

²⁶ GWC to BTW, 26 January 1911, TIA, 4, 1021-22.

²⁷ GWC to BTW, 31 March 1910, TIA, 4, 426.

²⁸ The value of Carver's call for more humus has been confirmed by discoveries of the role played by small fungi called mycorrhiza, which develop in contact with the tips of plant roots, particularly those living in humus. Mycorrhiza weave around roots a close cover of mycelial threads which replace root hairs. Biologists noting that the roots of many plants were infected with microscopic fungi considered them parasitic or competitive with the plant until German botanist Professor Wilhelm Pfeffer noticed the symbiotic relationship between the roots and these fungi in 1877. The subject remained in the sphere of scholarly research until the 1930s.

There are two large groups of mycorrhizas, endo- and ectomycorrhizae. Ectomycorrhizas encase the roots on the outside, and endo- penetrate the roots and live inside. Early investigators did not know that the vast majority of plants – 93 percent of them, including most cultivated crops – digest or consume the endomycorrhiza's protein- and carbohydrate-rich fungous threads through their roots, where they enter the sap-stream and help mature the plant. Photosynthesis of carbohydrates and proteins in green leaves depends on the digestion products of these soil fungi.

The above does not mean that we are to use no commercial fertilizer, but supplement our home manures with them, which will not only give us good results, but permanently improve the soil.

Carver's simple contention that commercial fertilizers "will stimulate and for a while produce good results," but "by and by a collapse will come," could have been a prophecy of the state of agriculture in our day. (Note: We will hear more of this in Chapter 7 of this Study.)

They provide the plant with nitrogen, which they fix, and other nutrients, while the plant provides them with carbon which they have fixed through photosynthesis. Mycorrhiza improve the efficiency with which plants take up available phosphorus, and also make rock phosphate soluble and transfer it to the host plant (Kugler, M., "Mycorrhiza - The Beneficial Bonding of Plants and Fungi." [The IDRC Reports, Vol. 15, No.1, Ottawa Canada, January 1986]). While bacteria fix nitrogen, fungi fix atmospheric phosphorus into chemicals such as phosphates and then act as vectors which allow a plant to absorb them and deposit them in their tissues.

Mycorrhiza's absorption of water and mineral matter, which they transmit to the roots, benefits both fungus and flowering plant, a case of symbiosis. Being indispensable to the host plant's well-being, mycorrhiza are of great importance to agriculture, and hence to us. Animals eat plants and are therefore able to live and reproduce after acquiring fixed nitrogen and phosphorus. Salt-based fertilizers kill the bacteria and fungi in the soil, killing the soil, the plants -and us.

In 1937 Sir Albert Howard, Director of the Institute of Plant Industry at Indore in India, found that where plants were grown with artificial fertilizers the "mycorrhizal relationship was either absent or poorly developed."... In his seminal book, *An Agricultural Testament*, he wrote of finding the mycorrhizal association to be "the living bridge by which a fertile soil (one rich in humus) and the crop are directly connected and by which food materials ready for immediate use can be transferred from soil to plant." He continued: "How this association influences the work of the green leaf is one of the most interesting problems science has now to investigate. It is more than probable that this must prove to be the case. Are these digestion products at the root of disease resistance and quality? It would appear so. If this is the case it would follow that on the efficiency of this mycorrhizal association the health and wellbeing of mankind must depend."

Lady Balfour, analysing Howard's work, stated that "crops grown with compost, or ample quantities of farmyard manure, always showed maximum mycorrhizal development, in marked contrast to those grown with artificials."

The book regarded as the "bible" on this subject is *Mycorrhizal Symbiosis*, 2nd Ed., by S. E. Smith, and D.J. Read (London: Academic Press, 1997).

Sources: Dr. William F. Ganung, *Textbook of Botany*, quoted in J. I. Rodale, *Pay Dirt. Farming & Gardening with Composts* (New York: The Devin-Adair Company, New York, 1946).
http://journeytoforever.org/farm_library-paydirt/paydirt_1b.html Accessed 12 September, 2005.
<http://www.helpfulgardener.com/phpBB2-viewtopic.php?t=932> Accessed 12 September, 2005.

He went on to recommend to Washington “that where manure has accumulated on the hillsides, bottoms, etc., to any appreciable degree, that it be raked up and hauled out on the farm and various places where needed;... that the stock be fed or penned at night where the manure can be saved; and that composting, or its equivalent, be put into effect at once, whereby the maximum amount of the manure’s fertility can be saved.”

He also recommended “that the pits where the night soil, etc., has thoroughly decayed be treated in the same way” as the other accumulations, or hauled to where it could be used.” “Night soil” was a euphemism for human feces. He instructed one of his assistants on its value:

Our night soil is especially valuable owing to the amount of lime it contains, so that the farm need not purchase any lime if this is properly taken care of... If this night soil is properly composted with leaves, trash, and refuse from the grounds... the farm I think could save several hundred dollars per year in valuable fertilizers alone, besides the great increase in vegetables and other products that it will bring to us... I am very certain that the school does not realize the vast amount of valuable fertilizers it could save in this way, besides teaching a most valuable object lesson. All the leaves, straw, grass, and rubbish of all kinds that would decay... could be put into this heap and there is no reason why it should not come out as fertilizer of a high grade.²⁶

Carver’s “object lesson” was that, despite our natural disgust with fecal matter, we should not overlook its great value. In our time, residents of Arcata, California have learned this lesson well. There, sewage goes to ponds where sludge settles out of it which is processed into fertilizer. The remaining wastewater is subjected to bacteria to break it down, then released into marshes and lagoons, where photosynthetic cycles of reeds, cattails, and bacteria filter and cleanse it. The marshes are a wildlife sanctuary and city park, where otters, seabirds, and abundant other marine wildlife attract tourists.

Some sorry-looking land that was part of Tuskegee’s Experiment Station hid buried wealth. Carver recalled in a 1938 article for the *Montgomery Advertiser*:

Several acres were so sandy and badly washed that it served only as a dumping ground for worthless trash (as we called it) from the campus, and an occasional load of sand when such was needed for plastering. This piece of land was plowed, harrowed, leveled up, and planted in white silver-skin onions, Rockey Ford cantaloupes, Carolina Bradford watermelons, Irish potatoes, and corn. It really proved to be one of the show places on the ground. Some of the onions measured seven inches in diameter. The watermelons and cantaloupes were of fine marketable size, abundant and very prolific; the vines remained green and continued to bear longer than in any other place. The Irish potatoes grew fine, large, and smooth with an enormous yield.³⁰

With his article to the *Advertiser*, Carver included a cover letter to the editor, which, like everything he sent them, they also printed. He wrote: "If every farmer, gardener, and householder having such accumulations would build a little pen and make his own compost it would not take the South long to build up a soil almost or quite equal to its virgin fertility with practically no cash outlay." In a bulletin he wrote during World War I when money was tight called *What Shall We Do For Fertilizers Next Year?* he told farmers that the use of compost "will convince you that many thousands of dollars are being spent every year here in the South for fertilizers that profit the user very little, while Nature's choicest fertilizer is going to waste."³¹ His *Advertiser* article also included this more recent story:

A few years ago while on one of my tours of inspection of waste materials, I discovered one of the finest pumpkin vines I have ever seen, growing right out in the open woods from the center of a pile of what appeared to be tin cans. It was, however, the daily accumulation that is more or less of a problem to everyone who wants to keep his premises clean. This pumpkin vine had seven runners 37 feet long by actual measurement, and just loaded with fine pumpkins. This pumpkin seed had found its way in this pile of what we generally regard as

³⁰ GWC to Mr. R. M. Atwell, [1902?], TIA, 2, 514-15, original in BTW collection, Library of Congress.

³⁰ See note 9 above.

³¹ GWC, *What Shall We Do For Fertilizers Next Year?*, Farmer's Leaflet, (Tuskegee Institute, 1916), TIA, 46, 567.

worthless accumulation (trash) and dispose of as above indicated, or rake up in a pile and burn.

Enough said. Beginning June, 1937 a compost pile was started. We built a pen 100 feet long by 50 feet wide. In this pen we piled all the organic waste from the campus in the form of paper, leaves, rags, grass, weeds, street sweepings, in fact, anything that would decay quickly. When this layer was about two feet thick, it was covered over with rich earth from the woods and swamps. It did not take us long to get a pile of 200 tons.

Beginning February and up to date we have used 75 tons of this well rotted material on trees, shrubs, nursery stock, flowerbeds, corn, and garden truck of all kinds. In every case it has been highly satisfactory as a carrier of plant food and in building up the soil permanently by supplying the much needed organic matter of which practically all of our upland soils are sadly in need. This compost pile has saved the school \$250. We have fully 40 tons ready for use now.

He concluded: "If farmers of the South would unite (observing every sanitary rule with reference to diseases of any kind, as well as fungus troubles and insect enemies) building a large or small pen according to their needs, and saving all of this valuable fertilizing material, returning same to the soil, it would not be long before the South would have but few if any non-productive areas."³²

Step Five: Introducing Soil-Building Crops—Legumes

In addition to Carver's many suggestions for adding humus to soil, his plan to restore Southern soils to their "virgin fertility" had one more feature. His friend Lyman Ward referred to it in a 1936 recollection to Carver of a Farmer's Institute, one of the monthly cost-free days of schooling for farmers and their families begun in 1897.³³ Ward said:

³² See note 9 above.

³³ Allen W. Jones, "The Role of Tuskegee Institute in the Education of Black Farmers," *Journal of Negro History*, 60:252, April 1975. This is cited in B. D. Mayberry, *History of the Carver Research Foundation of Tuskegee University, 1940-1990* (Tuskegee Institute: Tuskegee University, 2003), 53.

Yesterday I was in Montgomery and overheard the conversation of one of the most prominent farmers of the state. He was discussing the crop situation and said that while our corn would be short, there would be an abundance of cowpeas, peanuts, and soy beans. The first man I ever heard talk about cowpeas and George W. Carver at a farmer's institute at Tuskegee 38 years ago. No one at that time appreciated the value of cowpeas. You were not only explaining their nitrogenous giving qualities, but you were also giving a series of recipes for various ways of cooking cowpeas. Today the humble cowpea is almost as prevalent on every farm, especially on the poor man's farm, as his cotton.¹⁴

Carver explained his reasons for promoting crops in the pea and bean family, including cowpeas, or black-eyed peas, to a crowd at Voorhees in 1919:

When a boy, I was greatly insulted when they told me I did not know beans. I got mad at once. I was too ignorant to know that I didn't know. Madness is nearly always the outgrowth of ignorance.

When of sufficient age and intelligence, I was given some cow peas to analyze, (pull to pieces) to find out what they really were. I first discovered that they were not peas at all, but more nearly beans, and that they belong to a very large family, all of which constitute the most remarkable plants in existence, and the only ones as far as we know that can use the air in its peculiar way, to build up the soil.

He held up a bottle filled with roots of cowpea vines, and said:

In looking at these roots, I see they are literally covered with little beadlike swellings. (Fig. 2-7) I found that these swellings contained large quantities of little germs known as bacteria and these little germs had the power of drawing that expensive fertilizer, nitrogen, from the air, storing it away in these little swellings and afterward giving it to the soil. An acre of well grown pea vines would bring \$30.00 worth of nitrogen alone, free of charge to the farmer, if he would only grow them and turn the entire crop under. The above is for nitrogen alone and

¹⁴ Lyman Ward, Camp Hill, AL, to GWC, 14 July 1936, TIA, 19, 345-46.

does not take into account the large amount of vegetable matter (humus), some potash, phosphate, etc..³⁵

Carver wrote in *The Tuskegee Student* in 1899: "Leguminous crops, such as beans, peas, clovers, vetches, etc., were used in ancient crop rotation; they were simply guided by the effect, and knew nothing of the function the little swellings or nodules upon the roots of these plants performed."³⁶ In his 1903 bulletin *Cow Peas*, he elaborated on this:

Every progressive farmer recognizes that certain crops exhaust or make his soil poorer and certain others build it up or make it richer. He is also aware that a better crop follows a pod-bearing one, such as peas, beans, clovers, vetches, peanuts, etc.; therefore, they are absolutely indispensable in a wise crop rotation, and in the rational feeding of both man and beast.

The fertilizing value of these plants is due mainly to the relationship existing between certain germs in the soil and the free nitrogen of the air, they being the only recognized class having the power to extract and utilize this nitrogen from the air and convert it into a class of substances in the plant known as "albuminoids," which, when consumed by the animal, are converted into milk, wool, hair, hoofs, horns, and muscular tissue (lean meat).³⁷

Carver's story at the 1937 chemurgic conference of his early work on the Experiment Station grounds came to this conclusion: "The soil began improving year by year, and they began to get just a little bit more confidence in the value of our work."³⁸ (Fig. 2-8, 2-9)

Carver As An Organic Agriculture Pioneer

His procedures for rescuing his demonstration plots from centuries of abuse add up to what, today, is known as "organic agriculture." This is, very simply the way to farm with nature. Author Michael Pollan wrote in 2001 that "the theoretical roots of organic

³⁵ GWC, "Address by Dr. G. W. Carver at Voorhees Normal and Industrial School, Denmark, South Carolina, February 19, 1919," TIA, 46, 884.

³⁶ GWC, "A Few Hints to the Southern Farmer," *Tuskegee Student*, August 17, 1899, Austin W. Curtis Papers (hereafter cited as AWC Papers).

³⁷ GWC, *Cowpeas*, Bulletin no. 5. (Tuskegee Institute, 1903). TIA, 46, 37-8.

agriculture go back... principally to the work of a British scientist by the name of Sir Albert Howard. Based on his experiments in India and observations of peasant farms in Asia, Howard's 1940 treatise 'An Agricultural Testament' demonstrated the connection between the health of the soil and the ability of plants to withstand diseases and pests."³⁹ A statement Carver made in an obscure farmer's leaflet in 1902 show his thorough understanding of Howard's later conclusion. He wrote: "Have your garden as rich as possible. Your plants will then be more apt to overcome the attacks of insects and any other enemy which come upon them."⁴⁰

Forests as Topsoil Conservers

The more he saw of the countryside, the more he saw loss of forests leading to loss of topsoil. He wrote in 1902: "As one rides over our beautiful Southern States—all of which are more or less ideal, each possessed of its own peculiar charm— and sees the evidences of erosion and the devastation wrought by the forest fires and the woodman's axe, he is at once impressed with the importance of the subject."⁴¹ He found evidence of the problem, not only in landscapes, but in nature's smallest details. He observed to Washington, also in 1902: "Every year food for the bees becomes more scarce by reason of the flower bearing trees and plants being destroyed. It is true that bees will go a long distance for food but one can readily see that it would not be wise to cause them to go such a distance. As they can only make a few trips a day, a great deal of energy is spent in going this long distance and of course some of the bees are not able to get back."⁴² In 1941, writing to a man in Washington State, he used beavers to make the same point. He said: "When I first came to Tuskegee... there was a beaver dam at the lower end of my experiment station and I saw some of the beavers twice and collected some of the poles that they had cut off. I have them yet. Of course, now there is no such thing as a beaver within many miles of us."⁴³

³⁸ See note 5 above.

³⁹ Michael Pollan, "Naturally," *New York Times Magazine*, May 13, 2001, 33.

⁴⁰ GWC, *The Forage Crop*, Farmer's Leaflet no. 9 (Tuskegee Institute, September 1902), TIA, 46, 487.

⁴¹ GWC, "The Need For Scientific Agriculture in the South," *American Monthly Review of Reviews* [1902?], TIA, 46, 875.

⁴² GWC to BTW, 27 December 1902, TIA, 2, 511.

⁴³ GWC to C. F. Slagle, Randall, WA, 12 May 1941, TIA, 37, 343.

His friend James Wilson, one of his teachers at Iowa State who had gone on to become the U. S. Secretary of Agriculture,⁴⁴ put him in touch with the national scope of the problem when he wrote to him in 1908:

I have been out west, looking at the conditions of our national forests. The more I inquire, the worse I find them. You know I have been building up a beet sugar industry in the United States... In making preliminary inquiries this year, I find that two factories will not be able to run, because it was quite dry last year and the waters failed. The mountains have been stripped bare of their woods and the waters do not percolate into the ground but run down into the valleys and cause a freshet. I am more and more impressed with the necessity of taking care of our watersheds... We must hold the moisture.⁴⁵

Carver learned that farmers destroyed forests in several ways—burning them to clear land for farming, selling their wood lots to be cut down for lumber, or failing to check the spread of fires into swamps and forests when they burned last year's stalks and weeds. Some of those warm-weather farmers, never having seen the benefit of frost to fruit trees, thought their trees would suffer from spring frosts, and set fires to keep them warm, wasting forests for firewood. Carver's assistant Frank Cardozo wrote of this: "Sometimes the killing frost of spring is a blessing in disguise, giving the fruit trees and bushes a needed rest... It is a very costly procedure to burn many cords of high price wood... If there is the least wind, light or heavy smoke or heat will not remain over the orchard, but will be blown straight up or far over the trees."⁴⁶

Sir Harry Johnston, a British expert on Africa who toured the Central Alabama countryside in the course of compiling his book *The Negro in the New World*, indicated one reason for black farmers' willingness to let go of their forests when he wrote: "None of the Negroes with whom I conversed seemed to have acquired any feeling for landscape beauty." But then he spoke of exceptions, saying: "Some of them with whom I spoke

⁴⁴ Wilson served as Secretary of Agriculture under McKinley (1897-1901), Roosevelt (1901-1909) and Taft (1909-1913). Wilson served the longest term of any Cabinet member and was the only one to serve under three Presidents.

⁴⁵ James Wilson to Carver, 1 September 1908, TIA, 4, 122-23.

⁴⁶ See note 25 above, TIA, 46, 80.

were quite well off enough for themselves and their descendants not to cut down a patch of forest at all, but to keep these magnificent pines, magnolias, and evergreen oaks for the gratification of their eyes."⁴⁷

Carver bemoaned the sacrificing of forests in his speech at the dedication of the school Henry Ford named for him, and added a warning. He said: "Conservation is one of our big problems in this section. You can't tear up everything just to get the dollar out of it without suffering as a result. It is a travesty to burn our woods and thereby burn up the fertilizer nature has provided for us. We must enrich our soil every year instead of merely depleting it. It is fundamental that nature will drive away those who commit sins against it."⁴⁸ The fertilizer he spoke of was deposits of rotted leaves, especially those washed down hills with eroding topsoil to collect in lowlands and swamps. He wrote in 1912 to the Principal:

I went out this morning to see what might be done in the way of securing leaves, etc., upon our own grounds. I find that there is quite a quantity, beginning directly back of Rockefeller Hall and taking the entire skirt of woods well down in the bottom. I suppose ten or twenty wagon-loads could be raked up there... As I said to you in the office, I am very confident we shall make no mistake in getting those leaves, as they are exceedingly valuable as fertilizer—in fact, a large amount of the fertilizer we use upon the land may be found lodged in this muck that we are thinking of getting, as it washes from the hillsides and is deposited, along with the sediment, in the bottoms.⁴⁹

Booker responded to Carver's suggestions for the forests on Tuskegee's land holdings in this note to him in 1910: "I agree with you about the importance of preserving the natural forests and I have given orders to carry out what you suggest in this matter."⁵⁰

⁴⁷ Johnston, 426.

⁴⁸ See note 10 above.

⁴⁹ GWC to BTW, 6 January 1912, TIA, 5, 7-8.

⁵⁰ BTW to GWC, 2 March 1910, TIA, 4, 479. GWC's letter to which this is a response, if there was one, is not available.

The Small Farmer

Carver's opposition to cotton monocropping and his urging of blacks to acquire land constituted a strong statement on land use. He was in favor of the small farm. Having no political leanings, he did not advocate for his people's small farmers through political channels. He worked with them directly, as a teacher who built people up. His appearances at Farmer's Conferences and Institutes, his going out to the countryside on wagons to teach, were his way of helping the hard situations of most Black farmers. This shows very clearly in a passage his talk at Homer College in Louisiana:

Mr. President, citizens and visitors: I would have you to know that we belong to a very powerful race, or in other words, we can become very powerful if only we would organize.

There is not a single object in all the realm of animate nature that is not organized. Indeed the work of creation was a work of organization. We are told that in the beginning all was void and darkness covered all things and that our great Creator and Father began his work by setting all things in order or organizing them. And as He proceeded with his work, it was with deliberation and by well ordered degree. Not one of all the millions of things He made was left until it was pronounced "very good." What an example for us! And yet how different is our way of doing our work. How differently would we have gone about such a stupendous work! We would no doubt have made *man* first, without a place for him or food for his subsistence.

I hold before you my hand with each finger standing erect and alone, and so long as they are held thus, not one of all the tasks that the hand may perform can be accomplished. I can not lift. I can not grasp. I can not hold. I cannot even make an intelligible sign until my fingers organize and work together. In this we should also learn a lesson.

And again we should learn not only the power we have but also what we should do with this power. For God has said, 'In the sweat of thy face shalt thou eat

bread.' 'Judah and Israel shall dwell every man under his own vine and fig tree.' But how does that apply to us, or how do we comply with that? How many of us possess homes of our own? How many of our race live by the sweat of their own faces? Let us put into practice these commandments of our Creator.

Now, in the first place as farmers, we should not be ashamed of our occupation. We all know well that people in general have come to think of the farmer as a man with a great wide crowned hat, ... with huge rough boots all covered with dust or mud; with trousers coarse and untidy and well stained with soil, and with manners awkward, uncouth and ludicrous, and he himself of very limited intelligence. And we all too wrong[ly] are wont to assent to this idea of the farmer and foolishly show ourselves abashed when we come into the presence of men who represent the profession. But we should put away this mistaken notion, brace ourselves up and show to all that we esteem our occupation an honorable one. We should learn too that it is all erroneous and false to say or think that it requires little or no intelligence to be a farmer. Indeed, on the contrary, it requires the highest intelligence and the highest type of intelligence to be a farmer. For he who would be a farmer must deal with, must understand and must acquire the mastery over all the puzzling forces of nature.⁵¹

Carver support of replacing monocropping with greater crop diversity expressed itself in a similar way—not in a political context but in direct statements to farmers. He wrote in *The Colored Alabamian* in February 1909:

I took dinner in a country home, this was the bill of fare, flour from Minnesota, coffee from Brazil, macaroni from Italy, cheese from Wisconsin, bacon from Kansas, and cake made from eggs purchased at the store. In passing through the country I find a number of so called farmers without a garden of any description, not even a collard nor an onion. I also saw a farmer sell a bale of cotton for 7 cents per pound and buy side meat for 15 ½ cents per pound.

⁵¹ See note 13 above.

The next week I visited another home. They had cow peas, sweet potatoes, fruit, chicken, pork and greens, milk, butter, and cream, eggs, lettuce, radishes and onions, peaches, pears, pickles and preserves, corn bread and wheat bread. The corn was raised at home and ground at a nearby water mill and the receipts from the sale of butter and eggs purchased the flour. In fact everything on this table was produced at home even to the bunch of flowers that adorned the center of the table.

It is needless to comment on these two farmers, the first was literally living out of the store, the latter was not only living at home but had a surplus to sell. In looking into the former's condition more closely, I found that he had planted everything in cotton, even to the front yard around his home. So that he had nothing to eat except what he bought and nothing to sell except cotton. The other farmer raised plenty of corn, peas, potatoes, garden vegetables, fruit, fowl, etc., and has a few bales of cotton he is holding for better prices. Let us not make the mistake of putting everything in one crop, any one crop system is ruinous to the small farmer. Remember that a farmer to be happy and prosperous, must raise not only what he eats at home but must have a surplus to sell.

Also to be prosperous he must have a little money coming in all of the year. Now is the time to make your plans. Sit down and talk the matter over with your wife, and decide that so many acres shall put in corn, cotton, potatoes, peas, and certain amount set apart shall be planted in such and such things. Also that we will keep at least one cow, some hogs, chickens, etc. Put this plan on paper, work to it and you will just begin to find out that there is real joy and satisfaction in being a farmer.⁵²

Carver's Way of Dealing With "King Cotton"

As long as planters, white and black, were enslaved myopically in cotton-growing, Carver could demonstrate more successful methods of cotton cultivation on the restored

⁵² GWC, "Prof. Carver's Advice to Farmers—Cheap Cotton," *The Colored Alabamian*, February 13, 1909, TIA. 46. 619.

land at his Experiment Station. Since cotton was a soil robber, he would need to use green manuring between crops. This lament from his assistant Frank Henry Cardozo details the kinds of ignorance cotton farmers were showing: "The old practice of some cotton farmers, collecting and burning the cotton stalks in the fall instead of successfully plowing them under together with crab grass growth of the late summer to add humus to the already exhausted soil, shows very little forethought for his best good... A large number of even intelligent farmers purposely set fire to grass or forage crops they fail to harvest, in order to plow the land easier; but they have yet to see that this is a terrible blunder, and they need all this humus to decay in their soil and the average soils here can't have too much of this... You burn up the material that will benefit your land to produce another crop instead of plowing it under."⁵³

Carver put in some plots of cotton. His initial results were good. When he reported to Secretary Wilson at the end of the 1906 growing season of his success, Wilson replied, "You will do an infinity of good to the people of the south if you take pains to let them know how you grew that five bales of cotton on seven acres."⁵⁴ Early in 1907, Carver wrote to a man in Troy, Alabama:

I am endeavoring to show that a crop of cotton can be grown continuously upon the same piece of land and the said land become richer year by year, until the maximum of fertility has been reached, by following the cotton crop in the fall with a compensating crop and plowing the same under in the spring which will not only bring fertility but give to the soil the much needed vegetable matter... The value of turning under cotton stalks is being demonstrated; stalks four and five feet high have been plowed under this fall and are now completely rotted and ready for plants to take up."⁵⁵ (Fig. 2-10, 2-11)

The following year at planting time, he told the crowd of farmers at Homer College in Louisiana the results:

⁵³ See note 25 above, TIA, 46, 79 & 77.

⁵⁴ James Wilson to GWC, 6 September 1906, TIA, 3, 1121.

⁵⁵ GWC to Hon. W. W. Haralson, Director of Agriculture, Troy, AL, 23 February 1907, TIA, 3, 1185.

Now, let me ask how many of your farmers are raising a bale of cotton per acre? Well, let me tell you this. If you are not making a bale of cotton on every acre of land you cultivate, you are doing very poor farming. You are getting less from your land and less for your labor than you deserve to get, and less than you *can* get if you would farm as you should.

Now I am not saying what I heard or what I think or what I read, nor am I saying what is probably true or what must be true or what must be true from such and such an authority, but I am saying what I know personally to be true from what I have done myself. I am speaking from experiments that we have been making at our experiment station at Tuskegee for several years. And we are still making them there. Therefore, I know whereof I speak, for I have many times proved it to be true. Last year we harvested from five acres of ordinary land or what most of those who visit Tuskegee are accustomed to call very poor land, five bales of cotton weighing five hundred pounds each, and thirty pounds of lint per acre extra. And we only used six dollars worth of fertilizer per acre.

But in order to do this, we prepared ours and well, breaking it nine inches and breaking it twice and harrowing it twice. We then cultivated it well, stirring it very often. We were careful to cultivate it lightly, never ploughing deeper than two inches. I will not give you illustrations from a chart which we prepared from experiments made in the cultivation of cotton at Tuskegee. We prepared land as follows: "Breaking to a depth of one, two, four, six and nine inches respectively. The yield was as follows: The land broken nine inches, twelve bolls, six inches, five bolls, four inches, two bolls, two inches, two little bolls, one inch one little boll."⁵⁶ (Fig. 2-12)

⁵⁶ See note 13 above.

For Carver, teaching farmers to grow better cotton was a temporary measure. His larger aim was to topple King Cotton from its throne in the South.

The Impact of Carver's Suggestions on the Southern Economy

Carver's famous advocacy for the peanut is too large a topic to cover here. Suffice it to say that one man, working so persistently, so intelligently and so charmingly at anything is bound to have an effect. We will have more to say on his legacy in this area in Chapters 6 and 7.

Carver's effect on the lives of small farmers was, like his peanut work, certainly great but very hard to measure.⁵⁷ His urging farmers to "live at home" by growing their own food, canning and drying cultivated and wild foods, being thrifty and industrious, acquiring homes of their own; using clay paints and stains, making pottery, and his countless other suggestions—growing higher yield cotton, fattening hogs on acorns—must have had a great effect; but it was obscured by huge historical currents flowing against his efforts. The destruction of cotton crops by the boll weevil, along with the changes wrought by World War I, caused thousands to flock to cities, altering the landscape of American demographics. During the Great War, many immigrants from Europe left factory jobs to go back home and join their families or help defend their native lands. Southerners, both black and white, moved north to fill the vacated jobs. The widespread opinion in America of farming as low-class work, which Carver also tried to expose as a dangerous error, contributed to the mass exodus from country to city.

In Chapter 7 we will consider the possibility that it may be far more productive to look at Carver's ideas as solutions to errors that have been made in the field of farming rather than at his impact on farming as it is.

⁵⁷ Our best attempt at doing so appears in Appendix A.

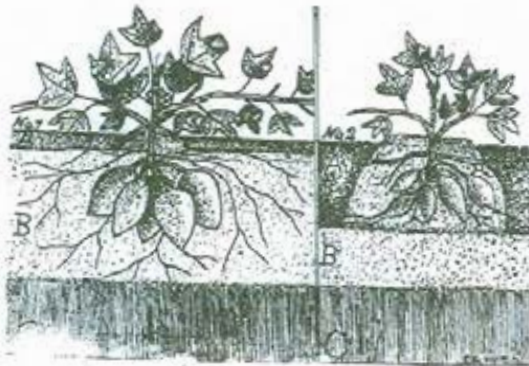


2-1. Carver holding a clump of soil, 1902



FIG. 1. Washed soils.

2-2. Badly washed soils, Tuskegee

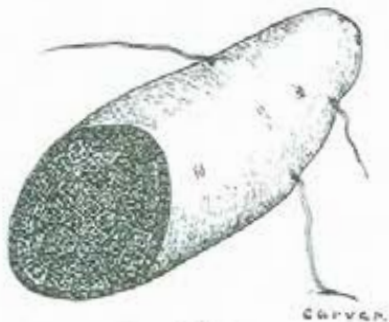


No. 1, Correct Cultivation

2-3. Depths of plowing



2-4. Justus von Liebig



The cut also shows a well matured potato, cells well filled with starch and sugar; the water reduced to a minimum. Such are essentially mature in the stocks of the various potato districts, and all other things being equal, keep well with but little effort.

2-5. Sweet potato diagram by Carver



2-6. Booker T. Washington in his garden



2-7. Nodules on roots of legume, by Carver



2-8. Working the Experiment Station, Tuskegee



2-9. Carver inspecting the Experiment Station, Tuskegee



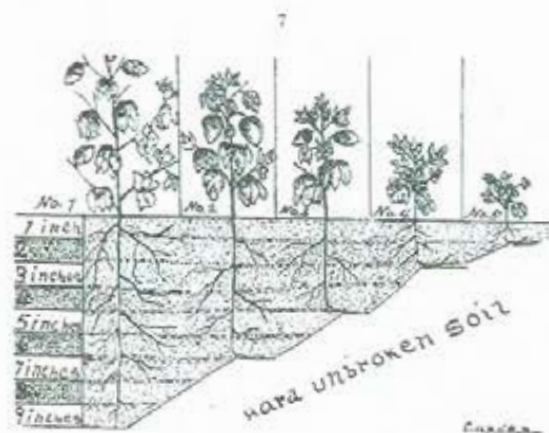
FIG. 3. Cotton stalks five feet high successfully turned under.

2-10. Cotton stalks plowed under



A Field of Carver's Improved Cotton

2-11. Carver's improved cotton



2-12. Depths of plowing--effect on cotton growth.

Research With Plant Disease and Mycology

Carver's interest in plant disease was lifelong. Visitors to the Carver Monument learn of neighbors calling him the "Plant Doctor" when he was a boy. In his often-quoted letter to Sophia Liston and Fitta Budd in 1897, he said: "Day after day I spent in the woods alone in order to collect my floral beautis [sic] and put them in my little garden I had hidden in brush not far from the house... And many are the tears I have shed because I would break the roots or flower off some of my pets while removing them from the ground, and strange to say all sorts of vegetation succeed to thrive under my touch until I was styled the plant doctor, and plants from all over the county would be brought to me for treatment."¹ In an interview in 1922 printed in the *Virginia Pilot* and the *Norfolk Landmark*, he added: "Often the people of the neighborhood who had plants would say to me, 'George, my fern is sick. See what you can do with it.' I would take their plants off to my garden and there soon have them blooming again... At this time I had never heard of botany and could scarcely read."²

At Iowa State

Carver arrived at the Iowa State Agricultural College—now Iowa State University—in February 1891, having just finished a semester of study at Simpson College in Indianola, Iowa.³ His new college was a coed school founded in 1858. Until his arrival, they had

¹ GWC to Mss. Liston and Budd [1897?], TIA, 1, 2.

² Daisy Nurney, "A Patient Scientist Works Out New Destinies For the Peanut," *Virginian-Pilot and the Norfolk Landmark*, November 5, 1922, IIA, 60, 377.

³ Iowa State, chartered in 1858 as the Iowa Agricultural College and Model Farm, became the nation's first land-grant institution when the General Assembly awarded it the state's land-grant charter in 1864. The college opened in 1868-69, and a class of 26 was graduated at the first commencement in 1872. Graduate study was offered almost as soon as classes began, and the first graduate degree was conferred in 1877. Iowa State has led the development of several fields of study that are

had no black students or professors. He was to become the first of both. At Iowa State, he learned technical terms for plants and fungi he had known, grown, grafted and loved. His training enabled him to add much to his experience as a naturalist by bringing to his attention, especially under the microscope, things he had not noticed before.

Not only did he gain knowledge, but his increased awareness of mycology also put food on his plate at times when funds were scarce. A young man working as a cook at Ames who shared banquet leftovers with the ever-frugal Carver remembered him in his room cooking mushrooms he gathered on walks, and sharing his meal.⁴

Carver added much to the College's herbarium and its mycology specimen collection. (Fig. 3-1, 3-2, 3-3) The present curator of Iowa State's Ada Hayden herbarium, Deborah Lewis, researched the relationship between Carver and Professor Louis Pammel (Fig. 3-4, 3-5), the prominent botanist who guided his studies for his master's degree. for a slide show she presented in 1999. She wrote in her notes: "Pammel quickly recognized Carver's interests and put him to work in the greenhouse, herbarium, and bacteriology laboratory. The two men did field work together and jointly co-authored at least two papers.⁵ Both had great skills of observation and put these skills to good use in their studies."⁶ In the 1897 letter to Sophia Liston and Etta Budd mentioned above, Carver wrote, "I received the prize offered for the best herbarium in cryptogamy."⁷ This last term refers to plants not producing flowers or seeds, including ferns, mosses and algae.

central to the land-grant movement, including engineering, agriculture, family and consumer sciences, and veterinary medicine. Extension, which celebrated its 100th anniversary in 2003, traces its roots to Iowa and early outreach programs by Iowa State's Adonijah Welch and Perry Holden, and the legislation establishing the national Agricultural Experiment Station system was written by Iowa State faculty members Seaman Knapp and Charles Bessey in the 1880s. Office of Institutional Research, Iowa State University, *Fact Book 2003-2004*. "History of Iowa State University." www.iastate.edu/~inst_res_info/FB04files/PDF04/FB04-01.pdf.

⁴ Graves to GWC, 2 November 1940, Guzman Papers, 1940. The writer of the letter was the brother of the young cook.

⁵ The papers are L. M. Pammel and Geo. W. Carver, "Fungus Diseases of Plants at Ames, Iowa, 1895." *Proceedings of the Iowa Academy of Sciences For 1895, Vol. III*, F. H. Conaway, State Printer, Des Moines, 1896, and L. M. Pammel and Geo. W. Carver, "Treatment of Currants and Cherries to Prevent Spot Diseases," Bulletin No. 30, Iowa Agricultural College Experiment Station, 1895.

⁶ Deborah Lewis, "Carver and Pammel: Outstanding Student, Beloved Teacher, and Life-long Friends." 1999 [Text for slide show]. For an example of the highly technical nature of Carver's work at Iowa State, see note 11 below.

⁷ See note 1 above.

His continual attentiveness to plants prior to entering Iowa State made him a field observer without equal, even among his distinguished professors. Pammel commented, "I never knew a person who could discriminate as well as Carver.⁸ ... He was the most wonderful collector I ever have known, much interested in collecting fungi among other things."⁹ Much later, in the 1930s, government mycologist Paul R. Miller said of him: "His ability as a collector of rare fungi is almost uncanny. I have been with him on collecting trips when half the specimens found would be the first record of occurrence in the state." Miller went on to cite Carver's scientific generalism as a contributor to his amazing skill, saying, "This is probably explained by the fact that Dr. Carver is a keen student of nature. Knowing the proper habitat of such fungi, it is easy for him to locate them. He not only knows botany but geology, soils, etc."¹⁰ (Fig. 3-6, 3-7, 3-8, 3-9, 3-10, 3-11)

Carver sent mycological specimens he collected at Iowa State to the prominent mycologist J. B. Ellis (Fig. 3-12) of Newfield, New Jersey, who then supplied fuller information on them. This note from Ellis, along with a three-page list of information on specimens Carver had sent, shows Carver's thoroughness in his studies: "Glad to have you put in all the notes + figures of spores with measurements + give names as far as you can. It all helps. The names you have given in this lot are mostly correct."¹¹

At Tuskegee

When Carver left for Tuskegee, he took along a sizable fungus collection of his own. He made mention of it in a letter of November 27, 1896 that is notable for antagonizing his new colleagues on Tuskegee's staff. Though that matter is not our subject, a little background may help in understanding the context. Since he was coming from a white institution, not a black one like Hampton, from which most of them came, he was on the wrong foot with them before he set his foot on campus. The room assigned to him for his living quarters was small, with insufficient space for his collections. Married couples on the faculty, however, had to fit into rooms the same size. Carver's letter, written about a

⁸ LCC Papers, 154.16g, 17.

⁹ LCC Papers, 154.16d, 53.

¹⁰ Rackham Holt, *George Washington Carver: An American Biography* (Garden City, NY: Doubleday, Doran, 1943), 320.

¹¹ J. B. Ellis, Newfield, NJ to GWC, 11 January 1896, UJA, 1. 754-57.

month after his arrival to the “Messrs. of the Finance Committee,” piled fuel onto the flames of their resentment. He wrote:

Some of you saw the other day something of the valuable nature of one of my collections. I have others of equal value, and along Agr. lines.

You doubtless know that I came here solely for the benefit of my people, no other motive in view. Moreover I do not expect to teach many years, but will quit as soon as I can trust my work to others, and engage in my brush work, which will be of great honor to our people showing to what we may attain, along, science, history, literature and art.

At present I have no rooms even to unpack my goods, I beg of you to give me these, and suitable ones also, not for my sake alone but for the sake of education. At the present the room is full of mice and they are into my boxes doing me much damage I fear.

While I am with you please fix me so I may be of as much service to you as possible... Trusting you see clearly my situation, and will act as soon as possible. I remain most Resp. yours, Geo. W. Carver¹²

Aside from the threat of mice was that of moth infestations, and—the one that would prove the worst—the Institute’s inferior protection against the rain and humidity of Alabama’s subtropical climate, especially compared to that of the well-financed Ames.

The website of the New York Botanical Garden has a section on a fungal collection of Carver’s that is housed there. Its author writes: “Very soon after his arrival at Tuskegee in 1896, Carver cooperated with Franklin Sumner Earle, (Fig. 3-13) the Chair of Biology and Horticulture in the Alabama Polytechnic Institute at Auburn, Alabama, in compiling a preliminary list of the fungi of Alabama which was later published. This study formed the basis of a relationship that lasted the entire time that Earle was in Auburn. In 1901, F. S. Earle came to the New York Botanical Garden, serving as the Garden’s first

¹² GWC to Messrs. of the Finance Committee, 27 November 1896, TIA, I, 771-72. Original in BTW Collection, Library of Congress.

mycologist.”¹³ In the Carver papers at Tuskegee is a 1903 letter from a William T. Home who was studying *Nectriae* under Earle’s direction, asking Carver for some fresh samples, to be grown “in artificial cultures for working out life histories.”¹⁴

At Tuskegee, Carver continued to add to his own collection. In August, 1899, he wrote to Pammel: “I have just returned from the seashore at Old Point Comfort, Va. had an excellent trip and made some valuable collections of fungi ect. [sic]”¹⁵ There is a record of a visit of Carver to Ames in July 1900 to visit Dr. Pammel and his wife and children, to work on the fungus collection and to study.¹⁶ This is probably the same visit referred to by a woman who worked for many years in Pammel’s office. She wrote in 1942 of Carver coming to visit for three days at home of the Pammels. Recalling her memories of him on that occasion, he said: “The two doctors spent most of their time sorting our duplicate herbarium specimens for the Tuskegee collection. He was overly genteel, pathetically shy, and bright as a new dollar. His sense of humor was much better than Dr. Pammel’s and the two of them had a lot of fun for the few days he was here.”¹⁷

In January 1901, Tuskegee published *Some Cercosporae of Macon County, Alabama*, Carver’s Experiment Station Bulletin # 4. In it, he wrote: “The exceedingly warm and humid atmosphere, together with the very remarkable fluctuations of climate and rapid development of fungus diseases under these favorable conditions, has made this study doubly interesting.”¹⁸ Later that year, in November, he wrote to William A. Orton, an Assistant Pathologist at the Bureau of Plant Industry in Washington, D.C.:

The fungus on peanut, that you sent me last winter, appears to be *Neocosmospora*, as you thought. I think it is most probable, however, that this is the cowpea fungus growing as a saprophyte on the mature peanut. The perfect stage of *Neocosmospora* appears to be always a saprophyte, and unless you have found an

¹³ New York Botanical Garden, “The Fungal Collections of George Washington Carver at NYBG,” <http://www.nybg.org/botcol/fung/Carver.html>

¹⁴ William T. Home, New York, NY, to GWC, 25 September 1903, TIA, 2, 1152.

¹⁵ GWC to Pammel, 2 August 1899, TIA, 1, 957.

¹⁶ GWC to BTW, New York, NY, 9 July 1900, TIA, 2, 15.

¹⁷ Elizabeth Tieman to Mr. Munns, 26 January 1942, TIA 67 [a], 589.

¹⁸ GWC, *Some Cercosporae of Macon County, Alabama*, Bulletin no. 4, Tuskegee Institute, 1901, TIA, 46, 32. This bulletin lists about 85 *Cercosporae* and their hosts.

unmistakable case of wilt on the peanut, where the plants exhibited signs of injury, I should not feel like calling the fungus parasitic on the peanut. The case is a very interesting one, however, and I am indebted to you for calling my attention to it.¹⁹

In February, 1902, Carver wrote to Pammel: "I am sending you a few specimens of Fungi which I think you will find interesting... I have a great many more but it seems that I never find time enough to get things in definite shape, although my building is almost through its most recent metamorphosis, if I may term it so, which gives me a nice large herbarium room and an additional museum room."²⁰ In early May of the same year, he was collecting fungi for Professor Pammel on pine and cedar.²¹

Starting in mid-May of that year, Carver lost many specimens in his collection to leaks through the roof of his museum. On November 5, he wrote to architect Robert R. Taylor:

If you come over now you will find the new part of the museum leaking in ten places which, however, is not as bad as it leaks when it rains very hard. People naturally wonder why things are not in first class order and feel that proper effort is not put forth to put them in order. No one knows but myself how many specimens of my valuable collection from Iowa and West have been ruined. I had hoped to leave this collection in toto for Tuskegee, but every rain brings partial destruction which in time means total destruction. No one feels this more keenly than myself as it simply means destruction of a series of years' work.

I had when I came here one of the largest collections of Western plants, but the lapse of time, insect depredations, rain, and other causes are reducing it pretty fast... You will observe leaks in the laboratory and my office as well... I have carried specimens here and there until I am exceedingly tired as I can see that I am not accomplishing much.²²

¹⁹ Wm. A. Orton to GWC, 27 November 1901, TIA, 2, 62.

²⁰ GWC to Pammel, 12 February 1902, TIA, 2, 217, original in Iowa State Archives.

²¹ GWC to Pammel, 1 May 1902, TIA, 2, 339.

²² GWC to R. R. Taylor, 5 November 1902, TIA, 2, 476.

In a letter to Booker T. Washington on the day of Christmas Eve, he catalogued the effect on his collection:

Date	Inches of Rain	Number of Specimens Destroyed
5/14	.48	15
5/15	1.19	42
5/16	.25	15
6/18	.20	20
6/20	.37	39
7/4	.60	75
7/15	.80	12
8/2	.30	18
8/11	.20	5
8/28	1.40	35
9/3	.20	4
9/4	.60	30
9/24	2.08	48
9/29	.49	3
10/25-6	2.24	50
11/4	2.22	37
11/25	.82	14
11/30	1.00	6
12/2	.50	15
12/16	4.65	45
12/21	.46	3

In the letter that includes this table, Carver wrote to the Principal:

I have constantly been reporting these conditions and as yet nothing has been done. What specimens remain are more or less moulded by reason of the dampness but I am cleaning them off and placing them as rapidly as I can. The situation is rather discouraging. I should indeed be thankful if some radical steps

might be taken to stop these leaks. You can readily see that the collection will soon be a thing of the past and besides it does not give one very strong encouragement to build up a good strong herbarium.

I possibly feel more keenly about this matter than I would if I had not given the specimens. Every specimen represents a particular locality and has been collected, named and mounted by me and when it is being destroyed by actual neglect I cannot help but feel keenly about it.²³

Six days later, Carver wrote, on a more upbeat note, to Pammel: "I presume that you have seen my list of new fungi which was published in the *Journal of Mycology* by Drs. Everhardt and Ellis... Moths have injured some of [the Iowa specimens] yet there are many that have kept remarkably well."²⁴

Carver's reference was to an article mentioned on The New York Botanical Garden's website: "Job Bicknell Ellis, a prominent mycologist whose herbarium was purchased by NYBG, received many valuable specimens in return for aiding Carver in identification. It is suspected that Carver's collections ended up at NYBG because of his relationship with J. B. Ellis. In 1902, Ellis collaborated with Benjamin Matlack Everhart on an article entitled 'New Alabama Fungi' which listed 60 important species he had received from Carver. Included on the list were two new species that Ellis and Everhart named for the Tuskegee scientist." On the NYBG website there is a photo of one of the two species Ellis and Everhart named for Carver, *Metasphaeri Carveri*.²⁵

The Spiritual Side of Carver's Mycology

Carver's mycological work, like all his work, had its roots in his ability to find God in nature. His ability to spot things experts missed may also be explained by his sense that he was surrounded in the woods, not just by objects of study, but by friends. When a

²³ GWC to BTW, 24 December 1902, T1A, 2, 507.

²⁴ GWC to Pammel, 30 December 1902, T1A, 2, 513.

²⁵ See note 13 above. The Garden's website says: "The fungus herbarium at The New York Botanical Garden has more than 100 specimens collected by Carver. Most of these specimens are represented in the exsiccata "Fungi Columbiani" by Ellis & Everhart. It is suspected that many more of Carver's collections exist in the herbarium."

woman wrote to him, "A friendly tree is nodding its branches almost into my windows, which are completely surrounded by heavy green vines,"²⁶ he replied. "Friendly tree is just the proper designation as all of God's great handiwork is friendly, and it is only as it becomes distorted by ourselves that it becomes an abomination or discorded."²⁷ For him, fungi were as friendly as green trees and leafy vines. A writer from *Alexander's* magazine in Boston observed in 1906. "He is a lover of the beautiful and he is able to see the beauty in the rapidly decaying bark of a tree as well as in the rose."²⁸

Carver's studies of fungi under the guidance of Professor Pammel gave him a penetrating look at the reverse of nature's coin—the side of death. He found it no less beautiful or spiritual than what most folks regard as life and growth. He said. "Strange and marvellous things in Fungi and other forms of plant life... show the majesty, power and glory of God as I believe nothing else does as they are all microscopic forms."²⁹

Throughout his life, his treks collecting fungi were no less than spiritual quests. He left no record of his walks at Ames, but said of one in Alabama: "One day after I returned from the woods something kept telling me. 'Go back, go back. You haven't got it all yet.'"³⁰ He wrote to Jim Hardwick in 1931: "Just last week I went out collecting some fungi (plant diseases) every day and many times per day since. The urge came to go back. I had left the grandest of all... This urge came so strong that I went back this afternoon. My I had not even touched the marvelous beauty that was there. I stayed in the one spot about as large as my little 'den' and collected for nearly an hour."³¹

On some such walks, his spiritual sight was opened. He wrote, again to Hardwick:

I went to the woods, got just behind the steam plant. God seemed to burst forth in such a startling way. Everything I touched seemed to say, "O God how wonderful are Thy works. In Wisdom Thou hast made them all."

²⁶ May Brunner, St. Paul, MN, to GWC, 29 May 1939, TIA, 29, 610.

²⁷ GWC to May Brunner, 2 June 1939, TIA, 29, 703.

²⁸ *Alexander's Magazine*, Boston, May 1906, 32, TIA, 60, 23.

²⁹ GWC to James T. Hardwick, 7 December 1930, TIA, 12, 541.

³⁰ Glenn Clark, "In the Upper Room With Dr. Carver," enclosure with letter of 17 April 1939, TIA, 28, 1136. Clark's essay concerns a meeting held on 18 March 1939 in a hotel room in Minneapolis where Carver was staying.

³¹ GWC to Hardwick, 10 February 1931, TIA, 12, 787. Hardwick was one of Carver's "Blue Ridge Boys."

I picked up dozens of dead twigs, such as old okra stalks, bean vines, dead leaves that had fallen from the trees, etc., etc.... All were teeming with the most simple (in some cases) and the most marvellously complex compound microscopic life.

Carver saw the coin of life and death as one thing, all alive. Continuing his story of his walk behind the steam plant, he drew this lesson: "The thing we call death in the plant is only a preparation for myriads of actual microscopic plants that could not have existed had those plants not given up their lives as we term it. How wonderful."³²

In July 1907, Carver wrote to Pammel: "I am now compiling a permanent list of the fungi of Macon County, Alabama."³³ This may have been in connection with Carver's period of focus on the resources of Macon County. This period began with a conversation with Booker T. Washington. As Carver's work was shifting from the classroom to lab work, Dr. Washington was hatching a plan for using Carver's talents in making displays and teaching rural people, which would involve much time on trains. Carver recalled:

Dr. B. T. Washington called me to his office to discuss the possibilities of an exhibit on health, especially as it applied to the rural people. This was to be placed in a railroad coach and taken all over the South.

I made the suggestion that we ought to go further, that we should analyze everything in Macon County (the county in which Tuskegee Institute is located) and as far as possible show the commercial possibilities of each thing analyzed. This met with his hearty approval and support as long as he lived.³⁴

Though Carver presented his idea as an extension of the Principal's, it was entirely different. He appealed to Washington's desire to see Tuskegee's work commercialized, and also to Booker's loyalty to Macon County. Washington, himself a frequent long-distant traveler, envisioned Carver taking a train-car classroom through the South. But until the coach was ready, Carver, who preferred a settled life, would do just what he loved the best—a wide examination of nature near his home. He never did take a "train

³² GWC to Hardwick, 29 November 1931, TIA, 13, 258.

³³ GWC to Pammel, 2 July 1907, TIA, 3, 1245.

³⁴ GWC, "Some Commercial Possibilities of the South" (typed manuscript, [n.d.]), TIA, 47, 166.

classroom” through the South.

Deborah Lewis writes in her notes: “Carver... continued his work in mycology and plant diseases at Tuskegee, yet he didn’t have a good facility for maintaining his collections. So he contacted Pammel, asking if the collection could be sent to Iowa State. He asks, “Can the school use such a collection?” Obviously it could, and at least 300 fungus specimens, several of which were types, or the specimens upon which a new species is based, were sent here and are still a part of the holdings of the Ada Hayden Herbarium.”³⁵

Carver did not write the letter Lewis mentions until July 23, 1919.³⁶ Pammel’s letter of acceptance is dated August 28 of that year.³⁷ Carver sent the collection in batches, leading to a couple of letters of thanks from Pammel, one on October 29³⁸ and another on December 1.³⁹

When Anna Jenkins of the USDA, the woman responsible for the naming of *Taphrina carveri*, asked Carver in 1938 for a specimen of that *Taphrina* he had collected in 1897, he answered: “Back as far as that I had a very large collection including my work in college in Iowa. It consisted of many hundreds of specimens. Coming down here I found it difficult to take care of them. In fact, I had no place to put them. Some were lost, others damaged so that they became unrecognizable. So, I gave the entire collection to my college at Ames, Iowa. No doubt they have a specimen.”⁴⁰

Bacteriology

Carver’s knowledge of bacteriology came into use frequently in his lab work in connection with the Experiment Station. In Chapter One we noted the multiplicity of his activities in the lab, especially around 1910-15 but continuing until his death. Lucy Crisp, the young friend of some of Carver’s “Blue Ridge Boys” who wanted to write a biography of Carver, left this description of him doing bacteriological work: “While

³⁵ See note 5 above.

³⁶ GWC to Pammel, 23 July 1919, TIA, 6, 257.

³⁷ Pammel to GWC, 28 August 1919, TIA, 6, 302.

³⁸ Pammel to GWC, 29 October 1919, TIA, 6, 362.

³⁹ Pammel to GWC, 1 December 1919, TIA, 6, 402.

⁴⁰ GWC to Anna E. Jenkins, 30 August 1938, TIA, 25, 567.

Delaney got his camera ready, I watched Dr. Carver take a bit of something on a knife point from a bit of wood, put it in a drop of water on a slide and examine it under his microscope. 'I've been trying to get to this for two days,' he said. When he'd taken a long look, he took out the slide, cleaned it, and put it away. Then with a stubby pencil he drew something on an old envelope he picked up off his desk, the name of the disease attacking the plant.⁴¹

William Walter Thompson, once the mayor of the town of Tuskegee, wrote this recollection to Carver from Florida on how his bacteriological analyses served his humanitarian ideals:

In 1909 to 1914 I was developing the old farms, and doing conservation work on old lands that had been worked for one hundred years, by using the methods that you had used and the information from you. I improved the health of all my tenants, who were suffering with malaria, chills and fever. One day you suggested some of the sickness might be caused by bad water, so I had all the surface wells filled, and put down fourteen artesian wells. You analyzed [sic] the water, and pronounced it good. My tenants' health improved, so you rendered a great service to humanity.⁴²

Services to Agriculture Through Mycology

Carver also analyzed fungi on peanuts, and other crops, for private interests. The greatest beneficiary of his expertise was the Tom Huston Peanut Company of Columbus, Georgia,⁴³ but he also helped others. His services were always free. In the well-known incident in New York City where the *New York Times* criticized him for saying that his scientific discoveries were from God, the initial, favorable article in the *Times* quoted him saying: "I've never received any money for my discoveries. Somebody who had

⁴¹ LCC Papers, 154.20.

⁴² W. W. Thompson, Sanford FL, 13 June 1941, TIA, 35, 825.

⁴³ Carver's correspondence with Huston and his employees at Tom's Foods in Columbus, GA covered a period from the 1924 (see TIA, 8, 365) until the end of Carver's life. His friends there, aside from Huston, were Bob Barry (Shelling Dept. Manager), Gladys Porter (Shelling Dept.), Wade Moss (Chemical Director) and Ford Davis. Huston had a bas-relief made of Carver which was unveiled

benefited by one of my products from the peanut sent me \$100 the other day, but I sent it back to him.”⁴⁴ J. H. Hunter wrote of this in his book *Saint, Seer and Scientist*:

There was trouble with the peanut in Florida. A disease had blighted the plants. What can the growers do? Send it to Dr. Carver. You may see the plant in the museum. He examined it, noted the trouble, sent back the remedy, and Florida has no more trouble with that disease. The grateful people sent him a cheque for \$100 in appreciation of his service. The cheque was promptly returned with the statement that the Creator had not charged anything for putting the plant on the earth, and Dr. Carver could not think of accepting any money for doing the Lord's work.⁴⁵

Correspondence on Fungi

Two letters of Carver's to Alonzo P. Meadows, an attorney in Ocala, Florida, in the spring of 1939 provide an excellent sample of his correspondence with people seeking information and advice about fungal attacks on their crops. Meadows sent him a cantaloupe, along with its vine and a sample of the soil in which it had grown. Carver first asked for more information. He wrote: "What kind of fertilizers were used, and what kind of crop preceded the cantaloupes? Look at the vines that have lain on the ground for some time and see if they are not covered with a white mold in which there are tiny egglike bodies. If so I should like to have a sample of them. Also see if this mold is not very general among the diseased plants and how widely distributed throughout the cantaloupe growing section this disease is found."⁴⁶

Two weeks later, in mid-June, having received the information he sought from Meadows, he wrote again:

at Tuskegee's Commencement in 1931. It is pictured in McMurry, 226, where McMurry discusses his dealings with the company, 220-26.

⁴⁴ "Negro's Chemistry Astounds Audience," *New York Times*, 19 November 1924, 5.

⁴⁵ J. H. Hunter, *Saint, Seer and Scientist: The Remarkable Story of George Washington Carver of Tuskegee, Alabama* (Toronto: Evangelical Publishers, 1929), 15.

⁴⁶ GWC to Alonzo P. Meadows, Ocala, FL, 30 May 1939, TIA, 29, 646

I incubated a portion of the vine and also a portion of the cantaloupe that you sent. I find that it is attacked by two principle troubles; one a bacteriological disease, and the other a fungus. Both are unusually destructive. I believe that if a mycologist would examine the roots very carefully that he would find perfect fruiting bodies that are very small, pink in color, belonging to the same disease that affects wilt of cotton, that is, *Neocosmospora*. First I found great quantities of *Fusarium* sp. (probably *Oxysporium*). This is probably the conidial stage of *Neocosmospora vasinfecta* which is also very destructive. The composition of your soil is such that would encourage wilting as it is practically void of organic matter, and with the high fertilization naturally encourages wilting. I am not sure about the variety of melon that you are planting, but the disease being universal, I believe that if the soil conditions were improved by putting in plenty of organic matter, either plowing in green crops or other forms of organic fertilizers in accordance with the bulletin I am enclosing, I believe that you can master the situation... It may be that these seed that you are using are susceptible to these wilts. If you can get any further information I should like very much to have it as I am very certain that the conditions can be overcome. Were I near enough to you I would inspect the different areas personally.⁴⁷

It might seem instructive to know more of Carver's mycological work around peanuts, but, as this letter suggests, one would have to have quite a lot of technical knowledge to get much interest out of it. In support of this, we include a letter to Dr. Shear, the Principal Pathologist in Charge at the USDA's Division of Mycology in 1932, which shows how highly technical Carver's work could be. He wrote:

I shall be interested to know if Dr. Chupp recognizes the *Cercos.*, or *Helmin.*, or *Broussonetia*. Thank you also for your notes on *Tryblidium* and *Tryblidiella*. I have examined many, many specimens from various patches of *Ilex Vomitoria*, and every one so far is *Tryblidium*, just one septate, although when I first came to Tuskegee 28 years ago I collected *Tryblidiella*.

⁴⁷ GWC to Meadows, 13 June 1939, TIA, 29, 380.

I remember also that when I came to Tuskegee, *Meliola* was abundant on many hosts. For the last few years, I have not been able to collect a single specimen, showing as you said before that they seem to disappear suddenly.

I shall be on the alert for all forms of *Tryblidium*s and *Tryblidiell*as for you on various hosts.⁴⁸

Contact With the USDA

The bulk of Carver's correspondence with the Division of Mycology began around 1930. In 1907, after Carver asked Pammel to refer him to a good mycologist, saying, "Since the death of Prof. Ellis I have been very much at sea," Pammel referred him to someone in the USDA. No one, however, seems to have proved a satisfactory substitute for Ellis. Carver's interest in fungi returned to the fore due to the enthusiastic energies of two employees of Tom Huston's company, Bob Barry and Grady Porter. They wanted to collect information on peanut diseases and realized that, with Carver willing to help them, they could do valuable work. Carver wrote of Barry's and Porter's work in a 1931 letter to J. J. Taubenhaus a mycologist at an Agricultural Experiment Station in Texas, saying that "neither time, pains nor expense were spared, even to that of making two trips to the peanut sections of Virginia and North Carolina." He added, "They collected many packages and are still sending them in from sections wherever the diseases are found... I am now working on a general collection of fungi found here in the South... I have now about 1500 specimens."⁴⁹ Six years later he recalled to Anna Jenkins, an Associate Mycologist for the USDA's Bureau of Plant Industry: "Within recent years I took a notion to do some more collecting and have now a rather nice workable set of mycological data."⁵⁰

From his letters to USDA personnel quoted thus far, it is not hard to see why they were impressed with his knowledge. Here is another of his notes to Dr. Shear, again from 1932: "It seems strange there is plenty of *Brous*. [*Broussonetia*] *Papy*. around here, but I have found it on just a few trees for three years in the same place on the same trees, and

⁴⁸ GWC to Dr. C. L. Shear, 7 November 1932, TIA, 13, 1028. Original held by Carver Monument.

⁴⁹ GWC to Dr. J. J. Taubenhaus, College Station, TX, date, TIA, 12, 953.

the same side of the tree (the west side)."⁵¹ In 1934 he wrote to Shear: "O yes, I am indeed interested yet in fungi and do quite a bit of collecting. Of course, many specimens are sent to me from cultivated plants."⁵²

Dr. Shear's regard for Carver's expertise was further boosted by his findings of particularly rare fungus species. He wrote to Carver of a finding of his on a cedar tree, an alien ornamental, in January 1935: "The most interesting specimen is that on *Cedrus deodara*. This is *Nectria chlorella* (Fr.) Tul. I have been unable to find any record of its occurrence in this country, and no record of its having been found on *Cedrus* anywhere before. I hope you will be able to find some more of it. Your eyes are evidently still sharp to see this."⁵³

Collaborator With Mycology Disease Survey, USDA

It became so obvious to people at the Division of Mycology that Carver was a tremendous asset to them that, in 1935, when he was seventy-one, they appointed him a Collaborator for the USDA's Mycology Disease Survey. He wrote on August 20 of that year to his new main contact there, Dr. John A. Stevenson: "I wish to say again that my being made a Collaborator is an honor that I had not expected, and I do not feel really equal to, as I am quite certain that I will not be able, as far as benefits are concerned, to give you in return that which I will receive."⁵⁴ Six days later, he wrote to Associate Pathologist W. W. Diehl: "My meager facilities for identification handicap me very much and as a result I will get a number of them wrong."⁵⁵ The following month he wrote to Stevenson: "I go out now rather frequently, I can't cover very much ground, however, but I am finding some very interesting things."⁵⁶

Stevenson emphatically agreed. In December he wrote: "Your collections for the season make a most interesting series, and we have been devoting considerable time to working

⁵⁰ GWC to Jenkins, 30 August 1938, TIA, 25, 567.

⁵¹ GWC to Shear, 11 October 1932, TIA, 13, 851.

⁵² GWC to Shear, 8 September 1934, TIA, 17, 428. Original held by Carver Monument.

⁵³ Shear to GWC, 24 January 1935, TIA, 17, 856. Original held by Carver Monument.

⁵⁴ GWC to Dr. John A. Stevenson, 20 August 1935, TIA, 18, 95.

⁵⁵ GWC to W. W. Diehl, 26 August 1935, TIA, 18, 114.

⁵⁶ GWC to Stevenson, 30 September 1935, TIA, 18, 288.

them over.”⁵⁷ Carver wrote to Stevenson the following May: “I am happy to learn that the miscellaneous collections which I am sending from time to time are not a bore to your department. I am very much interested in them myself, and to have them verified is a service for which I am more grateful to you than I can express. As the spring season comes on diseases are beginning to develop, and I shall be sending them in from time to time.”⁵⁸ A letter that June to Ford Davis of Phenix City, Alabama, one of his white “sons” who had an interest in science, said, “I am just getting off my 480th specimen to them.”⁵⁹

Taphrina Carveri

In late 1937, Anna Jenkins took the initiative to name a specimen for him. It was a *Taphrina* that Carver had, long before, discovered on a silver maple tree among a batch of trees that had been donated to Tuskegee. Jenkins arranged to have it named *Taphrina carveri*. The Council Bluffs, Iowa *Nonpareil* later mentioned that this “fungus that destroys leaves of the silver maple was named *Taphrina carveri* because he collected and made specimens of this parasite many years ago.”⁶⁰ Jenkins wrote of the specimen to Carver on October 1, 1938: “The photographs of Carver 153 which I mentioned in my letter of September 22 are now available, and I am happy to send you one of each. This will give you a representation of your gathering of *Taphrina* on *Acer dasycarpus*, on April 30, 1897, at Tuskegee that could be filed as a herbarium specimen, if you wish. This is what I plan to do with one set of these prints.” Jenkins also wrote of a specimen on a red maple, *Acer rubrum*, which had gotten her attention:

Relative to Carver 154, I am sorry I did not have a photograph made of the specimen bearing this number that you sent Ellis, but this can be done later. As I wrote this is labeled *Exeasus?* On *Acer saccharina* 154, Apr. 29, 1897. G. W. Carver., Tusk.

⁵⁷ Stevenson to GWC, 17 December 1935, TIA, 18, 658. The results on the USDA “workover” of Carver’s specimens may be found at TIA, 18, 916-18.

⁵⁸ GWC to Stevenson, 1 May 1936, TIA, 18, 1255.

⁵⁹ GWC to Ford Davis, 2 June 1936, Schomburg collection.

⁶⁰ “Named for Chemist,” *Council Bluffs Nonpareil*, June 17, 1939, TIA, 61, 1024.

I note that you collected this on the way back from Notasulga, where on the same day you also collected the specimen of Carver 154 on *Acer rubrum* which initiated our correspondence. It seems that you have made two collections on the same day which you gave the same collection number. I will regard them as separate specimens bearing the same number. When I critically examine the one from the Ellis collection, I can further verify the host which looks like the *Acer rubrum* by the size of the accl.⁶¹

When Jenkins sent Carver some questions about the batch of trees that included the *Taphrina*-affected silver maple, he answered: "I have answered the questions as best I could. This is not much information that I could get hold of because there are only two persons here that would know anything about this donation. The trees came from some nursery and they told me that when I first arrived that they came from Iowa. They were evidently about two years old when they were sent down as nursery men do not like to ship larger trees. There were quite a few of them, forty or fifty, but the soft maple *Acer dasycarpum* do not thrive in this locality. There are four or five of these trees left now just struggling for existence. They were just little tiny switches when I came."⁶²

Of note to Missourians is that, in one of Jenkins' letters to Carver, she mentions that a Dr. Maneval had collected and sent her specimens of *T. carveri* from Missouri.⁶³

In January, 1938 Carver wrote to Miss Jenkins of her action on behalf of recognizing him: "I don't feel that I am worthy of that distinction as it is through you that all this was worked out. I have done but very little except to collect the material."⁶⁴ In a letter the following month to Dr. Stevenson, Carver may have been dropping a hint regarding another of his finds when, along with a specimen of a *Sphaeropsis* on a peanut, he wrote: "I have never heard of a *Sph.* occurring on this plant... I am wondering also if you ever succeeded in finding name for the *Cercospora* on *Nandina domestica*."⁶⁵ Stevenson replied: "We... find no reason why the fungus present should not be referred to

⁶¹ Jenkins to GWC, 1 October 1938, TIA, 25, 1066.

⁶² GWC to Jenkins, 20 February 1939, TIA, 27, 1155.

⁶³ Jenkins to GWC, 18 July 1939, TIA, 30, 217.

⁶⁴ GWC to Jenkins, 4 January 1938, TIA, 22, 1337.

⁶⁵ GWC to Stevenson, 2 February 1938, TIA, 24, 52.

Sphaeropsis malorum Pk." He added, "Occurring as it does on an herbaceous stem, this makes a very interesting specimen."⁶⁶

The Pleasure Anna Jenkins Derived from Corresponding with Carver

Some of Carver's correspondence with Anna Jenkins provides great examples of the kind of personal pleasure people so often derived from his letters. In September 1938, while Jenkins was extending her work with the *Taphrina*, including *T. carverii*, for a presentation, he commented: "It is a great satisfaction to have you search out these specimens and trace them as you have. It requires a great deal of skill to do this; in fact unusual skill."⁶⁷ Jenkins replied: "I am gratified to learn through your most delightful letter of Sept. 27 that you were equally pleased as I was with the result of your efforts in tracing your classic and most valuable specimens. The efforts were mutual, I assure you, and I return to you the compliment you so kindly paid me."⁶⁸

In November, Jenkins wrote: "At the forthcoming mycological meeting at Richmond where the American Association will meet this year, I am to present my paper on the species of *Taphrina* on red maple and that on silver maple. Photographs of your available specimens will be shown as well as lantern slides or be otherwise exhibited."⁶⁹ In two letters Carver wrote to her that month, he wrote, "I know it will be so enlightening,"⁷⁰ and then, "I can just imagine how you will open the eyes of that highly intellectual body."⁷¹

Then the following March, Jenkins wrote to Carver that her findings were to be published in a mycology journal. He replied: "I am not surprised at the interest taken in your findings as I do not know of anyone else who could and would keep on working and putting different little threads of evidence together until the facts were collected as you have them. You are not only a scientist, but an artist as well, and I know without ever

⁶⁶ Stevenson to GWC, 9 February 1938, TJA, 24, 258.

⁶⁷ GWC to Jenkins, 27 September 1938, TJA, 25, 971.

⁶⁸ Jenkins to GWC, 1 October 1938, TJA, 25, 1066.

⁶⁹ Jenkins to GWC, 15 November 1938, TJA, 26, 572.

⁷⁰ GWC to Jenkins, 21 November 1938, TJA, 26, 729.

⁷¹ GWC to Jenkins, 29 November 1938, TJA, 26, 859.

hearing you that you are a most attractive speaker.⁷² After Jenkins' description of the two new species of *Taphrina* appeared in the May number of the "Journal of the Washington Academy of Sciences,"⁷³ he wrote to her: "I never thought that so much could be gotten out of the small amount of work which I was able to render you. It shows very conclusively what a master mind can do. I know you will forgive me for feeling very much puffed up and chesty over the name *Taphrina carveri* n. sp."⁷⁴

Jenkins drew this conclusion from her correspondence with Carver: "Through your letters, which are always delightful and most encouraging... I have discovered... that you have the simplicity that goes with greatness."⁷⁵ Carver replied with his characteristic modesty: "I was rather surprised at the high compliment you paid my letters because I felt that they were so mis-jointed and disconnected."⁷⁶

Extraordinary Finds

Carver continued making findings that were exciting to people at the USDA Division of Mycology until the last year of his life. In April of 1942, within a year of Carver's death, J. A. Stevenson wrote to him of a find on a length of rotting rope: "Miss Cash, of the herbarium staff, has determined the fungus on the old cord as *Orbilia decipiens* (Phill.) Sacc. She notes that this is the first specimen we have ever received of this species, but she finds that your material agrees very well with the description. This fungus was described originally as occurring on old twine in Great Britain, and your specimen is apparently the first record for America."⁷⁷ Then in June of that year, Stevenson wrote of a specimen, the host for which is not named, but, judging by the binomial for the fungus, was likely a poppy plant: "A *Cercospora* on this host has been but rarely reported for this country... This species (*Cercospora papaveri*) has been heretofore known only from Brazil."⁷⁸

⁷² GWC to Jenkins, 10 March 1939, TIA, 28, 207.

⁷³ Jenkins to GWC, 25 April 1939, TIA, 28, 1342.

⁷⁴ GWC to Jenkins, 9 June 1939, TIA, 29, 808.

⁷⁵ Jenkins to GWC, 30 June 1939, AWC Papers, 1932-9.

⁷⁶ GWC to Jenkins, 6 July 1939, TIA, 30, 1307.

⁷⁷ Stevenson to GWC, 4 April 1942, TIA, 40, 852.

⁷⁸ Stevenson to GWC, 29 June 1942, TIA, 41, 1058. Original held by Carver Monument

In August, Carver acknowledged receipt of a published recognition of his discovery: “This is to thank you for Volume 26 of *The Plant Disease Reporter* carrying a notice of the two *Cercosporas* newly reported in the United States. May I ask that you and Messrs. Muller and Chupp name my specimen, as I am not sufficiently versed in mycological lore for an undertaking of that kind. I can simply collect the specimens, and in a rather imperfect way put them into the great group to which they belong, and that is about as far as I can go... With the hope that you will understand how grateful I am to you for your continued assistance in identifying specimens for me.”⁷⁹ This last sentence shows that Carver, in his work for the USDA, received the benefit of having his most puzzling finds analyzed and identified by experts with more personnel and resources at their disposal than he had. Carver’s request that someone besides him name his rare find might be seen as a tactical move. While he, as is true of many people in taxonomical science, would have been delighted to have the *Cercospora* bear his own name, he would not have suggested that idea himself.

A resume of Carver’s fungus collection for the USDA, compiled by Paul L. Lentz and John A. Stevenson after Carver’s death, may be found in the Tuskegee University microfilms of Carver’s papers, reel 59, frames 368-390.

⁷⁹ GWC to Stevenson, 14 August 1942, TIA, 42, 725.



3-1, 3-2. Carver specimens for Iowa State--hepatica and ambrosia

3-3. Professor Louis Pammel
1894



3-4. Professor Louis Pammel in the field



3-5. Carver with his field specimen case,
1937



3-6. Carver in the field inspecting leaves,
Long Island Expressway, 1939



3-7. Carver at Rockefeller Center, New
York, inspecting a tree with the Center's
horticulturist, 1939.



3-8. Carver walking with sticks, probably for fungus specimens



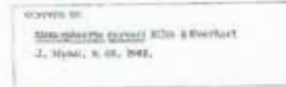
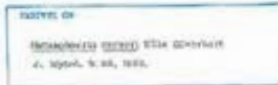
3-9. Carver with microscope, with twigs for inspection



10. Carver looking into microscope



3-11. Job Bicknell Ellis



3-12. Franklin Sumner Earle



Metasphaeria carveri K. & P. (n. sp.) and others of the same genus. Charles Carver, Carver, Iowa, 1898. The fungus was found on the twigs of the white pine, Pinus strobus, and was found to be a new species. It is characterized by its long, slender, cylindrical fruiting bodies, which are borne on the surface of the twigs. The fruiting bodies are arranged in clusters and are often found in the leaf axils. The fungus is a parasite of the white pine and is common in the region of Carver, Iowa.



near St. Joseph, Mo.
near St. Joseph, Mo. - same locality

3-13. Metasphaeria Carveri

Carver's Work With Wild Plants As Food and Medicine

We began the last chapter with the statement that Carver's interest in plant diseases was lifelong. The same was true of his knowledge of wild plants as foods and medicines. He spoke of this in an exchange of letters with Lyman Ward that began when Ward read this letter of Carver's to the *Montgomery Advertiser* of February 14, 1940:

In talking with a farmer yesterday he boasted that he was living more cheaply this Winter than he had in many years: that he raised a fine lot of sweet potatoes, and that his dinner consisted of two large baked potatoes and he had such a good dinner. I told him he did not have a good dinner, had just a stomach full of baked sweet potato which would sustain life for a considerable length of time, but could not supply practically any of the vegetable salts found only in green leafy vegetables and which the body must have or the individual cannot think clearly or render a good day's work physically.

I took this man and showed him the dandelion, a plant unusually rich in not only some of the vegetable salts found only in green leafy vegetables and which the body must have, but other food essentials as well. A good plate of dandelion greens cooked just like turnip greens, or a very rare dish composed of wild onions, seasoned and fried done, and at this point stir in an egg or two, he could have rightfully boasted of having a good dinner, and along with his baked potato, a dinner quite inexpensive but very appetizing and nourishing.

His attention was called to the Curled Dock, a delicious wild green which can be cooked like turnip greens or prepared as spinach with hard boiled egg.

One of the wild primroses, commonly called Butter Weed is a delicious wild vegetable, to be cooked the same as turnip greens.

All these three mixed together and cooked make an ideal vegetable dinner of greens. Where bacon cannot be had, use the peanut oil, peanut butter, or bacon rinds.¹ (Fig. 4-1, 4-2)

The next day, Ward, a Southern white, wrote Carver:

When I was a little boy a part of my regular diet in the spring time was dandelion greens. We also had what we called cowslip greens. I do not remember to have eaten any wild onions but we used to have leeks. There were many other wild products which we had on our table when I was a boy. In this connection permit me to say we seldom ever called our family Doctor. My grandmother had her attic filled every autumn with all sorts of herbs. Whether these herbs had a medicinal value or not I do not know. Any way there was an herb for every sort of disease and we all survived and most of us are living yet.²

Four days later, Carver replied: "You have described almost identically the way I was brought up. Never a spring came that we didn't have our wild greens. They were a part of our regular diet... They did indeed have distinct medicinal value. Our medicines before we learned how to make so many artificial products came from plants largely." He added a specific note: "The leek is of the wild onion family."³

As this exchange makes clear, neither Carver nor Ward found it necessary to separate the roles of wild greens as food and as medicine. They ate, for example, dandelion greens as salads and, since dandelion greens are a cleansing tonic especially good for the liver, received the added benefit of a dose of preventive medicine. A writer for the *Southern Workman* wrote in 1916: "Carver... eats food for medicinal purposes—tomatoes for this, beans for that, rape for another trouble, cabbage for another, watercress for another,

¹ GWC, "Choice Wild Vegetables Available Now," *Montgomery Advertiser*, 14 February, 1940, TIA, 46, 859.

² Lyman Ward to GWC, 15 Feb. 1940, TIA, 32, 1063.

³ GWC to Lyman Ward, 19 Feb. 1940, TIA, 32, 1068.

liquor of pine needles for colds, dandelions for something else.⁴ He knows and eats a score of vegetables that other people sneer at as weeds. He has a small range in his room, and when the bill of fare in the dining-room is not to his liking or to the benefit of his health he goes out into the seemingly barren fields, brings in things, cooks and eats them, and is happy and healthy."⁵

Carver's voluminous correspondence contains a few recipes for herbal medicines he learned as a boy on the Carver farm. These went to people who had an immediate practical need for the information. He was not willing to speak of his pain-laden early life to the merely curious, but, as with his response to Lyman Ward, he harked back to his early years when there was some helpful use in it.

Of special interest is the remedy he said the Carvers used for the whooping cough he caught when he was kidnapped with his mother. This is in a letter to the Boyntons of Selma, Alabama, who had named their child Carver in honor of him. Carver Boynton had the misfortune of following his namesake in contracting whooping cough as a young child. He was about 3½ years old. Carver wrote his parents on January 6, 1941: "I can remember the folks telling me that... I had it very severely and they cured me with onion juice. That is, take a red onion and roast it before the fire until it is soft and squeeze the juice out of it and sweeten with sugar... or thick molasses... Give the patient a little when the cough is severe. This is a home remedy and has proven quite successful to my knowledge... They tell me it saved my life."⁶ Carver Boynton's parents tried the remedy on him and reported: "The effect it has had upon him has been amazingly wonderful. Previous to the receipt of your letter we had tried everything imaginable with no results, but as soon as he took the onion juice we noticed that his coughing spells weren't half as

⁴ Rape (*Brassica napus*) was the common name for the plant that yielded rapeseed oil. A recent surge in the oil's popularity for cooking has caused the plant to be renamed canola for obvious commercial reasons.

⁵ Clement Richardson, "A Man of Many Talents: George W. Carver of Tuskegee," *Southern Workman*, Hampton, VA, November 1916, 602, FJA, 59, 808.

⁶ GWC to the Mr. and Mrs. S. W. Boynton, Selma, AL, 6 January 1941, TIA, 36, 66. The phrase "or thick molasses" is from GWC to the Boyntons, 3 February 1941, TIA, 36, 369. The final sentence is from GWC to the Boyntons, 21 January 1941, TIA, 36, 216.

straining and it came at longer intervals.”⁷

Rackham Holt, in her 1943 book *George Washington Carver: An American Biography*, depicts George as a victim of whooping cough *before* the slave raiders came, with his mother Mary administering honey doctored with tansy to him for a remedy.⁸ But Carver, in his biographical account to Mrs. Milholland in 1922, speaks of “the whooping cough I had caught on the way... down into Arkansas.”⁹ A note from Carver to a Mr. J. H. Ostwalt in 1911 indicates that Mrs. Holt’s guess of tansy, while erroneous, was an educated one. He wrote: “The plant submitted to me for examination proves to be a member of the tansy family. It goes by a variety of common names, such as Costmary, Alecost, etc. Its more technical name is (*Tanacetum balsamita*). It is a favorite household remedy for fevers, ague, coughs, colds, malignant swellings, female diseases, etc., etc. This is a very old type of plant, and is becoming quite rare. I am glad to get the specimen.”¹⁰

Another of Carver’s letters that mentions medicinal plants he had eaten as a child, written to a woman in Mississippi in 1942, says: “Nut grass is simply a form of Chufa that people grow for hogs. As children, we ate the nuts as they are sweet and delicious in the Spring, and the plants have strong medicinal properties. Some farmers just fence off badly infested areas, turn the hogs in, and let them fatten from the nuts.”¹¹ To the Secretary of the Chamber of Commerce in Hartsville, South Carolina, he wrote of watermelon, a stomach tonic: “We used to make syrup from the watermelon in our home when I was a boy, and it was a very nice product.” He added, “At the same time we made watermelon syrup, we made pumpkin syrup which is truly delicious, and also pumpkin butter which is now a lost art in culinary practice.”¹² Carver wrote of the watermelon’s medicinal virtues to a man in Montana interested in canning watermelon juice: “The Water Melon, as well as, other members of that great group of plants are highly medicinal and suitable for certain troubles. It is recognized by the United States Pharmacopoeia which of course

⁷ The Boyntons to GWC, 19 January 1941, TIA, 36, 199.

⁸ Holt, 2.

⁹ GWC to Helen Milholland, 1922, TIA, . . .

¹⁰ GWC to Mr. J. H. Ostwalt, 19 January 1911, TIA, 4, 988.

¹¹ GWC to Mrs. J. S. Sinclair, Meridian, MS, 3 July 1942, TIA, 42, 53.

¹² GWC to Mr. F. C. Chitty, Hartsville, SC, 2 August 1940, TIA, 34, 830.

makes it official. You evidently have a peculiar stomach trouble that needs just the things contained in the water melon juice and pulp. Your physician would have to decide just what your trouble is."¹³

One of the food-medicines available on the Carver farm was the raw material for a small-scale enterprise for George, his brother Jim and neighbor children. His correspondence on it began with this letter from Lenore Thompson, a nature teacher in Mount Vernon, New York, who had seen an article in the *New York World Telegram* telling of Carver's recipes for using wild plants. She wrote in February 1942: "Last summer one of the most popular activities on the nature program turned out to be making 'Indian lemonade' from sumac berries. Altho the camp director nearly died of fright, being sure it was poisonous, the boys made it all summer in mayonnaise jars and old milk bottles hidden in corners. I agree with you that a knowledge of common plants usable as food should be more widespread."¹⁴ Carver replied: "We used to play with sumac berries and make lemonade as we called it, and we would have our little store with sumac lemonade, grape vine wine (that is, we would take the young tender ends of grape vines and make them into a very pleasant drink), and sour grass, and many different things that children of the woods would know that the average city child would not."¹⁵ That August, he wrote of the medicinal properties of sumac berries in a letter to Frank Campsall, Henry Ford's secretary: "As far back as 170 years these berries were used for their medicinal and refreshing portions, and were noted as a cool and refreshing beverage, especially valuable in throat affections, and certain types of stomach troubles."¹⁶ A cautionary statement of his to a man in Chicago that November explains the reason for the camp director's near-death experience on finding out that the boys were making "sumac-ade": "Care must be taken to be sure that you get nonpoisonous sumac berries, as there is a variety of sumac that is poison."¹⁷

Carver's reason for writing to Henry Ford's secretary on sumac berries was that, during his third and last visit to Dearborn during that summer of 1942, he had been in the new

¹³ GWC to Mr. J. G. Krimbring, Havre, MT, 6 September 1939, TIA, 30, 1178.

¹⁴ Mrs. E. Lenore Thompson, Mt. Vernon, NY, to GWC, 28 February 1942, TIA, 40, 425.

¹⁵ GWC to Thompson, 4 March 1942, TIA, 40, 487.

¹⁶ GWC to Frank Campsall, 27 August 1942, TIA, 42, 939.

research laboratory Ford built and named for him when he mentioned "sumac-ade." Ford had people hanging on Carver's every word with instructions to study anything his words suggested. His mention of sumac berries spurred a chemical analysis of them, as did his making of sandwiches for Ford from wild greens he gathered nearby. Since Carver's "weed sandwiches" also bear on the subject of this chapter, we include this account from a witness:

Finally, the doctor asked the time and announced that the time had arrived to make sandwiches. He then informed us that he did not know what was going into those sandwiches the day before but that during the night it all came to him in a dream. There the sandwiches were all spread out before him just as he should make them. Some bland, others semi-bland, etc. At this, we assisted him to his feet, and with Dr. Curtis on one arm and a student holding another, he slowly passed out of the room. At this point I got the impression that I was viewing a man revered by his race, comparable to Mahatma Gandhi of India.¹⁸

The sandwiches Carver made were on soy meal bread made at a plant Ford had built in 1936 to manufacture soy products. Carver gathered vegetables of distribution so wide that most were also ingredients of the sandwiches he made when Ford had dropped by Tuskegee that March for a couple of hours. On that occasion, he wrote to Ford:

The following things from Nature's garden formed the filling for the sandwiches you had for dinner: Curled dock (*Rumex Crispus*) tender leaves; Wild Onion (*Allium canadensis*) whole plant; Chick Weed (*Stellaria media*) whole plant when tender; Plantain (*Plantago major*) leaves; Pepper Grass (*Lepidium Virginicum*) young plants; Bed Straw (*Galium aparine*) tender tops; Dandelion (*Taxacum officinale*) young plants; Wild Lettuce (*Lactuca canadensis*) tender leaves; Rabbit Tobacco (*Anenaria plantaginifolia*) tender leaves and stems.

¹⁷ GWC to Mr. M. W. Osburn, Chicago, Ill., 21 November 1942, T1A, 43, 625.

¹⁸ Ford Papers, Acc. no. 285, Box 2453, G. W. Carver Foundation.

About equal parts of these plants were taken, thoroughly washed, and run through a food grinder, using hash knife. Many kinds of dressing can be used... When I come up we will take your own dooryard plants and work them up.¹⁹ (Fig. 4-3)

On Carver's visit to Dearborn in July, each plant in his sandwiches was dutifully recorded and gathered for chemical analysis. Electroencephalographs, or brain wave instruments, were attached to human subjects who had ingested them to test their physiological effects. Carver, speaking of his time visiting his new namesake laboratory, told an audience of young men in Greenfield Village a few days later:

Now sometime I am going to determine what kind of ade that was we had. I don't know what we drank, but we're all alive. It was made from sumac berries--you know sumac berries? We used to pick them off when we were boys, make a beverage out of them, and sell it. We don't know even to this day what we were drinking. But we can't get discouraged. Before I go away, I'm going to know just what we drank. We've almost worked it out now. So that's what the laboratory is for.

We also served some weed sandwiches. We all ate them: we don't know what we ate, except nature's vegetables. We went out and just gathered the vegetables as nature had grown them—they're all about us—and we made them up into sandwiches. The laboratory will tell exactly what we ate, how it affects our body, how it affects our life, how it affects our prosperity and how it affects the surroundings in which we live."²⁰

Some plants Carver had used back in Diamond Grove were entirely, or predominantly, either foods or medicines. Plants toxic if taken internally could be medicines externally. Carver, recalling Moses and Susan Carvers' treatment of rashes from poison oak, wrote of one of these: "Our favorite remedy was *Solanum nigrum* (black nightshade). You take the first leaves and stems, bruise them thoroughly, squeeze the juice out, and mix it half

¹⁹ GWC to Henry Ford, Dearborn, Michigan, 23 March 1942. TIA, 40, 683-84.

²⁰ "Address of George Washington Carver at Martha-Mary Chapel, Greenfield Village, July 24, 1942," *Herald*, AWC Papers.

and half with sweet cream from cow's milk that is not soured and anoint with that. I have never known a case that it did not cure.²¹ Elsewhere he spoke of a plant regarded more as a food than a medicine: "We had a few maple trees and made some syrup every year."²²

Another wild food on the Carver farm was the Bur Oak. Carver wrote of it:

The trees were very plentiful. The correct name is *Quercus macrocarpa*. It is indeed the most beautiful of all the oaks to my mind. The acorn is eaten by some people with relish. When a boy I ate them myself, and when roasted they have a very pleasant and agreeable taste not wholly unlike a chestnut. If boiled in clear water they are still more palatable. The Indians prepared them in a number of different ways, and a number of persons whom I have met tasted their porridge and said it was really very nice. It may be that these acorns can be utilized as a valuable food product aside from their value for feeding hogs.²³

Carver used his knowledge of medicinal herbs all his life. He wrote to the chairman of an herbarium in Boston, a woman named Frances Williams, of his use of ragweed (probably Giant Ragweed, *Ambrosia trifida*) at Tuskegee:

For a number of years I taught Summer school, and along about the middle of June and July when green fruit came in, peaches, water melons, and cantaloupes, many of the teachers were indiscreet and drank great quantities of ice water, which naturally disarranged their digestion and threw them out of equilibrium. My classes consisted of between 75 and 80 people, and many of them simply had to be excused from classes or did not report on account of being sick. I naturally knew what the trouble was, and made a collection of plants used for that purpose, displayed them on the blackboard, and gave a lesson on their value. Most interesting to say, the very next day 90% were back in class. The ragweed headed the list. Several members of the class came to me and said they had never had anything that relieved them so quickly as that tea. One person told me when they

²¹ GWC to Mr. A. Girouard, Pinecastle, FL, 4 September 1941, FIA, 38, 687.

²² GWC to Wm. John Ballou, Chester, VT, 14 May 1941, TIA, 37, 363.

²³ GWC to Ernest Powell, Marshall, TX, 4 November 1940, TIA, 35, 763.

left the room so sick, they did not have time to make the tea, but simply got some leaves on the way, chewed them and swallowed the juice and got relief right away. Many who went out into the rural districts teaching used it for children and grown ups and claim they had splendid results, by just using the tea. Just take a small bunch of leaves, make a tea about the strength of ordinary tea that you drink, and take a sip of this tea."²⁴

Carver also used herbs in his role as the veterinarian to Tuskegee's farm animals. He wrote in 1902 to Booker T. Washington's brother John of the Institute's dairy herd:

I would... recommend that once a month these animals be given a dose of condition powders made from various medicinal barks, roots, herbs, etc., which can be secured out of the woods and which forms the basis of condition powders. This can be made here without any expense and will be just as good as the condition powders we buy—in many respects better—because we will know the quantity and quality of the ingredients which enter into it. It would not be a bad idea to give all our stock a dose of these powders. In fact, the beef herd have been given theirs already, I am sure that if the above is carried out we will greatly decrease the number of deaths in the dairy herd.²⁵

In Carver's study of nature in Macon County, Alabama, mentioned in the last chapter, medicinal herbs came into play. He recalled in an undated manuscript: "My assigned territory was Macon County. In this study I was greatly surprised and delighted to find such a large number of official drug plants, as well as an equally large number of non official, recognized now as only house hold remedies, many of which will become official as soon as their medicinal properties are better understood."²⁶ In a letter to a chemurgic correspondent in Texas, Victor Schoffelmayer, he enclosed a list of the medicinal herbs of Macon County and wrote: "I selected 115 plants, many of which are

²⁴ GWC to Frances R. Williams, Boston, MA, 1 September 1942, TIA, 42, 1026.

²⁵ GWC to John H. Washington, 6 October 1902, TIA, 2, 456-9, original in letters of John H. Washington in Booker T. Washington Collection, Library of Congress.

²⁶ GWC, "The South A Source for Our Future Supply of Vegetable Drugs," typed manuscript, [n.d.], TIA, 47, 236-37. This was probably written in 1925, evidenced by Carver's mention in the text of a trip to Marianna, Florida, where he visited that year.

of recognized value by the U. S. Pharmacopeia, along with their technical and common names, the parts used, with the hope that many acres of our fine Southern soils would be turned into the production of medicinal and pot herbs.²⁷ A partial list of the plants on Carver's catalog of Macon County's medicinal herbs follows:

Mentha Piperata (Peppermint) –This plant is familiar to almost every one as a specific for weak stomachs, diarrhea and as a stimulant. As a domestic herb it has a wide range of uses. The leaves and the tops are the parts used, they are quoted at \$.18 per pound.

Oenothera biennis (Evening primrose) –Valuable in the treatment of coughs and asthmatic troubles etc. The entire plant is used. The prices average about \$.05 per pound. (Fig. 4-4)

Plantago (several species of plantain) –This herb like the peach has many uses. It is employed in dropsy, dysentery, etc. etc. The leaves are the parts used and are quoted at \$.06 per pound.

Sassafras Varifolium (Sassafras) –A most valuable aromatic stimulant, greatly in demand. The bark of both the root and the tree is used, prices ranging from 4 to 26 cents per pound.

Achilles millefolium (Yarrow) –A tonic mildly astringent, aromatic and used in dysentery and low fevers. The herb is quoted at 3 1/2 cents and the leaves and tops are quoted at \$.07 per pound.

Asarum canadense (Wild ginger) –used in much the same way as the yarrow. The herb is quoted at \$.30 per pound.²⁸

Carver included many notes on uses of medicinal herbs in his letters. Following is a sample:

²⁷ GWC to Victor Schoffelmayer, 14 January 1942, TIA, 67 [a], 471. Schoffelmayer was called "The Father of Southwestern Chemistry."

²⁸ See note 26 above, TIA, 47, 236-40.

(Plantain) Take the tender leaves of and cook the stem, along with it the seed on, and they are so good for the system. I am so glad that you are keeping up with the program of the old time way of living. I can tell that you are getting stronger, just keep it up.²⁹

(Onions and garlic) The onions belong to the garlic type and can be used much in the same way as they contain very distinct medicinal properties such as garlic... I imagine when properly prepared they would be as good for high blood pressure as garlic. I feel sure that some scientist who has the time and inclination will test them out from that angle.³⁰

(Corn silk) I have a *materia medica* published in England one hundred forty-seven years ago, and it gives much of the virtues of corn silk... It is especially valuable in all types of urinary and bladder disorders and the silk is especially valuable when one needs a sweat.³¹

(Mullein) I wish to say that mullein is one of the oldest of our medicinal plants and is a noted remedy for all kinds of coughs and colds, rheumatic troubles, stopping of blood, asthmatic affections, and all manner of things that human ills are heir to. It is of unusual value along that line, one of the best known of household remedies. The flowers are especially valuable in aggravated cases of earache.³²

Jerusalem oak is used largely for worms in children.³³

Jimson weed is very highly medicinal and is used for almost all sorts of ailments such as swelling, fevers, salves, etc.³⁴ Our jimson weed is known as *Datura*

²⁹ GWC to Abbie Hugg, Torpedo, PA, 22 September 1942, CIA, 42, 1288.

³⁰ GWC to Mr. L. C. Frazer, Talladega, AL, 28 April 1941, TIA, 37, 152.

³¹ GWC to Mr. J. A. Dean, Decatur, AL, 14 December 1941, TIA, 39, 488.

³² GWC to Gertrude Thompson Miller, Huntington, WV, 23 October 1941, TIA, 38, 1282.

³³ GWC to Mrs. J. I. Bowden, Pinchurst, GA, 25 May 1939, CIA, 29, 545. Carver's reference would be to Jerusalem-oak goosefoot, *Chenopodium botrys*.

³⁴ See note 33 above.

stramonium. It is one of the best known remedies for asthma, and has a wide range of medicinal properties.³⁵

(Horse Chestnut) One of the barks was used many years ago as a substitute for quinine. The whole tree has very distinct medicinal properties.³⁶

(Catalpa) The long catalpa pods if gathered at the correct time have been used for a great many years as a bitter tonic in medicine, but not so much now since so many synthetic chemicals have come out. For a long time they seemed to take the place of quinine in certain types of medicine but there is practically no demand for them now. The other two pods have been noted from childhood for the making of vanity bags, pin cushions, and all sorts of pretty Christmas, New Year, and greetings of that kind. They dye beautifully.³⁷

Fringed gentian, sometimes called blue gentian... is used locally as a very powerful tonic. In its use it is wise to follow up the method that the old people used, as there are so many different ways now of using plants that it is important to follow up the old methods if you wish to use them. It really has medicinal value.³⁸ (Fig. 4-5, 4-6, 4-7, 4-8, 4-9)

Carver's great knowledge resulted in this encounter, told by G. Lake Imes, Tuskegee's secretary, in his brief book, *I Knew Carver*:

There came to the Institute an old lady, the mother of a member of the faculty, who... was interested to meet the great scientist. Seeing some dried herbs hanging in his laboratory, she identified some familiar household remedies that she had learned about in childhood. Dr. Carver was instantly alert and for several hours the two engaged in animated discussion of the properties and uses of various wild herbs. Telling of it afterwards, the scientist averred that this modest, obscure old lady knew more about the medicinal value of a wider range of herbs and plants

³⁵ GWC to William Fitzhugh, Los Angeles, CA, 13 July 1942, TIA, 42, 186.

³⁶ GWC to Jane P. Williams, Brookline, MA, 28 May 1941, TIA, 41, 442.

³⁷ GWC to Mrs. E. W. Pyle, Ft. Worth, TX, 1 December 1939, TIA, 32, 16.

³⁸ GWC to Mrs. M. L. Moore Bryant, Cottage Grove, AL, 14 December 1939, TIA, 32, 212.

than anyone he had ever met, and that he had learned a lot from her. For her part, she said that Dr. Carver "did know a lot about plants."³⁹

Carver was strongly of the opinion that the U. S. needed wake up to the value of its medicinal herbs. He gave an effective demonstration of this in Tulsa, Oklahoma during a talk to black businessmen there in October, 1927. A reporter for the *Oklahoma Black Dispatch* wrote of his use of the verse from Proverbs, "Where there is no vision, the people perish": "Dr. Carver pointed out that in the early morning hours he had trekked up Standpipe Hill and had found twenty-seven new plants indigenous to the soil of Oklahoma containing medicinal properties. 'I found down in Ferguson's Drug Store on North Greenwood,' continued Carver, 'seven patent medicines containing in their formulas certain elements contained in these plants on Standpipe Hill. The preparations were shipped in from New York. They should be shipped in from Standpipe Hill. My people are perishing for the lack of knowledge.'"⁴⁰

Carver wrote in 1941: "The United States is just now beginning to look up the possibilities of our native medicinal plants."⁴¹ When Marcellus Meek, an attorney in Chicago who was the Executive Secretary of the American Herbal and Botanical Institute, offered to send him some books on the subject, he wrote: "I am positively enthusiastic over the books that you are going to send me... There is no doubt but that you are engaged in one of the most forward movements that I know of."⁴² In May 1942, when America needed to adapt to the wartime cutting off of imports, the editor of the San Antonio, Texas *Evening News* sent him a tear sheet with an editorial on "Food for Victory," and he replied: "America must learn to feed itself definitely and also to prepare to grow its own drug plants and certain spice plants, make its own extracts and adopt a live-at-home program... I am very certain that the time is not far distant when the U. S. will produce its own drugs which will take the place of many that we depend upon now and which importations have reduced or cut off entirely."⁴³ To Tuskegee trustee Walter Crump, he wrote in that same month: "There isn't any question but that the United States

³⁹ G. Lake Intes, *I Knew Carver* (Harrisburg, PA: J. Horace McFarland, 1943), TIA, 59, 1072.

⁴⁰ "Finds Rubber Forest in Tulsa," *Black Dispatch*, October 13, 1927, Oklahoma Historical Society.

⁴¹ GWC to Mr. J. A. Boyd, Sapulpa, OK, 20 December 1941, TIA, 39, 566.

⁴² GWC to Marcellus W. Meek, Chicago, IL, 10 May 1938, TIA, 25, 290.

must prepare its own drugs... It would give physicians, surgeons, and those interested in medicine information with reference to the production of these wonderful herbs. I am now working on the fumitory group, the Horse Chestnut."⁴³ Then in June, he wrote to Victor Schoffelmayer in Dallas: "How very interesting that now we are beginning to recognize essential values in plants, minerals, etc. that heretofore nobody paid any attention to, and yet I, myself, have always advocated that the scientist's job was to find out the efficacy of these plants so that if it should ever become necessary that they could be used, and there is every evidence that those who look far enough ahead, and work out these problems, will be the ones who will contribute the highest values to our present needs."⁴⁵

Foods in Relation to Health

Carver's healthy diet and use of herbal medicines enabled him, not only to survive infancy, but to live a long, constantly active, and healthy life. He wrote to Booker T. Washington in 1914: "There is probably no subject more important than the study of foods in relation to their nutrition and health. To understand them one must know them chemically, botanically, and dietetically. As I told you the other day, I have not taken a pill, powder, salts, or oil as a purgative for at least 30 years. And it has been quite 35 years since I was in bed sick. I regulate myself with vegetables, fruits, and wild herbs, Nature's remedies, which God intended we should use."⁴⁶

⁴³ GWC to Editor, *San Antonio Evening News*, 5 May 1942, TIA, 41, 50.

⁴⁴ GWC to Walter Gray Crump, New York, NY, 27 May 1942, TIA, 41, 400. Crump, a Trustee of Tuskegee Institute from New York, had the idea of establishing the Walter G. Crump National Herb Park in Florida.

⁴⁵ GWC to Victor H. Schoffelmayer, Dallas, TX, 5 June 1942, TIA, 41, 615.

⁴⁶ GWC to BTW, 27 July 1914, TIA, 5, 454.

Carver's Drawings of Wild Edible Plants



(After Steudinger, Schuck, Schimper)
Taraxacum officinale—Dandelion

4-1. Dandelion



Rumex crispus—Curled Dock (U. S. Department of Agriculture)

4-2. Curled dock



Lepidium abrotanum—Small Pepper-grass
 (After C. M. King)

4-3. Pepper grass



Evening Primrose
 (After Reud)

4-4. Evening primrose



Amaranthus spinosus—Spiny Amaranth
 (After Durling)

4-5. Amaranth



Chenopodium album—Lamb's Quarter
 (After C. M. King)

4-6. Lamb's quarter



Oxalis cocklebur—Oxalis
 (After Bailey)

4-7. Oxalis



Phytolacca americana—Pokeweed
 (After C. M. King)

4-8. Pokeweed



Lactuca scariola—Prickly Lettuce (After

4-9. Prickly lettuce

Chemurgy

Chemurgy, a word coined in 1935 and used until the early 1940s, is little known today. Its more modern name, “biochemical engineering,” will awaken little more recognition in most than the original term. Chemurgy is simply the use of farm products, specifically plant carbohydrates, as feedstocks for the industrial production of plastics, paints, gasoline and other products. It is most often considered as an alternative to the use of petroleum. The aim of its proponents was to replace the petrochemical industry with industries based on farm-derived products. Carver, whom chemurgy writer Christy Borth dubbed the “First and Greatest Chemurgist,” saw it this way: “[I] believe the Great Creator has put oil and ores on this earth to give us a breathing spell... As we exhaust them, we must be prepared to fall back on our farms, which is God’s true storehouse and can never be exhausted. For we can learn to synthesize materials for every human need from the things that grow.”¹

Charles Kettering, General Motors vice president of research and the president of the Society of Automotive Engineers, (Fig. 5-1) pointed out one of the greatest advantages of chemurgy over the petroleum industry—the renewability of farm products—when he said: “We’re running [our automobiles] now by radiation of the sun, seasoned forty million years in the ground. Maybe we can learn how to pick up our sun-energy direct, instead of going along on that long-drawn-out process. I’m not worried about what we are going to do so long as the sun keeps on shining, because we can grow enough fuel.

¹ Lawrence Elliott, *George Washington Carver: The Man Who Overcame* (Englewood Cliffs, NJ: Prentice Hall, 1966), 208.

I'm sure we can grow all our fuel after a while because all of the fuel that we *have* has been grown."¹

The founder of chemurgy was chemist William Jay "Billy" Hale, (Fig. 5-2) described by Christy Borth as "the roly-poly scientist with the merry eyes." Born in 1876, with a PhD in chemistry from Harvard, Hale became an instructor at the University of Michigan. He married his student Helen Dow, the eldest daughter of H. H. Dow, founder of the Dow Chemical Company, in 1917. Though Helen died of influenza in 1918, Hale worked for Dow from that year until 1934, then became a consultant to the company.

Hale coined the name "chemurgy" in 1935 by combining the word chemistry with the Greek *ourgos*, meaning "work." He was fond of saying that "anything that can be made from a hydrocarbon can be made from a carbohydrate." He championed alcohol motor fuel over petroleum, saying, "There is no better fuel for internal combustion motors than alcohol and water. Its octane rating is far above 100. It burns without knock... And far above all else, alcohol burns to complete oxidation and thus eliminates discharge into the atmosphere from the exhaust."² Christy Borth, the most effective proponent of chemurgy through his 1939 book *Pioneers of Plenty*, said of Billy Hale: "Because he considered alcohol the key to the riddle of nature's chemical processes of organic transformation, he became, willy-nilly, the chief target for the fire of those who feared that the introduction of power-alcohol would interfere with the business of the petroleum industry. In him, the industry recognized a dangerous foe."³

Power Alcohol

An editorial in the August 8, 1935 *Birmingham News* caught Carver's attention. He wrote to the paper:

¹ Christy Borth, *Pioneers of Plenty* (Indianapolis: Bobbs Merrill, 1939), 18-19.

² "The Sky's the Limit," a 1945 talk quoted in <http://membership.aes.org/M:Midl/William%20J.%20Hale.%20Founder%20of%20the%20Midland%20Section%20ACS.html> Accessed March 2004.

³ Borth, 80.

Your very timely editorial, "The Use of Alcohol as Motor Fuel"..., struck one of the most outstanding dominant chords in the great commercial possibilities of the South.

There are many kinds of alcohol, having various and varied uses. The ethyl type having the formula C_2H_5OH is the one of the greatest importance at this time.

Years ago, almost before the coming of the automobile, Dr. C. V. Hines, famous sugar technologist, sensed this outstanding possibility when he said: "There is wasted in this country and many other countries, especially in those which produce quantities of sacchariferous as well as starchy products, sufficient crude material of suitable character to produce enough alcohol to supply the entire demands now placed upon the various petroleum products for heat, light and power in addition to the present demands in the arts."

The needs are much more apparent now than when these memorable words were said.

Alabama as well as many other sections of the South can furnish large quantities of suitable sacchariferous and starchy materials from which a high grade of ethyl alcohol can be made. Of saccharine substances, we have sugar cane, sorghum molasses, sugar beets, etc. In the starchy materials, we have sweet potatoes, corn, wheat, rye, rice, etc.

Fermentologists have improved the methods of fermentations of much that I believe a highly satisfactory alcohol in both quantity and quality can be made from several fruits high in sugar content, such as figs, grapes, persimmons, over-ripe oranges, etc.

Experiments prove that we can raise more bushels of sweet potatoes per acre, with less expense and less injury to the soil, than any other known crop, here in the South, and in connection with the starch mills just being established I am hoping

the production of ethyl alcohol from home-grown products and waste will be our next successful venture.⁵

Two months after Carver wrote this, he heard from Oswald Wilson of *Western Irrigation* magazine in San Francisco, who saw great potential for using Jerusalem artichokes as motor fuel:

Mr. Wallace, Secretary of Agriculture, has filed an application for an allotment... to reproduce one hundred gallons of anhydrous alcohol and recoverable by-products from agricultural products including the production of specially grown crops.

Of course, you can realize that the oil companies from a very narrow viewpoint do not favor farmers producing the raw material from which motor fuel can be obtained.⁶

Two weeks later, on 21 October, Carver wrote to President Franklin Roosevelt and Secretary Henry A. Wallace to urge the approval of the allotments. He asserted that this would be a "master stroke in helping the American farmer in a permanent way."⁷ The bill in question, though, was returned without approval. The logic behind the WPA's rejection was that plants for this experiment were not in place, and that the market outlets for such fuel were limited.⁸

But D. B. Gurney of Yankton, South Dakota had already been using his five hundred filling stations in five states as market outlets for a gasoline-alcohol blend. Allotments such as Wallace had proposed were all he needed to create a booming industry. Christy Borth reported that Gurney

had found it difficult to get alcohol for blending... Though his customers wanted blends for motor fuel, he was unable to meet the demand. There were many

⁵ "Dr. Carver Writes About a Southern Opportunity," *Birmingham News* 8 August 1935, TIA, 61, 352.

⁶ Oswald Wilson, *Western Irrigation*, S. F., CA, to GWC, 9 October 1935, TIA, 18, 357.

⁷ GWC to Franklin D. Roosevelt, 21 October 1935, TIA, 18, 422; GWC to Henry A. Wallace, 21 October 1935, TIA, 18, 427.

reasons, he said. First, he needed an unfailing source of farm-derived alcohol. Second, this alcohol would have to be completely anhydrous (water free) to make a perfect blend with gasoline. Third, it would have to be adulterated to remove it from the highly-taxed category of beverage alcohol. Fourth, it would have to be cheap enough to compete with premium gasoline. And fifth, and finally, there would have to be found an unfailing source of gasoline, the producers of which would not be opposed to the blending of their product with alcohol.⁸

Hope arose among power alcohol crusaders when Standard Oil made a move to enter the field. Borth quoted chemurgist Francis Garvan, a lawyer who was the only layman ever to receive the Priestley Medal from the American Chemical Society (Fig. 5-3):

We have been fed volumes to the effect that [alcohol-gasoline blend] was not practical fuel. Now... all these worries have been settled... All this chemical research has been done for us... The Standard Oil Company of New Jersey has gone over to England and... has joined hands with the English Distillers Company, and they together have produced, in their own words, the most perfect motor fuel the world has ever known. 33 1/3 per cent British alcohol! We were wrong on the ten-per-cent blend. We were wrong on the twenty-per-cent blend, and we thank them for telling us. Our problem now is to advance as rapidly as possible toward the perfect fuel, 33 1/3 per cent farm alcohol... We have lots of problems, but the problem of use is over... and for this I thank the Standard Oil Company and the Petroleum Institute.¹⁰

Borth wrote that Garvan, with two chemists,

moved swiftly to the establishment of a commercial-scale plant to demonstrate that power-alcohol could be produced from farm surpluses and sold in competition with gasoline. Within a year, [they] had converted experimental

⁸ A. J. S. Weaver, Chief, Grain Marketing Section, Division of Grains, Agricultural Adjustment Administration, USDA, to GWC. 1 November 1935, TIA, 18, 470.

⁹ Borth, 75.

¹⁰ Borth, 168.

operations... into a going business in what had been [an] alcohol plant in Atchison, Kansas...

In this plant, grains were processed for their carbohydrates which were fermented and distilled. The distillate was rendered anhydrous, adulterated to make it unfit for beverage use, and blended with gasoline. The remaining fiber was converted into concentrated stock feed, containing forty per cent protein, ninety per cent digestible, and sold or returned to the farmers.¹¹

Carver read of this in October of 1936 and wrote to the *News*:

"The constant dripping of the water will wear away the hardest stone." This is an age-old truism with tremendous significance. Another, more modern but equally strong in its power, is this: "Constant and well directed agitation will never fail."

Many months ago when the *Birmingham News* advocated the manufacture of alcohol as a motor fuel from crops from the farm, orchard, and garden, to the less thoughtful it sounded like one of the wildest "pipe dreams."

On September 25, Atchison, Kansas, boasted of possessing the first plant for the manufacture of power alcohol in America. This plant is using corn. Two batches from the stills have yielded 2,000 gallons, and the officials say that "in a month the capacity will reach 10,000 gallons a day."...

Now that it has become a reality here in the United States, we trust other sections will catch the vision and establish several plants throughout the South at strategic points wherever large quantities of starch and sugar producing crops can be raised.

The slogan of every farmer... should be... "Take care of the waste on the farm and turn it into useful channels."¹²

¹¹ Burth, 168-69.

¹² GWC to Mr. Kilpatrick, ed. *Birmingham News*, 6 October 1936, 11A, 19, 947.

Borth writes that four months after it began... "The plant was producing... ten thousand gallons of anhydrous alcohol daily, blending the output with gasoline supplied by independent producers, and marketing the blend through independent dealers and farmers' co-operatives in Kansas, Missouri, Nebraska, Iowa, Minnesota, the Dakotas, Colorado, Arkansas and Oklahoma."¹³ Borth continued:

The plant's business increased 1500 per cent. At that point the company acquired the unique distinction of halting expansion at a time when most businesses were experiencing a decline in sales. The decision to halt expansion was based on Dr. Christensen's survey of raw materials available in the area. Running on barley, rye, corn, grain sorghum (kaffir corn) and Jerusalem artichokes grown on surrounding farms, the plant had reached what its managers believed to be its maximum productive capacity. In other words, it had erased the crop surplus problem in the area!¹⁴

The plant in Atchison was so successful that it became the target of attacks from people in the oil industry who felt a threat to their dominance of the fuel market. Borth detailed the "scurrilous sabotage to which the experiment was subjected at every turn":

To the gray sheet-iron and brick headquarters at Atchison came sworn statements of hundreds of underhanded tricks employed to wreck the project. There were reports from dealers who wanted to market the blend and said they were intimidated and threatened. Among the neatest tricks to discourage the use of the blend were repeatedly reported demonstrations with which traveling "experts" proved that alcohol and gasoline do not mix. The self-styled "experts" conducted this little trick by driving into filling stations and showing proprietors and bystanders that Agrol fluid and gasoline separate into layers. It worked beautifully because the "experts" used small glass tubes which they carefully washed beforehand. Since a drop of water in a small vial is large enough to cause separation in the small amount of blended fuel in the tube, the demonstration was

¹³ Borth 168-69.

¹⁴ Borth, 169

very effective—until the Atchison chemists taught the fuel dealers to insist on the use of dry tubes.¹⁵ (Fig. 5-4)

Chemicalize the Farm

Carver wrote generally of chemurgy in a letter in June 1936 to the *Peanut Bulletin*: “Now is the crucial time to chemicalize the farm. We must not only make the farm support itself, but others as well, with a large manufactured surplus to sell to those who are not fortunate enough to own and properly care for a farm... Insulating boards, paints, dyes, industrial alcohol, plastics of various kinds, rugs, mats and cloth from fiber plants, oils, gums and waxes, etc., etc., all or much of it can be made from waste products of the farm.”¹⁶

Chemurgic Conferences—Jackson Mississippi, April 1937

Christy Borth, along with others in the movement, recognized George Washington Carver’s chemurgic work with the peanut, sweet potato, pecan and other products since the turn of the century, as a pioneer in their field. Borth used the phrase “First and Greatest Chemurgist,” as a chapter title in *Pioneers of Plenty*.

Once the chemurgists recognized Carver, they began to invite him to conferences. With power alcohol being the driving issue bringing them together, they made the Dearborn conferences an annual event. The first one Carver attended was a “Farm Chemurgic Conference” in Jackson, Mississippi, from April 12 through the 14, 1937. He wrote to his friend Dr. Marvin Ross of Topeka, a black physician, that the newly organized Farm Chemurgic Council was “a strictly scientific body.” He continued: “The meeting is sponsored by the Governor (Hugh White) and Commission of Agriculture of the State of Mississippi, and they are both making much of my appearing of their program. Naturally, we as colored people feel very happy over it, as this is the first time that a colored person has gotten into a scientific body such as this.”¹⁷

¹⁵ Borth, 170

¹⁶ GWC to the *Peanut Journal*, Suffolk, VA, 11 June 1936, TIA, 19, 72.

¹⁷ GWC to M. J. Ross, 30 March 1937, TIA, 20, 1008.

All the events on the bill for the conference were in the auditorium of the Edwards Hotel except for those on the afternoon of the 12, when Carver spoke. His talk, titled simply "My Work," was in the Jackson High School auditorium. He began with the quote: "This is the day I long have sought and mourned because I found it not."¹⁸ That came into my mind as I sat there and listened this afternoon and this morning to the marvelous things that I heard and saw."¹⁹

The addresses given that day had been: in the morning, at the hotel, an introduction by the Governor, a talk by Carl B. Fritsche, a Detroit industrial engineer²⁰ who was the managing director of the Farm Chemurgic Council,²¹ and one by William Hale; and in the afternoon at the high school, several talks on cotton and, just before Carver's talk, a Negro quartet and chorus from a black school in Piney Woods, Mississippi. Carver continued by quoting from First Corinthians, "Behold, I will show you a mystery,"²² and gave this illustration:

This is the English horse bean. You see that those beans are white, perfectly white. In the study of physiological botany, we learn to call a certain group plastids... These plastids come in three groups. First we have the leucoplastids, perfectly white. The bean is perfectly white. We put it into the ground and submit it to all the agencies that will promote growth and by and by it throws up a little shoot into the air and becomes green. We call these chloroplastids. Behold, when the flowers appear they are highly colored pink, red, etc.. We choose to call these chromoplastids. The green plastids have changed into the chromo. By and by the flower disappears, the green pod forms (chloroplastids only). As the bean develops, ripens and we burst open the pod and out comes a pure white bean

¹⁸ This sounds Biblical, but it is not. Its origin is obscure. On the internet, it appears once, in an article "Permanent Organization for El Camino Real Is Assured," *Los Angeles Herald*, 3 January 1904. <http://www.ujwaf.com/LA-1900s/04.01.html>. There, a Methodist Bishop named J. H. Johnson is quoted as saying it, but there is no context.

¹⁹ Speech at the Jackson High School Auditorium, 12 April 1937, manuscript, TIA, 46, 944-53 ff. Much of this talk was one of Carver's versions of his talk with "Mr. Creator."

²⁰ Borch, 76.

²¹ Program for the event, TIA, 1, 540 and AWC papers, "Miscellaneous Concerning George Washington Carver." On Fritsche's position, see GWC to President Patterson, 23 August 1937, TIA, 21, 1196.

²² 1 Cor. 13:51.

(leucoplastids). Just where we started from. I would like to see some chemist do that.

Carver's suggestion that we can only wonder at the miracles in nature's commonest objects was one he frequently made. He usually used the example of the rubber band, saying, "We don't know why rubber stretches." Later in his speech, however, he seems to imply the opposite of this attitude of wonder. He told the chemurgists:

Dr. Slosson, the father of creative chemistry, a short time before he passed on said that he believed firmly that we would add another kingdom to the three great kingdoms of the world, and instead of simply having the animal, mineral, and vegetable kingdoms, we would have a fourth kingdom, that would be the synthetic kingdom, and that the synthetic kingdom would preclude more marvelous things than all other three kingdoms.

I am sure also that you are acquainted with the remarkable work of Dr. Wood, and marveled when he said in substance: "I am confident that before a great many years the chemist in his laboratory will be able to reproduce, synthetically, every single thing that nature has produced." A marvelous statement, but when we review the field, as stated before, of synthetic chemistry, and see the almost unbelievable things that have already come out and those you will hear and see even during these meetings, that you will be inclined to believe that Dr. Slosson and Dr. Wood have pretty firm ground on which to base their conclusions.²³

Three years before this, in a speech at Tuskegee, Carver quoted Dr. Slosson as suggesting that out of the fourth kingdom, the synthetic kingdom, "would come more lacquers, more dyes and many other things to bring more happiness than from all the other three put together."²⁴ This idea that the synthesizing of certain products for human convenience could bring more happiness to us than all of created nature—mineral, vegetable, and animal—is, in the context of Carver's life teachings, a shocking one. It seems to fly in the

²³ Dr. Edwin Emery Slosson was a science popularizer and the editor of the first science writing syndicate in America. He wrote a book called *Creative Chemistry* and co-edited one with Oris W. Caldwell titled *Science Remaking the World* (Garden City, N.Y.: Doubleday, Page and Co., 1924).

face of all of his utterances on the wondrousness of God's works through nature as God created them. It seems to contain a startling scientific *hubris* absent from every other part of his life. The simplest explanation is that to take it this way is to misunderstand his intent—that he would not have suggested the redundancy of reproducing works of nature already in existence, and that he was merely overreaching in an attempt to point out the happiness humanity may experience through the chemist's rearranging of nature's chemical combinations.

Dearborn, Michigan, May 1937

Carver attended his second chemurgic conference the following month of May 1937, from the 25th to the 27th, in Dearborn, Michigan. This was titled the Third Dearborn Conference. Over 1200 persons attended the meetings, representing 42 states in the union, which, as Farm Chemurgic Council literature reported, "is a considerable increase over last year."

Here Carver had his first face-to-face meeting with Henry Ford, (Fig. 5-5) who invited him to a pre-conference luncheon at the Grand Ballroom of Detroit's Statler Hotel. Carver went, but sat outside the door while the group Borth called "the chemurgic highway-builders"— Ford, Hale, Herty, and others, all of them white—dined. Borth wrote: "Near the door, you catch just a glimpse of a jet-black face and a white woolly poll—Dr. George Washington Carver, the world-famous Negro chemist, listening to the after-luncheon oratory from the hallway because, as he quaintly puts it, 'Some folks might object to my presence at the table.'"

Though this interpretation of Carver's choice to remain outside garnered a lot of press, Austin Curtis, Carver's assistant and travel companion from 1935 on, disputed it. He said that Carver's old hands were shaky and he didn't want to embarrass himself by dropping a precious teacup. A third explanation, one that, like Curtis', rings truer than the first, came from Malcolm Bingay, editorial director of the *Detroit Free Press*. Six years later, immediately following Carver's death, Bingay recalled:

²³ GWC, "An Evening With the Creative Mind," *Tuskegee Messenger*, May 1934, 6, TIA, 46, 829.

When I saw him first that day he was sitting out in the corridor by the door of the banquet hall. The place was filled with leaders of industry and science. He was to be the speaker of the evening. But he did not enter. He had dined alone in his room. I asked him why he was not at the speakers' table. "It's nicer out here," he smiled. "Some people just do not understand, but I understand. They'll call me when they are ready for me." And so we sat and chatted and I forgot all about the dinner and the other speakers.

Bingay's talk with Carver went much deeper than a chat. It went to the heart of Carver's relationship to the chemurgy movement. Bingay wrote of Carver:

"God has ordained," he said, "that there should never be any want, any poverty of any kind. All we have to do is follow His guidance and find His secrets. It's all so simple, if we could only understand."

"Will the time ever come when there will be plenty for everybody?"

"Yes, yes," he said intense with eagerness. "There will come a day when, out of the soil, we will make our houses, our clothes, our automobiles— everything on earth we need. Plant chemistry is just at its beginnings. We have only opened a crack in the door. The age of plastics has not yet arrived. If wars are caused by the lack of things there will be no more wars because the earth will pour forth plenty for everybody. There will be no such a thing as a have-not nation. Mr. Ford understands that. That is why we began working together years ago."²⁵

While Carver and Ford had first met in person only a few hours before the pre-conference luncheon, there is sketchy evidence for Carver's statement (if it is indeed accurately reported) of prior contacts. There is a note dated 1921 on Carver's writing Ford,²⁶ and

²⁵ Malcolm W. Bingay, "Good Morning," *The Detroit Free Press*, 7 January 1943, TIA, 51, 788.

²⁶ The author has in his notes from 1994 a reference to a letter of 28 November 1921, AWC Papers, in a file titled "Correspondence 1920-21." His note reads "Had written to Henry Ford." The author contacted the Bentley Library in 2004 for further information, but the Graduate Reference Assistant who looked into the matter could not locate the reference.

Carver stated to a friend in 1933 that “the Ford trip was postponed at my request for more information.”²⁷

Carver’s address to the Farm Chemurgic Council was called “What Chemurgy Means to My People.” Since the content of the talk was largely the origin of his farm work at Tuskegee, we have heard much of it in Chapter 2. Carver’s talk was between an address on “Paper From Flax and Hemp” by Harry Hans Straus and one on plastics from corn. Other talks during the conference were devoted to “Agrol” —motor fuel from grain, sorghum, Southern sweet potatoes, Jerusalem artichokes, and sugar cane wastes.²⁸

Hemp

Carver could himself have talked on any of these subjects. In 1915, in his local botany, he had written of the hemp plant:

Hemp, *Cannabis sativa*... The plant is a native of India, but has escaped cultivation in America, so that in some sections such as Iowa, it has become a noxious weed. In this sections it is grown in clumps, here and there as an ornamental plant only... [It] is grown in Kentucky and many sections of the U. S. for its strong fiber, which makes an excellent quality of linen cloth, thread cordage, etc... The seeds are also sold in large quantities for making bird-seed mixtures. In Persia and other hot countries the plant is said to exude a sort of resin, which the natives smoke like tobacco, or make into an intoxicating drink of which they are very fond.²⁹

Harry Hans Straus, the speaker on paper from flax and hemp who preceded Carver, had 2,000 acres in Minnesota planted in hemp when the U. S. Government, in that same year of 1937, imposed a ban on hemp growing and shut down his operation.³⁰ Hemp for paper, as is the case with alcohol for fuel, has the chemurgic virtue of renewability, the source

²⁷ GWC to Dr. Marvin Ross, 25 May 1933, TIA, 14, 496.

²⁸ Program for the event, TIA, 1, 535.

²⁹ GWC, *Botany Made Easy*, manuscript for a botany textbook, 1915, TIA, 47, 383. This text was written “For Use in Common Schools, High Schools and Academies.” Though the date 1915 appears on title page, the book is dedicated to “the late” Louis Pammel, who died in March 1931.

³⁰ Bonh, 306.

plant taking four months to mature compared to at least twenty years for a pulp tree. The strength of the hemp fiber which Carver mentions causes hemp paper to last hundreds of years longer than paper made from trees.

The government's claim that their motive for the law was the potential use of hemp as a narcotic was questionable. Hemp grown for fiber has no narcotics in it. The type that is grown to exude, as Carver said, "a sort of resin" could easily have been outlawed separately. The law appears to have been aimed at keeping hemp's economic niche empty. Hemp had supplied up to 90% of the world's paper until after the U. S. Civil War, when it was replaced by the cheaper, less labor-intensive, but toxic wood-pulp sulfide process. Newspaper mogul William Randolph Hearst gained a virtual monopoly on the market by acquiring vast holdings of pulp timber and paper mills. In the 1930s, a new invention called the "decorticator" for separating the wood from the fiber enabled hemp fiber to be made into paper even more cheaply than wood pulp, potentially rendering the wood pulp sulfide process obsolete. Hearst responded to the huge threat to his financial empire with some of his infamous "yellow journalism" tactics, threatening the nation with drug-induced ruin if it was not outlawed. He was joined by DuPont, who owned the patents to the sulfide process, and who had patented Nylon, a petrochemical fiber also in hemp's economic niche, in 1935.

A temporary lifting of the ban for military uses of hemp fiber during World War II as much as proved that suppression of a drug was not the motive. Carver, at the time the ban was lifted in 1942, wrote to Reuben E. Blumenfeld of Savannah, Georgia who had an intense interest in fiber plants:

I notice... that the Government has lifted the ban on hemp under certain restrictions. I do not know just how this will affect the fiber situation, but in dealing with a fiber all the mineral in the form of extraneous matter must be taken out, instead of putting some into it because it would seem so out of place to put something into it and then turn around and take out some of it in a similar nature

as you want pure ligneous bast just unctuous as it is possible to make it, and the oil process helps to make it quite unctuous.³¹

The Power House Floor

Henry Ford, visiting Carver's lab in March of 1938, saw his stains from clays and soybeans and asked him if he would make one up to stain the floor of a Power House at his 75,000 acre estate in Ways, Georgia. Ford had J. F. Gregory, the manager of his farm at Ways, send Carver samples of flooring, which Carver stained with native clays.

Carver, in a letter of April 2, invited Gregory to observe that one stained with soybeans "bears a close resemblance to cherry... Notice how the different stains imitate rare high grade woods."³² Two days later, Carver wrote to Gregory, "These samples will improve in color as they grow older, which is not true with the average stain."³³

Gregory returned the sample that had been selected with a request for enough of it to stain 100 square yards of floor. Carver's strength was low due to heart trouble, so he wrote to Gregory that he would begin making the stain as soon as his physical strength improved. On May 10, he wrote that the stain was ready; but its shipping was delayed by a collapse of Carver's health that necessitated a long hospital stay. Ford wrote Carver in June that he was "looking forward to seeing the results of your work."³⁴ In August, Carver sent the stain to Ways with the note: "Now since I have kept the stain so long I suggest that you shake it up thoroughly and try it out on a piece of flooring... I am not sure if it has not oxidized, which will change its color somewhat, as it was made to be used within a few days after its preparation... If it does not come out well, I can make you some more... I am very anxious for this floor to be unique and very pretty. The last piece of work that I did was on a hickory walking stick. I was looking at it this morning. It is perfectly beautiful."³⁵

³¹ GWC to Reuben E. Blumenfeld, Savannah, GA, 18 March 1942, TIA, 40, 621.

³² GWC to J. F. Gregory, 2 April 1938, TIA, 24, 1266.

³³ GWC to Gregory, 4 April 1938, TIA, 24, 1290.

³⁴ Ford to GWC, 9 June 1938, TIA, 25, 320.

³⁵ GWC to Gregory, 22 August 1938, TIA, 25, 507.

In April of 1940, when Carver went to Ways to dedicate the new school there which Ford had named for him, he went to look at the floor with Ford, who said, "It's wearing beautifully."³⁶ During that visit, Ford learned from Carver uses of wild plants on his estate, and they discussed industrial uses of some fibrous crops like okra.

Direct References to Chemurgy

Carver made few references to chemurgy by that name. In correspondence with Victor Schoffelmayer, an editor of the *Dallas Morning News* and great chemurgy promoter who had visited Carver in his lab in 1928, he made a few references beginning with this statement of 2 August 1940 in response to a pamphlet Schoffelmayer sent him on chemurgy: "Chemurgy is indeed revolutionizing industry and especially along agricultural lines which is so sorely needed."³⁷ Due largely to the energetic Schoffelmayer's efforts, including his writing of the pamphlet *Here Comes Tomorrow*, chemurgy caught a large segment of the public imagination for a while in Texas.

Soybean Plastics

Ford the chemurgist was interested in the problem of synthesizing farm-grown plastic for use in auto bodies. Interviewed at Ways the month before Carver's visit, he predicted that in five years, the average automobile, being chiefly made of plastics, would drop in weight to 1400 pounds. Ford was already finishing his cars with lacquer from soybeans which was durable, and which, when polished, shone as if wet. A few months later, Carver wrote: "Mr. Henry Ford... is now wearing a suit of clothes made from the soy bean, so his secretary tells me."³⁸

After a visit of Carver's to Ford in Dearborn late in 1939, Carver reported: "Mr. Henry Ford... is one of the best authorities I know on soybean plastics as he is using them quite

³⁶ James H. Cobb, Jr., "Ford and Carver Point South's Way," *Atlanta Journal*, 17 March 1940, TIA, 62, 35.

³⁷ GWC to Victor Schoffelmayer, 2 August 1940, TIA, 334, 837.

³⁸ GWC to Entmich Bros., Vicksburg, MS, 8 June 1940, TIA, 34, 99.

exclusively in the construction of various parts of his Ford motor cars. In going to his place he never fails to show me the newest things in soybean plastics."³⁹

Christy Borth wrote in *Pioneers of Plenty* that in January 1938

Ford displayed to reporters a curved sheet of composition made from soy beans. Jumping up and down on it, he said, "If that were steel it would have caved in!"

"Do you still believe that automobiles will be grown?" he was asked.

"You will see the time when a good many automobile parts will be grown," he answered. "The engine, drive shaft and a few other parts will, of course, be of steel. But the rest, including the body, will be made of farm products."

"Maybe fifty years from now?" ...

"Fifty years? Humph!... Much sooner."⁴⁰

A few months prior to Carver's 1939 visit to Dearborn, a writer interviewing Ford at Ways reported: "Henry Ford envisions a day 'only several years off' when a farmer will grow most of the materials going into his motor car and perhaps provide the fuel from plants as well. 'We'll have an experimental body ready at our plant in a month or so made chiefly of plastics from cellulose fibers easily grown... The plastic body will be several hundred pounds lighter, and will be a better body for several reasons.'"⁴¹

In March of 1941, Henry Ford visited Carver at Tuskegee for the purpose of dedicating the new Carver Museum. A visitor to the museum that June wrote in the Dawson, Georgia News: "In a glass case are several automobile parts moulded from soybean plastics. Carver's eyes light up as he lauds industry for, after many years, awakening to the possibilities of plastic for automobiles, airplanes and other uses."⁴² The soybean plastics Ford had set into soft cement were products of his years of work envisioning

³⁹ GWC to A. J. F. Rowe, Durban Natal, South Africa, 4 April 1940, TIA, 33, 557.

⁴⁰ Borth, 208.

⁴¹ James H. Cobb, Jr., "Ford Sees Autos From Plants." [n.d.], 1939, TIA, 61, 1078.

⁴² W. T. Maynor, "Slave-Born Chemist Deplores Great Waste in American Industry," *Birmingham News*, 27 July 1941, TIA, 62, 108.

lightweight, farm-grown cars. That August, Carver wrote him: "How happy I was to get a copy of the *Detroit Free Press* for August 14, 1941 which gives a fine writeup with reference to your new plastic automobile achievement. I was not at all surprised to see it because I knew that it was coming just as other great things are coming from you from time to time."⁴³

Ford, according to Christy Borth, gave Robert Boyer, a thirty-year-old self-trained chemist, the mandate: "Find out everything there is in a soy bean and what it can be used for." Borth continued:

The first piece of equipment supplied to Bob was a thousand gallon still in which the beans were made to reveal their secrets. In time, as their classroom work under Ford instructors revealed special aptitudes and insatiable curiosity, additional youngsters joined young Boyer. Finally there were thirty of them digging away at the bean's secrets. Their average age in 1941 was only twenty-four!

"We were chosen," says Bob, "because we were not too sure that certain things were impossible."

One by one, the soy revealed its industrial values to these boys. First, the enamels. Then the plastics. And, as these laboratory findings showed promises of adaptation to commercial practice, full-scale soy processing plants were built...

At the end of 1940, the Ford plant included one of the largest plastic-molding plants in America. In that year it had converted 21,375 tons of beans into plastics for Ford cars...

Boyer himself concentrated on the search for that plastic automobile body about which the wiseacres were scoffing openly now. The lessons he had learned in plasticizing soy protein he now applied to other vegetation. He tried all sorts of combinations which he plasticized into rear compartment panels for a Mercury sedan. And, as fast as he finished them, Ford took them out and whacked them

⁴³ GWC to Henry Ford, 25 August 1941, TIA, 38, 527.

with an ax until he had succeeded in smashing them. Then he brought the cracked or nicked panels back, and Bob tried again.

Finally, after hundreds of experimental panels had been belted by blows such as nothing less than armor plate should be expected to resist, he turned out one that bounced the Ford-wielded ax off again and again.

"We've got something!" said the jubilant ax-swinger.

To make this panel, Boyer matted long and short fibers obtained from field straw, cotton linters, hemp, flax, ramie and slash pine. To the fibers he added a filler of soy meal. Then he impregnated the mass with a liquid resin binder and color and plasticized it in a hot press. That was a long and laborious process—all right in a laboratory but hardly suited to a mass-production factory.

But it was a triumph. It was at last the material Ford had been seeking. It had an impact strength at least ten times as great as the traditional sheet steel panel which it replaced. Though its tensile strength was less than that of steel, that weakness was easily remedied by molding it on a tubular steel frame. Even with that frame, it was a third lighter than a comparable steel panel. And when it popped out of the press it was finished, requiring no painting or polishing, and presenting a smooth surface from which the color could never be removed...

Boyer was a happy young man, for Ford had given the order that he be supplied with all the presses, dies and equipment needed to mold an entire automobile body out of his fibrous material. He worked out a method of matting the cellulose mass by floating it on water and lifting it out on screens which preformed it into a rough approximation of the finished panel as the mass dried. Then he figured out a way to increase the production rate of the molding presses by squeezing six panels at a time. Engineers and designers developed new principles of automobile construction by building a tubular steel frame of adequate strength to serve as a durable skeleton for a body whose 'skin' would be an assembly of fourteen plastic panels.

The result was exhibited for the first time on August 14, 1941, at the fifteenth annual Dearborn Home-coming Day celebration. It was an experimental, cream-colored automobile. Its body was seventy per cent cellulose and thirty per cent resin binder. Differing little in appearance from the conventional type of car, it weighed exactly 1,000 pounds less. It required no painting or polishing. Its color was integral, not superficial, and its surfaces were as smooth as the polished dies of the 1,000-ton presses that had squeezed the panels under heat and at pressures up to 1,500 pounds per square inch. Because its impact strength was greater than that of steel, it offered greater safety in collisions. In a bad crash there would be no jagged edges of torn steel to slash human flesh. In such collisions, fenders might be broken, but minor bumps which would dent or tear steel fenders would leave these undamaged because the plastic, unlike steel, does not "take a set," and therefore springs back into shape. Because the walls were composed of cellular organic matter, the interior proved to be cooler in summer, warmer in winter, and no sound-deadening "dope" was necessary to eliminate the drumming noises of vibration. Pound for pound, the plastic raw materials were more expensive than steel, but fewer pounds were necessary. Besides, fewer fabricating and finishing operations were required. For example, the rear-compartment panel when made of steel required no less than seven stamping operations, while only two were necessary for the same panel made of plastic.⁴⁴

When Carver wrote to Ford about his new achievement he said also: "I follow predictions with so much interest and real enthusiasm, indeed inspiring enthusiasm, as I have never known you to predict anything that did not come true."

But Ford's 1938 prediction that farm-grown cars would be the norm much sooner than in fifty years did not come true. The United States' entry into World War II and the suspension of automobile production forced him to abandon his efforts to mass-produce

⁴⁴ Borth, 360-65.

plastic car bodies.⁴⁵ His idea and research lay unused until our time. We will discuss their modern uses in Chapter 10.

Carver, for his part in the production of chemurgic plastics, had tried experiments in 1936, in making plastics from peanuts and from soybeans. He hadn't gone far with them, for the reason he gives in this letter to a man in South Africa in 1940: I have done practically nothing on either the peanut or soybean plastics. My work I endeavor to keep so that the man farthest down can profit by it. I am not so much interested in factories.⁴⁶

Oil producers back in Ford's time couldn't have failed to notice the implications of lightweight cars for their business. Christy Borth mentions their hiring of agents to bring down the farm-grown fuel business. Borth wrote of the ending of the story of the plant whose opening Carver hailed: "After things had been going so promisingly the little band of chemists who directed the destinies of this chemurgic project were forced to close the Agrol plant at Atchison's Thirteenth and Main Streets after a year of commercial operation and admit, as Dr. Hale bitterly expressed it, that 'the agents of greed and corruption have won.'"⁴⁷

⁴⁵ David L. Lewis, "Henry Ford and His Magic Beanstalk," *Michigan History Magazine*, May/June 1995.

⁴⁶ GWC to Mr. A. J. F. Rowe, Durban Natal, South Africa, 4 April 1940, TJA, 23, 537.

⁴⁷ For information on the suppression by the oil industry—specifically, the tetraethyl lead industry—of information on ethyl alcohol fuels, see the writings of Bill Kovarik, Ph.D., including the paper "Charles F. Kettering and the 1921 Discovery of Tetraethyl Lead In the Context of Technological Alternatives," originally presented to the Society of Automotive Engineers Fuels & Lubricants Conference, Baltimore, MD, 1994; revised 1999; at <http://www.radford.edu/~wkovarik/papers/kettering.html>; and <http://www.radford.edu/~wkovarik/papers/fuel.html>, "Henry Ford, Charles F. Kettering and the Fuel of the Future," *Automotive History Review*, Spring 1998, No. 32, p. 7-27, at <http://www.radford.edu/~wkovarik/papers/fuel.html>. The latter was originally from a paper of the same name at the Proceedings of the 1996 Automotive History Conference, Henry Ford Museum, Dearborn, Mich., Sept. 1996. See in particular footnote 97. For a list of missing documents relative to this subject, see <http://www.radford.edu/~wkovarik/ethylwar/leaddiary.html> (All sites accessed 14 September, 2005)



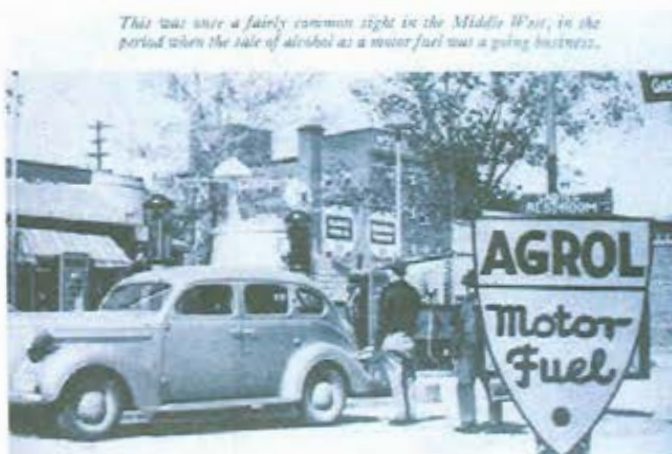
5-1. Charles Kettering



5-2. William "Billy" Hale



5-3. Francis Patrick Garvan



5-4. Agrol Station



5-5. Carver with Henry Ford

The Effects of Carver's Scientific Research On Generations That Succeeded Him—Overview

This chapter is in two main sections. The first assesses the impact of Carver's science on the world as it is today and also goes quite deeply into his potential effect on humanity if what he was saying gets wide recognition and acceptance. The second section covers the part of Carver's legacy that he dearly hoped would bless the world. The George Washington Carver Foundation at Tuskegee Institute.

Assessments of Carver's Science¹

Few people questioned the value of Carver's science while he was living. His clarity of mind and kindness won so many hearts that reporters, by and large, repeated uncritically claims they read of his impact. An exception to this willingness to parrot claims was this commentary from a writer for Tuscaloosa, Alabama's *News* in 1940:

Dr. Carver is perhaps the most widely known American scientist since Edison's day. We can think of no other man who has been so universally praised, who so often has been in the headlines as a benefactor of the human race—and still one question keeps popping up: Just what has Dr. Carver done to deserve all this?...

We are told that Dr. Carver has evolved "hundreds of products" from the peanut and sweet potato—but what are they? Name a few of them: to what practical use have they been put? Who has placed them on the market, and where do you buy them? When we consider the peanut, for instance, we know that it is largely used for feeding hogs, for confectionary purposes, and for producing a vegetable oil

¹ This section is from the author's draft of *George Washington Carver: Great Heart of Love*, chapter 15, "Science Is Truth," and Chapter 6, "Understanding Relations."

and meal. Beyond that we know little about the products of a peanut, and yet Dr. Carver's discoveries certainly do not play a major part in any of these three fields.

We are not one to say that Dr. Carver's work is not great because it is not practical. Perhaps he has labored more in the realm of pure science than in practical science, and what he has done will be of inestimable use to humanity, regardless of the layman's ignorance. But that is not the point. The man in the street has the idea that Dr. Carver has been an Edison of the vegetable world—that he has evolved countless products which have benefited humanity, directly and in a practical way—and yet he can name none of these where or by whom they are manufactured, not the trade name under which they are sold...

A writer recently made the statement that Dr. Carver is 'largely responsible for bringing [the peanut crop] from practically nothing to a \$60,000,000 industry,' and this is so palpably untrue that it makes the really great work which Carver has done seem ridiculous to the public.²

Carver, around the time this was written, used the sixty million dollar figure during a radio interview in Chicago with poet Edgar Guest.³ The inference that his work was instrumental in the peanut's rise in popularity was not "palpably untrue," as the *News* writer suggests. His challenger, by using as his gauge only the marketability of the peanut and sweet potato products, was missing Carver's seminal role in the legume's ascent. He had been the first person in the South to promote the plant.⁴ His presentation

² "Dr. Carver's Record," *Tuskegee News*, 29 February 1940, TJA, 62, 18.

³ "It Can Be Done," NBC radio broadcast from Chicago, 20 July 1937 with Edgar Guest, Tuskegee Institute Archives recordings

⁴ We are careful here to specify the South, because there were proponents of peanuts in Michigan and Ohio before Carver began promoting it. It is significant that the earlier proponents were promoting it for dietary and commercial reasons rather than for the health of the soil, which was Carver's motive. John Harvey Kellogg of Battle Creek, Michigan admired peanuts as a source of complete protein for vegetarians. He took out the first patent on peanut butter in 1895, when Carver was still at Iowa State. Kellogg, after seeing an article of Carver's on peanut milk in the *American Food Journal* in 1920, wrote to him: "I visited Tuskegee some years ago, and in a talk with the students and afterwards with Booker Washington, endeavored to create an interest in the peanut as an excellent substitute for meats." He added that he had planted peanut seeds and raised quite a crop. (Kellogg to GWC, 5 September 1920, AWC Papers, 1920-1)

before the House Ways and Means Committee in 1921⁵ had, at a crucial moment, helped protect the nation's peanut growers from foreign competition. As an unpaid consultant to Tom Huston's firm, answering sometimes several letters in a day with solutions to their problems in field and factory, he was key to the success of a major peanut producer.

The writer missed all these things because Carver did not spend his time blazoning his deservings. A year before his death, he gave his views on credit for scientific work in a letter to a man in Florida:

I wish to say that I have found, just as Abraham Lincoln found, that it was a waste of time to try to explain to people who didn't care to know, and who were not fair and honest enough to come out with the real truth and give credit where credit

A website called "Peanut Butter Lovers," <http://www.peanutbutterlovers.com/history/index.html>, offers the following information:

Africans ground peanuts into stews as early as the 15th century. The Chinese have crushed peanuts into creamy sauces for centuries. Civil War soldiers dined on "peanut porridge." These uses, however, bore little resemblance to peanut butter as it is known today.

In 1890, an unknown St. Louis physician supposedly encouraged the owner of a food products company, George A. Bayle Jr., to process and package ground peanut paste as a nutritious protein substitute for people with poor teeth who couldn't chew meat. The physician apparently had experimented by grinding peanuts in his hand-cranked meat grinder. Bayle mechanized the process and began selling peanut butter out of barrels for about 6¢ per pound.

Around the same time, Dr. John Harvey Kellogg in Battle Creek, Michigan, began experimenting with peanut butter as a vegetarian source of protein for his patients. His brother, W. K. Kellogg, was business manager of their sanitarium, the Western Health Reform Institute, but soon opened Sanitas Nut Company which supplied foods like peanut butter to local grocery stores.

The Kelloggs' patent for the "Process of Preparing Nut Meal" in 1895 described "a pasty adhesive substance that is for convenience of distinction termed nut butter." However, their peanut butter was not as tasty as peanut butter today because the peanuts were steamed, instead of roasted, prior to grinding. The Kellogg brothers turned their attention to cereals which eventually gained them worldwide recognition.

C.H. Sumner was the first to introduce peanut butter to the world at the Universal Exposition of 1904 in St. Louis. He sold \$705.11 of the treat at his concession stand and peanut butter was on its way to becoming an American favorite.

Krema Products Company in Columbus, Ohio began selling peanut butter in 1908 - and is the oldest peanut butter company still in operation today. Krema's founder, Benton Black, used the slogan, "I refuse to sell outside of Ohio." This was practical at the time since peanut butter packed in barrels spoiled quickly and an interstate road system had not yet been built.

⁵ The transcript of this appearance of Carver's, with a brief explanatory introduction, may be found in Gary Kremer, *George Washington Carver In His Own Words* (Columbia, MO: University of Missouri Press, 1987), 102-13.

was due. Nevertheless, I have also found that the real honest, high class, thinking individual knows very well where things originated. Then, I believe in the old saying that "truth crushed to earth will rise again." In my work I am more interested in producing the thing than trying to find out who originated it first."

He merely kept going ahead with what he felt guided to do. Mycologist Paul Miller remarked of him: "His methods of experimentation have not always been orthodox, but his innate ability and tireless efforts have far overshadowed any failure to conform to conventional procedure."⁷

The *News* writer's desire to conform Carver either to a "bottom line" measurement of his science or the label of "pure scientist" grew out of an empirical perspective Carver did not share. With his scorn for abstractions not hitched to "something the world wants done,"⁸ he certainly saw himself as a "practical" scientist, not a "pure" one - whatever that meant. His practicality, however, was not tied to markets as they existed in his time - or to any market in which people are looking out only for themselves - but to markets he saw as best serving humanity in the long run. In short, he was presenting an economic vision in advance of the one that exists to this day.

Carver answered the suggestion that his science could be measured by the presence of products in the marketplace in a letter to his former student Raleigh Merritt in 1929: "A contribution to humanity and all humanity through educational methods cannot be measured by the number of companies formed or the dollars and cents gotten out of it. Mr. B. T. Washington just made a bare living but look what a rich legacy he left to all peoples... The world cannot fully appreciate just what Mr. Washington's work has meant to the world. I believe it is the same with this work of mine."⁹

His words make it clear that his mission had for its primary goal education, with economics always secondary. When humanity was educated to his vision, their way of

⁶ GWC to Mr. N. A. Colbert, Sanford, FL., 3 February 1942, T1A, 40, 19.

⁷ Holt, 320.

⁸ GWC, Sunday evening Vesper service address in the Tuskegee Institute chapel, 20 October 1940, typed copy, T1A, 46, 970-71.

⁹ GWC to Raleigh Merritt, 6 January 1929, T1A, 45, 293.

“talking to nature and letting nature talk to them”¹⁰ would show them to the solution of economic problems. He was trying to lead humanity “through educational methods” to a science which he defined as truth, that is, a science with motives unclouded by desire for personal gain. He wrote a man in New York City in 1925: “Ever since last November immediately after speaking at the Marble Collegiate Church in your own City the criticism by the *New York Times*”¹¹ I have been getting remarkable letters... The thing that makes me happier than anything else is that my own people are catching the vision, I mean the vision of centuries to come, the vision of a contribution to education.”¹²

Carver’s biographers, beginning with Rackham Holt,¹³ made much of any of his products that the public had seen at work. There was the paint from clay wearing well on the walls of the Episcopal church in Tuskegee. There was the sweet potato flour which the U.S. Government, at Carver’s suggestion, had begun producing during World War I. There was a mucilage for stamps from sweet potatoes of which a writer for the *Montgomery Advertiser* reported on in 1929: “Scientists in the Federal Bureau of Chemistry and Soils have extracted dextrin of pleasant taste from the sweetpotatoes [which has been] used in tentative experiments as the chief ingredient of a glue for stamps and envelopes... At present most of the glue used on stamps and envelopes is made from tapioca.”¹⁴

It was natural for admiring writers to trumpet Carver’s tangible achievements. Their trumpeting, however, amounted to a strained effort to show that he had been a major contributor to the progress of “modern science.” In this, they made the same fundamental error the writer from Tuscaloosa made. His science was indeed for “centuries to come”—

¹⁰ “Activities Centered at Hungerford School During History Week,” AWC papers, folder “Newspaper clippings 1896-1930, concerning GWC”.

¹¹ This reference was to an editorial “Men of Science Never Talk That Way,” *New York Times*, 20 November 1924, written following Carver’s claim during a talk in New York that he relied on God for his discoveries. See Kremer, 128-30.

¹² GWC to Mr. W. O. Smyer, NY, NY, 7 July 1925, TIA, 9, 14.

¹³ Holt’s *George Washington Carver: An American Biography* (see Bibliography) was released a few months after Carver’s death. Biographies on him, most of them for young readers, poured off of presses until the 1960s and beyond.

¹⁴ Osburn Zuber, Associate Editor, “Negro Scientist Shows ‘Way Out’ For Southern Farmers,” *Montgomery Advertiser*, 22 December 1929, printed in *Joint Hearing Before the Committee on Public Lands and Surveys, United States Senate, and the Committee on Public Lands, House of Representatives, Seventy-Fifth Congress, First Session on S. 37, S. 312, and H.R. 647, Bills to Provide for the Establishment of the GWCNM, 5 February 1943, U.S. Government Printing Office, Washington: 1943, TIA, 64, 131.*

for an age and people that had matured beyond a kind of fetish worship of money and industrial technology. His impact on "modern science" was not great, but his biographers, aiming to make it seem so, tried to fit his work into a space far narrower than it was.

Carver's legacy was so much greater than to have made products which moved rapidly in some long-dead market, or to have helped make a high-tech society which we now know brings stress, not leisure. His great significance is that he stands ready at any time to show us a way of living which supports everyone in a way that can be sustained over the long term. Putting nature study first in education as he suggested, if widely done in his time, would have averted earth-wide environmental perils brought into being by human disconnection from nature. On the personal level, it would have taught the masses intelligent use of nature's cost-free products and good gardening, helping free individuals from economic systems which profit a few and trap the rest. His example of keeping technology simple enough to be equally useful to rich and poor, well heeded, could have stayed off the amassing of economic power into a few hands. His genius as a recycler of everything, taken to enough hearts, would have left plenty for us today.

In his 1956 book *Corn and Its Early Fathers*, Henry A. Wallace, himself the "father of hybrid corn," shows his sharp awareness that the science into which Carver didn't fit had lost touch with nature. After comparing Carver's belief in contacting the Spirit through plants¹⁵ to the Hopi Indian world view, Wallace goes on to say:

When the... author began inbreeding corn in 1913, he had only a fraction of an acre within the city limits of Des Moines on which to work. An inbred corn capable of unusually high yield came out of his backyard garden, which was but ten by twenty feet. (Fig. 6-1)

No doubt there are dozens of plant breeders who can point to the fact that when they were living very close to their plants, seeing them every day, and spreading attention thickly over a small area, they got many times greater a return per hundred square feet than they did when working with large numbers of plants

¹⁵ Henry A. Wallace and William L. Brown, *Corn and Its Early Fathers* (East Lansing, MI: Michigan State, 1956; revised: Ames, IA: Iowa State University Press, 1988), 124.

covering acres of land. Yet, even today, there are a surprising number of plant breeders who fail to recognize and appreciate this fact.

The modern trend in science is in exactly the opposite direction. The present emphasis is directed toward doing things in a big way, toward the use of large numbers and multidisciplinary research. In many of our educational institutions, scientific progress seems to be measured in terms of the growth of departments and the number and size of financial grants that can be obtained for support of the work...

Statistics have their place, a very important one, but they can never serve as a substitute for close association with plants. Their real value, it seems to us, is in measuring precisely what we already know in a general way...

We fear that until we return to thinking of corn in terms of what the plant itself is doing, instead of working out neat mathematical formulae to fit what we think its performance should be, no real advance will be made.

The great scientific weakness of America today is that she tends to emphasize quantity at the expense of quality—statistics instead of genuine insight—immediate utilitarian application instead of genuine thought about fundamentals. The American approach has performed miracles in utilizing our great resources in record-breaking time. We have become the best exploiters in the world, but in many fields we have not always become the best researchers...

The point we are making is that lots of land, equipment and power can never produce scientific advancement in corn breeding or anything else unless the ideas are big enough to match. And, unfortunately, when the equipment, land and manpower pass a certain point of immensity, the men who are supposed to do the scientific thinking tend to become mere administrators, making the wheels go around, keeping records, compiling data, conducting meetings, and appointing

committees, but not thinking often enough or hard enough about the next fundamental step forward.¹⁶

Wallace was comfortable discussing Carver's ways with nature and his faith, but cautious in assessing his science. When a man from the YMCA National Council in New York wrote to him of Carver, he replied: "Dr. Carver is not a scientist in the ordinary sense of the term... In certain fields of knowledge he has gone a long way although there are many curious blank spots. I am very fond of Dr. Carver and would prefer to have you draw your own conclusions after talking with him yourself."¹⁷ Two days after Carver's death, Vice-President Wallace telegraphed Tuskegee: "When Dr. Carver died the United States lost one of its finest Christian gentlemen... To the world he was known as a scientist. Those who knew him best however realized that his outstanding characteristic was a strong feeling of the immanence of God."¹⁸ Wallace hinted at Carver's ultimate legacy in this statement to a man in Baltimore: "Dr. Carver had an insight into the nature of things different from most scientists. He had possibilities of an even greater contribution than most folks realize."¹⁹ (Fig. 6-2)

But several months before his own death in 1965, writing to a relative, Wallace shared reservations that his general statements only glanced at. Mentioning Carver, he added in parentheses: "Between you and me I am inclined to think his ability as a chemist has been somewhat over rated. I have been in his chem lab at Tuskegee but frankly I doubt if much of practical value came out. I remember he had a kind of medicine derived from the peanut which he thought was good for colds."²⁰

Carver was unencumbered by illusions about his place in science as it existed in his time. John Sutton, who worked with him in his lab around 1919, recalled:

When I could not find the "real" scientist in him, I became hurt and deceived by my own errors concerning Carver himself. I should have known better since time

¹⁶ Wallace and Brown, 122-25.

¹⁷ Wallace to Mr. A. R. Elliott, National Council YMCA, NY, NY, 26 October 1933, TIA, 48, 808. Original in National Archives, gp. 16.

¹⁸ Wallace to Tuskegee, telegram, 7 January 1943, TIA, 51, 982.

¹⁹ Wallace to Mr. O. A. Stewart, Baltimore, MD, 23 March 1935, TIA, 48, 863.

²⁰ Wallace, South Salem, NY, to Don, 25 June 1965, TIA, 58, 1120.

and again he made it clear to me that he was primarily an artist who created good (God's creations) out of natural things. He knew that he was not "a real chemist" so-called engaged in even applied chemical research. He used to say to me jokingly, "You and I are 'cook-stove chemists' but we dare not admit it, because it would damage the publicity that Dr. Moton²¹ and his assistants send out in press releases about me and my research, for his money-raising campaigns."²²

Sutton told of his teacher's response to some of the publicity out of Moton's office: "I have known him to show momentary flashes of anger at some of the exaggerated claims made concerning the 100's of new products produced by his research activities, in the Principal's office press releases. He would frown and then laugh while saying, 'Oh me!', and his anger was gone."²³ Carver had made up accurate lists of his products, but stopped because, as he said, "it kept us constantly correcting 'John Jones' list, 'Peter Parker's' list and 'Bill Smith's,' all of which differed, and each one would be correct at the time issued."²⁴

The fact remained that, while many had seen the array of products at his talks and some had lists of them, few had sampled them. Young Lucius Harper watched him writing with his peanut ink in 1908.²⁵ A reporter from the *Montgomery Advertiser* gave an extensive list of plant dyes he observed in Carver's lab in 1917.²⁶ Many students and others had benefited from his massages with formulations of peanut oil. But later assessments of his work would criticize the lack of reproducible proof of the products' effectiveness—namely, chemical formulas.

Editor Robert Vann of the *Pittsburgh Courier*, a black paper, once asked Carver if he had recorded his formulas. Vann reported, "Dr. Carver looked at me and smiled and said, 'I

²¹ Robert Russa Moton was the successor to Booker T. Washington as the Principal of Tuskegee Institute.

²² Sutton to John W. Kitchens, 3 June 1975. TIA, 67 [a], 691.

²³ See note 22 above.

²⁴ GWC to Mrs. Ruth Sheldon Knowles, Petroleum Specialist, U. S. Dept. of Interior, DC, 23 June 1942, TIA, 41, 918.

²⁵ Lucius Harper, "Dustin' off the News," *Chicago Defender*, 10 June 1950. TIA, 62, 592.

²⁶ Littel McClung, "A Glimpse of the Remarkable Work of George Washington Carver, the Negro Scientist," *Montgomery Advertiser*, 25 November 1917. TIA, 7, 123-24.

have all of these formulas, but I have not written them down yet."²⁷ The most likely reason for Carver's coyness was that he saw the effect of public pigeonholing of him as the Peanut Man obscuring his larger message, and knew that, had he committed the formulas to paper, arguments about their potential economic merits would only have further submerged what he was trying to say.

A real, immediate, humanitarian need, however, sailed right past his coyness and directly to his fund of knowledge. He gave out his peanut milk recipe to a nurse whose name he remembered as Hilda Copen, visiting from Africa's Belgian Congo, recalling that "she returned in the next two or three years and told me what a wonderful thing it was proving in the hospital that she had charge of."²⁸ A missionary in the Congo, hearing of Carver's death, wrote to his assistant Austin Curtis:

I write to express to you our great sense of loss at the news of Dr. Carver's passing. We have been so indebted to him for 25 years, when I first learned of his work in extracting milk from the peanut. You see, it has never been possible for us to keep farm animals in interior Africa, for they are attacked by tigers and sickened by tsetse flies. So it used to be that when a new mother could give no milk her baby soon died. When I wrote this information to Dr. Carver in 1918 he responded by instructing us on the culture of the peanut plant and with detailed information on the procedure for deriving milk from the nuts. Hundreds of infants were so saved from death, and for this we can never properly express our thanks.²⁹

A former missionary wrote to President Patterson from Philadelphia after Carver died: "For over eleven years I worked in Africa where the influence of Dr. Carver was very much felt. Both as an inspiration to my people there and as a practical help in their cultural work."³⁰

²⁷ Robt. L. Vann, Pittsburgh, to Raleigh Merritt, 30 August 1938, in Merritt, 69; quoted in Barry Mackintosh, *The Carver Myth*, Part I, "George Washington Carver: The Man Behind the Myth," M.A. Thesis in Preparation, 1974, TIA, 59, 749.

²⁸ GWC to Miss Dora J. Armstrong, American Mission to Lepers, Atlanta, 9 February 1942, TIA, 40, 111.

²⁹ Elliott, 185. The quote is given as "from a missionary in the Belgian Congo to AWC," January 1943.

³⁰ Irwin W. Underhill, Jr., D. D., Philadelphia, PA, to President Patterson, 18 June 1943, TIA., 54, 365.

William Walter Thompson, Ernest Thompson's uncle, recalled to Carver another instance of his benevolent chemistry:

In 1909 to 1914 I was developing the old farms, and doing conservation work on old lands that had been worked for one hundred years, by using the methods that you had used and the information from you. I improved the health of all my tenants, who were suffering with malaria, chills and fever. One day you suggested some of the sickness might be caused by bad water, so I had all the surface wells filled, and put down fourteen artesian wells. You analyzed the water, and pronounced it good. My tenants' health improved, so you rendered a great service to humanity.³¹

Carver, paraphrasing St. Paul, said: "Study to show thyself approved, not of man, but of the Great Creator of all things."³² The greater part of his service to God and man (being, in his mind, not two kinds of service but one and the same), was only known to the souls he served, one or several at a time. His work, from dawn to dusk for decades, was his continual offering to God. He said: "In my work I have found it always better to let people be agreeably surprised by finding more than we say, rather than less."³³ As long as he was following God's direction, it mattered little to him how much folks knew or what they said. He said: "We are looking to those who really do things in life, rather than those who object to those who are doing something... The main thing is in all of our work to be sure you are right and go ahead... You will always find people who object to anything... unless it comes through them. They are not worth paying any attention to whatever."³⁴

The critics after his death who dismissed his work as practically worthless confirmed Carver's wisdom in not leaving his formulas, which would have been a giant target in the opposite direction from his vision of selfless, freely given service. Tuskegee's Secretary G. Lake Ince said of Carver's way with the public: "Much has been said in the press and in magazines and otherwise about his manners and his characteristics, and his

³¹ W. W. Thompson, Sanford, FL, to GWC, 13 June 1941, TIA, 35, 825.

³² Henry Ford Museum and Greenfield Village on-site manual, Ford Papers; Acc. 1, Box 112, Fair Lane. The Bible verse is 11 Tim, 2:15.

³³ GWC to R. H. Powell, 3 May 1940, TIA, 33, 975.

³⁴ GWC to Birdie Howard, Waycross, GA, 25 March 1940, TIA, 33, 381.

eccentricities too, and some mystery and glamor have been thrown around his achievements as though they were some miracle that dropped down from heaven. Perhaps Dr. Carver himself contributed not a little to that impression. I can say Dr. Carver was a good showman; he knew how to sell his wares."³⁵ (Fig. 6-3)

What Innes calls Carver's "wares" was his "mighty vision." When Glenn Clark once asked him, "Dr. Carver, do you consider yourself a chemist?" his reply, like the one to Robert Vann, shows a spiritual Houdini slipping free of any binding which would confine him to a part, however large, of his vision. He replied:

I should say with reference to that, that we have to be very careful lest the ego comes in. A person that can bake a reasonably good cake or a reasonably good pan of biscuit can't go out and put up a shingle and say that they're good cooks. But they simply use the stove or the range or the kettle or pan or whatever vessel they use as a means to carry out the end. So I simply use the chemical laboratory to find certain things that I'm looking for.

A laboratory is simply a place where we tear things to pieces. Sometimes we can get them together again if we want to put them together, and sometimes we can't. But nevertheless we can pull things to pieces and get the truth that we are searching for. We can at least find out out of what certain things are made, which gives us the information to do other things with.

Sometimes it is wise not to look for too much appreciation. The main thing is to be sure you are right and go ahead regardless of whether people appreciate it or whether they don't; because in time they will appreciate it. So simply be sure that you are on the right road, and then do—a question naturally comes in. "How can I be sure that I'm on the right road?" I should simply say this, that "In all thy ways acknowledge Him, and He shall direct thy paths." Now you must learn to look to Him for direction and then follow, and you'll never go wrong.³⁶

³⁵ *Congressional Record*, 78th Cong., 1st sess., 1943, TJA, 64, 146.

³⁶ Glenn Clark interview with GWC, National Park Service CD-127, George Washington Carver National Monument Archives, tape 602.

An audience response to a talk of Carver's in Manhattan, nine years after the address there that caused the editor at the *Times* to declare that "Men of Science Never Talk That Way," shows very clearly how men of science took him in. Jim Hardwick, in a letter on his trip in late 1933 with Carver and Wallace Friday, (Fig. 6-4) recalled:

The New York University meeting really climaxed all the others. He spoke to 150 members of scientific honor societies. They were cold at first, hardly smiling at his humor. Then you could see them warming up. When he had finished they cheered until he stood up twice and then they continued cheering...

You will be interested in these statements from members of the New York University faculty... E. George Payne, Assistant Dean, New York University: "I was amazed at the vitality of Dr. Carver as he was on his feet talking and answering questions for nearly four hours and would perhaps have been there yet if we had not protected him against the avid enthusiasm of his hearers."³⁷

A person Lucy Crisp³⁸ called "an eminent sociologist" gave her an excellent description of how Carver melted the ice in people like the scientists at NYC, saying: "He combines in the most surprising way the simplicity of a child, the humility of devout faith, and the confidence of scientific certainty. His first words are apt to impress you as almost childish. Then you become conscious of an unfathomable vein of mysticism and faith. Finally you yield to speechless wonder as he opens for you a few windows into the scientific maze where his feet are so much at home."³⁹ An NYC professor in that crowd Carver thawed out recalled: "Dr. Carver had his audience absolutely. He had an extraordinary effect on me personally. He is the first example I have ever seen of a consecrated chemist."⁴⁰

³⁷ "George W. Carver, Apostle of Interracial Appreciation," *Tuskegee Messenger*, January 1934, TIA, 61, 265.

³⁸ Crisp was a friend of several of Carver's "Blue Ridge Boys." The Lucy Cherry Crisp Papers at East Carolina University, Greenville, North Carolina, is an important source of primary material on Carver.

³⁹ Crisp, manuscript, ICC, 154.16d, IX, 19. Crisp only says the quote was from "an eminent sociologist."

⁴⁰ See note 37 above.

Just before he left the Harlem Y where he was staying with Jim and Wallace Friday for the NYU speech, Carver gave the *New York Herald Tribune* a quote that showed him unmoved from his position nine years earlier. He said: "I commune with nature and, of course, God speaks to you through the things He has created. That's what He was doing while I was developing all these things from the peanut. He was telling me I could do what I have done. I was interpreting for the Lord." He added: "I'm like a poet. A poet doesn't have anyone helping him with his words. Afterward, I have help, but I think alone."⁴¹

With words like these, he left for us his vision of what a scientist must be in order to be a blessing and not a curse to the world. A year before he died, he told Glenn Clark: "One can't go into a laboratory with gusto and a test tube and discover God's laws. But he can ask the Creator. Please let me find the Truth you want me to find this day, and great results will follow. Christ is not in a test tube, or in a tempest, or in a holocaust, or in a tornado, but in the still small Voice. I find Him always with me."⁴² And not six months before his death, visiting Henry Ford in Michigan, he gave this insight to an audience of young men on what real science is:

A person is at liberty to experiment with anything that he can. We try anything that shows promise: we feel around—when we don't know, we feel around until we happen to hit upon something. Our eyes and ears are always open. We must be patient and wait, as were the old prophets. Isaiah and the old prophets always had their eyes and ears open. You know, Isaiah, listening, heard a voice.

We have so much noise now that we hear nothing but noise. It comes and goes, and that's all of it, just noise. We can't think very well now because there are so many noises of different kinds.⁴³

⁴¹ "Ex-Slave Plans Cotton-Asphalt Highway Cover," *New York Herald Tribune*, in *Columbia (SC) News*, 13 December 1933, TIA, 61, 249.

⁴² Clark to his "Comrades," 21 January 1942, TIA, 39, 1023.

⁴³ "Address of Dr. George Washington Carver Given at Martha-Mary Chapel, Greenfield Village, July 24, 1942," *the Herald*, AWC Papers

Much of increase of noise he was hearing came from the cars Henry Ford was manufacturing right where he was in Dearborn. The automobiles so widely regarded as symbols of "progress" were, then, in his view, obstructing progress toward finding truth. Henry Wallace, speaking as a scientist to scientists in 1939 on their rightful role, made a similar point:

The ironic fact is that the economic maladjustments of the present day which threaten our democracy and the freedom of science are in large part due to the changes wrought by science.

In a democracy, every individual according to his station in life and according to his capacity should have opportunity for joyous service of the general welfare. Scientists, by their discoveries and inventions— which in countless ways have enriched our lives—have at the same time, without intending to do so, helped to break down this kind of democracy. Quite without intention, they have helped to replace it with an industrial system in which a small number of individuals make the decisions and the great majority have no feeling that they are taking part according to their capacity on equal terms in a common enterprise...

We may talk all we like about the beauties of democracy, the ideals of democracy, the rightness of democracy. In the long run, democracy or any other political system will be measured by its deeds, not its words...

Wallace concluded:

Are we as scientists doing all we can to make democracy succeed? Are we using our science vigorously and impartially, to bring greatly increased health, wealth, security and education to all the people of the United States? The fate of democracy and of scientific freedom will depend less on what we may say than on how unreservedly we dedicate ourselves to these deeds.⁴⁴

⁴⁴ Henry Wallace, "Racial Theories and the Genetic Basis for Democracy," *Science*, 17 February 1939, TIA, 61, 958-59.

Blue Ridge Boy John Crichton, in a 1974 essay for the Missouri Academy of Science magazine *Transactions*, presented his mentor Carver as a beacon that scientists may use to help steer humanity away from a collision course with worldwide woe. He began:

The achievements of modern science in various fields, for example, biology, medicine and astronomy, are awe inspiring. Yet never since the development of the scientific method have scientists had more doubts about what they are doing. Should scientists feel any responsibility for the results and uses of their research? Should there be a moratorium on scientific research and discoveries which, converted into new technologies, speed up the dizzy rate of social change? What exactly is the nature of the scientific method? Finally, is the scientific method adequate for investigating the whole spectrum of reality, or must it be supplemented by religion?

Crichton ended his article this way:

A number of the American astronauts returned from their journey to the moon with deepened religious insights. The luminous splendor of the earth seen from outer space; the realization that the earth itself is a spaceship on which all the consciousness of the limited nature and the fragility of the earth's envelope of atmosphere on which all life depends; and the feeling of being part of the immensity and glory of the natural universe— all these experiences tended to make them more God-conscious, more alive to the fact of human brotherhood, and alert to the need to protect our earthship, its life-sustaining atmosphere, and its irreplaceable resources.

This experience of the astronauts suggests that science and mysticism are not antagonistic, and the a mystic is a scientist—or other careful observer— who has viewed the earth in perspective or from a distance. Dr. Carver, without leaving the earth, had such a vision.⁴⁵

In a 1989 interview, Crichton offered further reflections on his friend:

He had the basic philosophy of the environmentalists, the people of the Wilderness Society and the Sierra Club in that he had an appreciation of the mystery and beauty of the universe... The earth to him was not just a treasure-house to be ransacked and to be plundered and to be profited from, but it was of course our home and it's the place of beauty and the mystery. It was God's handiwork, to some extent God's incarnation, you might say. So in these respects, I'm sure that he would today be concerned with problems that did not exist in his time, that is the greenhouse effect and the erosion or destruction of the ozone shield and the ravaging of the rain forests, the pollution of our oceans and inland waterways, of the air that we breathe with smog and so forth. I'm sure that he would be allied with the greater scientists of today in working on these problems which in my opinion will require not only the scientists to work at but the scientists and the theologians, in other words science and religion—science to find possible solutions and religion to help persuade people to the broad, worldwide view that is necessary for solving them.⁴⁶

The problems Crichton lists, which know no national boundaries, are best understood by those with eyes and ears open to nature. Tuned-in scientists, from Carver to the most insightful of our time, have offered us solutions to every problem we face. This description of Carver, sent to him from Esther Merrill of Sunbeam, Idaho, applies to all scientists who look and listen beyond themselves: "To me you are the greatest of all living men—the miraculous combination in one body of the great scientist and the great human heart. It is not given to many men to live deeply in both the Heart and Mind of God. To some are given superior intelligence, to others extraordinary depths of human sympathy, which draws them into the circle of divine understanding. To you have been given both gifts."⁴⁷

Even writers who took umbrage with Carver's science found him opening something in them that elicited admiration. Like Henry Wallace, they caught glimpses of "possibilities

⁴⁶ Crichton, "Dr. George Washington Carver: Scientist, Humanitarian and Mystic," *Transactions, Missouri Academy of Science*, v. 7-8, 1973-4, 239-43.

⁴⁷ Crichton interview with Gary Kremer, 1989, Park Service tapes.

⁴⁸ Esther Merrill, Sunbeam ID, to GWC, 4 August 1939, TIA, 39, 598.

of an even greater contribution than most folks realize." A 1962 report by University of Missouri professors William Carroll and Merle Muhrer, written with support from the U.S. Interior Department, quoted the Secretary-Treasurer of Sessions Peanut Company saying of Carver: "His sole contribution to the peanut industry so far as we have been able to learn consisted of focusing some public interest on the peanut and its products."⁴⁸ Carroll and Muhrer took this view and produced a report highly skeptical of the value of Carver's contribution. They concluded, however, with this incongruous applause: "We need more people like George Washington Carver. We need men that will use their scientific training to help their fellowman. With more men like Carver today's scientific knowledge could be used for greater understanding and a higher standard of living."⁴⁹

Linda McMurry, in her 1981 book on Carver subtitled *Scientist and Symbol*, takes as her thesis that he was exploited as a symbol by self-interested groups, and that his fame was based on myth. She portrays him as a man of thinly veiled vanity who finished his greatest work around the time of Booker T. Washington's death. Six pages away from the end, she opens a door to a previously unexamined room by writing: "A final question is whether Carver deserves continued recognition after the myth is destroyed. For some, such as [Barry] Mackintosh [a Park Service historian], the answer is no. Yet this is plausible only if the real Carver was nothing more than the mythology, an assertion that ignores the significance of his true vision, or philosophy, and his impact on individuals."⁵⁰ Then, swinging that door open, McMurry gives the final pages to observations like these:

When whole species became extinct and raw materials were being rapidly depleted, the ecology movement was born, and the philosophy of Carver became relevant...

⁴⁸ William R. Carroll and Merle E. Muhrer, "The Scientific Contributions of George Washington Carver," manuscript of Study supported by National Park Service, 1962, T1A, 59, 546.

⁴⁹ Carroll and Muhrer, T1A, 59, 532.

⁵⁰ Linda McMurry, *George Washington Carver: Scientist and Symbol* (Oxford: Oxford University Press, 1981), 308.

In the 1970s more people began to accept what Carver tried to say—that only short-term success can come to any system that ignores the whole, that man cannot subvert and destroy the environment without destroying himself.⁵¹

Thus two of the most critical assessments of Carver's science end with eloquent, insightful statements on his high value to people of a later time. An inorganic chemistry professor at Virginia Polytechnic Institute in Blacksburg, Jim Hardwick's alma mater, wrote Carver after his visit there with Jim in 1932: "No scientist can listen to you without being stimulated to greater effort in an endeavor to do more, through a scientific research, for the good of mankind."⁵²

Henry Wallace wrote of the modern trend toward bureaucratic, data-piling "think big" science—the antithesis of his and Carver's—back when the push by a few scientific firms to consolidate "lots of land, equipment and power" had only begun. A science that is poor in ideas easily degenerates into growth-hungry grabs for external things. In our day, the rush to acquire patents on living organisms poses an unprecedented threat to the world. Carver anticipated this danger in a talk to a gathering of Glenn Clark's disciples who came to sit at his feet in his hotel room in Minneapolis. Predicting a spiritual awakening, he compared its simplicity and beauty to a nearby rose in a vase and said:

At first that rose was not as attractive as it is now. It had only four petals and many thorns. People didn't pick them for they pricked and their fragrance was not as sweet as the rose we see here. At first there was no rose—just green leaves. Then the bud appeared and finally the blossom with all its beautiful color and fragrance. That rose as it grows and unfolds is like the spiritual awakening we are talking about. It is a symbol of the awakening going on in each individual heart. We, too, may grow and become as beautiful and fragrant as the rose if we let God do the growing, and if we grow in God's way. There is just as beautiful a plan for each of us if we let God bring it forth.

⁵¹ McMurry, 311.

⁵² J. W. Watson, Blacksburg, VA, to GWC, 21 October 1932, TIA, 13, 933. Original in Carver Museum, Tuskegee.

Hundreds of years ago, that rose's great-grandfather was just a little bit of a green ball, as green as that leaf, and just about as big around as this finger. Now it is what we call red, and it has a beautiful fragrance. In the laboratory the Great Creator worked through man. Now we can produce roses —any color we like, any size we wish —*within a certain limit*. If we exceed the limit, we would have a monstrosity. God says, "Thus far shall ye go, and no farther."⁵⁵

Carver suggests that nature, like a mother informing her children where dangers lie, shows her attentive students where lie limits they pass at their peril. He believed that we exceed those bounds when we forget that God created us to bring what is beautiful and useful to the world,⁵⁴ and turn instead to quick commercial schemes; for instance, by producing plants for sale whose generations are dead ends. These words from his bachelor's thesis show that he had thought this through by 1894: "A change in natural conditions tends to weaken our own plants. Man performs his work too suddenly, nature builds up her work slowly, man seeks to bring about the same results in one-half the time and as a result we invariably get a race of plants low in vitality, susceptible to the attack of fungus diseases and early decay."

Carver's words find an echo in a 1976 article by Dr. George Wald, 1967 Nobel Laureate in Medicine and Harvard University Higgins Professor of Biology. Writing of genetically engineered plants, he says:

Recombinant DNA technology faces our society with problems unprecedented not only in the history of science, but of life on the Earth. It places in human hands the capacity to redesign living organisms, the products of some three billion years of evolution.

Such intervention must not be confused with previous intrusions upon the natural order of living organisms: animal and plant breeding, for example; or the artificial induction of mutations, as with X-rays. All such earlier procedures worked within single or closely related species. The nub of the new technology is to move genes

⁵⁵ Glenn Clark, "In the Upper Room With Dr. Carver," essay in manuscript on meeting of 18 March 1939, TIA, 28, 1135.

back and forth, not only across species lines, but across any boundaries that now divide living organisms. The results will be essentially new organisms, self-perpetuating and hence permanent. Once created, they cannot be recalled.

Up to now, living organisms have evolved very slowly, and new forms have had plenty of time to settle in. Now whole proteins will be transposed overnight into wholly new associations, with consequences no one can foretell, either for the host organism, or their neighbors.

It is all too big and is happening too fast. So this, the central problem, remains almost unconsidered. It presents probably the largest ethical problem that science has ever had to face. Our morality up to now has been to go ahead without restriction to learn all that we can about nature. Restructuring nature was not part of the bargain. For going ahead in this direction may be not only unwise, but dangerous. Potentially, it could breed new animal and plant diseases, new sources of cancer, novel epidemics.⁵⁵

Indian physicist, ecologist, activist, editor, and author Dr. Vandana Shiva compares the rush by American corporations to commercialize patents of living to having a child perform a concert after her first piano lesson. She commented on the grab for patents on Indian staple foods in a 1998 InMotion magazine interview:

Contemporary patents on life... are pieces of paper issued by patent offices of the world that basically are telling corporations that if there's knowledge or living material, plants, seeds, medicines which the white man has not known about before, claim it on our behalf, and make profits out of it.

That then has become the basis of phenomena that we call biopiracy, where seeds such as the Basmati seed, the aromatic rice from India, which we have grown for centuries, right in my valley is being claimed as novel invention by RiceTec.

⁵⁴ GWC to Matthew Woods, Tuskegee Institute, 7 September 1940, TIA, 35, 66.

⁵⁵ George Wall, "The Case Against Genetic Engineering," reprinted from *The Sciences*, Sept./Oct. 1976, in *The Recombinant DNA Debate*, Jackson and Stich, eds., 127-28.

Neem, which we have used for millennia for pest control, for medicine, which is documented in every one of our texts, which my grandmother and mother have used for everyday functions in the home, for protecting grain, for protecting silks and woolens, for pest control, is treated as invention held by Grace, the chemical company...

Eighty percent of India takes care of its health needs through medicinal plants that grow around in back yards, that grow in the fields, in the forests, which people freely collect. No one has had to pay a price for the gifts of nature. Today every one of those medicines has been patented, and within five, ten years down the line we could easily have a situation in which the same pharmaceutical industry that has created such serious health damages is shifting to safe health products in the form of medicinal plant-based drugs, Chinese medicine, aromatic medicine from India, [and] will prevent the use [of them by others]. They don't even have to come and make it illegal because long before they have to take that step, they take over the resource base, they take over the plants, they take over the supply, they take over the markets, and leave people absolutely deprived of access.⁵⁶

Carver once received a letter from an attorney in Florida asking if the method of turning forest leaves to fertilizer, which nature gives us free, was patented.⁵⁷ Similar motives are found in companies who manufacture seeds that grow to sterile plants in order to force farmers to return each year to buy more. For private gain, they would reduce the diversity through which all living things are strengthened and kept healthy. Others have replaced living forests of the South with rows of clones they call trees, in which no bird or insect life survives frequent showers of pesticides. When citizens express alarm, in steps the public relations department, Carver said of such people: "You cannot always rely... upon newspaper reports, as a person rarely gives out personal reasons for not doing this or that.

⁵⁶ "An interview with Dr. Vandana Shiva," *In Motion Magazine*, 14 August 1998.
<http://www.inmotionmagazine.com/shiva.html> Accessed 16 January 2005.

⁵⁷ Lee J. Clyatt, Bartow, FL, to GWC, 13 January 1933, TIA, 14, 117.

There are so many people who do not think farther ahead than the amount of money they can collect. Sometimes money is the least thing we need."⁵⁸

Self-interest in the name of science sends forth lobbyists to line politicians' pockets. Carver once stated, "I have made a practice, all my life of never mixing politics with my work."⁵⁹ He wrote to an editor at the *India News* who sought his comments in 1942 on the need for freedom in India: "A scientist knows practically nothing about politics because his whole mind and strength are given over to matters pertaining to scientific studies. Anything that I would say would probably be an expression of my lack of knowledge of the political situation."⁶⁰

Carver's real science, then, is a calling, unmixed with politics or personal ambition, to which a scientist responds with all his mind and strength. Roland Hayes, the great black tenor, saw this firsthand. Knocking on the door to Carver's lab, he recalled, "Dr. Carver peered out suspiciously. He didn't speak - just looked, but his eyes didn't seem to see me at all, as if they had room only for the results of an interrupted experiment. I stammered my name. He repeated it vaguely. Then, 'Ooh!' he said as if waking up. He invited me in and took me through various laboratory units which he had to unlock and lock again as we went along."

When Hayes told Carver that his concert tours, along with running his farm in Georgia, often left him very tired, the scientist said he would make up something to build him up and help fortify him. Hayes said: "That would have been 1930. I remember it on account of the medicine Dr. Carver made up for me, for I took it along on my European concert tour of 1930... I believe it actually did build me up."⁶¹

The George Washington Carver Foundation

Carver's most obvious legacy, and one into which he invested great hope and all his financial legacy, was the Carver Foundation. Dr. B. D. Mayberry, acting director of the

⁵⁸ GWC to Mrs. Mary W. Zuber, 25 June 1937, T1A, 21, 421.

⁵⁹ GWC to Mrs. Louise Ferrer, Monterey Park, CA, 10 September 1940, T1A, 35, 106.

⁶⁰ GWC to Mr. R. Lal Singh, Ed., *India News*, 15 September 1942, T1A, 42, 1218.

⁶¹ "Foundation Programs tells what Dr. Carver Did for Humanity," *American Negro Press*, April 1944, typed transcript, T1A, 62, 914.

Foundation beginning in 1990. left a history of the Foundation from its inception in 1940 to 1990. In his preface, Mayberry says:

For close to 50 years, the Carver Research Foundation was an integral part of Tuskegee University and the campus building so named still serves as a living, operating and confirmed monument to the contributions of Dr. George Washington Carver in the area of applied agricultural and basic life science through research and education at this university... It was fortunate that [Carver] was able to see the realization of his dream and to serve as the Director for the first three years of its existence... Program approaches to the Foundation have been varied to keep pace with the larger society, and more importantly, with the changing requirements to support the mission and purpose of the University.⁶²

Mayberry's history of the Foundation begins:

Early in 1940, Carver indicated his desire to bequeath his savings -which, thanks to his fantastic frugality, amounted to some \$33,000- to the Institute, not after his death, but now while he might have a hand in how it was used. He responded favorably to a suggestion that the George Washington Carver Foundation be established. On February 10, it was signed into being, its purpose to provide facilities and a measure of support for young Negroes engaged in advanced scientific research. Of course, \$33,000 would not provide all that was needed, but after an intensive fund-raising campaign... sufficient money was accumulated to begin work at the Carver Museum- and very much in the Carver image...⁶³

Members of the George Washington Carver Society, the form of the Foundation that was signed into being on February 10, were F. D. Patterson, Tuskegee's President; Lloyd Isaacs, the Institute's treasurer; Austin W. Curtis, Carver's assistant; R. H. Powell, Carver's attorney; and Carver himself. Mayberry continues:

He gave all he had - \$33,000 -but this was invested as capital and only the income could be used for operations... To aid his struggling "child," Carver

⁶² Mayberry, B. D., *The History of the Carver Research Foundation of Tuskegee University, 1940-1990* (Tuskegee Institute: Tuskegee University, 2003), ix.

found himself assenting to things to which he would not previously even have listened. Never before had he considered accepting money— not even that which had been offered him for his work. Now to go out and ask for donations was certainly a reversal of his previous stance. Under these new circumstances, however, he consented to have another biography written. When Rackham Holt came to Tuskegee for this purpose, he released for the first time certain information about his early life, pictures of his relatives and others, and much other valuable data about himself... On September 1, 1941, the Foundation entered into a contract with the Carvoline Company... On October 1, 1941, a contract was signed with the Savannah Sugar Refining Corporation for a fiber research project... In addition to Mr. Curtis, whose experiments with paint pigments from clay were proving to be fruitful, two young men were brought in: Ralph B. Stewart, Jr., and Joseph W. Williams. Both were graduates of Tuskegee's Science Department and had worked with Carver during their studies...⁶⁴

Austin Curtis's Brief Directorship

At Carver's death on January 5, 1943, all the rest of his estate went to the Foundation, making his total contribution \$60,000. Funds continued to come in from those who shared his dream, and from commercial research projects.⁶⁵ Austin Curtis became director. During his leadership, Henry Ford, Sr. became a member of the Board of Trustees of the Foundation in April 1943. Frank E. Gannett, President of the Gannett newspapers of Rochester, New York... also became a trustee during the spring of 1943.⁶⁶

Progress Under Russell Brown's Leadership

On April 1, 1944, the young scientist Russell Brown became director of the Foundation. Following Carver's lead, Brown began by using local talent and the funds available; work was started on several projects. These projects included:

⁶¹ Mayberry, 17.

⁶⁴ Mayberry, 24.

⁶⁵ Mayberry, 17.

homestead research, which involved low cost homestead construction from native materials; the fermentation of sweet potatoes for production of acetone and industrial alcohols; the production of paper and paper board from agricultural wastes and native plants; the study of the relationship of mold nutrition for the production of antibiotics like penicillin; the production of a new colloidal edible gum from agricultural waste; and the completion of a textbook... Later that year the Grand City Container Corporation of New York granted funds for a fairly substantial project involving research on producing cardboard from native plants... As a trial project, the Parker Pen Company gave the Foundation a small grant for research on inks. Before the year was over, the results obtained were so outstanding, and the company so pleased, that it doubled the grant for continuing the project. Now it was possible to bring in more graduate research assistants. Their number was increased from the two of the previous year to four...⁶⁷

The Carver Research Foundation or CRF was initially conceived to become autonomous and self-perpetuating through the self-generation of resources for its operation. Early in the existence of the Foundation, it was found impractical to expect the Foundation to support itself. In the meantime, the University, in recognition of the importance and value of association with the legacy of George Washington Carver, made the decision to make whatever adjustment was necessary to assure its continuation. Over the years many legal and administrative changes have been made, some to be in compliance with changing Alabama State Law (e.g., with the Board of Trustees including the name change from "Tuskegee Institute" to "University" (in 1985), as well as other developments *vis-à-vis* the institution and the CRF.⁶⁸

The Foundation's Inability to Survive on Carver's Seed Money

From 1941 to 1947, the Foundation was located in the Carver Museum. From 1947 to 1951, it was housed in the picturesque, but by then antique, veterinary

⁶⁶ Mayberry, 25.

⁶⁷ Mayberry, 27-28.

⁶⁸ Mayberry, 55.

hospital constructed in 1900. Certain laboratories in other buildings had been renovated and equipped for research, yet space for expanding research activities was no longer adequate. Under the leadership of Dr. Brown with the full cooperation of his staff and the administration, a full-scale fund-raising program was successful in financing the construction of a new facility with research laboratories and administrative offices. A \$2 million building erected to house facilities for advanced study in botany, creative chemistry, mycology, plant genetics, and agronomy.⁶⁹ It was completed in 1951...⁷⁰

The HeLa Project

The most significant and wide-reaching of all research tasks undertaken by the CRF was the HeLa project with Director Brown as principal investigator and Dr. James H. M. Henderson (later to become CRF director) as assistant. In 2001, Dr. Henderson wrote this account of the project:

On February 8, 1951, George O. Gey and his co-workers at the Johns Hopkins University Hospital isolated cell strain HeLa from epithelial tissue obtained by biopsy from a patient with cervical adenocarcinoma, a Black woman named Henrietta Lacks. The code name HeLa, designating the cell strain, was derived from the first two letters of Henrietta Lacks' first and last names. [She] died, but cells from her malignant cervical tissue have obtained immortality because they continue to live in cell culture in vitro...

In 1953, Gey, William Scherer and Jerome Szybrenski reported that Poliovirus would infect cultures of the HeLa strain as HeLa cells were more sensitive to the cytopathogenic effect of poliomyelitis virus than monkey testicular cells. In culture, HeLa cells remained viable and unaltered in morphology. Further, they were very hardy when shipped by

⁶⁹ Mayberry, 17.

⁷⁰ Mayberry, 30.

train or plane and would begin to proliferate again upon adding nutritive fluid.

After Jonas Salk developed his polio vaccine in 1952, it was anticipated that the 23 laboratories participating in the subsequent evaluation process would require large amounts of monkey cells to measure the amount of antibody developed in response to the three types of poliovirus antigen. However, the required supply of Rhesus monkeys became doubtful. HeLa cell strain was selected as an alternative source of primate host cells...

The mission of the Tuskegee project was to culture HeLa cells on a relatively massive scale; to avoid viral, microbial, and other cellular contamination; to maintain the cells in a genetically unaltered condition; to prepare monolayer cultures of determined cellular population in tubes and bottles; and to ship these cultures to distant laboratories in such condition that they would be received ready for direct use in vaccine evaluation procedures...

The objective was to develop the capacity to ship at least 10,000 cultures per week, beginning June 1, 1953... By September 1953, we had six technicians at Tuskegee, including a laboratory supervisor. Shortly thereafter, the staff was increased to 10 full-time cell culture technicians plus the supervisor, and additional full-time laboratory helpers and shipping clerks, as well as part-time student helpers. At one time, 35 people were working on HeLa full-scale... By June 30, [1954], approximately 600,000 had been shipped.⁷¹

Change in the Carver Research Foundation's Role

By 1952, the changing role of the Foundation had shown the need for campus coordination, especially in public relations and fund-raising. The administration took a giant step in this direction when it issued an experimental policy designed

⁷¹ Mayberry, 32-33.

to strengthen and coordinate the process of proposal development and submission...⁷² The Carver Research Foundation was... designated as the research arm of Tuskegee Institute, responsible mainly for the administration, promotion, facilitation, implementation, stimulation, and coordination of all research activity... The Foundation was to function primarily as a campus-wide service to assist faculty in the preparation of proposals, conduct all grant and contract negotiations (including indirect cost determination), and assist in the establishment of related administrative policies and procedures.⁷³

This statement by CRF Trustee Dr. Harold Vagtborg in 1961 sums up the proposed change in the Foundation's role:

In essence, what is being suggested is that the CRF of TI become a central organization to do all of the things necessary from a primarily administrative point of view to bring about a strong and growing Tuskegee research activity, both basic and applied...⁷⁴

This change was carried out under the leadership of Dr. J. H. M. Henderson, 1968-1975. Mayberry writes of it:

The concept of having the Foundation responsible for research administration as opposed to research *per se* was neither universally understood nor universally accepted by all members of the administration, the faculty and the Board of Trustees. Serious concerns were expressed and questions raised leading to perennial discussions of the role and scope of the Foundation...

Mayberry quotes Tuskegee President Luther Foster's response in 1973 to questions about the role and scope of the Foundation:

The Mission of TI is research, instruction, and service falling under the following major precepts: (1) service to the disadvantaged, including Blacks and other

⁷² Mayberry, 35.

⁷³ Mayberry, 37.

⁷⁴ Mayberry, 41.

minorities; (2) focus primarily on the rural South; (3) dedication to a better society through the promotion of human dignity for Tuskegeens and others; (4) promotion and influence on increasing the economic status of its clientele; (5) emphasis in its areas of concentration on such subjects as health, humanities, food and nutrition, technology and engineering, economics, political science, and public policy; and (6) student enrollment. CRF's mission must be compatible with that of TI...⁷⁵

Mayberry's history continues:

The staff, especially clerical and accounting personnel, had increased so much by 1973 that serious questions were raised about moving them from the Foundation's facility. This led to plans to move administrative and accounting personnel to the first floor of Carnegie Hall.

The director of the Foundation, Dr. Henderson, supported the move from the Foundation building and justified the idea in the following way:

When CRF moved to its new research facilities in 1951, it was a "research doing" organization in the natural and applied (Agricultural and Home Economics) sciences and this role was more or less maintained until about ten years ago, making a significant and definite change in 1970. Now its role is more administration, management, and policy-making rather than "doing research." The current CRF building was built for, and is essentially, a research laboratory facility. Several of its administrative and management spaces are converted laboratory and research spaces—expensive areas by either current or 1960 dollars—thus reducing space previously dedicated to research and service to a considerably smaller area... It is obvious that the change, if effected, will not be an easy one psychologically, physically, nor functionally. There are pros and cons to the change, and it is only hoped that the pros far exceed the cons.

⁷⁵ Mayberry, 40.

In the final analysis, the pros did exceed the cons, resulting in the movement of the entire administrative and clerical staff to Carnegie Hall in June 1972...⁷⁶

Mayberry uses the 1984-85 Annual Report of the Carver Research Foundation to illustrate how the Foundation was realizing Carver's goals for it in the mid-1980s. It reads, in part:

Research is organized into eight program areas—food science and human nutrition, rural development, poultry, swine, ruminants, small fruits, vegetable crops, and sweet potato. Tuskegee now receives significant financial support annually for research from the United States government... administered nationally by the Cooperative State Research Service of the United States Department of Agriculture...

University and Foundation researchers are planning to expand their model small farm to 75 acres. The model farm, presently 25 acres, conducted experiments designed to demonstrate more efficient land use that results in higher productivity: intercropping, winter-cropping and crop rotation. The 25 acres are devoted to vegetable and fruit production and, when expanded, will include an animal production component. Marketing avenues are also being evaluated by selling farm commodities to the public directly from the farm. Also, in the late summer, the farm is open to the community on a U-pick basis. These activities are kept minimal so as not to compete with local producers.

In addition, there is another small farm program funded by the Farmers Home Administration in which training and technical assistance is provided to about 50 Black small farmers in nine counties in Alabama. Some of these are farmers who have become indebted and need redirection and rehabilitation.

The Experiment Station has developed a national reputation for its work with the sweet potato. Research is being conducted on sweet potato leaves as a source of human nutrition (in collaboration with the University's Home Economics

⁷⁶ Mayberry, 42.

Department), slow release fertilizers for sweet potato, nitrogen fixation by sweet potatoes, tissue culture of sweet potato, carbon dioxide's effect on sweet potatoes, protein quality-quantity from sweet potato, sweet potato as a means of alcohol fuel production, and the use of radiation in the preservation and disinfection of sweet potatoes. In 1984-85, an application was submitted to the National Aeronautics and Space Administration for a study of growing sweet potatoes in soilless culture for space missions. The proposed project brings sweet potato research into the space age.

A substantial sweet potato breeding program has been developed with the Station having produced five varieties of the sweet potato, two of which are white fleshed. The University participates in the national trials for new sweet potato varieties. In 1984, T1 80-140 and T1 80-130 were entered with the latter receiving #2 rank in canning quality. This same cultivar received a high rating in disease and nematode resistance...

The Experiment Station has also developed over 60 breeding lines of tomatoes, two of which are advanced but none of which have yet been released. The effort is to develop a variety with both cold and drought tolerance so that production can be extended within the growing season...

Research on small fruits is also being conducted focusing on the breeding and development of resistant varieties of muscadine grapes and rabbiteye blueberries. Intercropping systems to maximize returns per unit of land are also under study.

Animal research focuses largely on the reproductive, nutritional and genetic study of goats, cattle, swine, and poultry. Active areas involve the use of artificial insemination, estrus synchronization, and pregnancy detection methods for maximizing the reproductive efficiency of farm animals. Significant findings in lowering feeding non-competitive feedstuff (waste from sweet potato and poultry litter) while maintaining production is also being evaluated...

[Poultry studies include] the evaluation of dual-purpose birds (egg and meat) for production on small farms. Studies are also being investigated to produce chicken with less body fat and more lean meat, and to determine the effect of environmental pollutants on food quality of the poultry.

Other areas of Station research include solar pasteurization of soil, control of Spiroplasma, onion viruses, and evaluation of University forestry lands for increased productivity (in collaboration with the U. S. Forest Service)...

The 1985 proposal concerning the hydroponic production of sweet potatoes for long-duration space missions was funded by NASA in 1986 for the first of three five-year contracts and has recently been renewed for another four years. The George Washington Carver Experiment Station uses an interdisciplinary team approach involving scientists and engineers—25 faculty and 25 students—annually. Initially, the project included developing systems and cultures for optimum growth, life support systems as food for long term manned space missions.⁷⁷

Mayberry's history ends at 1990. When it was to be published in 2003, his advanced age and declining health prompted him to ask Walter Hill, Dean and Director of the College of Agricultural, Environmental and Natural Sciences, George Washington Carver Agricultural Experiment Station, to extend the history to the present day. Hill, as a researcher especially interested in demonstrating the sweet potato's ability to fix nitrogen as legumes do, was an appropriate choice. He wrote in a 2003 epilogue to Mayberry's book:

Since the late 1980s, the growth in scope and budget of research and development at Tuskegee University has been exponential and will require another document to tell the whole story. We will highlight... points that relate to continuing the legacy of the Carver Research Foundation and its original mission as defined by Carver...

⁷⁷ Mayberry, 8-11.

Carver desired that “the Research Work of this [the Carver] Foundation be directed chiefly along agricultural lines to the end that some contribution may be made to the great task of building up non-productive soil, especially throughout the South. I believe that it can be shown by actual demonstration to a people, now greatly discouraged and disheartened, that our soils can be built up and made much more productive, and thus being about a more ideal type of general prosperity and happiness for those whose labors are spent in the tilling of the soils.”

The above statement summarizes what Carver’s life at Tuskegee was about: a calling to use agriculture and natural resources and science as a means to improve the lives of “his people” – the poor, and African American farm families. In this regard we can be assured that Tuskegee University is continuing this calling through a number of university programs...

Today at Tuskegee University students obtain hands-on research experience in such areas as causes and cures for cancer and cardiovascular disease; developing foods, diet plans and herbs for health and nutrition in the U. S., internationally and for future space missions; developing new plant varieties through breeding, biotechnology and genomic research; reducing animal wastes in a manner that provides plant nutrition and avoids environmental pollution; developing regional marketing strategies so as to enhance incomes of small ruminant, fruit and vegetable producers; and investigating various food safety strategies all the way from on-farm production through consumption.

Carver fostered many partnerships throughout his life. One might say that Carver’s life manifested love of God and love of people in many ways, including building relationships with a wide spectrum of people—including poor families, small farmers, heads of corporations, presidents of nations, secretaries of agriculture, students, the sick (infantile paralysis or polio)... We are grateful to USDA, NASA, DOT, DOE, State of Alabama, Pioneer Hybrid, Dupont, DOJ, NSF, NIH, and USAID for working with Tuskegee University and the Carver

legacy to carry out cutting edge and much needed research and education that serves people and communities in the Black Belt region of the South and across the nation and globe...

In 1985, when a team of scientists at Tuskegee University responded to a challenge from NASA Kennedy Space Center (KSC) to develop a concept for funding that was linked to major research themes of KSC at that time, it was Carver's research on sweetpotato and peanut that served as the template for the initial proposal.

Now, some 18 years later, the work of Tuskegee University with NASA has blossomed into a major NASA-funded University Research Center. Twenty scientists and 35 students are currently working in four interdisciplinary teams— Food Crops and Controlled Environmental Systems, Food Processing and Product Development, Systems Integration and Education and Outreach –to address problems associated with growing foods in closed environments for long term (Mars and Lunar Missions) and short term (International Space Station) missions.. We are grateful that funding for this research has been \$1 million per year for the past 11 years...

We can say that the ultimate goals of Dr. Carver in establishing the Carver Foundation are being met and, in some cases, exceeded as we enter the new millenium. The dreams and aspirations of Dr. Carver are alive and well at Tuskegee University.⁷⁸

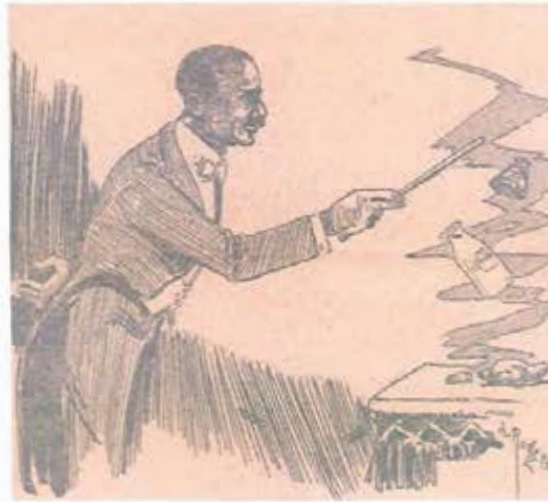
⁷⁸ Mayberry, 138-42. For a brief discussion of a NASA space project tangentially related to Carver because it was part of the legacy of the Carver Foundation, see Appendix B.



6-1. Henry A. Wallace



6-2. Carver with Wallace at Tuskegee



6-3. Carver Pictured as a Magician



6-4. Carver with Jim Hardwick on Tour, 1933.

Land Use Practices Since Carver's Time and How His Suggestions Might Help Us Now¹

Carver's far-sighted advice to "look to the permanent building up of our soils," and his warnings that heavy reliance on commercial fertilizers would lead to a soil "collapse" proved to be a voice in the wilderness. He was drowned out by a chorus of voices in farmers' cars, seeming to come from places of great authority, that gave out short-sighted prescriptions for soil health. As an example, the Agricultural Adjustment Act of 1933, instituted under Henry Wallace as part of FDR's New Deal program, advised farmers: Use all the lime you want; you can't overdo it. Experience taught farmers that this was wrong; using lime decreased soil fertility. The federal agents' response: Use commercial fertilizer.

Each remove from nature's cycles left soil sicker. At the chemurgy meeting in 1937 where Carver met Henry Ford, he described the soils he had known during his college years in Iowa as "the loess soil, forty feet of alluvial deposit in some places, impossible to wear that soil out, even with some of our lack of methods, down to nothing."² Just four years after he said that, a writer for the Work Projects Administration's guide to Iowa agreed that "Very little land in the state is unsuitable for agriculture," but added ominously, "However, this great natural fertility is in danger of being depleted, by erosion in some sections and by intensive farming throughout the State."³

¹ This chapter is derived from drafts of *Great Heart of Love: George Washington Carver*, Chapter 9, "The Individual Farthest Down," and Chapter 12, "The Old Guards."

² GWC, Speech at the Jackson High School Auditorium, 12 April 1937, typed manuscript, TTA, 46, 945.

³ Work Projects Administration, *Iowa: A Guide to the Hawkeye State*. New York: Viking Press, 1941, 6.

Carver had watched the dangers to America's soil—commercial fertilizers, one-crop systems, deforestation, loss of bird populations as insecticides—arising, and warned of the trouble with every one. Just how clearly he anticipated troubles which farming practices since his death have brought to pass is evident in a letter he wrote two months before he died to Henry Ford's secretary Frank Campsall. He said:

Dr. Northern of Mobile, I believe, gave up his lucrative practice to study the soil in its relation to the producing of food as he started out with this remarkable declaration that,—“A tomato can look in every way just like an ordinary tomato, but as far as food value is concerned have but little of the qualities of a well-grown unfertilized (artificially) tomato.”⁴ We do know, those of us who have studied soils, very definitely that plants are just as sensitive to narcotics and drugs as a human being. All that is necessary, those who grow watermelons and especially the laymen who eat watermelons know that if they are not exceedingly careful they remain sick as long as the watermelon season lasts, because of the improper use of nitrate of soda poisons the watermelon sufficiently to cause intestinal disturbance every time they are eaten.⁵

His comparison of artificial fertilizers narcotics or drugs was especially prescient. American croplands would increasingly come to resemble the body of a drug addict, relying on substances that did not feed it but kept it superficially content while killing it.

At the time of Carver's death during the Second World War, the producers of what Carver saw as soil narcotics and drugs—petrochemical fertilizers—were consolidating their power. Two years later, at the end of the war, they made a huge move to overwhelm

⁴ Dr. Charles Northern was an Alabama medical doctor in general practice who found that the only way that digestive disorders could be treated was by going back to the soil and addressing the quality of the food patients were consuming. He claimed that health was dependent on minerals present in the soils. In the late 1920s, he left his conventional practice in order to concentrate on rebuilding human health through soil restoration in the form of remineralizing the soil. The website <http://www.crossroads.ws/brixbook/BBook.htm> says: “Northern stridently protested against the mineral poor food that clogged commercial channels and markets. [He] entered history when his... research, as recorded by Rex Beach in an article in *Cosmopolitan*, was read into U. S. Senate testimony. This 1936 Senate Document No. 264 is widely quoted by hucksters selling liquid minerals. Those hucksters rarely bother to mention that humans are designed to get their minerals from food, not inorganic solutions.” For some quotes from Senate Document No. 264, see Chapter 9, footnote 78.

teachings like Carver's with "modern farming"—huge tracts sown in one crop, subjected to massive doses of their products. Their prices were low, helping their salesmen convince farmers who were managing manure to give it up. Farmers' replacement of draft horses with tractors had already made manure less available; this hastened the process. Cover crops, or "green manure," went the same way as animal manure.

Because, as Carver said in 1911, "commercial fertilizers will stimulate and for a while produce good results," the first two decades of the craze appeared to justify it. On its bandwagon, with few exceptions, jumped all the powers of government and experts from institutes of higher learning, lending voices of authority to the new practices.

But the products being dumped upon the soil killed its microorganisms, making even the best Midwestern soil begin to look more like the hardened soils that Carver found down south, which hold so little air or water that they are easily eroded. Thus, instead of his hope that Southern farmers could loosen subsoil so it would resemble the North's penetrable alluvium, the reverse occurred.

In the 1970s the boom came to its inevitable end as crop yields dropped; but the warning labels Carver had been reading on lifeless vegetables so early in the plant narcotic craze still went unheeded. Wes Jackson of Salina, Kansas, twenty miles south of Carver's high school town of Minneapolis, explained in 1981 that farmers had been too close to see the problem. He said: "It's like a guy who worked in the natural gas industry who told me that there's no energy crisis, because he himself saw lots of natural gas coming out of the ground."⁶ But Jackson, with insight like Carver's, read the writing on the land. He said: "The chemotherapy treatments of the land promote a temporary vigor more impressive than our fields have ever known. Though the physician may rejoice with his cancer patient that he is feeling better in response to the treatment, he is also careful to monitor the telltale systems of the body. Similarly, those interested in the long-term health of the land need only stand on the edge of a stream after a rain and watch a plasma boil and turn

⁶ GWC to Frank Campsall, Dearborn, MI, 10 November 1942, TIA, 43, 504.

⁷ Monte, Tom, "The Breakdown of Mechanized Farming," *East West Journal*, January 1981.

in the powerful current below and then realize that the vigorous production of our fields is, unfortunately, temporary."⁷

By 1980, the hardening of Iowa's soil was costing 200 million bushels of topsoil per year, or two bushels for each bushel of corn grown. Warnings like that of the WPA guide to Iowa had been so thoroughly ignored that, by then, an agribusiness operator in his air-conditioned tractor, burning fossil fuel with caloric energy five to twelve times that in the corn he would harvest, was turning up subsoil six inches deep. While nature worked patiently to build soil back up, taking as much as 500 years to make an inch, ignorance was costing five inches a year. To grasp the grim significance of such equations is to see sorrow unfolding. As David Pimentel, Professor of Ecology and Agricultural Sciences at Cornell University, in a paper written with his wife Marcia Pimentel, puts it: "Currently on U.S. farms, about 3 kcal of fossil energy are being spent to produce just 1 kcal of food. Our policy of supporting this 3:1 energy ratio has serious implications for the future. One cannot help but wonder how long such intensive agriculture can be maintained on U.S. croplands while our nonrenewable, fossil energy resources are being rapidly depleted."⁸

Wendell Berry, a soul with broad vision like Carver's and Wes Jackson's, in describing farming's downhill spiral, showed how artificial fertilizers led straight to insecticides:

Bumper crops led farmers (and absentee investors) to the conclusions that they were no longer bound to the cyclical, self-perpetuating type of small-farm agriculture. They expanded their tillage, consolidated their holdings, discarded profit-inhibiting conservative practices, and undertook massive-scaled intensive cropping. Market demands led to monocropping of hundreds of thousands of acres, and this inevitably resulted in an enormous increase in crop pest populations and crop diseases. Thus the wholesale use of dangerous poisons to rid the crops of pests and disease can be traced back to cheap chemical fertilizers.⁹

⁷ Daniels, Stevie, "Are We Farming Our Way to Extinction?", *East West Journal*, May 1980.

⁸ David Pimentel and Marcia Pimentel, Department of Entomology and Division of Nutritional Sciences, respectively, Cornell University, Ithaca, NY, "Land, Energy and Water: The Constraints Governing Ideal U.S. Population Size," *Negative Population Growth Forum Series*, January 1995.

⁹ Berry, *The Unsettling of America* (San Francisco: Sierra Club Books, 1977), quoted in Daniels, Stevie, "Are We Farming Our Way to Extinction?", *East West Journal*, May 1980, 34-35.

David Pimentel points out how the abandonment by monocrop farmers of another staple of Carver's teachings, crop rotation, is to blame for the increase in crop pests which Berry mentions. Speaking in England in 1999, he said:

In 1945... we applied zero amounts of insecticide in U.S. corn production and at that time all our corn was grown in rotation after soy beans, wheat and so forth. At that time we did not have a problems with.. the corn rootworm. Now, half the corn grown is corn-on-corn and the use of insecticides on corn in the U.S. has increased more than a thousand fold. Crop losses to insects in corn (this is all U.S. Department of Agriculture data) has gone from 3.5% to 12%, nearly a fourfold increase... I can grow corn in the U.S. now and get approximately 8% increase in yield with zero insecticide use, if you allow me to tell you how you should grow corn.¹⁰

Carver saw the problem of man-made poisons before they became a global health threat and offered the solution. In a report for the *Tuskegee News* on a Soil Conservation Conference at Tuskegee in September 1936 where Henry A. Wallace had come to speak, he wrote: "The systematic study of soils, their original composition, and the effect of the various spray mixtures we are frequently putting on them mark the coming of a new day for agriculture, and the safest and most logical way to bring prosperity from just around the corner that we have been hearing about for so long but have as yet not seen in a satisfactory way."¹¹ Thus he claims that by systematic study of two things—soil's "original composition" and the effect of insecticides—we may bring about a prosperous new day. We have just seen that, if agricultural scientists had been paying closer attention to the effect of artificial fertilizers on the original composition of soil, they would have seen its drug-like nature—as Carver had since 1910—and abandoned it.

As for pesticides, Carver wrote in 1939: "Now as to the Mexican Bean Beetle, which is exceedingly troublesome, the various Arsenic, Black Flag, Rotonone, and other

¹⁰ Pimentel, D., "Ecological Basis of Insect Pest, Pathogen and Weed Problems." *The Origins of Pest, Parasite, Disease and Weed Problems*. J. M. Cherrett and G. R. Sagar, Oxford, Blackwell, 1977, 3-31.

¹¹ "Dr. Carver Writes Soil Conservation Conference Report," *Tuskegee News*, 17 September 1936, 11A, 61, 468.

poisonous compounds will control the beetle, but it must be continuously applied as the insect flies, and when one generation is killed out another one comes very soon afterwards."¹² This obvious truth he points out, that in controlling a flying insect you need to drench crops continuously in poisons, suggests that farmers using them fight a losing battle. This is borne out by a tenfold overall increase in the use of "the various spray mixtures" between World War II and 1990 while loss of crops from insects doubled.

More serious over the long haul is the danger of these mixtures to us. A program of application from aircraft, where less than half of the spray hits its plant targets, amounts to chemical warfare on people in agricultural regions.¹³ The dangers of these sprays were on the minds of progressive thinkers during Carver's lifetime. Christy Borth, the man who dubbed Carver the "first and greatest chemurgist," wrote in 1939:

American farmers are now spending \$100,000,000 a year to fight insects. They have been using inorganic poisons until there is some reason for the alarm about the possibility of Americans slowly poisoning themselves with lead and arsenic. Because of that danger, chemistry is turning attention to organic materials harmless to man but deadly to bugs. One of these non-poisonous mainstays is pyrethrum of which we now import about 20,000,000 pounds every year and for which we pay millions of dollars to Japanese daisy-pickers.

In addition to pyrethrum and nicotine, we are turning to such bug-destroyers as rotenone [from fish] which, according to Dr. Roark of the United States Department of Agriculture, we may not need to import if we take it out of the devil's shoestring, a weed that grows from Ontario to Florida.¹⁴

Carver was informed on every natural insecticide Borth mentions—pyrethrum¹⁵ and tobacco, of which he told a gardening group in West Liberty, Iowa in 1896: "To kill

¹² GWC to William J. Wheat, E. Tallassee, AL, 15 July 1939, TIA, 30, 154.

¹³ Kitty Mattes, "Kicking the Pesticide Habit," *Amicus Journal*, National Resources Defense Council, Fall 1989.

¹⁴ Borth, 179.

¹⁵ GWC to Lewis A. Lincoln, Kansas City, MO, 21 June 1937, TIA, 21, 367.

vermin, pick off what you can, then wash thoroughly in whale oil soap suds or other suds, or put a paper sack or box over them and get a *neighbor* to fill it with tobacco smoke."¹⁶ In 1938 he ordered a government bulletin on the possibilities of Devil's Shoestring.¹⁷

The great lesson to we have to learn from Carver is always to take the simplest, most non-toxic way to do anything.¹⁸ He wrote to Dr. Luther Fisher of Atlanta in 1937:

I have done considerable work with... quite a number of insects and fungus diseases that affect roses... I control Thrips quite successfully by using a strong tobacco tea. Get tobacco stems and boil them for making the tea about the same strength of fairly strong tea used for drinking. The rose bushes are sprayed with this tobacco solution. It is also good for aphids. Another preparation for Thrips which worked very well was a strong soap solution-about two tablespoons of kerosene to the gallon thoroughly incorporated with soap suds. Care must be exercised in spraying so that the solution gets on the under side of the leaves. I also found that I could control aphids on roses by using simply a strong spray of water directly upon the aphids. It would knock them off, and they seemed to be unable to get back.¹⁹

David Pimentel says of the problems of pesticides today: "The impact of... 5 billion pounds of pesticide being applied [annually] in the world. (this is World Health Organization data) is that we have 26 million people being poisoned and 220,000 deaths annually. Now when we do use these pesticides we also have large impact on fish and on birds. In the U.S., sixty-seven million birds are killed annually from direct impact of pesticides."

For Carver, the killing of such huge bird populations by insecticides would have appeared doubly self-defeating, because he saw birds themselves as the best insecticides of all. He wrote in a bulletin in 1914:

¹⁶ *West Liberty Index*, 23 January 1896. AWC papers.

¹⁷ GWC to Chief of Bureau of Publication, Washington, D.C., 27 September 1938, TIA, 25, 964.

¹⁸ Burchard, *Carver: A Great Soul* (Fairfax, CA: Serpent Wise, 1998), 58-59.

¹⁹ GWC to Dr. L. C. Fisher, Atlanta, GA, 27 February 1937, TIA, 20, 580.

Year by year the war on insects that threaten to destroy our farm, field, orchard, and garden crops, and often our personal comforts, becomes greater. We lay this condition at the door of some mysterious providence. We do not seek the cause. If we did, every farmer and citizen would unite in one grand effort, not only to save, but to protect the birds, the greatest insect destroyers known...

Again we must remember that the woodman's axe and the forest fires have robbed thousands of our feathered songsters of their homes and haunts. The pernicious peanut-shooter in the hands of the small boy, and the more deadly Winchester upon the shoulders of his older brother, have been and are yet powerful agents in their destruction. Is it any wonder that this vast and ever-increasing army of insects have baffled the brain, brawn and wealth of the nation?

Someone has tersely said that "but for the birds, the insects in one year would destroy the forests, consume the vegetation and leave the pastures that furnish food for our stock as barren as a desert land."²⁰

Carver's observations on the need to save forests were covered in Chapter 2. His support of small farmers and multi-crop agriculture were part of his contribution to saving forests. Small farmers have always, as a rule, left far more forest intact on their land. Single-crop farming, using vast, open farms devoid of woods or wildlife, leaves land scorched. Those whom Carver called the "individual farthest down" are still, in our time, the best stewards of the land. Diversity of plants on their farms means far less risk in case one crop should fail. On equal areas of land, their yield is greater.

A small farmer's presence on a piece of land they own, work and love, in itself reduces or cancels their need for artificial products.²¹ As we heard Henry Wallace pointing out in the last chapter, close touch with one's plants is the key to farming success. In Carver's 1910 bulletin *Nature Study and Gardening for Rural Schools*, he tells how simply working a garden drives off insect pests: "[In winter, many insects] may be found hidden away under logs, stones, in stems of weeds and trash, in the earth, where they await the return

²⁰ GWC, *80 Birds of Macon County, Alabama, and Their Relationship To Our Prosperity*, 1914, typed copy of Bulletin No. 26, TIA, 46, 1076

of warm weather. As a rule hand picking and the frequent stirring of soil is the most effective way for beginners to get rid of insects. If this is done frequently many will leave to seek more congenial quarters, as most insects do not like to be disturbed.²²

Beginners weren't the only people he advised to deal with insects simply by constantly disturbing them. In his 1917 bulletin *Twelve New Ways to Meet the New Economic Conditions Here in the U. S.*, he made this one of the main ways of controlling boll weevils naturally. He wrote:

The boll weevil may be controlled as follows:

- a) prepare all land good and deep with a 2-horse plow
- b) fertilize well
- c) Plant an early variety of seed
- d) make rows a foot wider than is customary, and give the plants twice the distance in the drill
- e) stir the ground often to keep the cotton growing
- f) pick up squares and pick off weevils until the bottom and middle crops are made. Then stop picking off weevil.
- g) pick as fast as it opens
- h) when through gathering the bottom and middle crops, destroy the stalks at once and sow the field in a grain crop
- i) clean off and burn all rubbish from ditch banks, fence corners, waste places, as old weevils hide in these places and winter over.

²¹ Peter Rossett, "Small is Bountiful," *The Ecologist*, December 1999.

²² GWC, *Nature Study and Gardening for Rural Schools*, Tuskegee Agricultural Station Bulletin # 18, June 1910, T1A, 46, 142. Also see Kremer 93-101; T1A, 12, 30-31 & 46, 820.

j) Encourage your neighbors to do the same. In this way the weevil will be reduced to starvation.²³

Since his time, growers of huge tracts of cotton have drenched their crops with poisons that end up washing with topsoil into waterways. Carver's advice shows how intelligent and careful observation, coupled with a plan of action, can confront a problem with human energy, instead of poisons. His solution here is very labor-intensive; but in his bigger picture, flexible farmers solve the weevil problem by diversifying crops.

Kitty Mattes, writing of David Pimentel in the National Resources Defense Council's *Amicus Journal* in 1989, brings up another U.S. agriculture practice that leads to pesticide use. She says: "Federal policy also encourages farmers to grow certain crops in regions where they are more susceptible to pests—white potatoes and cotton in the South, for instance. Pimentel maintains that eliminating price supports would reduce insecticides for some crops by about a third."²⁴

Carver's agricultural vision for the South was of small farmers each buying a little patch of land and cherishing it. This was essentially a vision of equal distribution of land to farmers who will care for it, the opposite of the heavily subsidized megafarming system that has developed. Carver's logic of growing our food and trading locally, instead of eating meals shipped in from far away, is sound economy, avoiding waste; but it has been ignored. As one of innumerable examples, in 1979, New Yorkers bought 24,000 tons of broccoli from California, all of which would have grown very well in New York. The bill for hauling it across the country, including burning 950,000 gallons of gasoline, was six million dollars. The dominance of a system like this, that degrades all the earth's natural systems absolutely unnecessarily, is so great that nature's way of farming has been labeled "alternative."

Gradually the American public is awakening to the reckless folly of their agriculture system and increasingly demanding "organic" food. One producer of organic products,

²³ GWC, *Twelve New Ways to Meet the New Economic Conditions Here in the U. S.*, Tuskegee Agriculture Station Bulletin # 33, n.d. (before April 1917).

²⁴ See note 13 above.

Health Valley, reported in their mailing literature in the 1990s on action they were taking to avoid repeating a tragic situation in Wisconsin:

One of the essential elements needed in soil to grow crops such as corn and tomatoes is nitrogen. When chemicals such as ammonium nitrite are used, they can result in the leaching of toxic nitrates into the ground water. This is becoming a serious problem in many areas of the country. For example, a recent survey of wells in Wisconsin showed that 15% of them are no longer able to be used to provide drinking water because the amount of nitrates they contain exceed safe limits.

As a natural safe alternative to adding chemical nitrates to the soil, we are experimenting with growing certain varieties of legumes that are rich sources of nitrogen for the soil. These include several varieties of white beans and a legume known as Hairy Vetch.²⁵

They had rediscovered Carver's simple teaching.²⁶

²⁵ Health Valley, 1990s.

²⁶ For an excellent example of a farmer in our time restoring soil to its virgin fertility, see Appendix C.

Plant Disease and Mycology—Carver’s Work and USDA Connections

Carver’s work in mycology could hardly be said to have had a discernible effect in the history of the science. Though his skills as a field observer were extraordinary, such a specialized field requires much more time than he had to devote to make a mark. It may be said that, had he chosen to specialize in mycology—as he might have if he had stayed at Iowa State—he would probably have made a notable contribution. But even people famous within the field, like J. B. Ellis, are unknown to the general public, who rarely notice any but the most showy fungi. Because of this public inattentiveness, mycologists are frequently discovering new specimens, making Carver’s original finds unexceptional outside a discussion of his astoundingly diverse abilities.

Carver’s appointment as a Collaborator with the USDA’s Division of Mycology, however, did make an impact in an indirect way, in the naming of a USDA Agricultural Center in Beltsville, Maryland for him in 1999. His farm wisdom made him a perfect choice for the namesake, but it would not have come to pass had he not been associated with the USDA.

The Department of Agriculture’s George Washington Carver Center is a campus of four interconnected buildings occupying about forty-five acres of Federal land in Beltsville, Maryland. The land is located within the 6500-acre Beltsville Agriculture Research Center. The George Washington Carver Center operates as a headquarters facility and is an extension of USDA’s main Washington, D.C. complex.¹

The USDA sought the construction of the Beltsville Center as headquarter space in addition to the USDA headquarters in the government-owned Agriculture Complex on

¹ www.usda.gov/da/buildings Accessed March 2004.

the National Mall in Washington, D.C. and in leased offices in the metropolitan D.C. area. USDA has four government-owned buildings in Washington, D.C.--the South Building, the Sidney Yates Building (formerly known as the Auditors Building), the James I. Whitten Building, and the Cotton Annex Building--totaling about 1.6 million usable square feet of space. Since 1984 USDA has operated and maintained its government-owned buildings. In fiscal year 2000, USDA also occupied about 1.3 million square feet of leased space in multiple buildings in the Washington, D.C., area.

In 1991, USDA published a strategic plan entitled "Meeting the Future Housing Needs in the Washington Metropolitan Area" in an attempt to gain support and funding from the General Services Administration's Public Buildings Service which assigns space, including space in government-owned buildings, to agencies to satisfy their housing needs--for modernizing the South Building and for building a new facility in Beltsville, Maryland. In fiscal year 1995, USDA received appropriations to begin work on its strategic plan. The George Washington Carver Center was constructed in Beltsville and first occupied in 1998.²

In October 1999 a week-long dedication was held to honor George Washington Carver. The week was highlighted by the dedication ceremony on October 6, 1999, when the Secretary of Agriculture, Dan Glickman, officially named the facility The George Washington Carver Center.³ At the ceremony, Secretary Glickman announced that nearly \$1 million in additional assistance would be available for minority and socially disadvantaged farmers in the form of grants to 1890 land grant and other minority-based institutions. These grants would be used to provide technical and other assistance.⁴ (Fig. 8-1)

A USDA Departmental Administration report, "Revised Fiscal Year 2000-2001 performance Plans," under "Discussion of Performance Goals," says: "The new George Washington Carver Center [and the renovated South Building] will be energy efficient and conserve natural resources. These buildings will also provide a safe and healthy

² www.gao.gov/new.items/gg00208r.pdf Accessed March 2004.

³ See note 1 above.

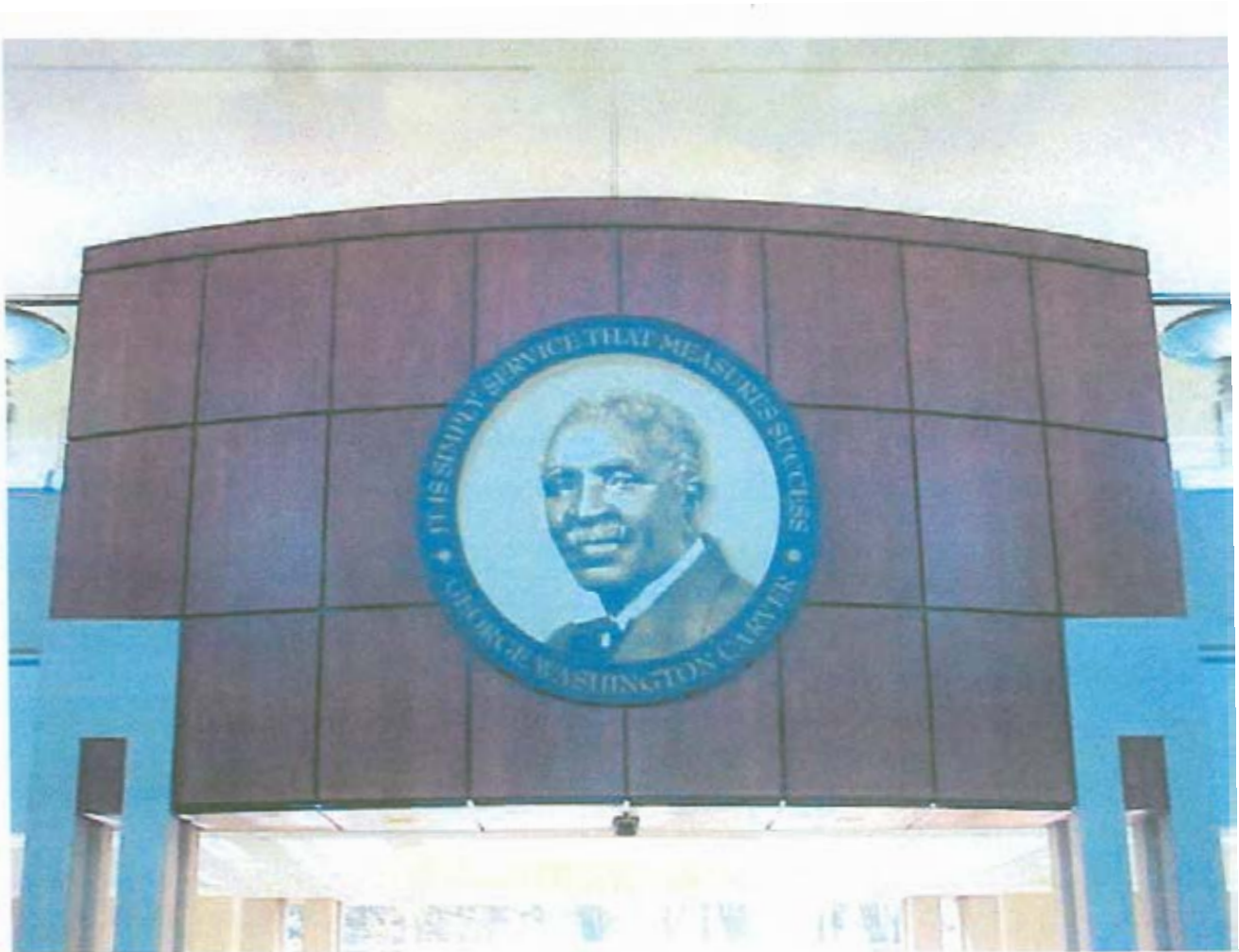
⁴ www.ctahr.hawaii.edu/adap2/com/whatsnew/federal_updates.htm Accessed March 2004.

workplace for USDA employees. Consolidation of USDA office space, from leased to Government-owned facilities, started with the completion of the George Washington Carver Center in Fiscal Year 1998.⁵

The Carver Center houses government offices and a medical center. It also includes the two-room Telework Center, a work site for use by USDA Headquarters and field employees away from their official duty stations or primary offices. One room has fourteen workstations with computers and three more for employees to plug in laptop computers. The second room, for use by short term task groups and/or special project groups of 90 days or less, offers a private office, secretarial station, ten workstations with computers, two for employees with laptops, and a fax machine/copier/printer. Two of the Center's workstations are set up to accommodate employees with disabilities, with features including a software package that reads on-screen text and turns it into speech, a keyboard with Braille imprint labels, software that offers enlarged print on the computer screen, and hydraulically height-adjustable workstations to accommodate wheelchairs.⁶

⁵ www.usda.gov/oc/foia/ap/ap2001/apppdf/apda.pdf Accessed March 2004.

⁶ www.usda.gov/news/pubs/newslett/old/vol59no2/article4.htm Accessed March 2004.



8-1. George Washington Carver seal at Carver Center.

Carver's Herbal Medicine and Dietary Suggestions— Present-Day Applications

“The Old Reliable Vegetable Drugs”

As with the field of mycology, Carver's influence on the science of herbal remedies is not measurable in a way to interest a historian. For one thing, herbalism, like mycology, was only one of many things he was doing, not a specialty. Another reason is that, unless one is a writer of a book on herbs that sells well—like Jethro Kloss, for example—herbalism is not a field that naturally produces prominent figures. Many of its greatest practitioners are quiet country people, like the old lady we read about Carver meeting in Chapter 4 (see footnote 38 of that chapter), who practice it to help people, not for fortune or fame.

But, as is true with every scientific pursuit Carver followed, careful reading of his general comments on this subject will pay us well in insight. One in particular warrants consideration. Writing of his study of Macon County's herbs in the 1910s, he said:

I had the privilege of co-operating with the Pan American Medical Congress, whose head quarters were... in Washington, D.C.¹ They realized that many of the

¹ The Pan-American Medical Congress had been in existence since 1893, when Grover Cleveland opened the first one on 5 September in Washington. The Congress, under government patronage, was organized for scientific discussion and to strengthen bonds in the medical fraternity of the Western Hemisphere. According to the [International Congress Series of the Department of History of Medicine, School of Medicine, Facultad de Medicina in Montevideo, Uruguay, “Due to the quadricentennial Columbian celebration [the 1893 event which Carver attended in Chicago], the Government of the United States requested from the American Medical Association the calling of a Pan-Am Medical Congress... The real purpose of this Congress was the interest of the US State Department in counteracting Western European colonial politics in Latin America.” <http://213.206.93.228/ifos/data.html:2663.htm> Accessed March 2004.

old reliable vegetable drugs were becoming very scarce, giving rise to many synthetic substitutes of questionable value.²

Carver's vision of a Southland covered with fields of those "old reliable vegetable drugs," of people out collecting the common wild herbs for small businesses, and of chemists studying their properties, was snuffed by manufacturers of those "synthetic substitutes of questionable value"—pharmaceuticals derived first from coal tar, then from petroleum. This story traces back to Justus von Liebig, mentioned in Chapter 2 as the inventor of commercial fertilizers. His student A. W. Hoffman went to London to head the Royal College of Chemistry, taking with him Liebig's fervent interest in coal tar, a byproduct of coked coal, as a raw material. Hoffman's eighteen-year-old student William Henry Perkin, during Easter break in 1856, was looking for a synthetic quinine substitute in coal tar and accidentally discovered the first aniline dye. Though Perkin himself made a fortune on his discovery, his countrymen were less willing than the Germans to invest the expertise and money to develop synthetic dyestuffs, and the Germans took the lead. Two huge spinoffs from this industry were pharmaceuticals and explosives, both closely related chemically to the dyes and producible from a coal tar, and later a petroleum, base. The Germans formed companies like CIBA, Bayer, BASF and AGFA. During World War I, these companies formed a consortium, I. G. Farben, which had a worldwide monopoly on aniline dyes.

One American interested in the new German pharmaceuticals was Frederick T. Gates, in charge of allocating oil magnate John D. Rockefeller's philanthropic contributions. Gates strongly opposed the homeopathic medicine practiced by Rockefeller's personal physician. In 1911—right in the middle of Carver's study of all of nature in Macon County, including its herbs—Gates formed an alliance with Abraham Flexner, an educator who admired the German insistence on studying only what is quantifiable, that led to the funneling of Rockefeller millions to medical schools that emphasized pharmacology and lab research over natural herbs and clinical work.³ By this, they turned

² GWC, "The South A Source for Our Future Supply of Vegetable Drugs," typed manuscript, [n.d.], TLA, 47, 236. See Chapter 4, note 25.

³ Lionni, Paolo. *The Leipzig Connection*. Sheridan, OR: Delphian Press, 1988. Lionni, writing of John D. Rockefeller, Sr.'s "General Education Board," founded in 1902, states, "Over the years (until

the nation's doctors to focus on illness and treatment, not on health. The shift away from a program of steady health maintenance using herbs and dietary wisdom, in turn, increased the need for pharmaceuticals designed for intervention in emergency cases. In 1928, the Rockefeller holdings were linked to I. G. Farben through huge mutual acquisitions of shares, forming the world's largest cartel and making official the link between German pharmaceuticals and those instrumental in steering Americans towards their use.

Carver, as a person so close to nature, had good reason to question the value of the new drugs. As petrochemicals in agriculture obstruct nature's healing of soil, so in medicine they ignore nature's way of healing the body. An herb from nature's medicine helps treat a number of different ailments, so taking one for one thing fortifies the body in ways

1960), the General Education Board would give a total of over \$96 million to medical schools which, like Johns Hopkins, disregarded naturopathy, homeopathy, and chiropractic in favor of medicine based on the use of surgery and chemical drugs."

Lionni's comments on the General Education Board are of interest here. He quotes Frederick T. Gates, Rockefeller's man in charge of philanthropy, saying that the Board's purpose was to "provide a vehicle through which capitalists of the North who sincerely desire to assist in the great work of Southern education may act with assurance that their money will be wisely used." Lionni states that, starting with a donation from Rockefeller of over \$1 million, the organization, designed as a philanthropic monopoly, quickly absorbed the major existing philanthropic groups working in the South— the Slater and Peabody Funds. Gates' statement in the Board's "Occasional Letter No. 1" is an intriguing twist on Booker T. Washington's idea of "casting down your bucket":

In our dreams, we have limitless resources and the people yield themselves with perfect docility to our molding hands. The present education conventions fade from their minds, and unhampered by tradition, we work our own good will upon a grateful and responsive rural folk. We shall not try to make these people or any of their children into philosophers or men of learning, or men of science. We have not to raise up from among them authors, editors, poets or men of letters. We shall not search for embryo great artists, painters, musicians nor lawyers, doctors, preachers, politicians, statesmen, of whom we have an ample supply.

The task we set before ourselves is very simple as well as a very beautiful one, to train these people as we find them to a perfectly ideal life just where they are. So we will organize our children and teach them to do in a perfect way the things their fathers and mothers are doing in an imperfect way, in the homes, in the shops and on the farm.

Gates' phrasing in the second paragraph here seems to echo some of ideas, and appears to have the same *immediate* aim, as Washington's and Carver's of teaching people to perfect skills "in the homes, in the shops, and on the farm"; but it lacks entirely their vision of "starting at the bottom" of these skills being steps towards freeing their people to rise into just those fields towards which Gates says the Board has no aim of leading them. We include this information also because Carver's Agriculture Department was established with Slater Fund money, and because Rockefeller Hall at Tuskegee, in which Carver lived for thirty-six years, was completed in 1903, the year after the General Education Board was set up.

additional to the one for which it is used. Pharmacological drugs are designed to do just the opposite, altering one thing only, such as a bacteria or nerve; but just because a drug is made to produce one effect doesn't mean it will stop there. The many other things it does—side effects—can be, and often are, harmful or fatal. Carver knew better than to embrace such drugs, sticking with the “old reliable vegetable drugs” that had served him well all his life. He made countless proofs of common herbs in Macon County and elsewhere, some of which have been discussed in Chapter 4.

Vision of Medicines Freely Available to All

Pharmaceuticals also bear on Carver's saying that “all of my operations as nearly as possible are kept within the reach of the individual farthest down.” His work featured nature's products because they are freely offered. He frowned on the exclusivity of making products that could help humanity available only to the rich. Though he took out three patents in his own name, on peanut cosmetics and on paints and stains, he suggested in a letter to “Blue Ridge Boy” Wallace Fridy in 1934 that patents would be unnecessary if not for human greed. He said: “Many of my creations are patented. I regret so much that the majority of us have become money mad and that the only real worth while contribution is the dollar.”⁴ Twelve years after he had taken out his last patent, he told Vance Packard: “One reason I never patent my products is that if I did, it would take so much time I would get nothing else done. But mainly I don't want my discoveries to benefit specific favored persons. I think they should be available to all peoples.”⁵

The theme he touches on here has proven to be a major problem with pharmaceuticals, which are often not affordable to the poor. The availability of AIDS drugs to Africa is always “Exhibit A” in this discussion. The issue is clearly spelled out in this joint press statement from two organizations on the front line of aid to Africans with AIDS —

⁴ Wallace Fridy to Austin W. Curtis, 24 June 1943, TIA, 54, 486. Fridy is quoting GWC to Fridy, 11 February 1934, TIA, 54, 486. Wallace Fridy was one of Carver's “Blue Ridge Boys” who had accompanied Carver on his fifth trip with James Hardwick, in November-December 1933, to Pennsylvania, New York, Connecticut, Virginia and North Carolina.

⁵ Vance Packard, “A Candid Talk With— A Scientist,” *Birmingham News*, 12 November 1939 and, *McCall*, MS *Enterprise*, 13 November 1939, TIA, 61, 1059 and 1062. Packard at the time was an AP Feature Service Writer. He went on to become an influential muckraker through books like *The Hidden Persuaders* and *The Waste Makers*.

Médecins sans Frontières (Doctors Without Borders, the worldwide relief organization that won a 1999 Nobel prize) and Oxfam, a major British famine-relief organization after a World Trade Organization meeting in Geneva on August 30, 2003: "Today's WTO agreement that is ostensibly intended to get drugs to the poorest countries... was designed to offer comfort to the U.S. and the Western pharmaceutical industry. Unfortunately, it offers little comfort for poor patients. Global patent rules will continue to drive up the price of medicines. . . This disappointing outcome must not prevent countries from immediately taking measures that are allowed under WTO patent rules in order to access affordable medicines and save lives."⁶

Modern Uses of Medicinal Herbs Carver Used

The market in herbs today features thriving companies selling bottled herbal preparations as dietary supplements. Among those herbs mentioned in Chapter 4 which are still available on the market (listed alphabetically by common name) are cornsilk (*Zea mays*), curled dock (*Rumex crispus*), dandelion (*Taxacum officinale*), evening primrose (*Oenothera biennis*), garlic (*Allium sativa*), horse chestnut (*Aesculus hippocastanum*), Jerusalem oak (*Chenopodium ambrosioides*), mullein (*Verbascum thapsus*), onion (*Allium cepa*), peppermint (*Mentha piperita*), plantain (*Plantago major*), saffron (*Sassafras officinale*), and yarrow (*Achillea millefolium*). While Carver did mention ginger, it was not the type normally found in stores and herbal preparations (*Zingiber officinale*), but Canada Wild Ginger (*Asarum canadense*).

Carver's Dietary Suggestions—Present-day Applications

Henry Ford, whose progressive spirit in the area of diet showed in his setting up of a plant for manufacturing soy foods long before they were popular, said that Carver had "the best explanation on diet of any man I know."⁷ Carver's genius in the field of diet is yet another of the many things about him which were submerged beneath his reputation as "The Peanut Man." Someone from *Alabama* magazine wrote of him when he was

⁶ This quote was widely circulated worldwide. It appears on <http://www.aids.org/africa-394-01.html>. Accessed March 2004.

⁷ Katharine Williamson to GWC, 7 February 1941, TIA, 36, 433-4; enclosure dated 6 February 1941, TIA, 36, 466.

seventy-two; “You’d think I knew nothing about anything but peanuts and sweet potatoes,” he complains, never losing his engaging humility but with just a trace of that impatience characteristic of world-weary oldsters.⁸ A visitor from the *Baptist Student* wrote: “I asked him if he considers his work with peanuts his greatest work. ‘No,’ he said, ‘but it has been featured more than my other work.’”⁹

The cornerstone of Carver’s dietary wisdom was his belief in nutritious food as medicine. At the end of Chapter 4 we quoted him saying that by using “vegetables, fruits, and wild herbs, Nature’s remedies, which God intended we should use,”¹⁰ he had kept himself in perfect health for decades. A writer for the *Southern Workman* in 1916 helps us picture how he did this: “Carver... eats food for medicinal purposes— tomatoes for this, beans for that, rape for another trouble, cabbage for another, watercress for another, liquor of pine needles for colds, dandelions for something else. He knows and eats a score of vegetables that other people sneer at as weeds. He has a small range in his room, and when the bill of fare in the dining-room is not to his liking or to the benefit of his health he goes out into the seemingly barren fields, brings in things, cooks and eats them, and is happy and healthy.”¹¹

Three pronouncements of Carver’s, one printed in a July 1915 *Negro Farmer* and two in bulletins of 1915 and 1927, underscore his belief that food can, and should, be medicine:

Fresh fruits and vegetables all have a medical value, and when wisely prepared and eaten every day will go a long way toward keeping us healthy.¹²

It is a noticeable fact, all other things being equal, that those who partake freely of fruits and vegetables every day have the clearest minds and the strongest and healthiest bodies.¹³

⁸ “Chemist,” *Alabama* magazine, 19 April 1937, AWC papers.

⁹ Frank H. Leavell, “George Washington Carver: An Interview for Students,” *Baptist Student*, November 1938, TIA, 59, 943.

¹⁰ GWC to BTW, 27 July 1914, TIA, 5, 454.

¹¹ Clement Richardson, “A Man Of Many Talents: George Washington Carver of Tuskegee,” *Southern Workman*, Hampton, VA, November 1916, TIA, 59, 808.

¹² Carver, “The Fat of the Land; How the Colored Farmer Can Live On It Twenty-One Times Each Week,” *Negro Farmer*, 31 July 1915, TIA, 60, 60.

If we eat plenty of good food, well cooked vegetables every day, all other things being equal, we can do more and work better than if we did not. We shall not get so tired, weary, and have to consult the doctor so often, and pay out such heavy doctor bills.¹⁴

The farmer Carver says “had just a stomach full of baked sweet potato” but was lacking vegetable salts (see beginning of Chapter 4) shows that rural people did not by any means all have good diets. The farmer was typical of Americans who generally rely too heavily on starch and sugar. In 1902, Carver complained to John H. Washington: “I wish you would take Mr. Maberry’s bill of fare for yesterday and look it over carefully... For dinner, I think you will find as follows: sweet potatoes, macaroni and cheese, and rice. No vegetables whatever from the farm. I have just been out to the truck garden to see if there was any trouble there. They report none. I also consulted with Mr. Greene and he gave me the following things which could have been had—corn, turnip salad, turnip roots, radishes, and peppers.”¹⁵

Several powerful trends during the twentieth century conspired to deteriorate the nutritional - -and hence medicinal- -value of the average American’s diet. One was the mass flight of populations from farms to cities, shifting tastes from rural appreciation for “wild vegetables” to more sophisticated urban tastes for sweeter, fatter, more refined food. Another was the pharmaceutical industry’s continual insistence that their products constituted “medicine,” overwhelming people’s perception of food as medicine. A third cause was the increased use of artificial fertilizers, draining nutritional value out of food crops by sickening soil. These trends have led to an acceptance of nutrition-poor, fat-rich “junk food” that has caused, in the early twenty-first century, an epidemic of childhood obesity that threatens to reverse a broad trend of increased human life expectancy for the first time in centuries.

¹³ GWC. *When, What, and How To Can and Preserve Fruits and Vegetables In the Home*. Bulletin # 27, 1915, TIA, 46, 224.

¹⁴ GWC. *How To Make and Save Money On the Farm*. Bulletin # 39, 1927, TIA, 46, 416.

¹⁵ GWC to John H. Washington, 5 October 1902, TIA, 2, 455. Original in BTW Collection, Library of Congress.

David Williston, a horticulturist at Tuskegee beginning in the early 1900s who was Carver's friend and tablemate, said of Carver's dietary preferences: "Dr. Carver liked simple food prepared the 'old fashioned' way... He liked wild mustard, dandelion, cow peas, sweet potatoes, western bacon, pig's feet, o'possum, and such foods."¹⁶ Carver's student Myrle Cooper exemplified the rising distaste for the "old-fashioned" food when he commented to Carver biographer Ethel Edwards in 1948 on Carver's "wild vegetable" concoctions: "They tasted terrible and if we didn't say they were good he got mad."¹⁷

Before the flight from farms to cities gained momentum during and after World War I, Carver was aware of the dangers of a weakening farm-to-kitchen connection. A letter he wrote to Booker T. Washington during the first year of the war so strongly emphasized this link that he called cooking the "science of agriculture." He wrote:

The science and practice of agriculture are intimate and inseparable companions, and should under no circumstances be divorced. I regret to see so often the attempt to separate them, as one is of little or no value without the other.

You will excuse me for using technical terms just here, but we have to use them in the laboratory, and it sounds scientific. I was going to say that it is not sufficient for the student to go into the laboratory and learn how to find the exact quantity and quality of the carbohydrates, albuminoids, protein, and so forth, simply for the sake of knowledge. This is abstract science and means nothing.

But now if he can take these different food nutrients—as they are found in the cowpea, or any other article of food, and bring them over to the domestic science department, to the kitchen, and put them together in proper quantity to make the highest quality of bone, brain, muscle, milk, fat, and fiber; and at the same time keep the body healthy and vigorous—full of life, so that the highest good can be gotten from it: I say the student who can do this will then see the real value of

¹⁶ Negro Division of the Alabama Extension Service in cooperation with Tuskegee, radio interview in Tuskegee's chapel, 27 February 1943, TIA, 63, 406-407.

¹⁷ Edwards, 219. Cooper added another concern which, considering Carver's high standards of cleanliness, was undoubtedly unfounded: "He cooked his weeds in beakers and heaven knows what had been in them. He was doing some experiments in organic fertilizers too."

scientific agriculture and its proper relation to the practical; and the farmer will succeed or fail only in proportion to his knowledge or ignorance of this fact, or the extent to which he applies thorough methods or the old slipshod rule.¹⁸

In Carver's agricultural work, he was as interested in the farmer's wife's work of bringing crops from field or garden to the table as he was in the farmer's. His bulletins feature hundreds of recipes. His 1916 *Three Delicious Meals Every Day For the Farmer*, telling farmers and their wives who feared wartime scarcity that they could live "cheaply, healthily, and happily" if they only made wise use of what was there, opened with these comments on cooking:

As we learn more about ourselves and the relation of food to our well being, we cannot but agree with those who have made it a study that "The prosperity of the nation depends upon the health and morals of its citizens, and the health and morals of a people depend mainly upon the food they eat, and the homes in which they live."

As a rule we are wasteful; we do not know how to save. Ignorance in the kitchen is one of the worst curses that ever afflicted humanity, and is directly or indirectly responsible for more deaths than all the armies combined. It sacrifices human life from the following angles:

1. A poor selection of food; that is, foodstuff lacking in the constituents necessary to build up the body and keep it healthy.
2. Bad combinations of food; that is, there are many foodstuffs good within themselves, but when combined with other material create an unnatural appetite; and quite frequently the body is undernourished, unduly stimulated, and as a result often leads to strong drink, bad morals, and bad manners.

¹⁸ GWC to BTW, [1914?], TIA, 46, 1070, B. T. Washington Papers at the Library of Congress Department of Research, Experiment Station, 1914, Carver.

3. **Bad preparation of food.** In this I think I make a conservative statement when I say that 75 percent of those who are entrusted with this important charge are deficient. Here is the very hot-bed for indigestion, constipation, sour stomach, mal-nutrition, colic, and a host of other stomach troubles.¹⁹

Six years later, when George F. Pickett, General Manager of New Llano Colony, a Utopian cooperative community in Louisiana, asked Carver for advice on diet, Carver quoted the 1916 bulletin, adding that the saying about “the prosperity of a nation” “is even more important today than when written, because we do not live as simply now as then.”²⁰ Throughout the part of the twentieth century he witnessed, he was acutely aware of the loss of the kind of simplicity he so highly valued.

Raw Food

Pickett had questions on the value of a raw food diet. Carver answered:

As to whether it is better to eat vegetables, fruits, meats, nuts, etc., cooked or raw, raises a very debatable question. There are radicals on both sides. However, I think that careful investigation from experienced dieticians, agree that the individual foodstuff, and the individual stomach almost wholly decides whether a foodstuff should be eaten cooked or raw. Some stomachs can eat fruits, vegetables, nuts, etc., cooked when they act almost as a poison, raw, and vice-versa. As a rule, I should say, eat well ripened fruits, nuts, etc. raw. Vegetables cooked until the tough fiber breaks, down softens, except in the case of cabbage, lettuce, cucumbers, onions, parsley etc., from which delicious and appetizing uncooked salads are made. Meats, to my mind, should be thoroughly cooked, never rare, unless the health of the animal is assured.²¹

As for Carver’s opinion of a vegetarian diet, while he once called a magazine titled *The Vegetarian* “a blessing to humanity,”²² he was well known around Tuskegee for his love

¹⁹ GWC, *Three Delicious Meals Every Day For the Farmer*, Bulletin no. 32, (Tuskegee Institute, 1916).

²⁰ GWC to Geo. F. Pickett of the Llano Colonists, New Llano, LA, 18 July 1922, TJA, 7, 65-66.

²¹ See note 20 above.

²² GWC to Miss Bertha Hoffman, Dobuque, IA, 11 September 1942, TJA, 42, 1163

of barbecue with a high percentage of fat. However, in his final year, he wrote: "I use [wild vegetables] as an uncooked salad twice per day... I find myself not craving meat like I used to. More and more I am getting to the point where I want less meat."²³

His estimation of the vital role of cooks to public well-being was undiminished in 1936, when he told a Commercial Dietetics class:

I think I am to talk to you on one of the most engaging, one of the most interesting subjects, a thing I like to do better than anything else, and that is cooking. My subject is "the preparation and serving of food as a fine art." Aside from cooking, there is nothing I like better than painting, but I think that cooking takes first place. I love it, because the handling and cooking of food is a marvelous thing.

Some people say, "Well, I am nothing but a cook." Now, if you are an artist in the kitchen, then you are something worthwhile, but if you are "just a cook" then you may turn out things that will produce ptomaine poison, indigestion, and many other disorders. We are given the art of cooking by the Great Creator, so let us do it in the best possible way.

It is just as fascinating as the art of painting with a brush. In painting, the artist attempts to produce pleasing effects through the proper blending of colors. In the same manner, the cook must blend her food in such a manner as to produce dishes which are attractive, wholesome, and appetizing. Harmony in foods is just as important as harmony in colors.

Digestion begins in the mouth. If digestion does not begin in the mouth, then look out for indigestion. Indigestion means no digestion. No digestion means no assimilation. No assimilation means no body-building. No body-building means dissolution and death.

It may seem startling when I say that the majority of our criminals are produced as a result of bad cooking and bad combination of food stuffs. But upon serious thought, one can see that this is true. When a person eats poorly cooked food, his

²³ GWC to Mr. Carl B. DeHaeing, Union Springs, NY, 7 March 1942, TIA, 40, 519.

body is not properly nourished. A poorly nourished body produces an unhealthy mind. A person who is poorly nourished quickly turns to stimulants, such as alcohol, to give him a feeling of well being, which should have been supplied by properly cooked food.

Nothing is so damaging as ignorance. The body is composed of fats, gums, resins, carbohydrates, and albuminoids. If we understand these, then we can prepare foods. An expert nurse is skilled in the preparation of food, because she must know how to build up the shattered systems of the sick. The cook must know the different food constituents and what they are for. With this knowledge, cooking can truly be made into an art.²⁴ (Fig. 9-1)

Aluminum Cooking Vessels

One cooking innovation that Carver tried and rejected was aluminum cooking vessels. In the late twentieth century, such vessels began losing popularity due to concerns about injurious health effects of food prepared in them. Back in 1938, a doctor writing Carver from Los Angeles included them among a list of his health concerns, and Carver replied: "I have been watching [this] with considerable interest... Years ago when aluminum cooking utensils first came out I was suspicious as to their value as cooking utensils. I got a few for myself but soon discarded them. I cannot help but believe that you are on the right track to work out something for definite."²⁵ Even into the twenty-first century, little is known "for definite;" an aluminum connection to Alzheimer's disease is still under study. The FDA's Dr. John Jones has suggested that if consumers are concerned, they should avoid cooking acidic foods, such as tomato sauce, in aluminum pans.²⁶

Carver wrote to Tuskegee's Director of Commercial Dietetics in 1941: "My feeling is, and has always been, that the preparation of foods with all of its intricate ramifications

²⁴ "A Few Notes On a Demonstration By Dr. Carver Before the Class In Commercial Dietetics," *The Tuskegee Messenger*, July-August-September, TIA, 46, 940. Carver delivered the speech on 29 June, 1936.

²⁵ GWC to Dr. D. L. Ransom, L. A., CA, 7 September 1938, TIA, 25, 667.

²⁶ Kurtzweil, P., "Can Your Kitchen Pass the Food Safety Test?" *FDA Consumer*, US Food and Drug Administration Publication No. 96-1229, revised October 2002. http://www.fda.gov/fdaec/features/895_kitchen.html. Accessed 23 April, 2005.

requires the highest type of intelligence."²⁷ Lucy Crisp recalled him saying, "Ignorance can never do anything but produce a comedy of errors."²⁸ While cooking errors usually struck him more as deep tragedy than comedy, one young woman in Tuskegee's cooking classes provided him with a big laugh. Writing to a cooking teacher who had left for summer break, he said:

The young ladies are carrying out your plans very nicely. I am having my own fun with them trying to find and cook mushrooms, and of all the curious concoctions they get up is most interesting. I certainly wish that you could see them. Mattie was given nearly half a gallon of nice mushrooms and when she got through with them she had about half a teaspoon of mushroom soup. She had cut both the tops and bottoms off the mushrooms and thrown the best part away, and I have laughed until my stomach is absolutely sore. I have all of them out now looking for mushrooms including Mrs. Martin.²⁹

By 1939, when the farm-to-kitchen association was weakened in many minds, Carver, speaking to an Alabama Hotel Association gathering at Tuskegee, came down on people in the food services who took advantage of this by playing up a meal's appearance and ease of preparation over its food value. Newspapers reported on his talk:

Deploing what he described as a tendency to make "pretty plates" instead of planning meals for their food value... the speaker bemoaned what he said had become the slogan of today, "Oh, What a Pretty Plate!" Few of those who have adopted this slogan, he said, knew anything about the body-building propensities or the wholesomeness of the food in the plate. He said too much foodstuff was artificial. The preparation of food, Dr. Carver added, needed a great deal of study... He said it had become stylish now to cook beans, potatoes and other vegetables for only a short time before serving them. In the case of beans, Dr.

²⁷ GWC to R. A. Spicely, Director Commercial Dietetics, Tuskegee, 13 November 1941, T1A, 39, 145.

²⁸ Lucy Cherry Crisp interview notes, June 1934, LCC Papers, 154.20h.

²⁹ GWC to Miss Lucile Womack, Americus, GA, 5 June 1939, T1A, 29, 752.

Carver said the time for boiling had been reduced to twenty minutes. "Well, I would not eat any twenty-minute beans or potatoes," he remarked.³⁰

He dropped a warning to those guilty of adulterating foods. With a twinkle in his eye, he said the day may be approaching when such persons will be shunted off to jail.³¹

Food Adulteration

The adulteration of food for profit during the twentieth century became closely connected with the pharmaceutical industry through supplementation of food with synthetic chemical products. It relied on the second cause we have given for the deterioration of the American diet—the acceptance of products from the chemical laboratory as “medicine.”

Food adulteration traces back to the 1700s, when white bread was becoming more widespread due to the introduction in England of sieves made of Chinese silk which helped produce finer, whiter flour. Though the sieves stripped the flour of its health value—75% or more of its dietary fiber due to the removal of the bran and its vitamins and minerals due the removal of the germ—white bread became a symbol of wealth and status. To the injury of destroying bread’s nutritive value, English bakers added the insult of adulterating it with alum lime, chalk and powdered bones to keep it “chalk white.”³² In America in 1831, Philadelphia Reverend Sylvester Graham, (Fig. 9-2) speaking in New York, preached hotly against bakers there who were cutting baking time over that of whole grain bread by using refined flour, further whitened with chemical agents, to produce a nutrition-poor, textureless and almost crustless loaf.³³

By 1940, Carver was having a hard time finding flour that hadn’t been denatured and bleached. He wrote to General Mills in Minneapolis: “I wish to say that the kind of flour I

³⁰ Associated Press, “Carver Joins In Food Hum,” *Huntsville Times*, Alabama, 23 June 1939, TIA, 61, 1014; “Carver Speaks to Hotel Men,” *Fulaula Tribune*, Alabama, 23 June 1939, TIA, 61, 1022.

³¹ “Carver Tells Plans For Food Health Research With Carrell,” *Montgomery Advertiser*, 25 June 1939, TIA, 61, 992.

³² “The History of Bread: The Industrial Age,” Federation of Bakers, U.K., http://www.bakersfederation.org.uk/industrial_age.aspx. Accessed March 2005.

³³ Graham became so strongly associated with these views that people called unholsted, whole wheat flour “graham flour,” and the products from it “graham bread” and “graham crackers.”

wanted was flour that had not been chemicalized in any way, that is, just the pure plain ground wheat flour without any chlorination or other forms of bleaching. I wanted this flour to make a particular kind of bread, the old-fashioned salt rising bread, which I have not been able to make with bleached flour but have no trouble with unbleached flour. I had a class in domestic science. In fact, they were commercial dietetic students, and I was very anxious to give them this type of bread which makes its own yeast... I have very remarkable success making this salt rising bread with unbleached flour, but it is practically impossible to get it down here."³⁴

Beginning in the 1930s, white bread was made to seem nutritionally acceptable due to the efforts of Elmer Holmes Bobst. (Fig. 9-3) As the American manager of the Swiss drug firm Hoffman-LaRoche (closely affiliated with I. G. Farben through cartel agreements), Bobst launched an advertising campaign for synthetic versions of the newly-discovered vitamins that was so successful that, he recalled, "Soon there was no... doubt about the need for mass consumption of vitamins."³⁵ Bobst, nicknamed thereafter the "Vitamin King," proceeded, not only to sell vitamins in tablet form, but to add synthetic vitamins and other chemicals his company made to white bread. He called this a "competitive coup."³⁶ The problem with additives to white bread is that, in the making of the bread, nature's spectrum of ingredients—copper, zinc, B vitamins and other important nutrients – is replaced with inferior substitutes for the few required by law.³⁷ During World War II, the government responded to food shortages and restrictions on the American baking industry by mandating enrichment of bread using synthetic vitamin products. The makers of the synthetics, chief among whom was Bobst, were far more enriched than the bread. In 1956, it became the law to enrich all refined breads.³⁸

Carver was never impressed by vitamin supplementation. Speaking in Greenfield Village to a group of young men during his last visit to Henry Ford, he answered a question about the value of nutrition in tablet form: "Well, there is nothing that will take the place of the

³⁴ GWC to F. C. Roberts, General Mills, Minneapolis, MN, 4 June 1940. TIA, 34, 47.

³⁵ Elmer Holmes Bobst, *Autobiography of a Pharmaceutical Pioneer* (New York: McKay, 1973), 189.

³⁶ Bobst, 185.

³⁷ Joe Star, "Bread Is the Staff of Life," Leri's Natural Foods,

<http://www.lorinatural.com/products/breads.htm> Accessed 20 April 2005.

old original form of eating... Now you can get a tablet that will contain all the nutritional values—they can all be concentrated into one little lozenge. They will never be popular as far as we are concerned, but it can be done. Such a thing can be done but we mustn't get too far from nature, what nature intended that we should do."³⁹

Carver had an indirect unpleasant connection to "the Vitamin King," Bobst said in his 1973 autobiography that he and Morris Fishbein, Executive Director of the American Medical Association from 1924 to 1949 and editor of its Journal, had "worked together to make the pharmaceutical industry what it has become—the handmaiden of the medical profession."⁴⁰ Morris Fishbein was responsible for killing a *Saturday Evening Post* article on Carver's healings of patients with infantile paralysis that was set to run in a 1936 issue. The *Post* accepted a story on the subject, and wanted it badly. When they sent it to Fishbein for review, he fired off a telegram to Dr. Luther Fischer of Atlanta, a surgeon who had spoken well of Carver's work, scaring Fischer into backing off any kind of endorsement of Carver's therapy.⁴¹ The *Post* returned the article with regret, reporting that Dr. Fishbein, saying the entire benefit was derived from the massage and not the peanut oil, couldn't approve of it.⁴²

Seeing Wealth in Wilderness

Carver, speaking at a clinic at Tuskegee in April 1940 for Alabama's black nurses, urged his large audience to learn the properties of the herbs and barks around them which could aid them in their work. Here he touched on what, to his mind, was the greatest defect in the training of twentieth century medical people—they were never led God's free storehouse of wholesome food and medicine, or encouraged to learn directly from the great physician, nature. His jotted notes for his talk read: "Peanut oil: Touch real life;

³⁹ Jeremy Likness, "All About Bread," <http://www.bodybuilding.com/fun/likness6.htm> Accessed 20 April 2005.

⁴⁰ "Address of GWC at Martha-Mary Chapel," the *Herald*, 24 July 1942, AWC papers.

⁴¹ Bobst, 146.

⁴² L. C. Fischer to GWC, 3 June 1936, TIA, 19, 25.

⁴³ *Saturday Evening Post* to GWC, 26 July 1936, TIA, 19, 450. The website <http://thepostman.50megs.com/timeline/1910-1919.htm> claims that Fishbein was an abrasive man whose power "was built on censorship, intimidation, and exercise of his powers to the limit," and that he was relieved of all his posts at the AMA in 1949 when exposed as a "habitual liar."

many who are not in bed need your services just as definitely as some who are there... They are walking along dying and do not know it; wild vegetables."⁴³

He told the nurses of a newspaper story from Kansas City that illustrated the tragic consequences for people who "walk along dying," never seeing the "wild vegetable" food all around them. Harry Larsen was the seventeen-year-old son of a widow on relief who was unable to see how she could provide any more for her six children to eat than corn meal mush. After being fed for months on mush alone, Harry became so depressed by his dietary monotony that he circled a strip of cloth around his neck, tied the ends to doorknobs and shut the doors, killing himself. Carver told the nurses that just outside the family's door was an array of foods to nourish bodies and minds. He once said: "There is no need for America to go hungry as long as nature provides weeds and wild vegetables which serve not only as food but as medicine."⁴⁴

Larsen turned his anguish on himself; but if he had taken it out on others, he might well have been among those criminals Carver said are products of poor nourishment. Carver's "startling" statement about the correlation between malnutrition and criminal behavior is brought up to date by a study from the University of Southern California, described in the 16 November 2004 *USC News* under the title "Nutrition Key to Aggressive Behavior." It reads:

For fourteen years, researchers followed the nutritional, behavioral and cognitive development of more than 1,000 children who lived on Mauritius, an island in the Indian Ocean off the coast of Africa. The sample of boys and girls included children with Indian, Creole, Chinese, English and French ethnicities.

Researchers assessed their nutrition at age three, looking for four indicators in particular: angular stomatitis, or cracking in the lips and corners of the mouth that is caused by a deficiency of the B vitamin riboflavin; hair dyspigmentation, a condition found primarily in tropical regions, where children's hair takes on a reddish-orange color due to protein deficiency; sparse, thin hair created by a

⁴³ GWC, handwritten notes for speech of 5 April 1940 to colored nurses of Alabama, [n.d.], TLA, 47, 859.

deficiency in protein, zinc and iron; and anemia, which reflects iron deficiency. The children's intelligence level and cognitive ability were also tested, and social workers visited their homes to come up with a so-called adversity score that summarized factors such as the income, occupation, health, age and education levels of their parents and their overall living conditions.

At ages eight, eleven and seventeen years, the researchers looked at how the children were behaving in school and at home. At age eight, teachers gave feedback about whether the subjects were acting out in school with behavior ranging from irritability to picking fights with other children. At age eleven, the feedback came from parents who told researchers about whether their children lied, cheated, got into fights, bullied others, destroyed property or used obscene language. At age seventeen, both parents and teachers reported on antisocial behavior such as stealing, drug use, destroying property or being deliberately cruel to others.

Over time, a link became evident between malnourishment and antisocial or aggressive behavior, said Adrian Raine, a coauthor of the study. . . . Compared to those in the control group—the group that did not suffer from nutritional deficiencies—malnourished children showed a 41% increase in aggression at age eight, a 10% increase in aggression and delinquency at age eleven and a 51% increase in violent and antisocial behavior at age seventeen.

While social class did not play a significant factor in behavior, intelligence level did, Raine said. "Poor nutrition, characterized by zinc, iron, vitamin B and protein deficiencies, leads to low IQ, which leads to later antisocial behavior," he said. "These are all nutrients linked to brain development." . . .

The findings have implications for the United States, Raine said, where 7% of toddlers suffer from iron deficiency, a number that jumps to between 9% and 16% in adolescent and female groups. Iron deficiency is between 19% and 22% in

⁴⁴ *Youngstown Vindicator*, 10 February 1942, quoted in Mrs. Charles C. Loveless, W. Farmington, OH to GWC, 11 February 1942, TIA, 40, 154.

black and Mexican American females, he said. "This is a problem in America. It's not just a problem in the far-away Indian Ocean," Raine said. "If it's causal, there's an intervention implication there. At a societal level, should parents be thinking more about what kids are eating?"

The study also casts antisocial behavior in a light where it may be preventable. "There's more to antisocial behavior than nutrition, but we argue that it is an important missing link," Raine said. "Biology is not destiny. We can change the biological disposition to antisocial and aggressive behavior."⁴⁵

Linna Denny of the Nurses Board of Examination and Registration in Birmingham, who convinced Carver to speak at the nurses' clinic, wrote to him of how he had improved his audience's vision: "I think all of us went home and looked in our Bibles to find with astonishment that instructions in nutrition were given in the first chapter of Genesis. We have known for a long time that you were a noted scientist but we did not know how closely you followed the word of God, and it has given us renewed faith in the provision that the Lord has made for His children."⁴⁶ A year later, she wrote to him: "I have heard from time to time that you walk in the cool of the morning and talk to the Lord, and I really believe it must be true, because you are able to give us so much illumination as to the purposes of God."⁴⁷

The verse from Genesis to which Carver pointed the nurses was his favorite: "Behold, I have given you every herb bearing seed, to you it shall be for meat." In the author of those words, Moses, Carver found an ideal of the vision that informed all his life work, which sees wealth where most see wilderness. Carver spoke of Moses in his Bible class, as Alvin Smith tells it:

⁴⁵ Usha Sutliff, "Nutrition Key to Aggressive Behavior," USC News, 16 November 2004. The authors of the study were Jianghong Liu, a postdoctoral fellow with USC's Social Science Research Institute; Adrian Raine, holder of the Robert Grandford Wright Professorship in Psychology in USC's College of Letters, Arts and Sciences; Samoff A. Mednick, a professor of psychology in USC College and director of the USC Social Science Research Institute, and Peter H. Venables, a professor of psychology at the University of York, England.

⁴⁶ Linna Denny, Birmingham, to GWC, 4 May 1940, TIA, 33, 984.

⁴⁷ Denny to GWC, 29 March 1941, TIA, 36, 1048.

It seemed that the story of Moses and the children of Israel in the wilderness was Professor Carver's favorite one. He said, "Where Noah's problem was shelter for himself and his family, Moses' was food for the hungry Israelites who were weary and confused during their escape from Pharaoh's army. But Moses had no fear, because he knew how to tune in, and the importance of staying in contact with the Creator of all things. Moses' mind's eye could see plenty to eat, but the children of Israel, being out of tune, saw nothing but swamps and a vast wilderness all about them... Lo and behold, there was manna all around them."

"What is manna?" several voices asked..

He laughingly repeated our question. "Why, we can find manna right here around Tuskegee."

This startled us. He was in for something now. We would certainly not let him rest until he had showed us this Tuskegee manna. Every one of the three hundred of us present was talking out at the same time. Dr. Carver stood there actually shaking with laughter. He waved his hand and we knew this was his way of telling us to be quiet, so that he could get on with the topic. He went on. "If we are truly in contact with our Creator, He will not only show us manna around Tuskegee, but He will show us a full meal in the grass growing around us."

I don't think that Dr. Carver ever said anything that was as funny to us as this statement, and he said many things during my four years, from 1915 to 1919, that had caused us to laugh. It was a joy to him to see us become jolly at something he had said. That's what he wanted, a jolly Bible Class, not a sanctimonious one with gloom all about. He said many times, "Our Creator wanted us to laugh." That was one of the reasons why so many boys never wanted to miss a session. Just before the time was up for that night's class, the professor said that he would show us some manna at the next class meeting.

Sure enough, when we entered the old library assembly room at the next meeting, eager to see the kind of manna the children of Israel had eaten thousands of years

ago, there it was on a table. It looked like little grains of white sand, but was soft. Beside the manna, there was a pile of grass about which Dr. Carver said, “We have a whole meal on the table. All this was found around here. The manna is the bread, and from the grass we get the other foods for the meal our Creator has stored therein.

“Moses is one of the best examples we need to have in mind when we meet with the problem of a food shortage.” he said. “You will find that God, the Creator, will direct you to His storehouse of ideas in the wilderness within yourselves, by which you can feed the multitude. Fear not. Keep yourselves in tune and you will see and do wonders.”⁴⁸

The manna Smith saw matches the description in Exodus of “a small round thing, as small as the hoar frost on the ground”⁴⁹; but the Bible doesn’t say specifically what manna was.

Carver’s statement that drew such a big laugh—that a full meal could be found in common grass—was still novel when he said in his 1942 talk to the young men at Greenfield Village:

Isaiah heard a voice: “Isaiah, cry aloud.”

“Why voice, what must I say?”

“Say that all flesh is grass.”

We have just recently learned that grass—just real grass—contains more of these elusive things called vitamins than any known form of vegetation. That’s what he was to cry aloud. Now you can go into the drugstore and buy grass put up in little lozenges. You can buy it by the ounce or pound—any quantity, just pure grass.⁵⁰

⁴⁸ Smith, 37-38

⁴⁹ Ex. 16:14.

⁵⁰ See note 39 above.

As Fascist dictators were on the ascendant in Europe, a reporter wrote: "Dr. Carver doesn't laugh as he refers to a dictator's advice for his people to 'eat grass.' 'Why not? Grass is rich in vitamins.'"⁵¹ Fifteen years after Carver's death, Ann Wigmore of Boston's Hippocrates Health Institute began to popularize "wheat grass therapy." While human beings' long and complex intestines can't handle the woody, fibrous cellulose in mature grasses, the water extract of young sprouted wheatgrass is easily digested and assimilated. In accordance with Carver's claims, wheatgrass contains every vitamin identified so far by science and all known mineral elements, being exceptionally high in calcium, magnesium, phosphorus, and potassium, as well as the trace minerals zinc and selenium, and its protein is easily assimilated. Dr. Wigmore reported that fifteen pounds of wheatgrass is nutritionally equivalent to 350 pounds of the choicest green vegetables. She cited a long list of testimonials from guests in her institute whom wheatgrass juice⁵² helped high blood pressure, diabetes, obesity, gastritis, stomach ulcers, pancreas and liver troubles, asthma, constipation, hemorrhoids, colitis, fatigue, female problems, arthritis, anemia, and athlete's foot. Its 70% chlorophyll content makes it a powerful antioxidant, blood purifier, tissue and cell cleanser and remover of harmful toxins from the body.⁵³

Soy

Carver anticipated so many products common now but ignored or scoffed at in his time. When Alfred Chapman, a young man with delicate health who had sat at Tuskegee's "Diet-Vegetarian table," wrote him in 1942 that "Soybean ice cream is going big in Detroit," he added in parentheses the word "Smile," to indicate that he was kidding;⁵⁴ soy products were almost impossible to find. Carver had been making them since 1903, when he began his peanut work, concluding that "the soy bean, with its numerous varieties, is almost, if not quite, as versatile as the peanut with its 300 products."⁵⁵ By producing soy milk and a bisque for ice cream, he made the two products most commonly seen today.⁵⁶

⁵¹ Dawson (GA) News, 19 June 1941, TIA, 62, 108.

⁵² "Q and A's on the Wonders of Wheat Grass Juice," Sweet Wheat, <http://www.sweetwheat.com/qa.htm> Accessed April 2005.

⁵³ Alfred S. Chapman, Detroit, MI, to GWC, [n.d.], TIA, 44, 417.

⁵⁴ GWC to editor, *Montgomery Advertiser*, 6 January 1936, TIA, 18, 716.

⁵⁵ He gave out his soybean milk recipe to a man in West Virginia; "Grind the soybeans and cover them with cold water; heat slowly, stirring constantly. When it reaches the boiling point, remove from the fire and strain through double cheese cloth. This milky liquid can be sweetened, lemon juice or

From soybeans he also made cheese, breakfast food, sprouts, salted nuts, coffee, and flours. In 1919, he told a crowd at South Carolina's Voorhees Normal and Industrial: "Here is a bottle of tofu. It is a Chinese preparation made from the soy bean and I find that the peanut makes it just as nice as the soy bean."⁵⁶

Henry Ford's progressive spirit showed in his building a demonstration plant producing soymilk in the mid-1930s. Carver told a group of chemurgists a month before he met Ford in 1937: "When Mr. Henry Ford (so the story goes) said that we could get along without cows' milk... many were the voices that rose up and said it could not be done. You know some people have a lot of free speech and no thought. I have an article here... which says: 'Can human beings be healthy without animal milk?' And it goes on to show that they can be healthy without it, because we have learned how to make vegetable milks from soy beans, peanuts, etc."⁵⁷ Henry A. Wallace, the son of Carver's professor of dairying at Iowa State, said of soy milk: "I drink it every day. It isn't milk at all. It's a milk substitute made of soy beans and is much richer for my purposes in nourishing qualities than milk itself."⁵⁸ Wallace referred to soymilk's having more iron and protein than cow's milk; it also has less fat and fewer calories.

Wheat Gluten

Another product Carver extracted before the general public heard of it was gluten, a base for protein dishes, both from soy and wheat. Wheat gluten, or *seitan* in Japanese, is a chewy, protein-rich food made from hard winter wheat that resembles meat in texture and flavor. When Alfred Chapman sent a book to Carver telling how to isolate wheat gluten, Carver replied: "I make mine a trifle different and I believe a little easier than the

any other fruit juice added, making a very palatable drink." He added, "Peanut milk can be made the same way from either parched or raw peanuts." GWC to Joseph Horshan, Charleston, WV, 26 June 1937, TIA, 21, 433.

⁵⁶ H. Unthank, "Prof. G. W. Carver's Lecture, Farmers' Conference, Feb. 16/21," typed transcription of a speech at Voorhees College, Denmark, SC, TIA, 46, 929.

⁵⁷ Transcript of a speech at the Jackson High School Auditorium, 12 April 1937, TIA 46, 949.

⁵⁸ "Soy Bean Milk Is Fine," *Dathan Eagle*, 16 November 1938, reprinted from *Albany Herald*, TIA, 61, 931.

directions in the book, but it may be because I have been accustomed to making it in this way all the time."⁵⁹

Carver recalled to Chapman, "When you were in school many were the questions that you asked that other students did not ask with reference to plants and food."⁶⁰ Chapman wrote to Carver of soy burgers and sent him a juicer so he could have carrot juice from "nature's organic laboratory."⁶¹ In 1941, when Carver's health was precarious, he sent him soy coffee which Carver said he used and liked, adding, "I am learning to drink less and less real coffee all the time and I believe it is helping me."⁶² Carver wrote Chapman: "You are really living beyond your day and generation as you have been able to catch hold of these advanced ideas with reference to food and nutrition that are far beyond what the average person can comprehend, and you are going to grow more and more into prominence by reason of it."⁶³

John Harvey Kellogg and Alfalfa Sprouts

When Alfred Chapman mentioned John Harvey Kellogg (Fig. 9-4) in one of his letters, Carver replied: "Every intelligent person interested in health, I am very certain, appreciates what Dr. Kellogg is doing. He is really my ideal."⁶⁴ Carver and Kellogg never met, but they exchanged letters between 1919 and 1926 on subjects like wild vegetables and growing alfalfa sprouts, another product now easy to find in markets, then almost impossible.

Kellogg had directed the strictly vegetarian Seventh Day Adventist Church's health sanitarium in Battle Creek, Michigan beginning in 1886. Chapman wrote to Carver of this:

The Battle Creek method, as given to me, in order to improve digestion and general health, was much in favor of a regular time to drink water as also for

⁵⁹ GWC to Alfred S. Chapman, Detroit, MI, 15 December 1938, T1A, 26, 1133.

⁶⁰ GWC to Chapman, 9 November 1942, T1A, 43, 490.

⁶¹ Chapman to GWC, 11 August 1942, T1A, 42, 648.

⁶² GWC to Chapman, 12 May 1941, T1A, 37, 333.

⁶³ GWC to Chapman, 15 July 1942, T1A, 42, 222.

⁶⁴ GWC to Chapman, 19 October 1938, T1A, 25, 1361.

regular meal habits. One glass of water a half hour or hour before meals, and one or two glasses of water about two hours after meals. Moderate breathing exercises the first thing in the morning is also mentioned.

The Battle Creek Sanitarium also names the following as bad combinations of food: Fruits and vegetables, milk and sugar, acid fruits and cereals, and large quantities of white bread and milk... A sweet apple will digest in about two hours, and when combined with vegetables of a much longer process of assimilation, the result is usually an acid stomach... Cane or beet sugar added to milk is often an irritating result to the delicate linings of the stomach and intestines... Acid fruits nutrifies the delicate digestive fluids of the mouth, which help to prepare starch contents of cereals, for digestion... White flour and milk tends to produce constipation. ...The Sanitarium would have their physician to diagnose your case first, and they prescribe you a special diet to suit your chemical type.⁶⁵

It is evident from Chapman's summary how far the American public is from Kellogg's ideal. Carver once quoted Kellogg as saying that there wasn't a healthy stomach in America.⁶⁶ What's oddest about the Kellogg story is that stomachs to this day fill up on breakfast cereals he originated and which bear the Kellogg name, but which evolved into products he condemned – denatured wheat steeped in so much sugar they should be sold as candy, advertised to to be served with milk and acid fruit.

This was the work of his brother Will. In 1888, when the only cold breakfast cereal in existence was a mixture of Graham flour and water invented by James Cale Jackson, John Harvey began to experiment with breakfast foods. After a patient showed him Shredded Wheat, being peddled as a main course by Henry Perky of Denver, he was struck with the idea of creating a popular ready-to-eat breakfast cereal. He hit on the making of flakes from wheat, and then from other grains. His brother convinced him to form a corn flake company in 1906. J. H. was the majority stockholder but, on returning from a trip to Europe to visit Pavlov, he found that his brother had bought up enough stocks to take control, renamed the company and begun putting sugar and other additives

⁶⁵ Chapman to GWC, 15 October 1938. TIA, 25. 1271.

into the recipe and advertising heavily, leading to the products we see today.⁶⁷ A 1990s ad for Fruit Loops, for example, touted its “new brighter colors!” achieved by increasing the content of artificial dyes, showing how far much of the public had fallen from assessing foods for nutrient content. Kellogg has been one of the huge trans-national corporations purveying genetically engineered grains.

When Carver in 1911 prepared the famous meal for Booker T. Washington, Tuskegee’s physician, their wives and “a number of the most fastidious people in our community” in which each course was made with peanuts, Washington sent the menu to Kellogg. Then in 1919 Carver, on the advice of Dr. David Fairchild of the Bureau of Plant Industry, whom he met on his visit to Washington to demonstrate sweet potato flour for use during World War I, contacted Kellogg. When Kellogg read the next year about peanut milk from Carver’s laboratory, he wrote to him: “I visited Tuskegee some years ago, and in a talk with the students and afterwards with Booker Washington, endeavored to create an interest in the peanut as an excellent substitute for meats.”⁶⁸

Thus Kellogg had been promoting the peanut from a dietetics angle prior even to Carver’s arrival at Tuskegee. A man in Philadelphia in 1939 wrote to Carver in 1939 suggesting that Kellogg’s knowledge of both peanuts and sweet potatoes outmatched his. He said:

It is my impression Dr. Jno. Harvey Kellogg of the Battle Creek Sanitarium is the foremost authority on these two foods. For almost fifty years he has maintained that the protein of the peanut is complete and as early as 1895 he developed a process of making a most delicious milk from this food, altho he is very careful to point out the peanut should never be served roasted as it is... indigestible in this form; so he has developed a process of steaming it to make peanut butter and from that he makes milk, which does not cause indigestion.⁶⁹

⁶⁷ GWC to John I. Miller, Mincola, NY, 11 February 1941, TIA, 36, 475.

⁶⁸ Carrie McLaren, “Pom Flakes: Kellogg, Graham and the Crusade for Moral Fiber,” *Stay Free!* Magazine, Issue 10, [n.d.], http://www.stayfreemagazine.org/10_graham.htm.

⁶⁹ John Harvey Kellogg, Battle Creek, MI, to GWC, 5 September 1920, AWC Papers, 1920-21.

⁷⁰ Emmett Baxter, Philadelphia, to GWC, 22 November 1939, TIA, 31, 1260.

The non-competitive Carver answered: "Dr. John Harvey Kellogg of the Battle Creek Sanatorium is a good friend of mine... I feel he has the key to real health."⁷⁰ His correspondence with Kellogg was in the spirit of fellow *savants* in the field of diet. Carver suggested that Kellogg tried alfalfa salad with vinegar, and Kellogg replied: "I know of no reason why alfalfa may not be used as a regular diet. In Germany it is used as a green. I have tried it and it seems tough and it has a disagreeable flavor which I do not like... On this account I prefer spinach and other green leaves... I will ask our folks to make a trial of your alfalfa salad, but I would by all means substitute lemon juice for the vinegar."⁷¹

Carver tried to diagnose Kellogg's problem with toughness and disagreeable flavor, saying "Mine... has absolutely no bitter taste, almost or quite as tender as lettuce, and of a very agreeable flavor. Now, I select the young shoots that are about six inches high. I take also those that break rapidly when the stems are bent. I have a small patch that I keep out off for that purpose, and use only the young shoots. I believe if such is selected and prepared as I have described you will like it. It seems to be excellent for digestion and for the stomach."⁷²

Kellogg said he would follow Carver's suggestion, and Carver answered with another diagnostic suggestion: "Now we have a sweet clover with white flowers and one with yellow flowers that look almost identical with alfalfa when young, and it is bitter and disagreeable. I am wondering if that is what the person got a hold of when gathering it." He added, "I have tried mine with several dressings, but I like the French dressing best. I certainly thank you for calling my attention to the lemon juice instead of the vinegar. It is delicious."⁷³

Acidophilus and Taro Chips

Two final products now widely available but little known in Carver's time were acidophilus milk and taro chips. He wrote to a dairy farmer in New York: "I do not know

⁷⁰ GWC to Baxter, 27 November 1939, TIA, 31, 1332.

⁷¹ Kellogg to GWC, 13 May 1926, AWC papers, 1926.

⁷² GWC to Kellogg, 18 May 1926, TIA, 9, 974.

⁷³ GWC to Kellogg, 2 June 1926, TIA, 9, 1012.

whether your section would be interested in a buttermilk proposition. Fermented milk has distinct medicinal values such as *kuniss*⁷⁴ and Bulgarian milk and acidophilus milk.”⁷⁵ To Professor Martha Potgeiter at the University of Hawaii’s Agricultural Experiment Station who had written him of their native taro plant, he wrote: “I grew quite a few Taro plants and I like them very very much. I am especially fond of the chips made from them. I like them, really, better than I do those made from the Irish potato.”⁷⁶ The American masses wouldn’t know of taro chips until the 1990s. Carver wrote to Potgeiter: “You are certainly doing such magnificent work that its value cannot be measured at the present time.”⁷⁷

Shadows of Tomatoes

Eating lots of fruits and vegetables grown in a way that diminishes their nutritional content nullifies the value of following the advice to eat plenty of them. We quoted Carver’s citation of Dr. Charles Northern in Chapter 7 (see footnote 4) that “A tomato can look in every way just like an ordinary tomato, but as far as food value is concerned have but little of the qualities of a well-grown unfertilized (artificially) tomato.”⁷⁸ In a report on a Soil Conference at Tuskegee in September 1936, he spoke of the plummeting food value of vegetables grown in soil treated with such fertilizers. He wrote:

To our amazement we are learning that a tomato may not be a tomato, nutritionally speaking, but only a mere hull or shadow of the savory, nutritious,

⁷⁴ His reference was to *kouniss*, a fermented beverage made originally by the nomadic people of central Asia from mare’s milk and now also from cow’s milk elsewhere.

⁷⁵ GWC to Marie J. Dana, Walton, N.Y., 10 December 1940, TIA, 35, 1167.

⁷⁶ GWC to Prof. Martha Potgeiter, U. of HI Agricultural Experiment Station, 8 October 1940, TIA, 35, 397.

⁷⁷ GWC to Potgeiter, 19 November 1940, TIA, 35, 942.

⁷⁸ The following statements from Charles Northern, from Senate Document No. 264 (See Chapter 7, footnote 4), bear on the content of this chapter:

The alarming fact is that foods—fruits, vegetables and grains—now being raised on millions of acres of land that no longer contains enough of certain needed minerals, are starving us—no matter how much of them we eat’...

An organism supplied with a diet adequate to, or preferably in excess of, all mineral requirements may so utilize these elements as to produce immunity from infection quite beyond anything we are able to produce artificially. You can’t make up the deficiency by using a patent medicine or drug...

palatable vegetable it should be, owing to the soil not having the minerals in it sufficient to produce it...

Thanks to scientific investigation for teaching us that a number of our food practices should be classified under the head of foods and foolishness, malnutrition, large stomachs, and anaemia (not pernicious anaemia). In short many low physical and mental conditions are due to a lack of food as to both quantity and quality.⁷⁹

As with all his other pursuits, Carver's dietary knowledge was founded on a spiritual basis. Writing to James Hale Porter of Chicago, an energetic agitator on behalf of their people, he went to what he saw as the ultimate root of human health. He wrote: "Science is indeed most active trying to find out things with reference to the suppression of our various physical troubles. There is much for us to learn and I am quite certain that when we get to the bottom of it we will find that we want to go way back and change our methods of living very materially, and live in accordance with the Golden Rule."⁸⁰

Sick soils mean sick plants, sick animals and people. Physical, mental and moral fitness depends largely upon an ample supply and proper proportion of the minerals in our foods. Nerve function, nerve stability, nerve cell building likewise depend thereon.

⁷⁹ "Dr. Carver Writes Soil Conservation Conference Report," *The Tuskegee News*, 17 September 1936, TIA, 61, 468.

⁸⁰ GWC to J. H. Porter, Chicago, Ill., 5 November 1937, TIA, 22, 463.

Chemurgy Today

Though Carver fed Henry Ford much information on chemurgic possibilities, there is no hard evidence for his role in Ford's development of the soybean car body. His own vision never would be an industrial one. As noted in Chapter 5, he tried experiments in making plastics from peanuts and from soybeans, but didn't go far with them due to his lack of interest in factories. However, Carver's position as the "first and greatest chemurgist," the person who was in the field before anyone else even thought of it, makes a general discussion of chemurgic activity in our time relevant.

As we will see further along, William Hale, Francis Garvan, Charles Kettering and the other early chemurgists had good reason for putting their primary energies into farm-grown energy production in the form of fuel. We will also see that the company started by Hale's father-in-law, Dow Chemical, is, seventy years after Hale started the chemurgy movement, partnered in a project that is looking at very large-scale biomass fuel use. The current viability of a farm-grown fuel economy is evident in this statement from a 1991 article in *Science*: "Cellulosic materials potentially available from energy crops, wastes, and conventional forestry could provide an amount of ethanol commensurate with current consumption of liquid transportation fuels in the United States."¹

One current ethanol user is Carver's alma mater, Iowa State, which runs the University's motor vehicles on farm-grown ethanol. Iowa State is a leader in research into switchgrass, a raw material for fuel that can be grown in minimally cultivated soil at the margins of food crops, thus not taking up valuable space for growing food and allowing us to avoid using food crops for fuel. A paper from University Extension says, "Switchgrass, a perennial warm-season grass native to all parts of Iowa and the Midwest,

has become a biomass fuel crop for energy generation in southern Iowa. It has excellent burn qualities, is easily managed, and attains reasonable yields without high rates of nitrogen fertilizer. Switchgrass adapts well to numerous soils and climatic conditions, allowing it to grow on both... loess and till-derived soils... Switchgrass also provides good habitat for wildlife."²

We will return to farm-grown fuel by way of a discussion of bioplastics. These may be made from corn, soy, wheat, switchgrass and other crops.

Corn kernels are the raw material for the first biomaterials to be produced on a large commercial scale. This is due to Cargill Dow, a joint venture by agricultural giant Cargill Inc. of Minnetonka, Minnesota, and Dow Chemical of Midland, Michigan, spun off from Cargill in 1997 and, as of 2002, employing about 230 people. In a report from that year, the company planned eventually to switch to cheaper agricultural waste such as corn stalks, wheat straw, rice hulls, sawdust and prairie grass, whose sugars are more difficult to break down.³

Cargill's entry into the business of biomaterials from corn sugar was a natural extension of their activities in the corn-wet-milling industry, which converts corn grain to products such as high-fructose corn syrup, citric acid, vegetable oil, bioethanol and animal feed. In 1999 this industry processed roughly 15 percent of the entire U.S. corn harvest for that year (almost 39 million tons).⁴ Cargill Dow's \$300 million factory in Blair, Nebraska, which became fully operational in January, 2002, uses a fermentation process to extract natural sugars from corn, then uses microorganisms to transform the sugars into lactic acid, and finally chemically links the lactic acid molecules into chains of plastic with attributes similar to the petrochemical plastic PET (polyethylene terephthalate), used in soda bottles and clothing fibers. The end result is polylactide, or PLA, known by the

¹ Lee R. Lynd, Janet H. Cushman, Roberta J. Nichols, and Charles E. Wyman, "Fuel Ethanol from Cellulosic Biomass," *Science*, 15 March 1991.

² Teel, Alan, Stephen Barnhart and Gerald Miller, Extension agronomists, "Management Guide for the Production of Switchgrass for Biomass Fuel in Southern Iowa," Iowa State University, University Extension, www.extension.iastate.edu/Publications/PM1710.pdf Accessed 29 April, 2005.

³ Terence Chea, "From Fields to Factories: Plant-Based Materials Replace Oil-Based Plastics, Polyesters," *Washington Post*, 3 May 2002

⁴ Tillman U. Gemgross and Steven Slater, "How Green Are Green Plastics?" *Scientific American*, August 2000,

brand name NatureWorks PLA™, which Cargill Dow ships in bulk to Coca-Cola for making soft-drink cups, McDonald's for making salad containers, and Pacific Coast Feather Company for making fiber for filling pillows and comforters. Cargill spokesman Michael O'Brian predicted that by 2013, the company expected to be converting 10 percent of the nation's annual corn supply into 1 billion pounds of corn-derived plastics and fiber per year. Patrick Gruber, vice president and chief technology officer at Cargill Dow, said in 2002, "It's all about sustainability. Would you rather buy a product made from corn from the Midwest or petroleum from the Middle East?"⁵

It is, of course, "all about sustainability" only after it's much about money. Cargill Dow entered the business of corn plastic because their corn-derived polymer could compete directly with petroleum-based plastics and polyesters in price and performance. An article on PLA in the *Washington Post* of 2 May 2002 quoted a managing director at a San Francisco venture capital firm which created a \$50 million fund to invest in early-stage start-ups focused on biomaterials and bioprocessing, saying, "There's a lot of potential here, but I think we're early on in realizing this potential... Investors would like to see how they're going to get a return on their investment. That's quite clear in health care, but it's much less clear in some of these new areas." Another plant polymer, PHA (polyhydroxyalkanoate), turned out to cost substantially more than its fossil fuel-based counterparts and offered no performance advantages other than biodegradability. Monsanto has owned the process and associated patents since 1995, but has found no way to make it profitable.⁶

As for the sustainability of the PLA process, an article in the August 2000 *Scientific American* title "How Green Are Green Plastics?" by Tillman U. Gemgross and Steven C. Slater, addressed this issue. Because it leads back to biomass fuels as the means for making the process sustainable, we quote it at length:

⁵ Sustainability is the practice of conserving enough natural resources to support future generations. When the author spoke at Synergy, the February 2004 Third Annual Sustainable Living Conference at Evergreen State College, Olympia, Washington, an organizer for the conference suggested titling his talk on Carver "The Grandfather of Sustainability."

⁶ PHA is made by subjecting plant sugar to a bacterium, *Ralstonia eutropha*, that converts it directly into plastic, causing PHA to accumulate naturally within the microbes as granules that can constitute up to 90 percent of a single cell's mass. This sidesteps the requirement with PLA of a chemical step outside the organism to synthesize the plastic.

Fueling this process requires 20 to 50 percent fewer fossil resources than does making plastics from oil, but it is still significantly more energy intensive than most petrochemical processes are. Company officials anticipate eventually reducing the energy requirement. The process has yet to profit from the decades of work that have benefited the petrochemical industry. Developing alternative plant-sugar sources that require less energy to process, such as wheat and beets, is one way to attenuate the use of fossil fuels. In the meantime, scientists at Cargill Dow estimate that the first PLA manufacturing facility... will expend at most 56 megajoules of energy for every kilogram of plastic—50 percent more than is needed for PET but 40 percent less than for nylon, another of PLA's petrochemical competitors.

The energy necessary for producing plant-derived plastics gives rise to a second, perhaps even greater, environmental concern. Fossil oil is the primary resource for conventional plastic production, but making plastic from plants depends mainly on coal and natural gas, which are used to power the corn-farming and corn-processing industries. Any of the plant-based methods, therefore, involve switching from a less abundant fuel (oil) to a more abundant one (coal). Some experts argue that this switch is a step toward sustainability. Missing in this logic, however, is the fact that all fossil fuels used to make plastics from renewable raw materials (corn) must be burned to generate energy, whereas the petrochemical processes incorporate a significant portion of the fossil resource into the final product.

Burning more fossil fuels exacerbates an established global climate problem by increasing emissions of greenhouse gases, such as carbon dioxide. Naturally, other emissions associated with fossil energy, such as sulfur dioxide, are also likely to increase. This gas contributes to acid rain and should be viewed with concern. What is more, any manufacturing process that increases such emissions stands in direct opposition to the Kyoto Protocol, an international effort led by the United Nations to improve air quality and curtail global warming by reducing carbon dioxide and other gases in the atmosphere.

The conclusions from our analyses were inescapable... PLA seems to be the only plant-based plastic that has a chance of becoming competitive in this regard... It takes advantage of major factors contributing to an efficient process: low energy requirements and high conversion yields (almost 80 percent of each kilogram of plant sugar used ends up in the final plastic product). But despite the advantages of PLA over other plant-based plastics, its production will inevitably emit more greenhouse gases than do many of its petrochemical counterparts.

As sobering as our initial analyses were, we did not immediately assume that these plant-based technologies were doomed forever. We imagined that burning plant material, or biomass, could offset the additional energy requirement. Emissions generated in this way can be viewed more favorably than the carbon dioxide released by burning fossil carbon, which has been trapped underground for millions of years. Burning the carbon contained in corn stalks and other plants would not increase net carbon dioxide in the atmosphere, because new plants growing the following spring would, in theory, absorb an equal amount of the gas. (For the same reason, plant-based plastics do not increase carbon dioxide levels when they are incinerated after use.)

We and other researchers reasoned that using renewable biomass as a primary energy source in the corn-processing industry would uncouple the production of plastics from fossil resources, but such a shift would require hurdling some lingering technological barriers and building an entirely new power-generation infrastructure. Our next question was, "Will that ever happen?" Indeed, energy-production patterns in corn-farming states show the exact opposite trend. Most of these states drew a disproportionate amount of their electrical energy from coal—86 percent in Iowa, for example, and 98 percent in Indiana—compared with a national average of around 56 percent in 1998. (Other states derive more of their energy from sources such as natural gas, oil and hydroelectric generators.)...

Interestingly, it was switching to a plant-based energy source—not using plants as a raw material—that generated the primary environmental benefit. Once we

considered the production of plastics and the production of energy separately, we saw that a rational scheme would dictate the use of renewable energy over fossil energy for many industrial processes, regardless of the approach to making plastics. In other words, why worry about supplying energy to a process that inherently requires more energy when we have the option of making conventional plastics with much less energy and therefore fewer greenhouse gas emissions? It appears that both emissions and the depletion of fossil resources would be abated by continuing to make plastics from oil while substituting renewable biomass as the fuel.

Unfortunately, no single strategy can overcome all the environmental, technical and economic limitations of the various manufacturing approaches. Conventional plastics require fossil fuels as a raw material; PLA and PHA do not. Conventional plastics provide a broader range of material properties than PLA and PHA, but they are not biodegradable. Biodegradability helps to relieve the problem of solid-waste disposal, but degradation gives off greenhouse gases, thereby compromising air quality. Plant-based PLA and PHA... compete with other needs for agricultural land. And although PLA production uses fewer fossil resources than its petrochemical counterparts, it still requires more energy and thus emits more greenhouse gases during manufacture.

The choices that we as a society will make ultimately depend on how we prioritize the depletion of fossil resources, emissions of greenhouse gases, land use, solid-waste disposal and profitability - all of which are subject to their own interpretation, political constituencies and value systems. Regardless of the particular approach to making plastics, energy use and the resulting emissions constitute the most significant impact on the environment.

In light of this fact, we propose that any scheme to produce plastics should not only reduce greenhouse gas emissions but should also go a step beyond that, to reverse the flux of carbon into the atmosphere. To accomplish this goal will require finding ways to produce nondegradable plastic from resources that absorb

carbon dioxide from the atmosphere, such as plants. The plastic could then be buried after use, which would sequester the carbon in the ground instead of returning it to the atmosphere. Some biodegradable plastics may also end up sequestering carbon, because landfills, where many plastic products end up, typically do not have the proper conditions to initiate rapid degradation.

In the end, reducing atmospheric levels of carbon dioxide may be too much to ask of the plastics industry. But any manufacturing process, not just those for plastics, would benefit from the use of renewable raw materials and renewable energy. The significant changes that would be required of the world's electrical power infrastructure to make this shift might well be worth the effort. After all, renewable energy is the essential ingredient in any comprehensive scheme for building a sustainable economy, and as such, it remains the primary barrier to producing truly "green" plastics.⁷

Scientific American gave Patrick Gruber an opportunity to address the issues raised by Gerngross and Slater in an interview printed with article. Here we hear Gruber, working for Dow, touching on Billy Hale's vision and also on Carver's ideal of "zero waste": "Not only are we developing production methods that require less energy, we are also investigating more efficient ways to generate energy, including co-generation and use of renewable fuels such as plant material, or biomass. We are also pursuing alternative raw materials for PLA. Using fermentable sugars from corn stover⁸ would allow a second crop to be harvested from the same land used to grow corn grain. PLA can also be derived from wheat, beets, and other crops best suited to particular climates."

Chemurgic products from soy in use today include soy ink and crayons, both made from soybean oil. Soy ink is used in over 90 percent of daily newspapers in the U.S. because it prints more paper per pound and offers better color reproduction. Soybean crayon production avoids the use of petroleum-based paraffin wax, and provides a much brighter and smoother color that doesn't flake in comparison to regular crayons. A building

⁷ See note 3 above.

⁸ The corn stover is the stalks, leaves and cobs –that is, the whole corn plant excepting the grain.

material similar to wood, harder than oak yet lighter than granite, is made by combining soy flour and recycled paper.⁹

Soy plastics, which came to the public's attention early due to Henry Ford's efforts, have a small market in our time. Iowa State Professor Jay-lin Jane has done pioneering research on them. The process is similar to making pasta: a protein powder from soybeans is mixed with water and other food-grade materials, making the end products, such as picnic ware, suitable for use with food. This mixture is put through a machine that makes it into strands resembling spaghetti. Then the strands can be made into the plastic product on site or cut into smaller pellets for shipping or storage.¹⁰

Roy Taylor, president and CEO of Soy Works Corporation, based in Illinois, with patents on the process of making soy plastics, said in 2004 that his company has prototypes for edible chew treats for dogs, table top dishes and cutlery, and fast food containers. He explained that the market has been insisting on "things that will last for years until you are ready to dispose of them." Soy plastics not being as durable as petroleum products, he said, "We cannot really expect our items to last for decades," but he pointed out the good side of this perceived shortcoming: these single or limited-use items "are among the biggest culprits filling up our landfills." The fact that many soy-based plastics are impermanent and easily biodegrade could help avoid crowding our future world with undecomposed plastic waste.¹¹

It is possible to produce plant-based plastics with a soy component, like the one like Henry Ford developed for car bodies, that are hard and durable like their petroleum-based counterparts. A 20 percent soy-based plastic truck liner named Bio Tuffö, as of 2004, had been tested by the American Society for Testing and Materials. A United Soybean Board press release said that they found that Bio Tuffö performed just as well as its petroleum

⁹ Tennessee Farm Bureau Federation, "First Grade Master—Technology," www.tnfb.com/specialprograms/pages/1stgrade:technology.pdf

¹⁰ Adrian Larose, "Making Plastics from Soybeans," *Peace and Environmental News*, November-December 2004, Peace and Environment Rescue Center, Ottawa, <http://perc.ca/PEN/2004-11-12/s-larose.html>. Accessed April 2005.

¹¹ See note 10 above.

counterparts in hardness and tensile strength, and actually beat its competitors in elongation stress tests.¹²

Ford's chemurgic pioneering and research into soybean plastics was cut off by the cessation of auto production when the U.S. entered World War II. His chemurgic ideas lay mostly unused until our time, more than six decades later. David Morris, co-founder and vice president of the Institute for Local Self-Reliance in Minneapolis, Minnesota, and a proponent of a "carbohydrate economy," wrote in 1988 that "The dreams of Henry Ford and the rest of the chemurgy movement were postponed, but they seem to be resurfacing." Morris cites the work of Russell Buchanan, a scientist in Maryland, who he says "envisions the rise of botanic-chemical complexes, as he calls them, rather than petrochemical complexes, as we learn to extract from cellulose the same things that we can extract from petrochemicals." Morris explains: "One is a hydrocarbon; the other is a carbohydrate. Compare these words and they're basically the same. One of the differences, however, between a botano-chemical complex and a petrochemical complex is that it's easy to transport oil over long distances, whereas it's not easy to transport plant matter over long distances. So botano-chemical complexes will tend to be locally based and rurally based near their sources of raw materials and supplies."¹³ This bears on Carver's vision of local economies, and also takes us back to Patrick Gruber's rhetorical question of whether you'd like to buy a product made from Midwestern corn or Middle Eastern oil.

On a closing note, the present president of Ford Motor Company, Henry Ford's great-grandson Bill Ford, appears to have inherited the best side of his family's patriarch. He said in 2000:

We need a second revolution. Our industry has brought tremendous benefits—the freedom to live and work and vacation where you choose—but they've come at a cost. And that cost is primarily to the environment... Our goal has to be nothing less than an emission-free vehicle that is built in clean plants, which actively

¹² See note 10 above.

¹³ Morris, David, "The Green City As a Thriving City: Implications for Local Economic Development," *Raise the Stakes*, Winter 1988.

contribute to the environment. And it can happen within my lifetime—hopefully within my working lifetime... One of the interesting little secrets of being green is that it saves you money... My sister told me the other day that I'm sounding more and more like a '60s idealist. But there's one big difference. In the '60s we could see a lot of environmental problems emerging, but we didn't have the solutions. Now the technologies are coming onstream so fast that the solutions really are in our grasp. I have not been half as outspoken in the past as I intend to be in the future."¹⁴

¹⁴ Martin Wright, "Bill Ford Has a Better Idea." *Green Futures*. Cambridge, U.K. reprinted in *U2*, March-April 2001.

Conclusion

In Chapter One, we pointed out that any discussion of Carver's motivation begins very quickly to sound theological. His complete lack of a line drawn between spirit and matter—or, as he phrased it, between science and religion—made “temporal” and “spiritual” matters, for him, the same. In J. H. Hunter's 1939 pamphlet on him, titled *Saint, Seer and Scientist*, he quotes the scientist speaking as a seer:

The world ha[s] departed far from the truth, but... the pendulum [is] swinging back again. I believe we are going to have a spiritual awakening. Young people are beginning to want the truth. The heart of mankind can never be satisfied with the husks of materialism, but the pathetic thing about the times is that men and women will not come to Him Who is the Source of all truth. They went out after that which profiteth not...

This ha[s] been the history of mankind down through the ages. Men would not be honest with God. They sought their own way and would not have His. They were just like Naaman in the Old Testament... who was told to go and bathe seven times in Jordan, and was offended because he thought he had as good a river, or better, in which to bathe. But when he went and obeyed the command of the Lord his flesh came again as the flesh of a little child.

We are in a pitiful condition today, when it would be so easy to make this a heaven on earth.¹

A person reading these words without knowing who said them, or knowing Carver only as “the peanut man,” might imagine the speaker to be a minister or other spiritual teacher. Readers of this study know that his way of seeing the “pitiful condition” of humanity

¹ Hunter, 29-30.

included, not just theological failings, but a deep acquaintance with the state of the soil and the crops grown on it, food processing methods, dietary habits, industrial processes, and medical practice. They know that his lament that men and women “went out after that which profiteth not” encompasses humanity’s taking the wrong direction, not just in from a religious angle, but in all these fields of endeavor.

In the Biblical story of Naaman² which he cites, Carver is in the position of the prophet Elijah when he told Naaman, a Syrian military captain, that he could cure his leprosy by washing seven times in the Jordan River. Naaman, expecting a prescription requiring some grand and dramatic gesture on his part, protested gruffly that rivers back in Syria were far superior to the puny Jordan. When his advisers reasoned with him that he had nothing to lose by trying, he was restored to health at no expense and no need to leave where he was.

Humanity, like Naaman, has undervalued the immense importance of simple suggestions like Carver’s because they seem too simple and undramatic to be efficacious. His counsels on soil renewal, herbalism, diet and a farm-to-factory industrial system, to us of a later generation who spend much time interfacing with technological gadgets like televisions, computers, and cell phones, may seem too quaintly countrified to be up to date. But our needs to eat, take medicine of one kind or another from time to time, and use at least some products from factories are not likely to go out of date any time soon.

Carver’s statement that “the heart of mankind can never be satisfied with the husks of materialism” finds easy application to the lifestyles of those who buy into technology’s vaunted indispensability by surrounding ourselves with high-tech tools. His way of following his own advice to “talk to nature and let nature talk to you”³—the source of his seamless blend of the spiritual and the earthly, and of his expertise and wisdom in all the fields covered in this study—seem, again, just too simple. If we think that time studying a plant out our back door seems too easy and obvious a way to help humanity reach a heaven on earth, we may, like Naaman, find that we’ve been missing healing much more

² II Kings, Chapter five.

³ Lillian G. Brown, “Activities Centered at Hungerford School During History Week,” 11 February 1938, Hungerford, AWC papers, miscellanea concerning GWC.

readily available than we thought it was. Those who do turn their attention to nature, and thus learn to place the highest value on our with living things, will not be surprised at studies showing a correlation between a lot of internet use and depression.⁴ Martin Luther King showed himself in full agreement with Carver when he said: "We as a nation... must rapidly begin the shift from a thing-oriented society to a person-oriented society. When machines and computers, profit motives and property rights are considered more important than people, the giant triplets of racism, materialism, and militarism are incapable of being conquered."⁵

Carver's conclusion that mankind has, by and large, put itself in a "pitiful condition" by making Naaman's mistake of discounting simple but good advice, is the conclusion of this study. We have pointed out that—with happy exceptions—humanity has squandered our topsoil, weakening its structure and thus allowing it to wash away. We have let compostable organic matter—kitchen scraps and manure—go to waste without setting up systems by which they can go to restoring soil. We have permitted the domination of a monocropping farming system where corporate farming displaces the more productive and ecologically friendly small farms. We have allowed petroleum to dominate markets for fuel, fertilizer, medicines and industrial feedstocks, when Carver and others in his time were pointing out ways around this which could have saved us no end of trouble and disease. We have allowed human manipulation of genetic material as a way of trying to improve farming yields and curing disease while largely ignoring the simple steps Carver clearly laid out—in effect jumping ahead to steps we might never need have taken had we put those primary ones into practice.

Let us bring forth several examples:

- 1) If the opinion of Dr. Charles Northern—whose work Carver cited⁶—that a humanity subsisting on food grown in soil boosted with artificial fertilizers will be sick due to deficiencies in immunity-boosting minerals, then a humanity living on mineral-rich soil would have had much less need for research into highly technical

⁴ The highest profile study on this was done in 1998 by Psychologist Robert Kraut. See <http://www.apa.org/monitor/sep98/isolat.html> Accessed 27 August, 2005.

⁵ Martin Luther King, "The Inner Truth," Riverside Church, New York City, 4 April 1967.

approaches to curing disease, such as genetic modification. In the same vein, if we had kept our soil rich in mycorrhiza—the result of following Carver’s prescriptions—we would need very little fertilizer, and would thus have reduced the sort of over-fertilization that leads to runoff and contamination of ground water.⁷

- 2) If America had adopted ethyl alcohol fuel in favor of ethyl leaded gasoline—the former being as good a product in producing anti-knock results and easily available—the world would have been spared sixty years of filling fuel tanks and the atmosphere with carcinogenic tetraethyl lead. William Kovarik, an associate professor at Virginia’s Radford University, addressing the Automotive History Conference in Dearborn in 1996, said, “Even though experts like Alice Hamilton of Harvard University insisted that alternatives to gasoline were available, the Public Health Service, in 1926, allowed leaded gasoline to remain on the market. Leaded gasoline was not banned until 1986, when it was discontinued due to the same public health concerns that had been expressed sixty years earlier.”⁸ Again, we would have been spared looking so hard for a cancer cure if we had not filled the world with carcinogens.

- 3) We can only attempt to imagine how much of the need for military and foreign intelligence technology could have been circumvented had the world been able to hear Francis Garvan’s comment at the Second Dearborn Conference, a year prior to the one Carver attended: “They say we have foreign oil. Well, how are we going to get it in case of war? It is in Venezuela, it is out in the east in Persia, and it is in Russia. Do you think that is much defense for your children?”⁹

⁷ See Chapter 7, page 135, and Chapter 9, footnote 78.

⁸ <http://www.bunchgrapes.com/index.html>. Accessed 12 September, 2005.

⁹ Bill Kovarik, “Henry Ford, Charles F. Kettering and the Fuel of the Future,” *Automotive History Review*, Spring 1978, No. 32, 7-27. Reproduced on the Web at <http://www.radford.edu/~wkovarik/papers/fuel.html>. Originally from a paper of the same name at the Proceedings of the 1996 Automotive History Conference, Henry Ford Museum, Dearborn, Mich., Sept. 1996.

¹⁰ Francis P. Garvan, “Scientific Method of Thought in Our National Problems,” Proceedings of the Second Dearborn Conference on Agricultural, Industry and Science (New York: The Chemical Foundation, 1936), 86, quoted by Kovarik.

- 4) If hemp had not been outlawed, it could have supplied enough of humanity's need for paper to make unnecessary the cutting of vast tracts of forest. Thus there would be no need for work on genetically modifying trees for specific purposes. Hemp used to make fabric could also have decreased our need for cotton, a crop which has required intensive use of huge quantities of poisonous pesticides to grow (and hence, again, created medical crises which could have been circumvented), and decreased our need for petroleum-derived fabrics like polyester.

On the hopeful side, a growing number of people, alarmed by the disaster that awaits any group who ignores the soil and nature, have been finding the ways Carver tried to point out, in the forms of organic farming, natural diet and healing, and looking beyond the petroleum economy. These people, while being well enough educated to know of Carver, rarely have any idea of how progressive he was in their fields. It is hoped that this study will increase the number of people who appreciate him, and, more important, who draw inspiration and knowledge from his prescriptions for humanity and act on them. His dear friend Bess B. Walcott wrote of him, in his paraphrase, that "it might be a curious fact that the person who was once a slave might be the means of freeing the entire South."¹⁰ Perhaps Carver, from now on, can play a much larger role in freeing, not only the South, but his real home, the world at large.

¹⁰ GWC to Mrs. Walcott, 11 February 1942, T1A, 40, 163.

Appendix A

An Attempt to Measure Carver's Effect on Local Agriculture

In an attempt to determine any measurable effect of Carver's work in Macon County, Alabama between 1897 and 1915 (around which time he began to travel in a much larger sphere due to his rising fame), we have compiled a table comparing Macon County's agricultural production during these years to the state as a whole.¹

The 1890 agricultural census states that Alabama was "one of three states, every county of which produced cotton." It was "exceeded only by Mississippi in ratio of acreage to population." It may be of interest at the outset to look at the pattern of cotton production from 1821 to the 1890 census. (Note the effects of the Civil War.)

Alabama Cotton Production (in pounds)

1821	20,000,000 pounds	
1833	65,000,000	+325%
1839	117,138,823	+180%
1849	225,771,600 (1 st in nation)	+193%
1859	440,529,975 (2 nd)	+195%
1869	186,395,188 (3 rd)	-58%
1879	316,943,262 (4 th after Mississippi, Texas and Georgia)	+70%
1889	436,555,170 (avg. 0.331 bale [158.11 pounds] per acre)	+38%

The chart below pairs Macon County agricultural production statistics, selected for their relevance to Carver's work, with Alabama ones, to make comparison easy. It also includes percentage gains and losses, to make less necessary the interpretations of the numbers, which refer variously to acreage, bushels of a crop produced, or bales of cotton produced. The interpretation follows the chart.

¹ Our source is the Agricultural Censuses for 1890, 1900, 1910 and 1920, as follows: U.S. Census 1890, Department of the Interior, *Report on the Statistics of Agriculture in the United States at the Eleventh Census: 1890* (Washington: Government Printing Office, 1895); *Twelfth Census of the United States, Taken in the Year 1900, Volume V, Agriculture*, (Washington: United States Census Office, 1902); *Thirteenth Census of the United States, Taken in the Year 1910, Volume VI, Agriculture*, (Washington: Government Printing Office, 1913); and *Fourteenth Census of the United States, 1920, Agriculture, Vol. VI*, (Washington: Government Printing Office, 1922).

Macon County Agricultural Statistics Compared with Statewide Figures

	1890	1900	1910	1920
MC population	18,439 ²	31,826 +72.6%	32,867 +3.3%	Not avail.
AL population	1,513,017	1,828,697 +20.9%	2,138,093 +16.9%	2,348,000 +9.8%
MC farms, total	2766	3824 +38.2%	4475 +17.0%	3966 -11.4%
AL farms, total	157,772	223,220 +41.4%	262,901 +17.7%	256,099 -2.6%
MC farms, white	Not avail.	749 (44% tenant)	632 -15.6%	606 -4.1%
AL farms, white	Not avail.	129,137	152,458 +18.0%	160,896 +5.5%
MC farms, colored	Not avail.	3075 (93% tenant)	3842 +24.9%	3349 -12.8%
AL farms, colored	Not avail.	94,083	110,443 +17.3%	95,203 -13.8%
MC avg. farm size	79	66.8 -15.4%	56.1 -16.0%	55.3 -1.4%
AL avg. farm size	126	92.7 -26.4%	78.9 -14.9%	76.4 -3.2%
MC acres in farms	218,650	255,443 +16.8%	251,265 -<0.1%	218,836 -12.9%
AL acres in farms	19,853,000	20,692,494 +4.2%	20,732,312 +<0.1%	19,576,856 -5.6%
MC acres improved	116,479	142,568 +22.4%	171,118 +20.0%	145,692 -14.9%
AL acres improved	7,698,343	8,654,911 +12.4%	9,693,581 +12.0%	9,893,407 +2.1%

² This figure, from the general Census of 1890 rather than from the Agriculture Census, seems not to fit with what follows, indicating a near-doubling of the population of the county in ten years.

	1890	1900	1910	1920
MC acres unimpr. ³	102,171	Not avail.	80,038	73,135 -8.6%
AL acres unimpr.	12,154,657	Not avail.	11,038,731	9,683,449 -12.3%
MC cotton, acres ⁴	56,134	69,441 +23.7%	89,796 +29.3%	58,123 -35.3%
AL cotton, acres	2,761,165	3,202,135 +16.0%	3,730,482 +16.5%	2,628,154 -29.5%
MC cotton, bales (.34 per acre) ⁵	19,099	20,661 (.297 p. a.) +8.1%	21,168 (.236 p.a.) +2.5%	12,233 (.210 p.a.) -42.2%
AL cotton, bales	915,210	1,078,519 (.337 p.a.) +17.8%	1,129,527 (.303 p. a.) +4.7%	718,163 (.272 p.a.) -36.4%
MC sugar cane, acres	586	1047 +78.6%	490 -53.2%	271 -44.7%
AL s. cane, acres	19,415	32,871 +69.3%	27,211 -17.2%	25,302 -7.0%
MC sorghum, acres	474	70 -85.2%	61 -15.7%	500 +819.7%
AL sorghum, acres	21,189	14,831 -30.0%	17,819 +20.1%	52,406 +294.1%
MC peanuts, bushels	5170	5000 -3.3%	6558 +31.2%	8256 +25.9%
AL peanuts, bu.	278,359	1,021,708 +367.0%	1,573,796 +54.0%	6,288,594 +399.67%
MC sweet pots, bu.	77,177	58,450 -24.3%	76,596 +31.0%	92,038 +20.2%
AL sw. pots., bu.	4,339,170	3,457,386 -20.3%	5,314,857 +53.7%	8,095,405 +52.3%

³ The drop in these figures represents, in the main, a trend Carver lamented, the cutting down of woodlands. Unimproved" land was about 90% woodlands, which Carver did not regard as "improved" when cut and farmed.

⁴ In 1889, out of Alabama's 66 counties, Macon was one of 19 with over 25,000 acres in cotton production.

⁵ This statistic is included in light of Carver's saying on page 41 of this study that if a farmer was not getting a bale of cotton per acre, he was doing very poor farming. These statistics make it easy to see why he had to emphasize, "I am saying what I know personally to be true from what I have done myself."

	1890	1900	1910	1920
MC peas, bushels ⁶	11,825	16,297 +37.8%	14,709 -9.7%	14,626 -0.1%
AL peas, bushels	326,413	665,388 +203.8%	418,007 -37.2%	486,126 +16.3%
MC corn, bushels	316,365	457,423 +44.6%	345,525 -24.5%	429,180 +24.2%
AL corn, bushels	30,072,161	35,053,047 +16.6%	30,695,737 -12.4%	43,699,100 +42.4%
MC oats, bushels	46,709	24,540 -47.5%	68,834 +280.5%	13,584 -80.3%
AL oats, bushels	3,230,455	1,822,060 -43.6%	3,251,146 +78.4%	1,120,384 -65.5%
MC wheat, bu.	455	1810 +397.8%	83 -95.4%	1529 +1842.2%
AL wheat, bu.	208,591	628,775 +301.4%	3,251,146 -571.1%	3,222,838 -0.9%
MC grasses, acres ⁷	198	223 +12.6%	1481 +664.1%	944 -36.3%
AL grasses, acres	39,993	75,125 +187.8%	238,656 +317.7%	318,791 +133.6%

⁶ This statistic is included in an attempt to measure changes in production of cowpeas, they being one of the crops Carver most encouraged farmers to grow. The measurement is not thoroughly reliable, however, due to changes in what was being measured. In 1890, cowpeas were listed separately; in 1900 they were under "Pease"; in 1910 and 1920 they were under "Dry peas." For the 1890 number, we have added in the much smaller number (MC, <.1% and AL, 1.6%) of "Canada pease."

⁷ We include this because Carver encouraged the growing of hay for forage, and generally of acquiring stock. In 1890 it is listed simply as "Hay (All kinds)." In 1900 it is divided into 1) Wild, salt and prairie grasses, 2) Millet and Hungarian grasses, 3) Alfalfa or Lucern, 4) Clover, 5) Other tame and cultivated grasses, 6) Grains cut green for hay, and 7) Forage crops. Under the latter, "Corn Stalks" are listed only in tons, so we have not included them. In 1910, "All hay and forage" includes all the above listings (with "Forage Crops" replaced by "Coarse Fodder") except nos. 2-4. We have totaled the categories in common for a listing with some consistency. In 1919, the first three listings are similar, with slight changes in language, in this order: Nos. 5, 1, and 6. Then come Annual legumes cut for hay; Silage crops; Kaffir, Sorghum, etc., for forage; and Root crops for forage. We have included the first three along with the latter two to replace #7, eliminating corn for forage because it would throw off any hoped-for consistency in the numbers.

	1890	1900	1910	1920
MC apples, bushels	2336	2004	1259	952
		-14.2%	-37.2%	-24.4%
AL apples, bu.	1,238,734	719,175	888,386	577,356
		-41.9%	+23.5%	-35.0%
MC peaches, bu.	14,080	637	5168	4381
		-95.5%	+811.3%	-15.2%
AL peaches, bu.	2,431,203	184,543	1,416,584	1,083,142
		-92.4%	+767.6%	-23.5%
MC pecans, lbs.	Not avail.	860	575	5420
			-33.1%	+942.6%
AL pecans, lbs.	Not avail.	60,670	228,341	1,179,735
			+376.4%	+516.7%
MC misc. vogs., acres ⁸ (except 1890)	\$46	873	1148	15
			+31.5%	-98.7%
AL misc. vogs. (except 1890)	\$431,828	55,563	69,468	12,750
			+25.0%	-81.6%
MC sheep	347	160	119	42
		-53.9%	-25.6%	-64.7%
AL sheep	386,380	317,054	142,930	81,868
		-17.9%	-54.9%	-42.7%
MC cattle	9,958	9312	11,375	14,801
		-6.5%	+22.2%	+30.1%
AL cattle	875,976	586,337	932,428	1,044,008
		-33.1%	+59.0%	+12.0%
MC horses	1292	2778	1912	1591
		+215.0%	-31.2%	-16.8%
AL horses	121,207	152,643	135,636	130,462
		+43.5%	-11.1%	-3.8%
MC mules	1725	2701	3244	3642
		+56.6%	+20.1%	+12.3%
AL mules	133,892	192,070	247,146	296,138
		+43.5%	+28.7%	+19.8%

⁸ This is another combination of different listings for different decades. In 1890 there is a listing for "Market garden products, value." In subsequent decades, it changes to "Miscellaneous vegetables," and is measured in acres. It is worth including because this group, though its numbers are very low, is one Carver fervently encouraged farmers to grow—vegetables for small-scale subsistence sales.

MC swine	15,488	16,964 +9.5%	14,531 -14.3%	16,133 +11.0%
AL swine	1,421,884	1,423,329 +0.1%	1,266,733 -11.0%	1,496,893 +18.2%
MC domestic fowl	79,235	76,862 -3.0%	63,012 -18.0%	72,246 +14.7%
AL domestic fowl	6,252,044	5,186,536 -17.0%	5,028,104 -3.1%	6,266,756 +23.8%

Interpretation

Many of the figures in the chart, though compiled by the most reliable gatherer of information at the time, the Federal Government, fluctuate so wildly that they seem either to beg the question of how possible it is that they are correct, or to point to an agricultural economy that was terribly unstable. For two glaring examples, check the production of peaches and wheat, both county- and statewide.

The figures for peanuts are especially interesting for Carver students. Macon County shows a satisfying rise in production during the years one would expect Carver's message to be getting through, 1910 and 1920. But the gain from 1890 to 1920, 59.7%, is very tame compared to those for other crops; and the gains in peanut production statewide during the same period—of 2,259.2%—is so phenomenally greater, that Carver's influence on Macon County in particular seems very small. These figures seem to support Linda McMurry's belief that the rise in peanut production generally would have occurred without Carver.⁹

The numbers for pecans could show Carver's influence. He was a proponent of growing them, and their numbers shot up over the period covered. It is unlikely, however, because Carver's work with them seems to have been mostly done in the 1920s.¹⁰

The author's prediction for these figures was that they would not show anything conclusive about Carver's influence. Our interpretation of the figures supports this.

⁹ McMurry, 171.

¹⁰ The earliest reference the author has to Carver's work with pecans is in GWC to R. R. Moton, 30 September 1927, TIA, 10, 794-95.

Appendix B

Tuskegee's Work With Sweet Potatoes for NASA

We include this section in this study because the work with sweet potatoes done at Tuskegee for NASA space program was part of the legacy of the Carver Foundation, as mentioned in the last chapter. On July 23-27, 1999, NASA sent the space shuttle Columbia up carrying the the Chandra Xray Observatory. On board was a Tuskegee University experiment testing sweet potato plant response to microgravity. The mission was in danger due to a worn wire causing a power fluctuation that led two engine controllers to shut down five seconds after launch, but backup controllers took over automatically and the flight was not affected.¹

The intent of the inclusion of the experiment aboard the shuttle was explained by Desmond Mortley, Project Coordinator for Tuskegee's Center for Food and Environmental Systems for Human Exploration of Space: "If exposure to microgravity alters the way starch granules are distributed within the stems, it could limit the availability of the carbohydrates needed to support root growth. Starch is the main storage component of sweet potato and will also be a major source of energy for future space workers assigned to outposts on the moon or Mars. We need to know about possible negative influences from microgravity." As for the result of the experiment, Mortley told the author of this Study:

What we were interested in was to see the impact of microgravity on some of those cells within the root. The cells are called amyloplasts. Within those cells, starch grains are stored. We wanted to see if microgravity altered the number of amyloplasts, or even the number of starch grains. It was a short flight, a wee bit under five days. The roots were disoriented as usual on space flights, growing every which way. We did get the plants to put out new shoots. Our conclusion was that we didn't see much if any difference apart

¹ Matthew Fordahl, "Space Shuttle's Overhaul Raises Concerns," AP, posted 17 February 2003,

from the fact that the amyloplasts were segregated in the space grown plants, which was expected. The control plants, normal sweet potatoes, had the amyloplasts sedimented at the tips of the roots. As for the number of amyloplasts and starch grains, we looked closely but didn't see any differences. We concluded that the short flight did not adversely affect them.²

http://www.space.com/missionlaunches/sts107_overhaul_030217.html

² Desmond Mortley, interview with the author, 10 May 2005.

Appendix C

How Nature Works on a Farm With Cover Crops and Humus

In Chapter 2, we quoted Carver saying in 1910 that “the stimulus in the way of commercial fertilizers in the soil is not enough for the trees; they are starving for a better physical condition of the soil. Green crops turned under repeatedly will do it.”¹ In 1989, California almond grower Glenn Anderson spoke of how growing legumes on his orchard floor started chains of natural events that put all of nature to work with and for him. He said:

My blossom begins later than the neighboring orchards, and seems to last longer. We think that’s due to the cover crop. The delay gives me an advantage over bad weather, and it gives my bees more chance to pollinate the blossoms. (Fig. A-1)

All the experts said, “You can’t have a cover crop because it lowers the air temperature and your bloom will get frosted.” So the understory of all the almond orchards is usually as bare as a desert... We discovered that just the opposite was true. The cover crop seems to be the reason my trees bloom later, which gets me further out of bad weather with less frost damage. It seems to be a higher soil temperature...

I rely on my green manure cover crop to supply all the nitrogen my trees need. The cover crop also provides habitat for the predatory insects that keep harmful bugs in check. This year’s University study showed that I had less insect damage to my crop than farmers who used pesticides. It’s all because I have so many wasps and spiders out here doing the work for me. It’s important to stop using pesticides; our well water is so polluted here we have to drink bottled water. (Fig. A-2)

¹ GWC to BTW, 31 March 1910, TIA, 4, 426.

By mid-May... my predatory insects, particularly the microscopic wasps, are starting to overtake the problem insects like the peach twig borer. The cycle works so well it's even turned that borer into an ally. There is such a large and complex population of insects here that an entomologist from U. C. Berkeley has just started to identify what's going on here. (Fig. A-3)

The early season borers really like the tender shoots at the top of the tree. These shoots can get real elongated and spindly unless it gets "stung" by the peach twig borer. After the "sting," the shoot stops rampant vertical growth, and develops lateral branches instead... So I actually believe that the level of peach twig borer infestation I have is reducing my pruning work load and increasing my production...

In June and July, I use a flail mower to knock the cover crop down. It works like a mulch now. We find it still provides the predatory insect habitat. There's a growth of fungus under that mulch that's fantastic... There's a whole layer of lush decomposition and a lot of earth worms. The mulch layer almost completely suppresses the weed growth. The mulch also seems to lower the soil temperature during the hottest part of the summer, which might be reducing stress on my trees, and it stretches my irrigation water... (Fig. A-4)

Every year the humus level in my soil is better. The texture of the soil is soft, not at all like the sandy soil I started out with. And every year the organic matter breaks down faster; the microbial life in the soil is really active all the time now. When the cover crop is fully integrated into the soil, the orchard floor is floated, giving it a clean surface for harvesting nuts... (Fig. A-5)

We shake the nuts out of the trees by hand. We then sweep the nuts into windrows, mechanically collect them, and ship the nuts to the huller. By that time, the cover crop of vetch and brome re-seeds itself, and starts to sprout. The whole cycle begins over by itself. I'm just really pleased to be growing almonds with

these methods. It's made my farm a really pleasant and poison-free place to raise my children and work with my family.² (Fig. A-6)

The peach twig borers Anderson speaks of would undoubtedly be one of those insects Carver spoke of as “enemies”³; but its transformation into an ally in Anderson’s orchard only underscores the wisdom of Carver’s approach to farming in tune with nature’s ways.

² Otis Wollan, “Glenn’s Organic Almonds: Nuts to the Experts,” *Organic Food Matters*, Fall/Winter 1989.

³ Carver’s student Anita Stigger, recalled her time in his class in 1904, “I always think of you as a great teacher for you used to take our class for walks and show us about the black eyed pea vines, the sweet potatoes, the peach borers.” Anita Stigger Hooker, Columbus, OH, to GWC, 5 September 1939, TIA, 30, 1162.

Glenn Anderson's Organic Almond Orchard



A-1. February-March,
spring bloom



A-2. Late March, end of bloom
(cover crops)



A-3. Mid-May (cover crops
four feet high, predatory insects
overtake problem insects)



A-4. June-July (mowed cover crop is
mulch with fungi, predatory insects)



A-5. July: cover crop turned under
for humus



A-6. Harvest time: cover crop
re-seeding itself

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