

THE SCIENTIFIC CONTRIBUTIONS

of

GEORGE WASHINGTON CARVER

by

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PREFACE



Early in 1961 Mr. Merrill J. Mattes, Regional Historian of the United States Department of Interior, National Park Service, consulted President Elmer Ellis of the University of Missouri concerning a study of the Scientific Achievements of George Washington Carver. President Ellis discussed the proposed project with Dean Elmer Kiehl and members of the Department of Agricultural Chemistry. There was general agreement concerning the desirability of and the need for such a study.

A study plan was prepared by the Department of Agricultural Chemistry following recommendations from Mr. Mattes. The study plan was approved by University of Missouri and Department of Interior authorities. The project was given financial support by the Department of Interior and the University of Missouri provided the personnel and facilities for the study.

The objectives of the study were to:

1. Review the literature found in the University of Missouri library and other libraries to find what is known about George Washington Carver's scientific achievements.
2. Bring together the complete list of Carver contributions.
3. Document and evaluate the contributions.
4. Establish the rightful place of the Carver contributions in the evolution of present day achievement in the field of utilization of agricultural products.

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5. Solicite the opinion of present day workers in Carver's field of specialization to either confirm or contradict our conclusions.

The investigators should visit the Iowa State College Department where Dr. Carver did his first research. While there the investigator should look for original reprints of published material as well as unpublished notes and data.

The investigator should also visit the Tuskegee Institute where Dr. Carver did most of his research work and determine what records are there.

The researcher from Missouri should bring back to the Missouri University Campus information found at the institutions where Dr. Carver did his research.

The information should be summarized and evaluated in light of the impact on today's research as well as the effects upon standards of living in Dr. Carver's time and the present.

A manuscript should be prepared for publication.

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GEORGE WASHINGTON CARVER

INTRODUCTION

During the twenty-two years from 1921 to January 5, 1943, George Washington Carver achieved both national and international fame. Prominent among the words often used to describe him is the expression "great scientist". Biographers and reporters active in this two-decade period compiled long lists of Carver's scientific contributions. The purpose of this report is to evaluate these scientific contributions.

For this report Dr. Carver's career is divided into two parts; the first started in 1895, when he went to Tuskegee Institute at the request of Booker T. Washington, and lasted until the death of Booker T. Washington late in 1915. The second division of Carver's career can itself be considered in two phases: the shorter somewhat obscure part dating from 1916 to about 1921, and the longer portion from 1921 until his death on January 5, 1943. It was during this last portion of his life after he was already at least fifty-seven years of age that Dr. Carver became famous.

THE BOOKER T. WASHINGTON ERA

Carver was appointed director of the newly formed Agricultural Department of Tuskegee Institute in 1896.¹ From this time until 1916 he published thirty bulletins and two circulars (inclosure 1). These bulletins were patterned after the Farmers' Bulletin and similar publications of the United States Department of Agriculture. In addition, Bulletin 31, published in 1916, was written in 1915.²

The Tuskegee Bulletins were prepared primarily as information and direction for the poorer farmers of Alabama, especially of Macon county. The exception to this fact was Bulletin 4 entitled Some Cercospora of Macon County, Alabama. Carver hoped to have this one published in scientific journals and the bulletin was written in language appropriate for such publication.³ The information in the bulletins can scarcely be said to be of great scientific importance even though it was both important and new for the farmers for whom it was intended.

Bulletins 1, 5, 9, 10, 11, 12, 13, 14, 16, 17, 18, 19, 20, 22, 23, 24, 27, 30, and 31 contained information which was generally available but without these publications the Negro farmer of Alabama in the early part of the century might not have been aware of this information. Bulletins 2, 3, 6, 7, 8, 15, 21, 25, 26, 28, and 29 are descriptions of work at the experimental station and directions for the utilization of the results of the experiments by the farmers. These experiments were of importance to

the rural people of Macon county, but can not be considered more important than those being conducted at the neighboring Station at Auburn.

Very likely most of the Tuskegee Bulletins were the results of Carver's ideas but numbers 10, 12, 16, 25, and 29 were suggested, in fact ordered, by Booker T. Washington.⁴

During these twenty years Carver practiced and preached soil building, crop rotation, property improvement, use of natural fertilizers, and other sound agricultural practices which could justly be expected from a man in his position at the school. He also conducted experiments in a scientific manner to determine the best crops and the best species for the conditions of Macon county. At the same time he developed a new variety of cotton by crossing Sea Island and Russell Big Boll species. In 1910 Carver announced to Washington that he was ready to provide the local farmers with "Carver's Hybrid" cotton seed and with instructions for planting and cultivating it.⁵ This new cotton was claimed to be better adapted to conditions in central Alabama than other species.

In 1912 Carver announced his "Carver's Improved Hybrid", the result of crossing his original hybrid with Simpson's Prolific. Harry Simms, United States Demonstration Agent for Wilcox county, Alabama, visited Tuskegee Experiment Station in September 1912. He praised Carver's new cotton, describing large bolls and the position of the bolls on the ten inch branches which contained 8 to 12 bolls each. He also expressed

appreciation for Carver's use of natural fertilizers.⁶

Tuskegee Bulletin 26, 1915, describes the Carver improved cotton. Cotton buyers Laslie and Preer of Tuskegee, Alabama wrote as follows to Carver on March 22, 1915, concerning a bale of cotton purchased from the Experiment Station: "We wish to state that the bale of cotton is extra good staple, being 1 to 1 1/16 of an inch in length.... If all the cotton on this section was thus harvested and ginned, it would bring on an average of \$1.25 more per bale."⁷

However satisfactory Carver's hybrid cotton may have been in 1915, it is not considered an important species of cotton today. The Encyclopedia Americana gives the following information concerning cotton:

"By 1936 more than 1200 cotton varieties had been listed as grown in the United States....."

"In early 1930 a committee of plant breeders and agronomists of the Association of Agriculture Workers began the selection of certain typical varieties of the cotton belt for use as standards for future breeding. The committee chose 31 typical varieties many of which were represented by several strains. The list was published in the Journal of the American Society of Agronomy, January 1936."⁸

It should be noted that Carver's cotton was absent from this list. In an article on cotton breeding J. O. Ware gave a long list of cotton breeders in the United States who had developed noteworthy strains since the beginning of cotton

growing in this country. Carver's name is unlisted. According to Ware most of the varieties of cotton became unpopular for any of various reasons: some were sporadic bloomers over a number of years, some retained the weevil infested parts instead of dropping them, some matured late, thus becoming victims of the boll weevil.⁹ It is not easy to determine which of these reasons was responsible for Carver's cotton not catching on.

Prior to 1906 Carver experimented with small grains to determine whether such crops could be grown successfully in Macon County. In Tuskegee Bulletin 8 he reported that wheat, rye, oats, and barley could "be made a paying crop on Macon County soils." This report preceded by four years a statement by Professor Duggar of Auburn University that he "is certain that grain can be successfully grown in the northern part of the state after experiment."¹⁰

Probably as a result of his studies in art, Carver developed an interest in the local clays as a source of color, stains, and washes. His bulletin number 21, 1911, gives directions for the preparation of color washes to be used on farm buildings. It is written in simple direct language for the uneducated farmer. But as Dr. Mayberry pointed out to me, even these bulletins had to be read, explained, and demonstrated to the people it was supposed to help. Whether this type of paint is the same as the one Carver talks about in 1912 is doubtful. In letters to Booker T. Washington, he mentions the

use of a stain he had made for the Episcopal Church in Tuskegee. John H. Drakeford of the Bank of Tuskegee stated on March 25, 1912, "Everyone who sees this stain is impressed with its beauty and it is hard to make some believe that it is a home product."¹¹ On July 15, 1912, Carver announced to Washington the development of four shades of stains priced at "\$0.75 to \$1.20 per gallon without containers."¹² But nowhere did Carver record a procedure for making these stains. Despite claims made in later years of the development of a large number of paints, pigments, and dyes from clays, peanuts, sweet potatoes, and other organic materials, there are no records of any processes for these products, either, with the exception of two patents (enclosure 2). No use seems to have been made of either patent.

Of less interest but mentioned here to emphasize Carver's interest in things practical for the small farmer is a soldering fluid, the quality of which was described as excellent by the chief canner at the Institute canning factory, in 1912. That same year Carver developed from clay a powder for cleaning gold, silver, etc. This was used locally and seemed "Most satisfactory."¹³ No record has been found of the process for making either product.

In spite of Carver's diligence and interest in his work, some of the members of the Tuskegee Institute staff seriously doubted his ability. Much of this lack of respect may be attributed to jealousy on the part of the faculty, but

Washington himself criticized Carver at one time for letting fifty bushels of sweet potatoes rot after publishing a bulletin called Saving the Sweet Potato Crop. He also reproved him on many occasions for not making a success of the Institute poultry yard, especially since he had published a bulletin entitled Poultry Raising in Macon County.¹⁴

In letters to Washington in 1915, Carver first mentioned his awakening interest in peanuts and tells of a bulletin soon to be published (number 31 issued in 1916). This bulletin turned out to be a directive for planting, cultivating, harvesting, and cooking peanuts. The bulk of the publication consisted of 105 recipes which had been collected by Carver in his travels around the local countryside. Although the peanut was to be the source of his publicity within five years, there was no hint of anything unusual in this bulletin.

Throughout most of this period Carver corresponded frequently with Professor L. H. Pammell of Iowa State College.³ His letters reveal a continuing interest in mycology and describe various species that he collected during this period. He was unable to identify many of them and sent them to specialists who were able to help him. This particular practice was rather common at the time with collectors of fungi, as few had the equipment or experience necessary to identify unusual specimens.¹⁴

The letters to Pammell also contain descriptions of Carver's analyses of the water supply at Tuskegee for bacteria

and other organic contamination. These tests were made in connection with a typhoid outbreak at the school and the vicinity.

In a letter to Pammell dated April 18, 1902, Carver mentions his paints but the reference is vague. "I also thank you (Pammell) for your congratulations on the discovery of oxydic paints, etc. The gentlemen will be here in a few days I presume--according to promise--to look the matter over with a view to perfecting the organization for the manufacture of the material." It is difficult to determine what this "discovery" was as no experimental data are available. Rackham Holt implied that the technique was stolen by a paint company but this hypothesis is also unsupported.¹⁵

In summarizing Carver's scientific career during the Booker T. Washington era, it should be brought out that Washington respected Carver as a researcher although some of Carver's practices did not win Washington's overwhelming approval.¹⁶ Carver attempted to develop procedures to aid the impoverished farmers of that locality, but there is no reliable record of anything of great importance being discovered or invented by him. Many practices already tried and proved feasible in other areas were attempted at the Institute and the ones worthwhile for Macon County were passed on to the local farmers. Apparently Carver could recognize good ideas when he read or heard of them and he readily tested them at Tuskegee.

In Bulletin 7, 1905, on cotton growing Carver did not mention the boll weevil even though it was already rampant in Texas at the time. Later, in Bulletin 20, 1911, Carver cautioned against the coming of the boll weevil and advised how to control it. The methods were not claimed as his but as those of "the best authorities." It was claimed later that Carver was responsible for the replacement of cotton growing by peanut growing in much of the South (especially in Alabama), but there is no evidence available that such was the case. He advocated this practice, as did others in agriculture, but he was merely joining a trend. In 1911 W. R. Beattie made the statement, "The peanut is worthy of more general cultivation throughout the Southern States, especially in the boll weevil district where it will in many cases be found more profitable than cotton."¹⁷

Among Carver's various duties was the responsibility for the analysis of water, food, stock feed, soil, and products of the Tuskegee Institute. He even provided such services free for the surrounding community. He exhibited a general and sincere interest in scientific subjects and in accepted procedures and made serious efforts to apply them to local conditions.

THE ERA OF FAME

1916-1921. During the war Carver attempted to develop permanent dyes from vegetable matter. Holt credited him with 536 dyes from twenty-eight different plants.¹⁸ These dyes were reported to be fast in either washing or strong sunlight and satisfactory for leather, cotton, wool, silk, and linen. Supposedly one or more textile companies were interested, but apparently nothing came of Carver's dyes. Holt ascribed this circumstance to the ending of World War I and the subsequent acquisition by The United States of German dye patents. Apparently Carver's formulas and directions have disappeared so it is impossible to judge their value.

The food shortage of 1917-1918 caused Carver to encourage the consumption of wild vegetables (weeds) and to make the most of peanuts and sweet potatoes. He advocated the dehydration of food as a means of preservation (certainly nothing new) and developed a flour from sweet potatoes. This also was nothing new as W. R. Beattie mentions this possibility as well as the production of alcohol in 1908.¹⁹

During this five year period Carver "developed" many of the products he obtained from the peanut. Many of these were various ways to prepare peanuts for human consumption, some were uses of peanuts on the farm, some supposedly had industrial possibilities. Other than his recipes there is no available record of procedure or formulas. Many of the recipes were admittedly assembled from other sources and many of the

non-edible uses were definitely not new.²⁰ The following lines from the Farmers' Bulletin mentions some of these peanut products as early as 1885.

"Peanut oil is used for lubricating and for soap making and is a good substitute for olive oil for salads and the other culinary purposes, and is a substitute for lard and butter in cooking. The residue from oil making known as "peanut cake" is a highly valued cattle food in the countries of Europe and is also ground into fine flour and used as human food. It makes good soup, griddle cakes, muffins, etc., and is one of the most nutritive of foods. . . . "The vines when dried become very nutritive hay readily eaten by stock."²¹

Carver, in constantly advocating the use of peanut products, came to the attention of the United Peanut Association. This organization, impressed with Carver's persuasive ability, asked him to appear before a Senate committee to intercede for a protective tariff on peanuts. His successful appearance in Washington was the beginning of his road to fame. From this date (January 20, 1921) Carver's name was constantly before the nation and became almost synonymous for peanut products.

1921-1943. During the last twenty-two years of his life Carver made countless public appearances and delivered many speeches. His every statement, suggestion, hypothesis, or outright guess received great acclaim in the nation's newspapers and magazines. His list of products derived from

peanuts finally reached three hundred and those from sweet potatoes exceeded one hundred. He told of making many dyes from peanuts, of using cotton to reinforce asphalt roads, of developing a medicine from peanuts for the treatment of polio, and other headline catchers. Many famous people, most of whom were not scientists acclaimed him for his scientific discoveries. Thomas Edison is said to have offered Carver a large salary to work in Edison's laboratory.²² Henry Ford called Carver the greatest living scientist.²³

However, not everyone agreed with the popular concept that Carver had made great scientific discoveries. Most doubters kept silent, possibly for fear of accusation of prejudice, but some made their views known. In a letter answering a question concerning a Readers' Digest article, a high official in the U. S. Department of Agriculture expressed such a doubt. (Enclosure 3).

In 1937 the Guardian, Boston, Massachusetts, October 2, related that the author of the article had met Carver in 1917 and had seen samples of his artificial rubber. When the Federal Government attempted to develop artificial rubber, Secretary Hoover had attempted to secure samples of Carver's rubber through Mr. Robert Taylor, Director of Mechanical Industries at Tuskegee. He had no success. Later, no commercialization was ever made of Carver's paints. The Carver Products Company also failed. The author went on, "The question arises, of what practical good have the discoveries been either to the race or to mankind generally?"

In the same vein, on February 29, 1940, the Tuscaloosa, Alabama News questioned Carver's products as benefiting humanity "directly and in a practical way." It asked where the directions and formulas for his peanut products were.

Charlie S. Wilkins, President of Arkansas A and M College made the following statements in the May, 1949, issue of the Chemurgic Digest: "The late scientist Dr. Carver of Tuskegee was reported to have produced over 300 products from peanuts. Among them were milk, cream, buttermilk, cheese, coffee and condiments. None of these are known to be produced commercially and unfortunately he left few notes on his experiments."

There is less reliable record of Carver's scientific achievements during this period than of any other time. During Booker T. Washington's lifetime Carver wrote thirty-one bulletins, during the next five years he wrote seven more but during the last twenty-two years of his life he wrote only six!

DISCUSSION

In an effort to get a true picture of Carver's scientific achievements I visited the Tuskegee Institute, Auburn University, Iowa State University, The Library of Congress, The National Archives, and The Plant Industry Station at Beltsville, Maryland. I have made a comprehensive library survey at Auburn University, Iowa State University, and Missouri University. In addition I have interviewed various individuals

who were in a position to evaluate certain aspects of Carver's work. The results of these interviews are given in this section.

Interviews. Dr. B. D. Mayberry, Department of Agriculture, Tuskegee Institute, stated (June 1961) that he had been interested in Carver's work when he (Mayberry) had first come to Tuskegee. He had been unable to develop any research as an extension of Carver's experiments because he had been unable to find any record of Carver's technique. He stated that it would be impossible to determine the effect of Carver's work on the local farmers of today as farming in Alabama has changed considerably from the kind that was practiced during Carver's day. This is in keeping with similar changes throughout the entire country. Carver had been interested in the one-horse poor ignorant farmer and such small farmers are going by the wayside.

Dr. James H. M. Henderson of the Carver Foundation made available his file of Tuskegee Bulletins for my study. He stated that he could find few Carver papers except for these bulletins.

Director of the Carver Foundation, Dr. Clarence Mason stated that shortly after his arrival at Tuskegee he had attempted to organize Carver's "original papers and notes", but had been greatly surprised to find that, except for the Tuskegee Bulletins and a few circulars, none existed. His conclusion was that Carver kept his experimental results in

his head and not in a journal or file. Dr. Mason had some of the peanut oil product that Carver used in massaging polio victims analyzed. The analysis showed nothing that could be considered helpful. He then decided that expert massaging by Carver was the beneficial factor. In concluding his observations, Dr. Mason stressed the fact that Dr. Carver's greatest contribution to science is the Carver Foundation devoted to science teaching and research.

Mrs. Jessie Guzman, Head of the Department of Research and Records, Tuskegee Institute Library, made available the four drawer filing cabinet containing the Carver Papers and clippings. The clippings had been arranged chronologically and they covered a sixty-year period. They were of historical or biographical interest but contained little of value in actual testimony of Carver's work. There were no notes, procedures, formulas, etc. Mrs. Guzman assured me that all the material about Carver that she had was in this file.

In Tuskegee, Alabama, I interviewed attorney R. H. Powell, Jr., son of R. H. Powell (deceased) who had been an attorney and a personal friend of George Washington Carver at the time of Carver's death. Mr. Powell, Sr. was one of several men involved in a business venture with Carver to market some of Carver's peanut products. The company was known as Carvoline.

Mr. Powell, Jr. was not able to shed any light on Carver, but he made available two folders of material that had belonged

to his father. One folder was concerned with the formation of the Carver Foundation, and the other contained information about the Carvoline Company.

There was neither formula nor procedure for the proposed products of the Carvoline Company in the file, but correspondence in the folder listed several of these products. A paragraph in a letter from Powell to United States Senator Lister Hill dated January 24, 1942, is quoted below:

"For over thirty years Dr. Carver has been working along this line (commercial use of peanut oil to encourage peanut growing in the South), and for the past two years certain local individuals have associated themselves with him and have promoted the manufacture and sale of peanut oil products such as facial and hand lotions, hair groom, rubbing oil, salad oils and a peanut flour which has received a great deal of favorable publicity the past few months. I state this in order that you may know that we have already found many varied uses for peanut oils in addition to their use from an edible standpoint, such as peanut butter, salad dressing and as a cooking oil."

At Auburn University, Dr. D. C. Sturkie, Department of Agronomy and Soils, had known Carver but did not know of any outstanding product or process that Carver may have developed.

Dr. C. A. Basole, Department of Chemical Engineering, Auburn University, had visited Carver in his laboratory and had encouraged some of his students to do likewise. Dr. Basole stated that Carver never gave a direct answer to any question

pertaining to how his products were made. He was of the opinion that Carver was a fine gentleman, but he was not much of a scientist.

Mr. J. C. Grimes (retired) of Auburn University had known Carver well and had visited his laboratory. Mr. Grimes stated that he respected Carver and would not want to detract from his reputation, but that he did not feel that Carver was a "great" scientist. He felt that Carver's reputation in other fields was well earned.

Dr. P. O. Davis (retired) of the Extension Department of Auburn University knew and liked Carver but did not believe that he had been much of a researcher.

Dr. Norman D. Davis, Department of Botany and Plant Pathology, Auburn University, who is making a study of the peanuts stated that he did not know Carver. In his studies he had not come across any reference to any work done by Carver on or with peanuts.

Dr. C. E. Scarsbrook, Soil Chemist, Auburn University, expressed interest in Carver's work and in my project. He promised to investigate whether there is any record of Carver's work in the Alabama State Agriculture files at Montgomery. His finding is included in the enclosures (4).

Dr. Paul Lentz, Plant Industry Station, Beltsville, Maryland, stated on July 14, 1961, that he had examined most of the many specimens of fungi that Dr. Carver had sent to the Plant Industry Station. According to Dr. Lentz these specimens

were not unusual but were of the type usually received from the many active collectors.

Dr. John A. Stevenson (retired) of the Plant Industry Station shared the opinion of Dr. Lentz as to the value of the mycology specimens received from Carver.

Dr. Paul Miller, Plant Industry Station, stated that he considered himself a personal friend of Dr. Carver. This friendship had extended the last thirteen years of Carver's life and during this time Dr. Miller visited Tuskegee often. He considered Carver a fine person and an excellent collector of botanical specimens, but he did not believe that his work along this line was of any great importance to the field of mycology. Dr. Miller felt that Dr. Carver should be classified as a "naturalist" rather than as a botanist.

Dr. C. H. Werkman (retired), bacteriologist at University of Iowa stated in June, 1961, that he was a friend of Dr. R. W. Brown, Dean of Research, Tuskegee Institute, and former director of the Carver Foundation. Dr. Werkman had been the advisor of Dr. Brown when the latter was doing graduate work at Iowa State. Dr. Werkman visited Dr. Carver in his laboratory at Tuskegee and was impressed with Carver as a person but not as a scientist. He considered Carver more as a dabbler than as a systematic scientist. However, he was quick to point out the immense good that has resulted from the Carver publicity especially in the establishment of the Carver Foundation.

Dr. R. E. Buchanan, former Dean of the Graduate School and still an active bacteriologist, visited Carver at Tuskegee. He felt that Carver's methods of experimentation were not scientific considering the state of advancement of scientific investigation in the 1920-1940 period. But he felt strongly that it would be most unfortunate if Dr. Carver's achievements were to be measured only in terms of direct scientific contribution. Dr. Buchanan felt that as an inspiration to the Negro people and as an influence in promoting Tuskegee Institute, Dr. Carver has earned public acclaim. "The Carver Foundation itself is a contribution to science that entitles the man to public recognition."

Library Research. It was pointed out on page 10 of this report that many of the peanut products attributed to Carver were known long before he became interested in peanuts. Enclosure number 5 is a list of 292 products credited to Carver as compiled by the Carver Museum, Tuskegee Institute. Of these, 126 are human food products, 10 are stock foods, 20 are cosmetics, 11 are "medicines", 51 are general or industrial, and 68 pertain to dyes and paints.

It is difficult to determine how many of the recipes for the peanut as a human food are actually Carver's. In the many recipes he collected, certain uses were well established. Peanut oil as a substitute for olive oil in salads and other culinary purposes, peanut cake as a source of flour, and the use of the vines as hay were mentioned on page 10.

About forty of Carver's peanut foods can be derived almost directly from these basic uses. For example, various sauces, candies, salad oils, flours, cakes, biscuits, margarines and mayonnaise are closely related to the products previously mentioned. Furthermore, "It is reported that peanut butter first came into use about 1890 as a food for invalids."²⁴

H. C. Thompson reported the following extensive uses of peanuts in 1917: "Practically all confectioners and bakers use peanuts in making their products. Peanuts are used in peanut bars, peanut butter, chocolate coated peanuts, and chocolate bars as well as in other types of confection, and also large quantities for salted peanuts. Bakers use peanuts in considerable quantities in making fancy cakes of various kinds."²⁵

W. J. Morse, in an article on the soybean industry in the United States in 1917 reported that the Chinese had long used soybeans as a source of oil and food. Among the products they had developed were meal, flour, sauces, soybean milk, buttermilk, cheese, chocolate custards, etc.²⁶ These products bear such a close resemblance to many of Carver's peanut products that it is quite possible he used these well established processes for his preparations and merely substituted peanuts for soybeans. Of course, scientific insight was necessary to see the possibilities of peanuts in terms of soybeans.

With respect to the nonedible uses of the peanut,

Thompson reported that in 1917 (before Carver's stepped-up publicity) peanuts were used in making various stock foods and high-grade soap-oil.

Bailey and LeClerc of the Bureau of Chemistry, United States Agriculture Department, list the uses of peanuts in salad oils, margarines, flour, bread, biscuits, cakes, waffles, griddle cakes, candies, cookies, etc.²⁷ This was also in 1917.

In 1911 W. R. Beattie gave extensive directions for planting, cultivating and harvesting peanuts. He stated that the only common disease at this time was "Cercospora personata (B. & C.) (E. & E.) which appears in the form of small brown spots on the leaves." He gave directions for its control.²⁸

In February, 1917, fourteen years before Carver issued his circular "Some Peanut Diseases," the Alabama Agriculture Station at Auburn in its Bulletin 194 described various diseases of peanuts. Among them were Cercospora personata (leaf spot) and Scherotum rolfsie (root rot). The bulletin stated that crop rotation, other than cotton, was the best treatment for the former, but at that time, there was no good treatment for the latter.

Government workers developed a wallboard and reported it in recognized scientific publications. "In 1917 the Forest Products Laboratories of the Forest Service of the U.S.D.A., located at Madison, Wisconsin, carried on a number of experiments to determine the suitability of peanut hulls for use in the manufacture of paper board-- Other experiments also have

shown that a satisfactory cheap wallboard or cardboard can be made from peanut hulls."²⁹

Basil Miller wrote: "In an article on June 13 (1941), in the Montgomery Advertiser he (Carver) told the farmers, who for many years had been reading his articles, that, according to one of his recent investigations peanut hulls would solve their fertilizer problems."³⁰ But in 1926 Clay and Williams had this to say about peanut hulls: "Large quantities are used as a filler in fertilizers."³¹

On page 75 of the same bulletin they stated that at that time most of the hulls were burned at the shelling and roasting plants to save coal and to dispose of the hulls. Three tons of hulls are equal in heating ability to one ton of coal. Mr. Williams Seals of the National Peanut Council told me during an interview on July 13, 1961, that most of the hulls are still burned at the shelling plants because they are too light, even after being ground, to make shipping any distance feasible.

Much credit has been given to Carver for the growth of the peanut industry. For example, the August 7, 1923, edition of The Peanut Journal carried the following: "Twenty-five years ago the peanut was a 'no account' in American agriculture. Today the annual production of peanuts in the United States is about 53,000,000 bushels. The yearly production of peanut butter alone is more than 7,000,000 lbs. and of peanut oil more than 3,000,000 gallons, and these are only two of the 145 useful

products developed from the goober through the experiments of Professor Carver."

However, The United States Department of Agriculture reported that in 1916 the peanut crop in the United States was about 1,740,000 acres with a yield of 38,000,000 bushels, and 3,488,649 gallons of peanut oil were manufactured!³² The 1917 Yearbook showed that three factories alone made over 7,000,000 pounds of peanut butter in 1916 and that about 4,000,000 bushels of peanuts were used for this purpose by the industry. One factory which had made about 4,000,000 pounds in 1916 increased its output to 6,000,000 pounds in 1917.³³ These figures were realized before Carver became extensively active in peanut experiments and publicity. Holt acknowledges this fact somewhat reluctantly when she said: "He was not alone in seeing the value of the two crops (peanut and sweet potato), and an exact measure of responsibility for their enormous increase can not be apportioned, but he was the individual who focused attention upon them."³⁴

The sweet potato presents a similar picture (Enclosure 6). Although Carver was interested early in sweet potatoes, so was W. R. Beattie, Assistant Horticulturist, Bureau of Plant Industry. His bulletins were much more comprehensive than Carver's in everything but how to cook sweet potatoes.³⁵

T. E. Keith of the South Carolina Experiment Station reported on drying sweet potatoes and that "by drying and grinding the dried product into a meal, the meal can be preserved

indefinitely, and it does not lose any of its flavor when made into pies and custards." A successful method of making starch was also announced.³⁶ The South Carolina Station also reported that it had made alcohol from sweet potatoes in 1908 at the rate of a gallon of alcohol from 21 cents worth of raw materials.

Unfortunately there is no detailed record of the products other than recipes that might be attributed to Dr. Carver.

In the third field in which Carver developed many products, the picture is a little clearer. This is in making use of native clays of Alabama. In his early years at Tuskegee, Carver became interested in these clays as a source of color to enliven the unpainted houses of the Negro farmers. The most important factors were low cost and simplicity. In his bulletin number 21 on preparing colored washes he achieves both aims in providing directions for a sort of paint available to everyone at no cost. He went on from there to develop some interesting colors but apparently the processes became more complicated as he did not make them available to the general public. As he left no record of procedure in this case either, one can only make an estimate of the value of his work. Apparently no new principle is involved but rather known principles are applied to local conditions. Carver was especially proud of a beautiful blue pigment he produced from the Alabama clay and asserted that it was the blue used by the ancient Egyptians. He said he secured this color by "six

successive processes of oxidation***If oxidized a few more times it becomes royal purple."³⁷

No record of the actual process or formula of this pigment is available. According to Josef Bersch, Egyptian blue is a copper silicate. Carver reported finding copper in the Tuskegee area so it is not impossible that he could have produced this color. But the preparation of Egyptian blue is not an oxidation process so it is unlikely that this is the blue he made. Dr. Bersch gave directions in 1901 for the preparation of Egyptian blue from white sand, copper oxide, chalk and soda. After being fused together, the mixture is poured into water and then ground. "It appears from the examination of the colours of the Egyptian mural paintings that this pigment was already known to the ancient Egyptians."³⁸

It is quite possible, however, that Carver's blue pigment was an ultramarine as the process vaguely described by Helt, Miller and other biographers could easily refer to the preparation of this substance. Bersch gives detailed instructions for the manufacture of blue ultramarine from kaolin, soda, sulfur, and coal.³⁹ The latter three substances should have been readily available to Carver, and kaolin, or China clay, is the white clay that he described as being suitable for pottery and china ware.⁴⁰ The Geological Survey for Alabama shows a considerable deposit of this material.⁴¹ The production of ultramarine is fairly simple and the final step is an oxidation by air. If a further oxidation is carried out with chlorine,

a violet pigment is obtained.⁴² The blue ultramarines have the approximate formula $\text{Na}_6\text{Al}_4\text{Si}_6\text{S}_4\text{O}_{21}$, and the violet, $\text{Na}_5\text{HAl}_4\text{Si}_6\text{S}_4\text{O}_{24} \cdot \text{H}_2\text{O}$. Thus, Carver's blue was very likely not a new substance, but it had value in that it apparently could be made from Alabama's clays.

SUMMARY

This investigation found no concrete proof that Carver's many products have any great scientific significance. The complete lack of notes, journals, and records prevents the use of his work and the results thereof as stepping stones to further knowledge. If Dr. Carver did not keep such records, regardless of his reasons for not doing so, he lacked one of the chief attributes of a scientist. Any one who might wish to pursue the studies of Carver's research must start from the beginning. Such was the case of Dr. Mayberry of the Tuskegee Institute and Dr. Mason of the Carver Foundation. Thus, two very capable men follow other courses rather than starting again.

If Dr. Carver did keep records, the location of such records is really a mystery. Several possibilities have been suggested. Some one unfamiliar with their value may have destroyed them; they may have been destroyed in the fire that ravaged the Carver Museum; they may be in the possession of some one who does not care to divulge the contents for reasons known only to him or her; they may be in the possession of A. W. Curtis who was Dr. Carver's assistant at the time of his death and who Dr. Carver evidently thought would carry on his work.⁴³ Unfortunately, Mr. Curtis is not willing to discuss the matter except for a fee (enclosure 7).

Based on available information, Dr. Carver's products were not the result of new ideas or procedures. Rather they were the adaptations of the results of experiments of scientists other than Carver to the raw materials and prevailing

conditions of Alabama. Such work is, of course, valuable, but in so doing, he should have given credit to the original investigators. On the contrary, only in a few instances did Carver or the press give proper credit, and almost invariably the implication was that the products were original with Carver.

It appears after a study of Carver's life that he would have been just as great a person, although possibly not quite as famous, if he had set the record straight from the start.

It is my belief that Carver welcomed the growing publicity to offset the adverse criticism of the faculty of the Tuskegee Institute. The Booker T. Washington papers reveal a bitter feeling among the staff members toward Carver right up to Washington's death, and it is not likely that such feeling dissipated immediately thereafter, if ever. Carver was very careful that a copy of any letter or press clipping that was laudatory to him came to the attention of Washington. After Washington's death it is difficult to determine the relationship of Carver with the rest of the faculty. Carver often called the attention of Professor Pammel of Iowa State College to favorable press releases also.

Dr. Carver appears now to have been an intelligent and gifted individual with great perseverance and varied interests even in scientific fields. Due to the circumstances under which he first went to Tuskegee Institute he was unable to

follow any one interest to completion. He did not make any great scientific discoveries nor did he further scientific knowledge to any great extent.

On the other hand, Dr. Carver attempted to work, first, for the Negro farmer, and then for the betterment of the State of Alabama by showing the people how to use the material provided by nature. The fact that neither the farmers nor the other people saw fit to take full advantage of Carver's suggestions is not an indictment of Carver's intentions or efforts. As Mr. Seals of the National Peanut Council informed me, even if Carver had left detailed instructions for the manufacture of all his products from peanuts, the same products could be made cheaper from other raw materials. The largest demands for peanuts are still peanut butter, roasted peanuts, peanut candy, and peanut oil (enclosure 8).

The same thing can truthfully be said of sweet potato products. For example, sweet potato starch can not compete with starch made from other sources (enclosure 9).

Dr. Carver could recognize sound ideas. He was an advocate of crop rotation, soil building, natural fertilizers, use of local natural resources, and industrial uses of farm products.

At least one of these ideas was tested in 1935. In an effort to find new uses for cotton, Carver had advocated the use of cotton fiber to reinforce asphalt roads. A runway

was constructed at Fort McClellan, Alabama by using alternate layers of asphalt and cotton muslin, and with normal repair is still in service (enclosure 10).

Director C. H. Fisher of the Southern Utilization Research and Development Division confirms our conclusions in a letter included in enclosure 11 page 49. It is generally agreed among those studying the achievements of George Washington Carver that his scientific achievements were primarily in the fields of his early training, namely Botany and Plant Pathology. His later publications were valuable but more of an applied nature and not scientific achievements.

Perhaps in the long run, one might turn to his biographers for a summing up of Carver's contributions to science. Rackham Holt expressed them: "His discoveries, with the exception of his mycological work, did not properly belong in scientific journals. They were not revolutionary in themselves. Anyone with the proper education could milk the peanut, or abstract paper from suitable fibers, or rubber from the sweet potato or any other vine which secreted latex. His special contribution was to expose these hidden properties in plants to the public view and dramatizing them, serve as a signpost for those who had the facilities to incorporate them into the contemporary pattern of living."⁴⁴

From a slightly different viewpoint, Edward J. Dies stated: "From the standpoint of human welfare his direct

achievement was in teaching poor Negroes and whites how to grow at their homes nutritious foods, how to cook them, and how to effect a balanced diet. Thus he lightened the scourge of pellagra."⁴⁵

George Washington Carver had many of the characteristics of a successful scientist. He was well trained. His early training in Missouri was continued in a Kansas High School with college training in Iowa. In addition, he earned an advanced degree from a land-grant state college. He used his knowledge to solve the problems as he found them. He combined two science disciplines, Botany and Chemistry, to help solve his problems. This interdisciplinary approach is useful in research. Solving problems in agriculture needs the knowledge of Botany, Chemistry and the other sciences.

Carver then caused his finding to be widely published. Unlike many scientists he wrote in the language and literature of the layman and not in strictly scientific journals. Therefore, he was more popular to the layman than to the scientist.

We need more men like George Washington Carver. We need men that will use their scientific training to help their fellow man. With more men like Carver today's scientific knowledge could be better used for greater understanding and a higher standard of living.

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Enclosure 1

Bulletins by George W. Carver

Number	Date	Title
1	1898	Feeding Acorns
2	1898	Experiments with Sweet Potatoes
3	1899	Fertilizer Experiment with Cotton
4	1901	Some Cercospora of Macon Co., Alabama
5	1903	Cow Peas
6	1905	Cotton Growing on Sandy Upland Soils
7	1905	How to Build up Worn-out Soils
8	1906	Successful Yields of Small Grain
9	1906	The San Jose Scale in Alabama
10	1906	Saving the Sweet Potato Crop
11	1909	Relations of Weather and Soil Conditions to the Fruit Industry of South-east Alabama
12	1907	Saving the Wild Plum Crop
13	1908	How to Cook Cow Peas
14	1908	How to Make Cotton Growing Pay
15	1909	Increasing the Yield of Corn
16	1909	Some Ornamental Plants of Macon Co., Alabama
17	1910	Possibilities of the Sweet Potato in Macon County
18	1910	Nature Study and Gardening for Rural Schools
19	1911	Some Possibilities of the Cow Pea in Macon County
20	1911	Cotton Growing for Rural Schools
21	1911	White and Colored Washing with Native Clays from Macon County, Alabama
22	1912	Dairying in Connection with Farming
23	1912	Poultry Raising in Macon County
24	1912	The Pickling and Curing of Meat in Hot Weather
25	1913	A study of the Soils of Macon Co. Alabama and their Adaptability to Certain Crops
26	1915	A New and Prolific Variety of Cotton
27	1915	When, What, and How to Can and Preserve Fruits and Vegetables in the Home
28	1915	Smudging an Orchard with Native Material in Alabama
29	1915	Alfalfa, The King of all Fodder Plants, Successfully Grown in Macon County
30	1915	Possibilities of the Sweet Potato in Macon County (Revision of # 17)
31	1916	How to Grow the Peanut and 105 Ways of Pre- paring it for Human Consumption

Enclosure 1 Con't.

Number	Date	Title
32	1916	Three Delicious Meals Every Day for the Farmer
33	1917	Twelve Ways to Meet the New Economic Conditions here in the South
34	1917	Forty-three Ways to Save the Wild Plum Crop
35	1917	How to Grow the Cow Pea and 40 Ways to Prepare it as a Table Delicacy
36	1918	How to Grow the Tomato and 105 Ways to Prepare it for the Table
37	1918	How to Make Sweet Potato Flour, Starch, Bread, Sugar and Mock Cocoanut
38	1918	How the Farmer Can Save His Sweet Potatoes
39	1927	How to Make and Save Money on the Farm
40	1935	The Raising of Hogs
41	1936	Can Live Stock Be Raised Profitably in Alabama?
42	1936	How to Build Up and Maintain the Virgin Fertility of Our Soils
43	1942	Nature's Garden for Victory and Peace
44	1943	The Peanut
Circular	1912	The Canning and Preserving of Fruits and Vegetables in the Home
Leaf-let	1915	A New and Prolific Variety of Cotton
Leaf-let	1915	How to Raise Pigs with Little Money
Leaf-let	1916	How to Live Comfortably this Winter
Leaf-let	1916	What Shall We Do for Fertilizer this Year?
Leaf-let	1931	Some Peanut Diseases
Leaf-let	1938	Some Choice Wild Vegetables that Make Fine Foods

Enclosure 2

PAINT PATENTS HELD BY GEORGE W. CARVER

U. S. 1541478, June 9, 1925, "Pigments from Clay and Iron," A pigment adapted for use in paints and stains is obtained by boiling clay and metallic iron with acid, e. g., sulfuric or hydrochloric, and separating the coarse particles.

U. S. 1632365, June 14, 1927, "Pigment for Use in Paint and Stain," Ferruginous clay is treated with acid, e. g., sulfuric or hydrochloric, and a $KFeCN$ compound such as $K_3Fe(CN)_6$ or $K_4Fe(CN)_6$ is then added.

Above two patents taken from Chemical Abstracts.

The following patent was not found in Chemical Abstracts.

U.S. 1522176, January 6, 1925, "Cosmetic and process of producing the same."

Enclosure 3

"Dr. Carver has without doubt done some very interesting things--things that were new to some of the people with whom he was associated, but a great many of them, if I am correctly informed, were not new to other people. His activities have been tremendously publicized, as in the article in the Reader's Digest by James Saxon Childers. From this article and others, however, I am unable to determine just what profitable application has been made of any of his so-called discoveries. I am writing this to you confidentially and without an opportunity to make further investigation and would not wish to be quoted on the subject."

Copy of letter from an Official of the U. S. Department of Agriculture (1937) in response to a question concerning a Reader's Digest article. Letter is on file in the National Archives, Washington, D. C.

Enclosure 4

A U B U R N U N I V E R S I T Y

Auburn Alabama

School of Agriculture and
Agricultural Experiment Station System

July 5, 1961

Dr. William R. Carroll
Department of Agriculture Chemistry
University of Missouri
Columbia, Missouri

Dear Dr. Carroll:

After reading your letter this morning I called the Commissioner of Agriculture in Montgomery. Both the commissioner and his assistant are long time friends of mine so I could take the liberty of inquiring about the existence of any state records on Dr. Carver. Mr. Pete Gilmer, the assistant commissioner of agriculture, advised me that there was no possibility of any records on research or other activities of Dr. Carver. The basis for his positive statement was that the Department of Agriculture is a strictly regulatory agency and its records pertain to the regulatory function only.

I regret that this lead is not a fruitful one. If you uncover any other possible sources of information I will be glad to assist you in any way that I can.

With highest regards and continued interest in your report, I remain

Sincerely yours,

C. E. Scarsbrook
Soil Chemist

CES:DB

Enclosure 5

LIST OF BY-PRODUCTS FROM PEANUTS BY
 GEORGE WASHINGTON CARVER
 (as compiled by the Carver Museum)

Beverages

Beverage for Ice Cream
 Blackberry Punch
 Evaporated Peanut Beverage
 Cherry Punch
 Normal Peanut Beverage
 Peanut Beverage Flakes
 Peanut Lemon Punch
 Peanut Koumiss Beverage
 Peanut Orange Punch # 1
 Peanut Punch # 2
 Plum Punch

Cosmetics

All Purpose Cream
 Antiseptic Soap
 Baby Massage Cream
 Face Bleach and Tan Remover
 Face Cream
 Face Lotion
 Face Ointment
 Face Powder
 Fat Producing Cream
 Glycerine
 Hand Lotion
 Oil for Hair and Scalp
 Peanut Oil Shampoo
 Pomade for Scalp
 Pomade for Skin
 Shampoo
 Shaving Cream
 Tetter and Dandruff Cure
 Toilet Soap
 Vanishment Cream

Dyes, Paints, and Stains

Dyes for Cloth (30)
 Dyes for Leather (19)
 Paints
 Wood Stains (17)
 Special Peanut Dye

Stock Foods

Hen Food for Laying (peanut hearts)
 Molasses Feed
 Peanut Hay Meal

Stock Foods Con't.

Peanut Hull Bran
 Peanut Hull Meal
 Peanut Hull Stock Food
 Peanut Meal
 Peanut Stock Food (3)

Foods

Bar Candy
 Breakfast Food (5)
 Bisque Powder
 Buttermilk
 Butter from Peanut Milk
 Caramel
 Cheese Cream
 Cheese Nut Sage
 Cheese Pimento
 Cheese Sandwich
 Cheese Tutti Frutti
 Chili Sauce
 Chocolate Coated Peanuts
 Chop Suey Sauce
 Cocoa
 Cooking Oil
 Cream Candy
 Cream from Milk
 Crystallized Peanuts
 Curds
 Dehydrated Milk Flakes
 Dry Coffee
 Evaporated Milk
 Flavoring Paste
 Golden Nuts
 Instant Coffee
 Lard Compound
 Malted Substitutes
 Mayonnaise
 Meat Substitutes
 Milks (32)
 Mock Goose
 Mock Chicken
 Mock Meat
 Mock Oyster
 Mock Veal Cutlet
 Oleomargarine
 Pancake Flour

Enclosure 5 Con't.

PEANUT PRODUCTS

Foods Con't.

Peanut Bar # 1
 Peanut Bisque Flour
 Peanut Brittle
 Peanut Butter, regular (3)
 Peanut Cake (2)
 Peanut Chocolate Fudge
 Peanut Dainties
 Peanut Flakes
 Peanut Flour (11)
 Peanut Hearts
 Peanut Kisses
 Peanut Meal, brown
 Peanut Meat Loaf
 Peanut and Popcorn Bars
 Peanut Relish (2)
 Peanut Sausage
 Peanut Surprise
 Peanut Tofu Sauce
 Peanut Wafers
 Pickle, plain
 Salad Oil
 Salted Peanuts
 Shredded Peanuts
 Substitute Asparagus
 Sweet Pickle
 Vinegar
 White Pepper, from Vines
 Worchestershire Sauce

Medicines

Castoria Substitute
 Emulsion for Bronchitis
 Goiter Treatment
 Iron Tonic
 Laxatives
 Medicine similar to Caster Oil
 Oils, Emulsified with Mercury
 for venereal disease (2)
 Rubbing Oil
 Tannic Acid
 Quinine

General

Axel Grease
 Charcoal from Shells
 Cleanser for Hands
 Coke (from hulls)
 Diesel Fuel
 Fuel Bricketts
 Gas
 Gasoline
 Glue
 Illuminating Oil
 Insecticide
 Insulating Boards (18)
 Linoleum
 Lubricating Oil
 Nitroglycerine
 Paper (colored) from skins
 Paper (Kraft) from Vines
 Paper (white) from Vines
 Printers Ink
 Plastics
 Rubber
 Shoe and Leather Blacking
 Sizing for Walls
 Soap Stock
 Soil Conditioner
 Wall Boards (from hulls) (11)
 Washing Powder
 Wood Filler
 Laundry Soap
 Sweeping Compound

Enclosure 6LIST OF PRODUCTS MADE FROM SWEET POTATOES BY
GEORGE WASHINGTON CARVERFoods

After Dinner Mints (3)
 Bisque Powder
 Breakfast Food (5)
 Candies (14)
 Chocolate
 Coffee, dry
 Dried Potatoes (2)
 Dry Paste
 Egg Yolk
 Flour (4)
 Granulated Potatoes
 Instant Coffee
 Lemon Drops
 Meal (4)
 Mock Coconut
 Molasses (3)
 Orange Drops
 Potato Nibs
 Sauce
 Spiced Vinegar
 Starch
 Sugar
 Synthetic Ginger
 Tapioca
 Vinegar
 Yeast

Stock Foods

Hog Feed
 Stock Feed Meal (3)

General

Alcohol
 Dyes (73)
 Fillers for Wood (14)
 Library Paste (5)
 Medicine
 Paints
 Paper (from vines)
 Rubber Compound
 Shoe Blacking
 Stains
 Synthetic Cotton
 Synthetic Silk
 Writing Ink

Enclosure 7

A. W. CURTIS LABORATORIES
454 Farnsworth
Detroit 2, Michigan

Phone TE. 3-6979

May 10, 1960

Mr. Clarence H. Schultz, Superintendent
George Washington Carver National Monument
Diamond, Missouri

Refer To: D 6215

Dear Mr. Schultz:

This is to acknowledge receipt of your letter and a request for specimens of products developed by Dr. Carver.

There is material that we can provide and an estimate of the cost will be forwarded as soon as the approximate time involved can be determined. My schedule is a very busy one at this time and does not leave me with much free time.

Without reservations I can proudly boast that I, who was Dr. Carver's Assistant at Tuskegee for $8\frac{1}{2}$ years and remaining at Tuskegee Institute one year following Dr. Carver's death, know more about his work and the man than any other individual. It is too bad that the services of one so qualified and versed on Dr. Carver's life and work has not been utilized in the development of this memorial.

With very best wishes.

Most Cordially,

/t/ A. W. Curtis Laboratories
/s/ Austin W. Curtis

Enclosure 8

S E S S I O N S
COMPANY
INC.

Enterprise, Alabama
July 6, 1961

Dr. William R. Carroll
Department of Agriculture Chemistry
University of Missouri
Columbia, Missouri

Dear Dr. Carroll:

Thank you for your letter of July 2 telling us that you are doing a research project on the scientific achievements of George Washington Carver but have been unable to find any link between his work and any product produced commercially today. What you say bears out our own experience.

Dr. Carver was a fine old man and quite ingenious in his laboratory but his sole contribution to the peanut industry so far as we have ever been able to learn consisted of focusing some public interest on the peanut and its products.

This immediate area began growing peanuts in 1915 when the Mexican Boll Weevil laid waste the cotton lands, and peanuts have been an important crop here ever since. Our firm, founded in 1932 manufactures peanut butter, also crushes peanuts and refines the oil to make the famous Peanut Cooking oil which is literally unexcelled for deep frying. So far as we know though no important commercial product is being produced from peanuts anywhere in the country except peanut butter, peanut oil, salted peanuts, candy, etc. as you mentioned. In this connection, however, you could undoubtedly obtain helpful data from the Southern Research Utilization Laboratory at New Orleans, Louisiana.

With every good wish.

Sincerely yours,

SESSIONS COMPANY, INC.

Robin Bird
Secretary-Treasurer

RB/jbh

THE CHAMBER OF COMMERCE
OF LAUREL, MISSISSIPPI

July 27, 1961

William R. Carroll, Ph.D.
Assistant Professor of Chemistry
Agricultural Chemistry Department
University of Missouri
Columbia, Missouri

Dear Dr. Carroll:

Your letter of July 23rd., addressed to the Mayor of Laurel has been forwarded to this office for a reply.

Around 1935 the Department of Agriculture set up a pilot plant at Laurel to manufacture starch from sweet potatoes, since this vicinity had climate and soil conditions very favorable to the raising of sweet potatoes.

I am not familiar with the process used but the products of the plant were starch and the residue, a dark brown pebbly substance suitable for cattle feed. Incidentally, a person familiar with the process gave me a small quantity of the starch and the residue and if you would like small samples I can send them to you.

Although they found it possible to make an acceptable starch from sweet potatoes, there was no advantage over existing processes and was, therefore, not economically feasible on a commercial scale.

Sometime around 1940 the plant was discontinued and transferred to a Co-op which built curing and processing buildings to produce dehydrated sweet potatoes. This process was successful and the entire production of the plant was sold to the Army during the last world war. Near the end of the war the plant was faced with two major problems:

1. The Army no longer needed dehydrated sweet potatoes and nobody else was interested in buying the product since canned sweet potatoes are just as economic and much more attractive to the consumer.

Page # 2

Dr. Wm. R. Carroll
Columbia, Missouri

July 27, 1961

2. They were faced with a considerable claim by the government for making excess profits on government contracts which took all their cash reserve to settle.

The land and buildings thereon were subsequently sold to the Masonite Corporation which owned all the surrounding land.

The buildings were torn down and the land is now used by Masonite Corporation as a wood yard.

Yours very truly,

OWEN L. NEATHERY
Executive Secretary

OLN/br

cc: Hon. A. S. Scott, Sr., Mayor
City of Laurel
Laurel, Mississippi

Enclosure 10

HEADQUARTERS
Fort McClellan, Alabama
August 17, 1961

Dr. William R. Carroll
Assistant Professor of Chemistry
Agricultural Chemistry Department
University of Missouri
Columbia, Missouri

Dear Dr. Carroll:

I am glad to send you all available information requested in your letter of July 23, 1961.

The project you referred to was constructed in 1935-1936; was of "T" shaped configuration, with the main east-west runway 150' wide x 2300' long and a shorter north-south runway 150' x 700' abutting the main runway at approximately mid-point.

The construction details are rather non-technical; most of the work was performed by hand labor and consisted of a 5" / porous rock base with emulsified type asphalt penetration; then successive alternate layers of sprayed asphalt and cotton muslin. The number of layers is indefinite, probably 6 to 8. The final wearing surface applied was approximately 100 lbs/S.Y. of mixed in place and rolled asphalt and stone.

It is noteworthy that the field was inactive from 1936 to 1940, and from 1947 to 1954. It has been in constant use since 1955 and has received only the minimum amount of maintenance.

With new requirements, the main runway has received new 75' x 350' paved extensions plus a cleared over-run at each end.

It is advised that the original construction has held up rather well, however, it has developed numerous sporadic cracks, probably due to long periods of non-use. It appears that the cotton muslin has been severed at these cracks.

A copy of the specifications used in a recent application of slurry seal is enclosed for your general information.

It is hoped that this information will be of some help to you. If I can be of any further assistance, let me know.

Sincerely yours,

LON H. SMITH
Colonel, Infantry

Enclosure 11

UNITED STATES DEPARTMENT OF AGRICULTURE
Agricultural Research Service
Southern Utilization Research And Development Division
1100 Robert E. Lee Boulevard
New Orleans 19, Louisiana

October 20, 1961

Dr. William R. Carroll
Department of Agricultural Chemistry
College of Agriculture
University of Missouri
Columbia, Missouri

Dear Dr. Carroll:

This is in further reply to your letter of July 24 requesting information bearing on Dr. George Washington Carver's contributions in the field of industrial utilization of peanuts.

Questions of the type you raise have come up before and some of them have been, and still are, difficult to answer because of the meager documentation of Dr. Carver's work in this field. We have taken time to make a further search of available sources of pertinent information, in an effort to develop a more complete picture.

Enclosed is a list of all publications credited to Dr. Carver by citations in the two leading abstract journals that cover the fields of his work and most of the period of his activity. Aside from the items listed, other published information appears to be confined to press items and articles or books by other authors. One article that appears to present a particularly intelligent review of Dr. Carver's contributions from a scientific viewpoint is the following by Professor Clarence W. Wright, who at the time was a member of the faculty of Livingstone College, Salisbury, North Carolina:

"George Washington Carver, an American Scientist." Jour. Chem. Education, Vol. 23, pp. 268-70, 1946.

It is to be noted that D. Carver's published contributions are primarily in the fields of his earlier training and experience, namely botany, plant pathology, and agriculture (including extension and demonstration aspects). About the only exceptions are one bulletin and two patents dealing with preparation of paint or stain pigments from native clays of Alabama, and one patent on cosmetic preparations from peanuts.

2-Dr. William R. Carroll-10-20-61

The only published articles on peanuts that appear to be of record are two Tuskegee Bulletins,--No. 31 of 1916 "How to Grow the Peanut and 105 Ways of Preparing it for Human Consumption," and a later one, No. 44, "The Peanut." The information reported in the former is confined to production of the crop and kitchen recipes for various prepared food items. The latter bulletin deals entirely with production.

The single patent in the field of peanuts, (U.S. 1,522,176, "Cosmetic and Process of Producing the Same," January 6, 1925) covers various modifications of a process which essentially comprises fine comminution of peanuts and preparing a homogeneous creamy paste with water, with and without incorporation of finely divided clay and additional peanut oil. (The date of this patent is erroneously given as "June 6, 1925" in the article by Dr. Wright, cited above.)

The book on Carver by Basil Miller contains a statement on page 67 that about 1927 he obtained another patent on "Penol," a creosote emulsion from peanut juices. We have not, however, been able to verify this statement. No such patent is listed by the Official Gazette of the U. S. Patent Office for 1927 or through the years 1925 to 1929.

For further reference in connection with the questions you bring up, we enclose the following of our publications:

"SRRL Publications on Peanuts, 1942-1953," with additional titles and abstracts inserted to bring up to date.

"Abstract Bibliography of the Chemistry and Technology of Peanuts, 1830-1939."

"Peanut Protein for Industrial Utilization: A Literature Survey."

"Peanut Butter."

(Reprints of most of the items in our list of publications are available, should you desire any for more detailed information.)

We are also enclosing a copy of USDA Marketing Research Report No. 16, "Peanuts and their Uses for Food."

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For a concise but comprehensive review of all phases of peanut utilization we would recommend that you consult the following monograph:

"Processed Plant Protein Foodstuffs," edited by Aaron M. Altschul. Academic Press, Inc., New York City, 1958.

See Chapter 16, "Groundnuts (Peanuts) and Groundnut Meal," by Gordon D. Rosen, pp. 419-468. (Cites 361 references.)

Interesting early information on the history of peanut growing in the United States and on utilization of peanuts and peanut products is contained in the following publications of the U.S. Department of Agriculture:

Farmers Bulletin 25, 1895

"Peanuts: Culture and Uses," by R. B. Handy

Farmers Bulletin 356, 1909

"Peanuts," by W. R. Beattie

Farmers Bulletin 431, 1911

"The Peanut," by W. R. Beattie

Much useful information is also contained in the following more recent publication:

"Marketing Peanuts and Peanut Products," by Harold J. Clay USDA Miscellaneous Publication No. 416, 1941.

In respect to your specific questions, we believe you will find much of the answer in the material which we are enclosing and in the other references cited above. As far as concerns the relation between Carver's work and our investigations on industrial utilization of peanuts, you will note that our efforts in this area have been concerned mainly with industrial products from peanut meal and particularly the isolated protein; and with certain aspects of the properties and processing of peanut oil, including some work on solvent extraction. Work on industrial use of oilseed meals and proteins, including those from peanuts, was not new when we began our program. However, none of the products which we have seen attributed to Carver appears to have involved isolation of the protein. Some of them involved the properties imparted by the protein content of the whole peanut or perhaps the oil press cake; but it is doubtful that conscious recognition of the factor was involved.

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Peanuts were crushed for oil and the product used for a variety of purposes well back in the nineteenth century or earlier, at least in the Old World (more details below). Outside of some recent work of a fundamental nature, our other investigations on peanuts were concerned with certain problems in improved manufacture of peanut butter. Peanut butter was originally developed as a food for sanitarium use about 1890; and shortly afterward, it began to appear on the retail market.

Among the products which are reported to have been demonstrated by Dr. Carver, at least in the form of samples are: milk, cream, ice cream, butter, cheese, coffee, breakfast food, flour, flavorings, relishes, Worcestershire sauce, cosmetics, shaving lotion, face powder, shampoo, soaps, massage oil, wood stains, oil dyes, paints, ink, stock feed, etc.

Most of these products could be prepared by relatively simple processing of the whole peanut kernels or of the separated oil and meal, with or without added ingredients. It is known from the patent disclosures that some of Dr. Carver's cosmetic preparations prepared from peanuts included added clay. It is very likely that the "paints," "stains," or "dyes" involved use of suitably processed colored clays, as pigments, with perhaps peanut dispersions or peanut oil as vehicles. Carver was greatly interested in utilization of the native clays of Alabama and received two patents on preparation of pigments from them.

As to the chronological relationship of both food and industrial uses of peanuts to Carver's claims, some answers may be found in recorded information.

Local production of milk and curd substitutes from peanuts is reported to have long been practiced in China. A 1917 patent covers a milk substitute based on mixed extracts of peanuts and soybeans. This is U.S. Patent 1,243,855, "Substitute for Milk Made from Soya Beans and Arachis (Pea) Nuts," issued October 23, 1917, to William J. Melhuish, Parkstone, England, (filing date, October 22, 1915). Peanut butter, as stated above, was a market commodity in the 1890's. Margarine incorporating peanut oil were in production before that time.

Interesting information on the status of peanut utilization prior to 1895 when Carver was still a botanist at Iowa State College, is to be found in USDA Farmers Bulletin 25 of 1895, entitled "Peanuts: Culture and Uses."

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To summarize the information as of 1895: data on composition of peanuts include figures for peanuts of different variety and points of origin in the United States and foreign countries, as well as averages of over 2,000 analyses for peanut meal collated by German authorities.

Fully three-fourths of the crop was being used for food purposes, the three better grades for roasted peanuts, and a fourth grade sold to confectioners to be used in making "burnt almonds," peanut candy, and cheaper grades of chocolates.

(About fourteen years later USDA Farmers Bulletin 356, 1909 the more important food uses, in addition to roasted peanuts in the shell, were given as salted shelled peanuts, blanched peanuts, peanut candies and brittle, in combination with popcorn and puffed rice, peanut butter, and vegetarian "meats.")

In respect to use for oil, millions of bushels of peanuts were being used for that purpose in countries of the Old World. The oil was regarded as equal to olive oil, and was used both as a salad oil and in margarines. It was also reported to be used in India, Europe, Brazil, and this country for medicinal purposes, as a substitute for olive oil in fulling cloth, and lighting fuel. In addition, many gallons were being used in Europe for manufacture of soap and as a lubricant in machine shops. Information is quoted from a report of the Consul-General at Frankfort, Germany, to the effect that first pressed (cold pressed) oil from African or the best American peanuts was used as salad oil and for various culinary purposes.

Further statements are quoted from a practical treatise on animal and vegetable fats and oils by W. T. Brannt (London, 1888) to indicate that the first cold pressing of peanuts yielded a very fine table oil; the second pressing was used for table purposes also, and for burning; and the third (hot) pressed oil was used for soaps and lubricants. Another interesting item is that during the years 1861 to 1865 peanut oil was manufactured by at least four mills in the southern states and used as a lubricant for locomotives, by wool and cotton spinners as a spindle lubricant, and by housewives in place of lard as shortening. The press cake from oil extraction is said to have been eaten by many living in the vicinity of the mills and was highly spoken of.

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Further information is given on the use of peanut oil cake or meal in Germany and other countries for stock feed. German experiments with use of the meal for human food are also mentioned.

In an article entitled "The American Peanut Industry," by C. Lewis Wrenshall (Economic Botany, Vol. 3, pp. 158-169, 1949), the author opens a brief discussion of industrial uses with the following paragraph and footnote:

"Walter Winchell and numerous other journalists to the contrary notwithstanding, the late Dr. George W. Carver of Tuskegee Institute did not establish a large number of industrial uses for peanuts (Footnote). As a matter of fact peanut products do not at present enter into industrial uses to any important extent."

(Footnote: "This is a plain statement of fact that is not intended to detract from Dr. Carver's reputation. According to the testimony of his colleagues, Dr. Carver's life was devoted to the task of elevating the standard of living of his people by showing them what could be done with the materials at hand. It seems doubtful that he was even interested in industrial developments. He was as much craftsman as scientist, perhaps more farmer than either. One of his chief concerns was to make his people aware of the value of keeping a cow on the farm. His published contributions on the subject of peanuts were only two-- the two Tuskegee Bulletins .")

Wrenshall's remark on the extent of industrial utilization of peanuts still holds good twelve years later, certainly here in the United States. A major contributing factor is the economic one that the costs of growing and harvesting peanuts in this country are out of line with profitable utilization of the crop as industrial raw material. Some years ago the findings of research on textile fibers and other products from peanut protein stimulated much industrial interest, and one commercial enterprise undertook limited manufacture of textile fiber in this country (such a development had previously taken place in Britain). Shortly, however, the U. S. undertaking gave up peanut protein in favor of another vegetable protein which could be made available in more assured sustained supply.

Whatever the ultimate appraisal of the originality of his work on utilization of peanuts, there seems to be no doubt that full recognition should be given Dr. Carver for his contributions in

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focusing attention the high food value of peanuts, as well as their potentialities for other uses, and the extensive possibilities for other uses, and the extensive possibilities for their expanded commercial production in the south at a time when diversified crops were urgently needed to improve the farm economy. One occasion which brought him particular notice was in 1921 when he was called to appear before the Ways and Means Committee of the House of Representatives as a witness in support of including a protective tariff on imported peanuts in the pending Hawley-Smoot Bill. From reports it would appear that his testimony and display of numerous samples of products which he said could be made from the peanut or its constituents contributed in no small measure to the inclusion of peanuts when the tariff measure was eventually passed.

Very truly yours,

C. H. Fisher
Director of Division

Enclosures-6

Enclosure 11 Con't.

Publications of Dr. George Washington Carver

As Listed in Abstract Journals Indicated

Experiment Station Record
U. S. Department of Agriculture

1893 - 1898

Expt. Sta.
Record
Year

1893. "Grafting Cacti"
Trans. Iowa Hort. Soc. 1893, pp. 257-259
- 1894-95. "Best Ferns for the North and Northwest"
Iowa Agr. Expt. Sta. Bull. 27, pp. 150-153
- 1895-96. "Treatment of Currants and Cherries to Prevent
Spot Diseases"
(L. H. Pammel and G. W. Carver)
Iowa Agr. Expt. Sta. Bull. 30, pp. 298-301
- 1896-97. "Our Window Gardens"
Iowa Agr. Expt. Sta. Bull. 32, pp. 516-525
- 1897-98. Reference to G. W. Carver's Work with Fungi.
In: New York Agr. Expt. Sta. Rept. 1895.

1898 - 1942

Bulletins of the Experiment Station,
Tuskegee Normal and Industrial InstituteExpt. Sta.
Record
Year

- 1898-99. "Organization and Work of the Tuskegee Experiment
Station" "Feeding Acorns"
Bull. 1, pp. 3-5 and 6-9
- 1899-1900. "Experiments with Sweet Potatoes"
Bull. 2, 15 pp.
- 1900-01. "Fertilizer Experiments with Cotton"
Bull. 3, 16 pp.

Expt. Sta.
Record
Year

- 1901-02. "Some Cercosporae of Macon County, Alabama"
Bull. 4, 8 pp.
- 1903-04. "Cowpeas"
Bull. 5, 10 pp.
- 1905-06. "How to Build up Worn-Out Soils"
Bull. 6, 15 pp.
- "Cotton Growing on Sandy Upland Soils"
Bull. 7, 11 pp.
- "Successful Yields of Small Grains"
Bull. 8, 10 pp.
- 1906-07. "Saving the Sweet Potato Crop"
Bull. 10, 14 pp.
- 1908-09. "How to Cook Cowpeas"
Bull. 13, 12 pp.
- "How to Make Cotton Growing Pay"
Bull. 14, pp. 5-14
1909. "Increasing the Yield of Corn"
Bull. 15, pp. 5-11
1910. "Some Ornamental Plants of Macon County, Alabama"
Bull. 16, pp. 5-24
- "Possibilities of the Sweet Potato in Macon County,
Alabama"
Bull. 17, pp. 5-19
- "Nature Study and Gardening for Rural Schools"
Bull. 18, pp. 3-23
1911. "Some Possibilities of the Cowpea in Macon County,
Alabama"
Bull. 19, pp. 5-23
- "Cotton Growing for Rural Schools"
Bull. 20, pp. 5-29
1912. "White and Color Washing with Native Clays from
Macon County, Alabama"
Bull. 21, 4 pp.

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Expt. Sta.
Record
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1913. "Poultry Raising in Macon County, Alabama"
Bull. 23, pp. 3-20
- "The Pickling and Curing of Meat in Hot Weather"
Bull. 24, 22 pp.
- "The Canning and Preserving of Fruits and Vegetables
in the Home"
Tuskegee, Ala., 1912, 8 pp.
1914. "A Study of the Soils of Macon County, Alabama, and
Their Adaptability to Certain Crops"
Bull. 25, pp. 5-13
1915. "A New and Prolific Variety of Cotton"
Bull. 26, 7 pp
- "When, What, and How to Can and Preserve Fruits and
Vegetables"
Bull. 27, pp. 3-8
- "Alfalfa"
Bull. 29, pp. 1-7
- "Possibilities of the Sweet Potato in Macon County,
Alabama"
Bull. 30, 22 pp.
1916. "How to Grow the Peanut and 105 Ways of Preparing it
for Human Consumption"
Bull. 31, 35 pp.
1917. "Three Delicious Meals Every Day for the Farmer"
Bull. 32, pp. 3-7
- "Twelve Ways to Meet the New Economic Conditions
Here in the South"
Bull. 33, pp. 3-7
- "Forty-three Ways to Save the Wild Plum Crop"
Bull. 34, 12 pp.
1918. "How to Grow the Cowpea and Forty Ways of Preparing it
as a Table Delicacy"
Bull. 35, 24 pp.

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Expt. Sta.
Record
Year

1918. "How to Grow the Tomato and 115 Ways to Prepare it for the Table"
Bull. 36, 39 pp.
1919. "How to Make Sweet Potato Flour, Starch, Sugar, Bread and Mock Coconut"
Bull. 37, 6 pp.
1922. "How the Farmer Can Save His Sweet Potatoes, and Ways of Preparing for the Table"
Bull. 38, pp. 5-33
1928. "How to Make and Save Money on the Farm"
Bull. 39, 16 pp.
1936. "The Raising of Hogs"
Bull. 40, 7 pp.
- "Can Live Stock be Raised Profitably in Alabama?"
Bull. 41, 12 pp.
1937. "How to Build up and Maintain the Virgin Fertility of Our Soils"
Bull. 42, 10 pp.
1942. "Nature's Garden for Victory and Peace"
Bull. 43, 18 pp.
1943. "The Peanut"
Bull. 44, 14 pp.

Other Items Cited in Experiment Station Record

Expt. Sta.
Record
Year

- 1901-02. Address by Dr. Carver on Tuskegee, before Convention of Association of American Agricultural Colleges and Experiment Stations, Atlanta, Ga., October 7-9, 1902.
- 1907-08. "The Value of Nature Study and Children's Gardens"
Cornell Countryman, Vol. 4, No. 8, pp. 249-250 (1907)
1923. Award of Spingan Medal at 14th Annual Meeting, NAACP.

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Expt. Sta.
Record
Year

1931. Unveiling of bronze base relief at Tuskegee.
1937. Reference to Carver's work in the Plant Disease Reporter, May 15, 1936.
1940. Donation by Dr. Carver of \$33,000 to a Foundation for Chemical Research at Tuskegee; also gift of 100 of his paintings to the Carver Museum.
1943. Notice of death, January 7, 1943.
1944. "Dr. George Washington Carver - Scientist" by Basil Miller
Grand Rapids, Mich., Zondervan Publishing House, 1944, 3rd Ed.

Chemical Abstracts

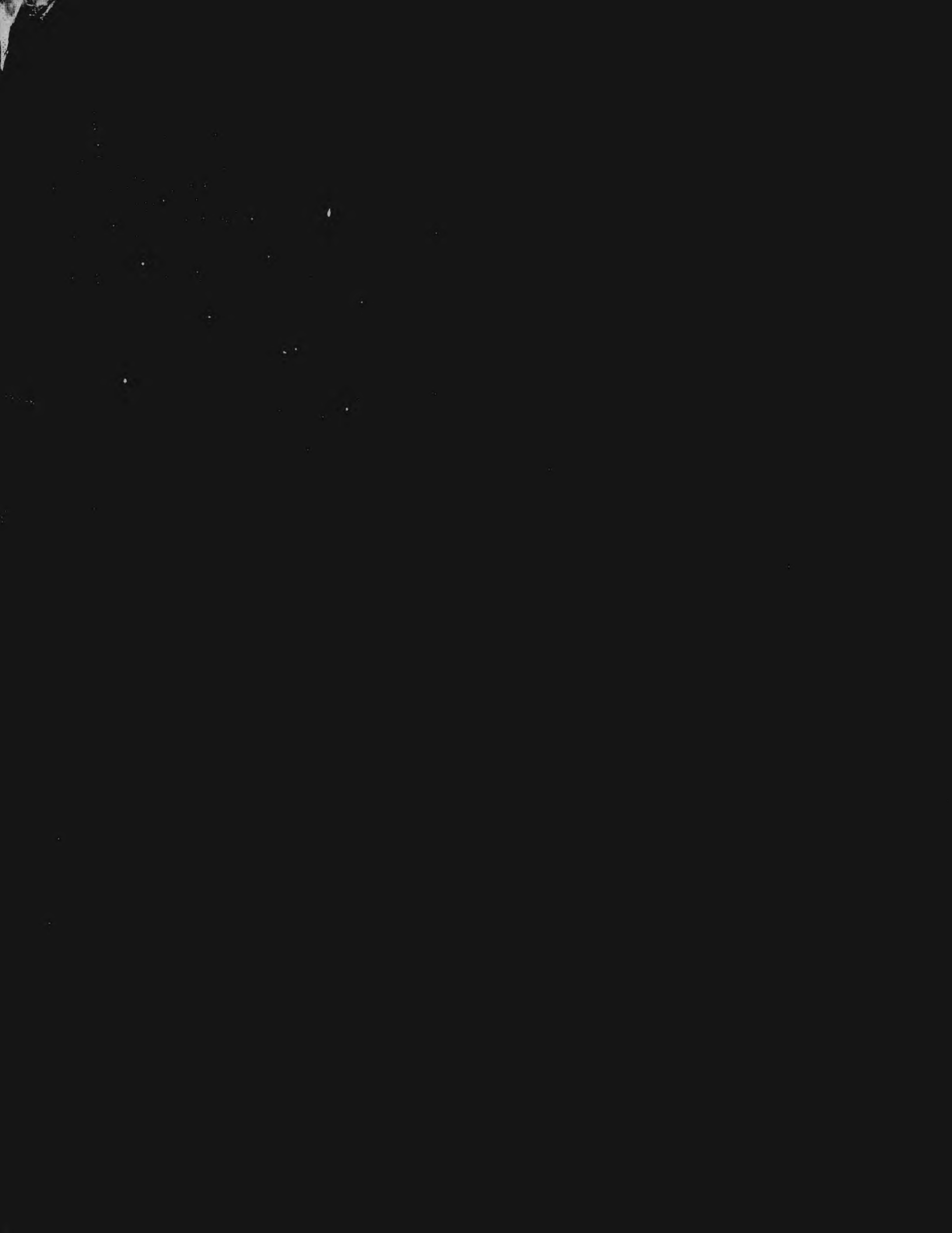
The only additional references found in Chemical Abstracts since its beginning cover the following two patents:

Vol. 19, p. 2277: "Pigment from Clay and Iron"
George Washington Carver, U. S.
Patent 1,541,478, June 9, 1925

Vol. 21, p. 2567: "Pigment for Use in Paints and Stains"
George Washington Carver, U. S.
Patent 1,632,365, June 14, 1927

One item not cited in the above abstract journals is the following additional patent:

"Cosmetic and Process of Producing the Same"
George Washington Carver, U. S. Patent 1,522,176,
Jan. 6, 1925



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