THE MENDEL NEWSLETTER

Archival Resources for the History of Genetics & Allied Sciences

ISSUED BY THE LIBRARY OF THE AMERICAN PHILOSOPHICAL SOCIETY

New Series, No. 16 December 2007

Mendel Newsletter To Go Digital

IMPORTANT NOTICE TO LIBRARIANS AND SUBSCRIBERS

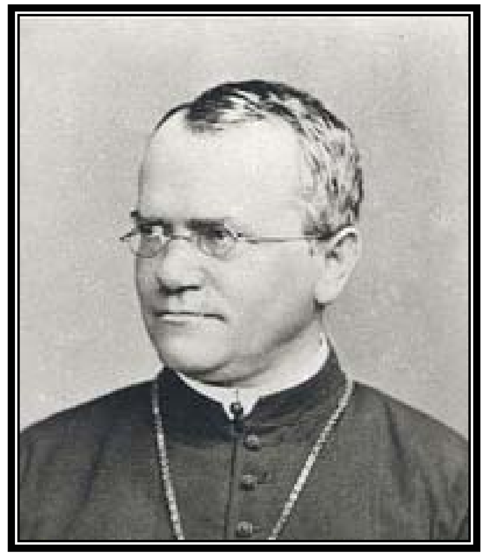
BEGINNING with the next issue, the *Mendel Newsletter* will be available exclusively in digital format. This will bring this title in line with other publications of The American Philosophical Society, which are now distributed electronically. This allows timely access by our international membership and researchers and students anywhere. Such accessibility from any place in the world continues the Society's founding purpose, 265 years ago, of disseminating Useful Knowledge. There will be no change to the high-caliber, informative content that our readers have come to expect in the *Newsletter*. The Editor still encourages inquiries about contributions to the next issue; and as before, there is no charge for the *Newsletter*.

Past issues of the *Newsletter*, 1996–2006, have been available for several years in traditional HTML format on the newsletter webpage: **www.amphilsoc.org/library/mendel**. When the next issue appears, it may be obtained on this web page in PDF format. Its appearance will be exactly like this traditional, printed publication. It may be easily and quickly downloaded; individuals and libraries who wish to retain paper copies of this publication may print their own. Subscribers and libraries will be given notice of each new issue's availability by e-mail. Back issues of many printed numbers of the *Newsletter* are still available upon inquiry to the Society's Library.

If you wish to continue to read the *Mendel Newsletter* free of charge, and to receive notices of its availability, please send us the email address you wish us to use. Send your address to:

Mendel@amphilsoc.org

Please Note: This email address is only for subscription information for the *Mendel Newsletter*. To reach the Editor regarding submissions and other editorial matters, see the contact information on page 2.



Gregor Mendel

IN THIS ISSUE

Mendel Newsletter

American Philosophical Society Library
105 South Fifth Street
Philadelphia PA 19106-3386

Editor
Michael Dietrich
Department of Biological Sciences
215 Gilman Hall, HB 6044
Dartmouth College
Hanover NH 03755
Michael.Dietrich@dartmouth.edu

Managing Editor
Martin L.Levitt
mlevitt@amphilsoc.org

Assistant Managing Editor
Earle E. Spamer
espamer@amphilsoc.org

Editorial Board

Subscription Information

The *Mendel Newsletter* is distributed once a year. There is no charge.

Beginning with the next issue, the *Mendel Newsletter* will be available *only* in electronic format and may be downloaded through the American Philosophical Society website. To be placed on an email list for notification of the newsletter's availability, send your email address to: **Mendel@amphilsoc.org**

For information on back issues and to download many recent issues, visit the *Mendel Newsletter* webpage: **www.amphilsoc.org/library/mendel**

Arno Motulsky Papers at the American Philosophical Society

Charles Greifenstein
Associate Librarian and Manuscripts Librarian, American Philosophical Society
cgreifenstein@amphilsoc.org

ONE OF the sweeter aspects of my job is occasionally traveling to acquire a collection. In February 2006 I went to Seattle to arrange for the shipment of the papers of Arno Motulsky of the University of Washington. Dr. Motulsky had already donated his books to his University (see *Mendel Newsletter 2006)*), but Dr. Motulsky agreed that his papers would join those of his friend, APS President Dr. Baruch Blumberg,, and the other geneticists' papers held in the Library.

It was my first trip to Seattle, and I was treated to some unusual weather: it snowed. I stayed at the Edgewater Hotel; rumor had it you could fish out the windows in good weather (I never quite believed it). I did not get to see much of the city (only Pike Place Market on the last day), having to use my time on the papers, from which I selected 160 linear feet out of about 250 for shipment east. I had the privilege, however, to spend almost two full days with Dr. Motulsky, my gentlemanly host, talking about his career, his papers, genetics, archive work, and many other topics. I returned to Philadelphia with some understanding of his career, but only later did I come to understand his eventful early life.

> **. . . many of Dr. Motulsky's professional interests show his continuing concern about medical ethics and, in a broad, humanistic sense, a concern about the moral life of humankind.**

Born in East Prussia in 1923 in the town of Fischhausen, Motulsky, who in early childhood had little experience with racism, saw anti-Semitism begin to increase following the Nazis' rise to power in 1933. The family moved to Hamburg in 1937 with the intention of emigrating to the United States, where Motulsky's uncle lived. Motulsky's father had to flee Hamburg in 1938, ending up in Cuba, awaiting his admittance to the US; the family he could not take with him lived through Kristallnacht in November 1938. Determined to emigrate, Motulsky's mother managed to gain passage to Cuba. While the S.S. *St. Louis* was at sea, however, the Cuban government invalidated most landing certificates, and passengers had to stay aboard after the ship docked. Negotiations failed and the ship sailed to the US, which refused entry; the ship had to sail back to Europe. Following world-wide clamor, several European governments granted the desperate passengers temporary asylum, the Motulsky's ending up in Brussels.

On May 1, 1940 the Motulskys obtained a US visa, but the Germans invaded on May 10; the Belgians arrested all German nationals. Men were detained, including 16-year-old Arno; women and children released. Bayonet-wielding guards forced the men to board cattle cars while a mob jeered. Crammed with over 50 men per car, without food and water, hit once by a bomb that killed 25, in four days the train arrived in western France. Moved from the first camp to another, St. Cyprien, Motulsky and other Jews were held even after non-Jewish Germans were returned home following France's defeat. Typhoid fever broke out, killing 60. Motulsky was moved to another camp, endured the lack of beds, lack of food, and rampant dysentery. Moved again to a transit camp in Aix-en-Provence, Motulsky managed to travel to Marseilles and renew his US visa. Arranging transit through Spain and Portugal, with ship fare supplied by his father (who had made it to Chicago), Motulsky was nearly detained by the Nazi-friendly Spanish government; the 17-year-old was ten days shy of 18, the age people were denied transit. In 1941 Motulsky was reunited with his father in Chicago. Motulsky's mother, sister, and brother survived their own harrowing experiences in occupied Europe; the whole family was reunited in the United States after the war.

This remarkable tale is documented in the Motulsky Papers by among other items interviews, biographical sketches, a brief incomplete diary (in German), a German passport, and a letter (in French) to the commandant of the St. Cyprien camp.

After settling in Chicago, Motulsky took a high school equivalency test and also found work in a virology lab at Michael Reese Hospital. A scholarship allowed him to enroll in premedical courses at Central YMCA College (later Roosevelt University). In an English class he met wife Gretel Stern, whom he married in 1945; they would have two daughters and a son.

Motulsky was accepted at the Medical School at the University of Illinois in Chicago. Shortly afterward, he joined the army and was assigned to the specialized training program, then sent to Yale to finish premedical courses. A brief stint as an orderly at a Boston-area military hospital preceded his return to Chicago for medical school. At first interested in neurology and psychiatry, Motulsky over the next decade would gradually come to focus his interest on medical genetics. Following graduation from medical school in 1947, he had his internship and residency at Michael Reese, where his research focused on hematology under the guidance of Karl Singer. Singer and Motulsky came close to demonstrating that the hemoglobin in sickle cells anemia erythrocytes was difference from normal red cells, but experiments with rabbits were not successful. Harvey Itano and others in Linus Pauling's lab later proved the difference electrophoretically, thus becoming "the first proof linking physical chemistry to genetic inheritance of a selectable trait affecting biological fitness." *ANB,* vol 17, Pauling, Linus, 167.

Recall by the Army in 1951 prevented Motulsky from taking a research fellowship in hematology offered by William Castle in Boston. Service at Camp Atterbury Hospital in Indiana was followed by a stint in William Crosby's hematology lab at Walter Reed Graduate School. In 1953 Motulsky became an instructor in hematology at the University of Washington, working with Clem Finch, who emphasized the importance of asking the right scientific questions and writing clear scientific papers.

Dr. Motulsky began giving lectures in medical genetics in order to acquaint students with the field. Urged to set up a division of genetics, Motulsky visited labs and was influenced particularly by James Neel. In 1957 the genetics division was established at Washington. Following the establishment of the department, Motuskly spent an academic year at the Galton Laboratory in England with Lionel Penrose that greatly benefited Motulsky and the new division.

In the papers at the APS, the documentation of Motulsky's activities in the 1950's and 1960's appears to be rather lacking. All the papers have been partially processed, divided into 14 series and reboxed. The dates range from the 1930's through the 2000's, but the bulk is from the 1970's through the 2000's. The papers thus mostly cover Motulsky's later career, when he still did research but also was very active as an editor, board member, teacher, and consultant.

Correspondence makes up the first series, although there is correspondence in other series as well (such as Organizations and Committees). The series is not arranged strictly alphabetically — some is chronological, as Motulsky had it—but I found correspondence from L. L. Cavalli-Sforza, Victor McKusick, Ernest Beutler, and Friedrich Vogel.

The conferences and meetings series has material from a variety of meetings. There are meetings represented that one could anticipate: the National Academy of Sciences, the American Society of Human Genetics. Other meetings represented in the papers include, for instance, many folders, dating from 1975-1997, on the March of Dimes' birth defects conferences. (In 1996 the March of Dimes Birth Defects Foundation presented Motulsky with the Colonel Harland Sanders Award for Lifetime Achievement in Genetics.)

In 1985 Dr. Motulsky attended a meeting of CANDLES—Children of Auschwitz Nazi Deadly Lab Experiment Survivors—founded by twins who survived Dr. Joseph Mengele's medical experiments. At the meeting evidence was heard by a distinguished panel about the ghastly experiments performed by the Angel of Death. Motulsky testified as an expert in medical genetics.

The University of Washington series covers administrative work at the University. Unfortunately, there appears to be not much on the founding of the department of genetics, nor on the Center for Inherited Diseases at the University, founded by Motulsky in 1972, nor on the establishment of the Center for Ecogenetics and Environmental Health. The archives at the University should cover these important events, however. There is in the UW series material about genetic counseling and grants.

The organizations and committee series documents the many advisory roles that Motulsky has played. Among the extensive files in the series are those on the National Academy of Sciences' Institute of Medicine. Motulsky served on the IOM Council from 1980-82. He also was chair of the Committee on Assessing Genetics Risks, and wrote the preface and contributed to its report, *Assessing Genetic Risks: Implications for Health and Social Policy* (1994). Another extensive file, ranging in dates from 1976-2001, is on the American Society of Human Genetics; Motulsky served as president 1977-78. Also, Dr. Motulsky served from 1979-83 on the President's Commission for the Study of Ethical Problems in Medicine and Biomedical and Behavioral Research and contributed to the reports of the Commission. Among the international committees with significant material is the Radiation Effects Research Foundation, for which Motulsky served as scientific councilor from 1983-97, and since 1969 he has served on the World Health Organization's Expert Advisory Panel on Human Genetics; the collection contains files about both committees. The significant reports produced by the committees on which Motulsky served often concern the intersection of science, ethics, and public policy.

As a leading geneticist of the last half of the twentieth century, Motulsky played an advisory role in the early formation of biotechnology firms. He served on the advisory boards of the firms as they were being established: Genescreen, Mercator, and Amgen. The Amgen files are fairly extensive and look to serve as a good source of information about its formation.

The research series is not large but contains a number of folders about Motulsky's research into glucose-6-phosphate pehydrogenase (G6PD) deficiency. A lack of the G6PD enzyme can cause hemolytic anemia. Motulsky went to the Congo in 1959 to study the deficiencies, which has the genetic benefit of granting the carrier resistance to malaria. The work in Africa resulted in a number of papers, but it was the saved blood samples that by happenstance proved more historically significant. A sample of a patient from Leopoldville, now Kinshasa, was in the mid-1980's shown to have HIV-AIDS antibodies present, the earliest known evidence of the HIV in a human sample. The patient's name is not known, but is designated in the research as L70. (See a popular account, *The River: A Journey to the Source of HIV-AIDS* by Edward Hooper.)

Arno Motulsky in 1941. Pencil on paper.

Motulsky held a number of significant editorships: *Human Genetics* (1969-97), the monograph series *Progress in Medical Genetics* (1974-2000), and is still editor of Oxford Monographs on Medical Genetics. The papers have files on these and many of the nine editorships he has held and twenty-six editorial boards on which he has served.

The papers also have material on the separate monographs edited by Dr. Motulsky, to which he was an important contributor. Among these books are *The Genetic Basis of Common Diseases*, and *Human Genetics: Problems and Approaches*, first published in 1979, now in a third edition and translated into Italian, Japanese, Chinese, and Russian.

Many of the articles by Motulsky (he has published about 400 papers) have a copy in the collection. One of the most significant appeared in *JAMA* in 1957. Writing at the request of the AMA subcommittee on blood dyscrasias of the Committee on Research, in three pages he first delineated what Friedrich Vogel in 1959 termed pharmacogentics. At the conclusion of his report, Motulsky writes:

> Genetically conditioned drug reactions not only are of practical significance but may be considered pertinent models for demonstrating the interaction of heredity and environment in the pathogenesis of disease. In [the conditions cited in the report] it can be shown clearly how hereditary, gene-controlled enzymatic factors determine why, with identical exposure [to a drug], certain individuals become "sick," whereas others are not affected. It is becoming increasingly probable that many of our common diseases depend upon genetic-susceptibility determinants of this type.[1]

What can be seen now as the common sense (based on the experimental evidence) behind Motulsky's report was at first more or less ignored. But as further research confirmed the evidence, pharmacogentics grew into a discipline and also spawned sister disciplines (which also receive Motulsky's attention) such as ecogenetics, nutrigenetics, and pharmacogenomics.

There are more aspects to Dr. Motulsky's career that should be mentioned: his genetic study of hyperlipidemia that led to the discovery of a new disease (familial combined hyperlipidemia) and made possible the Nobel Prize-winning work of Joseph Goldstein; his determining that a genetic polymorphism affects red color perception; his writings about genetic counseling; his research into diseases of Ashkenazi Jews. The collection at the APS awaits more comprehensive examination, and the preliminary arrangement will likely be revised. Dr. Motulsky will also be sending the APS more of his papers. But going through those deposited last year, two things became clear to me. First, Dr. Motulsky throughout his career has not forsaken clinical medicine, valuing his contact with patients as much as any other aspect of his work. Second, many of Dr. Motulsky's professional interests show his continuing concern about medical ethics and, in a broad, humanistic sense, a concern about the moral life of humankind. "While there are many bad things in this world," said Dr. Motulsky, "there is much good in human beings. We should try to bring out the best in people."[2] As a physician, teacher, researcher, and active professional, Dr. Arno Motulsky has done just that.

C ollection Contact Information:

Manuscripts Department
American Philosophical Society Library
105 South Fifth St.
Philadelphia PA 19106
manuscripts@amphilsoc.org

Notes

[1] Arno Motulsky, "Drug Reactions, Enzymes, and Biochemical Genetics, *JAMA*, Vol. 165, Oct. 19, 1975, 837.

[2] Profile of Dr. Motulsky. "Holding Out Hope in a Cruel World: Geneticist Arno Motulsky Recalls Wartime Europe," *UW Medicine*, vol. 25, no. 2, Fall 2002, 12.

Information for this piece came from the article in n.2 , and biographical and other files in the Motulsky Papers.

Discovery of the Correspondence of Hugo de Vries with His Friend and Colleague Jan Willem Moll

Ida H. Stamhuis
Vrije Universiteit, Amsterdam

"THERE IS also something in the basement. Would you like to see it?"

On 19 April 1993, I had been browsing for a couple of hours through notebooks of Jan Willem Moll (1851-1933), professor of botany in Groningen from 1890 to1921, hoping to find interesting information about his pupil Tine Tammes. In 1919 she had become the first professor of genetics and the second female professor in The Netherlands. I was studying her life and work. I had already gone through her most important genetic investigations and I hoped to find backgound information. Because I had been told that there was no Tine Tammes Archive, I hoped to find interesting material in the archive of her teacher, mentor and later colleague, situated in the library of the University of Groningen. Moll's notebooks, however, did not give me the feeling that I would be very succesfull. Therefore, when the librarian of the University of Groningen drew my attention to more "Moll Archive", I hoped to find something more interesting, but at the same time feared to find more of the same. I doubted if April 19, 1993 would become a fruitful day (see Stamhuis, 1995b, for a more extensive discussion).

When a helpful assistant opened one of the many cupboards in the basement, I didn't see notebooks but instead a number of files with letters. On the back of one was written "Hugo de Vries". When I opened it, I saw a large number of letters and postcards, all written by Hugo de Vries (1848-1935) and addressed to Moll. I immediately had the feeling that this discovery was interesting, but did not yet realize its full importance. Although I had a general knowledge of Hugo de Vries, I was not an expert. I had only recently begun to study the history of botany and the history of genetics around 1900, but had concentrated on Tine Tammes.

Only a few days later, when I discussed my discovery with other historians of science, the relevance of the discovery became clearer to me. I was told that, although there is a sizable "Hugo de Vries Archive" in the biological library of the University of Amsterdam, little of his personal correspondence had been preserved. It seems that De Vries destroyed almost everything. I then realized that my discovery was very interesting, although I needed to study the contents of the letters and had to look at other possible archival sources to establish its exact relevance.

At the University of Amsterdam, the archive of Hugo de Vries consists of 7.3 meters of documents. (Zevenhuizen, 1996, gives a description of the archive of Hugo de Vries and related archives). Was it not to be expected that the material in this archive was so copious and so interesting that the correspondence with Moll would add nothing new? Many letters to Hugo de Vries are preserved in the archive. The number of correspondents is about 400. Don't these letters contain the same kind of information than can be expected in the correspondence with Moll? The answer is no. First, there are only letters *to* Hugo de Vries in the archive, none *by* him. The letters from Miss E.D. Palmer and Th.J. Stomps are the most numerous: 81 from Stomps and 128 from Palmer). The earliest letters from Stomps (1885-1970), his pupil and successor, date from after 1910. Palmer's letters start after 1904. Miss Bessie Palmer was a teacher of botany at the Los Angeles High School, who met De Vries during his first trip to the USA in 1904 and who greatly admired him.

The letters show that the period of the 'rediscovery' [of Mendel's Laws] was the time when De Vries was immersed in the composition of *The Mutation Theory.*

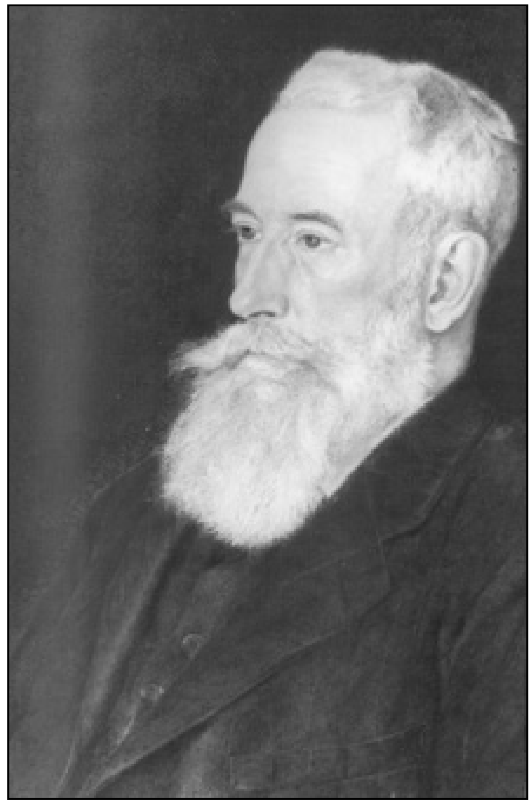
The correspondence with Jan Willem Moll is therefore unique; 396 items are by Hugo de Vries and 54 by Moll. They were mostly written in the years 1874 to 1904, while a few letters date from after that period. From the point of view of the history of genetics this is the most interesting period in De Vries's life. During these years he moved from plant physiology to evolution and heredity; he published *Intracellular Pangenesis* (1889), *The Mutation Theory* (1901 and 1903) and rediscovered Mendel's Laws (1900). A first glance at the collection showed that Moll and De Vries were on familiar terms, and that Moll was closely involved in De Vries's extensive and important scientific work. I will discuss some characteristics of this correspondence and describe its contents, as for most readers the Dutch language will constitute an impregnable barrier. First I'll sketch the lives and careers of both correspondents.

Hugo de Vries and Jan Willem Moll

Hugo de Vries was born in 1848 into a family of intellectual and political distinction. He lived in Haarlem close to dunes, woods and the sea. He regularly took long walks in these woods and dunes and studied the flora native to these natural environments. In 1868, when he was a student in Leyden, he read Darwin's *Origin of Species*, and became a keen adherent of Darwin's theory of evolution. In the same year he studied the recently published *Lehrbuch der Botanik* by the German Julius Sachs, in which the new plant physiological approach of botany was promoted. He participated in a competition entitled "What is known of the effect of heat on plant roots?" organized by the University of Groningen and was awarded the Gold Medal. He used some of the material from his prize-winning contribution in his PhD dissertation in 1870. Having gained his doctorate he visited Julius Sachs in Würzburg. As De Vries had to earn a living, he worked the next four years as was a secondary school teacher in Amsterdam. During this period he frequently spent his entire summer break at Sachs's institute.

In 1878 he was appointed lecturer at the University of Amsterdam, where he became a full professor in 1881. After his appointment in Amsterdam he lectured on evolution and heredity. In 1889 he published *Intracellular Pangenesis* and in 1901 and 1903 *The Mutation Theory*. In the Netherlands he became a public figure. Notwithstanding various job offers from Dutch and foreign universities (in 1910 from Columbia University), he remained in Amsterdam till his retirement in 1918. He became well-known by his role in the rediscovery of Mendel's laws and, especially in the United States by the publication of his *Mutation Theory.* He made three tours to the States, in 1904, 1906 and 1912, during which he visited colleagues, gave lectures and received honorary doctorates (Stamhuis 2005).

His friend and colleague Jan Willem Moll, never gained an international reputation. He was born in 1851. His father was a professor of theology. In 1870 he enrolled at the Athenaeum Illustrre, later the University of Amsterdam. Two years later, he met Hugo de Vries in



Jan Willem Moll

the Botanical Garden of the Athenaeum. In 1876 Moll was awarded his doctoral degree on a thesis on plant physiology. After a period as a teacher at a secondary school in Utrecht, he was appointed professor of botany at the University of Groningen in 1890. Moll's scientific contributions were mainly in the area of methodology and the development and refinement of research tools. In 1899, on his initiative, a new botanical laboratory was opened in Groningen, which was equipped for both teaching and research. This new laboratory became a model for all other new Dutch botanical institutes. Moll tried to establish an agricultural course at the University of Groningen. He also did his utmost to give his promising pupil, Tine Tammes, the opportunity to develop herself in accordance with her interests and abilities. In the end this resulted in her appointment as the first Dutch professor of genetics in 1919 (Stamhuis 1995a and 1995b).

The correspondence between De Vries and Moll

The period of the correspondence between Moll and De Vries covers more than fifty years, from 1872 to 1928. De Vries wrote many more letters to Moll in some periods than in others. It is noticeable that there are particularly many letters from De Vries to Moll, 101, more than a quarter of the total, during the four year period from 1887 to 1890. Many letters deal with De Vries's *Intracellular Pangenesis*, especially in 1888. In 1890 various aspects of Moll's appointment as professor are discussed. In the years from 1900 to 1903 De Vries wrote 65 letters to Moll. Many are devoted to De Vries's *Mutation Theory*, which he was then writing. After 1904, and more obviously after 1907, the frequency of the exchange of letters decreased to a minimum. It is not clear why this happened. The collection of letters written by Moll to De Vries is rather incomplete. I found these letters in three so-called "copy-books". Moll preserved copies of letters chronologically in these books, not only letters directed to De Vries, but to many other correspondents as well. The first copy-book starts in June 1887 (Stamhuis, 1995b).

After their first meeting in the Botanical Garden of the future University of Amsterdam, a friendship developed between Moll and De Vries. The first letter of the collection, written by De Vries on May 23, 1872, marks the beginning of their friendship (VM1, 23/5/1872). The next letter, written two years later, reflects their closer friendship (VM2, 1/8/1874). The subjects raised in this letter concern personal matters ("I will be very pleased to meet your future wife, for the moment I ask you to give her my sincere regards."), as well as impressions gained at work.

The letters written by De Vries contain many passages showing that De Vries was very fond of Moll. In 1876 when Moll was awarded his doctoral degree, De Vries was working in Würzburg. He invited Moll to come to Würzburg as well. He gave the following reason: "I should be very pleased if you could come, for despite the many people I know here, they are all acquaintances, but not yet friends" (VM 10, 7/9/1875). Moll equally valued his friendship with De Vries. In 1928, on the occasion of De Vries's eightieth birthday he wrote a letter saying: "These days our longstanding friendship brings to mind all kinds of memories, which are associated with gratitude for the many things I received from you, not only in the scientific field, but also in the areas of social life and friendship (…) The period of the composition of "The Mutation Theory, during which I was able to lend modest assistance, for which I am grateful to this day. My monthly visits to Amsterdam and your cordial invitations that I was always so happy to receive." (draft of Moll to De Vries. 1928).

The large number of requests by De Vries asking Moll to read and comment on drafts of his papers is striking. This happened for the first time at the end of 1876 and for the last time in 1904 (VM: 22/12/1876 and 14/4/1904). In 1878 Moll received a draft of De Vries's inaugural address for comment. De Vries reacted to Moll's comments saying: "I entirely re-edited my inaugural lecture in accordance with your recommendation, in fact I almost entirely rewrote it," and he continued, "nevertheless I did not like the result, and I don't believe you will like it. Therefore I have decided to write a completely new lecture on a somewhat different subject" (VM 35, 2/9/1878). There were other occasions when Moll's comment was so critical that De Vries found it necessary to rewrite a paper (VM 42, 28/10/1879). Apparently De Vries always considered Moll's criticism to be valuable.

The importance of the (re)discovery of Mendel's Laws

The question as to whether De Vries was an independent rediscoverer of Mendel's laws or not has taken up reams of paper. When I discovered the De Vries-Moll correspondence and learnt that it was an exchange of letters between good friends and colleagues, one of the first questions that came into my mind was whether a study of this correspondence would result in a final conclusion of this case.

I will quote parts of the letters that he wrote just before and just after March 14, 1900, the date when he posted the two short articles in which he claimed the independent rediscovery (De Vries 1900a and 1900b).

November 22th, 1899: De Vries invited Moll to have dinner and stay in his house on Saturday, apparently because there was a meeting of the Royal Academy. He announced *The Mutation Theory* as follows: "I would like to hear your opinion on a book I am writing, opposing the selection doctrine."

January 19th, 1900: De Vries wrote that he expected Moll for dinner on Saturday together with their Utrecht colleague F.A.F.C. Went. He mentioned he had received a paper by Tammes. Then he moved on to *The Mutation Theory*: "Now my manuscript of the first instalment of my *Mutation Theory* has been written. I always had in mind your advice "Don't make it too short." De Vries expressed his hope that Moll would comment on it. He announced that he intended to publish a list of students in botany and zoology and he asked Moll to send a list of students in Groningen. His aim was to restrict their number. He was of the opinion that there were too many.

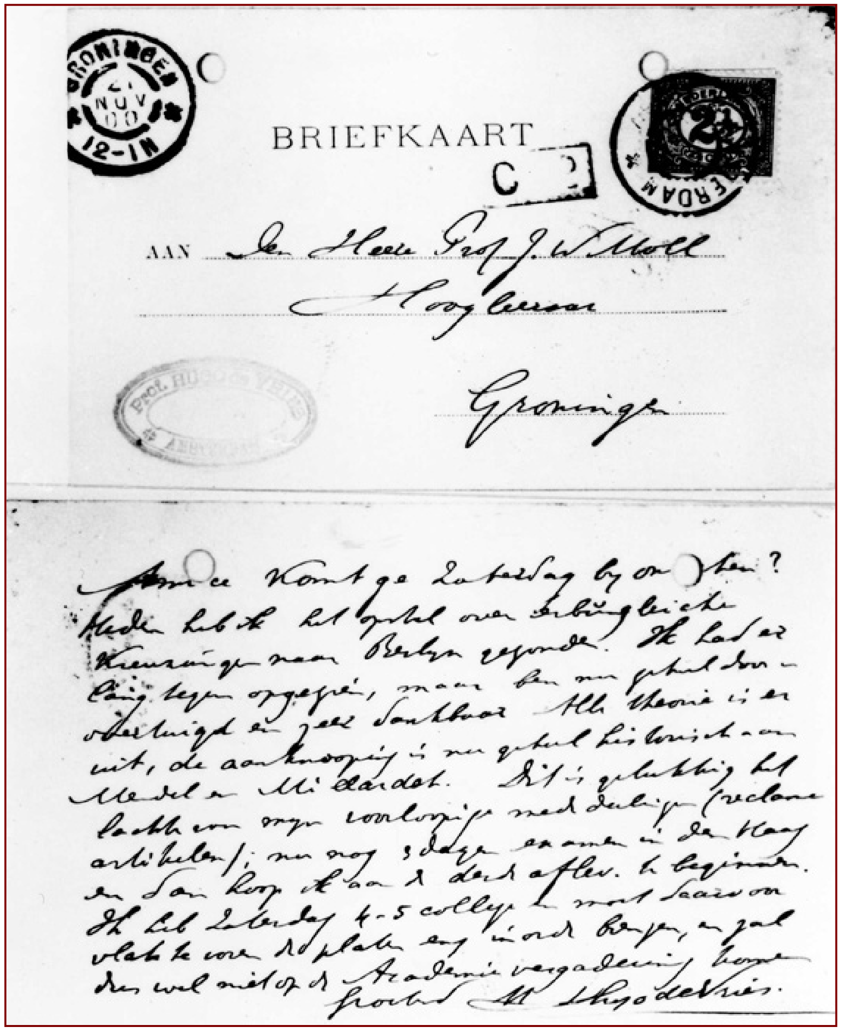
February 17th, 1900: "With some concern I read in the newspaper that more than 1000 people are ill with influenza in Groningen. We hope very much that you are both recovering. (…) Yesterday I totally unexpectedly received an offer from the firm Veit & Co at Leipzig, which offers 100 Marks a sheet for my book! Do you perhaps know that firm, and can you give me any information about it; even the name was unknown to me."

Between February 17th and March 17th (date illegible): "Thank you for sending the information and congratulations on your partial recovery. (…) I will now accept the offer of the firm Veit & Comp."

March 17th, 1900: "We shall be pleased to see you here. (…) Veit & Comp. want the title to be modified because they find 'Experimentelle Studien' too exclusive; they propose *Versuche und Beobachtungen über Vererbung im Pflanzenreich* [Experiments and Observations about Inheritance in the Plant Kingdom] or something. What is your opinion about this? Please think about it before Wednesday. Please, think about illustrations as well; they definitely want them (in the text). The contract came yesterday, I would like to discuss it with you before I sign it." There isn't any indication that De Vries also wanted to talk about his articles on Mendel's laws that he had just written and posted.

The next letter of *March 27th, 1900* gives no indication either that Mendel was a topic of discussion: "Now, you will no longer find any trace of Pangenesis. I'd like to know whether you find the foreword and the introduction good as they are, or what I still have to change before I make a fair copy."

April 4th, 1900: This letter is almost totally dedicated to *The Mutation Theory*. De Vries sent three sections of a chapter for comment. He hoped to reread the part on the *Oenotheras* and then he would occupy himself with the illustrations.



April 23rd, 1900. De Vries thanked Moll for his comments, which he incorporated with pleasure. He was occupied with the illustrations now. Then he changed the subject. He announced that he had sent the seeds Moll had asked for and he instructed Moll on how to sow them.

The letters show that the period of the "rediscovery" was the time when De Vries was immersed in the composition of *The Mutation Theory.* He started writing this enormous work around November 1899, and he had finished volume 1 by August 1901 (VM: 22/11/1899).

Mendel was mentioned for the first time in November 1900, more than half a year later. Then De Vries wrote: "Today I posted the paper on 'erbungleiche' hybrids to Berlin. (…) All theory has been left out and I have provided an historical link with Mendel and Millardet" (21/11/1900). One month later, De Vries wrote on the relationship between his pangenesis theory on the one hand and Mendelian hybridizations and "erbungleiche" hybridizations on the other hand. De Vries was taking Mendel's laws so seriously then that he took them into account when thinking about his pangenesis theory (VM: 18/12/1900).

Is it possible from the newly discovered evidence to draw a final conclusion on De Vries's role in the so-called rediscovery of Mendel's laws? The correspondence throws light on an important aspect of this event, viz. its relevance in De Vries's mind. If De Vries attached any significance to his possibly independent rediscovery of Mendel's laws around March 1900, this should have been reflected in the correspondence. We have seen that there isn't any trace of this during that period. These facts show convincingly that, in the spring of 1900, De Vries did not attach any importance to the discovery or rediscovery of Mendel's laws. He was engaged in the composition of the first volume of *The Mutation Theory*. In the early part of 1900

Mendel's laws were an unimportant sideline of De Vries's work. When De Vries referred to Mendel for the first time in this correspondence, the "rediscovery" had already occurred more than half a year before. Mendel's laws were then generally recognized as important, although they were not undisputed.

Although this correspondence did not solve the question of the independent rediscovery, this problem could be solved a few years later, as a result of the discovery of research notes in the archive of Hugo de Vries in Amsterdam. From these could be established that De Vries was an independent rediscoverer, although in the framework of his own ideas on heredity as formulated in *Intracellular Pangenesis* (Stamhuis et al, 1999).

Tine Tammes

De Vries's relationship to Mendel's Laws is of course not the only topic on which the letters shed new light. They also provide interesting information on other research topics in which De Vries was engaged as well as on the Dutch and international relations in the botanical world of that time. In addition I found interesting information on Tammes, the original reason for my interest in the Moll Archive (Stamhuis 1995a). Moll used his position, his influence, his friendship with De Vries and his organizational abilities to assist Tammes's scientific development. He had noticed her talents early on. In 1896 Moll wrote about her to De Vries: "She is indeed a very talented girl, who is devoted to science with all her heart." (MV: Copy book 3, p. 259ff. 12/11/1896) In 1889, a year after her appointment as his assistant, Moll wrote to Hugo de Vries: "And now something about Miss Tammes. Previously I have said to you that, sometime during her time as an assistant, I would like to second her to you to do some research under your guidance." (MV: Copy book 3, p. 420ff. 09/11/1898). Moll continued: "I know you don't at all like having a lady as a visiting researcher, but I think it will turn out better than you expect; she is able to work independently very well and to choose her own direction. Therefore I am sure you will not be bothered by her." Moll concluded this topic with the words: "I hope you will not reject this suggestion." De Vries answered: "With respect to Miss Tammes I have serious objections to your proposal, but if this is what you want, I will of course agree. But beforehand I would like to know more about the expectations you both have of it. My opinion is that it will be most disappointing." (VM: 11/11/1898). So thanks to the relationship between Moll and De Vries, Tammes could, for several months, do research at De Vries's laboratory. During this period Moll raised another topic, a job for her as an assistant at the Phytopathological Laboratory at Amsterdam. Moll had asked De Vries, who had been involved in the foundation of this institute, to use his influence to get Tammes appointed, but the latter wrote: "I fear that I can do as little for Miss Tammes as you. I am no longer a member of the board of the Phytopathological Laboratory (...). The problem is in particular that a lady cannot be required to inspect the fields in all weathers; I did it once when the weather was inclement, and it is dreadful work. (...) I have hopes that no one else can be found and that Miss Tammes will nevertheless be appointed" (13/02/1899).

As a result of the discovery of the correspondence I acquired a great deal of interesting information on Tine Tammes. Since then Hugo de Vries has become a research topic for me. The discovery made the headlines of the Dutch newspapers. 19 April 1993 turned out to be a fruitful day indeed.

____

Archive Street Address:
University Library
Broerstraat 4
9712 CP Groningen
The Netherlands

Archive Post Address:
Postbus 559
9700 AN Groningen
The Netherlands

http://www.rug.nl/bibliotheek

References

Ida H. Stamhuis, 1995a: A Female Contribution to Early Genetics: Tine Tammes and Mendel's Laws for Continuous Characters, *Journal of the History of Biology* 28, 495-531.

Ida H. Stamhuis, 1995b: The "Rediscovery" of Mendel's Laws Was Not Important to Hugo de Vries; Evidence from his Letters to Jan Willem Moll, *Folia Mendeliana* 30, 13-30. This journal issue appeared in 1997.

Ida H. Stamhuis, Onno G. Meijer en Erik J.A. Zevenhuizen, 1999: Hugo de Vries on Heredity, 1889-1903: Statistics, Mendelian Laws, Pangenes, Mutations, *Isis* 90, 238-267

Ida H. Stamhuis, 2005: Hugo de Vries's Transitions in Research Interest and Method, *Pre-Print 294 of the Max Planck Institute for the History of Science: "A Cultural History of Heredity III: 19th and Early 20th Centuries",* 115-136

Hugo de Vries, Das Spaltungsgesetz der Bastarde, *Berichte der deutschen botanischen Gesellschaft* 18 (1900a), 83-90

Hugo de Vries, Sur la Loi de Disjonction des Hybrides. *Comptes Rendus de l'Académie des Sciences* 130 (1900b), 845 a.f.

Hugo de Vries, Über erbungleiche Kreuzungen, Berichte der Deutschen Botanischen Gesellschaft 18 (1900), p. 435 a.f..
Hugo de Vries, *Intracellulare Pangenesis* (Jena: Fisher, 1889), reprinted in Opera E Periodicis Collata (Utrecht: Oosthoek, 1918-1927), 7 vols., Vol V, 1-149.
Hugo de Vries, *Die Mutationstheorie. Versuche und Beobachtungen über die Entstehung von Arten im Pflanzenreichh;* zwei Bänder (Leipzig: Veit, 1901-1903).
Erik J.A. Zevenhuizen, *De Wereld van Hugo de Vries,* (Internal Publication of the University of Amsterdam, 1996).

Archie Carr and Biology in the Twentieth Century: Insights from the Archie F. Carr, Jr. Papers

Frederick Rowe Davis
Florida State University

LIKE E.O. WILSON AND PAUL EHRLICH, the University of Florida ecologist, Archie Carr, demonstrates the diversity of biology over the course of the Twentieth Century. While many biologists and programs in biology turned to genetics and molecular biology, others remained committed to the naturalist tradition of the eighteenth and nineteenth Centuries. In studying the Carr's research into the ecology and conservation of sea turtles, I discovered much to support Paul Farber's conclusions in *Finding Order in Nature*. Farber demonstrated remarkable continuity between the naturalists of the eighteenth and nineteenth centuries and the practice of twentieth-century biologists, ecologists, and conservationists. The "naturalist tradition," as Farber employed the term, refers to the continuation of practices of natural history and views of nature that developed in the eighteenth century and continues to the present day.[1] Similarly, Carr's career suggests that nineteenth-century natural history evolved into the related fields of ecology, evolution, conservation, and eventually conservation biology over the course of the Twentieth Century. This brief essay indicates how the Archie F. Carr, Jr. Papers at the University of Florida inform this view of biology.

Early in his career as a herpetologist, Archie Carr extensively revised taxonomic classifications of turtles and described several species new to science. He also published many papers on the natural history of frogs, snakes, fish, and turtles. Through these activities, Carr developed a network of many of the American herpetologists who contributed to his education and professional development. Carr's *magnum opus* in herpetology was the *Handbook of Turtles* (1952), and it contributed significantly to what was known of the biology and natural history of turtles at the time.[2] Moreover, the book won the Daniel Giraud Elliott Medal of the National Academy of Sciences.

Carr published more than one hundred scientific papers on taxonomy and ecology. Many but not all of these were devoted to the ecology and migrations of sea turtles. In addition to technical monographs, Carr was a prolific nature writer. His subjects included Honduras, the Caribbean, Africa (two books), reptiles, sea turtles, the Everglades, and Florida (published posthumously). A careful study of Carr's publications reveals that unlike many scientists he was particularly attentive to local knowledge in developing his research agendas and in his writing, technical and popular alike. In his earliest papers on the reptiles and amphibians of Florida, Carr incorporated local stories. As he began to study sea turtles, interviews with Caymanian turtle captains provided valuable clues that Carr developed as hypotheses to test. While exploring the beaches of the Caribbean for evidence of sea turtle nesting, Carr encountered a cultural diversity as great as the natural diversity. Caribbean culture became the focus of two books.[3] Similarly, in Africa he relished local stories and myths regarding nature.[4]

As an ecologist, Carr's study of the ecology and migrations of sea turtles formed the basis for further investigations of sea turtles. Carr's conservation ethic developed out of his work in natural history. He drew upon his sea turtle life histories and scientific studies to target principal areas for conservation efforts. Archie Carr received numerous awards for his conservation efforts with the Caribbean Conservation Corporation, including the World Wildlife Fund Gold Medal (1973), the New York Zoological Society Gold Medal for biological conservation (1978), and an official post in the Order of the Golden Ark (Netherlands) for biological research and conservation (1978). The Ecological Society of America awarded Carr its highest honor, Eminent Ecologist, just weeks before his death in 1987. A National Wildlife Refuge in Florida bears Carr's name as a tribute to his pioneering work.

The genesis of sea turtle conservation appears in Carr's correspondence with Joshua Powers and the other founders of the Caribbean Conservation Corporation *. . .*

Throughout his career, Archie Carr tried to reach a larger audience than the community of scientists and conservationists. To that end, he wrote eight nature books for the public (one published posthumously). In addition to the prize given to the *Handbook for Turtles*, his publications received several major awards for writing: the O'Henry Memorial Award for a short story (1956), the John Burroughs Medal of the American Museum of Natural History for nature writing (1957), and the Hal Borland Award of the National Audubon Society for making a lasting contribution to the understanding, appreciation, and protection of nature through his writing and publications (1984).

During his fifty-year affiliation with the University of Florida, Carr taught thousands of students about natural history, evolution, and ecology. As an advisor and mentor, he supervised the doctorates of eighteen students, many of whom continued to work in biology and conservation. In honoring one of its most illustrious graduates and professors, the University of Florida promoted Carr to Graduate Research Professor (its highest academic rank) in 1959, granted him the Annual Outstanding Alumni Award in 1971, established the Archie Carr Jr. Postdoctoral Fellowship in the Department of Zoology in 1983, and named one of the zoology buildings in his honor. Many of Carr's former students and colleagues cherish memories of the charismatic professor.

The life and work of Archie Carr offers insights into the institutional history of the Department of Biology at the University of Florida and the Museum of Comparative Zoology at Harvard, the disciplinary history of herpetology, popular travel narratives, and the social history of popular conservation movements. Archie Carr's work and contacts serve as a guide to these general trends in the history of science. At the same time, the examination of developments in natural history produces a rich image of Archie Carr as naturalist, herpetologist, ecologist, and conservationist.

Archie Carr shared one of his greatest accomplishments with his wife Marjorie Harris Carr. The two naturalists were married for fifty years (1937 to 1987), and their marriage shaped many aspects of their careers. Before they came together, their lives followed parallel paths. In the early years of marriage, Archie and Marjorie Carr's interests continued to develop in tandem as Marjorie completed her master's degree studying the breeding habits of freshwater fish. Moreover, during the course of seven summers at the Museum of Comparative Zoology at Harvard, Marjorie worked in the Ornithology Collection (birds), while Archie studied the taxonomy of turtles with Thomas Barbour. After several trying years during World War II, when both were distracted from their mutual interests in nature, the Carrs spent five years exploring the tropical forests of Honduras together on horseback while their cook prepared meals for their growing family and a niñera (nurse) looked after the children (four in all by the time they returned to Gainesville and another arrived a few months later).

Though Marjorie's interest in ecology and conservation continued to develop, she was also primarily responsible for the children's upbringing. Each of the Carr children remembers their mother's efforts to "keep them out of daddy's hair," while he was working on an endless stream of writing projects. Marjorie continued her activities as part of the Gainesville Garden Club and the Alachua Audubon Club (which she co-founded). Through the latter group, she spearheaded the fight to save the Ocklawaha River from the ravages of the Cross-Florida Barge Canal (one of the first successful environmental campaigns to stop a project planned by the Army Corps of Engineers) Among Florida environmental activists, Marjorie Carr is better known than her husband (in fact, her efforts have received greater attention in the popular and scholarly literature). In addition, once the last of their children had started college, Archie and Marjorie resumed their collaboration. Marjorie's efforts produced a suite of important papers regarding the nesting ecology of sea turtles at Tortuguero. In studying Archie and Marjorie Carr, we find that they shared a remarkable relationship for its lasting mutual support of related interests, beginning with their passion for natural history.

In light of his long career, the Archie F. Carr, Jr. Papers (40 linear feet, 63 boxes) in Special Collections at the University of Florida offer considerable insights into his life and the development of natural history, ecology, and conservation.[5] The papers begin when Carr was in graduate school (he was the first person to receive a Ph.D. in Biology at U.F.) and continue to his death in 1987. The primary collection of papers is organized into four series: Published and Unpublished Manuscripts, 1935-1984; Correspondence, 1930-1987; Organizational Records and Sponsored Research, 1953-1985; and Miscellaneous Paper. In addition, there is a significant Supplement (14 boxes) to the primary collection that includes additional papers that contribute to each of the four series listed above. Finally, another supplement contains photographs of Archie Carr. A related collection is the papers of the Florida Defenders of the Environment, the organization that Marjorie Carr co-founded to save the Ocklawaha River from the ravages of the Cross Florida Barge Canal.

Rather than exhaustively detailing the contents of the collection, I would like to highlight several key sections it contains. With drafts of scientific papers and popular books, the Manuscript collection facilitates an understanding of Archie Carr as a writer. Though his gift for writing was recognized early in his education, it was a gift that was hard earned. The careful revisions on manuscripts indicate that his award-winning prose was the product of considerable effort. The correspondence with editors and publishers reveal typical concerns regarding distribution and promotion. After publishing two of his books, the editor at Knopf questioned Carr's decision to publish elsewhere. Even Alfred Knopf himself queried Carr in a letter.

The Correspondence files represent the richest vein of archival material in the Carr Papers. From his days as a graduate student in the early 1930s, Carr kept most of the incoming letters. He sent his first publication (on the calls of Florida frogs) to many of the prominent herpetologists in America. This gesture resulted in key professional contacts and long-term friendships. Among others, Carr's correspondence with Thomas Barbour at Harvard's Museum of Comparative Zoology reveals the most productive kind of intellectual relationship. Nearing the end of his career and life, Barbour took Archie and Marjorie under his wing and supported them through seven summers at the MCZ (1937-1943). He felt that interest in natural history was waning at Harvard and collaborated with Archie Carr on several papers regarding the taxonomy of turtles. In 1997, Marjorie Carr convinced the Harvard Archives to send copies of the letters in their collection to U.F. for inclusion with the Carr Papers.

Carr's voluminous correspondence continued throughout his career and there are exchanges with many biologists and conservationists covering nearly five decades. The genesis of sea turtle conservation appears in Carr's correspondence with Joshua Powers and the other founders of the Caribbean Conservation Corporation (CCC), which supported Carr's conservation efforts. Operation Green Turtle was an attempt to re-introduce sea turtles to the beaches of the Caribbean by releasing hatchlings from Tortuguero. As it became clear that Tortuguero held the largest colony of green turtles (*Chelonia mydas*) in the Western Caribbean, Carr and the CCC advocated for its protection as a National Park. Carr's friend and CCC Vice President, Guillermo Cruz became the voice of CCC in Costa Rica and worked with Mario Bosa and Alvaro Ugalde to obtain federal designation of the park. Though sympathetic to the idea of sea turtle farming early in his career, Carr later reversed his position and criticized the Cayman Turtle Farm for drawing upon natural stocks and creating a market for turtle products. In this effort, his student David Ehrenfeld joined him. In addition to these major discussions, Carr also corresponded with well-known scientists and authors such as E.O. Wilson, B.F. Skinner, Peter Matthiessen, and Marjorie Stoneman Douglass.

Series 3 (Organizational Records) reveals Carr's enviable grantsmanship. One of the most extraordinary aspects of Carr's research on sea turtles was his success in receiving federal funds. The National Science Foundation funded Carr's green turtle tagging program at Tortuguero, Costa Rica from 1955 to 1987, *continuously*, in itself an impressive record. In addition, the Office of Naval Research funded his research on the migrations of sea turtles and he enjoyed privileges to use Military Air Transport (MATs) flights to virtually anyplace in the world. Thus, he and his students were able to travel to Ascension Island in the middle of the Atlantic Ocean to tag the green turtles there. Late in Carr's career, he received generous funding from the National Marine Fisheries Service to conduct Western Atlantic Turtle Surveys, the first extensive surveys of sea turtle nesting across the Caribbean. Carr was the first Chair of the International Union for the Conservation of Nature's (IUCN) Marine Turtle Specialist Group and there are many exchanges with Sir Peter Scott, IUCN's first chair.

Finally, Series 4 contains miscellaneous papers on a range of issues and environmental debates in which Carr played a minor role.

In 1999, nineteen additional boxes were added to the collection. For the most part, the additional records are personal papers although there is correspondence between Carr and his editor at Alfred Knopf and the organizational records of the Caribbean Conservation Corporation.

Though unsorted, the Florida Defenders of the Environment Papers indicate how Marjorie Carr led the fight to save the Ocklawaha River. The Cross Florida Barge Canal was born of post-war shipping concerns and the project had considerable support in Congress and the White House. Authorized in 1965 with an appropriation of $10 million, the Army Corps of Engineers constructed two major dams and destroyed five thousand acres of forest in the process. For five years before authorization, Marjorie Carr led a campaign to stop the canal. Despite the devastating setback of the forest destruction, Carr and the FDE continued the fight until the canal President Nixon halted further work on the canal in 1971.

Inevitably, a brief account like this can only scratch the surface of a significant collection such as the Carr Papers, but my recent biography of Archie Carr gives a more detailed account of Carr's achievements in science and conservation and the continued role of the naturalist tradition in twentieth-century biology.[6]

Collection Contact Information:
Department of Special & Area Studies Collections
P.O. Box 117007
208 Smathers Library
University of Florida
Gainesville, FL 32611

Telephone: (352) 392-9075
Fax: (352) 846-2746

Email: special@uflib.ufl.edu

Notes

[1]Paul Lawrence Farber, *Finding Order in Nature: The Naturalist Tradition from Linnaeus to E.O. Wilson*, Baltimore: Johns Hopkins, 2000.

[2]Archie F. Carr, *Handbook of Turtles: The Turtles of the United States, Canada, and Baja California*, Ithaca, N.Y.: Comstock, 1952.

[3]See Archie F. Carr, *High Jungles and Low*, Gainesville: University Press of Florida, 1953 and idem., *The Windward Road: Adventures of a Naturalist on Remote Caribbean Shores*, Gainesville, University Press of Florida, reissue edition, 1979.

[4]See Archie F. Carr, Jr., *Ulendo: Travels of a Naturalist in and out of Africa*, Gainesville: University Press of Florida, reissue edition, 1993 and idem., *The Land and Wildlife of Africa*, New York: Time-Life Books, 1964.

[5]"Archie F. Carr, Jr. (1909 – 1987) Papers," a detailed finding aid, can be accessed at http://www.uflib.ufl.edu/spec/archome/MS30.htm.

[6]Frederick Rowe Davis, *The Man Who Saved Sea Turtles: Archie Carr and the Origins of Conservation Biology*. New York: Oxford University Press, 2007.

Trials and Registers:
The Archives of the Svaloef Weibull and Vilmorin Companies

Staffan Müller-Wille
Egenis, University of Exeter
S.E.W.Mueller-Wille@exeter.ac.uk

Christophe Bonneuil
Centre Koyré d'Histoire des Sciences et des Techniques
bonneuil@damesme.cnrs.fr

THE "CENTURY OF THE GENE" presents us with an astonishing success story. Starting from a relatively modest experimental basis, genetics achieved nothing less than the "atomization" of life within the first decade of the 1900s. As many historians have pointed out, this rapid development took place in contexts of intense social and economic "rationalization". Breeding profitable strains of agricultural plants became a major economic concern and provided one of the main incentives as well as arenas for developing and deploying genetic knowledge. Important Mendelians of the first decade of the twentieth century worked in institutions committed to agricultural and horticultural research: Edward M. East at the Illinois and Connecticut Agricultural Experiment Stations; William E. Castle at Harvard's Bussey Institution for Applied Biology; Wilhelm Johannsen at the Carlsberg Laboratory and later at the Royal Veterinary and Agricultural College in Copenhagen; William Bateson became first director of the John Innes Horticultural Institution in 1910, Erwin Baur Professor of Botany at the *Landwirtschaftliche Hochschule* of Berlin in 1911; and Erich Tschermak von Seyssenegg, one of the co-discoverers of Mendel's paper, worked at agricultural stations and later at the *Hochschule für Bodenkulutur* in Vienna. Garland Allen has emphasized that such connections suggest "that the very content of biological theory, as developed in the context of commercial breeding, has been conditioned by social, economic, and institutional, rather than "objective" biological, factors" (Allen 1991, 536).

Such a close connection with applied research seems to provide a straightforward explanation for the success of a new scientific paradigm: the prospect of economically useful results affords a powerful motive for promoting research, and practical successes can count as indirect evidence for the correctness of the science involved. Yet the relation is not as straightforward: On the one hand, it is exceedingly difficult to establish with sufficient confidence the share that a science like genetics may have had in the practical successes of plant-breeders, while traditional breeder's knowledge persisted as a partly autonomous technological paradigm that meshed in complex ways with developing scientific theories. On the other hand, research carries with it considerable risks, as it depends on explorative strategies that very often deviate from established standards and norms and may lead into dead ends or onto erratic pathways. In an application-dominated context, this may result in economic disaster. It therefore comes as no surprise that Mendelism initially met with suspicion, doubts, and even outright disbelief among many commercial plant breeders as well as agricultural scientists. The problems of breeders and geneticists, as Jonathan Harwood recently pointed out, were simply not the same (Harwood 2006, 238). In the following we want to draw attention to two institutional archives containing rich materials that may help to explore the uneasy relationship between the science of heredity and practical plant breeding in the late nineteenth and early twentieth century. While personal archives have been used to quite some extent to understand the early history of Mendelism, we believe it is crucial that institutional archives are considered as well, especially for the experimental records they may contain.

The Archive of Svaloef Weibull AB,

The experimental breeding station at Svalöv was installed from resources of the Swedish Seed Association (*Sveriges Utsädesförening*), founded by private entrepreneurs, state officials, and agricultural co-operatives in 1886. The motivation for its foundation was that land reform and mechanisation had created surpluses in agriculture that made export economically interesting for the first time in Swedish history. However, the English and German cultivars that had been imported to Sweden for their high returns did not endure its winter very well — in contrast to the traditionally cultivated, but less yielding, so-called "landraces" of Sweden. The expressed concern of the Swedish Seed Association was therefore to test the viability of foreign seed material under the climatic conditions of Sweden, to raise its viability, if necessary, by breeding, and to multiply and distribute the material thus tested and ameliorated to the market. Land for trials and multiplication as well as agricultural buildings, including a mill, were donated by the agriculturalist Birger Welinder, one of the main driving forces behind the Associations foundation.

In accordance with its practical orientation, the Assosiation initially hired a German agricultural engineer, Thomas Bruun von Neergaard from Kiel. Neergard relied on mass-selection procedures, but rationalized them through the introduction of defined criteria and specially developed measuring tools. In the winter of 1899/90 alone, 11000 individual plants of a single sort of barley were examined. Alongside cereals, potatoes, leguminous plants, and clover were tested. Neergard gave account of his work in annual reports to the Associations managing board.

In March 1891 a major reorganisation took place at Svalöv with the foundation of a separate and independent joint-stock company that was to be responsible for the multiplication and marketing of seed varieties raised at the experimental station, and which, as a matter of course, had exclusive access to these varieties. The Swedish Seed Association continued to run the experimental station, as well as a bureau for seed control. Neergard had left his directorship some months before already in protest against this change, which he viewed as going against the interest of commercial plant breeders and farmers. He was succeeded by Nils Hjalmar Nilsson (1856-1925), a trained botanist, who saw the company through further reorganisations regarding its relationship with the joint-stock company and its main sponsor, the Swedish state. His successor as director of the experimental station was Hermann Nilsson-Ehle (1873–1949), who held this post until 1939. In the 1950s and 1960, the experimental station did pioneering work on polypoidy. In 1980, the Swedish Seed Associations experimental station at Svalöv was integrated with the company again, now both forming the private company *Svaloef Weibull AB*, although the Swedish State initially held 40% of its shares. The com-any is today jointly owned by the agricultural cooper-ative *Svenska Lant-männen* and the *BASF Plant Science Holding* (see the company's website at http://www.swseed.com; for historical accounts of the Svalöv experimental station see Newman 1912, Sveriges Utsädesförening 1936, Olsson 1986, Widmalm 1999).

> **. . . economically useful results afford a powerful motive for promoting research, and practical successes can count as indirect evidence for the correctness of the science involved.**

While acknowledging his predecessors' successes, Nilsson Hjalmar Nilsson introduced a number changes at Svalöv. A chemical laboratory was set up, allowing to study protein content and baking quality of cereals. Nilsson himself, however, saw his chief task in establishing a "type collection (*typsamling*)" (Nilsson 1892, 129). Already in the first two years of his appointment, Nilsson raised the number of cultivated cereal strains to 2000, each of these strains occupying its own, little parcel on the experimental station's acres. Breeding was now to proceed by the creation and purification of pedigrees or "pure lines". This afforded the creation of meticulous registers and protocols, recording the development of strains grown at Svalöv over the years. In 1891, a journal was created (*Sveriges Utsädesförenings Tidskrift*), containing annual reports, maps over the experimental grounds, registers over the strains grown, and articles covering technological and scientific achievements made at the station. In the following years, the experimental station underwent a strong internal differentiation, with the creation of separate departments dedicated to the study of different species of agricultural plants. Under Nilsson-Ehle's directorship a department for chromosomal studies was added in 1931.

Due to the nature of its work, which may make it necessary to retrace varieties to their origin, the Svalöv station has kept an exceptionally well-preserved record of its early experimental activities, which today forms part of the company's library and archives. This is especially true of the register created by Hjalmar Nilsson to observe the development of individual "types" comparatively and over successive generations. This register consisted of three elements: a "journal of analysis" that recorded the results of comparative tests for yield potential of different strains; "descent cards (*härstamningskort*)", *i.e.* annual lists of which strains had been cultivated on which parcels; and finally, "field books (*fältböcker*)", in which a number of observations on each cultivated strain was put down for each year. The latter two together were called "register (*stambok*)", in analogy to a family register. The journal of analysis was mainly used to decide which strains were to be passed over to the joint-stock company for marketing, and mainly consisted of tables recording chemical and biological properties as measured in the laboratory. The register has a more complicated structure. The descent cards recorded which varieties were grown on which parcels during a given year, and on which parcels they had been grown in the previous year. Parcels were identified by a numbering system initially based on a complicated classification of fields and parcels according to species sown out and the season of sowing, but later simplified to running numbers. Varieties that were of interest for one reason or other would receive unique identification numbers or so-called "register numbers' (*stamboksnummer*)". It is thus possible to retrace some of the varieties developed at Svalöv to their "origin" from an individual plant in 1892 (see Anon. 1936, 54-56).

In the beginning, botanical observations were inserted into the descent cards directly. But they soon found their own place in the field books, which were correlated with the descent cards by the parcel numbers. Thus a lot more space was created for these observations. Field book entries included the following information: year; parcel and register number; parcel number for the previous year; parcel number of the following year; a detailed botanical description; further information on development, diseases and pests affecting the plants, as well as cultivation techniques applied. The register offers a unique opportunity to study in detail the breeding experiments that were carried out at Svalöv, and have recently been used to reconstruct the opportunities, but also obstacles, that Svalöv offered for Mendelian experiments like those carried out by Nilsson-Ehle in the first decade of the twentieth century (Müller-Wille 2005).

The library and archive of Svalöv Weibull AB contains two further sets of materials that are of interest to the historian of Mendelism. The library includes offprints and books owned by Nilsson-Ehle containing manuscript annotations. Annotations in a copy of Erich Tschermak's edition of Mendel's 1866 paper, for example, show how Nilsson-Ehle tried to extract the main lines of the Mendelian approach and how he grappled with the combinatorics it implied. It shows, in short, that Mendel's paper was used as a textbook by early Mendelians. The abundant files, finally, containing internal correspondence, minutes, and reports from the station document the intense conflicts that arose between Hjalmar Nilsson and Nilsson-Ehle over the introduction of Mendelian procedures at Svalöv (Roll-Hansen 1986; Tunlid 2004, pp. 55–64). There is also a large collection of photographs, documenting both life and work at Svalöv, as well as the various exhibitions that were organized by the station.

The Archives of Vilmorin Co.

The Vilmorin company originated in the eighteenth century from seed and plant companies (Geoffray, Lefèvre) that had existed since the seventeenth century. In 1781, it took the name "Vilmorin-Andrieux" that lasted until late in the 20th century. In 1967, the Vilmorin family sold the company, which is now a part of Limagrain, the fourth largest seed producer in the world.

From the late eighteenth century to the mid twentieth century, the company was headed by a dynasty of Vilmorins who were both energetic industrialists and dedicated natural scientists, most of them being members of the Academy of Agriculture and chairs of the Société d'Horticulture de France or the Société Botanique de France. Pierre d'Andrieux (1713-1780) bore the title of "Jardinier du Roi" and played a key role, together with his grandson Philippe Victoire Lévêque de Vilmorin (1746-1804), in the introduction of various exotic plants and crops to France. Philippe-André de Vilmorin (1776-1862) established in 1815 the experimental and seed production plots of the company estate at Verrières-le-Buisson, South of Paris, and spent most of his spare time in advancing dendrology and acclimatizing trees from North America. His son, Louis de Vilmorin (1816-1860) is famous for his breeding work on sugar beet and for the introduction of the pedigree technique ("sélection genéalogique", 1856) in plant breeding. This is how he formulated his approach:

> La puissance de transmission des caractères étant le point essentiel à déterminer, on conçoit combien il était nécessaire de récolter séparément les graines de chaque plante; cela m'a amené à posséder un état civil et une généalogie

> parfaitement correcte de toutes mes plantes depuis le début de l'expérience. (Vilmorin, 1856, 873)

Louis de Vilmorin also gathered important collections of cultivars for many crops and published detailed classified inventories (or catalogs) of cultivars (on wheat, see Vilmorin, 1850) that contributed to the constitution of "variety" as a central category and research object of agricultural research.

His son, Henri de Vilmorin (1843-1899) developed the firm beyond its traditional domains (flowers, exotic plants, market gardening plants and seeds and garden products), and was a successful commercial breeder in sugar beet, potatoes and cereals. By 1900, the company was a major one in Europe and employed near to 500 persons, as opposed to 170 in 1878. In the 1870s, Henri de Vilmorin was one of the first cereal breeders to use artificial crosses systematically to combine traits from two varieties, followed by inbreeding to fix the new combinations. From his crosses between productive and hardy English cultivars and precocious and good baking Aquitaine cultivars, originated most of the elite wheat varieties that dominated the French seed market in the first half of the twentieth century.

Henri's son, Philippe de Vilmorin (1872-1917) was not only a dedicated commercial breeder as his father was, but also inclined to more speculative research. After his conversion to Mendelism at the London International Conference on Genetics (1906), he played a key role in the introduction of Mendelism in France and organised the 1911 International Conference of Genetics in Paris. After 1906, he launched Mendelian studies concerning several species that led him to collaborate with William Bateson. In 1910, when his first Mendelian article was published (Vilmorin, 1910), he established a "laboratory of botany and genetics" at Verrières. Here, researchers pursued Mendelian research not only on cultivated plants (peas, wheat, rye, barley, beet, beans, potatoes…) but also on dogs (studies of the inheritance of the size of the tail and legs), boars (body color) and rats. Headed by Auguste Meunissier, the laboratory welcomed foreign geneticists recommended by Bateson or Punett, such as A. Hagedoorn and W. Backhouse and was, together with Cuenot's group in Nancy, one of the few research centers for Mendelian genetics in France. Thanks to various Mendelian crosses, Meunissier and Vilmorin documented at the 1911 Conference twenty characters in wheat whose inheritance was "Mendelian." By then Vilmorin's wheat collection contained no less than 1200 cultivars (Gayon and Zallen, 1998; Meunissier 1918).

Unfortunately for French genetics research, P. de Vilmorin died while still young in 1917, but the Vilmorin Company continued to support the development of genetics in France. In a context when French biologists ignored or rejected the chromosome theory, Auguste Meunissier reported on the 1927 international conference on Genetics as "*the crowning of the chromosome theory*" and the company developed cytological research, a domain that remained underdeveloped in French plant biology between the wars.

Most of the archives of the company, concerning the breeding work and scientific correspondence of the Vilmorins, was lost after the Company was sold some decades ago. Only fragments are now available to historians of genetics and plant breeding.

The documentation service of Vilmorin (now a subsidiary company of Limagrain Holding) near Angers (49), holds a few boxes of "archives" (preprints, press clippings, biographies, leaflets, and miscellaneous notes and a few letters) which unfortunately do not suffice to document Vilmorins huge commercial and scientific achievements. But this documentation service holds as well a great part of the library of the Vilmorins, including books from around the "rediscovery" of Mendel annotated by Philippe, and breeding registers for various crops (especially peas and vegetables crops)

The cereal breeding registers are kept elsewhere in a cereal breeding station of Limagrain's holding at Verneuil l'Etang (77), some dozens km SE from Paris. There, breeders keep with care and respect Vilmorins cereals breeding books. These include the "cahiers des céréales" (1873 and 1890 to mid-twentieth century) and the "experiences céreales" books (from 1908 on, with lay out of the experiment plots).

For the descent of artificial crosses until 1906, the yearly "cahier des céréales" breeding register entries typically featured the following information: parcel/row number; parcel/row number for the previous year; name of the parent cultivars; dates of ear formation and harvest; succinct key agronomic descriptions (sanitary aspect, size, ear characters, etc); and sometimes an indication of the decision taken for next year (eliminate the line, keep it or put it in yield experiment). It is interesting to see from these notes that Vilmorin did not hesitate to make a selection within F1 plants, a practice – typical of a practitioner managing thousands of cultivars and plots and trusting the "breeder's eyes" to detect "golden crosses" among this mass– that he progressively delayed to the F2, F3 and F5 generations after his conversion to Mendelism. The breeding books also reveal that Vilmorin made his first "croisements mendéliens" (i. e. crossing parent cultivars differing by only one trait so as to verify Mendel's 1:2:1 ratio in F2) in the spring of 1906. In 1907, Vilmorin, given the space constraint of his usual breeding registers, had to paste additional sheets into the register, on which he counted and calculated F2 ratios (for his "Mendelian crosses" but also for some of his usual crosses), and after 1908 calculations and Mendelian analyses were done in an additional register. So, as in the case of Svalöv, these breeding registers offer a unique opportunity to reconstruct the pathway by which Mendelism entered the experimental practices of Philippe de Vilmorin and to follow the breeding strategies at play and their evolution through time, before and after Vilmorin's conversion to Mendelism. This is still ongoing work but a preliminary conclusion is that Mendelism did not drastically change Vilmorin's breeding strategies and practices; breeding did not become a straight-forward application of Mendelism as some enthusiastic Mendelians have claimed; rather, a few of its pragmatic principles (do not select in F1, do not hesitate to use a parent bearing an unwanted trait together with wanted traits because independent assortment is more likely to happen than correlation) were integrated in a wider, complex and evolving technological paradigm (Bonneuil 2006).

Two additional resources might prove useful for the historian of plant breeding and genetics. The Vilmorins' herbarium (56000 specimens) is kept at the: Verrières-le-Buisson's town library (Bibliothèque Municipale. 13, rue d'Antony. F-91370; see http://www.savoirs.essonne.fr/dossiers/la-vie/botanique/article/type/0/intro/l-aventure-d-un-herbier-l-histoire-des-hommes) and will perhaps be used someday for historical work on plant breeding using molecular markers. Finally a 1923 movie showing the various steps of wheat breeding at Vilmotrin Company, held by the Bibliothèque Nationale, provides a unique grasp at breeders skills and material practices (Vilmorin, 1923)

Collection Contact Information:

Svaloef Weibull AB
SE-268 81 Svalöv, Sweden

Vilmorin Co.
[*N.B.*: Requests for authorization to consult these collections must first be submitted to Groupe Limagrain BP. 1. F-63720 Chappes]

Archives, breeding registers (except cereals), library and drawings: Vilmorin. Service Documenta-tion, F-49250 La Ménitré

Cereal breeding registers: Vilmorin-Limagrain-Verneuil Recherche, BP 3, F-77390. Verneuil l'Etang

---

References

Allen, G. E. 1991. Essay Review: History of Agriculture and the Study of Heredity – a New Horizon. *Journal of the History of Biology* 24, no. 3: 529-536.

Bonneuil, C. 2006. Mendelism, plant breeding and experimental cultures: Agriculture and the development of genetics in France. *Journal of the History of Biology* 39, no. 2: 281-308.

Gayon, Jean, and Zallen, D. T. 1998. The role of the Vilmorin Company in Promotion and Diffusion of The Experimental Science of Heredity in France, 1840-1920. *Journal of the History of Biology* 3: 241-262.

Harwood, J. 2006. Introduction to the Special Issue on Biology and Agriculture. *Journal of the History of Biology* 39, no. 2: 237-239.

Meunissier, Auguste. 1910. *La loi de Mendel et ses applications*. Versailles: Aubert et Cie, 1910.

Meunissier, Auguste. 1918. "Expériences génétiques faites à Verrières." *Bulletin de la Société Nationale d'Acclimatation de France* 65 : 43-55, 81-91, 115-121, 134-136 and 174-180.

Müller-Wille, Staffan. 2005. Early Mendelism and the subversion of taxonomy: Epistemological obstacles as institutions. *Studies in History and Philosophy of Biological and Biomedical Sciences* 36, no. 3: 465-487.

Newman, L. H. 1912. *Plant Breeding in Scandinavia*. Ottawa: The Candian Seed Grower's Association.

Olsson, G. (ed.). 1986. *Svalöf 1886-1986. Research and results in plant breeding*. Stockholm: LTs Förlag.

Sveriges Utsädesförening. 1936. *Sveriges utsädesförening 1886-1936: en minnesskrift*. Malmö: Skånska litogr. AB.

Roll-Hansen, Nils. 1986. Svalöf and the origins of classical genetics. In *Svalöf 1886-1986: Research and results in plant breeding*, edited by G. Olsson, 35-43. Stockholm: LTs Förlag.

Tunlid, Anna. N.d. Ärftlighetsforskningens gränser. Individer och institutioner I framväxten av svensk genetik. Lund: Lunds Universitet.

Vilmorin, Louis de, *Essai d'un catalogue méthodique et synonymique des froments qui composent la collection de L. Vilmorin*.Paris : Librairie agricole, 1850.

Vilmorin, Louis de, 1856. Note sur la création d'une nouvelle race de betterave - considération sur l'hérédité des végétaux. *Comptes Rendus des séances hebdomadaires de l'Académie des Sciences* 43 (1856): 871-874.

Vilmorin, Philippe de. 1910. Recherches sur l'hérédité mendélienne. *Comptes Rendus des séances hebdomadaires de l'Académie des Sciences* 151: 548-551

Vilmorin, Henry L. de. 1923. *Obtention et sélection des blés*. Gaumont (série enseignement, recueil

agriculture, 23m 14s movie). Available at the Bibliothèque National under IKM-4428(4).
Widmalm, Sven. 1999. Den stora växtförädlingsanstalten: Svalöf, Weibullsholm och vetenskapens samhällsroll under mellankrigstiden. In *Vetenskapsbärarna. Naturvetenskapen i det svenska samhället, 1880-1950*, edited by S. Widmalm. Södertälje: Gildlunds.

New on "Profiles In Science": The Rosalind Franklin Papers

LAUNCHED IN 1998, Profiles in Science®, located at http://profiles.nlm.nih.gov**,** is the National Library of Medicine's (NLM) online digital archive of twentieth-century biomedicine, science, and public health. Profiles in Science features extensive digitized collections of primary historical documents by Nobel laureates and other leading innovators in scientific fields, such as genetics and genetic engineering, psychopharmacology, AIDS and infectious diseases, and biological warfare. Current collections include, among others, the papers of pediatric surgeon and former U.S. Surgeon General, C. Everett Koop; co-discoverer of the double helix, Francis Crick; and geneticist and microbiologist, Joshua Lederberg. Using an exhibit-based format, Profiles highlights the richness and depth of NLM's collections within its History of Medicine Division and those of collaborating institutions, including the American Philosophical Society, with whom we have collaborated twice on the papers of Barbara McClintock and Salvador Luria. Exhibits contain a broad range of documents and visuals that are placed into context through in-depth historical narratives. Profiles offers viewers access to one-of-a-kind materials, such as unpublished letters, manuscripts, photographs, and audiovisual materials, as well as digitized copies of the key publications of these scientific pioneers.

In February 2007 NLM released a new Profiles collection featuring selections from the papers of the British chemist and crystallographer Rosalind Franklin (1920-1958). The original papers--housed at the Churchill Archives Centre of Cambridge University as well in the hands of Franklin's surviving family--were made available on Profiles through a collaboration. This marked the second trans-Atlantic collaboration for Profiles in Science, following the digitization of selections from the papers of Nobelist Francis Crick, whose papers reside at the Wellcome Library in London.

Rosalind Franklin is best known for her role in the discovery of the structure of DNA. It was her x-ray diffraction photos of DNA and her analysis of that data—provided to Francis Crick and James Watson without her knowledge—that gave them clues crucial to building their correct theoretical model of the molecule in 1953. While best known for this work, Franklin also did important research into the micro-structure and properties of coals and other carbons, and spent the last five years of her career elucidating the structure of plant viruses, notably tobacco mosaic virus.

As an online digital collection designed for researchers, educators, and students, Profiles is intended to be a user-friendly, virtual archive. We suggest that visitors begin their exploration of the Franklin collection through the Profiles homepage by clicking on Rosalind Franklin's name, listed among the names of other featured scientists under "Biomedical Research." On the main page of the Franklin collection visitors can read an introduction to the site and learn that documents and visuals may be accessed through various entry points, including the collection's exhibit narrative and the search and browse functions of Profiles. (Visitors may perform a text search within the Franklin Papers alone, or across all Profiles collections.) A link to the Rosalind Franklin Papers finding aid is also provided here, along with the contact information for the Churchill Archives Centre, should a visitor want to study the original papers.

The Rosalind Franklin Profiles site is organized into four exhibit sections, each containing a narrative guiding visitors through the significant periods of Franklin's scientific career and professional life: "Biographical Information," "The Holes in Coal: Research at BCURA and in Paris, 1942-1951," "The DNA Riddle: King's College, London, 1951-1953," and "Envisioning Viruses: Birkbeck College, London, 1953-1958." Within these sections visitors will find a wide array of scanned materials, such as pages from Franklin's lab notebooks from 1952-1953 on the possible structure of DNA (with annotations written by her scientific executor Aaron Klug), as well as correspondence to and from other notable scientists including Sydney Brenner, Francis Crick, and James Watson. Another highlight of the collection is a November 1950 letter from Franklin to J. T. Randall showing Franklin's preparations for crystallographic studies of DNA at King's college. Visitors may also view a draft manuscript of Franklin's own article that appeared alongside Watson and Crick's famous 1953 article in *Nature* on the structure of DNA. Hers was dated March 17, one day before the news of Watson and Crick's model reached her. Several of Franklin's publications are also available on Profiles in Science, including early articles on the structure and properties of coal, and later articles on the structure of the tobacco mosaic virus, the last of which was delivered for her at a conference four months after her early death at age 37 from cervical cancer. Other distinctive materials on the site that may interest visitors are the photographs from the personal collection of Franklin's sister, who loaned and then later donated to the Churchill Archives Centre photographs of Franklin as a three-year-old child with a baby carriage, Franklin at around age 12 with her siblings, and, as an adult, mountain climbing and traveling in Norway, the French Alps, and Italy.

Profiles in Science was launched nearly 10 years ago with the release of the papers of Oswald T. Avery. The most recent Profiles collection, the Sol Spiegelman Papers, was mounted in July. More collections will be added in the future.

The leadership of Profiles in Science includes Donald King, Elizabeth Fee, Clement McDonald, Aaron Navarro, and Paul Theerman. Current project staff include, in the History of Medicine Division's Digital Manuscripts Program: Meghan Attalla, Erica Haakensen, Walter Hickel, Christie Moffatt, Gregory Pike, Edwin Rivera, Susan Speaker, Sandra Taylor, and Michele Tourney; and on the Digital Library Research and Development team of the Lister Hill National Center for Biomedical Communications are Mike Flannick, Marie Gallagher, Xiaohui Ma, and Karl Wolf.

Our collaborators at Churchill Archives Centre, in particular, Allen Packwood and Sandra Marsh, are gratefully acknowledged.

Inquiries about Profiles In Science may be directed to profiles@nlm.nih.gov

Questions about researching NLM's History of Medicine collections may be directed to the reference desk at hmdref@nlm.nih.gov, or by phone at 301-402-8878. The Library is located at 8600 Rockville Pike, Bethesda, Maryland (Washington METRO stop: Medical Center) and is open 8:30 AM-5:00 PM, Monday through Friday except Federal holidays.

Please Remember

To receive notifications about
future issues of the new
Mendel Newsletter
available in PDF online
send your email address to

Mendel@amphilsoc.org

THE MENDEL NEWSLETTER

Archival Resources for the History of Science