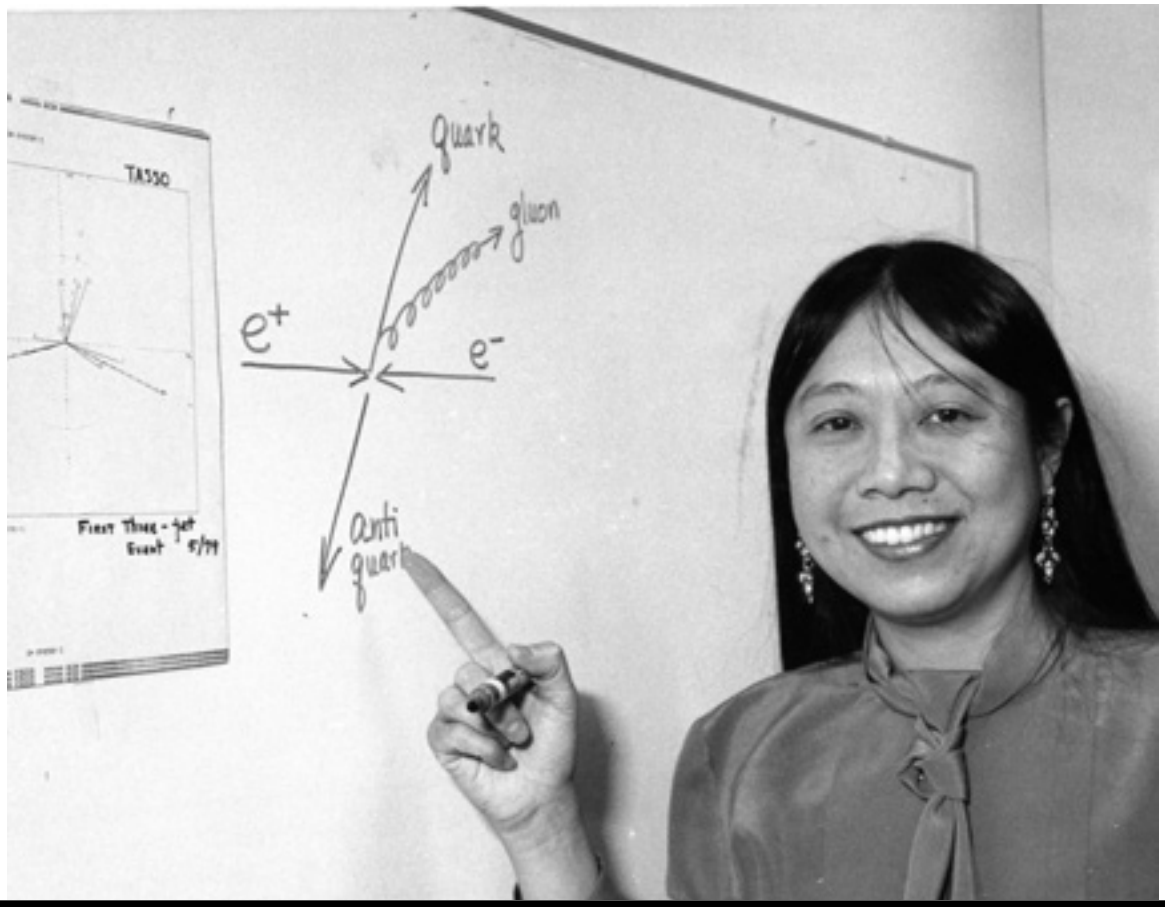
AIP

HISTORY NEWSLETTER

Volume 52 (2020), Number 2



Sau Lan Wu, Particle Physicist

Read this article on page 14.

A publication of the American Institute of Physics

ABOUT THE NEWSLETTER

This newsletter is a biannual publication of the Center for History of Physics, American Institute of Physics, 1 Physics Ellipse, College Park, MD 20740; phone: +1.301.209.3165; email: **chp@aip.org** or **nbl@aip.org**. Editor: Joanna Behrman. The newsletter reports activities of the Center for History of Physics, Niels Bohr Library & Archives, and other information on work in the history of the physical sciences.

Any opinions expressed herein do not necessarily represent the views of the American Institute of Physics or its Member Societies. This newsletter is available on request without charge, but we welcome donations (tax deductible) (**foundation.aip.org**). The newsletter is posted on the web at **www.aip.org/history-programs/history-newsletter**.

AIP Member Societies
Acoustical Society of America
American Association of Physicists in Medicine
American Association of Physics Teachers
American Astronomical Society
American Crystallographic Association
American Meteorological Society
American Physical Society
AVS: Science and Technology of Materials, Interfaces, and Processing
The Optical Society
The Society of Rheology

IN THIS ISSUE

Q&A WITH AUTHOR JAMIE HOLMES

By Corinne Mona, Assistant Librarian

Jamie Holmes. © Marissa Rauch Photography.

An image from *12 Seconds of Silence*. The aftermath of a V-1 strike in central London, June 1944. U.S. Army Signal Corps, National Archives.

The work of author Jamie Holmes has appeared in print or online in the *New York Times*, The *New Yorker*, *Slate*, the *Christian Science Monitor*, the *New Republic*, the *Atlantic*, *Foreign Policy*, *USA Today*, and the *Daily Beast*. As part of his research for his latest book, he used collections from the Niels Bohr Library & Archives: transcripts of four oral history interviews with Merle Tuve (30 March 1967, 6 May 1967, 13 January 1982, and 5 February 1982) and correspondence from the Samuel A. Goudsmit Papers, all of which are digitized and fully accessible online. We were delighted to catch up with him to ask a few questions about the book, titled *12 Seconds of Silence: How a Team of Inventors, Tinkerers, and Spies Took Down a Nazi Superweapon*.

What an exciting title! What is your book about?

World War II was the first war in history to be decided by weapons that did not exist at the start of the conflict. Everyone knows the story of the atomic bomb, but the bomb had no effect on the European war. *12 Seconds of Silence* tells the story of the secret invention that did: the proximity fuse. It's been called the first "smart" weapon. It's important to understand that at the beginning of the war, Allied antiaircraft guns were pretty much worthless. In the early weeks of the Blitz, it reportedly took an astounding 20,000 shots on average to bring down a single German bomber. The idea behind the proximity fuse was to install a little sensor inside an explosive antiaircraft shell that would go off automatically if a plane was within 70 feet. In effect, the device made Luftwaffe bombers look like 50-times-bigger targets. By the end of the war, the secret device was taking down a German aircraft with every 100 shots. The book focuses on the group of scientists and inventors who built the fuse, against very long odds.

In 1944, Section T's smart fuse faced off against perhaps its toughest target: the Nazi V-1 flying bomb. Over 80 days that summer, some 7,000 V-1s were launched toward England from occupied Europe. They were programmed to drop over London, and the average time that it took for them to strike after their noisy engines cut out was 12 seconds.

How did you get interested in this story?
Both my grandfathers fought in the war. As a boy, I heard stories of how my mother's father, a B-25 pilot, survived for a month after crash landing on a coral reef in New Guinea. His men suffered from gangrene before they were finally rescued. Back home, my grandmother worked as a draftsperson for military devices—for the Manhattan Project, as my mother recalls it. I've always been awed by the magnitude of World War II; I'm also a science writer. When I dug into the role that scientists played during the war, I discovered the amazing story of the fuse. The men and women who developed it raced against a ticking clock, overcame huge obstacles, and helped win the war. Yet most people have never heard of them.

How did you go about researching your book? What was your starting point?
I began with the archives at the Department of Terrestrial Magnetism in DC (now part of the Earth and Planets Laboratory). That's where the Section T started and where their leader, Merle Tuve, worked after the war. Many Section T reports were also available at the National Archives (NARA), as were military reports of the fuse in action. The Library of Congress has extensive holdings for Merle Tuve and for his boss, Vannevar Bush. Those three archival sources were the main depositories and the foundation of my research efforts.

How much research has previously been done with these records?
It quickly became clear that no previous writing on the fuse had properly drawn from the vast archives now available. The previous book on the fuse, an insider's history published in 1980, does not have a bibliography or endnotes. On top of that, many resources available at the National Archives were not declassified until 1993. I was living in New York City, and I knew that the archives would take at least six months to sort through. So I moved to DC. The result is that the book is highly original. I'd say around half is drawn from archives never written about before, as far as I can tell. I was able to correct several historical misconceptions, including the myth that the British "invented" the fuse and delivered it to the Americans who merely produced it. I was surprised that much of the writing about the smart fuse—one of the most important weapons of the war—turned out to misrepresent what happened.

What led you to the Niels Bohr Library & Archives (NBL&A)? What was your research experience like at NBL&A?
NBL&A holds the rights to four interviews with Merle Tuve, the leader of the fuse project. Two occurred in 1967 and two in 1982. They are, quite simply, the best available interviews of Tuve and a very valuable window into who he was as a person. He discusses his childhood and scientific career, and goes into detail regarding his wartime work and the fuse project. They were indispensable resources. I'm not sure what I would have done without them.

Do you have a physics background? How did this affect your research?
I don't, but I don't believe that hurts the book. The smart fuse presented engineering challenges more than anything. If I were writing a more academic volume, a background in electrical engineering might have helped. But Section T produced so much documentation—so many notes and weekly reports and summaries presented in lay language—that I never felt like I couldn't understand some central puzzle they were facing. At the beginning of my research, of course, there was a steep learning curve as I learned the vocabulary of the project.

Are there archival findings or odds and ends you uncovered in your research that stick out in your mind as memorable but did not make it into the book?
Yes! Reams of wonderful material never made it into the book. I have an electronic database of over 5,000 documents that contains all sorts of gems. Maybe the most memorable archival discovery came when I found samples of fuse parts from an explosives company.

continued on page 6

Do you have any particular habits while you're researching and writing, such as a certain time of day that you enjoy writing, music that you listen to, a certain food or drink, a lucky pencil, cell phone set to buzzing or silent?
I write in the morning and don't listen to music unless I'm doing something very menial, like formatting a bibliography. For fifteen years I've used Uni-Ball Eye Rollerball pens.

Do you have another project in the works? What will you work on next?
I do! My next project will focus on the Golden Age of flight.

References:

- Holmes, Jaime. 2020. *12 Seconds of Silence: How a Team of Inventors, Tinkerers, and Spies Took Down a Nazi Superweapon*. Boston: Houghton Mifflin Harcourt.
- Interview of Merle Tuve by Albert Christman. 1967 May 6. Niels Bohr Library & Archives, American Institute of Physics (AIP), College Park, MD, USA.
- www.aip.org/history-programs/niels-bohr-library/oral-histories/3894.
- Interview of Merle Tuve by Charles Weiner. 1967 March 30. Niels Bohr Library & Archives, AIP.
- www.aip.org/history-programs/niels-bohr-library/oral-histories/4920.
- Interview of Merle Tuve by Thomas D. Cornell. 1982 January 13. Niels Bohr Library & Archives, AIP.
- www.aip.org/history-programs/niels-bohr-library/oral-histories/4921-1.
- Samuel A. Goudsmit papers. Niels Bohr Library & Archives, AIP. https://repository.aip.org/islandora/object/nbla%3AAR2000-0092.

The author holds Merle Tuve's souvenir fuse, of the type used against the V-1s. The label reads "Tuve personal." Courtesy of the author.

Merle Tuve, with a camera around his neck, writing notes in 1966. AIP Emilio Segrè Visual Archives, John Irwin Slide Collection.

A NATIONAL HISTORY DAY FOR THE HISTORY BOOKS

By Audrey Lengel, Digital Collections Manager

It's only fitting that in this, the History Newsletter, we share a little about an annual event that draws roughly half a million participants from around the world to engage with and communicate their historical research. And did I mention they are all in middle and high school? I'm talking, of course, about the National History Day Contest.

The National History Day (NHD) program begins at the local level—students, with support from their teachers, present their projects (papers, exhibits, performances, documentaries, and websites) to their respective schools around the world. Winners from the local contests are invited to state- and affiliate-level contests, and then the top two entries in each category in these contests are invited to the national event, held each year in College Park, Maryland. Roughly 3,000 students end up participating in the week-long National Contest, which culminates in a raucous Awards Ceremony at the University of Maryland (UMD).

You may remember, back in 2018, that NBL&A sponsored the first History of the Physical Sciences & Technology Prize, which awards two scholarships, one to a junior- and one to a senior-level entry. The award recognizes outstanding entries that explore people or events in the history of science and/or technology. Past year's recipients' projects have been on topics such as Lise Meitner, Galileo Galilei, Philo Farnsworth, and the Manhattan Project.

In previous years, representatives from the Niels Bohr Library & Archives have traveled the long distance (one whole mile!) to UMD to judge and attend the Awards Ceremony to award our History of the Physical Sciences & Technology Prize to the winners. This year, however, the NHD National Contest was held virtually due to the COVID-19 pandemic. Some members of our staff read and provided feedback for virtual papers submitted by eighth graders about Jackie Robinson, Sally Ride, and Benjamin Lawson Hooks, and we watched the virtual Awards Ceremony in June from the comfort and safety of our computer screens at home.

Winners of the special History of the Physical Sciences & Technology Prize this year were Rohan Singh, from Washington Junior High School in Bentonville, Arkansas, and Reganne Watts, from Boise High School in Boise, Idaho, for their historical interactive websites. Rohan's individual website, titled Brahmagupta, the Jewel of Indian Mathematicians: Inventing the Idea of Nothing, won the junior special award, and Reganne's individual website, titled Maria Mitchell: Breaking Barriers to Prove the Sky Is Not the Limit for Women, won the senior special award. To view both websites, visit https://www.nhd.org/project-examples.

Anyone who has attended or participated in the day-long Awards Ceremony at the end of every NHD Contest knows how much of an inspiring, fun-filled day it can be. This year, as we all work and learn from a distance, it was a joy to watch the virtual Awards Ceremony and to celebrate and hear all about the incredible work being done by the next generation of historians.

For more information about this year's National History Day, visit: www.nhd.org/virtual2020.

The National History Day logo. Source: www.nhd.org/media-tools.

NBL&A staff Audrey Lengel (left) and Sarah Weirich (right) with Avary Serpa, one of the winners of the 2019 History of the Physical Sciences and Technology Prize, at last year's NHD Awards Ceremony. Avary, along with Helena Pajak, won in the Junior Group Performance category with their entry Stolen Glory: The Hidden Story of the Father of Television. Credit: National History Day National Contest 2019, www.nhd.org.

AIP FOUNDATION LAUNCHES

By Mariann Salisbury, Director of Development

AIP is proud to announce the formation of the AIP Foundation. At a time when funding models are rapidly changing and traditional supports for science are diminishing, we know we must make an even more profound commitment to our physical sciences community. We must invest more energy and resources in advocacy for the physical sciences, for scientific principles at large, and to benefit AIP Member Societies. Through these Member Societies, our community remains connected, informed, and vital. To support these efforts, the Foundation has been created to support AIP's charitable, scientific, and educational mission.

The AIP Foundation will raise awareness of the breadth of the physical sciences represented by AIP's Member Societies and the many ways AIP supports the sciences generally. The Foundation will help grow the AIP community of friends and supporters and the philanthropic support it needs to thrive.

Our network of committed donors and funders will make a transformative impact by

- Growing key history and student programs;
- Helping to attract and inspire others to join in partnership with us by demonstrating the critical importance of our community and its work; and
- Supporting AIP's most critical funding objectives and highest priorities.

We've housed and cared for many rare books in our Niels Bohr Library & Archives and have fostered a commitment to understanding the history of the physical sciences in our Center for History of Physics. We have brought together early career historians of physics—the leaders of the next generation of historians—to connect them to each other and to AIP's wonderful research resources.

Under the leadership of the Foundation's executive director, Tanya Easton, AIP's Development Office team will support

- A Board of Trustees devoted to building philanthropic partnerships and securing new financial resources integral to supporting and sustaining our community and its mission.
- The opportunity to advance the AIP federation and physical sciences in exciting new ways by moving beyond customary baselines in funding expectations and creating a powerful, public, philanthropic extension of our work.

Former director of the National Science Foundation, France Córdova, will be serving on the Board of Trustees as the founding chair. Córdova brings with her an immense appreciation and depth of knowledge for the physical sciences, as well as strategic thinking, consensus building, and leadership in relationship building to guide our new and growing board and in the launching of our new AIP Foundation.

The Foundation team knows that philanthropy has the power to help AIP realize ambitious new goals and reach new levels of impact. The Foundation team will work with AIP leadership, its trustees, and the broader community to continue raising support for our history and library programs, which are an integral part of our mission to advance the physical sciences for the benefit of humanity.

We hope you will continue to offer your generosity in support of AIP and that you will join us as we create an even stronger philanthropic presence through the Foundation. Know that your gifts will go directly to the AIP programs you designate after being recorded and receipted by the AIP Foundation.

For more information, please visit **foundation.aip.org**, but also feel free to contact us directly at **aipfoundation@aip.org**.

The logo in support of the newly launched Foundation.

TRIMBLE LECTURES

The Lyne Starling Trimble Science Heritage Public Lecture Series features prominent science historians and writers who highlight the important roles that science plays in modern society and culture. Due to COVID-19, until further notice all upcoming lectures, including those listed below, will be held virtually over a live Zoom webcast. A question-and-answer period follows each talk. Past talks are also available for viewing on the AIP History Programs' YouTube channel (**www.youtube.com/channel/UCb8Mbb-f04r_1sUKG2D17Yw**). More information, including talk abstracts and speaker biographies along with registration information, is available on the Center for History of Physics website: **www.aip.org/trimble-lectures**.

September 30, 2020

Manufacturing Hands: Japanese Robotics and Human Labor
Yulia Frumer, Johns Hopkins University

October 21, 2020

Tests and Testing: The Case of Hearing and the Making of Modern Aurality in the Long Twentieth Century
Alexandra Hui, Mississippi State University

November 11, 2020

ATOMIC SPY: The Dark Lives of Klaus Fuchs
Nancy Greenspan

December 2, 2020

When Condensed Matter Physics Became King
Joseph D. Martin, University of Durham

January 27, 2021

Science in the Post-Truth Era: A Decolonial Approach
Katemari Rosa, Universidade Federal da Bahia

February 17, 2021

How Prussian Precision Became Political
Kathryn Olesko, Georgetown University

WELCOME MESSAGE FROM THE ASSISTANT PUBLIC HISTORIAN

By Joanna Behrman, Assistant Public Historian

Joanna Behrman. Photo credit: Abel Corver.

"Do you like being in a laboratory or a library more?" A graduate school interviewer posed this question to me after I'd confessed that I was torn between attending graduate school in history or in physics. I didn't know it at the time, but it is fairly common among historians of science to have made a transition from science to history. My interviewer had made this transition himself, and answering the question of "laboratory versus library" had confirmed his decision. Answering this question also made something click for me and confirmed that a switch to history was right for me.

Up until this point in time, physics had been my dominant focus but was accompanied by a not-insignificant parallel interest in history. I had had experience with what it was like to learn physics, and a little bit of what it was like to do physics, but something never felt quite right. In retrospect, all the signs were there of a historian hiding in a physicist's body:

Do I like reading physics textbooks?—Yes
Do I like doing the physics problems?—Sometimes
Do I like talking to physicists about their lives and experiences?—Yes
Do I like listening to science research talks?—Not really
Do I like languages?—Yes
Do I like computer languages (i.e. programming)?—No
Did I once drop an experiment with the sample side down and pretend that it would still work fine and then further pretend to be surprised when it absolutely didn't work?—Yes. Yes I did.

Realizing that I preferred working in a library to working in a laboratory was probably the tipping point of a journey from physics to history that had been a longer time in the making. On the one hand, I felt motivated and creative while working in the history of science in a way that I never had while working in physics. On the other hand, I was hesitant to become one of the many women who leave physics after undergraduate school. This is sometimes referred to by the flawed metaphor of the "leaky pipeline." Although I had experienced incidences of gender-based harassment and discrimination, I eventually decided that history would likely have drawn me even without those experiences.

Nevertheless, my personal experiences and the stories told to me by other women in physics inspired me to focus my historical research at the intersection of the histories of gender, education, and science. How does education shape who does or does not become a physicist? And what role has gender played in shaping the education, opportunities, and labor of physicists? Taken as a whole, these are fairly broad questions with very long answers. I have chipped away at them in discrete projects. My PhD dissertation, someday to become a book, examined the lives of female physicists at women's colleges before World War II. In that work, as in my work at AIP, I wanted to move the study of women in the history of physics from the periphery to the center. I started this new position just after finishing up my graduate studies at Johns Hopkins in July of this year.

As the assistant public historian at AIP Center for History of Physics, I oversee education and outreach initiatives, which include the Teaching Guides on History of the Physical Sciences. Some of you may note that the teaching guides have undergone a slight name change, as they used to be called the Teaching Guides on Women and Minorities in Physics. There were a few different motivations for the change, including

- To acknowledge that the teaching guides cover many areas of the physical sciences, not just physics,
- To move away from use of the term "minorities,"
- To remove the implication that "women" and "minorities" are two separate groups, thus ignoring women of color,
- To incorporate and center these teaching guides as part of the larger history of physics rather than implying that they are relegated to a niche interest.

Previous articles in the *AIP History Newsletter* have noted how the goal of the teaching guides is to draw in and uplift diverse voices in the history of physics into K–12 and college classrooms. One aspect of this is to normalize the history of women in physics as the history of physics and the history of people from minoritized groups in physics as the history of physics.

Screenshot of the new landing page for the Teaching Guides, available at history.aip.org/teaching-guides.

Thanks to this year's wonderful SPS summer intern, Maria Stokes, three new lesson plans have been added online: "France Córdova & Multiwavelength Astronomy," "The Heritage of all Mankind - Abdus Salam and the Four Fundamental Forces," and "On the Shoulders of Giants: Inertia from Ibn Sina to Newton." These lesson plans illustrate how we hope to improve the other lesson plans currently uploaded to the website and all future lesson plans. For instance, two of the new lesson plans feature educational videos available to watch on the AIP History YouTube channel. In addition, all three of these lesson plans incorporate science lessons which will fit easily into a high school or college class in physics or astronomy. We hope to create additional educational videos and incorporate more science lessons into the teaching guides.

Other responsibilities of being AIP's first (and so far only) public historian include working on the Trimble Public Lecture Series, our social media outreach, and this very newsletter. All of these projects bridge worlds, and, in fact, the purpose of a public historian is to connect history to different audiences outside specialized academics.

The Center for History of Physics has a foot in the world of physics and a foot in the world of history. We connect with those who are professionals in their fields, students of their subject, or simply interested enthusiasts. As a public historian I hope to expand our outreach in these communities and to the public more broadly. To this end we are continuing to improve our existing projects (and have a few new surprises up our sleeve).

For instance, although initially motivated by public health concerns following the onset of COVID-19, the move of our Trimble Public Lectures to an online format has drawn a larger and more diverse audience than ever before. As you will see in this newsletter on page 9, we have an exciting slate of speakers scheduled for the rest of 2020 and early 2021, including two speakers who will give their talks from outside the United States. And for those of you on social media, our Twitter account is bringing you news and articles from the history of physics, as well as updates about the new resources at the History Center, appearing daily.

We post new transcripts of oral history interviews online to the AIP website every week—wouldn't you like to be the first to hear about them?

And you might not notice the subtle changes coming to the Newsletter, as they are mostly behind-the-scenes, but perhaps you will enjoy the regularized publication schedule. And do you have a short article you would like to publish in this venue? We accept submissions on a rolling basis, with a deadline for the Fall issue of September 15th and for the Spring issue of March 15th. Email me for more details at **chp@aip.org**.

Stay tuned for more exciting updates, and I hope everyone finds something in these expanded projects to spark their interest—whether they like working in a library, a laboratory, or elsewhere.

WELCOME MESSAGE FROM THE ASSISTANT ORAL HISTORIAN

By Jon Phillips, Assistant Oral Historian

Jon Phillips working from his home office. Photo credit: Jon Phillips.

Last summer, a friend suggested that I apply for a NASA Heliophysics Oral History Fellowship at the Center for History of Physics. If I'm being honest, I was a little hesitant at first. I'd had training in oral history in grad school, but my very first interview was a complete train wreck. The eminent scientist I was interviewing arrived almost three hours late, visibly intoxicated, and spent the next ninety minutes dwelling on personal grievances and sharing anecdotes illustrating his own odd and occasionally criminal behavior. Not only was it probably the single most awkward and uncomfortable conversation I've ever had, his condition was such that there was no way I could ethically use the interview in my work. After days of preparation and hours of travel, I had nothing to show for it. I decided that maybe oral history wasn't really for me. But eventually, after talking with other oral historians about their experiences, I realized that this first, disastrous interview was probably a once-in-a-career fluke. This CHP fellowship might be the perfect opportunity to wade back in. I'd already gotten my worst interview ever for my whole career out of the way, and everything would be great from here on out.

Then, the morning of my first interview for the heliophysics project, I found a nest of angry hornets living in my hotel room.

Despite the somewhat ominous start, that trip was an amazing experience. I flew to Boulder, Colorado, and interviewed four researchers working on different aspects of solar physics and space weather. These interviews showed me what oral history is supposed to be like. The scientists I sat down with were not only delightful people, they were active and engaged partners in producing the oral histories. In the course of my dissertation research, I'd read thousands of pages of interview transcripts, but the experience of actually producing oral history as a creative, collaborative process was revelatory. I was hooked and managed to extend the original three-month fellowship for another round, and then another. And when a permanent position for an Assistant Oral Historian opened up, I leapt at the chance.

The timing of all of this was very fortuitous. Oral history has always been central to CHP's mission, but it wasn't until last November that we hired our first Oral Historian, David Zierler, and a dedicated oral history program within CHP began to take shape. Over the past year, David and I have been working to build that nascent program into the main institutional home for oral histories in the physical sciences. The collection we inherited contains over 2,000 interviews, going back over six decades. Transcripts of many of these interviews are available on our website, but there are hundreds that, for various reasons, have not been processed or published online. The first project I undertook as Assistant Oral Historian was to track down these unpublished interviews, determine why they weren't included in our digital collection, and whenever possible, start moving them toward publication. This is a significant, long-term effort, but as a first step, we've already had dozens of previously unprocessed interviews transcribed. Over the next year, in collaboration with NBL&A, we hope to make many of these transcripts available to researchers for the first time.

But the real story of what we've been able to accomplish in our first year again comes down to timing. 2020 has been a cascade of escalating, mutually reinforcing crises. These crises have disrupted society in ways that would hardly have been imaginable even a year ago. They've also had major implications for the work we've been doing in the oral history program. COVID-19 has completely transformed the process of conducting oral history interviews by making it impossible to meet with anyone face-to-face. Instead, we've embraced the use of videoconferencing platforms like Zoom. Without having to worry about travel, and with most of our interview subjects already working remotely over Zoom, we've been able to produce more interviews in any given week since the pandemic started than we otherwise would have in a month. By the year's end, we'll have added over 300 new interviews to our collection.

Beyond the number of interviews we've been able to do, we're also capturing crucial stories. The most striking example of this is a series of interviews from earlier in the year with NIH physicists at the leading edge of research into the novel coronavirus. But almost every interview we've done this year has explored the disruptions university and government research has faced, or academia's reckoning with racial injustice, or the newly uncertain future we're all facing. I think it's safe to say that these stories will be of significant historical value beyond the history of the physical sciences.

Most of my own interviewing this year has been on the heliophysics project, which finally concluded at the beginning of October. I'm now developing an interview agenda around a few new themes and topics to work on next. For instance, I've recently conducted the first of what I hope will be many interviews on astrobiology, a field that sits at the intersection of astronomy, planetary science, organic chemistry, evolution, ecology, and more. I've also been surprised by the number of physicists I've interviewed who are not just readers, but published or aspiring authors of science fiction; this will hopefully be the basis of a future oral history project. And the issue of social justice and activism in science comes up frequently in interviews, but I'd like to make it a more explicit and central focus going forward.

The oral history program has grown faster and accomplished far more than we expected in its first year. I'm glad I get to be a part of that and am very excited to see where we go from here.

SAU LAN WU: PARTICLE PHYSICIST

By Caitlin Shafer, Library Project Assistant

One day, as I was assembling a book display, I stumbled across a page about Sau Lan Wu in one of our library books: *Women in Science: 50 Fearless Pioneers Who Changed the World*, and I was inspired to find out more about her. Her profile stood out to me as one of the few women of Asian heritage in the book. The timing was appropriate since Asian Pacific American Heritage month was approaching. As I began researching her more closely, I found Sau Lan Wu's life story fascinating and worthy of attention. Currently, Wu is the Enrico Fermi Distinguished Professor of Physics at the University of Wisconsin-Madison, and she continues to contribute to scientific innovations to this day.

Portrait of Sau Lan Wu. Credit: Robert Palmer, Brookhaven National Laboratory, courtesy AIP Emilio Segrè Visual Archives.

Sau Lan Wu was born during the Japanese occupation of Hong Kong in the early 1940s during World War II. She grew up in poverty. Her mother, Ying Lai, was the sixth concubine to Tat Chee U, a wealthy man who became known as the Ginger King for his control over the ginger industry at the time. Lai lived with U during her pregnancy, but she was disliked by U's primary wife and was cast out shortly before giving birth to Sau Lan Wu. As a child, Wu slept next to a rice shop and attended a school in the slums. When Wu was 12 years old, her father played a more active role in her life and facilitated her family's move to an apartment in a better region. It also seems that he funded Wu and her brother's better education at missionary schools.

After completing secondary school in 1959, Wu was determined to become financially independent of men, and her illiterate mother urged her to pursue an education and supported her desire to go to college. She randomly selected the names of 50 colleges from a hefty library book and applied to all 50 schools. Vassar College offered her a full scholarship in 1960, and Wu accepted. She arrived in the U.S. with only $40 in her pocket, but her overall experience at Vassar was a positive one. A group of Vassar alumnae women greeted her with a homemade cake when she first set foot in the U.S. in San Francisco. Then, when she arrived in New York, the alumnae took the time to show her the Metropolitan Museum of Art. In addition to her scholarship, Vassar allowed her to charge her school books to the college bookstore, and Vassar students kindly bestowed clothes upon her. A professor even paid Wu to iron her suits—even though Wu accidentally burned a large hole in one suit (Dawson 2003). Finally, Wu graduated summa cum laude after completing her degree in only three years.

She next decided to pursue a higher degree in physics. At that time, Princeton only admitted wives of male faculty. Caltech rejected her, stating that it had no dorms for women and claiming that it only selected "exceptional" women (Schmitt 2019). However, she received offers from Berkeley, Columbia, Yale, and Harvard. It was Harvard's PhD program that Wu chose. She also happened to be the only woman Harvard accepted in her area of study that year.

After graduating from Harvard in 1970, MIT offered Wu a research associate position. In 1974, Sau Lan Wu and her team at Brookhaven National Laboratory helped discover a fourth type of quark called the "charm quark." Their finding was referred to as the November Revolution, because it helped lead to the development of the Standard Model of particle physics (Roebke 2018). The 1976 Nobel Prize committee gave credit for this discovery to two men: Burton Richter and Samuel C.C. Ting (Nobel Media 2020). Wu was not awarded the prize, despite her team's fundamental work in the discovery.

In 1977, the University of Wisconsin-Madison hired Wu as an assistant professor. After about two years as a faculty member, she led her team at the University of Wisconsin-Madison to discover the gluon, an elementary particle that helps hold quarks together. Later, in 1995, she received the European Physical Society Prize for High-Energy Physics for her gluon findings.

In July 2012, Wu was a member of the team at the European Organization for Nuclear Research (CERN) that identified

what appears to be the Higgs boson particle, the missing component of the Standard Model of particle physics. The observations and data thus far seem to indicate that the particle is in fact the Higgs boson. The current theory is that the Higgs boson particle imparts mass to all the elementary particles through the "Higgs field." However, the challenge has been proving this theory for each type of elementary particle through experimentation. Physicists have managed to provide evidence that muons, the "cousins" of electrons, do receive mass from the Higgs, but more study is needed in order to achieve confirmation regarding the other elementary particles (Garisto 2020).

In addition to those mentioned above, Wu has won a variety of honors and awards during her lifetime. Some of these include the Outstanding Junior Investigator Award of the U.S. Department of Energy (1980), Fellow of the American Physical Society (1992), Fellow of the American Academy of Arts and Sciences (1996), and more.

Would you believe that Sau Lan Wu originally aspired to be a painter? Thankfully for the science world, a biography of Marie Curie inspired her to become a scientist, and she was undeterred by her encounters with racism and sexism throughout her life and career. Her first experience with racism in the U.S. occurred when she visited the Supreme Court building with two Chinese friends. When they needed to use the restroom, they were presented with doors labeled either "White" or "Black" (Dawson 2003). In an interview with Vassar, she also reminisces on how people sometimes called her Dragon Lady, a racist name implying that her success as a woman was indicative of an aggressive character quality. She points out that people often assume women are not competent until they prove they are, and she has battled this mindset repeatedly. Some male colleagues did not take her seriously, and if she spoke up about unfair treatment, they became upset. Sexism also impacted her decision not to have a child during her assistant professorship; if she had, she likely would have lost her funding and her chance to secure tenure (Krusberg 2013).

Yet, despite her initial poverty and the obstacles she faced as a woman of Asian heritage, Sau Lan Wu has made some of the most important discoveries in particle physics. Let us not overlook the women who have contributed to scientific achievements such as Wu's. For further reading, please peruse the references listed below.

Here is a final piece of advice that Wu often imparts to her physics students: "Communicate. Don't close yourselves off. Try to come up with good ideas on your own but also in groups. Try to innovate. Nothing will be easy. But it is all worth it to discover something new" (Roebke 2018).

Front cover of *Women in Science: 50 Fearless Pioneers Who Changed the World*, written and illustrated by Rachel Ignotofsky, 2016. Photo credit: Caitlin Shaffer.

References

- CERN. n.d. "The Higgs Boson." Accessed May 18, 2020. https://home.cern/science/physics/higgs-boson.
- Dawson, Lindsay. 2003. "A Charmed Life." Vassar: The Alumnae/i Quarterly. Accessed Sept. 21, 2020. https://vq.vassar.edu/issues/2003/03/beyond-vassar/charmed-life.html.
- Garisto, Daniel. 2020. "Higgs Boson Gives Next-Generation Particle Its Heft." Scientific American. Accessed Sept. 21, 2020. https://www.scientificamerican.com/article/higgs-boson-gives-next-generation-particle-its-heft/.
- Ignotofsky, Rachel. 2016. Women in Science: 50 Fearless Pioneers Who Changed the World. New York: Ten Speed Press.
- Krusberg, Zosia. 2013. "The Joy of Discovery: Sau Lan Wu '63." Vassar: The Alumnae/i Quarterly. Accessed Sept. 21, 2020. https://vq.vassar.edu/issues/2013/01/beyond-vassar/joy-of-discovery.html.
- Nobel Media AB. 2020. "Press Release: The Nobel Prize in Physics 1976." Accessed Sept. 21, 2020. https://www.nobelprize.org/prizes/physics/1976/summary/.
- Roebke, Joshua. 2018. "Three Major Physics Discoveries and Counting." Quanta Magazine. Accessed May 13, 2020. https://www.quantamagazine.org/sau-lan-wus-three-major-physics-discoveries-and-counting-20180718/.
- Schmitt, Preston. 2019. "A Pioneer's Perseverance." On Wisconsin. Accessed May 18, 2020. https://onwisconsin.uwalumni.com/features/a-pioneers-perseverance/.
- University of Wisconsin-Madison. n.d. "Sau Lan Wu." Accessed May 15, 2020. https://www.physics.wisc.edu/people/sau-lanwu.
- Vassar. 2012. "Sau Lan Wu: The Discovery of the Higgs." Vassar College. Video, 1:01:33. https://youtu.be/hTP3x5dHiQ4.

Cover photo: Portrait of Sau Lan Wu pointing to a chart, circa 1989. Credit: Deutsches Elektronen Synchrotron (Desy), Hamburg, courtesy of AIP Emilio Segrè Visual Archives, Physics Today Collection.

DR. JAMES STITH: FEATURED ORAL HISTORY

By Corinne Mona, Assistant Librarian

Apart from the Emilio Segrè Visual Archives, the oral history collection is one of our most-used collections at the Niels Bohr Library & Archives. Like the overall field of physics, Black physicists are underrepresented in all of our collections, including our oral histories which allow us to read and hear about the experiences of scientists in their own words and from their point of view. Recognizing how important it is to represent a more complete and accurate history of physics, the Niels Bohr Library and Archives and the Center for History of Physics have begun focused efforts to capture the personal and professional experiences of Black physicists over the past few years. New oral history interviews will be published online, and some featured in this Newsletter, as they become available.

Today we are featuring, Dr. James Stith, physics educator, researcher, and former vice president of the Physics Resource Center at the American Institute of Physics. Dr. Stith is a past president of the American Association of Physics Teachers and of the National Society of Black Physicists, as well as a Fellow of the American Association for the Advancement of Science and of the American Physical Society. He has held positions at a number of institutions including The Ohio State University and a professorship at West Point for 21 years. Here, we have select ESVA photographs and excerpts from the eye-opening oral history interview conducted on August 14, 2009, following his retirement from the Physics Resource Center. Will Thomas, then the Associate Historian at the Center for History of Physics and now a senior science policy analyst at FYI: Science Policy News, conducted the interview.

James Stith. Credit: AIP Emilio Segrè Visual Archives.

On his childhood:

I was born in Brunswick County, Virginia. That is just about 15 miles from the North Carolina border in a little town called Alberta, Virginia. My family was tobacco farmers, so I grew up, my younger life, on a tobacco farm. In my earlier life I wasn't quite sure what I wanted to do, but I did know what I didn't want to do, and that was to be a tobacco farmer. So I worked hard to get off that farm. I was born to a single mom, Ruth Stith, and fortunately, even though she was a third-grade graduate, she believed in education and pushed me to do well in school and made sure that I didn't miss school. In that respect I was extremely fortunate. I went to a three-room school called Oak Grove, located in Cochran, Virginia. We were fortunate in many respects to go to a three-room school because in the three-room school, even though it was a poor neighborhood, because I excelled I could do my math, which whatever grade was the appropriate grade, I was always challenged. Up until I graduated from elementary school, I did an awful lot of things, like I taught an awful lot of classes, and as an example, my job when I was in seventh grade was to teach the sixth- and seventh-grade mathematics, so that helped to shape the person that I am.

How he fibbed to his parents to get out of school for six months, but it turned out to be a good thing for him:

When I was a freshman in high school I broke my ankle, and I told my mom a little fib. I went to see the doctor to set the ankle, and when I came back she asked, "What did the doctor say?" And I told her that the doctor had said that I should not go to school on

a broken leg. So I sat at home for six months. If I look back upon that experience, it ended up being one of the better things that ever happened to me, because in those six months I grew up an awful lot. I was always small for my age and a bit shy. So when I went to high school, I really didn't do well my first year there. I was basically a C student. So when I broke my leg, with the opportunity to stay at home for six months and read and do those kinds of things, I matured an awful lot. So when I went back to high school at the end of that six-month hiatus, I was roughly half a year behind the rest of my class. I became a more serious student, and I worked real hard. I went from being a C student to an A student and ended up being valedictorian of my class, largely due to the fact that I was trying to catch up with the rest of my class, and because of the need to take English every year, there was no way to catch up and know that. But as I said, it ended up being one of the better things that ever happened to me… when I graduated, as I said, I was the valedictorian of my class.

Caption: James Stith presents a lesson to students. Credit: AIP Emilio Segrè Visual Archives.

How one of his teachers advocated for him and changed his life: She was going around the room, and she was asking each of us where we were going to go to college. I was the last person that she asked, and she said, "Herman," because that's what they called me back in those days, my middle name, "Where are you going to go to school?" I said, "I'm not going to college." She said, "Why not?" "Well, people in my family don't go to college." "What are you going to do?" "I'm going to go into the Air Force." And she said, "You're not going to go to the Air Force." So I said, "What am I going to do?" She said, "You're going to go to college." I said, "I don't have any money to go to college." So she said, "You can live with me and go to St. Paul's. My husband is on the faculty at St. Paul's, and I know we can get you a scholarship." My response was, "I don't want to go to St. Paul's. I want to get out of this town." So then she said, "If I get you a scholarship to Virginia State," which was about 40 miles away from where I lived, "Will you go there?" And I said yes, because I mean, throughout my first—at that time, the further I had ever been away from Brunswick County was 60 miles, and that was Richmond, Virginia. So 40 miles was far enough away from Lawrenceville for me. Somehow, well I was a good student, but she came back of the order of maybe three weeks to a month later and informed me that she had secured a full scholarship for me to Virginia State University. That's really what changed my life in many respects. So I went there.

How he got interested in physics in the first place: When I was in high school and I took my first course in physics, all of the questions that I had been asking over the years, I started getting answers to….As an example, when I was a kid growing up I had a bicycle. There was a country store, and I'd take my bicycle down to the country store to put air in the tires. I had to put in "80 pounds of air" for the tire. When I went to the same store with my uncle to put air in his car tires, we only put in 28 to 32 pounds of air. My question that I had been [asking], why was it that my bicycle tire could hold 80 pounds of air, whereas a car tire could only hold 32 pounds of air, given that the car tire was much bigger than a bicycle tire? This was a question that I kept asking, and I couldn't get an answer to. What I learned when I took physics was that it wasn't pounds of air that we were putting in, it was "pounds of pressure." So it was a pressure reading instead of a weight reading, so that finally answered that question.

After getting his doctorate in physics from Pennsylvania State University**,** Stith spent time in the military. He did research and held teaching positions at a number of institutions, including the U.S. Military Academy at West Point. In the interview, he discusses the racial inequality he noticed at West Point and how he became a subtle advocate for Black students. He recounts a discovery about student grades and conversations he had during bowling team practice with the other teachers:

STITH: I just put their names in the file, these are African American cadets, these are White cadets—same basic SAT scores. Then I wrote a small computer program that would every now and then go into a database and pull up the grades of the White cadets and the African American cadets. What I noticed was even for those kids who had very, very similar board scores, in terms of their grades, you would see something like this…

THOMAS [interviewer]: They were uneven, for the sake of the tape. You're holding your hands up like that.

continued on page 18

STITH: They were uneven, and they were about a file or two below the averages for the white cadet. I was an avid bowler back in those days. I bowled a couple of times a week. We had departmental bowling teams. What I started doing, while I'm sitting in the bowling alley talking to faculty—Let's go back and take a look at the West Point education. During their freshman year, they took a double dose of mathematics, and they took chemistry. That was the bulk of their courses they took. They took English and other things. When I bowled with the chemistry bowling team or we were bowling with the mathematics bowling team. We were sitting there, and I would say, "You've got John Jones in your class?" "Yes I do." "How is John doing?" "John's doing well. John has a solid C." I would say, "I find it strange that with an SAT Math of 730 that John can only do C work in mathematics." Invariably, the next time I would pull up the [academic] file, John had moved up, and now there was no significant difference between the White kids and John Jones. And so I said, "Hmm, that's interesting." So I would then look at other kids and simply just sitting there having a conversation, I would simply ask the question. I mean I knew who the instructor was because I could look it up and say something to that instructor. Invariably, the next time we look, they were here. [At the same level as comparable to white cadets]

This is only a small sample of the stories James Stith recalls in his oral history interview. Enquire with the Niels Bohr Library & Archives to access the complete digitized audio from the recording, and the full transcript is available online. Additional photographs of Stith are also available through the ESVA database.

References:

Interview of James Stith by Will Thomas on 2009 August 14, Niels Bohr Library & Archives, American Institute of Physics, College Park, MD USA. <www.aip.org/history-programs/niels-bohr-library/oral-histories/33903>.

James Stith (left) demonstrating equipment to an unidentified student in a classroom at West Point, NY. Credit: AIP Emilio Segrè Visual Archives.

A TALE OF TWO EDITIONS: A LIBRARIAN'S INVESTIGATION

By Allison Rein, Associate Director of Library Collections & Services

One afternoon, we were showing off some of our rare books to visitors when one of them asked if we had Thomas Young's 1807 *A Course of Lectures on Natural Philosophy and the Mechanical Arts*. She said she was a big fan of Thomas Young and wanted to see one of the famous colored prints in person.

I quickly found that we had an 1845 edition but not the 1807. Undeterred, I asked my colleague, Corinne Mona, to quickly check the Wenner Collection inventory we'd been working on all year to see if we had the 1807 edition in that collection. And we did! Corinne and I pulled both editions for our excited visitor and were impressed by how different the two editions were; this was a great illustration of why the Niels Bohr Library & Archives collects successive editions of scientific texts and what they can tell us about the past.

As an aside, Thomas Young was a very fascinating person. Sometimes called "the last man who knew everything," he mainly studied and practiced medicine but explored other topics of study as well. For instance, his interest in the anatomy of the eye led him to his study of optics. He wrote several papers on the workings of the eye, including a theory for how the eye could detect color. In 1801 Young was appointed professor of ,atural philosophy at the Royal Institution, where he was rather unpopular. As one listener put it, "He presumed...on the knowledge and not the ignorance of his hearers" (O'Connor 2006). Thankfully he was undeterred by his negative press and later turned those lectures into these books, which reflect the diversity of his curiosity and knowledge about the world. He wrote confidently on a number of scientific topics that would all be separate disciplines today. He was better known for his physics than his medical studies, and he was controversial for proposing that light was a wave and not a particle, which ran counter to the beloved Isaac Newton's theory of light. If all that wasn't enough, later in life he helped decipher the Rosetta Stone.

The first thing we noticed about the two Young editions was the physical differences in their outward appearance. The 1807 edition is much larger and is fully bound in leather, whereas the 1845 edition is smaller and only half bound in leather (Figure 1).

When investigating further, we noticed some provenance details, as illustrated in the image collage below. (Provenance means the history of the item's former ownership, for those who aren't used to archivist vocabulary words.)

Provenance information in the 1807 edition.

The top left image shows a gold-tooled seal from the Society of Writers to Her Majesty's Signet, a private society for Scottish lawyers dating back to 1594. Presumably, the two 1807 volumes

continued on page 20

were bound for the society's library. In the top right image, the sticker bookplate of HF Norman appears to be evidence of a more contemporary owner. And as shown in the bottom image, there's also a clearly dated inscription from 1813, "Ex Lib. Bibl. Scribar. Sig. Reg."

All of these details paint a picture of many owners and perhaps a prized possession passed down through many hands. Up until very recently, books were expensive objects and prestigious to own, hence the large size and expensive binding. Its large size played a part in keeping it in such pristine condition. Since it was too large to be easily carried, it stayed in one place and wasn't as heavily used as a pocket reference book or textbook.

The 1845 volumes look very different, even if the text remained mostly the same. (The 1845 edition is technically "A New Edition with References and Notes by the Rev. P. Kelland.") The 1845 edition is much smaller in size, in spite of these added references and notes, and only half bound in leather but with some nice gold tooling and blind embossing on the spine. We also have fewer details of provenance evident in the physical copy, just our own library bookplate. Instead, we get more information about the printing. In the 1807 edition, the illustrations were likely hand painted, as color printing was extremely difficult. In the 1845 edition, we get a detail that appears only on the colored pages, "Baxter's Patent Oil Printing" (Figure 2). Born a few years before Young's first edition was published, George Baxter invented commercial color printing. Later in the 19th century, even cheaper and easier methods were discovered, but in 1845, printed color like this in a book was rare and special.

So what do we know about this 1845 edition? Though it was smaller and easier to carry, it still probably wasn't something just anyone could own. But it does show that science was becoming more popular. What used to be a hobby for rich men (and some women) was becoming more accessible to the public, as were books. By the year 1845, England was firmly in the industrialized printing era; printing and publishing were getting easier and cheaper. Even paper was getting cheaper to produce, moving from the rag paper (literally made of old cloth rags) to the much cheaper wood pulp paper. By the end of the century, books were marketed to just about everyone, some costing merely a dime.

The explanations provided in this article are just the tip of the iceberg. By examining details found in different editions of texts, you can easily fall down the rabbit hole of the history of printing and publishing. (And that rabbit hole doesn't even include an investigation into the actual subject matter or the author Thomas Young himself!)

The two editions of this book tell us more than just what's written in them. They give us information about physics, optics, astronomy, etc., but they also tell us about the worlds and times they were made in and the world we live in now. They are also objects of beauty. Check out these illustrated plates (Figures 3 and 4) I keep talking about. I'm not a physicist, I have no idea what they're trying to tell me! I just think they're beautiful.

References:

- O'Connor, J. J. and E. F. Robertson. 2006. Thomas Young. MacTutor History of Mathematics Archive. Accessed July 24, 2020. http://www-history.mcs.st-andrews.ac.uk/Biographies/Young_Thomas.html.
- Robinson, Andrew. 2006. The Last Man Who Knew Everything: Thomas Young, The Anonymous Polymath Who Proved Newton Wrong, Explained How We See, Cured the Sick, and Deciphered the Rosetta Stone, among Other Feats of Genius. New York: Pi Press. Accessed July 24, 2020. https://archive.org/details/lastmanwhoknewev00robi.
- Sack, Harold. 2016. "George Baxter and the Color Printing Process." SciHi Blog. Accessed July 24, 2020. http://scihi.org/george-baxter-color-printing-process/.
- Tretkoff, Ernie. "May 1801: Thomas Young and the Nature of Light." May 2008 (Volume 17, Number 5). This Month in Physics History. Accessed July 24, 2020. https://www.aps.org/publications/apsnews/200805/physicshistory.cfm.
- Young, Thomas. A Course of Lectures on Natural Philosophy and the Mechanical Arts. London: Johnson, 1807.
- Young, Thomas. A Course of Lectures on Natural Philosophy and the Mechanical Arts. London: Taylor & Walton, 1845.

Figure 1. Photo credit: Allison Rein.

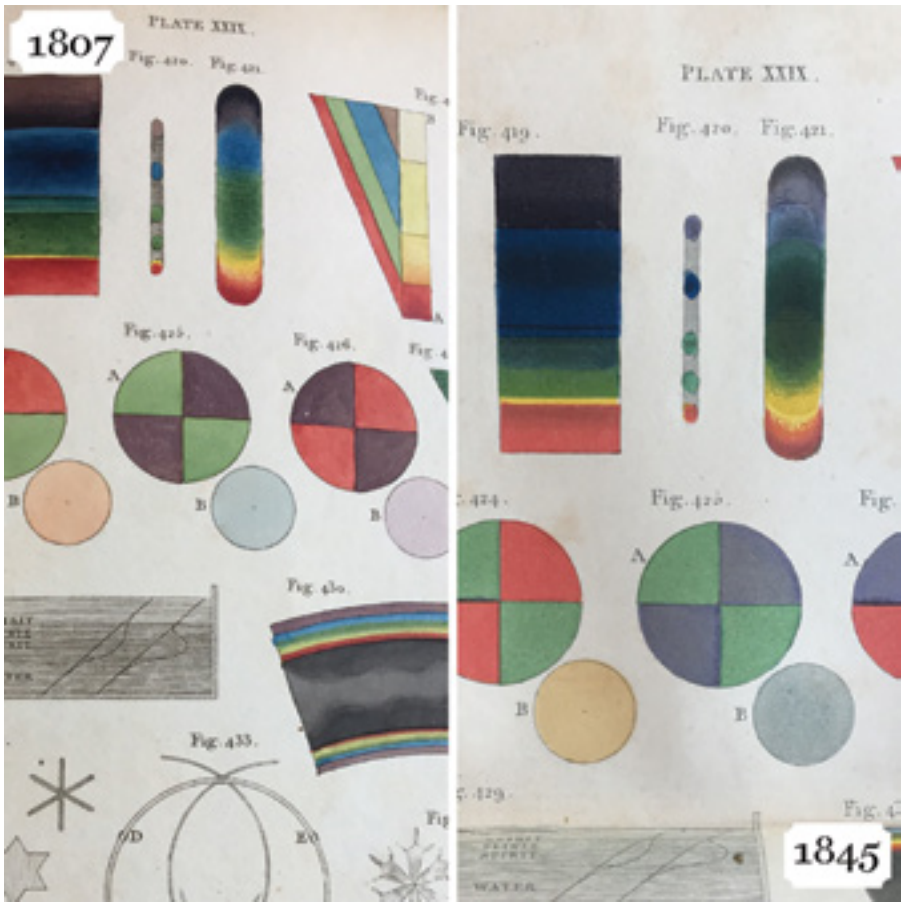


Figure 3. Side-by-side illustrations. Photo credit: Allison Rein.

Figure 2. Photo credit: Allison Rein.

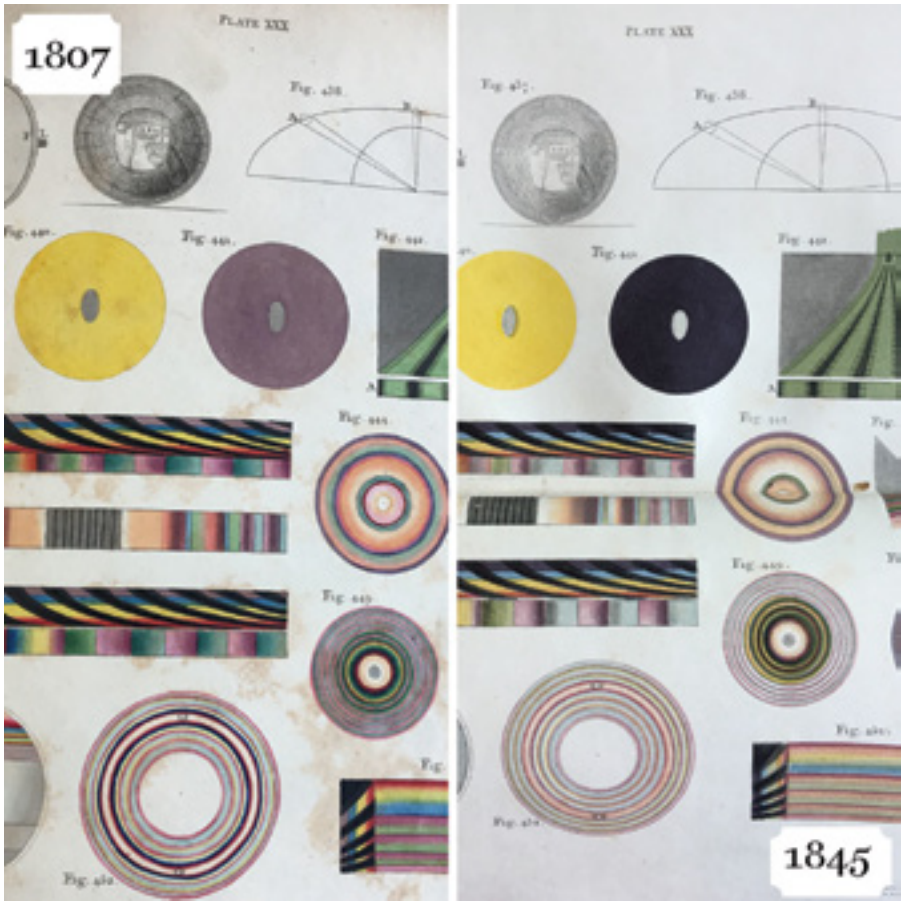


Figure 4. Side-by-side illustrations. Photo credit: Allison Rein.

EINSTEIN'S ESSAYS IN HUMANISM AND THE PROBLEMS OF OUR DAYS

By Gergana Kostova, Rare Book Project Cataloger

The Wenner Collection is a substantial addition to the Niels Bohr Library & Archives, received in 2018. Some of the books in this collection are rare, old, and hard to find outside of libraries. Other books in the collection are available in later publications. They are enjoyable as companions for leisure time, or serve as sources for contemplation and comparison with a personal point of view. *Essays in Humanism* (1950) by Albert Einstein is one of these books. It is currently available in print and as an e-book version in bookstores or on the Internet Archive website. The essays in this book were written between 1931 and 1950, during the aftershock of the Great Depression.

Niels Bohr and Einstein conversing. Photograph by Paul Ehrenfest, courtesy AIP Emilio Segrè Visual Archives, Gamow Collection.

The scope of Einstein's *Essays in Humanism* is wide, and the richness of the language is delightful. The expressed opinions reveal the point of view of this encyclopedic humanist who is thinking about the world in many dimensions. Einstein's other popular essays are collected in *The World As I See It* (1931), *Essays in Science* (1934), and *The Theory of Relativity and Other Essays* (1996, 1950). The Center for History of Physics at the American Institute of Physics has a special virtual exhibit on Einstein's opinions and his contributions to humanity (AIP 2004).

Whenever someone looks for inspiration, Einstein's *Essays in Humanism* (1950) are a great choice. They are exceptionally easy to read and rich in metaphoric language and messages revealing his social and scientific philosophy. He writes them with the full recognition that his opinions and statements related to everyday life and politics may not be popular and acceptable by some people and that this is fine. He explains his point of view and his right as a human to have his opinion and freedom to voice it (essay "At a Gathering for Freedom of Opinion"). It is such a strong message to society that its members should actively look at what is going on and build relations between individuals that are humane, prevent hostility, and practice social justice. He analyzes the reasons for historical and ethnical stereotypes and how ethnic oppression can transform into motivation for success for Jews (essay "Where Oppression Is a Stimulus"). As a naturalized citizen of the United States and a minoritized person, he presents his opinion on slavery and racial inequality. He says, "I believe that whoever tries to think things through honestly will soon recognize how unworthy and even fatal is the traditional bias against Negroes." Moreover, every citizen who has a good will "must have the courage to set an example by word and deed, and must watch lest his children become influenced by this racial bias" (essay "The Negro Question," written in 1946, p. 10).

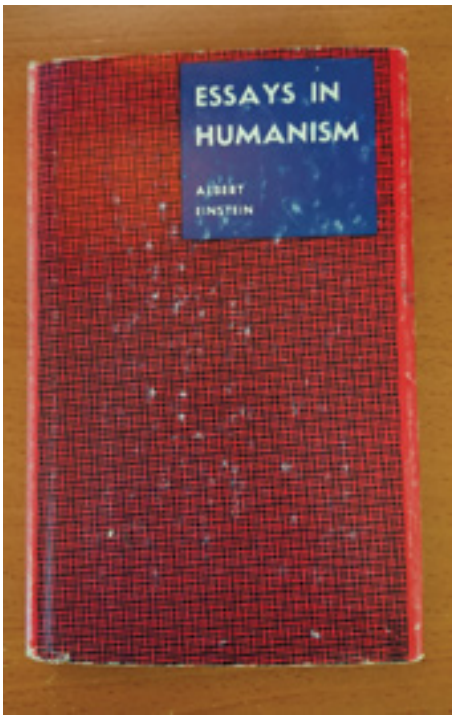
It is interesting to make here a digression about the evolution in Einstein's view to other nations and races during his life. There were moments in the 1920s when he wrote informal notes in his travel diaries about other nations that contradict everything that he wrote later about racism and that can be tagged as racist expressions. *The Travel Diaries of Albert Einstein: The Far East, Palestine, and Spain, 1922–1923* was published in 2018. They were written during the travel of Einstein and his wife, Elsa Einstein, to Hong Kong, Singapore, Japan, China, Palestine, and Spain. The *Diaries'* translator, Ze'ev Rosenkranz, who is also a senior editor and assistant director of the Einstein Papers Project at the California Institute of Technology, noticed some shocking statements in these personal informal writings about other peoples who are described as "being biologically inferior" (Flood 2018).

In fact, there is a big difference in Einstein's points of view between his *Travel Diaries* from early 1920s and his

Essays from the 1930s to 1940s. The *Diaries* and *Essays* are spaced apart in time by at least a decade. The evolution in Einstein's approach to races and ethnic groups is based on global and regional clashes, and personal observations and reflections. This change also shows how philosophical relativity could impact the way one thinks and acts, including highly honored people who sometimes may not realize that there is a conflict between what was once thought and what is right and ethical.

The humanistic power of Einstein's writings and actions is very strong in his essays. They are his thoughtful messages to society. As a physicist, he points to the importance of science in the prevention of new world conflict (essay "Atomic War or Peace"). In one of his very short essays, only half a page (essay "International Security"), he sees a reason for an active role of the United States in "building up an international court of arbitration" (Einstein 1950, p. 76), and solving international disputes.

In some other politically flavored essays in the same book, Einstein's statements challenged the people of his time. They continue to provide food for thought for readers today as well, for example, his reflections on socialism (essay "Why Socialism?"). However, there are many other essays on the impact of education and scientific discoveries on human life, which are still very popular among readers. For example, several of the essays in the book are Einstein's reflections on great minds in different areas of science and political life (Isaac Newton, Marie Curie, Max Planck, Mahatma Gandhi, Carl von Ossietzky, etc.) All these essays present Einstein's views on the world, on peace, on relations between nations, on racism and anti-Semitism, and on how much we depend on society and science. These essays show that, indeed, Einstein was thinking and living his life among real people. He was one of the intellectuals of his time to see, analyze, and speak freely about various world issues.



Front cover of *Essays in Humanism* by Albert Einstein, 1950. Photo credit: Gergana Kostova.

The reader of *Essays in Humanism* will be amazed to see how little in some respects the world has changed since the 1940s. There are still the same issues, still the same challenges to humanity. Human nature is changing very slowly. However, today people may need to learn faster from political, social, and science history to prevent the same mistakes.

One of these essays has a strong connection to the current pandemic situation. In "The Menace of Mass Destruction," Einstein compares the means of mass destruction with a "menacing epidemic" (Einstein 1950, p. 69). He points out that in both situations, fear and anxiety create aggression, and efforts for intelligent, objective, and humane thinking are "suspected and persecuted as unpatriotic" (Einstein 1950, p. 69). Einstein sees a productive way to solve such a challenging situation by getting all experts together "to work out an intelligent plan to combat" the epidemic. Similar statements have been very popular recently in the media. Currently, researchers in the sciences and medicine are working hard to make that happen, and hopefully, we will see the results of these efforts soon.

Einstein was a master of the essay genre. His essays have simple and powerful messages. They are a real pleasure to read. Reading this book is perhaps an opportunity to compare and rethink our approach to the world.

References:

- AIP Center for History of Physics. 2004. Virtual exhibit "Albert Einstein: Image and Impact." https://history.aip.org/exhibits/einstein/.
- Einstein, Albert. 1950. Essays in Humanism. New York: Philosophical Library, Inc.
- Einstein, Albert. 2018. The Travel Diaries of Albert Einstein: The Far East, Palestine, and Spain, 1922–1923. Princeton, NJ: Princeton University Press.
- Flood, Alison. 2018. "Einstein's Travel Diaries Reveal 'Shocking' Xenophobia." Last modified on June 13, 2018. https://www.theguardian.com/books/2018/jun/12/einsteins-travel-diaries-reveal-shocking-xenophobia.
- Joseph, Yonette and Tiffany May. 2018. "Einstein the Anti-Racist? Not in His Travel Diaries." June 06, 2018. https://www.nytimes.com/2018/06/14/world/einstein-travel-diaries.html.
- Popova, Maria. 2011. "7 Einstein Classics, Digitized for the First Time: What the theory of relativity has to do with world government and the ethics of nuclear proliferation." Accessed May 27, 2020. https://www.brainpickings.org/2011/03/18/albert-einstein-ebooks/.

THREE DECADES OF V. M. SLIPHER–EDWIN HUBBLE CORRESPONDENCE

By Lauren Amundson and Kevin Schindler, Lowell Observatory

The Lowell Observatory Archives in Flagstaff, Arizona, collects, preserves, and provides access to records that document the institution's 126-year history. One of its most historically significant collections is a series of letters between Lowell Observatory astronomer V. M. Slipher and Mount Wilson Observatory cosmologist Edwin Hubble. Between 1922 and 1953, they exchanged 50 letters that are now preserved in the observatory's Putnam Collection Center.

Hubble and Slipher first crossed paths at least as early as August 1914, at the 17th meeting of the American Astronomical Society in Evanston, Illinois. Hubble was then in the early stages of graduate studies at the University of Chicago. For the previous two years, Slipher had been taking spectra of a variety of spiral nebulae, and it was at this meeting that he reported the velocity measurements of 15 of them (Slipher 1914). His startling results—that most were receding at unheard-of high velocities—garnered a standing ovation from scientists in attendance and were critical for Hubble's later work establishing a distance-recessional velocity relationship for the nebulae, in what became known as Hubble's law (Hoyt 1980, p. 411).

In the fall of 2019, University of Arizona graduate student intern Zachary Peach digitized the letters and uploaded them to Omeka, Lowell Observatory's digital collections platform. The first letter, dated February 15, 1922, is a request from Slipher to Hubble for information about observations of nebulae (galaxies). Slipher was the chairman of the International Astronomical Union's Committee on the Nebulae, and he asked Hubble for "the assistance of your wide experience in the investigation of nebulae." He outlined some discussion suggestions, including a general photographic survey, light quality of the nebulae, proper motion and rotational studies, and continued spectrographic observations. Slipher then commented, "In recent times scientific interest in the nebulae and clusters has grown greatly. It is true also that our knowledge of them has substantially increased, and at the same time the questions to be answered concerning them have perhaps also increased" (Slipher 1922).

Portrait of Edwin Hubble with a drawing of a galaxy. Credit: Hale Observatories, courtesy AIP Emilio Segrè Visual Archives.

Portrait of Vesto Melvin Slipher. Credit: AIP Emilio Segrè Visual Archives.

The two men continued to correspond about research projects, committee meetings, and travel throughout the 1920s. In a curious letter dated April 11, 1930, Hubble asked Slipher, "Would you be willing to give me your unpublished values of radial velocities of extra-galactic nebulae? Not for publication, of course, but merely to make certain that some general results we seem to be getting here [at Mount Wilson Observatory] are not vitiated by results on other nebulae observed at other places." Hubble well knew Slipher's original results and here could possibly be trying to deny that.

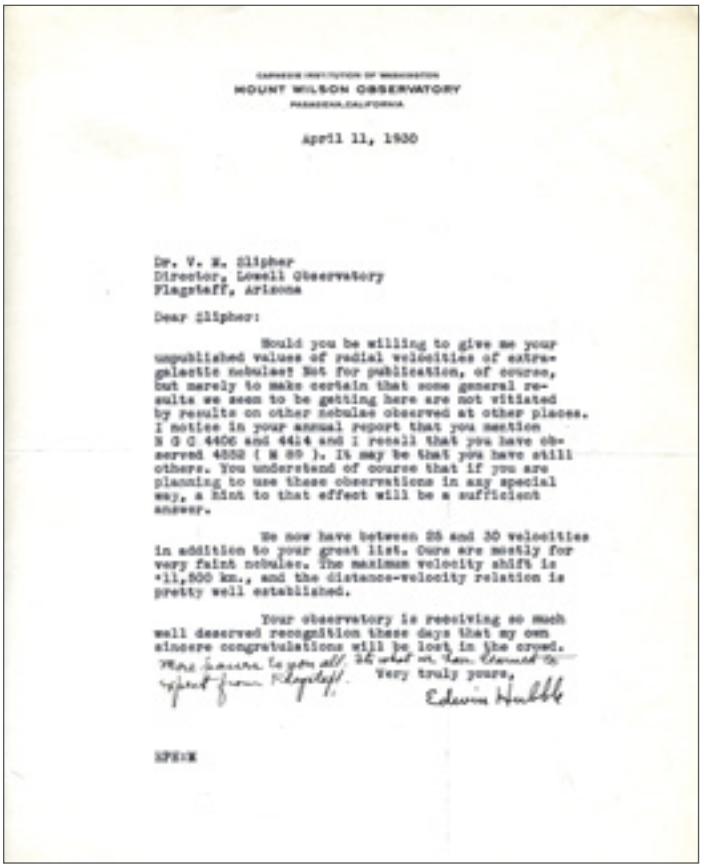
In that April 11 letter, Hubble also referenced Lowell Observatory's recent discovery of Pluto, saying, "Your observatory is receiving so much well deserved recognition these days that my own sincere congratulations will be lost in the crowd" (Hubble 1930).

Their correspondence continued throughout the 1930s and 40s and into the 1950s. On March 6, 1953, Hubble noted that he was preparing to give the prestigious George Darwin Lecture in England, which he titled "The Law of Red Shifts." He wrote, "Because the initial phase (of the study of red shifts) represented the combination of your velocities and my distances, I should very much like to show a slide or two representing these data." He then asked Slipher for copies of two spectra: his initial spiral nebula spectrum (of M31, taken in 1912) and one of NGC 584, which featured the greatest velocity of any nebula measured by Slipher. Hubble continued, "I regard such first steps as by far the most important of all. Once the field is opened, others can follow" (Hubble 1953). Although Hubble previously had publicly acknowledged the critical contribution of Slipher's data to the "Hubble law" (e.g., Hubble 1936, p. 105), his failure to cite Slipher—or even to mention Slipher's name—in the influential paper that first correlated Slipher's recession velocities to Hubble's deduced distances (Hubble 1929) has resulted in what many regard as an underrecognition of Slipher's important role in the law's formulation (Elizalde 2018).

Their final exchange was two weeks later on March 20, when Slipher agreed to send the requested slides and spectra (Slipher 1953a). The last letter in the collection is from Slipher and his wife to Hubble's widow, dated September 29, 1953, the day after Edwin died. The message, in V.M.'s handwriting, well represents the cordial nature of the correspondence overall. "My heartfelt sympathy is extended you in your great bereavement. In Dr. Hubble's passing astronomy loses a great leader and we a cherished friend" (underlined original to letter; Slipher 1953b). Thus concluded 32 years of correspondence between two of the 20th century's most influential astronomers.

The correspondence is significant because it offers a firsthand account of the interactions between two eminent scientists whose common research interests brought together two otherwise opposite personalities. Hubble is well known not only for his cutting-edge scientific pursuits, but also for his arrogant and

continued on page 26



MOUNT WILSON OBSERVATORY

April 11, 1930

Dr. V. M. Slipher
Director, Lowell Observatory
Flagstaff, Arizona

Dear Slipher:

Would you be willing to give me your unpublished values of radial velocities of extra-galactic nebulae? Not for publication, of course, but merely to make certain that some general results we seem to be getting here are not vitiated by results on other nebulae observed at other places. I notice in your annual report that you mention N G C 4406 and 4414 and I recall that you have observed 4552 (M 89). It may be that you have still others. You understand of course that if you are planning to use these observations in any special way, a hint to that effect will be a sufficient answer.

We now have between 25 and 30 velocities in addition to your great list. Ours are mostly for very faint nebulae. The maximum velocity shift is +11,000 km., and the distance-velocity relation is pretty well established.

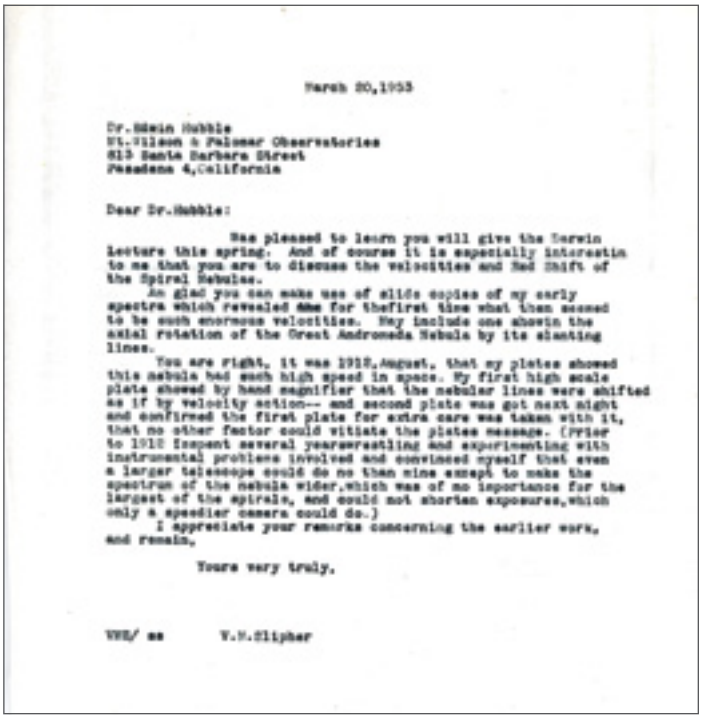
Your observatory is receiving so much well deserved recognition these days that my own sincere congratulations will be lost in the crowd.

Very truly yours,

Edwin Hubble

EPH:M

Edwin Hubble to V. M. Slipher, April 11, 1930, on nebulae velocity results, Lowell Observatory Archives.



March 20,1953

Dr.Edwin Hubble
Mt.Wilson & Palomar Observatories
813 Santa Barbara Street
Pasadena 4,California

Dear Dr.Hubble:

Was pleased to learn you will give the Darwin Lecture this spring. And of course it is especially interestin to me that you are to discuss the velocities and Red Shift of the Spiral Nebulae.

Am glad you can make use of slide copies of my early spectra which revealed 4Mm for thefirst time what them seemed to be such enormous velocities. May include one showin the axial rotation of the Great Andromeda Nebula by its slanting lines.

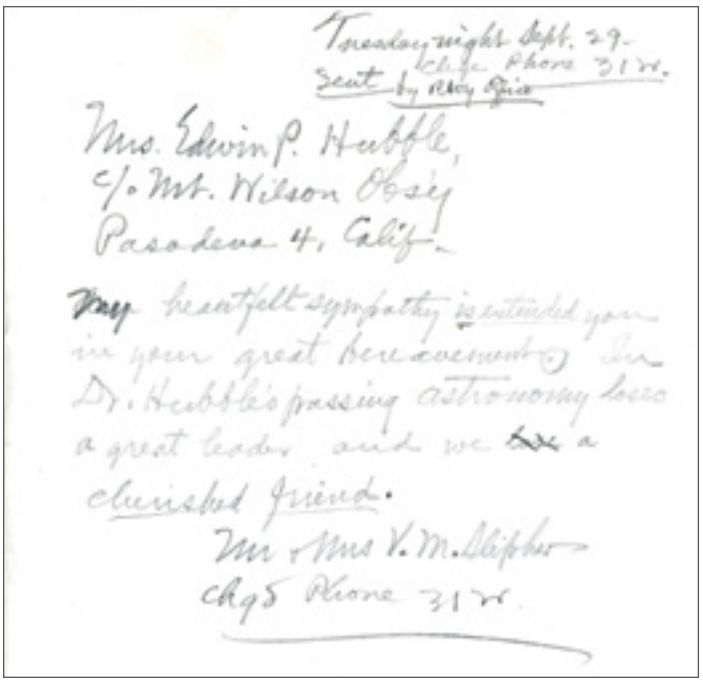
You are right, it was 1912,August, that my plates showed this nebula had such high speed in space. My first high scale plate showed by hand magnifier that the nebular lines were shifted as if by velocity action-- and second plate was got next night and confirmed the first plate for extra care was taken with it, that no other factor could vitiate the plates message. (Prior to 1910 I spent several yearswrestling and experimenting with instrumental problems involved and convinced myself that even a larger telescope could do no than nine enough to make the spectrum of the nebula wider,which was of no importance for the largest of the spirals, and could not shorten exposures,which only a speedier camera could do.)

I appreciate your remarks concerning the earlier work, and remain,

Yours very truly,

VMS/ ms V.M.Slipher

V. M. Slipher to Edwin Hubble, March 20, 1953, on use of slides and spectra about nebulae for lecture, Lowell Observatory Archives.



V. M. Slipher and wife to Grace Hubble, September 29, 1953, on Edwin Hubble's death, Lowell Observatory Archives.

self-aggrandizing personality (for an excellent assessment, see Christianson 1996). The self-effacing Slipher was conservative in his scientific views and not above admitting his shortcomings, one of them being a limited publication record. On July 27, 1942, Hubble requested information about Slipher's measurements of the rotation of several galaxies, asking for "any other items that would serve to clarify the quite brief abstracts of your reports that were published in the journals" (Hubble 1942).

Rather than responding defensively to what could have been taken as a pointed criticism, Slipher admitted, "Of course I have long realized that I have published too briefly on the work here, and that abstracts of papers read at meetings are especially apt to be seriously wanting in data and clearness." Slipher goes on to reveal a seemingly passive mindset that indicates one of the reasons for his generally sparse publication record. He wrote, "I had delayed fuller publication with the hope that the Observatory was going soon to be able to publish in full the study made here on the nebulae, but unfortunately that hope was only postponed from time to time through the years" (Slipher 1942).

Beyond revealing these personality differences, and perhaps most importantly, the correspondence offers a record of the interactions between the man who first measured the radial velocities of spiral galaxies (Slipher) and his counterpart who incorporated these findings into his own research (without, at least initially, even acknowledging Slipher) that led to Hubble's formulation of the velocity-distance relation that is central to what has recently been renamed the Hubble-LeMaître law (Benvenuti et al. 2018). This is among the most famous examples in the oft-debated discussion in scientific circles of credit for discoveries, in this case, credit for detecting and understanding the expanding nature of the universe. These and other questions will find some answers in this correspondence. The digitized collection is available to anyone, and at no fee, at **http://bit.ly/2OBhDpp**. Any reproduction of the letters for public use must credit the Lowell Observatory Archives.

References:

- Benvenuti, P., Smith-Spanier, M., and Christensen, L. L. 2018. IAU members vote to recommend renaming the Hubble law as the Hubble-LeMaître law. International Astronomical Union Press Release iau 1812. 28 October 2018. https://www.iau.org/news/pressreleases/detail/iau1812/.
- Christianson, G. 1996. Edwin Hubble: Mariner of the Nebulae. University of Chicago Press.
- Elizalde, E. 2018. Reasons in favor of a Hubble-LeMaître-Slipher law. Symmetry 11:35-48. https://www.mdpi.com/2073-8994/11/1/35/htm.
- Hoyt, W. G. 1980. Vesto Melvin Slipher 1875–1969. Biographical Memoirs National Academy of Sciences, Volume 52.
- Hubble, E. P. 1929. A relation between distance and radial velocity among extra-galactic nebulae. PNAS 15: 168–173.
- Hubble, E. P. 1930. April 11, 1930 letter to V. M. Slipher. Lowell Observatory Archives. https://collectionslowellobservatory.omeka.net/items/show/989.
- Hubble, E. P. 1936. The Realm of the Nebulae. Yale University Press, New Haven, CT.
- Hubble, E. 1942. July 27, 1942 letter to V. M. Slipher. Lowell Observatory Archives. https://collectionslowellobservatory.omeka.net/items/show/1006.
- Hubble, E. P. 1953. March 6, 1953 letter to V. M. Slipher. Lowell Observatory Archives. https://collectionslowellobservatory.omeka.net/items/show/1011.
- Slipher, V. M. 1914. Spectrographic observations of nebulae (abstract of paper read at the 17th AAS [Evanston] Meeting). Publications of the American Astronomical Society, 3: 98–100.
- Slipher, V. M. 1922. February 15, 1922 letter to Edwin Hubble. Lowell Observatory Archives. https://collectionslowellobservatory.omeka.net/items/show/956.
- Slipher, V. M. 1942. September 7, 1942 letter to Edwin Hubble. Lowell Observatory Archives. https://collectionslowellobservatory.omeka.net/items/show/1007.
- Slipher, V. M. 1953a. March 20, 1953 letter to Edwin Hubble. Lowell Observatory Archives. https://collectionslowellobservatory.omeka.net/items/show/1012.
- Slipher, V. M. 1953b. September 29, 1953 letter to Mrs. Edwin Hubble. Lowell Observatory Archives. https://collectionslowellobservatory.omeka.net/items/show/1013.

DOCUMENTATION PRESERVED

The History Newsletter usually includes a report of new collections or new finding aids based on our regular survey of archives and other repositories. Many of the collections are new accessions, which may not be processed, and we also include in this report previously reported collections that now have an online finding aid available.

Due to COVID-19 and other factors, this survey has been postponed. It will return in the following issue and issues thereafter.
To view and learn more about collections we have previously reported on, use the International Catalog of Sources for History of Physics and Allied Sciences at **https://libserv.aip.org**. You can search in a variety of ways, including by author or by repository.

The Fifth Biennial Early-Career Conference for Historians of the Physical Sciences

Crossing Borders and Fostering Collaborations

The American Institute of Physics (AIP) Center for the History of Physics is pleased to announce a fifth international conference for graduate students and early career scholars hosted by the Niels Bohr Archive in Copenhagen, Denmark. The conference will be held in September 2022, rescheduled from September 2020. Precise dates will be announced. The goal of this conference is to foster communication and collaboration among junior scholars and to provide a forum for exploring and reflecting upon current issues in the historiography of the physical sciences.

To submit an application or for more information, please contact **earlycareer.aip@gmail.com** or visit the conference website at **www.aip.org/history-programs/physics-history/early-career-conference**.

CENTER FOR HISTORY OF PHYSICS
AMERICAN INSTITUTE OF PHYSICS
1 PHYSICS ELLIPSE
COLLEGE PARK, MD 20740