Commentary

A Life Interrupted: The Story of Botanist Calvin Sperling from Minnesota to Biodiversity

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Abstract

This paper examines the life and work of Dr. Calvin R. Sperling (1957–1995), beginning on his family farm to becoming a trusted source on biodiversity conservation and directing Plant Exploration for the Department of Agriculture. Changes in his work are noted in relation to the changing meaning of germplasm from governance as a product of world heritage to governance under each nation's sovereign control. In addition, understanding of genetic resources shifts as they become a recognized part of biodiversity, making Dr. Sperling's insights from ethnobotanical studies with Richard Schultes more important and specimens Calvin collected became valuable herbarium samples and germplasm for crop improvement. These changes eventually helped focus Calvin's career on combatting genetic erosion, ensuring the conservation of crop relatives, and expanding his communication abilities. By understanding the transitions and responses to change, this biography makes such changes accessible to those pursuing related professions. The paper concludes with using such a biography in the classroom and finally, introducing the endowed lecture series conducted in honor of Dr. Sperling's courage and forthrightness.

KEYWORDS: Calvin Sperling; commemoration; genetic resources; gene banks; plant collectors; herbarium; conservation; genetic erosion

Received: 18 April 2025
Accepted: 04 June 2025
Published: 20 Jun 2025

INTRODUCTION

At its annual meeting in 1985, the Technical Committee for the Preservation of Valuable Germplasm [1] reviewed the past years' achievements, which, for the first time, included those of a young graduate student who had just returned from his first field trip abroad. Commissioned by the U.S. Department of Agriculture (USDA), through Oregon State University, he would collaborate with partners from Ankara University in Turkey and Tel-Aviv University in Israel to enhance understanding of the ecogeographic distribution of wheat and its wild relatives on the Anatolian Plateau.

The team was dispatched to find areas where wheat and its wild relative species were growing and from which minifloras could be prepared, and in so doing, to "relate the occurrence of the wild relatives of wheat with natural vegetation in the Middle East" [1]. This work was undertaken as a CRIS Project (Current Research Information System), which meant that it would be part of a USDA documentation system for ongoing agricultural research.

The individual leading these field studies was Calvin Ross Sperling (Figure 1). His courage and career are recounted here because despite the terribly abrupt ending to his life, there is hope that in the retelling of his story future generations will learn and benefit from his achievements. To conduct such a goal, this paper will address three questions central to Calvin's career, his personal development, and the tragic ending of his life at age 38. These questions include:

1. What steps were involved in Calvin's transition from a dairy farm in rural Minnesota to the persona of a beloved and renowned scientist?
2. What can be learned from classifying Dr. Sperling's specimens gathered during his travels, either those placed in genebanks or those deposited in various herbaria?
3. What can future generations learn from Calvin's practical and scholarly work, and how might relevant pedagogy be prepared for such instruction?

Figure 1. Calvin Sperling, pictured as he appeared while working for USDA. Source: USDA.

By its conclusion then, it is hoped that this retelling of Dr. Sperling's life becomes "a focus for aspiration," [2] and inspires future generations about a career of which many readers are not aware. Secondly, it will highlight the importance of the early years of a scientist's life by following Calvin's inner drive for collecting and love of the natural world, which unknowingly became a foundation for his profession. The third is recognizing the moment of original insight which becomes key for, in Calvin's case, dedicating a life to

conservation. Finally, Calvin's active years are compared with those of other plant collectors, leaving readers to reflect on Calvin's achievements, made in such a paucity of time and years.

BEGINNINGS: CHILDHOOD, LITERATURE, FAMILY, AND EXPLORATION (1957–1979)

Even from the humblest of beginnings, greatness was to arise. Calvin was a Minnesotan, born into a city house that had been transplanted to the country and set down on a working farm bought by his father. The date was February 7th, 1955, when Calvin became the fourth of four children born to Clarence and Doris Sperling, following Joann, Roger, and Beverly. Here, in Alexandria, Minnesota, he grew up living and working on the dairy farm currently overseen by his sister, Beverly Cole.

In these early years, Calvin attended District School 457, as a first grader (as seen in Figure 2), while in high school a teacher captured Calvin's attention by showing him how to collect and dry plant specimens. Clarence was a county agricultural inspector who monitored county roadsides for weeds. When time permitted, Calvin accompanied and worked part-time alongside Clarence, gaining practical experience in weed identification and their control and eradication. Calvin's father remembered how quite often, "Calvin would ask the man driving the truck to stop, and Calvin would get off and collect some plant specimen," [3].

Figure 2. Calvin Sperling's first grade class at public elementary school 457 in Minnesota. Calvin is seated in the first chair in row 2, on the right-hand aisle. He is the one with a big smile.

The family also subscribed to *National Geographic*, and around the time he would have been ten, they received a copy of *The World in Your Garden*. It was written by lead author Wendell Camp [4] as one of the Geographic's Natural Science Library. This book greatly influenced Calvin, beginning with its forward, titled "*The Romance of Plant Discovery*." The importance of such books in motivating those who became naturalist explorers should not be underestimated. They contributed to the wanderlust and eventual motivation of many individuals who gained the courage to depart as a ship's naturalist or overland explorer, even though they had never yet left home.

Besides books and school, farm life played a key role in Calvin's growing up, and his father recalled his son's love of the farm, writing, "Calvin also joined 4-H and had a dairy heifer that he took to the state fair, where he got a blue ribbon," [3]. But soon, his pursuits grew beyond livestock shows and gathering plants to dry and press. In addition, "he had an interest in rocks and minerals, so we fixed up a little room in the basement for him to work in."

However, while he did well in secondary school, and his specimen collections consistently increased in number, he was indecisive about attending college, and in fact, "one day he came home and told his mother he was not going to college" ([3]. Calvin's mother said that they would not force him to go anywhere, but without such a degree, his career choices would be greatly limited, especially for the type of work he had been talking about. No doubt this caused Calvin to think again about his work and collections; how limited they would remain as would his knowledge of the world around him. This was apparently enough to turn things around. After that talk with his mother, and upon his own reflection, Calvin got re-involved in school and excelled.

From secondary school, Calvin was accepted to North Dakota State University (NDSU), where his botanical pursuits reached new heights. He became an Herbarium Curatorial Assistant, preparing herbarium specimens into an extensive collection of vascular plants. The collection grew so large that upon graduation in 1979 it amounted to thousands of plants forming an almost complete collection of Minnesota flora. These specimens became valuable to educators who had a unit on botanical instruction, and Calvin undertook their distribution accordingly.

While completing his Bachelor of Science at NDSU, Calvin was encouraged to continue with his education, and one of his undergraduate teachers suggested he apply to multiple places. While Harvard was a whim at the time, his advisor said they looked for diversity, and coming from North Dakota was an immense help in this regard. The results of this application came as a major surprise to his parents. One week after coming home from NDSU Calvin "announced that he was going to Harvard. They told him that we could never afford to send him, but he told them it wouldn't cost them a thing, as he planned to get a full scholarship. And he did!" [3]. From here, Calvin moved to

Cambridge, where he started studies with Dr. Schultes. His classes began immediately, graduating in 1981 with his master's in biology and finishing his doctoral degree in 1987. It was then that his dreams of travel, exploration and collection began to materialize.

But even though his thoughts drifted outwards, towards a world he had yet to experience, he still was building and following rituals with his family, one being an annual race in the snow during winter. But this was no ordinary race. Instead, Calvin, his brother and nephew, attired in minimal dress of just socking feet and shorts, raced through the snow, around the yard and then up the porch and inside to a nice wood fire. These traditions were some of the fondest memories of Calvin's nephew Scott Cole. Later, Scott would recall this race:

"*Unfortunately, now, these traditions will never have the same life and zeal as they once had. Last June Uncle Calvin lost a long battle with skin cancer. His cherubim eyes, plump, round cheeks, and skew sense of humor will no longer race across the frozen ground. He'll never return to the safe haven of the old wooden farmhouse that he loved so dearly*" [5].

DISSERTATION, COLLECTING AND MARRIAGE (1980–1989)

No matter how far he traveled, Calvin stayed in close contact with his family—and nothing demonstrated his love of parents and extended family more than these letters home, ending up being 2–3 typewritten pages in length. Each letter was addressed to eight other family members, just to ensure that he reached all those he cared about.

Twenty-one of these letters from expeditions in South America and Turkey were bound together, ready for future readers. These letters [6] were handwritten by Calvin in the field, explaining in detail the most intricate events of the day. Upon their arrival in Minnesota, the letters were passed onto his father, who was apparently the only family member able to read his son's handwriting and then typed them for dissemination to the rest of the family. The preface to these letters read as follows: "Through his eyes we were all able to share in his experiences and travels" [6], as these letters hold onto the values and insights Calvin shared while describing what one may expect when collecting plants abroad.

One of these letters was composed in Bogotá and dated October 8, 1981 [7]. A small excerpt expresses the accuracy which he conveyed to his Minnesotan family:

"*I left in the morning for Cali. I passed through a rich coffee-growing district. As coffee doesn't like full sun, a shade plant is planted with it. Usually this is a legume tree that has a form like an American elm that gives shade but doesn't branch out lowdown. And here they were using banana plants for shade and as a double crop*" [7].

After meeting Deborah Gilmore in Boston, the couple married on July 15, 1989, at the Sperling Farm in Douglas County, MN. They then settled on a home in metro Washington, D.C., where their son Carl was born in 1992 (Figure 3A, B).

(A) **(B)**

Figure 3. (**A**). Calvin with son Carlon their front porch swing, Silver Spring. Carl is six months old. (**B**). Carl is two years old here, sitting in Bolivian wedding hammock. Photos courtesy of Debra Gilmore.

Calvin's dissertation focused on the Basellaceae, an Andean tuber crop, which was a suggestion made to him by Dr. Schultes. Calvin acknowledges this, as well as his appreciation to Dr. Schulte's for, "most of all for teaching me the value of studying plants used by man," [8]. Calvin concluded his work in 1987, two years after Schultes officially retired and was made Emeritus Professor of Biology, meaning he could no longer serve as the chair of a graduate advisory committee. Consequently, Calvin's dissertation was sent to his new advisor, Dr. Rolla Tryon, through the Department of Organismic and Evolutionary Biology.

Immediately thereafter, in 1987, Calvin applied for and was offered a full time position as a Research Associate with USDA's Germplasm Service Laboratory. This new position and responsibilities, coupled with his upcoming plans for marriage and relocation from Boston to Washington, D.C., all meant that there was no real time or opportunity to convert his dissertation into a publishable paper. However, the dissertation copy on file continues to attract attention and is often referenced. One such tribute was paid by [9] in the Kew Bulletin, who mentioned that:

"The unpublished dissertation by Sperling [8], and the subsequent publication of two new species [10], should also be especially mentioned. His dissertation focused on the biology of Ullucus but also included a detailed taxonomic treatment of the entire family." Besides submitting his written thesis, which is now available through ProQuest [8], Calvin also provided 272 plant specimens in the Harvard University Herbarium collections [11], followed by a second deposit to the USDA National Plant Germplasm System

(NPGS). The totality of the NPGS-Harvard accessions will be reviewed shortly in terms of species and emphasis while collecting.

Opportunities also arose to collect specimens of other species, with one example being a rare member of the mustard family, *Lepidium meyen*, known by the Quechua-speaking peoples of Peru as Maca [12]. For this excursion, Calvin collected with Steven King, a graduate student at the time. They made their way to collecting areas around Ninacaca, a town northeast of Lima in the Andes. Here, maca could be found, surviving on lands that were extremely difficult to farm. Such expeditions were also recounted by Balick and Lee [13].

Besides the ex situ conservation assignments, Dr. Sperling also advised in many other areas, as for example, summarized by Forsline and Hummer [14], "He facilitated the process of prioritization and establishment of international relationships in the era before international treaties for exchange of plant genetic resources became common."

Much of this work was initiated by Dr. Sperling during his trips to Kazakhstan which was one stop on the first expedition to collect apple germplasm. When subsequent trips were planned, Calvin's prior plant-collection experience ensured he could help prepare new teams for travel to the former Soviet Union and collaborating with Professor Dzhangaliev [15]. Calvin's willingness and generosity to apply his knowledge also made him available to many others, including for Project Noah, as implemented by U.S. AID (See coming section, THE TRANSITION FROM GERMPLASM TO BIODIVERSITY) for details).

HERBARIUM SPECIMENS AND GERMPLASM ACCESSIONS

By the time Calvin reached the final years of his career, he had traveled to approximately 40 countries, overseeing nearly 100 explorations. Accessions attributed to Calvin's collecting expeditions from 12 of those countries are found in the U.S. National Plant Germplasm Bank, totaling 1897 accession records with expeditions supported by either Harvard University or USDA/ARS (Figure 4). From these 1897 accessions, 473 appear as duplicates, which occurs as collectors often take more than one sample of a plant while in the field. Thus, there are 1414 distinct accessions from Calvin's collection trips [16].

Out of the 61 genera collected, 13 had at least 20 accessions (Figure 5). The four genera having the most accessions by percentage are Prunus (18%; apricot, mountain cherry), Triticum (16%; wheat, Einkorn wheat), Malus (15%; wild apple) and Vicia (12%; species of vetch), indicating Calvin's interest in economically important plants.

Figure 4. Calvin Sperling seeking wild relatives of the carrot, on the Cayambe volcano in Ecuador. Photo courtesy USDA.

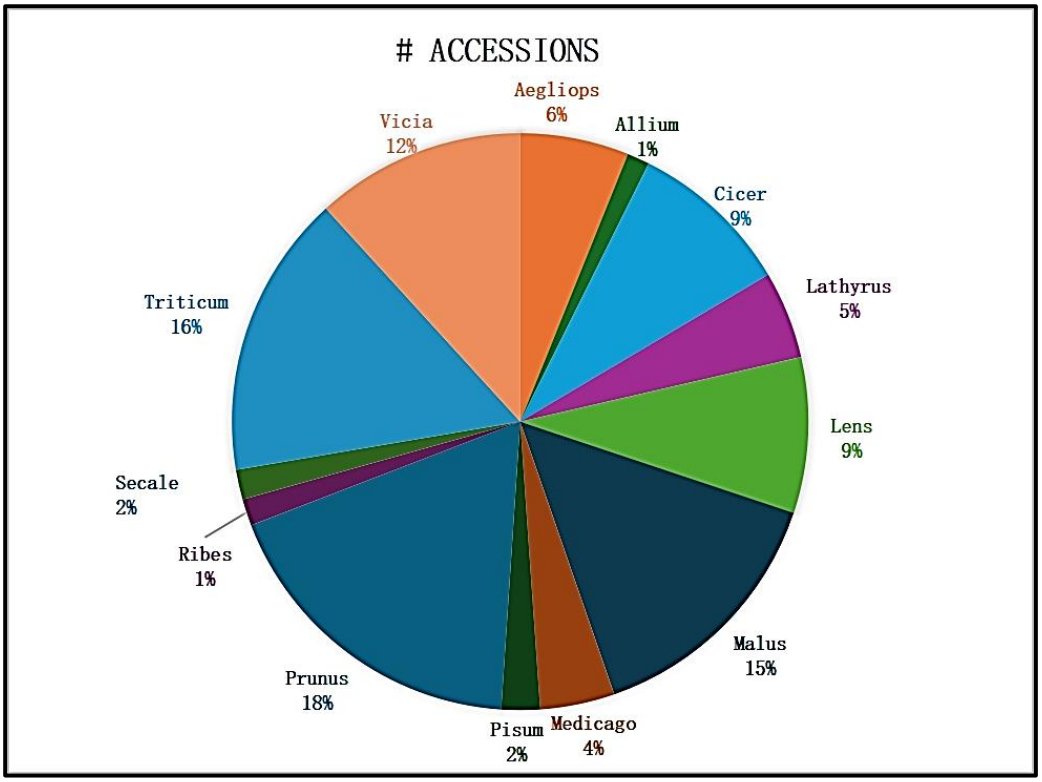


Figure 5. Number of accessions, in percentages of total, for genera having over 20 species as collected and deposited by Calvin Sperling.

Besides the deposits in the national genebank, many samples were also accessioned by the Gray Herbarium, one part of the Harvard University

Herbaria, found in Cambridge, Massachusetts. This collection totals accessions from 20 genera and 53 species, including samples of Calvin's work with Dr. Schultes. Presently, Harvard has over five million specimens in its Herbaria collections, and less than half of those have been scanned [17]. The remaining specimens from Dr. Sperling have not yet been located, so additional specimens from Calvin's expeditions may yet be discovered.

Having these samples accepted to the herbarium means that Dr. Sperling is included in the Harvard University List of Botanists [18] and as an ASA Botanist, ID #120430. The Tropicos, a database storehouse of botanical information and collections, also has two records of Calvin's explorations, both conducted in July 1982. The first is showing a collector's number of 6407 for a trip to Bolivia searching for *Mascaginia lasiandra*.

A second record from Dr. Sperling's list has collector's number 6416 from Bolivia. This passage took Dr. Sperling and Steven King to remote locations in the Andes in search for, among other crops, a climbing liana belonging to the family Bignoniaceae. Not one to be easily stopped, Calvin was able to keep his collections in the news after his death. This was made possible through a forward written for a publication by Dr. Nowicke of the Smithsonian but published in Calvin's name [19]. Dr. Nowicke came across the species in Calvin's dissertation and recognized that they had been overlooked because Calvin's dissertation was never published.

Calvin's ecogeographic focus while collecting information that accompanied each plant, combined with the guidance and oversight he provided for dozens of collection trips, led to a plan for filling strategic gaps in the National Plant Germplasm System. Calvin's enthusiasm for this plan, plus the heightened insight such planning provided for collection expeditions, led to thousands of important accessions added to the U.S. gene banks.

USDA/ARS CHIEF PLANT EXPLORATION OFFICER (1987–1995)

Calvin's employment with USDA, beginning in 1987, coincided with four significant trends, including: (i) increasing numbers of local and national genebanks coming online; (ii) growing awareness of global environmental concerns and effects; (iii) utilizing various tools of emerging biotechnologies; and (iv) reconsidering the "belief that germplasm, like the oceans and air, is a world heritage to be freely shared for the benefit of all humanity [20]; Figure 6. This expansion of national genebanks became apparent in the 1980s and into the 2000s, with a significant increase in number over those present initially in a survey on genetic resource conservation ([21]).

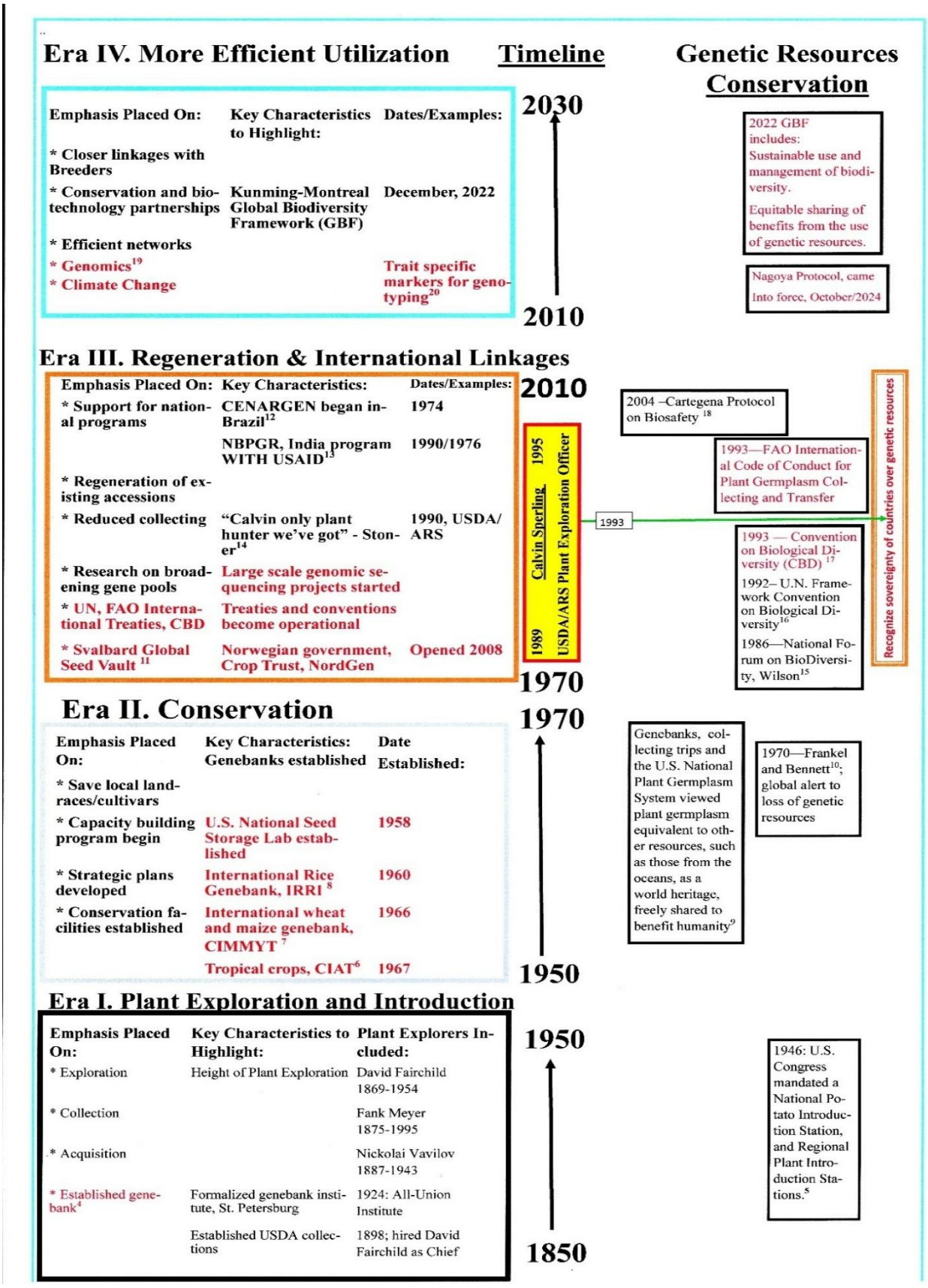

Era IV. More Efficient Utilization
Timeline
Genetic Resources Conservation
Emphasis Placed On:
Key Characteristics to Highlight:
Dates/Examples:
* Closer linkages with Breeders
* Conservation and biotechnology partnerships
Kunming-Montreal Global Biodiversity Framework (GBF)
December, 2022
* Efficient networks
* Genomics[19]
* Climate Change
Trait specific markers for genotyping[20]
2030
2010
2022 GBF includes:
Sustainable use and management of biodiversity.
Equitable sharing of benefits from the use of genetic resources.
Nagoya Protocol, came Into force, October/2024
Era III. Regeneration & International Linkages
Emphasis Placed On:
Key Characteristics:
Dates/Examples:
* Support for national programs
CENARGEN began in-Brazil[12]
1974
NBPGR, India program WITH USAID[13]
1990/1976
* Regeneration of existing accessions
* Reduced collecting
"Calvin only plant hunter we've got" - Stoner[14]
1990, USDA/ARS
* Research on broadening gene pools
Large scale genomic sequencing projects started
* UN, FAO International Treaties, CBD
Treaties and conventions become operational
* Svalbard Global Seed Vault [11]
Norwegian government, Crop Trust, NordGen
Opened 2008
2010
1970
1989 USDA/ARS Plant Exploration Officer Calvin Sperling 1995
1993
2004 –Cartegena Protocol on Biosafety [18]
1993—FAO International Code of Conduct for Plant Germplasm Collecting and Transfer
1993 — Convention on Biological Diversity (CBD) [17]
1992– U.N. Framework Convention on Biological Diversity[16]
1986—National Forum on BioDiversity, Wilson[15]
Recognize sovereignty of countries over genetic resources
Era II. Conservation
Emphasis Placed On:
Key Characteristics: Genebanks established
Date Established:
* Save local landraces/cultivars
* Capacity building program begin
U.S. National Seed Storage Lab established
1958
* Strategic plans developed
International Rice Genebank, IRRI [8]
1960
* Conservation facilities established
International wheat and maize genebank, CIMMYT [7]
1966
Tropical crops, CIAT[6]
1967
1970
1950
Genebanks, collecting trips and the U.S. National Plant Germplasm System viewed plant germplasm equivalent to other resources, such as those from the oceans, as a world heritage, freely shared to benefit humanity[9]
1970—Frankel and Bennett[10]; global alert to loss of genetic resources
Era I. Plant Exploration and Introduction
Emphasis Placed On:
Key Characteristics to Highlight:
Plant Explorers Included:
* Exploration
Height of Plant Exploration
David Fairchild 1869-1954
* Collection
Fank Meyer 1875-1995
* Acquisition
Nickolai Vavilov 1887-1943
* Established genebank[4]
Formalized genebank institute, St. Petersburg
1924: All-Union Institute
Established USDA collections
1898; hired David Fairchild as Chief
1950
1850
1946: U.S. Congress mandated a National Potato Introduction Station, and Regional Plant Introduction Stations.[5]

Figure 6. Ex situ conservation eras, showing original table modifications, career highlights and global agreements. Figure 6 is an updated and revised version of Figure 1 in [21]. Entries in red are revised sections of the figure, not known at time of original publication; Timeline is in keeping with original table. Entries in column marked "conservation awareness/genetic resources" are general indicators of trends in each Era. They are not to be interpreted as a comprehensive listing of all events. Figure 6 references: First version of figure did not list earliest start-up dates for USDA collections (Garland-Campbell 2024) nor for the All Union Institute in Soviet Union (Loskutov et al. 2024); [5] 1946: formal program to acquire, test and preserve introductions (Garland-Campbell 2024); [6] CIAT: International Center for Tropical Agriculture. Examples only; many more international genebanks came online; [7] CIMMYT: International Maize and Wheat Improvement Center; [8] IRRI: International Rice Research Institute; [9] Concept of "world heritage" originally set for genetic resources (USDA 1990; See [20]); [10] Frankel, O.H. and E. Bennett (Eds). 1970; [11] Svalbard Global Seed Vault. 2025; See [22]) [12] Cunha Alves and Azevedo. 2018; [13] Smith, M.A., and A. Blumberg. 1990. Examples only; many more genebanks came online; [14] Alan Stoner, quoted in, Farnham, A. 1990; [15] Wilson, E.O. and F.M. Peters. 1988 (See (Wilson EO, et al., 1988)); [16] Marden, E., R.S. Hamilton, M. Halewood, and S. McCouch. 2023; (See Marden E, et al., 2023) [17] Marden, E., R.S. Hamilton, M. Halewood, and S. McCouch. 2023; [18] Marden, E., R.S. Hamilton, M. Halewood, and S. McCouch. 2023; [19] Aubry, S. 2023; [20]. Remaining references: Aubry S. Genebanking plant genetic resources in postgenomic era. Agric Hum Values. 2023;40:961-971; Cunha-Alves AA, Azevedo VCR. Embrapa network for Brazilian plant genetic resources conservation. Biopreservation Biobanking. 2018;16:350-351; Farham A. Saving the world one seed at a time. Fortune. 1990;121:68; Frankel OH, Bennett E. Genetic resources in plants: their exploration and conservation. 1970; Garland-Campbell K. Celebrating the importance of plant germplasm. CSA News. 2024; p. 26-30; Loskutov IG, et al. VIR: from a small Bureau in the Russian Empire to the present-day National Center for Plant Genetic Resources. Genet Resour. 2025; S2:58-69; Smith MA, Blumberg A. Conservation of India's plant genetic resources: USAID's largest biodiversity activity. Diversity. 1990;6:7-9.

The years Calvin worked for USDA/ARS were added to Figure 6 to emphasize them in relation to time available for exploration and collection. As shown in Table 1, Dr. Sperling's career time was 15 years, the least by far of all of the other pioneers together, which are located in Era III, out of a total of four eras of genetic resource conservation. It begins with Era I, as the world was opened by intrepid explorers of the plant kingdom, who to this day remain of a singular character and bravery. This beginning eventually led to the international system of ex situ conservation (Era IV, Figure 6) now having a backup facility carved out of rock and permafrost in Norway [22].

Table 1. Professional career years for nine plant expedition/collectors, ranked in order, with focus on timeline for Calvin Sperling.

Collector ID #	Collector Name	Professional Career: Years of Service [i]	Age at Death	Year of Birth and Death	Average and Actual Computation
1	Otto H. Frankel	78	98	1900–1998	
2	John G. Hawkes	77	92	1915–2007	
3	Charles Heiser	70	90	1920–2010	
4	David Fairchild	65	85	1869–1954	
5	Wilson Popenoe	63	83	1892–1975	
6	Jack Harlan	61	81	1917–1998	
7	Nikolai I. Vavilov	26	56	1887–1943	
8	Frank Meyer	23	43	1875–1918	
9	Calvin Sperling	15	38	1957–1995	1995–1980 = 15 year (actual) careers
Totals	Age	N = 9	666	-	666 years/9 = 74 years of age
Compute career age	Minus 20 years pre-career/education	−20 years	-	-	74 years−20 = 54 career years average

[i]: This value is computed by subtracting 20 years (as an average value of experience plus education completed prior to career position) from everyone's age at death.

As the exploits, success, and range of material collected by plant collectors increased, so did the need for safe storage and conservation. Without adequate storage, the viability of seed and other planting material drops dramatically, making further seed production or characterization difficult. However, this untapped potential or discovery also requires adequate investigation [23]:

"*The enormous plant potentials discovered in the centers of primary origin forms and species of cultivated plants should be subjected to investigation not only by the taxonomist, but also by the physiologist, the biochemist and the pathologist…opening an immense field of the most fascinating and urgent work.*" (Vavilov 1951)

If viability could not be ensured by having functional short- to long-term storage, then an accession's potential value could decline. Table 2 presents an updated analysis of when modern genebanks were opened in chronological order. As shown, the United States and Russian systems were operational by or before the early to late 1950s. Genebanks at the international agricultural research centers became operational in the 1960s (Figure 6, Era II). National gene bank programs in developing countries, and bilateral/multilateral support programs began in earnest in Era III. The increase in gene banks coincided with three related developments, affecting where and when genebanks were established and the role they would assume. The developments include:

1. Enhanced trait information per accession. With additional genebanks, related information systems and new molecular technologies [24], came the ability to generate more knowledge per accession, thereby generating more interest in access (Era IV, Figure 6).
2. Applications of biotechnology. New tools of biotechnology promised to address old problems with fresh solutions [25] and by offering ability to transfer single genes for agronomic traits. (Era IV).
3. Material transfer agreements. Genetic resources became subject to exchange using material transfer agreements [26] which were meant to ensure equitable returns of benefits accruing from the use of modern technologies incorporating traditional material (Era III).

During Calvin's initial field trips [27], collecting samples, reviewing taxonomic species correctness, and seeking germplasm to address US agricultural needs was foremost on his mind. These trips also relied on Calvin's innate ability to communicate, and his passion for this work came across to his peers and colleagues, as reflected in comments from Dr. Phil Forsline, who described Calvin's first trip to the former Soviet Union, where he met with Professor Dzhangaliev, and together "they discovered the vast, very-diverse *Malus sieversii* forests," [28].

Table 2. Chronological and illustrative examples of growth of genebanks: National and international.

Year Genebank Opened	# Accessions	Country	National PGR Program Affiliations	IARCs (Examples Only) (Illustrative, not Inclusive)
1920–1975	230,000	Soviet Union	All Union Institute of Applied Botany and New Crops (1924)	
1958		United States	USDA/ARS/NPGS NSSL, Ft. Collins, CO	
1960	86,000	International		IRRI, Philippines
1966	103,249	International		CIMMYT, Mexico
1967	60,000	International		CIAT, Cali, Colombia
1986	342,798	India	NBPGR	
1988	50,000	Kenya	KALRO/GeRRI	
2012	181,000 (wheat & maize)	Mexico	CNRG	
2013	420,000	China	CAAS	

The next ethnobotanical study was derived from a seven person team cataloging the plant community supported by an Indigenous Andean people. Calvin was asked to be one of the members, and the study was able to identify 507 plant species [29]. The research team gathering plant information consisted of those experienced in plant collection techniques combined with anthropologists trained in informal interviewing. While Dr. Sperling's expertise lay in the first group, the surveys and data collection were

conducted in an interdisciplinary manner, establishing “a basic methodology for ethnobotanical fieldwork, which we continue to use,” [29].

Calvin’s diligence, his dedication to surmounting challenges in front of him and his ability to work well with a broad range of partners was also seen in identifying collection gaps in, for example, the wild germplasm of species in the Malus family. As noted by their findings:

“*The under-representation of wild germplasm, particularly from the apple’s center of origin, was critical because such would likely contain more genetic diversity for such important traits as disease and insect resistance, fruit quality, growth attributes and physiological characteristics, along with …..* [30].

Such strategic studies, along with the results of his own expeditions and as his collections. However, as trips and collections grew more extensive, Calvin became even more concerned with the loss of landraces, wild relatives, and other related species. Gradually, his concerns with this loss came to be known as genetic erosion. This term conveyed the loss over time of genetic diversity that occurred by either natural or human-induced processes [30].

THE TRANSITION FROM GERMPLASM TO BIODIVERSITY

With the arrival of biotechnology’s molecular tools came the possibility of adding one’s gene of choice to the background genome of a given plant species. This meant that what once had been considered part of a common “genetic resource” could now be, either in theory or practice, patented and protected in commercially sold seed for which only the technology developer received compensation.

This emerging perception led to the notion that rather than continue to see genetic resources as products of a common heritage, they would instead become part of a nation’s biodiversity and would therefore be placed under that country’s sovereign domain and use of such resources determined by that country.

Furthermore, to balance expectations of financial gain between technology development and the newly subscribed owners of a given genetic resource, an article on “benefit sharing” was introduced to the Convention on Biological Diversity, raising hopes that contributing countries would gain financially from its contribution.

Then the question became one of who and how such a global and far-reaching concept could be brought into practice. How does a United States federal agency execute further exchange of germplasm when they have not ratified the CBD because of the unanimous concern about this very principle? This is where Calvin stepped in and produced suggestions as to how the Department might respond.

In 1986, a national symposium was organized that introduced the significance of biodiversity to an intentionally broad audience, with speakers

grouped into twelve sessions and covering diverse research topics [31]. Subsequently, many of the introduced topics became research disciplines. Interests generated from that meeting increased the focus on biodiversity, with many United States Government agencies developing biodiversity granting plans. What became Project Noah was one such project of the Agency for International Development.

In 1990, Congress requested that USAID study the need for conservation of biological diversity, as well as programs requiring support through Agency assistance. The program originally was envisioned by Congress as an "international rescue mission for the thousands of animal and plant species faced with the prospect of imminent extinction." The effort was given the name "Project Noah" in reference to the biblical story. This project was also in response to intra-Agency responses from the Office of Agriculture emphasizing that genetic resources were a part of biodiversity, and that the word did not refer to tropical forests and megafauna alone.

The Noah Project and its respective initiatives aim to stimulate urgent concern for the loss of the world's biodiversity, promote the science and technology necessary to advance the ex situ preservation of genetic material, and foster within the foreign aid community a recognition that a healthy natural environment is an indispensable requirement for successful human development.

Once individual grants from the Project Noah funds were made to the recipient scientists, invitations were sent to the principal investigators asking them to contribute a chapter to a forthcoming book using a case study modality. The final book was one of the first volumes to look at in situ crop fields in agricultural landscapes [32].

Dr. Sperling's first expeditions were conducted in the early to mid-1980s, so that once the transition to national sovereignty occurred, he too revised his approach to benefit sharing, and then had much to contribute, as by the time help was requested, he had accumulated many years of germplasm collecting and deposits. There are two major changes occurring in this period. The first has to do with the intent and meaning of the term biodiversity.

The second had to do with germplasm exchange and expected benefits, and how these agreements would be managed in the future. The changes are put into sequence order with Calvin's life in Figure 6, Column IV, global developments, and Table 3. As for the first change, Thomas Lovejoy introduced the use of "biological diversity," in 1980, then it was not until 1985 that Walter Rosen coined the abbreviated form of, "biodiversity." Finally, in 1986, the forum on biodiversity was held in Washington, DC, and this popularized the use of the abbreviated form globally. Shortly thereafter, an agency task force on biodiversity was organized through the State Department, and Calvin represented USDA for seven years [33].

With the expansion of awareness around the term biodiversity, came the need to clarify the resources pertinent to agriculture, as a subset of global

diversity. For this, the term “plant genetic resources for food and agriculture, or PGRFA. This term was used in the FAO International Code of Conduct for Plant Germplasm Collecting and Transfer, which was released in 1993 (Figure 6, Era III). The USDA response was to draft the NPGS Code of Conduct for Foreign Plant Explorations [34]. Ever since its development, this NPGS code has been used by plant explorers when working in a different country.

The second change had to do with the UN Framework Convention on Biological Diversity, and the UN Conference on the Environment, each held in 1992. Responsiveness to the first changes, culminating in the UN Framework Convention on Biological Diversity, and the introduction of what would lead to a material transfer agreement for the exchange of genetic resources.

In support of these various working groups, Calvin developed new guidelines to help with exploration, equity issues, and exchange of genetic material. The importance of understanding both the value of germplasm and cultural sensitivities while collecting came from Calvin’s own experiences and explorations:

“Sperling makes about three trips per year. While much of his time is spent hiking over the fields, he has found it equally rewarding to spend time in local markets and if lucky, in the homes of farmers and local residents, taking part in their native meals” [35].

PUBLIC PERCEPTION AND EDUCATION

The year 1992 marked the 500th anniversary of the Columbus arrival in the Americas. As such, numerous symposia were held, one by the CSSA on international germplasm transfer. For this symposium, Dr. Sperling was asked to address the exchange of horticultural crop germplasm over the past 500 years. His discussion considered the diversity, or lack thereof, in the American diet, as reflective of this long history of horticultural exchange. Calvin charted his meals over a one year period and determined that he had consumed some 307 vascular plants [36]. Calvin’s self-assessment was a novel way to show how, by using these various foods as examples, an American diet could be augmented to increase its diversity.

Calvin’s prescience here, like in many other topics covered, was very much future oriented, with the theme and message being picked up more recently in The Washington Post. Here, in the article by Kennedy [37], the importance of eating with diversity as a meal planning tool is also posited as part of the solution for our climate crisis. As noted by Sperling and Williams, “The hemispheric exchange of germplasm initiated by Columbus 500 years ago continues, and, despite appreciable genetic erosion, untapped sources of genetic diversity are still far from exhausted.”

Table 3. Calvin sperling lifetime history, accomplishments among global developments in genetic resources.

Year and Date (s)	Country	Purpose and/or Crop of Interest	Location/ Organization	Collection and Research or Health Details
1957 February 7	USA	Birth	Farwell, MN	Parents: Clarence and Doris Sperling
1975–1979	USA	Five-year floristic survey Of Minnesotan flora and fauna and ethnobotany	State-wide collecting	5000 specimens
1980–1981	Brazil Columbia	Studies in South America included: Quecua ethnobotany	Graduate school	
	Ecuador, Peru, Bolivia	Tuber crop: *Ullucus tuberosum* Common name: olluco, ulluku, melloco		
1983	Global	Genetic resources as *common heritage of humankind*	As published by the FAO	Germplasm collected with this understanding
1984–1986	Turkey and Israel	Wheat and wild relatives	Contract/grant employment with USDA and USAID	Ecogeographic study of wheat in the region
1987–1994	40 different countries	Kazakhstan, Uzbekistan, Tajikistan	More than 1000 accessions species added to NPGS	Collecting wild food legumes
1987	USA	National Germplasm Resources Laboratory	USDA/ARS/NPGS	Beltsville Plant Exploration Officer
1989	USDA	Becoming Plant Exploration Officer		
	Kazakhstan	Wild apricot tree relatives		
1989	USA	One of 25 most fascinating “business people”	Fortune Magazine	Awards for selected individuals of 1989
1992	Rio de Janeiro	UN Conference on Environment and Development	Brazil	Cancer diagnosis
1993	Kenya	The UN Framework Convention on Biological Diversity was ratified and came into force	Conference of the Parties to the CBD held in Nairobi, Kenya	Countries develop National Action Plan on Biodiversity
1993	Ethiopia	Led U.N. mission to Ethiopia	Conserve native or traditional germplasm	Crops threatened by drought
1993	USA	Richard Evans Schultes Award, Ethnobotany	Cambridge, Massachusetts	First-ever Schultes Award presented
1995 May 10	USA	Awarded Frank Meyer Medal	USDA-ARS	More experimental cancer treatments undertaken
1995 May 20	USA	Died, age 38, at home	Silver Spring, Maryland	Malignant melanoma cancer; died four years after diagnosis

Most presentations or lectures by Dr. Sperling's were delivered to professional societies or audiences (Figure 7). Consequently, the words and experiences of Dr. Sperling were missed by younger students or the coming generation. Incorporating lessons from the work of scientists such as Dr. Sperling would fill a gap in education, as there are limited opportunities for bringing agriculture into secondary classrooms, especially within highly urban school systems. For example, the relation between agricultural systems and natural resources, sustainability, and biodiversity is not found in the conceptual framework [38]) supporting the Next Generation Science Standards.

Concordia College presents
The 11th Annual
Professor R.E. Fuglestad Memorial Lecture
featuring

Dr. Calvin R. Sperling
Plant Exploration Officer
National Germplasm Resources Laboratory,
Washington, D.C.

"Global Conservation of Wild Crop Relatives"

Thursday, November 4, 1993 ■ Knutson Center Centrum ■ 7:30 p.m.
Sponsored by the Department of Biology, Concordia College, Moorhead, Minnesota

- **Dr. Calvin Sperling** heads the USDA's Agricultural Research Service Plant Exploration Office and is the coordinator of worldwide plant collecting activities to collect and preserve the genetic sources of food, forage and fiber crops.
- A native of Fergus Falls, Minn., and a graduate of North Dakota State University, Sperling will discuss plant genetic diversity and its role in supporting the bio-diversity of our food supply that is often taken for granted.
- He will illustrate with slides his trips into remote regions of the world in search of wild crop relatives of such staples as sugar beets, sunflowers, wheat, potatoes, corn and soybeans.
- Dr. Sperling annually leads exploration trips to collect the wild relatives of major and little-known crops in the Amazon, the Andes, the Near East Fertile Crescent, Russia, Central Asia and Turkey.
- His work is an important part of the effort to preserve the wild relatives of crop plants throughout the world. Anyone who eats food will find something of interest in this lecture!

It is the policy of Concordia College to provide equal opportunity for all qualified persons in its educational programs and activities. The college is in full compliance with the laws of the United States and all applicable regulations. The college does not discriminate on the basis of race, creed, color, national origin, age, sex or physical handicap in the educational programs that it operates.

Figure 7. Calvin Sperling invited speaker for the 1993 Fuglestad memorial lecture.

Dr. Sperling is quoted as saying, “Genetic diversity is the key to maintaining and improving agriculture, whether it’s discovering new crops or finding the genes for resistance to diseases...” [39]. However, when such diversity and conservation is discussed in secondary education, it is taught from the perspective of human impact on biodiversity, where related issues of agricultural biodiversity do not appear. When schools adopt the Next Generation Science Standards (NGSS), biodiversity becomes the final performance expectation as: “Create or revise a simulation to evaluate a solution to mitigate adverse impacts of human activity on biodiversity,” [40] for which responses usually pertain to endangered animal species.

Recent emphasis on engaging students in the “who” of scientific discovery and not just the “what” or “why” emphasizes use of grade-level biographies [41]. Selecting scientist biographies can emphasize diversity [42] and/or be chosen based on assessing student interests [43] Introducing a modified version of Dr. Sperling’s contemporary biography would have direct curriculum links to biodiversity, genetic diversity and erosion, and conservation, as examples.

PLANT EXPLORATION AND COLLECTORS

Table 1 presents the lives of nine pioneering plant collectors and the respective number of years that can be considered as a “productive lifetime,” meaning the number of years working in their chosen occupation. The average productive lifetime for this group is 53 years. However, when the short-term life values are separated from those not so constrained, the productive lifetime for those three individuals (Frank Meyer, Nikolai Vavilov, and Calvin Sperling) is 21 years, which is approximately 32 years less than the longer-term survivors.

This group of nine holds those whose life was long, and those whose life was taken far too soon, as seen by the fact that on average Calvin Sperling’s life was 32 years less in activity than the other seven. For what do we commemorate these individuals? For in remembrance we return to those who mattered but who are no longer here; to those who stood for ideals endorsed by many, but for which they were imprisoned, and to know the people and ideas that preceded and influenced us.

Of the three collectors who have the briefest lifetimes, Calvin’s lifetime and his time collecting were too brief, being less than half of the time available for Nikolai Vavilov, whose final years were spent in prison, leading to an end caused by starvation and governance. It is appropriate to compare Calvin’s life in service and his accomplishments with other collectors because of his responsibilities as the lead scientist for Plant Exploration in USDA. Historically, each of the plant explorers in Table 1 lived and explored in a world far different from today. The germplasm accessions amassed often came before long-term storage facilities existed in the countries in which they traveled.

Seed left there could perish were it not for seed banks elsewhere, from which native seed could be repatriated should that prove necessary.

A LIFE CUT SHORT: CONSERVATION AND COMMEMORATION

Conservation

Calvin Sperling began serving as the U.S. Chief Plant Explorer in 1987, which included leading a 1993 United Nations project to conserve plant populations threatened by drought in Ethiopia. In 1995, he was awarded the Frank N. Meyer Medal [44,45], midway through his sixth year with the National Plant Germplasm System (NPGS). This award marked the culmination of his work since graduate school in both the theory and practice necessary for effective conservation of plant genetic resources. His assignments with NPGS had brought his understanding of taxonomy and systematics together with his collection missions, often gathering seed from endangered crops and their relatives. As a recipient of the Meyer Award, Calvin would have been recognized for finding and conserving plant germplasm which was matched by his desire to see diversity not only conserved and characterized but, wherever possible, enter into and diversify the American diet.

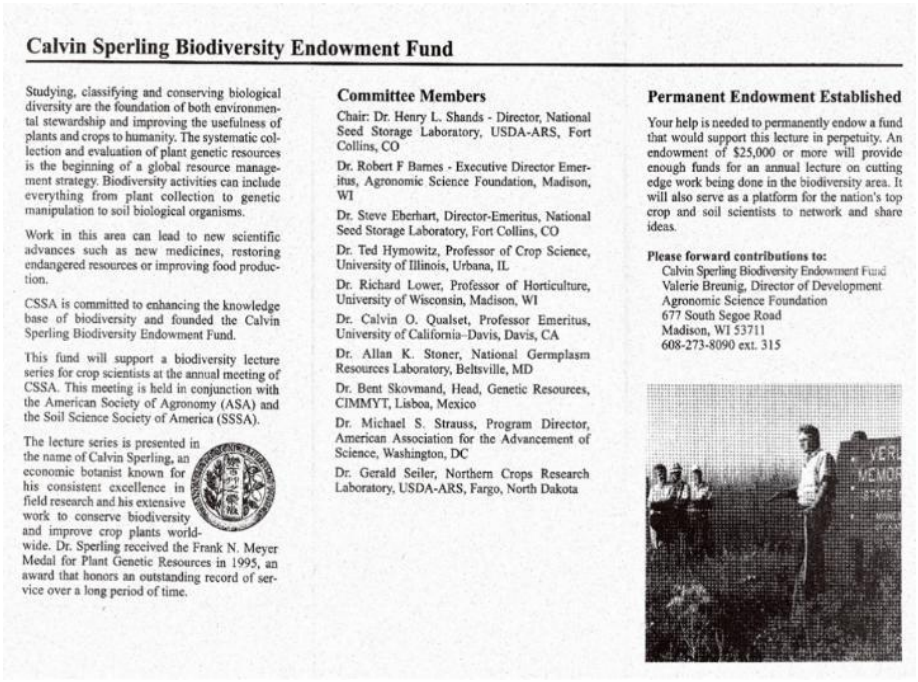
Calvin pioneered collection priorities as well for NPGS [46], eventually dividing planned acquisitions into four groups: landraces of plants, wild progenitors of domesticated plants, plants with unique active properties, and rarities of evolution [47]. In addition, new conditions, and understandings by which germplasm was collected were changing. began to change in agreement with international views and conventions on biological diversity. By taking these changes into account, Dr. Sperling helped USDA evolve to meet the requirements of this new guidance. This work also coincided with his proposal for developing a more rational system for setting collecting and conservation strategies, leading to his organizing nearly 100 explorations to over 40 different countries.

Beyond ex situ conservation, or genebanks, Calvin pioneered models for in situ conservation, especially of wild relatives, which can become a part of crop conservation efforts and further biological diversity goals. However, as many of Dr. Sperling's accomplishments can be recalled, they are limited due to three reasons. First, his rapid move from the systematics of the Basellaceae to the demands and needs of the NPGS position gave him insufficient time to publish his dissertation, despite its value [9,19]. Secondly, Calvin's time to publish diminished as he assumed greater responsibility within the NPGS and collaborated with other entities in getting their own genebanks in operation. Finally, came the onset of Calvin's cancer, which was not immediately understood and, by virtue of its aggressive nature, resulted in prolonged

suffering, thus limiting the time he could work from the office and making travel impossible.

Commemoration

After Calvin's death, the family explored options for sustaining a perpetual reminder of Calvin's contributions. Eventually, Sperling family members joined with friends, and professional colleagues to create an endowment bearing Calvin's name. This has been implemented and watched over by the Agronomic Science Foundation (ASF) of the Crop Science Society of America (CSSA) (Figure 8). As such, the ASF is responsible for ensuring that a suitable candidate is selected each year to offer a presentation in November. It was created to honor the memory and research pursuits of Dr. Sperling. Its purpose is to "bring renowned biodiversity lecturers from outside the CSSA to share their research experiences, knowledge, and views on biodiversity as they interface with crop agriculture and the interests at the CSSA annual meeting [48] (ASF 2014). For such an event, family, ASF, CSSA officials attended (Figure 9).



Calvin Sperling Biodiversity Endowment Fund

Studying, classifying and conserving biological diversity are the foundation of both environmental stewardship and improving the usefulness of plants and crops to humanity. The systematic collection and evaluation of plant genetic resources is the beginning of a global resource management strategy. Biodiversity activities can include everything from plant collection to genetic manipulation to soil biological organisms.

Work in this area can lead to new scientific advances such as new medicines, restoring endangered resources or improving food production.

CSSA is committed to enhancing the knowledge base of biodiversity and founded the Calvin Sperling Biodiversity Endowment Fund.

This fund will support a biodiversity lecture series for crop scientists at the annual meeting of CSSA. This meeting is held in conjunction with the American Society of Agronomy (ASA) and the Soil Science Society of America (SSSA).

The lecture series is presented in the name of Calvin Sperling, an economic botanist known for his consistent excellence in field research and his extensive work to conserve biodiversity and improve crop plants worldwide. Dr. Sperling received the Frank N. Meyer Medal for Plant Genetic Resources in 1995, an award that honors an outstanding record of service over a long period of time.

Committee Members

Chair: Dr. Henry L. Shands - Director, National Seed Storage Laboratory, USDA-ARS, Fort Collins, CO

Dr. Robert F Barnes - Executive Director Emeritus, Agronomic Science Foundation, Madison, WI

Dr. Steve Eberhart, Director-Emeritus, National Seed Storage Laboratory, Fort Collins, CO

Dr. Ted Hymowitz, Professor of Crop Science, University of Illinois, Urbana, IL

Dr. Richard Lower, Professor of Horticulture, University of Wisconsin, Madison, WI

Dr. Calvin O. Qualset, Professor Emeritus, University of California–Davis, Davis, CA

Dr. Allan K. Stoner, National Germplasm Resources Laboratory, Beltsville, MD

Dr. Bent Skovmand, Head, Genetic Resources, CIMMYT, Lisboa, Mexico

Dr. Michael S. Strauss, Program Director, American Association for the Advancement of Science, Washington, DC

Dr. Gerald Seiler, Northern Crops Research Laboratory, USDA-ARS, Fargo, North Dakota

Permanent Endowment Established

Your help is needed to permanently endow a fund that would support this lecture in perpetuity. An endowment of $25,000 or more will provide enough funds for an annual lecture on cutting edge work being done in the biodiversity area. It will also serve as a platform for the nation's top crop and soil scientists to network and share ideas.

Please forward contributions to:
Calvin Sperling Biodiversity Endowment Fund
Valerie Breunig, Director of Development
Agronomic Science Foundation
677 South Segoe Road
Madison, WI 53711
608-273-8090 ext. 315

Figure 8. The Agronomic Science Foundation (ASF) brochure, announcing the Calvin Sperling endowment and subsequent activities. Courtesy of ASF.

Figure 9. Family members, guests, and members of the CSSA and ASF, attending the 2023 Sperling Memorial address. Photograph by J.I. Cohen.

Since its inception in 2001, 24 speakers have been invited and participated in the CSSA annual meetings. This memorial fund ensures that Calvin Sperling's name remains on the program each year. and thus helped to familiarize those attending. However, it was noticed that many attending presently, (meaning since 2014) were no longer familiar with Dr. Sperling's name or his accomplishments. It was based on this observation and related discussions that a special memorial presentation was added to the lectureship in 2023 [49]. This same presentation formed the foundation for this paper.

As 2025 approaches, the ASF carries the memory of a soul that was taken far too soon. Each year, since 2001, the award's steering committee meets to select an individual that offers the Crop Science Society a unique perspective on biodiversity. However, if given a moment, the session could also become a "call to remembrance" [50], allowing those in attendance to reflect on and remember Calvin in their own way.

Even on his last days, Calvin made sure all those present knew he lived for and with family and career, not with regret. His life, though interrupted in such a tragic way, was lived as a constant presence, urging those around him forward, not showing any sign of retreat or loss, leaving us with a permanent image of his humor, strength, and courage.

DATA AVAILABILITY

The dataset of the study is available from the author upon reasonable request.

CONFLICTS OF INTEREST

The author declares that they have no conflicts of interest.

ACKNOWLEDGEMENTS

The author wishes to express his upmost appreciation to the following individuals, each of whom played such an important role in bringing about this commemorative paper and presentation to the CSSA: Debra Gilmore, Calvin's spouse; Beverly Cole, Calvin's Sister; Jane Dever, ASA Fellow; Georgia Eizenga, Chair, Division C-8, Plant Genetic Resources; Cullen McGovern, USDA/ARS; Daren Harmel, Director, USDA/ARS-CARR; Karen Williams, USDA/ARS; Sarah Uttech, ASF, and Seth C. Murray, Past CSSA President; and Anthony R. Brach, Senior Curatorial Technician, Harvard University Herbaria. Special thanks to Mott Greene for patiently reviewing earlier drafts and pointing out what was needed for improvement and impact and to Phil Forsline for sharing remembrances and publications of Calvin and his work.

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How to cite this article:
Cohen J.I. A life interrupted: The story of botanist Calvin Sperling from Minnesota to Biodiversity. Crop Breed Genet Genom. 2025;7(2):e250007. https://doi.org/10.20900/cbgg20250007.