

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SYNGENTA CROP PROTECTION
AG,
Petitioner,

v.

INFLEXION POINT
TECHNOLOGIES, LLC
Patent Owner.

Case PGR2025-00045
Patent 12,102,027 B2

**DECLARATION OF SYLVIA D HALL-ELLIS, Ph.D., IN SUPPORT OF
PETITION FOR POST-GRANT REVIEW OF U.S. PATENT NO. 12,102,027**

I. INTRODUCTION

I, Sylvia D. Hall-Ellis, hereby declare:

1. I have been retained as an expert by BakerHostetler LLP, Counsel for Syngenta Crop Protection AG (referred to herein as “Syngenta”).

2. I have written this Declaration at the request of Syngenta to provide my expert opinion regarding the authenticity and public availability of several publications. My Declaration sets forth my opinions in detail and provides the basis for my opinions regarding the public availability of these publications.

3. I reserve the right to supplement or amend my opinions, and bases for them, in response to any additional evidence, testimony, discovery, argument, and/or other additional information that may be provided to me after the date of this Declaration.

4. I am being compensated for my time spent working on this matter at my normal consulting rate, plus reimbursement for any additional reasonable expenses. My compensation is not in any way tied to the content of this Declaration, the substance of my opinions, or the outcome of this proceeding. I have no other interests in this proceeding or with any of the parties.

5. All of the materials that I considered are discussed explicitly in this Declaration.

II. QUALIFICATIONS

6. I am currently an Adjunct Professor in the School of Information at San José State University. I obtained a Master of Library Science from the University of North Texas in 1972 and a Ph.D. in Library and Information Science from the University of Pittsburgh in 1985. Over the last fifty years, I have held various positions in the field of library and information resources. I was first employed as a librarian in 1966 and have been involved in the field of library sciences since, holding numerous positions.

7. I am a member of the American Library Association (“ALA”) and its Association for Library Collections & Technical Services (“ALCTS”) Division, and I served on the Committee on Cataloging: Resource and Description (which wrote the new cataloging rules) and as the chair of the Committee for Education and Training of Catalogers and the Competencies and Education for a Career in Cataloging Interest Group. I also served as the Chair of the ALCTS Division’s Task Force on Competencies and Education for a Career in Cataloging. Additionally, I served as the Chair for the ALA Office of Diversity’s Committee on Diversity, as a member of the REFORMA National Board of Directors, and as a member of the Editorial Board for the ALCTS premier cataloging journal, *Library Resources and Technical Services*, as a Co-Chair of the Membership Committee for the Library Research Round Table (LRRT) of the American Library

Association, and as a member of the LRRT Nominating Committee. Currently I serve as a member of the CORE Margaret Mann Citation Committee.

8. I have also given over one-hundred presentations in the field, including several on library cataloging systems and Machine-Readable Cataloging (“MARC”) standards. My current research interests include library cataloging systems, metadata, and organization of electronic resources.

9. My full *curriculum vitae* is attached hereto as Attachment 6 to this Declaration.

III. PRELIMINARIES

10. I am not an attorney and will not offer opinions on the law. I am, however, rendering my expert opinion on the authenticity of the document referenced herein and on when and how each document was disseminated or otherwise made available to the extent that persons interested and ordinarily skilled in the subject matter or art, exercising reasonable diligence, could have located the document.

11. I understand that an item is considered authentic if there is sufficient evidence to support a finding that the item is what it is claimed to be. I also understand that authenticity can be established based on the contents of the documents themselves, such as the appearance, contents, substance, internal patterns, or other distinctive characteristics of the item, taken together with all of

the circumstances. I further understand that an item is considered authentic if it is at least 20 years old, in a condition that creates no suspicion of its authenticity, and in a place where, if authentic, it would likely be. Lastly, I understand that a document's authenticity can be established by comparison with an authentic specimen.

12. I understand that a printed publication qualifies as publicly accessible as of the date it was disseminated or otherwise made available such that a person interested in and ordinarily skilled in the relevant subject matter could locate it through the exercise of reasonable diligence.

13. While I understand that the determination of public accessibility under the foregoing standard rests on a case-by-case analysis of the facts particular to an individual publication, I also understand that a printed publication may be rendered "publicly accessible" if it is cataloged and indexed by a library such that a person interested in the relevant subject matter, exercising reasonable diligence, could locate it (i.e., I understand that cataloging and indexing by a library may show public accessibility, though there are other ways that a printed publication may qualify as publicly accessible). I understand that the cataloging and indexing by a single library, even in a foreign country, of a single instance of a particular printed publication may show public accessibility. I understand that, even if access to a

library is restricted, a printed publication that has been cataloged and indexed therein may be publicly accessible so long as a presumption is raised that the portion of the public concerned with the relevant subject matter would know of the printed publication. I also understand that the cataloging and indexing of information that would guide a person interested in the relevant subject matter to the printed publication, such as the cataloging and indexing of an abstract for the printed publication, can show public accessibility.

14. I understand that routine business practices, such as general library cataloging and indexing practices, can be used to establish an approximate date on which a printed publication became publicly accessible.

IV. LIBRARY CATALOGING PRACTICES

15. In preparing this Declaration, I used authoritative databases, such as the Online Computer Library Center (OCLC) bibliographic database, the Library of Congress Online Catalog, and the Library of Congress Subject Authorities, to confirm citation details of the publications discussed below. It is my opinion that this standard cataloging and classification protocol was followed for the publications discussed below.

16. Based on my experience working in research libraries, it is my opinion that members of the public would have been able to locate the material

discussed herein on their own or with the assistance of a research librarian with relative ease using the tools and resources described herein.

A. INDEXING

17. A researcher may discover material relevant to his or her topic in a variety of ways. One common means of discovery is to search for relevant information in an index of periodical and other publications. Having found relevant material, the researcher will then normally obtain it online, look for it in libraries, or purchase it from the publisher, a bookstore, a document delivery service, or other provider. Sometimes, the date of a document's public accessibility will involve both indexing and library date information. However, date information for indexing entries is often unavailable. This is especially true for online indices.

18. Indexing services use a wide variety of controlled vocabularies to provide subject access and other means of discovering the content of documents. The formats in which these access terms are presented vary from service to service.

19. Before the widespread development of online databases to index articles in journals, magazines, conference papers, and technical declarations, libraries purchased printed volumes of indices. Graduate library school education mandated that students learn about the bibliographic control of disciplines, the prominent indexing volumes, and searching strategies required to use them

effectively and efficiently. Half of the courses that I studied in library school were focused on the bibliography and resources in academic disciplines.

20. Librarians consulted with information seekers to verify citations, check availability in union catalogs, printed books catalogs, and the OCLC database, and make formal requests for materials, *e.g.*, books, conference proceedings, journal articles. Requests were transmitted using Telex machines, rudimentary email systems, and the United States Postal Service. During my career, I have performed and supervised staff who handled these resource sharing tasks.

21. A major firm known for the breadth of subjects and comprehensive treatment in the preparation of index volumes, the H. W. Wilson Company offered these reference resources since the firm was founded in 1898. The *Reader's Guide to Periodical Literature* is one of the best-known titles available from H. W. Wilson. Each volume includes a comprehensive index for 300 of the most popular and important periodicals published in the United States and Canada. Information seekers have subject access expressed in plain language terminology, author access, and cross references to find the desired results from their searches. The family of index titles included *Science & Technology Index*, *Business Periodicals*, *Applied Science & Technology Index*, *Humanities Index*, *Biological & Agricultural*

Index, and *Industrial Arts Index*. These printed indices have been superseded by digital database offerings available to information seekers through Ebsco.

22. A citation of a document by another is evidence that the document was publicly available and in use no later than the publication date of the citing document.

23. Online indexing services such as Google Scholar¹ or ScienceDirect² commonly provide bibliographic information, abstracts, and full-text copies of the indexed publications, along with a list of the documents cited in the indexed publication. These services also often provide lists of publications that cite a given document.

24. A researcher may discover material relevant to his or her topic in a variety of ways. A citation of a document by another is evidence that the document was publicly available and in use no later than the publication date of the citing document. One common means of discovery is to search for relevant information in an index of periodicals and other publications. Having found relevant material, the researcher will then normally obtain it online, look for it in libraries, or purchase it from a publisher, a bookstore, a document delivery service, or other

¹ Google Scholar, <https://scholar.google.com/> (last accessed June 12, 2025).

² Science Direct, <https://www.sciencedirect.com/> (last accessed June 12, 2025).

provider. Sometimes, the date of a document's public accessibility will involve both indexing and library date information. However, date information for indexing entries is often unavailable. This is especially true for online indices.

25. Indexing services use a wide variety of controlled vocabularies to provide subject access and other means of discovering the content of documents. The Library of Congress Subject Authorities includes standard forms of terms and cross references that are included in bibliographic records. Subject headings are terms that an individual seeking a document regardless of format can enter in the search bar of the online catalog. Subjects also connect an authenticated term (one included in the Library of Congress subject headings list) with related, broader, and narrower terms. The formats in which these access terms are presented vary from service to service.

26. Online indexing services commonly provide bibliographic information, abstracts, and full-text copies of the indexed publications, along with a list of the documents cited in the indexed publication. These services also often provide lists of publications that cite a given document. A citation of a document is evidence that the document was publicly available and in use no later than the publication date of the citing document.

B. MARC RECORDS AND THE ONLINE LIBRARY CATALOG

27. I am fully familiar with the library cataloging standard known as the MARC standard, which is an industry-wide standard method of storing and organizing library catalog information.³ MARC was first developed in the 1960s by the Library of Congress. A MARC-compatible library is one that has a catalog consisting of individual MARC records for each of its items. Today, MARC is the primary communications protocol for the transfer and storage of bibliographic metadata in libraries.⁴

28. MARC is a framework into which descriptive bibliographic data are transcribed to interact with the software in online library catalogs to provide access

³ The full text of the standard is available from the Library of Congress at <http://www.loc.gov/marc/bibliographic/>.

⁴ Almost every major library in the world is MARC-compatible. *See, e.g., MARC Frequently Asked Questions (FAQ)*, Library of Congress, <https://www.loc.gov/marc/faq.html> (last visited June 12, 2025) (“MARC is the acronym for MACHine-Readable Cataloging. It defines a data format that emerged from a Library of Congress-led initiative that began nearly forty years ago. It provides the mechanism by which computers exchange, use, and interpret bibliographic information, and its data elements make up the foundation of most library catalogs used today.”). MARC is the ANSI/NISO Z39.2-1994 (reaffirmed 2016) standard for Information Interchange Format.

to books, journals, and other resources in the collection. The bibliographic data provide points of access and can be searched by a person of ordinary skill in the art (“POSITA”) to identify and obtain resources in the library collection. An information seeker (or POSITA) can search a local online library catalog or the holdings of a group of libraries in a state or region or in the global catalog WorldCat.

29. MARC records are not designed for public viewing. Although a significant number of libraries provide access to the MARC version of a bibliographic record, the public display is designed to show information in a succinct manner that is quickly understood and useful to the information seeker. Libraries determine the default search for the online catalog to make the entry of search terms efficient and result in a successful search. Information seekers can enter a keyword, title, author, or standard number for the item. Libraries may also provide a search capability called “Summon” that allows the information seeker to enter known information about the item to conduct a search.

30. Since at least the early 1970s and continuing to the present day, MARC has been the primary communications protocol for the transfer and storage of bibliographic metadata in libraries.⁵ As explained by the Library of Congress:

You could devise your own method of organizing the bibliographic information, but you would be isolating your library, limiting its options, and creating much more work for yourself. Using the MARC standard prevents duplication of work and allows libraries to better share bibliographic resources. Choosing to use MARC enables libraries to acquire cataloging data that is predictable and reliable. If a library were to develop a “home-grown” system that did not use MARC records, it would not be taking advantage of an industry-wide standard whose primary purpose is to foster communication of information.

Using the MARC standard also enables libraries to make use of commercially available library automation systems to manage library operations. Many systems are available for libraries of all sizes and are designed to work with the MARC format. Systems are maintained and improved by the vendor so that libraries can benefit from the latest advances in computer technology. The MARC standard also

⁵ A complete history of the development of MARC can be found in *MARC: Its History and Implications* by Henrietta D. Avram (Washington, DC: Library of Congress, 1975) and available online from the Hathi Trust (<https://babel.hathitrust.org/cgi/pt?id=mdp.39015034388556;view=1up;seq=1>; last visited June 12, 2025).

allows libraries to replace one system with another with the assurance that their data will still be compatible.

Why Is a MARC Record Necessary? LIBRARY OF CONGRESS, <http://www.loc.gov/marc/umb/um01to06.html#part2> (last visited June 12, 2025).

31. Examining the MARC records for a specific item reveals the comprehensive data transcribed about a particular item at the time that cataloging and classification occurred. In addition to the creator, title, subjects, and standard numbers, additional information may provide additional and relevant data depending on the type of resource. Understanding the full extent of bibliographic data for an item and the points of access associated with it provides essential information that can be used to determine the indexing and public availability for documents described in this Declaration.

1. MARC RECORDS

32. A MARC record comprises several fields, each of which contains specific data about the work. Each field is identified by a standardized, unique, three-digit code corresponding to the type of data that follow. For example, a work's title is recorded in field 245, the primary author or creator of the work is recorded in field 100, an item's International Standard Book Number ("ISBN") is recorded in field 020, an item's International Standard Serial Number ("ISSN") is recorded in field 022, an item's Library of Congress call number is recorded in

field 050, and the publication date is recorded in field 260 under the subfield “c.” *Id.*⁶ If a work is a periodical, then its publication frequency is recorded in field 310, alternate publication frequency is recorded in field 321, and the publication dates (*e.g.*, the first and last publication) are recorded in field 362, which is also referred to as the enumeration/chronology field. *See* <http://www.loc.gov/marc/bibliographic/bd3xx.html> (last visited June 12, 2025).

33. The library that created the record is recorded in Field 040 in subfield “a” with a unique library code. When viewing the MARC record online via Online Computer Library Center’s (“OCLC”) bibliographic database, hovering over this code with the mouse reveals the full name of the library. I used this method of “mousing over” the library codes in the OCLC database to identify the originating library for the MARC records discussed in this Declaration. Where this “mouse over” option was not available, I consulted the Directory of OCLC Libraries to

⁶ In some MARC records, field 264 is used rather than field 260 to record publication information. *See* <http://www.loc.gov/marc/bibliographic/bd264.html> (last visited June 12, 2025) (“Information in field 264 is similar to information in field 260 (Publication, Distribution, etc. (Imprint)). Field 264 is useful for cases where the content standard or institutional policies make a distinction between functions”).

identify the institution that created the MARC record.⁷

34. MARC records also include several fields that include subject matter classification information. An overview of MARC record fields is available through the Library of Congress at <http://www.loc.gov/marc/bibliographic/>. For example, 6XX fields are termed “Subject Access Fields.” See <http://www.loc.gov/marc/bibliographic/bd6xx.html>. Among these, for example, is the 650 field; this is the “Subject Added Entry – Topical Term” field. See <http://www.loc.gov/marc/bibliographic/bd650.html>. The 650 field is a “[s]ubject added entry in which the entry element is a topical term.” *Id.* These authenticated subject entries “are assigned to a bibliographic record to provide access according to generally accepted thesaurus-building rules (*e.g.*, *Library of Congress Subject Headings* (LCSH), *Medical Subject Headings* (MeSH)).” *Id.*

35. Further, MARC records include call numbers, which themselves indicate a subject and physical location within the library collections. For example, the 050 field is the “Library of Congress Call Number.” See <http://www.loc.gov/marc/bibliographic/bd050.html> (last visited April 28, 2025). A defined portion of the Library of Congress Call Number is the classification number, and “source of the classification number is *Library of Congress*

⁷ <https://www.oclc.org/en/contacts/libraries.html>

Classification and the *LC Classification-Additions and Changes*.” *Id.* Thus, included in the 050 field is a subject matter classification. Each item in a library has a single classification number. A library selects a classification scheme (*e.g.*, the Library of Congress Classification scheme just described or a similar scheme such as the Dewey Decimal Classification scheme or the National Library of Medicine Classification scheme) and uses it consistently. When the Library of Congress assigns the classification number, it appears as part of the 050 field. If a local library assigns the classification number, it appears in a 090 field. In either scenario, the MARC record includes a classification number that represents a subject matter classification.

36. Each item in a library has a single classification number. A library selects a classification scheme (*e.g.*, the Library of Congress Classification scheme just described or a similar scheme such as the Dewey Decimal Classification scheme) and uses it consistently. When the Library of Congress assigns the classification number, it appears as part of the 050 field, as discussed above. For MARC records created by libraries other than the Library of Congress (*e.g.*, a university library or a local public library), the classification number may appear in a 09X (*e.g.*, 090) field. See <http://www.loc.gov/marc/bibliographic/bd09x.html> (last visited April 28, 2025).

2. OCLC

37. The OCLC was created “to establish, maintain and operate a computerized library network and to promote the evolution of library use, of libraries themselves, and of librarianship, and to provide processes and products for the benefit of library users and libraries, including such objectives as increasing availability of library resources to individual library patrons and reducing the rate of rise of library per-unit costs, all for the fundamental public purpose of furthering ease of access to and use of the ever-expanding body of worldwide scientific, literary and educational knowledge and information.”⁸ Among other services, OCLC and its members are responsible for maintaining the WorldCat database (<http://www.worldcat.org/>), used by independent and institutional libraries throughout the world.

38. OCLC also provides its members online access to MARC records through its OCLC bibliographic database. When an OCLC member institution acquires a work, it creates a MARC record for this work in its computer catalog system in the ordinary course of its business. MARC records created at the Library

⁸ Third Article, Amended Articles of Incorporation of OCLC Online Computer Library Center, Incorporated (available at <https://www.oclc.org/content/dam/oclc/membership/articles-of-incorporation.pdf>).

of Congress were initially tape-loaded into the OCLC database through a subscription to MARC Distribution Services daily or weekly. Once the MARC record is created by a cataloger at an OCLC member institution or is tape-loaded from the Library of Congress, the MARC record is then made available to any other OCLC members online and therefore made available to the public. Accordingly, once the MARC record is created by a cataloger at an OCLC member institution or is tape-loaded from the Library of Congress or another library anywhere in the world, any publication corresponding to the MARC record has been cataloged and indexed according to its subject matter such that a person interested in that subject matter could, with reasonable diligence, locate and access the publication through any library with access to the OCLC bibliographic database or through the Library of Congress.

39. When an OCLC member institution creates a new MARC record, OCLC automatically supplies the date of creation for that record. The date of creation for the MARC record appears in the fixed field (008), characters 00 through 05. The MARC record creation date reflects the date on which, the item was first acquired or cataloged. Initially, field 005 of the MARC record is automatically populated with the date the MARC record was created in year, month, day format (YYYYMMDD) (some of the newer library catalog systems

also include hour, minute, second (HHMMSS)). Thereafter, the library's computer system may automatically update the date in field 005 every time the library updates the MARC record (*e.g.*, to reflect that an item has been moved to a different shelving location within the library). Field 005 is visible when viewing a MARC record via an appropriate computerized interface. The initial field 005 date (*i.e.*, the date the MARC record was created) does appear. The date upon which the most recent update to field 005 occurred also appears in field 005. Thus, when an item's MARC record has been printed to hardcopy—as is the case with the exhibits to this declaration—the date reflected next to field 008 is necessarily on or after the date the library first cataloged and indexed the underlying item.

40. Once one library has cataloged and indexed a publication by creating a MARC record for that publication, other libraries that receive the publication do not create additional MARC records—the other libraries instead rely on the original MARC record. They may update or revise the MARC record to ensure accuracy, but they do not replace or duplicate it. This practice does more than save libraries from duplicating labor, it also enhances the accuracy of MARC records. It also allows librarians around the world to know that a particular MARC record is authoritative. In contrast, a hypothetical system wherein duplicative records were created would result in confusion as to which record is authoritative.

41. The date of creation of the MARC record by a cataloger at an OCLC member institution reflects when the underlying item is accessible to the public. Upwards of two-thirds to three-quarters of book sales to libraries come from a jobber or wholesaler for online and print resources. These resellers make it their business to provide books to their customers as fast as possible, often providing turnaround times of only a single day after publication. Libraries purchase a significant portion of the balance of their books directly from publishers themselves, which provide delivery on a similarly expedited schedule. In general, libraries make these purchases throughout the year as the books are published and shelve the books as soon thereafter as possible in order to make the books available to their patrons. Thus, books are generally available at libraries across the country within just a few days of publication.

C. JOURNALS

42. Catalogers can create MARC records for all types of print, online, and digital resources. For example, MARC records cover serial publications, including both serially-published monographs and journals. OCLC hosts MARC records for more than 320 million serial publications. Serial publications are those publications that have the same collective title but are intended to be continued indefinitely with enumeration such as a volume or issue number (*e.g.*, magazines, journals, etc.). In the OCLC bibliographic database, the first issue of the serial

publication is typically cataloged (*i.e.*, a corresponding MARC record is created), but the date is left open-ended with the use of a punctuation mark such as a dash. OCLC serial publication MARC records represent the entire run of the serial title. With knowledge of the first issue published, future issues can be predicted based on the information provided in the MARC record, for example in field 362. In my extensive professional experience, is it highly unusual for a library to stop collecting and shelving a serial publication prior to the end of its publication run. If a subscription to a serial publication ends its run or is cancelled before the end of its run, the library will denote that it has stopped receiving new volumes by filling in the end date in the MARC record.

43. The handling of printed journal subscriptions is shown on the cover or the first few pages of individual issues. As was the best practice among libraries, issues arrived at a central facility and were immediately received, verified as part of a subscription, checked in, and stamped or labeled with the institution's name and date. Determining that the issue was part of the library subscription ensured that the entire set of publications for the year had been received so that they could be professionally bound and retained. This process also verified that all of the published issues arrived so that the library staff did not have to request or claim an issue that did not arrive as expected. In large public libraries with branches and

multi-campus libraries within academic institutions, the journals were sorted and delivered to the subscribing unit. The new issue was placed in the public area; the older issue was stored so that it remained available.

44. The foregoing process has been standard library practice longer than I have been working in the profession. I first learned the steps in the process in the late 1970s and later supervised it. Although the checking in process has become automated and now links electronically to holdings records for the MARC record for each serial title, the manual placement of a stamp or label and placing the issue in a public area has not changed for 50 years. Unless I note otherwise below in reference to a specific serial publication, it is my expert opinion that this standard protocol was followed for the serial publication discussed below.

V. PUBLICATIONS

A. “Effects of Various Planters on Emergence and Seed Distribution Uniformity of Sunflower” by Ahmet Çelik, Ismail Ozturk, and Thomas R. Way [Exhibit A]

45. Attached hereto as Exhibit A is a copy of the journal article titled “Effects of Various Planters on Emergence and Seed Distribution Uniformity of Sunflower” by Ahmet Çelik, Ismail Ozturk, and Thomas R. Way (hereafter “Çelik”). The Çelik article was published in Volume 23, Number 1 of the journal *Applied Engineering in Agriculture*. I obtained the Çelik article from the Linda Hall Library of Science, Engineering & Technology (Kansas City, Missouri). The

Çelik article appears beginning on page 57 of this issue dated January 2007. Exhibit A is a true and correct copy of the Çelik article (pages 57-61) that I understand is being submitted as an exhibit in this proceeding. Specifically, the text of the article is complete; no pages are missing, and the text on each page appears to flow seamlessly from one page to the next; further, there are no visible alterations to the document. The Çelik article is also available from the digital repository *Academia*⁹ and through the digital repository *ResearchGate*.¹⁰ The Çelik article is cited as Publication #204668 of the Soil Dynamics Research at Auburn University as part of the U. S. Department of Agriculture (USDA) Research Service.¹¹ Exhibit A was found within the custody of a library – a place where an authentic copy of this journal would likely be. Exhibit A is a true and correct copy in a condition that creates no suspicion about its authenticity.

⁹https://www.academia.edu/85501164/Effects_of_Various_Planters_on_Emergence_and_Seed_Distribution_Uniformity_of_Sunflower

¹⁰ https://www.researchgate.net/profile/Ahmet-Celik-17/publication/43271074_Effects_of_Various_Planters_on_Emergence_and_Seed_Distribution_Uniformity_of_Sunflower/links/56a2199e08ae2afab885c9d5/Effects-of-Various-Planters-on-Emergence-and-Seed-Distribution-Uniformity-of-Sunflower.pdf

¹¹ <https://www.ars.usda.gov/research/publications/publication/?seqNo115=204668>

46. Attached hereto as Attachment 1A is a true and correct copy of the MARC record for the journal *Applied Engineering in Agriculture* from the Linda Hall Library of Science, Engineering & Technology online catalog. The library ownership is indicated by the presence of the library's code ("LHL") in field 049. The library continues to update and enhance this MARC record to meet current cataloging rules. The most recent enhancement to Attachment 1A occurred on November 23, 2020, as shown in field 005 ("20201123"). I personally identified and retrieved the MARC record that is Attachment 1A.

47. Based on finding a print copy of Exhibit A in the Linda Hall Library of Science, Engineering & Technology and MARC record in its online library catalog attached as Attachment 1A, it is my opinion that the Çelik article published in the journal *Applied Engineering in Agriculture* was publicly available in print on or shortly after January 31, 2007.¹² Attachment 1A also shows that Exhibit A was catalogued with a descriptor term reading "Agricultural engineering \$v

¹² The journal *Applied Engineering in Agriculture* was published semiannually and, therefore, new issues were available approximately 180 days. Based on the frequency of publication (see Attachment 1B, field 310) and my years of experience working with serials, it is my opinion that issues would be published by the end of the month. Therefore, a public availability date of January 31, 2007, is reasonable.

Periodicals” (see Attachment 1B, Library of Congress subject heading sh2007100803) in the 650 field.

48. As noted in the holdings information (362 field), the Linda Hall Library of Science, Engineering & Technology has received the journal *Applied Engineering in Agriculture* since June 1985 and continues to receive the publication. In view of the MARC record for Exhibit A, the Çelik article was publicly in print on or shortly after January 31, 2007, because the serial title had been received, cataloged, and indexed at the Linda Hall Library of Science, Engineering & Technology and made part of its online catalog database.

49. Attached hereto as Attachment 1C is a true and correct copy of the MARC record for the journal *Applied Engineering in Agriculture* obtained from the OCLC bibliographic database. As previously noted, the library that created the record is recorded in field 040 with a unique library code. For Attachment 1C, that library code is “NSD,” which means that the MARC record for this serial was cataloged as part of the National Serials Data Program at the Library of Congress. As can be seen in field 008 (“Date entered on file”) in the MARC record for this exhibit, a cataloger at the Library of Congress created OCLC record number 12258667 on July 12, 1985 (“850712”). The library continues to update and enhance this MARC record to meet current cataloging rules. The most recent

enhancement to Attachment 1C occurred on June 19, 2025, as shown in field 005 (“20250619”). I personally identified and retrieved the MARC record that is Attachment 1C. The “BLvl” entry in Attachment 1C is “s,” which indicates that the journal *Applied Engineering in Agriculture* is a serial publication. Field 310 of Attachment 1C reads “Semiannual.” Accordingly, the MARC record for Exhibit A corresponds to the journal *Applied Engineering in Agriculture* from the time the serial title began publication and includes the date of the Çelik article.

50. Attachment 1C includes an entry in field 050 (“S671 \$b .A67”)—as described above, a subject matter classification number consistent with the Library of Congress classification system (analogous to the Dewey Decimal classification system) and an entry in field 082 (“630”)—as described above, a subject matter classification number consistent with the Dewey Decimal classification system. Attachment 1C further includes a descriptor term reading “Agricultural engineering \$v Periodicals” (see Attachment 1B, Library of Congress subject heading sh2007100803) in the 650 field. Thus, as of its cataloging, the publication corresponding to the MARC record attached hereto as Attachment 1C was indexed according to its subject matter by virtue of at least three independently sufficient classifications: the field 050 entry, the field 082 entry, and the field 650 entry. As of July 12, 1985, the MARC record attached hereto as Attachment 1C

was accessible through any library with access to the OCLC bibliographic database or the online catalog at a library that subscribed to the serial, which means that the corresponding publication was publicly available on or before that same date through any library with access to the OCLC bibliographic database or through an individual library.

51. WorldCat indicates that the journal *Applied Engineering in Agriculture* as cataloged at the Library of Congress is currently available from 138 libraries.¹³ In view of the above, this issue of the journal *Applied Engineering in Agriculture* was publicly available in print on or shortly after January 31, 2007, because by that date it had been received, cataloged, and indexed at the Library of Congress and made part of the OCLC bibliographic database, and received in the Linda Hall Library of Science, Engineering & Technology. For these reasons, it is my opinion that Exhibit A was published and accessible to the public on or shortly after January 31, 2007.

B. “Corn Seed Spacing Uniformity as Affected by Seed Tube Condition” by M. F. Kocher, J. M. Coleman, J. A. Smith, S. D. Kachman [Exhibit B]

52. Attached hereto as Exhibit B is a copy of the journal article titled “Corn Seed Spacing Uniformity as Affected by Seed Tube Condition” by M. F.

¹³ <https://search.worldcat.org/title/12258667>

Kocher, J. M. Coleman, J. A. Smith, S. D. Kachman (hereafter “Kocher”). The Kocher article was published in Volume 27, Number 2 of the journal *Applied Engineering in Agriculture*. I obtained the Kocher article from the University of Idaho Libraries (Moscow, Idaho). The Kocher article appears beginning on page 177 of this issue dated March 2011. Exhibit B is a true and correct copy of the Kocher article (pages 177-183) that I understand is being submitted as an exhibit in this proceeding. Specifically, the text of the article is complete; no pages are missing, and the text on each page appears to flow seamlessly from one page to the next; further, there are no visible alterations to the document. The Kocher article is also available from the digital repository at the University of Nebraska – Lincoln¹⁴ and through the digital repository SciSpace.¹⁵ Exhibit B was found within the custody of a library – a place where an authentic copy of this journal would likely be. Exhibit B is a true and correct copy in a condition that creates no suspicion about its authenticity.

¹⁴https://digitalcommons.unl.edu/biosysengfacpub/194/?utm_source=digitalcommons.unl.edu%2Fbiosysengfacpub%2F194&utm_medium=PDF&utm_campaign=PDFCoverPages

¹⁵<https://scispace.com/pdf/corn-seed-spacing-uniformity-as-affected-by-seed-tube-h5j4n1d11k.pdf>

53. Attached hereto as Attachment 2A is a true and correct copy of the MARC record for the journal *Applied Engineering in Agriculture* from the University of Idaho Libraries online catalog. The library ownership is indicated by the presence of the library's code ("MAIN") in field 049. The library continues to update and enhance this MARC record to meet current cataloging rules. The most recent enhancement to Attachment 2A occurred on June 19, 2025, as shown in field 005 ("20250619"). I personally identified and retrieved the MARC record that is Attachment 2A.

54. Based on finding a print copy of Exhibit B in the University of Idaho Libraries and MARC record in its online library catalog attached as Attachment 2A, it is my opinion that the Kocher article published in the journal *Applied Engineering in Agriculture* was publicly available in print on or shortly after April 25, 2011, as shown by the stamp on the cover. In common practice these stamps are applied at or around the time the volume is entered into the library's collection and the volume is made available to library patrons within a short time thereafter. Attachment 2A also shows that Exhibit B was catalogued with a descriptor term reading "Agricultural engineering \$v Periodicals" (see Attachment 1B, Library of Congress subject heading sh2007100803) in the 650 field.

55. As noted in the holdings information (362 field), the University of Idaho Libraries has received the journal *Applied Engineering in Agriculture* since June 1985 and continues to receive the publication. In view of the MARC record for Exhibit B, the Kocher article was publicly in print on or shortly after April 25, 2011, because the serial title had been received, cataloged, and indexed at the University of Idaho Libraries and made part of its online catalog database.

56. Attached hereto as Attachment 2B is a true and correct copy of the MARC record for the journal *Applied Engineering in Agriculture* obtained from the OCLC bibliographic database. As previously noted, the library that created the record is recorded in field 040 with a unique library code. For Attachment 2B, that library code is “NSD,” which means that the MARC record for this serial was cataloged as part of the National Serials Data Program at the Library of Congress. As can be seen in field 008 (“Date entered on file”) in the MARC record for this exhibit, a cataloger at the Library of Congress created OCLC record number 12258667 on July 12, 1985 (“850712”). The library continues to update and enhance this MARC record to meet current cataloging rules. The most recent enhancement to Attachment 2B occurred on June 19, 2025, as shown in field 005 (“20250619”). I personally identified and retrieved the MARC record that is Attachment 2B. The “BLvl” entry in Attachment 2B is “s,” which indicates that

the journal *Applied Engineering in Agriculture* is a serial publication. Field 310 of Attachment 2B reads “Semiannual.” Accordingly, the MARC record for Exhibit B corresponds to the journal *Applied Engineering in Agriculture* from the time the serial title began publication and includes the date of the Kocher article.

57. Attachment 1C includes an entry in field 050 (“S671 \$b .A67”)—as described above, a subject matter classification number consistent with the Library of Congress classification system (analogous to the Dewey Decimal classification system) and an entry in field 082 (“630”)—as described above, a subject matter classification number consistent with the Dewey Decimal classification system. Attachment 2B further includes a descriptor term reading “Agricultural engineering \$v Periodicals” (see Attachment 1B, Library of Congress subject heading sh2007100803) in the 650 field. Thus, as of its cataloging, the publication corresponding to the MARC record attached hereto as Attachment 2B was indexed according to its subject matter by virtue of at least three independently sufficient classifications: the field 050 entry, the field 082 entry, and the field 650 entry. As of July 12, 1985, the MARC record attached hereto as Attachment 2B was accessible through any library with access to the OCLC bibliographic database or the online catalog at a library that subscribed to the serial, which means that the corresponding publication was publicly available on or before that same date

through any library with access to the OCLC bibliographic database or through an individual library.

58. WorldCat indicates that the journal *Applied Engineering in Agriculture* as cataloged at the Library of Congress is currently available from 138 libraries.¹⁶ In view of the above, this issue of the journal *Applied Engineering in Agriculture* was publicly available in print on or shortly after April 25, 2011, because by that date it had been received, cataloged, and indexed at the Library of Congress and made part of the OCLC bibliographic database, and received in the University of Idaho Libraries. For these reasons, it is my opinion that Exhibit B was published and accessible to the public on or shortly after April 25, 2011.

C. “Liquid Property and Nozzle Effects on Flight Time of Pulsed Jet Spray” by D. Ken Giles, Daniel Downey, and D. C. Slaughter [Exhibit C]

59. Attached hereto as Exhibit C is a copy of the journal article titled “Liquid Property and Nozzle Effects on Flight Time of Pulsed Jet Spray” by D. Ken Giles, Daniel Downey, and D. C. Slaughter (hereafter “Giles”). The Giles article was published in Volume 14, Number 2 of the journal *Atomization and Sprays*. I obtained the Giles article from the University of Wisconsin – Madison Libraries. The Giles article appears beginning on page 111 of this issue dated

¹⁶ <https://search.worldcat.org/title/12258667>

March-April 2004. Exhibit C is a true and correct copy of the Giles article (pages 111-126) that I understand is being submitted as an exhibit in this proceeding. Specifically, the text of the article is complete; no pages are missing, and the text on each page appears to flow seamlessly from one page to the next; further, there are no visible alterations to the document. The Giles article is also available from the publisher.¹⁷ Exhibit C was found within the custody of a library – a place where an authentic copy of this journal would likely be. Exhibit C is a true and correct copy in a condition that creates no suspicion about its authenticity.

60. Attached hereto as Attachment 3A is a true and correct copy of the MARC record for the journal *Atomization and Sprays* from the University of Wisconsin – Madison Libraries online catalog. The library ownership is indicated by the presence of the library’s code (“GZM”) in field 049. The library continues to update and enhance this MARC record to meet current cataloging rules. The most recent enhancement to Attachment 3A occurred on March 22, 2018, as shown in field 005 (“20180322”). I personally identified and retrieved the MARC record that is Attachment 3A.

¹⁷<https://www.dl.begellhouse.com/de/references/6a7c7e10642258cc,6d1c54000adc112,4cf4c2e50ed82741.html>

61. Based on finding a print copy of Exhibit C in the University of Wisconsin – Madison Libraries and MARC record in its online library catalog attached as Attachment 3A, it is my opinion that the Giles article published in the journal *Atomization and Sprays* was publicly available in print on or shortly after March 31, 2004.¹⁸ Attachment 3A also shows that Exhibit C was catalogued with two descriptor terms reading “Spraying \$v Periodicals” (see Attachment 3B, Library of Congress subject heading sh85126990 and Attachment 3C, Library of Congress subject heading sh85099890) and “Atomization \$v Periodicals” (see Attachment 3D, Library of Congress subject heading sh85009331 and Attachment 3C, Library of Congress subject heading sh85099890) in the 650 fields.

62. As noted in the holdings information (362 field), the University of Wisconsin – Madison Libraries has received the journal *Atomization and Sprays* since January 1991 and continues to receive the publication. In view of the MARC record for Exhibit C, the Giles article was publicly in print on or shortly after March 31, 2004, because the serial title had been received, cataloged, and indexed

¹⁸ The journal *Atomization and Sprays* was published bimonthly and, therefore, new issues were available approximately 60 days. Based on the frequency of publication (see Attachment 3A, field 310) and my years of experience working with serials, it is my opinion that issues would be published by the end of the month. Therefore, a public availability date of March 31, 2004, is reasonable.

at the University of Wisconsin – Madison Libraries and made part of its online catalog database.

63. Attached hereto as Attachment 3E is a true and correct copy of the MARC record for the journal *Atomization and Sprays* obtained from the OCLC bibliographic database. As previously noted, the library that created the record is recorded in field 040 with a unique library code. For Attachment 3E, that library code is “NSD,” which means that the MARC record for this serial was cataloged as part of the National Serials Data Program at the Library of Congress. As can be seen in field 008 (“Date entered on file”) in the MARC record for this exhibit, a cataloger at the Library of Congress created OCLC record number 19822075 on June 6, 1989 (“890606”). The library continues to update and enhance this MARC record to meet current cataloging rules. The most recent enhancement to Attachment 3E occurred on June 4, 2025, as shown in field 005 (“20250604”). I personally identified and retrieved the MARC record that is Attachment 3E. The “BLvl” entry in Attachment 3E is “s,” which indicates that the journal *Atomization and Sprays* is a serial publication. Field 310 of Attachment 3E reads “Quarterly.” Accordingly, the MARC record for Exhibit C corresponds to the journal *Atomization and Sprays* from the time the serial title began publication and includes the date of the Giles article.

64. Attachment 3E includes an entry in field 050 (“TP156.S6 \$b A87”)—as described above, a subject matter classification number consistent with the Library of Congress classification system (analogous to the Dewey Decimal classification system) and an entry in field 082 (“660/.294515”)—as described above, a subject matter classification number consistent with the Dewey Decimal classification system. Attachment 3E further includes two descriptor terms reading “Spraying \$v Periodicals” (see Attachment 3B, Library of Congress subject heading sh85126990 and Attachment 3C, Library of Congress subject heading sh85099890) and “Atomization \$v Periodicals” (see Attachment 3D, Library of Congress subject heading sh85009331 and Attachment 3C, Library of Congress subject heading sh85099890) in the 650 fields. Thus, as of its cataloging, the publication corresponding to the MARC record attached hereto as Attachment 3E was indexed according to its subject matter by virtue of at least three independently sufficient classifications: the field 050 entry, the field 082 entry, and the field 650 entries. As of June 6, 1989, the MARC record attached hereto as Attachment 3E was accessible through any library with access to the OCLC bibliographic database or the online catalog at a library that subscribed to the serial, which means that the corresponding publication was publicly available on or before that same date

through any library with access to the OCLC bibliographic database or through an individual library.

65. WorldCat indicates that the journal *Atomization and Sprays* as cataloged at the Library of Congress is currently available from 77 libraries.¹⁹ In view of the above, this issue of the journal *Atomization and Sprays* was publicly available in print on or shortly after March 31, 2004, because by that date it had been received, cataloged, and indexed at the Library of Congress and made part of the OCLC bibliographic database, and received in the University of Wisconsin – Madison Libraries. For these reasons, it is my opinion that Exhibit C was published and accessible to the public on or shortly after March 31, 2004.

D. “Pulsed-Jet Microspray Applications for High Spatial Resolution of Deposition on Biological Targets” by Daniel Downey, D. Ken Giles, and D. C. Slaughter [Exhibit D]

66. Attached hereto as Exhibit D is a copy of the journal article titled “Pulsed-Jet Microspray Applications for High Spatial Resolution of Deposition on Biological Targets” by Daniel Downey, D. Ken Giles, and D. C. Slaughter (hereafter “Downey”). The Downey article was published in Volume 14, Number 2 of the journal *Atomization and Sprays*. I obtained the Downey article from the University of Wisconsin – Madison Libraries. The Downey article appears

¹⁹ <https://search.worldcat.org/title/19822075>

beginning on page 93 of this issue dated March-April 2004. Exhibit D is a true and correct copy of the Giles article (pages 93-109) that I understand is being submitted as an exhibit in this proceeding. Specifically, the text of the article is complete; no pages are missing, and the text on each page appears to flow seamlessly from one page to the next; further, there are no visible alterations to the document. The Downey article is also available from the publisher.²⁰ Exhibit D was found within the custody of a library – a place where an authentic copy of this journal would likely be. Exhibit D is a true and correct copy in a condition that creates no suspicion about its authenticity.

67. Attached hereto as Attachment 4A is a true and correct copy of the MARC record for the journal *Atomization and Sprays* from the University of Wisconsin – Madison Libraries online catalog. The library ownership is indicated by the presence of the library’s code (“GZM”) in field 049. The library continues to update and enhance this MARC record to meet current cataloging rules. The most recent enhancement to Attachment 4A occurred on March 22, 2018, as shown in field 005 (“20180322”). I personally identified and retrieved the MARC record that is Attachment 4A.

²⁰<https://www.dl.begellhouse.com/de/references/6a7c7e10642258cc,6d1c54000adc112,2ee0bd575216f646.html>

68. Based on finding a print copy of Exhibit D in the University of Wisconsin – Madison Libraries and MARC record in its online library catalog attached as Attachment4A, it is my opinion that the Downey article published in the journal *Atomization and Sprays* was publicly available in print on or shortly after March 31, 2004.²¹ Attachment 4A also shows that Exhibit D was catalogued with two descriptor terms reading “Spraying \$v Periodicals” (see Attachment 3B, Library of Congress subject heading sh85126990 and Attachment 3C, Library of Congress subject heading sh85099890) and “Atomization \$v Periodicals” (see Attachment 3D, Library of Congress subject heading sh85009331 and Attachment 3C, Library of Congress subject heading sh85099890) in the 650 fields.

69. As noted in the holdings information (362 field), the University of Wisconsin – Madison Libraries has received the journal *Atomization and Sprays* since January 1991 and continues to receive the publication. In view of the MARC record for Exhibit D, the Downey article was publicly in print on or shortly after March 31, 2004, because the serial title had been received, cataloged, and indexed

²¹ The journal *Atomization and Sprays* was published bimonthly and, therefore, new issues were available approximately 60 days. Based on the frequency of publication (see Attachment 4A, field 310) and my years of experience working with serials, it is my opinion that issues would be published by the end of the month. Therefore, a public availability date of March 31, 2004, is reasonable.

at the University of Wisconsin – Madison Libraries and made part of its online catalog database.

70. Attached hereto as Attachment 4B is a true and correct copy of the MARC record for the journal *Atomization and Sprays* obtained from the OCLC bibliographic database. As previously noted, the library that created the record is recorded in field 040 with a unique library code. For Attachment 4B, that library code is “NSD,” which means that the MARC record for this serial was cataloged as part of the National Serials Data Program at the Library of Congress. As can be seen in field 008 (“Date entered on file”) in the MARC record for this exhibit, a cataloger at the Library of Congress created OCLC record number 19822075 on June 6, 1989 (“890606”). The library continues to update and enhance this MARC record to meet current cataloging rules. The most recent enhancement to Attachment 4B occurred on June 4, 2025, as shown in field 005 (“20250604”). I personally identified and retrieved the MARC record that is Attachment 4B. The “BLvl” entry in Attachment 4B is “s,” which indicates that the journal *Atomization and Sprays* is a serial publication. Field 310 of Attachment 4B reads “Quarterly.” Accordingly, the MARC record for Exhibit D corresponds to the journal *Atomization and Sprays* from the time the serial title began publication and includes the date of the Downey article.

71. Attachment 4B includes an entry in field 050 (“TP156.S6 \$b A87”)—as described above, a subject matter classification number consistent with the Library of Congress classification system (analogous to the Dewey Decimal classification system) and an entry in field 082 (“660/.294515”)—as described above, a subject matter classification number consistent with the Dewey Decimal classification system. Attachment 4B further includes two descriptor terms reading “Spraying \$v Periodicals” (see Attachment 3B, Library of Congress subject heading sh85126990 and Attachment 3C, Library of Congress subject heading sh85099890) and “Atomization \$v Periodicals” (see Attachment 3D, Library of Congress subject heading sh85009331 and Attachment 3C, Library of Congress subject heading sh85099890) in the 650 fields. Thus, as of its cataloging, the publication corresponding to the MARC record attached hereto as Attachment 4B was indexed according to its subject matter by virtue of at least three independently sufficient classifications: the field 050 entry, the field 082 entry, and the field 650 entries. As of June 6, 1989, the MARC record attached hereto as Attachment 4B was accessible through any library with access to the OCLC bibliographic database or the online catalog at a library that subscribed to the serial, which means that the corresponding publication was publicly available on or before that same date

through any library with access to the OCLC bibliographic database or through an individual library.

72. WorldCat indicates that the journal *Atomization and Sprays* as cataloged at the Library of Congress is currently available from 77 libraries.²² In view of the above, this issue of the journal *Atomization and Sprays* was publicly available in print on or shortly after March 31, 2004, because by that date it had been received, cataloged, and indexed at the Library of Congress and made part of the OCLC bibliographic database, and received in the University of Wisconsin – Madison Libraries. For these reasons, it is my opinion that Exhibit D was published and accessible to the public on or shortly after March 31, 2004.

E. *Design and Evaluation of a Seed-Specific Applicator for In-Furrow Chemical Application* by John Houston Hancock [Exhibit E]

73. Attached hereto as Exhibit E is a copy of a master's thesis titled *Design and Evaluation of a Seed-Specific Applicator for In-Furrow Chemical Application* by John Houston Hancock (hereafter "Hancock") and dated May 2003, as shown on page 4. The attached copy of the Hancock thesis (Exhibit 1005) is a true and correct copy of the TRACE: Tennessee Research and Creative Exchange cover page, memos to the Graduate Council, title page, ProQuest information page

²² <https://search.worldcat.org/title/19822075>

with the identification number 1573330, title page, archives page, dedication, acknowledgements, abstract, table of contents, list of tables, list of figures, and text from the TRACE digital repository.²³ Specifically, the text is complete; no pages are missing, and the text on each page appears to flow seamlessly from one page to the next; further, there are no visible alterations to the document. Exhibit E was found within the custody of the custodian to whom the author granted permission to make copies and reproductions. Exhibit E is a true and correct copy in a condition that creates no suspicion about its authenticity.

74. Attached hereto as Attachment 5A is a true and correct copy of the online catalog record for this master's thesis from the University of Tennessee (Knoxville, Tennessee) online catalog, as shown by the library's identification code "TKN" in field 049. The catalog record indicates that a copy of the thesis is available via the university thesis collection as shown in field 690. The MARC record for Hancock thesis indicates that the document was cataloged on September 30, 2003, as shown in field 008 ("030930"). The MARC record was contributed to the OCLC bibliographic database and can be found through WorldCat (see

²³ https://trace.tennessee.edu/utk_gradthes/6033

Attachment 5B).²⁴ I personally identified and retrieved Attachment 5A and Attachment 5B.

75. A master's thesis exhibits the following characteristics: the master's thesis is attributed to a single creator or author (in this case John Houston Hancock) who affixes a date of creation (in this case May 2003), recognizes a committee of three or more faculty members with their affiliations, (in this case John B. Wilkerson, William E. Hart, D. Raj Raman, and Melvin A. Newman), a list of scholarly references (in this case 38 references), and publishes the document through the higher education institute conferring the graduate degree (in this case the Biosystems Engineering Program in the Herbert College of Agriculture at the University of Tennessee).

76. Attachment 5A includes points of access for the author, John Houston Hancock (field 100) and the thesis title (field 245). Thus, as of its cataloging, the publication corresponding to the metadata record attached hereto as Attachment 5A was indexed by at least two points of access.

77. In view of the above information, Hancock thesis was publicly available after May 31, 2003, and by September 30, 2003, at the latest, because the thesis was published and publicly available through the TRACE digital repository

²⁴ <https://search.worldcat.org/title/53116322>

at the University of Tennessee and could be found in WorldCat.. For these reasons, it is my opinion that the Hancock thesis was published and accessible to the public no later than September 30, 2003, at the latest.

VI. SUMMARY OF OPINIONS

78. In view of the foregoing, it is my opinion that the publications described above were publicly available no later than the corresponding date listed in the table below:

Exhibit No.	Publication	Publicly Available On or After
A	Celik, Ahmet, Ismail Ozturk, and Thomas R. Way. “Effects of Various Planters on Emergence and Seed Distribution Uniformity of Sunflower.” <i>Applied Engineering in Agriculture</i> , vol. 23, no. 1 (January 2007): 57-61.	January 31, 2007
B	Kocher, M. F., J. M. Coleman, J. A. Smith, S. D. Kachman. “Corn Seed Spacing Uniformity as Affected by Seed Tube Condition.” <i>Applied Engineering in Agriculture</i> , vol. 27, no. 2 (September 2010): 177-183.	April 26, 2011
C	Giles, D. Ken, Daniel Downey, and D. C. Slaughter. “Liquid Property and Nozzle Effects on Flight Time of Pulsed Jet Spray.” <i>Atomization and Sprays</i> , vol. 14, no. 2 (March-April 2004): 111–126.	March 31, 2004
D	Downey, Daniel, D. Ken Giles, and D. C. Slaughter. “Pulsed-Jet Microspray Applications for High Spatial Resolution of Deposition on Biological Targets.” <i>Atomization and Sprays</i> , vol. 14, no. 2 (March-April 2004): 93–109.	March 31, 2004

Exhibit No.	Publication	Publicly Available On or After
E	Hancock, John Houston. <i>Design and Evaluation of a Seed-Specific Applicator for In-Furrow Chemical Application</i> . Master's Thesis. Biosystems Engineering. University of Tennessee. Knoxville, TN: University of Tennessee, 2003.	September 30, 2003

In signing this Declaration, I recognize that the Declaration will be filed as evidence in a case before the Patent Trial and Appeal Board of the United States Patent and Trademark Office. I also recognize that I may be subject to cross-examination in the case and that cross-examination will take place within the United States. If cross-examination is required of me, I will appear for cross-examination within the United States during the time allotted for cross-examination.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code.

Date: July 1, 2025


Sylvia D. Hall-Ellis, Ph.D.

Attachment 1A

leader 01364cas a2200397la 4500
 001 992771293405961
 005 20201123165743.0
 008 850712c19859999miufr1p 0 a0eng d
 010 ##\$asn 85007123
 012 ##\$i8603 \$l1
 022 0#\$a0883-8542 \$y0001-2351
 035 ##\$(OCOLC)12258667
 035 ##\$(Horizon)383735
 035 ##\$(MoKL)277129-lhalldb
 035 ##\$(lhalldb)277129-lhalldb
 037 ##\$bAmerican Society of Agricultural Engineers, 2950 Niles Rd., St. Joseph, MI 49085-9659
 040 ##\$aNSD \$cNSD \$dGUA \$dNST \$dm/c \$dLHL
 042 ##\$ansdp
 049 ##\$aLHLA
 082 1#\$a630 \$211
 090 ##\$aS671 \$b.A66
 210 0#\$aAppl. eng. agric.
 222 #0\$aApplied engineering in agriculture
 245 00\$aApplied engineering in agriculture.
 250 ##\$aGeneral ed.
 260 ##\$a[St. Joseph, MI : \$bAmerican Society of Agricultural Engineers, \$c1985-
 300 ##\$av. : \$bill. ; \$c28 cm.
 310 ##\$aSemiannual
 362 0#\$aVol. 1, no. 1 (June 1985)-
 500 ##\$aTitle from cover.
 599 11\$aSelected volumes/issues transferred from the Engineering Societies Library, January 1995.
 650 #0\$aAgricultural engineering \$vPeriodicals
 710 2#\$aAmerican Society of Agricultural Engineers
 936 ##\$aJune 1985
 945 ##\$aApplied engineering in agriculture. \$bApplied engineering in agriculture.
 948 ##\$aLTI 09/01/2008

Attachment 1B

[The Library of Congress](#)>> [Go to Library of Congress Online Catalog](#)

LIBRARY OF CONGRESS AUTHORITIES

[Help](#)[New Search](#)[Search History](#)[Headings List](#)[Start Over](#)< [Previous](#)[Next](#) >[MARC Display](#)[Labelled Display](#)**LC control no.:** sh2007100803**LCCN Permalink:** <https://lcn.loc.gov/sh2007100803>**HEADING:** Agricultural engineering Periodicals

000 00485cz a2200169n 450

001 7335147

005 20110729155740.0

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035 __ |a (DLC)sh2007100803

040 __ |a DLC |b eng |c DLC

150 __ |a Agricultural engineering |v Periodicals

667 __ |a Record generated for validation purposes.

670 __ |a Work cat.: Research in agricultural engineering =, 2000-

906 __ |t 8888 |u te00 |v 0

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S.E.
Washington, DC 20540**Library of Congress Authorities**URL: <http://authorities.loc.gov/>**Library of Congress Online Catalog**URL: <https://catalog.loc.gov/>**Questions, comments, error reports:** [Contact Us](#)

Attachment 1C

Bibliographic Record - OCLC Number: 12258667

LDR	Record Status	'c' - Corrected or revised
	Type of Record	'a' - Language material
	Bibliographic Level	's' - Serial
	Type of Control	' ' - No specified type of control
	Encoding Level	' ' - Full level
	Descriptive Cataloging Form	'a' - AACR2
001	12258667	
005	20250619014749.9	
008	Date Entered on File	'850712'
	Type of Date/Publication Status	'c' - Continuing resource currently published
	Date1/Beginning Date of Publication	'1985'
	Date2/Ending Date of Publication	'9999'
	Place of Publication, Production, or Execution Code	'miu' - Michigan
	Frequency	'b' - Bimonthly
	Regularity	'r' - Regular
	Type of Continuing Resource	'p' - Periodical
	Form of Original Item	' ' - None of the following
	Form of Item	' ' - None of the following
	Nature of Entire Work	' ' - No specified nature of entire work
	Nature of Contents	' '
	Government Publication	' ' - Not a government publication
	Conference Publication	'0' - Not a conference publication
	Original Alphabet or Script of Title	'a' - Basic Roman
	Entry Convention	'0' - Successive entry
	Language Code	'eng' - English
	Modified Record	' ' - Record is not modified
	Cataloging Source Code	'c' - Cooperative cataloging program
010	sn 85007123	
040	NSD \$b eng \$c NSD \$d GUA \$d NST \$d NSD \$d NST \$d AGL \$d DLC \$d OCLCQ \$d TXA \$d LVB \$d NSD \$d DLC \$d UBY \$d OCLCQ \$d DLC \$d OCLCQ \$d DLC \$d OCLCO \$d O CLCF \$d OCLCO \$d I8M \$d OCLCQ \$d GILDS \$d OCLCO \$d CPO \$d OCLCQ \$d DLC \$d OCLCQ \$d OCLCL	
012	\$i 8603 \$j 0 \$k 1 \$l 1 \$m 1	
022 0	0883-8542 \$l 0883-8542 \$y 0001-2351 \$2 1	
032	005366 \$b USPS	
037	\$b American Society of Agricultural Engineers, 2950 Niles Rd., St. Joseph, MI 49085-9659	
042	nsdp \$a pcc	
050 1 0	ISSN RECORD	
050 1 4	S671 \$b .A67	
070 0	S671.A66	
072 0	N000	
082 1 4 630 \$2 11 \$1	https://id.oclc.org/worldcat/ddc/E3CMjtyBFMPdrWcgHbbBTCVCWg	
210 0	Appl. eng. agric.	

222 0 Applied engineering in agriculture
 245 0 0 Applied engineering in agriculture.
 250 General ed.
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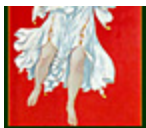
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Attachment 3E

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300		\$avolumes :\$billustrations ;\$c25 cm
310		\$aBimonthly,\$bJan./Feb. 1994-
321		\$aQuarterly,\$bJan./Mar. 1991-Oct./Dec. 1993
336		\$atext\$btxt\$2rdacontent
337		\$aunmediated\$bnc\$2rdamedia
338		\$avolume\$bnc\$2rdacarrier
362	0_	\$aVol. 1, no. 1 (Jan./Mar. 1991)-
500		\$aTitle from cover.
530		\$aAlso available on the Internet.
650	_0	\$aSpraying\$vPeriodicals.
650	_0	\$aAtomization\$vPeriodicals.

650	07	\$aSpray.\$2swd
650	07	\$aZerstäubung.\$2swd
655	_4	\$aZeitschrift.
776	08	\$iOnline version:\$tAtomization and sprays (Online)\$x1936-2684\$w(DLC) 2007214268\$w(OCOLC)60623788
850		\$aDLC\$aInLP\$aWaU
994		\$aC0\$bGZM
997 MMS IDs		\$aMARCIVE

Document ID:

999621188402121

Network Electronic IDs:**Network Physical IDs:**

999621188402121

mms_mad_ids:

9917102323602122

Attachment 4B

Bibliographic Record - OCLC Number: 19822075

LDR	Record Status	'c' - Corrected or revised
	Type of Record	'a' - Language material
	Bibliographic Level	's' - Serial
	Type of Control	' ' - No specified type of control
	Encoding Level	' ' - Full level
	Descriptive Cataloging Form	'a' - AACR2
001	19822075	
005	20250604171729.8	
008	Date Entered on File	'890606'
	Type of Date/Publication Status	'c' - Continuing resource currently published
	Date1/Beginning Date of Publication	'1991'
	Date2/Ending Date of Publication	'9999'
	Place of Publication, Production, or Execution Code	'nyu' - New York
	Frequency	'q' - Quarterly
	Regularity	'r' - Regular
	Type of Continuing Resource	'p' - Periodical
	Form of Original Item	' ' - None of the following
	Form of Item	' ' - None of the following
	Nature of Entire Work	' ' - No specified nature of entire work
	Nature of Contents	' '
	Government Publication	' ' - Not a government publication
	Conference Publication	'0' - Not a conference publication
	Original Alphabet or Script of Title	'a' - Basic Roman
	Entry Convention	'0' - Successive entry
	Language Code	'eng' - English
	Modified Record	' ' - Record is not modified
	Cataloging Source Code	'c' - Cooperative cataloging program
010	91660101 \$z sn 89000027	
040	NSD \$b eng \$c NSD \$d DLC \$d WAU \$d NST \$d NLM \$d OCLCQ \$d DEBBG \$d OCLCQ \$d OCLCF \$d DLC \$d OCLCO \$d OCLCL	
012	2 \$i 9111 \$k 1 \$l 1	
016 7	9884957 \$2 DNLM	
016 7	SR0069095 \$2 DNLM	
016 7	1070811-x \$2 DE-600	
019	977571637	
022 0	1044-5110 \$l 1044-5110 \$2 1	
030	ATSPE2	
037	\$b Taylor & Francis, Inc./Hemisphere Publishing Corporation, 1900 Frost Rd., Suite 101, Bristol, PA 19007	
042	nsdp \$a pcc	
050 0 0	TP156.S6 \$b A87	
082 0 0	660/.294515 \$2 20	
082 4 621	\$2 12 \$1 https://id.oclc.org/worldcat/ddc/E4djYmFy7KK4mwFQy33t3Tt7kT	

210 0 At. sprays
 222 0 Atomization and sprays
 245 0 0 Atomization and sprays : **\$b** journal of the international institutions for liquid atomization and spray s
 ystems.
 260 3 1991- : New York, NY : **\$b** Taylor & Francis/Hemisphere, **\$c** c1991-
 260 3 3 <2012-> **\$a** Redding, CT : **\$b** Begell House, Inc.
 300 v. : **\$b** ill. ; **\$c** 25 cm.
 310 Quarterly
 362 0 Vol. 1, no. 1 (Jan-Mar 1991)-
 500 Title from cover.
 650 0 Spraying **\$v** Periodicals.
 650 0 Atomization **\$v** Periodicals.
 650 7 Atomization. **\$2** fast **\$0** (OCoLC)fst00820649
 650 7 Spraying. **\$2** fast **\$0** (OCoLC)fst01130880
 650 0 7 Spray. **\$2** swd
 650 0 7 Zerstäubung. **\$2** swd
 655 4 Zeitschrift.
 655 7 Periodicals. **\$2** fast **\$0** (OCoLC)fst01411641
 776 0 8 **\$i** Online version: **\$t** Atomization and sprays (Online) **\$x** 1936-2684 **\$w** (DLC) 2007214268 **\$w** (O
 CoLC)60623788
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 029 1 AU@ **\$b** 000008369424
 029 1 DEBBG **\$b** BV012579473
 029 1 ZWZ **\$b** 040262804

Attachment 5A

leader 00743nam 2200217la 4500
9916264700102311
005 20200525181208.0
008 030930s2003 xx a b 000 0 eng d
035 ##\$a(OCOLC)53116322
040 ##\$aTKN \$cTKN
049 ##\$aTKNN
099 ##\$aThesis \$a2003 \$a.H263
100 1#\$aHancock, John Houston, \$d1977-
245 10\$aDesign and evaluation of a seed-specific applicator for in-furrow chemical application
/ \$cJohn Houston Hancock.
260 ##\$c2003.
300 ##\$axvii, 151 p. : \$bill. (some col.) ; \$c28 cm.
502 ##\$aThesis (M.S.)--University of Tennessee, Knoxville, 2003.
500 ##\$aVita.
504 ##\$aIncludes bibliographical references (p. 113-116).
690 ##\$aUTK Theses \$xBiosystems engineering.
994 ##\$aE0 \$bTKN

Attachment 5B

Bibliographic Record - OCLC Number: 53116322

LDR	Record Status	'c' - Corrected or revised
	Type of Record	't' - Manuscript language material
	Bibliographic Level	'm' - Monograph/Item
	Type of Control	' ' - No specified type of control
	Encoding Level	' ' - Full level
	Descriptive Cataloging Form	'a' - AACR2
001	53116322	
005	20240308154311.9	
008	Date Entered on File	'030930'
	Type of Date/Publication Status	's' - Single date
	Date1/Beginning Date of Publication	'2003'
	Date2/Ending Date of Publication	' '
	Place of Publication, Production, or Execution Code	'xx' - No place, unknown, or undetermined
	Illustrations	'a'
	Target Audience	' ' - Unknown or unspecified
	Form of Item	' ' - None of the following
	Nature of Contents Code	'bm'
	Government Publication	' ' - Not a government publication
	Conference Publication	'0' - Not a conference publication
	Festschrift	'0' - Not a festschrift
	Index	'0' - No index
	Literary Form	'0' - Not fiction
	Biography	' ' - No biographical material
	Language Code	'eng' - English
	Modified Record	' ' - Record is not modified
	Cataloging Source Code	'd' - Other
040	TKN \$b eng \$c TKN \$d OCLCQ \$d OCLCO \$d OCLCF \$d OCLCO \$d OCLCQ	
100	1 Hancock, John Houston, \$d 1977-	
245	1 0 Design and evaluation of a seed-specific applicator for in-furrow chemical application / \$c John Hous ton Hancock.	
264	0 \$c 2003.	
300	xvii, 151 pages : \$b illustrations (some color) ; \$c 28 cm	
336	text \$b txt \$2 rdacontent	
337	unmediated \$b n \$2 rdamedia	
338	volume \$b nc \$2 rdacarrier	
502	\$b M.S. \$c University of Tennessee, Knoxville \$d 2003	
500	Vita.	
504	Includes bibliographical references (pages 113-116).	
655	2 Academic Dissertation	
655	7 Academic theses. \$2 fast \$0 (OCoLC)fst01726453	
655	7 Academic theses. \$2 lcgft	
655	7 Thèses et écrits académiques. \$2 rvmgf	

Attachment 6

CURRICULUM VITAE SYLVIA D. HALL-ELLIS

EDUCATION

Ph.D., University of Pittsburgh, Pittsburgh, Pennsylvania, 1985
 M.P.S., University of Denver, Denver, Colorado, 2014
 Post Graduate Studies, University of Texas – San Antonio, Texas, 1975-1976
 M.L.S., University of North Texas, Denton, Texas, 1972 B.A.,
 Rockford University, Rockford, Illinois, 1971

PROFESSIONAL EXPERIENCE

- 1981- Consultant for higher education, non-profit organizations, and corporations.**
- 2002- Adjunct Professor, School of Information, San José State University, San José, California.** Serve as part-time faculty member teaching graduate students in technical services (cataloging, bibliographic control, classification), “core courses,” and special topics.
- 2014-2016 Director, Grants and Resource Development, Colorado Community College System.** Provided leadership and vision to foster the continued growth of rigorous scholarship, innovative projects, and creative work for statewide system, 13 campuses, and 50 teaching sites serving 155,000 students. Responsible for leadership and ensured efficient functioning of contract and grants in compliance with state & federal requirements and successful implementation and management. Served as a subject matter expert and liaison for college Grant Directors for all issues relating to grants and subcontracts.
- 2010-2014 Senior Grant Administrator, Morgridge College of Education, University of Denver (Colorado).** Provided leadership and vision to foster continued growth of rigorous scholarship, innovative research, and creative work in the Morgridge College of Education. Ensure that contract and grants processes function effectively and efficiently for 60 faculty and researchers with a focus on the successful progression and efficient management of grants totaling \$13M. Worked effectively and collegially with Department Chairs and Program Coordinators on operational grant-related management activities and with a broad range of internal and external constituencies. Supported the dissemination and promotion of faculty research and scholarship to outside constituents at conferences and through publications. Assisted Principal Investigators and grant project teams by coaching, mentoring, and financial management.
- 2011-2013 Interim Director & Assistant Dean, Westminster Law Library, Sturm College of Law, University of Denver.** Planned, organized, and directed all administrative activities for the library serving students, faculty, and alumni; oversaw the employment, retention, promotion, transfer and termination of library personnel; represented the library at professional conferences and public meetings; created and promoted a climate and culture of acceptance for new programs and services, a positive high-quality image of the law library, and that reflect the organization’s values, encourage excellent performance, and reward high productivity and innovation; provided leadership and set strategic direction of the organization; ensured that the library provided excellent customer service through solution-oriented staff response to patron needs and by responsiveness and continuous improvement of the organization; promoted, developed, and maintained positive working relationships with colleagues and customers including key stakeholders and groups, higher education institutions, the legal community, other regional libraries and districts statewide, and national library organizations.
- 2007-2014 Associate Professor, Library & Information Science, Morgridge College of Education, University of Denver (Colorado).** Served in leadership role and worked collaboratively in

program, college, campus and community environments. Advised and supervised students, taught core and specialized courses at the graduate level in an integrative, student-centered learning environment. Served on LIS, College, and University committees, and maintained working relationships with colleagues in other academic units and information professionals in the Rocky Mountain region and beyond. Served on and chair doctoral student dissertation committees. Oversaw and facilitated the College and LIS graduate student association.

- 2002-2007** **Assistant Professor, Library & Information Science, College of Education, University of Denver (Colorado).** Served as tenure-track faculty member teaching graduate students in “core courses,” resource description and access, service learning, and independent studies. Advised graduate students, participate on LIS and College committees, and serve on doctoral student dissertation committees. Oversaw and facilitated the LIS graduate student association and alumni association.
- 2000-2002** **Affiliate Faculty, Library & Information Science, College of Education, University of Denver (Colorado).** Served as part-time faculty member teaching graduate students in technical services (cataloging, bibliographic control, classification), “core courses,” and special topics. Oversaw and facilitated the LIS graduate student association and alumni association.
- 2000-2001** **Special Assistant to the Secretary’s Regional Representative, U.S. Department of Education, Region VIII, Denver, Colorado.** Served as the principal advisor and representative of the U. S. Secretary of Education’s Regional Representative (SRR). Ensured the implementation of major goals of the SRR and the Secretary. Provided leadership on behalf of the SRR in contacts with high-level officials in Region VIII requiring sensitive policy interpretation in communication with senior Department officials to solve problems and resolve issues raised by State and local education officials. Served as the primary contact for School-to-Work/Career, Children’s Health Insurance Program, and Safe and Drug-Free Schools. Delivered technical assistance to local education agencies and institutions of higher education in technology, professional development, and school construction.
- 1999-2000** **Catalog Librarian, Jefferson County Public Library, Lakewood, Colorado.** Performed original, copy cataloging and classification of library materials (English and Spanish) using standard library protocols; completed original descriptive cataloging and subject analysis; enhanced brief catalog and authority records in III.
- 1997-1999** **Development Officer, McREL International, Aurora, Colorado.** Served as senior member of corporate management team in strategic planning, development of proposals and contracts, implementation, and evaluation of new services, products, and programs for educational agencies. Provided creative leadership to corporate committees to solicit ideas, identify goals and objectives, plan, develop, present, and evaluate professional development opportunities.
- 1995-1997** **Education Specialist, Education Service Center, Region One, Edinburg, Texas.** Served as member of Administrative Cabinet team in strategic planning, development of proposals and contracts, implementation, and evaluation of telecommunications capabilities, services, products, and programs for 40 school districts serving 283,000 students in 7 counties. Provided creative leadership to regional and state committees to solicit ideas, identify strategic goals and objectives, plan, develop, present, and evaluate funding opportunities and professional development for 400 librarians.
- 1993-1996** **Assistant Professor of Library Science, Sam Houston State University, Huntsville, Texas.** Served a faculty member teaching 400 graduate students in technical services (cataloging,

bibliographic control, classification), automation, and networking. Participated in distance education program and coordinated annual conference. Conducted university and Texas Library Association-funded field research focused on library collection development and academic achievement.

- 1992-1993** **Head Librarian, Rocky Mountain College of Art & Design, Denver, Colorado.**
Responsible for the daily operation, selection and acquisition of materials, formulation of policies for library operations, media center, and photography/slides archives. Designed and implemented library automation and delivery of electronic resources to college community.
- 1981-1985** **Development Officer, PRLC, Inc., Pittsburgh, Pennsylvania.** Served as senior member of corporate management team in strategic planning, development of proposals and contracts, implementation, and evaluation of new services, products, and programs for 100 institutional member organizations. Coordinated the development of proposals and contracts totaling \$4,000,000 annually. Provided creative leadership to corporate committees to solicit ideas, identify goals and objectives, plan, develop, present, and evaluate professional development opportunities.
- 1981** **Director of Library Development, Pennsylvania Department of Education, Harrisburg, Pennsylvania.** Responsible for statewide development, technical assistance, professional development, resource sharing, children's services, institutional library services, networking, and state aid program for all libraries throughout the Commonwealth. Functioned as liaison to Governor's Advisory Council, LSCA Advisory Council, District Administrators, private colleges, universities, consortia managers, and network directors. Supervised \$14,000,000 formula-based state aid program and \$3,000,000 grant awards to individual libraries, consortia, and networks.
- 1978-1981** **Assistant Director, Southern Tier Library System, Corning, New York.** Coordinated operation of system-wide programs (technical assistance, professional development, resource sharing, technical services, outreach) to 40 public libraries in 5 counties serving 500,000 residents. Solicited ideas, identified goals, sponsored, and evaluated professional development opportunities and technical assistance sessions.
- 1976-1978** **Division Librarian for Technical Services, Corpus Christi Public Libraries, Corpus Christi, Texas.** Provided leadership in acquisitions, cataloging, serials control, and processing for main library and 4 branches serving 250,000 residents. Participated as senior member of library management team. Compiled and prepared technical evaluations, reports, and statistical analyses of Division operations to measure the achievement and cost of annual goals, objectives, and staff performance.
- 1975-1976** **System Coordinator, San Antonio Major Resource Center, San Antonio, Texas.** Served as senior member of the management team for District X Office, charged to provide technical assistance, resource sharing, media services, and professional development to librarians and staff representing 30 public library jurisdictions in 21 counties serving 1,500,000 residents. Functioned as liaison to System Director, staff, and members of governing bodies with the System Board of Directors and the Texas State Library and Historical Commission. Prepared LSCA grant applications and monitored awards totaling \$1,100,000 annually.
- 1973-1975** **Bilingual Branch Librarian, San Antonio Public Library, San Antonio, Texas.** Worked as librarian providing reference, information, and readers' advisory services in branch serving 50,000 Spanish-speaking residents in southwest San Antonio. Participated in collection development and resource acquisition activities, specializing in children's work, Spanish language resources, and multicultural studies.

1972-1973 **Librarian, Holding Institute, Laredo, Texas.** Worked as high school librarian serving 500 boarding students in Spanish-speaking environment of private school. Provided reference, research assistance, and library instruction to students and 35 faculty members.

1966-1971 **Rockford Public Library, Rockford, Illinois.** Worked in branches as part-time as a Library Assistant, Clerk, and Page in city library serving 150,000 residents.

PUBLICATIONS

Editor-reviewed Monographs (Completed and in Progress)

- Hall-Ellis, Sylvia D., and Mary Beth Weber. *Contemporary Cataloging in an RDA Environment: A Handbook for Students and Practitioners*. Chicago, IL: American Library Association. Under contract & In development.
- RDA Testing: Lessons Learned and Challenges Revealed*. Sylvia D. Hall-Ellis and Robert O. Ellett, Jr., eds. Binghamton, N.Y.: Haworth, 2012. 128 p.
- Hall-Ellis, Sylvia D., Stacey L. Bowers, Christopher D. Hudson, and M. Claire Williamson. *Librarian's Handbook for Seeking, Writing, and Managing Grants*. Santa Barbara, Calif.: Libraries Unlimited, 2011. 315 p.
- Hall-Ellis, Sylvia D., with Ann Jerabek, and Merrie W. Valliant. *Contemporary Cataloging: A Handbook for Practitioners and Students*. Open access text. Athens, GA: University of Georgia System Regents, 2011. 767 p.
- Grealy, Deborah S. and Sylvia D. Hall-Ellis. *From Research to Practice: The Scholarship of Teaching and Learning in LIS Education*. Westport, Conn.: Libraries Unlimited, 2009. 175 p.
- Hall-Ellis, Sylvia D. with J. Ann Jerabek. *Grants for School Libraries*. Westport, Conn.: Libraries Unlimited, 2003. 197 p.
- Hall-Ellis, Sylvia D., Doris Meyer, Frank W. Hoffmann, with J. Ann Jerabek. *Grant Writing for Small Libraries and School Library Media Centers*. Boulder, Colo.: NetLibrary, 2001. 173 p.
- Hall-Ellis, Sylvia D., Doris Meyer, Frank W. Hoffmann, with J. Ann Jerabek. *Grant Writing for Small Libraries and School Library Media Centers*. Englewood, Colo.: Libraries Unlimited, 2000. 173 p.

Editor-reviewed Chapters (Completed and In Progress)

- Hall-Ellis, Sylvia D. "Prepared to Lead: Talent, Skills, and Competencies." In *Telling the Technical Services Story*. Chicago, IL: American Library Association, 2020. Program Presentation for Re-Accreditation by the American Library Association, School of Information, San Jose State University, 2022.
- Hall-Ellis, Sylvia D. "Grant Writing and Sponsored Research Funding for Academic Librarians." In *The New Librarianship*. Vol. 4. Bradford Lee Eden, ed. New York: Scarecrow Press, 2015. (pp. 163-174)
- Hall-Ellis, Sylvia D. "Organizing Information: Technical Services." In *Information Services Today: An Introduction*. Sandra Hirsch, ed. Lanham, Md.: Rowman and Littlefield, 2015. (pp. 139-148)
- Hall-Ellis, Sylvia D. "Metadata, MARC, and More." In *Rethinking Technical Services, Considering Our Profession and Ourselves: What's the Future of Our Profession?* Mary Beth Weber, ed. Lanham, Md.: Rowman and Littlefield, 2015. (pp. 29-55)
- Hall-Ellis, Sylvia D., ed. "Contingent Faculty: Non-Tenure Track Faculty Series." In the *Faculty Personnel Guidelines Relating to Appointment, Promotion, and Tenure*. November 2011. Denver, Colo.: University of Denver, 2011. 42 p.
- Hall-Ellis, Sylvia D., ed. "Standard VII: Information Resources." In the *Sturm College of Law Self-Study Presentation for Accreditation by the American Bar Association*. Denver, Colo.: University of Denver, Sturm College of Law, 2011. 20 p.

Hall-Ellis, Sylvia D. "Applying for Grants from Foundations, Corporations, or Government." In *The Volunteers' Guide to Fundraising: Raise Money for Your School Team, Library or Community Group*. 1st ed. Ilona M. Bray, ed. Berkeley, Calif.: Nolo, 2011. (pp. 1-38 on accompanying disc)

Hall-Ellis, Sylvia D., ed. "Standard III: The Faculty." In the *Library and Information Science Program Self-Study Document for Accreditation by the American Library Association*. Denver, Colo.: University of Denver, Morgridge College of Education, 2010. 22 p.

Hall-Ellis, Sylvia D. "Library and Information Science Programs and Education for Catalogers and Metadata Specialists: Challenges for the Twenty-first Century." In *Conversations with Catalogers in the Twenty-First Century*. Elaine R. Sanchez, ed. Santa Barbara, Calif.: ABC-CLIO, 2010. (pp. 226-254)

Hall-Ellis, Sylvia D., ed. "Standard III: The Faculty." In the *Library and Information Science Program Self-Study Document for Accreditation by the American Library Association*. Denver, Colo.: University of Denver, College of Education, 2003. 15 p.

Lesesne, Teri S. and Sylvia D. Hall-Ellis. "The Selection, Evaluation, and Integration of Culturally Authentic Texts: A Case for Making the Online Catalog Reflect Parallel Cultures." In *Literacy: Traditional, Cultural, Technological*. Pittsburgh, Pa.: International Association of School Librarianship, 1995. (pp. 110-113)

Lesesne, Teri S. and Sylvia D. Hall-Ellis. *The Selection, Evaluation, and Integration of Culturally Authentic Texts: A Case for Making the Online Catalog Reflect Parallel Cultures*. In *Conference Proceedings of the 23rd Annual International Association of School Librarianship*, Pittsburgh, Pennsylvania, July 17-22, 1994. ERIC Document ED374816. 17 p.

Hall-Ellis, Sylvia D. "Curriculum Folio for School Library Media Specialist Programs." In the *National Council for Accreditation of Teacher Education Self-Study for Sam Houston State University*. Huntsville, Tex.: Sam Houston State University, College of Education and Applied Science, 1994. 25 p.

Bruntjen, Scott and Sylvia D. Hall. "Attempting to Automate: Lessons Learned Over Five Years." In *Advances in Library Administration*. Volume 4. Weston, Conn.: JAI Press, 1985. (pp. 177-192)

Peer-Reviewed Journal Articles (Completed and In Progress)

Hall-Ellis-Sylvia D. "Job Design for Cataloging and Metadata Librarians." Submitted to *Journal of Library Administration*. In progress.

Hall-Ellis, Sylvia D. "The Relationship of Situational Leadership and the Dreyfus Model of Skill Acquisition for Supervisors in Cataloging and Metadata Services." To be submitted to *Library Resources and Technical Services*. In progress.

Hall-Ellis, Sylvia D. *The Relationship of Core Competencies on Learning Outcomes and Employers' Expectations for Catalog Librarians and Metadata Specialists*. To be submitted to the *Journal of Education for Library and Information Science*. In progress.

Hall-Ellis, Sylvia D. "Building Cataloger Competencies: The Dreyfus Model as a Prototype for the Education and Professional Development of Catalog Librarians and Metadata Specialists in Bibliographic Control." To be submitted to the *Cataloging & Classification Quarterly*. In progress.

Hall-Ellis, Sylvia D. "Descriptive Impressions of Entry-Level Cataloger and Metadata Specialists Positions, 2000-2016: Reflections and Trends." To be submitted to *Library Resources and Technical Services*. In progress.

- Hall-Ellis, Sylvia D. "Competencies for Metadata and Cataloging Leaders: What Employers Expect as Reflected in Position Descriptions, 2000-2016." *Cataloging & Classification Quarterly*. In progress.
- Hall-Ellis, Sylvia D. "Stackable Micro-credentials – A Framework for the Future." *The Bottom Line* 29, no. 4 (April 2016), <http://www.emeraldinsight.com/doi/pdfplus/10.1108/BL-02-2016-0006>
- Ellis, Sylvia D. "Succession Planning and Staff Development – A Winning Combination." *The Bottom Line*, 28 no. 3 (May 2015): 95-98.
- Hall-Ellis, Sylvia D. "Succession Planning and Staff Development – A Winning Combination." *The Informed Librarian Online* (September 2015), http://www.informedlibrarian.com/featuredArticle.cfm?FILE=succession_1509.pdf
- Hall-Ellis, Sylvia D. "Nudges and Decision Making: A Winning Combination." *The Bottom Line* 28, no. 4 (July 2015): 133-136.
- Hall-Ellis, Sylvia D. "Succession Planning and Staff Development – A Winning Combination." *The Bottom Line* 28, no. 3 (May 2015): 95-98.
- Hall-Ellis, Sylvia D. "Metadata Competencies for Entry-Level Positions: What Employers Expect as Reflected in Position Descriptions, 2000-2013." *Journal of Library Metadata* 15, no. 2 (June 2015): 102-134.
- Hall-Ellis, Sylvia D. "Onboarding to Improve Library Retention and Productivity." *The Bottom Line* 27, no. 4 (October 2014).
- Hall-Ellis, Sylvia D. "Accept, Coach, and Inspire: A Formula for Success." *The Bottom Line* 27, no. 3 (July 2014): 103-106.
- Hall-Ellis, Sylvia D. *Reward Systems for Staff in Higher Education Institutions: Case Studies of 15 Higher Education Institutions in Colorado*. Capstone Thesis. Denver, Colo.: University of Denver, University College, 2014.
- Hall-Ellis, Sylvia D. "Reward Systems Promote High-Performance Work Teams Achieving Library Mission." *The Bottom Line* 27, no. 2 (April 2014): 66-69.
- Hall-Ellis, Sylvia D. "Investment in Staff Development for Seeking External Grant Funds." *The Bottom Line* 27, no. 1 (January 2014): 22-25.
- Hall-Ellis, Sylvia D. "Staff Investments for High Performance Teams." *The Bottom Line* 26, no. 4 (October 2013): 149-152.
- Hall-Ellis, Sylvia D. and Deborah S. Greal. "Service Learning in LIS Education: A Case for Holistic Assessment." *Catholic Library World* 82, no. 3 (March 2012): 178-187.
- Hall-Ellis, Sylvia D., and Deborah S. Greal. "The Dreyfus Model of Skill Acquisition: A Career Development Framework for Succession Planning and Management in Academic Libraries." *College and Research Libraries* (June 2012). <http://crl.acrl.org/content/early/2012/06/19/crl12-349.full.pdf+html>
- Hall-Ellis, Sylvia D. "Cataloger Competencies...What Do Employers Require?" *Cataloging & Classification Quarterly* 46, no. 3 (2008): 305-330. <http://ccq.haworthpress.com/doi:10.1080/01639370802034565>

Hall-Ellis, Sylvia D. "Subject Access for Readers' Advisory Services: Their Impact on Contemporary Spanish Fiction in Selected Public Library Collections." *Public Library Quarterly* 27, no.1 (2007): 1-18.
<http://plq.haworthpress.com/doi:10.1080/01616840802122377>

Hall-Ellis, Sylvia D. "Language Proficiencies among Catalogers and Technical Services Librarians." *Technical Services Quarterly* 25, no. 2 (2007) 31-47. http://tsq.haworthpress.com/doi:10.1300/J124v25n02_03

Hall-Ellis, Sylvia D. "Cataloging Electronic Resources & Metadata: Employers' Expectations as Reflected in *American Libraries* and AutoCAT, 2000-2005." *Journal of Education for Library and Information Science* 47, no. 1 (2006): 38-51.

Hall-Ellis, Sylvia D. "Descriptive Impressions of Managerial & Supervisory Cataloger Positions as Reflected in *American Libraries*, AutoCAT, and the *Colorado State Library Jobline*, 2000-2004: A Content Analysis of Education, Competencies, and Experience." *Cataloging & Classification Quarterly* 42, no. 1 (2006): 55-88.

Hall-Ellis, Sylvia D. "Descriptive Cataloging Proficiencies among Beginning Students: A Comparison among Traditional and Virtual Class Students." *Journal of Library & Information Services in Distance Education* 2, no. 2 (2005): 13-44.

Hall-Ellis, Sylvia D. "Descriptive Impressions of Entry-Level Cataloger Positions as Reflected in *American Libraries*, AutoCAT, and the *Colorado State Library Jobline*, 2000-2003." *Cataloging & Classification Quarterly* 40, no. 2 (2005): 33-72.

Hall-Ellis, Sylvia D. and Mary Ann Berry. "The Impact of Library Resource Centers on Academic Achievement in Selected Public Schools in South Texas: Preliminary Findings." *Texas Library Journal* 71, no. 2 (Summer 1995): 94-97.

Hall-Ellis, Sylvia D. "Visual Arts as Foundation for Successful Library Automation: The Rocky Mountain College of Art & Design Experience." *Art Reference Serials Quarterly* 4 (1994): 43-54.

Hall, Sylvia D. *High School Databases: An Examination of Bibliographic Data Elements*. Dissertation. Pittsburgh, Pa.: University of Pittsburgh, School of Library and Information Science, 1985.

Technical Reports

Hall-Ellis, Sylvia D. *Preparing Catalogers and Metadata Specialists Through Competency-Based Education: The San José State University iSchool Experience*. Report for the 2021 Re-Accreditation Program Presentation to the American Library Association. San José, Calif.: San José State University iSchool, 2020.

Hall-Ellis, Sylvia D. *Colorado Community College System Grant Handbook*. Denver, Colo.: Colorado Community College System, 2015.

Faculty Voices: Testimonials from the Frontiers of a Development Education Redesign. Elaine DeLott Baker, Marilyn Smith, and Sylvia D. Hall-Ellis, eds. Denver, Colo.: Colorado Community College System, 2014.

Lewis, Melanie, Jamie M. Van Leeuwen, and Sylvia D. Hall-Ellis. *Project Homeless Connect 7 Event Evaluation*. Denver, Colo.: University of Colorado Denver, 2009.

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<http://portfolio.du.edu/grants>

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- Hall-Ellis, Sylvia D. *Strategic Plan for Denver Medical Library System: Final Report*. Denver, Colo.: HealthONE and Denver Medical Library, 2008.
- Hall-Ellis, Sylvia D. and Duan Zhang. *Project Homeless Connect 5 Event Evaluation*. Denver, Colo.: Center for Community Engagement and Service Learning, 2008.
- Hall-Ellis, Sylvia D. *Strategic Plan for Denver Medical Library System: Phase Two Report*. Denver, Colo.: HealthONE and Denver Medical Library, 2007.
- Hall-Ellis, Sylvia D. and Duan Zhang. *Project Homeless Connect 4 Event Evaluation*. Denver, Colo.: Center for Community Engagement and Service Learning, 2007.
- Hall-Ellis, Sylvia D. *Strategic Plan for Denver Medical Library System: Phase One Report*. Denver, Colo.: HealthONE and Denver Medical Library, 2007.
- Hall-Ellis, Sylvia D. *Denver Public Library: Opportunities for Change*. Denver, Colo.: University of Denver, Colorado Community-Based Research Network & Metropolitan Organization of People, 2005.
- Hall-Ellis, Sylvia D. *Resources in Grant Writing for Colorado Schools and Libraries*. Sponsored by the Colorado Department of Education, Educational Telecommunications Unit, 1999. Revised September 2000.
- Hall-Ellis, Sylvia D. *Lewis & Clark Fellows Concept Paper for the Bicentennial Commemoration*. Vancouver, Wash.: Lewis and Clark Bicentennial Council, 1998.
- Hall-Ellis, Sylvia D. and Mary Ann Berry. *The Impact of Library Resource Centers on Academic Achievement in Public Schools in Texas: The Final Report*. Prepared under the sponsorship of the Research Enhancement Fund award from Sam Houston State University, the Texas Association of School Librarians, the Children's Services Round Table, and the Young Adults' Services Round Table. Huntsville, Tex.: Sam Houston State University, College of Education and Applied Science, 1997.
- Hall-Ellis, Sylvia D. *The Impact of Library Resource Centers on Academic Achievement in Selected Public Schools in Texas*. Huntsville, Tex.: Sam Houston State University, College of Education and Applied Science, 1997.
- Hall-Ellis, Sylvia D. *Planning for Educational Technology: the Distance Education Implementation Phase: An Investigation of Technology and Telecommunication Needs for Region One Education Service Center, South Texas Community College, TCI Cablevision of South Texas, Inc., Tech Prep of the Rio Grande Valley, Inc., Texas State Technical College, Centro Cultural en el Valle de Texas, McAllen Independent School District, Harlingen Consolidated Independent School District, Donna Independent School District, Edinburg Consolidated Independent School District, La Joya Independent School District, Mercedes Independent School District, Pharr-San Juan-Alamo Independent School District, Sharyland Independent School District, Easter Seal Society of the Rio Grande Valley, Inc., and McAllen Memorial Library*. Harlingen, Tex.: Tech Prep of the Rio Grande Valley, 1996.
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- Hall-Ellis, Sylvia D. [et. al.] *Planning for Educational Technology: A Study of Future Technology Needs for the Donna Independent School District, Region One Education Region Service Center, Tech Prep of the Rio Grande Valley, Inc. South Texas Community College, and the Department of Library Science, Sam Houston State*

University. Research team: Sylvia D. Hall-Ellis, Ruth Ann Riggins, Noe Torres, Patricia G. Bubbs, and Michael D. Bell. Harlingen, Tex.: Tech Prep of the Rio Grande Valley, 1994. Funded through a grant award from the Texas Education Agency.

Hall-Ellis, Sylvia D. and Mary Ann Berry. *The Impact of Library Resource Centers on Academic Achievement in Selected Public Schools in South Texas*. Huntsville, Tex.: Sam Houston State University, College of Education and Applied Science, 1993. Funded through a grant award from the Sam Houston State University Research Enhancement Fund.

Hall-Ellis, Sylvia D., Alice Krueger, and Linda Brannan. *Thesaurus Development for National Curriculum Materials Database at the Eisenhower National Clearinghouse for Mathematics and Science Education, Columbus, Ohio*. Developed under the sponsorship of Mid-Continent Regional Educational Laboratory Corporate Library, Aurora, Colo. Washington, D.C.: National Science Foundation; Columbus, Ohio: ERIC Clearinghouse for Mathematics and Science Education, 1993.

Hall-Ellis, Sylvia D. and Clarence L. Coffindaffer. *Partners in Progress: The 1992 Montana Library Federation Study Final Report*. Helena, Mont: Montana State Library and The Blue Bear Group, Inc., 1992.

Hall-Ellis, Sylvia D. and Clarence L. Coffindaffer. *Montana Federation Study Identification Paper*. Denver, Colo.: The Blue Bear Group, Inc., 1992.

Bruntjen, Scott and Sylvia D. Hall. *Recommendations on the Development of System-Wide Efforts of the Northern Waters Library Service*. Ashland, Wisc.: Northern Waters Library Service and The Blue Bear Group, Inc., 1989.

Hall, Sylvia D. *The Iowa Union List of Serials as A Part of The Iowa Locator: Planning Document*. Des Moines, Ia.: State Library of Iowa, 1988.

Hall, Sylvia D. *Iowa Computer-Assisted Network (ICAN Users' Manual. IBM Compatible Edition: Version 7.0*. Des Moines, Ia.: State Library of Iowa, 1988.

Hall, Sylvia D. *Iowa Computer-Assisted Network (ICAN Users' Manual. IBM Compatible Edition: Version 5.0*. Des Moines, Ia.: State Library of Iowa, 1986.

Hall, Sylvia D. *Iowa Computer-Assisted Network (ICAN Users' Manual. Apple MacIntosh Edition: Version 5.0*. Des Moines, Ia.: State Library of Iowa, 1986.

Bruntjen, Scott and Sylvia D. Hall. *The District of Columbia Public Library Planning for Retrospective Conversion of Bibliographic Records and Automation Issues for the 1990's: Final Report*. Central City, Colo.: The Blue Bear Group, Inc., 1986.

Bruntjen, Scott and Sylvia D. Hall. *The Iowa Locator: Final Report*. Central City, Colo.: The Blue Bear Group, Inc., 1986.

Bruntjen, Scott and Sylvia D. Hall. *Discovering Resource Sharing Treasures: Accessing Pennsylvania's High School Library Collections*. Harrisburg, Pa.: State Library of Pennsylvania, Bureau of School Library Media Resources, 1985.

Hall, Sylvia D. *Retrospective Conversion and the Completeness of Cataloging in Pennsylvania High School Libraries*. Pittsburgh, Pa.: PRLC, Inc., 1985.

Bruntjen, Scott and Sylvia D. Hall. *The Iowa Locator*. Des Moines, Ia.: State Library of Iowa, 1985-
<http://www.statelibraryofiowa.org/ld/silo/locator>

Bruntjen, Scott and Sylvia D. Hall. *ICAN Analysis*. Des Moines, Ia.: State Library of Iowa, 1985.

- Bruntjen, Scott and Sylvia D. Hall. *Zebras: Bar Codes, Standards, and Library Automation*. Central City, Colo.: The Blue Bear Group, Inc., 1985.
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- Hall, Sylvia D. *Reconfiguration of the ITAC Cataloging Data Base to Machine Readable (MARC) Format*. Classified Document. Arlington, Va.: U. S. Army Intelligence and Threat Analysis Center, 1984.
- Bruntjen, Scott and Sylvia D. Hall. *South Dakota Library Automation Plan: Final Report*. Pittsburgh, Pa.: PRLC, Inc., 1982. Reprinted by the South Dakota State Library, 1983.
- Bruntjen, Scott and Sylvia D. Hall. *Altoona Automation Plan: Final Report prepared for the Altoona Area Public Library and the Altoona District Library Center*. Pittsburgh, Pa.: PRLC, 1983.
- Bruntjen, Scott, Sylvia D. Hall and Paul J. Pugliese. *College Space Utilization Study*. Pittsburgh, Pa.: PRLC, Inc., 1983.
- Hall, Sylvia D. *Pennsylvania Public Library Film Center Union Catalog Cataloging and Technical Services Procedures Manual*. Pittsburgh, Pa.: PRLC, Inc., 1982.
- Hall, Sylvia D. *History of Library Development in Pennsylvania: A Review and Content Analysis of the Plans, 1955-1980*. Pittsburgh, Pa.: PRLC, Inc., 1982.
- Hall, Sylvia D. *Newspapers on Microfilm: A Listing of Newspapers in Allegheny, Chemung, Schuylers, Steuben, and Yates Counties*. Ithaca, N.Y.: South Central Reference and Research Council, 1981.
- Hall, Sylvia D. *OCLC/ILL Subsystem at Southern Tier Library System*. Albany, N.Y.: SUNY/OCLC Network, 1980.
- Hall, Sylvia D. *Retrospective Conversion for Major Public Libraries in South Central New York State: A Technical Report*. 2 vols. Corning, N.Y.: Southern Tier Library System, 1979-1980.
- Hall, Sylvia D. *The Librarian and the Mexican-American Patron in Texas*. Austin, Tex.: Texas State Library, 1978.

Other Publications

- Hall-Ellis, Sylvia D., ed. *Library and Information Science Program Self-Study Document for Accreditation by the American Library Association*. St. Paul, MN: St. Catherine University, 2017. 255 p.
- Hall-Ellis, Sylvia D., and Robert O. Ellett, Jr., guest editors. *RDA Testing: Lessons Learned and Challenges Revealed: A Special Issue of Cataloging & Classification Quarterly* 49, no. 7-8 (November 2011).
- Hall-Ellis, Sylvia D. and Robert O. Ellett, Jr. *Fundamentals of Cataloging I: An Online ALCTS Course*. Chicago, Ill.: American Library Association, 2009.
- Hall-Ellis, Sylvia D., Angela J. Kinney and Martha Ann Bace, editors. *Best Practices in Cataloging Education Identified at the 2007 ALCTS Pre-conference: A Special Issue of the Journal for Library and Information Science Education* 49, no. 2 (Spring 2008).
- Hall-Ellis, Sylvia D. *Cataloging Education: A New Emphasis for the Library and Information Science Curriculum*. Presentation delivered to the ALCTS Pre-conference, 132nd Annual Conference, American Library Association, Washington, D.C., June 22, 2007. <http://www.loc.gov/aba/professional/>

Hall-Ellis, Sylvia D. "Cataloger Competencies: Do the Employers Require What the Professors Teach?" Presentation delivered to the ALCTS CCS Heads of Cataloging Discussion Group, 131st Annual Conference, American Library Association, New Orleans, Louisiana, June 26, 2006. <http://dlist.sir.arizona.edu/>

Hall-Ellis, Sylvia D., guest editor, with Deborah S. Grealy, Clara L. Sitter, and Tassos Petrou. *Library Students' Voices in Colorado: An Issue of Colorado Libraries* 31:1 (Spring 2005).

Hall-Ellis, Sylvia D., ed. *Library and Information Science Program Self-Study Document for Accreditation by the American Library Association*. Denver, Colo.: University of Denver, College of Education, 2003. 125 p. with CD-ROM.

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Hall-Ellis, Sylvia D. "Adaptive Furniture for the ADA-Qualified: An Investigative Study." 2001. Unpublished manuscript.

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Hall-Ellis, Sylvia D. "E-books: Acquisition and Circulation Issues in Public Libraries." 2001. Unpublished manuscript.

Hall-Ellis, Sylvia D. "Authority Control and Its Importance in School Library Media Online Catalogs." 1999. Unpublished manuscript.

Hall, Sylvia D. "Cooperation Improving Service in San Antonio System." *Texas Libraries* XXXVII (Spring 1976): 27-29.

Hall, Sylvia D. "Summer is Sea Monstrously Fun!" *Texas Library Journal* L (December 1974): 224-226.

Hall, Sylvia D. "A Brief Annotated Bibliography of Non-book Materials on the Mexican American." *Texas Library Journal* XLVIII (October 1972): 213-232.

Book Reviews

ALA Book of Library Grant Money. Ann Kepler, ed. 8th ed. Chicago, IL: American Library Association, 2011. 978-0-8389-1058-0, \$175.00 [*Colorado Libraries*, June 2012]

Developing a Compensation Plan for Your Library. Paula M. Singer and Laura L. Francisco, comps. 2nd ed. Chicago, IL: American Library Association, 2009. 978-0-8389-0985-0, \$57.00 [*Colorado Libraries*, March 2012]

Frugal Librarian. Carol Smallwood, ed. Chicago, IL: American Library Association, 2011. 978-0-83891-075-7, \$42.00 [*Colorado Libraries*, February 2012]

Dowlin, Ken. *Getting the Money: How to Succeed in Fundraising for Public and Nonprofit Libraries*. Westport, Conn.: Libraries Unlimited, 2008. 978-1-59158-597-X, \$50.00 [*Colorado Libraries*, February 2009]

Lundahl, Mats. *Bebo de Cuba; Bebo Valdés y Su Mundo*, by Mats Lundahl. Traducción de Linda Oakeshott Dragó. Barcelona: RBA Libros, 2008. 978-849-86-7259-6, \$33.99 [*Críticas*, November 2008]

- Bonelli, Florencia. *Marlene*, by Florencia Bonelli. Buenos Aires: Aguilar, Altea, Taurus, Alfaguara, 2008. 978-987-04-0995-3, \$24.95 [*Críticas*, October 2008]
- Keret, Etgar. Traducción de Ana María Bejarano. *Pizzería Kamikaze y Otras Relatos*. México, D.F.: Editorial Sexto Piso, 2008. 968-5679-29-0, no price given [*Críticas*, September 2008]
- Littauer, Marita, and Florence Littauer. *Enriquece tu Comunicación*. Miami, Fla.: Editorial Unilit, 2008. 978-0-7899-1521-4, \$11.99 [*Críticas*, August 2008]
- Martínez, Guillermo. *La Muerte Lenta de Luciana B.* New York: Rayo Planeta, 2008. 978-0-06-156551-9, \$14.95 [*Críticas*, May 2008]
- Matthews, Joseph R. *The Evaluation and Measurement of Library Services*. Westport, Conn.: Libraries Unlimited, 2007. 978-1-59158-532-9, \$50.00 [*Colorado Libraries*, April 2008]
- Gómez-Jurado, Juan. *A Masacre de Virginia Tech: Anatomía de una Mente Torturada*. Barcelona: Ediciones El Andén, 2007. 978-84-935789-4-7, €16.50 [*Críticas*, February, 2008]
- Matthews, Joseph R. *Library Assessment in Higher Education*. Westport, Conn.: Libraries Unlimited, 2007. 978-1-59158-531-2, \$45.00 [*Colorado Libraries*, February 2008]
- Chacón, Inma. *La Princesa India: Cuando el Viento Azul*. México: Alfaguara, 2006. 970-770398-9, \$19.95 [*Críticas*, June 2006]
- Vargas Llosa, Mario. *Israel/Palestina: Paz o Guerra Santa*. fotogs. by Morgana Vargas Llosa. Spain/U.S.: Aguilar: Santillana, 2006. 84-03-09691-7, paper, \$19.95 [*Críticas*, May 2006]
- Findlay, Diane. *Digging into Dewey*. Fort Atkinson, Wisc.: Upstart Books, 2005. 978-1-932146-18-9, \$16.95 [*Colorado Libraries*, May 2006]
- Pequeñas Resistencias 4: Antología del Nuevo Cuento Norteamericano y Caribeño*. Menéndez, Ronaldo, Ignacio Padilla & Enrique del Risco, eds. Madrid: Páginas de Espuma, 2005. 84-95642-59-X, paper, \$36.95 [*Críticas*, April 2006]
- Rueda, André. *Vengo a Salvar a España: Biografía de Un Franco Desconocido*. Madrid: Nowtilus (Investigación Abierta), 2005. photogs., bibliog. 84-9763-202-8, paper, \$23.95 [*Críticas*, March 2006]
- Becerra, Ángela. *El Penúltimo Sueño*. 1st ed. Barcelona: Planeta, 2005. 84-08-05795-2, \$25.95. [*Críticas*, January 2006]
- Aguilar Camín, Héctor. *La Conspiración de la Fortuna*. 1st ed. México: Planeta, 2005. 970-37-0368-2, \$19.95 [*Críticas*, October 2005]
- México en Sus Libros*. Enrique Florescano with Pablo Mijangos, editors & compilers. 1st ed. México, D.F.: Taurus Aguilar, 2004. 968-19-0783-3, \$16.95 [*Críticas*, September 2005]
- Historia Económica de México*. Coordinator, Enrique Semo. México: Universidad Nacional Autónoma de México, Editorial Oceano de México, 2004. 13 vols. 970-32-0805+3 (obra completa), \$9.25 each [*Críticas*, August 2005]

- Czarnowsky, Christyne A. and Michael H. Williams. *Managing Your Wired Workforce: A Practical Guide*. Denver, Colo.: Bradford Pub., 2003. 1-883726-79-4, \$24.95 [*Colorado Libraries*, 2004]
- Abraham Lincoln*. Colección Grandes Biografías. Madrid: Edimat Libros, 2003. 84-8403-858-0, €4.95 [*Críticas*, 2004]
- Alponte, Juan María. *Colón: el Hombre, el Navegante, la Leyenda*. México, D.F.: Aguilar, 2003. 968-19-1260-8, \$16.95 [*Críticas*, 2004]
- Olcese Salvatecci, Alfieri. *Cómo Estudiar con Éxito: Técnicas y Hábitos Para Aprender Mejor*. México, D.F.: Alfaomega Grupo Editor, 2002. 970-15-0764-9 [*Críticas*, 2003]
- Mujeres Como Islas: Antología de Narradoras Cubanas, Dominicanas, Puertorriqueñas*. Edición: Olga Marta Pérez, Thelma Jiménez, Andrés Blanco D., eds. Santo Domingo, República Dominicana: Ediciones Ferilibro, 2002. 959-209-419-5 [*Críticas*, 2003]
- Tibol, Raquel. *Los Murales de Diego Rivera: Universidad Autónoma Chapingo*. México, D.F.: Editorial RM, Universidad Autónoma Chapingo, 2002. 968-5208-08-5 [*Críticas*, 2003]
- Lindsay-Poland, John. *Emperors in the Jungle: the Hidden History of the U.S. in Panama*. Durham, N.C.: Duke University Press, 2003. 0-8223-3098-9, \$18.95 [*Críticas*, 2003]
- Kaplan, Allison G. and Ann Marlowe Riedling. *Catalog It! A Guide to Cataloging School Library Materials*. Worthington, Ohio: Linworth Pub., 2002. 1-58683-014-7, \$44.95 [*Colorado Libraries*, 2002]
- Bardach, Ann Louise. *Cuba Confidential: Love and Vengeance in Miami and Havana*. New York: Random, 2002. 0-375-50489-3, \$25.95 [*Library Journal*, 2002]
- Swan, James. *Fundraising for Libraries: 25 Proven Ways to Get More Money for Your Library*. New York: Neal Schuman, 2002. 1-55570-433-6, \$69.95 [*Colorado Libraries*, 2002]
- Puig de Lange, Victoria. *Sol Con Agua*. Nashville, Tenn.: Editorial Vistazo/Ediciones Reio Negro, 2002. 0-9724506-0-2, \$17.75 [*Críticas*, 2002]
- The Encyclopedia of Latin American Politics*. Edited by Diana Kapiszewski; assistant editor, Alexander Kazan. Westport, Conn.: Oryx Press, 2002. 1-57356-306-4, \$74.95 [*Library Journal*, 2002]
- Vargas Lizano, Isabel. *Y Si Quieres Saber de Mi Pasado*. Con la colaboración de J.C. Vales. Madrid: Santillana Ediciones Generales, S.L., 2002. 84-03-09278-4, \$18.95 [*Críticas*, 2002]
- Ruy Sánchez, Alberto. *Los Jardines Secretos de Mogador: Voces de Tierra*. México, D.F.: Alfaguara, S.A., 2001. 968-19-0879-1, \$16.95 [*Críticas*, 2002]
- Chávez, Ricardo and Celso Santajuliana. *El Final de las Nubes*. Barcelona: RBA Libros, S.A., 2001. 84-7901-760-0, \$11.95 [*Críticas*, 2002]
- The Power of Language / El Poder de la Palabra: Selected Papers from the Second REFORMA National Conference*. Edited by Lillian Castillo-Speed and the REFORMA National Conference Publications Committee. Englewood, Colo.: Libraries Unlimited, 2001. 1-563089459, \$35.00 [*Colorado Libraries*, 2001]
- Martínez, Rubén. *Crossing Over: A Mexican Family on the Migrant Trail*. Metropolitan: Holt, 2001. 0-8050-4908-8, \$26.00 [*Library Journal*, 2001]

Guevara, Ernesto "Che." *The African Dream: the Diaries of the Revolutionary War in the Congo*. Translated from the Spanish by Patrick Camiller. With an introduction by Richard Gott and a foreword by Aleida Guevara March. New York: Grove Press, 2001. 0-8021-3834-9, \$13.00 [*Library Journal*, 2001]

Cooper, Gail and Garry Cooper. *New Virtual Field Trips*. Englewood, Colo.: Libraries Unlimited, 2001. 1-56308-887-8, \$27.50 [*Colorado Libraries*, 2001]

NATIONAL SERVICE & PROFESSIONAL AFFILIATIONS

American Library Association, Life Member

Association for Library Collections & Technical Services (now CORE)
Cataloging, Classification, and Metadata Section
ALCTS Editorial Board, Member, 2015-2019
Committee on Cataloging: Description and Access, Member, 2008-2012
Test Site for RDA, Manager, 2009-2011
Nominating Committee, Member, 2007-2008
Committee for Education and Training of Catalogers, Chair, 2006-2007, Member, 2003-2007
Competencies & Education for a Career in Cataloging Interest Group, Chair, 2010-2012; Member, 2010-
President's Program Committee, 2015-2016
Education Committee, Member, 2005-2007
Task Force on Competencies and Education for a Career in Cataloging, Chair, 2007-2009
2007 Annual Meeting Pre-conference, "What They Don't Teach in Library School: Competencies,
Education and Employer Expectations for a Career in Cataloging," Steering Committee Chair
Fundraising Committee, Member, 2004-2006
Office of Diversity
Committee on Diversity, Chair, 2010-2011
Diversity Research Advisory Committee, Member, 2009-2010
Spectrum Scholar Mentor, 2009
Diversity Grants Review Committee, Member, 2007, 2010, 2012
Office of Statistics and Research
Research and Statistics Committee, Member, 2005-2007; Intern, 2003-2005
Library Research Round Table
Nominating Committee, 2022-2023
Membership Committee, 2019-2021
Board of Directors, Member At-Large, 2009-2012
Office of Accreditation
Accreditation Panel Member (training completed 2004)
Accreditation Review Panel Member (training completed 2004)

REFORMA, Life Member

National Board of Directors, 2005-2013
National Fundraising Chair, 2005-2013
National Recruiting and Mentoring Committee, 2008-2010
Colorado Chapter, Secretary, 2004-2005
Colorado Chapter Liaison to National Board of Directors, 2004-2013

American Association of Law Libraries (AALL), Life Member Online Audiovisual Catalogers Association (OLAC) Colorado Association of Law Librarians (CoALL)

American Association of University Women Association for Library and Information Science Education (ALISE)

University of Denver ALISE Representative, 2003-2008; 2010-2011
Membership Advisory Committee, 2007-2010
Technical Services Education Special Interest Group, 2003-
Garfield Doctoral Dissertation Award Reviewer, 2012
Garfield Doctoral Dissertation Scholarship Reviewer, 2014

American Association of University Professors (AAUP), 2006-

American Grant Writers Association, 2014- Grant Professionals Institute, 2016- National Grants Management Association, 2014-

Grant Reviewer (National and Regional Team Leader), U.S. Department of Education, 1998- Grant Reviewer, Broadband Technologies Opportunity Program, U.S. Department of Commerce, 2009
Grant Reviewer, Institute of Museum and Library Services, 1998-2000
Grant Reviewer, Colorado Department of Education, 2014-
Grant Reviewer, Colorado State Library, 1998-
Grant Reviewer, American Association of Community Colleges *Working Connections* program, 1999
Peer Reviewer, *Journal for Library and Information Science Education*, 2005-
Peer Reviewer, *Journal of Library Metadata*, 2009
Peer Reviewer, *International Journal of Library and Information Science*, 2011
Regular Columnist, *The Bottom Line*, 2013-2016
Book Reviewer, *Library Journal*, 2001
Book Reviewer, *Críticas*, 2002-2009
Book Reviewer, *Colorado Libraries*, 2000-2012

REGIONAL SERVICE & PROFESSIONAL AFFILIATIONS

Mountain Plains Library Association

Professional Development Grants Committee, Member, 2005-2006
Professional Development Policy and Guidelines Sub-committee Chair, 2006

Colorado Association of Libraries

“Student Voices” Column Editor, *Colorado Libraries*, 2005-2006
Conference Planning Committee, Member, 2002
Technical Services and Automation Division, Chair, 2002-2003; Member, 2000-
Academic Libraries Division, Peer Review Conference Papers Committee, Member, 2007-2009
Education Committee, Member, 1988-1993
Diverse Populations Committee, Member, 2009-2013

SERVICE TO THE UNIVERSITY OF DENVER

Center for Teaching and Learning Faculty Advisory Board, 2007-2008; 2010-2012
Center for Community Engagement and Service Learning Advisory Board, 2007-2012
Faculty Senate
Executive Committee, 2008-2013
Nominations, Rules & Credentials Committee, Chair, 2008-2013; Member 2007-2013
Appointment, Promotion, and Tenure Revision Committee, 2010-2012
Grievance Policy Committee Member, 2007-2010
Law Library Director Search Committee Chair, 2012-2013
PROF Grant Review, College Representative to the University Review Team, 2006, 2008
Project Homeless Connect Evaluations, Principal Investigator, 2006-2009
University Technology Council, 2007-2009
University of Denver Hyde Interviews for Incoming Freshmen, 2003-2012

SERVICE TO THE MORGRIDGE COLLEGE OF EDUCATION

Appointment, Tenure & Review Committee
Member, voting, 2003-2005; 2007- 2009
Chair, Clinical Faculty Promotion & Tenure Policy Subcommittee, 2008-2009
Member, Community Engagement Subcommittee, 2007-2009
Member, Tenure Review Panel, 2003
Advancement and Alumni Relations Committee, Chair, 2003-2007; Member, 2002-2007
College Building Committee Member, 2004-2010

College of Education Student Association, Faculty Advisor, 2004-2007; 2009-2010
Faculty Senator, 2007-2013
Research and Scholarship Committee, Chair, 2008-2009; Member, 2002-2003, 2008-2009
Research and Grant Mentoring Committee, Chair, 2009-2010
Research Task Force Member, 2010-2012
Search Committee Member, Assistant Professor for Curriculum & Instruction, 2010-2011
Workload Task Force Member, 2010-2011

SERVICE TO THE LIBRARY & INFORMATION SCIENCE PROGRAM

Library and Information Science Student and Alumni Association, Faculty Advisor, 2002-2008
ALA Student Chapter, Faculty Advisor, 2005-2008
Beta Phi Mu Phi Chapter, Faculty Advisor, 2004-2014
Steering Committee Member, Accreditation by the American Library Association, 2001-2004
Search Committee Member, Associate Professor for LIS, 2006
Search Committee Chair, Assistant Professors for LIS, 2003, 2005, 2006, 2007
Search Committee Ex-Officio Member, Director for LIS, 2004

SERVICE TO SAM HOUSTON STATE UNIVERSITY

Rio Roundup: South Texas Literature Conference, Conference Coordinator, 1993
External Relations, Fund Raising, Grants Committee, Chair, 1993-1995
Advisory Council Committee, Chair, 1993-1995
Students, Admissions, and Advisement Committee, Chair, 1994
Institutional Effectiveness Committee, Member, 1993-1995

SERVICE TO THE COLLEGE OF EDUCATION AND APPLIED SCIENCE

Faculty Affairs Committee, Member, 1993-1995
Curriculum Committee, Member, 1993-1995
Continuing Education Committee, Member, 1993-1995

SERVICE TO THE COMMUNITY

French Teacher & Student Exchange with Laon, France, Monarch High School, Boulder Valley School District (Boulder, Colorado), 2017-
Denver/Boulder Games 2022, Board of Directors, Secretary-Treasurer, 2015-2018
United Way Campaign Committee, College of Education, 2006
Arapahoe County, Election Judge for the County Clerk and Recorder, 2000-2005
Arthritis Foundation, Rocky Mountain Chapter, Certified Educator & Trainer, 1999-2008
Bonfils Blood Center, Silver Level Donor, 2000-2016
Denver Museum of Natural History, Docent, 1992
Tech Prep of the Lower Rio Grande Valley, Inc. (Harlingen, Texas) Board of Directors, 1995-1997
Executive Committee, 1996-1997; Chair, Development Committee, 1995-1997; Chair, Fiscal Agency Committee, 1995-1996; Chair, Colleges and Universities Committee, 1996-1997
Gilpin County (Colorado) Public Library Board of Trustees, 1986-1989; Vice President, 1987-1989
City of Central (Colorado) Economic Development Committee, 1987-1989
Columbine Family Health Centers, Inc. (Nederland and Black Hawk, Colorado) Board of Directors, 1988-1989

CERTIFICATION

Permanent Public Librarian Certificate - Pennsylvania, New York, Texas
Westlaw Expert Witness, 2008-
Certified Grant Writer®, 2016-

AWARDS AND HONORS

Advanced Practitioner for Service Learning and Community Engagement, University of Denver, 2011

Platinum Star Alumnae, College of Information, Library Science & Technologies, University of North Texas, 2009
 Commendation for Integration of Technologies in Teaching & Learning Environment, University of Denver, 2006
 Outstanding Adjunct Faculty Member Award, College of Education, University of Denver, 2002
 Beta Phi Mu, Pi, University of Pittsburgh, 1985
 Alpha Lambda Sigma, University of North Texas, 1972
Albert Nelson Marquis Lifetime Achievement Award, Who's Who in America
Who's Who in American Women
Who's Who of Women Executives
Dictionary of International Biography
Who's Who in the East
Who's Who in the South and Southwest
Who's Who in the World
Who's Who of Online Professionals
Who's Who in Library and Information Science
2,000 Notable Women
Who's Who of Emerging Leaders
Who's Who in Professional and Executive Women
Who's Who in American Education
International Who's Who of Professional and Business Women
International Leaders in Achievement
International Educator of the Year
Who's Who in Finance and Industry
Who's Who in Finance and Business

Invited International and National Conference Presentations

Driscoll, Margaret, Christy Confetti Higgins, Scott Brown, and Sylvia D. Hall-Ellis. *A View from Within: Open House Tour of Three Canvas Core Courses*. Presentation to be delivered at the School of Information, San José State University Professional Development Seminar, San José, California, October 17, 2019.

Hall-Ellis, Sylvia D. *Invest in Me -- I'm Your Future: Succession Planning for Libraries*. Keynote presentation delivered at the ALCTS President's Symposium, Boston, Mass., January 8, 2016.

Seidel, Kent E. and Sylvia D. Hall-Ellis. *Making Grants Work for You: Strategies for Doctoral Students and Early Career Scholars*. Presentation delivered at the University Council for Educational Administration, Early Career Scholars Session, Indianapolis, Ind., November 9, 2013.

Hall-Ellis, Sylvia D. *So You Want to be a Manager; Leadership Skills and Competencies for Technical Services Managers and Administrators*. Presentation delivered at the 138th Annual Conference, American Library Association, Chicago, Ill., June 29, 2013.

Seidel, Kent E., Karen S. Riley, Lyndsay Agans, Susan Korach, and Sylvia D. Hall-Ellis. *Making Grants Work for You (Instead of Just Working for Grants)*. A panel discussion delivered at the University Council for Educational Administration, Early Career Scholars Session, Denver, Colo., November 17, 2012.

Hall-Ellis, Sylvia D. *After the Great TS Reorganization: The Westminster Law Library*. Presentation delivered at the 137th Annual Conference, American Library Association, Anaheim, Calif., June 23, 2012.

Hall-Ellis, Sylvia D. *Conversations with Catalogers in the 21st Century*. A panel discussion sponsored by the ALCTS Competencies for a Career in Cataloging Interest Group, delivered at the 137th Annual Conference, American Library Association, Anaheim, Calif., June 22, 2012.

- Hall-Ellis, Sylvia D., moderator. *Mid-Career Leaders Program*. A panel discussion sponsored by the ALA Committee on Diversity delivered at the 136th Annual Conference, American Library Association, New Orleans, La., June 26, 2011.
- Hall-Ellis, Sylvia D., moderator. *Diversity Town Hall*. A community conversation sponsored by the ALA Committee on Diversity delivered at the 136th Annual Conference, American Library Association, New Orleans, La., June 24, 2011.
- LaBarre, Kathryn, Sylvia D. Hall-Ellis, Karen Anderson, Rick Hasenyager, Christopher Cronin, and Penny Baker. *Briefings from RDA Test Participants*. A panel discussion delivered at the Midwinter Conference, American Library Association, San Diego, Calif., January 7, 2011.
- Miksa, Shawne, Marjorie Bloss, and Sylvia D. Hall-Ellis. *Educating the Next Generation of Catalogers: Teaching RDA*. A panel discussion delivered at the 97th Annual Conference, Association for Library and Information Science Education, San Diego, Calif., January 7, 2011.
- Hall-Ellis, Sylvia D., Robert Maxwell, John Hostage, and George Prager. *RDA Panel: What Cataloging Managers Need to Know*. Presentation delivered at the 103rd Annual Conference, American Association of Law Librarians, Denver, Colo., July 12, 2010.
- Hall-Ellis, Sylvia D. and Stacey L. Bowers. *Catalogers in the RDA Environment: Skill Sets, Expectations and Challenges*. Presentation delivered at the 103rd Annual Conference, American Association of Law Librarians, Denver, Colo., July 11, 2010.
- Hall-Ellis, Sylvia D. *Comfortable in Your Cataloging and Metadata Specialist Skin? Or, So You Want to Hire a Cataloger*. Presentation delivered to the ALCTS Research Group at the 134th Annual Conference, American Library Association, Chicago, Ill., July 11, 2009.
- Perez, Megan, Sylvia D. Hall-Ellis, and Denise Anthony. *From Novice to Expert: Collaboration for Succession Planning*. A “hot topic” presentation delivered at the 14th ACRL Conference, Seattle, Wash., March 13, 2009.
- Hall-Ellis, Sylvia D. *Cataloging in the RDA Environment: Skill Sets, Expectations and Challenges*. Presentation delivered to the ALCTS Research and Publications Committee at the Midwinter Conference, American Library Association, Denver, Colo., January 24, 2009.
- Hall-Ellis, Sylvia D. *LIS Cataloging Education for the 21st Century: Expectations and Challenges*. A panel discussion held at the 95th Annual Conference, Association for Library and Information Science Education, Denver, Colo., January 23, 2009.
- Chu, Clara, Sylvia D. Hall-Ellis, and Mark Winston. *The Doctoral Degree & Building a Career*. A panel discussion delivered at the ALA Office of Diversity Spectrum Doctoral Fellows E.J. Josey Leadership Institute, Midwinter Conference, American Library Association, Denver, Colo., January 20, 2009.
- Hall-Ellis, Sylvia D. and Robert O. Ellett, Jr. *Fundamentals of Cataloging Course: An Overview of the ALCTS Online Course*. Presentation delivered to the ALCTS Big Heads Group, 133rd Annual Conference, American Library Association, Anaheim, Calif., June 30, 2008.
- Hall-Ellis, Sylvia D. *Employers’ Expectations for Technical Services Librarians: What We Don’t Know*. Presentation delivered to the ALCTS Research and Publications Committee Program, 133rd Annual Conference, American Library Association, Anaheim, Calif., June 28, 2008.

Hall-Ellis, Sylvia D., Virginia R. Maloney, and Mary Stansbury. *Institutional Responses to Engaged Scholarship: The Carnegie Foundation Engaged University Classification at Two Universities*. Presentation delivered to the 94th Annual Conference, Association for Library and Information Science Education, Philadelphia, Pa., January 11, 2008.

Hall-Ellis, Sylvia D. *Puzzles, Problems, and Predicaments*. Presentation delivered to the ALCTS Research Discussion Group, 132nd Annual Conference, American Library Association, Washington, D.C., June 23, 2007.

Hall-Ellis, Sylvia D. *Cataloging Education: A New Emphasis for the Library and Information Science Curriculum*. Presentation delivered to the ALCTS Pre-conference, 132nd Annual Conference, American Library Association, Washington, D.C., June 22, 2007. <http://www.loc.gov/catdir/cpsocareercat.html>

Ellett, Jr., Robert O. and Sylvia D. Hall-Ellis. *Copy Cataloging Done Smarter*. Presentation delivered to the International Conference on Interdisciplinary Information Sciences and Technologies (InSciT2006), October 25-28, 2006.

Hall-Ellis, Sylvia D. and Robert O. Ellett, Jr. *Cooperative Cataloging: Challenges and Opportunities for Defense Libraries*. Presentation delivered to the 1st Annual Conference of Defense Libraries, Spanish Ministry of Defense, Madrid, Spain, July 7, 2006.

Hall-Ellis, Sylvia D. *Cataloger Competencies: Do the Employers Require What the Professors Teach?* Presentation delivered to the ALCTS CCS Heads of Cataloging Discussion Group, 131st Annual Conference, American Library Association, New Orleans, La., June 26, 2006.

Grealy, Deborah S. and Sylvia D. Hall-Ellis. *From Research to Practice: The Scholarship of Teaching and Learning in LIS Education*. Presentation delivered to the at the 92nd Annual Conference, Association for Library and Information Science Education, San Antonio, Tex., January 18, 2006.

Hall-Ellis, Sylvia D. *Employers' Expectations for Entry-Level Catalogers: What Position Announcement Data Indicate*. Research paper delivered to the Technical Services Special Interests Group, 91st Annual Conference, Association for Library and Information Science Education, Boston, Mass., January 12, 2005. <http://dlist.sir.arizona.edu/>

Hall-Ellis, Sylvia D. *Common Errors in MARC Records Prepared by LIS Students: What Does It Mean?* Research paper delivered to the ALCTS CCS Cataloging Norms Discussion Group, Mid-Winter Conference, 90th American Library Association, San Diego, Calif., January 10, 2004.

Hall-Ellis, Sylvia D. *Visual Arts as Foundation for Successful Library Automation: The Rocky Mountain College of Art & Design Experience*. Paper delivered at the 6th Annual Conference of Higher Education, Charleston, S. C., 1993.

Hall, Sylvia D. *Design Elements for Bibliographic Databases: An Overview*. Paper delivered at the 14th Online National Conference, New York, 1983.

Invited Regional Conference Presentations

Hall-Ellis, Sylvia D., Hudson, Christopher D., Brittany Cronin, and Kathryn Michaels. "The Colorado Law Project: Meeting the Public's Need for Legal Information." Panel discussion delivered at the Mountain Plains Library Association Conference, Billings, Mont., April 9, 2011.

Grealy, Deborah S. and Sylvia D. Hall-Ellis. *Education for Information Professionals in New Mexico: Library & Information Science Graduate Education at the University of Denver*. Presentation delivered at the New Mexico Library Education Summit, Las Vegas, N.M., September 26, 2005.

Hall-Ellis, Sylvia D. *Public Library-School Library Partnerships*. Presentation delivered at the 3rd Annual Colorado Association of Libraries Conference with the Mountain Plains Library Association, Denver, Colo., October 22, 2004.

Hall-Ellis, Sylvia D. *Learn All You Can – Educational Partnership Opportunities for the Lewis and Clark Bicentennial Commemoration*. Paper delivered at the 3rd Annual Lewis and Clark Bicentennial Council National Planning Conference, Bismarck, N.D., April 26, 1998.

Invited State Conference Presentations

Grealy, Deborah S. and Sylvia D. Hall-Ellis. *Academic Library Leadership Changes: Using Succession Planning and Mentoring*. Presentation delivered at the Minnesota Library Education Conference, St. Cloud, Minn., October 10, 2013.

Hall-Ellis, Sylvia D., Merrie Valliant, and Melissa Powell. *RDA: What Is It and What Do You Need To Do With It At Your Library?* Presentation delivered at the Colorado Library Consortium Spring Conference, Ft. Morgan, Colo., April 26, 2013.

Hall-Ellis, Sylvia D. *Service Learning and the Library & Information Science Graduate Education at the University of Denver*. Presentation delivered at the 4th LEADS Scholars Orientation, Denver, Colo., August 5, 2009.

Hall-Ellis, Sylvia D. *Service Learning: Enhancement to Library & Information Science Graduate Education at the University of Denver*. Presentation delivered at the 3rd LEADS Scholars Orientation, Denver, Colo., June 2008.

Hall-Ellis, Sylvia D. *Law Librarianship: A Community Conversation*. Sponsored by the Colorado Association of Law Libraries. Paper delivered at the Colorado Supreme Court Library, Denver, Colo., May 14, 2008.

Hall-Ellis, Sylvia D. *Opportunities and Challenges in Law Librarianship: A Community Conversation*. Presentation delivered at the Sturm College of Law, Denver, Colo., November 7, 2007.

Ellis, Sylvia D. *Grant Writing Resources for Nursing Professionals*. Presentation delivered at the Presbyterian / St. Luke's Health One Medical Center 1st Annual Research Symposium, Denver, Colo., October 17, 2007.

Hall-Ellis, Sylvia D. *Project Homeless Connect 4 Event Evaluation – Insights and Lessons Learned*. Presentation delivered at the Homelessness Research Symposium: What is DU Doing about Homelessness in Denver, Denver, Colo., September 14, 2007.

Hall-Ellis, Sylvia D. *Service Learning and the Library & Information Science Graduate Education at the University of Denver*. Presentation delivered at the 2nd LEADS Scholars Orientation, Denver, Colo., August 10, 2007.

Hall-Ellis, Sylvia D. *Education for Information Professionals in a Digital Environment: Library & Information Science Graduate Education at the University of Denver*. Presentation delivered at the 15th Spring Mountains and Plains Paraprofessionals Conference, Denver, Colo., February 24, 2007.

Hall-Ellis, Sylvia D. *Public Library Service to Spanish-Speaking and Latino Residents in Denver: A Case Study*. Presentation delivered at the 4th Annual Colorado Association of Libraries Conference, Denver, Colo., November 10, 2005.

- Hall-Ellis, Sylvia D. *Education for Information Professionals in a Digital Environment: Library & Information Science Graduate Education at the University of Denver*. Presentation delivered at the 14th Annual Mountains and Plains Parapros Conference, Aurora, Colo., July 29, 2005.
- Hall-Ellis, Sylvia D. *Educational Opportunities: Library & Information Science Graduate Education at the University of Denver*. Presentation delivered at the 13th Annual Mountains and Plains Parapros Conference, Centennial, Colo., August 6, 2004.
- Hall-Ellis, Sylvia D. *Library Education & Training: Focus on the West: An LIS Faculty Member's Personal Response*. Presentation delivered at the 1st Annual Colorado Association of Libraries Conference, Keystone, Colo., October 18, 2002.
- Hall-Ellis, Sylvia D. *Grant Writing for School Librarians*. Presentation delivered at the 2002 Annual Colorado Education Media Association Conference, Colorado Springs, Colo., February 15, 2002.
- Hall-Ellis, Sylvia D. *Grants – Opportunities for the Future*. Paper delivered at the Southeast Regional Accountability Annual Conference, Lamar, Colo., November 12, 1998.
- Hall-Ellis, Sylvia D. *The Texas Library Connection and Interlibrary Loan: An Experiment in Resource Sharing*. Paper delivered at the Texas Computer Educators' Association Annual Conference, Austin, Tex., February 6, 1997.
- Hall-Ellis, Sylvia D. *Finding Grant Sources on the Internet: A Guide for Librarians*. Paper delivered at the 2nd Annual Institute for School Library Personnel, Pharr-San Juan-Alamo North High School, Pharr, Tex., July 29, 1996.
- Hall-Ellis, Sylvia D. *Mathematical and Logical Thinking: A Critical Intelligence*. Paper delivered at the 3rd Annual Paraprofessional Conference at the University of Texas - Pan American, Edinburg, Tex., March 8, 1996.
- Hall-Ellis, Sylvia D. *Cataloging Trends and Issues: Update Session*. Paper delivered at the 1st Annual Institute for School Library Personnel, South Texas Community College, McAllen, Tex., July 19, 1995.
- Hall-Ellis, Sylvia D. *Grant Writing: Tips and Encouragement for School Librarians*. Paper delivered at the 1st Annual Institute for School Library Personnel, South Texas Community College, McAllen, Tex., July 18 and 19, 1995.
- Hall-Ellis, Sylvia D. *How to Become an Expert Grant Writer*. Paper delivered at the 3rd Annual High School Principals' Academy, South Padre Island, Port Isabel, Tex., June 19, 1995.
- Texas Library Study: Results from Regions I and II*. Paper delivered at the 3rd Annual Technology Conference, Texas A&M University, College Station, Tex., November 18, 1994.
- Hall-Ellis, Sylvia D. *Academic Achievement and Middle School Students*. Paper delivered at the 8th Annual Young Adult Conference, Sam Houston State University, Huntsville, Tex., November 5, 1994.
- Hall-Ellis, Sylvia D. *Multimedia Resources for Library Leaders*. Paper delivered at the Institute for Librarians in A Multicultural Environment, Sam Houston State University, Huntsville, Tex., June 10, 1994.
- Hall-Ellis, Sylvia D. *Finding the Resource: Empowering the User, or, the Case for Curriculum Based Subject Access to Learning Resource Center Collections*. Paper delivered at the 81st Annual Texas Library Association Conference, Corpus Christi, Tex., April 12-16, 1994.
- Hall-Ellis, Sylvia D. and William H. Pichette. *Sam Houston State University Makes Use of OCLC/AMIGOS Collection Analysis CD*. Paper delivered at the 81st Annual Texas Library Association Conference, Corpus Christi, Tex., April 12-16, 1994.

Hall, Sylvia D. *Funding and Library Development in Pennsylvania: A Symbiotic Relationship*. Paper delivered at the Annual Graduate Student Colloquia, University of Pittsburgh, School of Library and Information Science, 1982.

Hall, Sylvia D. *Leadership for Public Library Trustees*. Paper delivered for the Trustees Division, Pennsylvania Library Association Annual Conference, Lancaster, Penn., 1981.

Seminar and Professional Development Presentations

Taylor, Meredith, and Sylvia D. Hall-Ellis. *Talent Management and Succession Planning*. ALCTS eForum, held March 22, 2017.

Hirsh, Sandra, Heather O'Brien, Michelle Holschuh Simmons, Michael Krasulski, and Sylvia D. Hall-Ellis. *Information Services Today: An Introduction. Part 3: Information Services: Roles in the Digital Age*. Rowan and Littlefield in partnership with Library Journal webinar, recorded February 5, 2015.

Hall-Ellis, Sylvia D. and Jennifer Sweda. *Copy Cataloging in an RDA Environment*. ALCTS eForum, held May 14 and 15, 2013.

Hall-Ellis, Sylvia D. *Law Librarianship: A Community Conversation*. Sponsored by the Colorado Association of Law Libraries, presented at the Colorado Supreme Court Library, Denver, Colo., May 14, 2008.

Hall-Ellis, Sylvia D. and Beatrice Z. Gerrish. *Reading and Libraries: Recent Research in Reading*. Presentation at the Ricks Center for Gifted Education, Denver, Colo., March 4, 2008.

Hall-Ellis, Sylvia D. *Cataloger Competencies: Do the Employers Require What the Professors Teach?* Presentation for the School of Library and Information Science, San José State University, February 12, 2008.

Hall-Ellis, Sylvia D. and Robert O. Ellett, Jr. *Cooperative Cataloging: Rules, Tools, and Conventions for Building a Multi-institutional Catalog*. Sponsored for the Spanish Ministry of Defense, Madrid, Spain, July 10, 2006.

Hall-Ellis, Sylvia D. *Cash for Kids: Grant Writing Opportunities for Youth Services Librarians*. Sponsored by the Colorado Young Adult Librarians; presented at Bemis Memorial Library, Littleton, Colo., November 13, 2002.

Hall-Ellis, Sylvia D. *MARC Records and Authority Control: Planning for Bibliographic Database Migration*. Sponsored and held at the Douglas County Public Library, Castle Rock, Colo., May 28, 2002.

Grant Writing: A Refresher for Librarians. Sponsored by Library and Information Science Program, College of Education, University of Denver; presented at University Center at Chaparral, August 12, 2000.

Hall-Ellis, Sylvia D. *Shaking the Money Tree – Basic Grant Writing for Colorado Educators*. Sponsored by the Office of Educational Telecommunications of the Colorado Department of Education.

Pikes Peak Community College, Colorado Springs, Colo., November 16, 1998.

Pueblo School District 60, Pueblo, Colo., November 12, 1998.

University of Northern Colorado, Greeley, Colo., November 10, 1998.

United Technology Educational Partnership, Grand Junction, Colo., November 9, 1998.

Hall-Ellis, Sylvia D. *Cataloging Multimedia, Kits, Globes and Map Materials in USMARC*. Sponsored and hosted by Region One Education Service Center, Edinburg, Tex., April 24, 1997 and December 12, 1996.

Hall-Ellis, Sylvia D. *New Standards for School Library Media Centers*. Sponsored and hosted by Region One Education Service Center, Edinburg, Tex., April 15, 1997.

- Hall-Ellis, Sylvia D. *The School Library Media Specialist in the 21st Century: Visions for the Future*. Sponsored and hosted by Pharr-San Juan-Alamo Independent School District, Pharr, Tex., April 4, 1997.
- Hall-Ellis, Sylvia D. *Cataloging Sound Recordings and Audio Materials in USMARC*. Sponsored and hosted by Region One Education Service Center, Edinburg, Tex., March 20, 1997 and November 21, 1996.
- Hall-Ellis, Sylvia D. *Evaluating and Selecting CD-ROMS for School Library Media Collections*. Sponsored and hosted by Region One Education Service Center, Edinburg, Tex., March 18, 1997.
- Hall-Ellis, Sylvia D. *Cataloging Audiovisual Materials in USMARC*. Sponsored and hosted by Region One Education Service Center, Edinburg, Tex., February 27, 1997, November 7, 1996 and October 24, 1996.
- Hall-Ellis, Sylvia D. *Introduction to Dialog: Basic Searching Strategies*. Sponsored and hosted by Region One Education Service Center, Edinburg, Tex., February 14, 1997.
- Hall-Ellis, Sylvia D. *Cataloging Books in USMARC*. Sponsored and hosted by Region One Education Service Center, Edinburg, Tex., January 30, 1997, October 10, 1996, September 26, 1996 and August 8, 1996.
- Hall-Ellis, Sylvia D. *Advanced Internet Searching Techniques for Librarians*. Sponsored and hosted by Region One Education Service Center, Edinburg, Tex., January 21, 1997.
- Hall-Ellis, Sylvia D. *Texas Library Connection Full-Text Searching*. Sponsored and hosted by Region One Education Service Center, Edinburg, Tex., December 13, 1996 and October 25, 1996.
- Hall-Ellis, Sylvia D. *Developing Evaluation Strategies for Grants and Proposals*. Sponsored and hosted by Region One Education Service Center, Edinburg, Tex., December 10, 1996.
- Hall-Ellis, Sylvia D. *Developing Needs Assessment for Grants and Proposals*. Sponsored and hosted by Region One Education Service Center, Edinburg, Tex., November 12, 1996.
- Hall-Ellis, Sylvia D. *Texas Library Connection Union Catalog Searching*. Sponsored and hosted by Region One Education Service Center, Edinburg, Tex., November 8, 1996 and September 6, 1996.
- Hall-Ellis, Sylvia D. *Grant Resources on the Internet*. Sponsored and hosted by Region One Education Service Center, Edinburg, Tex., October 23, 1996.
- Hall-Ellis, Sylvia D. *Preparing a Response to the Telecommunications Infrastructure Fund Board: Needs Assessment, Professional Development Framework, and Evaluation Strategies*. Sponsored and hosted by Region One Education Service Center, Edinburg, Tex., October 16, 1996.
- Hall-Ellis, Sylvia D. *Texas Library Connection: Building the Districtwide Bibliographic Database*. Sponsored and hosted by Mercedes Independent School District, Mercedes, Tex., September 13, 1996 and August 8, 1996. Sponsored and hosted by Los Fresnos Consolidated Independent School District, Los Fresnos, Tex., August 12, 1996.
- Hall-Ellis, Sylvia D. *School-to-Work and Special Education: An Inclusive Partnership for Success*. Sponsored and hosted by the Office of Special Education, Region One Education Service Center, Edinburg, Tex., September 11, 1996.
- Hall-Ellis, Sylvia D. *Telecommunications Infrastructure Fund Board: An Overview of Funding for Secondary Schools*. Sponsored and hosted by Region One Education Service Center, Edinburg, Tex., August 31, 1996.
- Hall-Ellis, Sylvia D. *Cataloging Books, Multimedia, and Realia in USMARC*. Sponsored and hosted by Edinburg Consolidated Independent School District, Edinburg, Tex., August 6, 1996.

Hall-Ellis, Sylvia D. *Internet Resources for Grant Writers*. Sponsored and hosted by Region One Education Service Center, Edinburg, Tex., April 20, 1996.

Hall-Ellis, Sylvia D. *Enhanced Grant Writing Skills for Mathematics Educators: Writing Skills for Campus Teams*. Sponsored and hosted by the Office of General Education, Region One Education Service Center, Edinburg, Tex., March 22, 1996.

Hall-Ellis, Sylvia D. *Internet Resources for Grant Writers*. Sponsored and hosted by the College of Education and Applied Science, Sam Houston State University, Huntsville, Tex., March 9, 1996.

Hall-Ellis, Sylvia D. *Grant Writing for Mathematics Educators: A Development Process for Campus Teams*. Sponsored and hosted by the Office of General Education, Region One Education Service Center, Edinburg, Tex., March 4, 1996.

Hall-Ellis, Sylvia D. *Shaking the Money Tree: Preparing Successful Technology Grant Applications*. Sponsored and hosted by the Office of Technology and Media Services, Region One Education Service Center, Edinburg, Tex., February 29, 1996 and April 29, 1996.

Hall-Ellis, Sylvia D. *District-wide Technology Planning: Technical Assistance for the Texas Education Agency Initiative*. Sponsored and hosted by the Office of Technology and Media, Region One Education Service Center, Edinburg, Tex., February 2, 1996.

Hall-Ellis, Sylvia D. *Enhanced Grant Writing Skills*. Sponsored and hosted by Pharr-San Juan-Alamo Independent School District, Pharr, Tex., January 27, 1996.

Hall-Ellis, Sylvia D. *United States Copyright Act of 1976, Video Transmissions, Computer Software and the Internet*. Sponsored and hosted by the Office of Technology and Media, Region One Education Service Center, Edinburg, Tex., January 24, 1996.

Hall-Ellis, Sylvia D. *The Grant Writing Development Process*. Sponsored and hosted by Pharr-San Juan-Alamo Independent School District, Pharr, Tex., January 20, 1996.

Hall-Ellis, Sylvia D. *MARC Cataloging of Materials for Library Media Centers*. Sponsored and hosted by the Office of Media Services, Region One Education Service Center for the Donna Independent School District, Donna, Tex., August 17, 1995.

Hall-Ellis, Sylvia D. *Classification*. Sponsored by AJ Seminars, Rockville, Maryland; presented at University Hilton Hotel, Houston, Tex., May 10, 1995.

Hall-Ellis, Sylvia D. *Library Technical Services*. Sponsored by AJ Seminars, Rockville, Maryland; presented at University Hilton Hotel, Houston, Tex., April 26, 1995.

Hall-Ellis, Sylvia D. *Grant Writing: An Introduction for Public School Administrators*. Sponsored and hosted by the Office of Administrative Services, Region One Education Service Center, Edinburg, Tex., April 19, 1995.

Hall-Ellis, Sylvia D. *The School Library Media Specialist in the 21st Century: Visions for the Future*. Sponsored and hosted by the United Independent School District, Laredo, Tex., March 31, 1995.

Hall-Ellis, Sylvia D. *Using USMARC*. Sponsored by AJ Seminars, Rockville, Maryland; presented at University Hilton Hotel, Houston, Tex., March 29, 1995.

Hall-Ellis, Sylvia D. *Library Media Center Policies and Guidelines: How to Prepare for School Board Adoption*. Sponsored and hosted by the Office of Technology and Media Services, La Joya Independent School District, La Joya, Tex., March 10, 1995.

Hall-Ellis, Sylvia D. *Developing District-wide Policies and Guidelines for Library Media Centers*. Sponsored and hosted by the Office of Technology and Media Services, La Joya Independent School District, La Joya, Tex., January 10, 1995.

Hall-Ellis, Sylvia D. *MARC Cataloging of Audiovisual Materials for Library Media Centers*. Sponsored and hosted by the Office of Library Media and Technology Services, Cypress-Fairbanks Independent School District, Houston, Tex., December 1, 1994.

Hall-Ellis, Sylvia D. *The School Library Media Specialist in the 21st Century: Visions for the Future*. Sponsored and hosted by United Independent School District, Laredo, Tex., October 14, 1994.

Hall-Ellis, Sylvia D. *The School Library Media Specialist in the 21st Century: Visions for the Future*. Sponsored and hosted by the Laredo Independent School District, Laredo, Tex., October 7, 1994.

Hall-Ellis, Sylvia D. *MARC Cataloging for Library Media Centers*. Sponsored by the Office of Library Media and Technology Services, Cypress-Fairbanks Independent School District, Houston, Tex., October 5, 1994.

Hall-Ellis, Sylvia D. *Jump to the Head of the Class: Undergraduate Library Resources Available at Sam Houston State University*. Sponsored by the Office of the Associate Vice President for Student Services, Sam Houston State University, Huntsville, Tex., October 4, 1994.

Hall-Ellis, Sylvia D. *CD-ROMs - 1994's Newest and the Best for Secondary Level Media Centers*. Sponsored and hosted by Clear Lake Independent School District, Houston, Tex., June 3, 1994.

Hall-Ellis, Sylvia D. *Introduction to Classification*. Sponsored by AJ Seminars, Rockville, Maryland; presented at Holiday Inn, Market Center, Dallas, Tex., May 18, 1994.

Hall-Ellis, Sylvia D. *Basic Descriptive Cataloging*. Sponsored by AJ Seminars, Rockville, Maryland; presented at University Hilton Hotel, Houston, Tex., May 4, 1994.

Hall-Ellis, Sylvia D. *Shaking the Money Tree - Part II: Writing Successful Grant Applications*. Sponsored by Donna Independent School District, Donna, Texas, and Region One Education Service Center Edinburg, Texas; presented at South Texas Community College Library, McAllen, Tex., April 29, 1994.

Hall-Ellis, Sylvia D. *Using MARC*. Sponsored by AJ Seminars, Rockville, Maryland; presented at Holiday Inn, Market Center, Dallas, Tex., April 6, 1994.

Hall-Ellis, Sylvia D. *Automated Authority Control*. Sponsored by AJ Seminars, Rockville, Maryland; presented at University Hilton Hotel, Houston, Tex., March 23, 1994.

Hall-Ellis, Sylvia D. *Automating the District School Library Media Centers: Choices and Opportunities*. Sponsored and hosted by the Office of Technology and Library Media Services, Fort Bend Independent School District, Sugar Land, Tex., March 4, 1994.

Hall-Ellis, Sylvia D. *Shaking the Money Tree - Part I: Preparing Successful Grant Applications*. Sponsored and hosted by the Office of Library Media Services, Donna Independent School District, Donna, Tex., February 4, 1994.

GRADUATE COURSES TAUGHT

San José State University, School of Library and Information Science

INFO 249 – Advanced Cataloging and Classification (Fall 2015, 2016; Summer 2016)
INFO 287 – Special Topics in Cataloging and Classification (Spring 2017, 2018, 2019, 2020, 2021, 2022, 2023; Fall 2020, 2021, 2022)
LIBR 248 – Beginning Cataloging and Classification (Summer 2002, 2003, 2004, 2005, 2006)
LIBR 249 – Advanced Cataloging and Classification (Summer 2003; Fall 2014; Summer 2015)

University of Denver, University College

Grant Writing Certificate Seminar for Non-Profit Organizations (Fall 2020, 2021; Spring 2021)

University of Denver, Morgridge College of Education HED

5991 – Grant Writing in Higher Education (Spring 2011)
LIS 4010 – Organization of Information (Fall 2002-2009; Winter 2005; Spring 2004-2006)
LIS 4020 – Professional Principles and Ethics (Summer 2000)
LIS 4040 – Management of Libraries and Information Centers (Fall 2010; Spring 2003, 2009 (DS); Winter 2005)
LIS 4070 – Cataloging and Classification (Winter 2008, 2009, 2010, 2011, 2012; Fall 2009 (DS)) LIS
4321 – Collection Management (Spring 2005)
LIS 4326 – LIS Research (Winter 2009 (DS); Spring 2009 (DS))
LIS 4350 – Adult Materials and Services (Summer 2006, 2009)
LIS 4379 – Social Sciences Resources (Spring 2009)
LIS 4400 – Cataloging and Classification (Spring 2000, 2001; Winter 2002-2009; Summer 2005, 2006 – course renumbered LIS 4070, September 2007)
LIS 4401 – Descriptive Cataloging (Winter 2001; Spring 2002, 2003, 2006-2009; Summer 2005)
LIS 4402 – Subject Cataloging (Spring 2001, 2009; Summer 2005, 2006, 2007, 2008)
LIS 4403 – Classification Schemes (Fall 2007, 2008, 2009 (DS)) LIS
LIS 4405 – Authority Control (Winter 2009)
LIS 4510 – Materials and Services for Children (Winter 2004; Summer 2005)
LIS 4620 – Grant Writing and Fundraising (Summer 2000, 2002, 2004, 2010; Winter 2006; Fall 2006-2009)
LIS 4700 – Seminar in Technical Services (Fall 2001)
LIS 4700 – Seminar in Public Libraries (Summer 2002)
LIS 4804 – Management of Electronic Records (Spring 2004; Fall 2005)
LIS 4902 – Capstone Projects (Winter 2003, Spring 2008, 2009, 2011)
LIS 4910 – Independent Study (every quarter Winter 2000 through Spring 2011)
LIS 4920 – Service Learning (every quarter Summer 2004 through Spring 2011)
RMS 4954 – Grant Writing (Summer 2013, 2014)
RMS 4959 – Content Analysis Methodology (Spring 2015)
QRM 4978 – Grant Writing (Summer 2011, 2012)

Rutgers University, School of Communication and Information

SC&I 522 – Cataloging and Classification (Summer 2013)

University of Arizona, College of Behavioral and Social Sciences

LIS 602 – Cataloging and Classification (Summer 1995)
LIS 612 – Advanced Online Search and Retrieval (Summer 1995)

Sam Houston State University, College of Education & Applied Science

LIS 532 - Cataloging and Classification (Fall 1993, 1994, 1995)
LIS 563 - Advanced Cataloging and Classification (Summer 1994)
LIS 567 - Research Methods (Spring 1994, Spring 1995)
LIS 591 - Educational Technology (Spring 1994, 1995)
LIS 596 - Networking and Computer Technologies in Education (Fall 1993, Summer 1994, Fall 1995)

Dissertations at the University of Denver

- Bowers, Stacey L. *Library Anxiety of Law School Students: A Study Utilizing the Multidimensional Library Anxiety Scale*. Chair, May 5, 2010.
- Fattor, Melissa M. *Student Engagement Differences by Ethnicity and Scale for Ninth Grade Students*. Chair, November 1, 2010.
- Fulton, Roseanne. *A Case Study of Culturally Responsive Teaching in Middle School Mathematics*. Kent Seidel, Chair, June 18, 2009, Outside Chair.
- Greal, Deborah S. *Tribes and Territories in Library and Information Studies Education*. Bruce Uhrmacher, Chair, June 10, 2008, Committee Member.
- McCord, J. Michael. *Developing a Standard of Care for Educational Malpractice*. Chair, April 15, 2011.
- Priebe, Sarah J. *Distinguishing Effects of Domain and General Knowledge on Passage Fluency and Comprehension*. Jan Keenan, Chair. July 21, 2011, Outside Chair.
- Snyder-Mondragon, Sandra M. *Institutional Factors that Impact the Retention of Graduate Students of Color in Schools of Library and Information Science: A Metaregression of Accredited Library School Statistics on Student Retention and Graduation Rates*. Kathy Green, Chair, July 24, 2009, Committee Member.
- Taylor, Karen Pickles. *Effective Teaching*. Elinor Katz, Chair, July 15, 2009, Outside Chair.
- Thompson, Jennifer. *Distinguishing a Western Women's College: A History of the Curriculum and Student Experience at Colorado Women's College*. Edith W. King, Chair, July 16, 2010, Committee Member.
- Walker, Emelda. *Influence of Organizational Factors on Job Satisfaction of Disability Service Providers at Postsecondary Institutions*. Chair, April 29, 2010.

Dissertation Proposals at the University of Denver

- Bowers, Stacey L. *Library Anxiety of Law School Students: A Study Utilizing the Multidimensional Library Anxiety Scale*. Chair, November 5, 2009.
- McCord, J. Michael. *Developing a Standard of Care for Educational Malpractice*. Edith W. King, Chair. April 23, 2010.
- Thompson, Jennifer. *History of Colorado Women's College*. Edith W. King, Chair, October 30, 2008. Committee Member.
- Walker, Emelda. *Influence of Organizational Factors on Job Satisfaction of Disability Service Providers at Postsecondary Institutions*. Chair, July 21, 2009.

Dissertations at Other Institutions

- Rodríguez-Mori, Howard. *The Information Behavior of Puerto Rican Immigrants to Central Florida, 2003-2009: Grounded Analysis of Six Case Studies Use of Social Networks during the Migration Process*. Kathleen Burnett, Chair, April 10, 2009, Florida State University, Committee Member.
- Schwartz, Brian *More than a Look-up Skill: Medical Information Literacy Education in Osteopathic Medical Schools*. D. Mirah Dow, Chair, July 18, 2017. Emporia State University, Committee Member.
- Snow, Karen. *A Study of the Perception of Cataloging Quality among Catalogers*. Shawne D. Miksa, Chair, August 1, 2011. University of North Texas, Committee Member.

Dissertation Proposals at Other Institutions

Schwartz, Brian *More than a Look-up Skill: Medical Information Literacy Education in Osteopathic Medical Schools*. D. Mirah Dow, Chair, December 4, 2015. Emporia State University, Committee Member.

Snow, Karen. *A Study of the Perception of Cataloging Quality among Catalogers*. Shawne D. Miksa, Chair, May 11, 2010. University of North Texas, Committee Member.

Master's Thesis at the University of Denver

Hemingson, Jeff. *Recital Paper*. Lamont School of Music, February 2010, Outside Chair.

Capstones at the University of Denver

Anthony, Alisa. *Correlation of Library and Information Science Program outcomes and Vacant Position Qualifications Listed on the Colorado State Library Jobline by Employers During the Period September 1, 2000 through August 31, 2002*. Chair, Winter Quarter, 2003.

Borden, Donna M. *Improving Emergency Communications Systems: Is a Radio Communications Network the Answer?* Fall Quarter, 2014.

Bowden, Heather L.M. *Exploring Biological Models for Long-term Data Preservation*. Chair, Spring Quarter, 2008.

Casenada, Cassandra Y. *Challenges to the Recruitment, Education, and Retention of Librarians of Color*. Chair, Spring Quarter, 2008.

Chang, Jennifer C. *Legal Research Practice and Preference: A Law Firm Perspective*. Chair, Spring Quarter 2011.

Ellis, Megan S. Fitzgerald. *Design of a Public Library Adult Volunteer Recruitment Program and Training Curriculum*. Chair, Winter Quarter, 2003.

Kircher, Kathy. *Development of a Library Pathfinder for Exobiology and Posting it on the Internet*. Chair, Winter Quarter, 2003.

Melhado, Loretta. *Design of St. John's Episcopal Church Library*. Chair, Spring Quarter, 2008.

Radcliff, Kathy. *Original Cataloging of Archival materials in the HERS Collection in Penrose Library*. Chair, Winter Quarter, 2003.

Sass, Carol Ann. *ACT Periodical Index: Access to Catholic Thinking Periodical Index: Web Index to Select Catholic Periodicals*. Spring Quarter 2000.

Stone, Sergio D. *Conducting Community Analysis for the Bemis Public Library (Littleton, Colorado) Using 2002 U.S. Census Data and the Online Outcome-Based Evaluation Toolkit*. Chair, Winter Quarter, 2003.

Tureson, Tamara. *Design and Use of an Information Audit Tool for Use in a Law Library*. Chair, Winter Quarter, 2003.

Tweed, Beth. *Evaluation of Email Reference Service in a Consumer Health Library Environment*. Chair, Winter Quarter, 2003.

GRANTS AND CONTRACTS

Student Learning in Agriculture STEM through Teacher Professional Development. Research team: Stanton Gartin (PI) and Cyndi Hofmeister, Northeast Junior College; Jeff Cash, Cheryl Sánchez, Anne-Marie Crampton, Lamar Community College; Suzanna Spears, Morgan Community College; Jack Wiley, Kerry Gabrielson, Trinidad State Junior College; Michael J. Miller, Colorado State University; Michael Womochil (Co-PI), Casey Sacks, and Sylvia D. Hall-Ellis, Colorado Community College System. U.S. Department of Agriculture, Agriculture and Food Research Initiative, Food, Agriculture, Natural Resources and Human Sciences Education and Literacy Initiative, \$404,460 (2017-2020)

Leading and Achieving: the Colorado Agriculture Regional Consortium. Research team: Jack Wiley (PI), Kerry Gabrielson, Trinidad State Junior College; Jeff Cash (PI), Cheryl Sánchez, Anne-Marie Crampton, Lamar Community College; Suzanna Spears, Morgan Community College; Cyndi Hofmeister, Northeast Junior College; Michael Womochil (Co-PI), Casey Sacks, and Sylvia D. Hall-Ellis, Colorado Community College System. U.S. Department of Agriculture, Hispanic Serving Institutions Education Grants Program, \$504,414 (2017-2020)

Cyber Prep Program Planning Grant. Research team: Debbie Sagen (PI), Brenda Lauer, Pikes Peak Community College; Gretchen Martin, Koiosa Insights; and, Sylvia D. Hall-Ellis, Colorado Community College System. U.S. Department of Commerce, Regional Alliances and Multi-stakeholder Partnerships to Stimulate (RAMPS) Cybersecurity Education and Workforce Development, \$199,681 (2016-2018)

Career and Technical Education in Colorado: Pathways to Education and Employment. Research team: Heather McKay (PI), Rutgers University; Sarah Heath, Casey Sacks, Sylvia D. Hall-Ellis, Colorado Community College System. U.S. Department of Education, Institute of Education Sciences, \$1,400,000 (2017-2021)

Pre-Alliance Planning Grant Colorado Community College Alliance. Research team: Victor Vialpondo (PI) and Janel Highfill, Community College of Aurora; Heidi Loshbaugh (Co-PI), Community College of Denver; Rick Reeves, Bill McGreevy, Liz Cox, and Kristin Aslin, Red Rocks Community College; Cathy Pellish, Front Range Community College; Samuel DeVries, Arapahoe Community College; Sylvia D. Hall-Ellis, Colorado Community College System. National Science Foundation, Louis Stokes Alliance for Minority Participation (LSAMP), \$86,817 (2016-2017)

Towards Scalable Differentiated Instruction Using Technology-enabled, Competency-based, Dynamic Scaffolding. Research team: Karen Wilcox (PI) and Vijay Kumar, Center for Computational Engineering, Massachusetts Institute of Technology; Flora McMartin, Broad-based Knowledge; Quinsigamond Community College; and, Casey Sacks, and Sylvia D. Hall-Ellis, Colorado Community College System. U.S. Department of Education, First in the World Developmental Grant, \$2,891,882 (2015-2019)

Colorado Strategic Partnerships Emergency Grant. Research team: Elise Lowe-Vaughn (PI), Amy Hodson, Celia Hardin, Barbara McBride, James Newby, Christopher Dewhurst, Nina Holland, Kate Anderson, MaryAnn Roe, Chrystalynn Chrystalynn, Elaine Edon, Mona Barnes, Tom Morgan, Rob Hanni, and Marie Valenzuela, Colorado Department of Labor and Employment; Steve Anton, Joelle Brouner, and, Katie Griego, Colorado Department of Human Services; Rebecca Holmes, Judith Martinez, and Jennifer Jirous, Colorado Department of Education; Emily Templin Lesh, Colorado Workforce Development Council; Cory Everett, Colorado Department of Regulatory Agencies; and, Casey Sacks and Sylvia D. Hall-Ellis, Colorado Community College System. U.S. Department of Labor, Strategic Partnerships Emergency Grant, \$5,000,000 (2015-2017)

CAEL Jump Start Program: Competency-Based Education. Research team: Jerry Migler (PI), Casey Sacks, Debra Cohn, Thomas Hartman, and Sylvia D. Hall-Ellis, Colorado Community College System; Matt Jamison, Front Range Community College; Mike Coste, Red Rocks Community College; Amanda Corum, Pueblo Community College; Janet Colvin, Pikes Peak Community College; and, MaryAnn Matheny, Community College of Denver. Council for Adult and Experiential Learning, \$15,000 (2015)

Summit on the Redesign of Developmental Education. Research team: Jerry Migler (PI), Casey Sacks, and Sylvia D. Hall-Ellis, Colorado Community College System; Chip Nava, Pueblo Community College; Kim Moultny, Arapahoe Community College; Debbie Ulibarri, Trinidad State Junior College; and, Kris Bernard, Front Range Community College. American Association of Community Colleges, \$15,000 (2015-2016)

Equity in Excellence at Colorado Community Colleges. Research team: Keith Howard (PI) and Sylvia D. Hall-Ellis, Colorado Community College System; Estela Mata Bensimon, Center for Urban Education, University of Southern California; and Kerry Gabrielson, Trinidad State Junior College. Colorado Department of Higher Education, Colorado Opportunity Scholarship Program, \$150,000 (2015-2016)

MBA High School of Business in Colorado. Research team: Laurie Urich (PI) and Sylvia D. Hall-Ellis, Colorado Community College System; Rudolph Sumpter and Beatrice Gerrish, Boulder Valley Schools; Keith Curry Lance, RSL Research Group. Colorado Department of Higher Education, Colorado Opportunity Scholarship Program, \$501,295 (2015-2016)

Fullbridge Program in Colorado. Research team: Keith Howard (PI) and Sylvia D. Hall-Ellis, Colorado Community College System; Suzanna Spears, Fort Morgan Community College; and, Cheryl Sánchez and Anne-Marie Compton, Lamar Community College. Colorado Department of Higher Education, Colorado Opportunity Scholarship Program, \$300,000 (2015-2017)

Colorado Community College System Alternative Credit Program. Research team: Jerry Migler (PI), Keith Howard, and Sylvia D. Hall-Ellis, Colorado Community College System. American Council on Education, \$13,000 (2015)

Internationalization in Higher Education. Researcher: Samuel D. Museus. Technical reviewer for MCE: Sylvia D. Hall-Ellis. University of Denver, Office of Internationalization, \$8,000 (2014-2015)

International Perspectives on Bilingual Education. Researcher: Sharolyn Pollard-Durodola. Technical reviewer for MCE: Sylvia D. Hall-Ellis. University of Denver, Office of Internationalization, \$3,700 (2014-2015)

Cultivating Culturally Relevant and Responsive Curriculum and Pedagogy in College. Researcher: Samuel Museus. Technical reviewer for MCE: Sylvia D. Hall-Ellis. University of Denver, iRise Grant, \$5,000 (2014-2015)

Project EMERGE (Educational Model for Evaluation and Replicability in Gifted Environments). Research team: Norma Hafenstein (PI) and Bruce Uhrmacher. Technical reviewer for MCE: Sylvia D. Hall-Ellis. Lynde and Harry Bradley Foundation, \$235,000 (2014-2015)

Collecting Asian American Refugee Stories. Researcher: Samuel Museus. Technical reviewer for MCE: Sylvia D. Hall-Ellis. American Educational Research Association, Research Grant, \$5,000 (2014-2015)

Developing Expertise in Teaching K-5 Mathematics. Research team: Julie Sarama (PI) and Douglas H. Clements (Co-PI), in partnership with the School of Education at the University of Michigan. Technical reviewer for MCE: Sylvia D. Hall-Ellis. National Science Foundation, \$130,344 (2013-2015)

Investigation of the Long-Term Outcomes for Special Education Students. Researcher: Antonio Olmos-Gallos. Technical reviewer for MCE: Sylvia D. Hall-Ellis. Jefferson County School District, Office of Assessment, \$40,000 (2014)

Refugee Community Collaboration. Researcher: Vicki Tomlin (PI) in partnership with the African Community Center and Jewish Family Service. Technical reviewer for MCE: Sylvia D. Hall-Ellis. University of Denver, Center for Community Engagement and Service Learning, \$14,854 (2014-2015)

Access to Mathematics for All. Research team: Richard S. Kitchen (PI), Nicole M. Russell (Co-PI), and Terrence Blackman (Co-PI), Curriculum Studies and Teaching Program, Morgridge College of Education; Álvaro Árias (Co-PI, Department of Mathematics); and, James Gray (Co-PI), Department of Mathematics, Community College of Aurora. Technical reviewer for MCE: Sylvia D. Hall-Ellis. National Science Foundation, The Robert Noyce Scholarship Program, Capacity Building Project, \$349,926 (2014-2016)

Cognitive Test Battery for Intellectual Disabilities. Research team: Karen Riley (PI), Lyndsay Agans, Jessica Lerner, and Karin Dittrick-Nathan in partnership with David Hessel (PI), The MIND Institute at the University of California – Davis, and Elizabeth Berry-Kravis, Rush University Medical Center. Technical reviewer for MCE: Sylvia D. Hall-Ellis. National Institutes of Health, Outcome Measures for Use in Treatment Trials for Individuals with Intellectual and Developmental Disabilities (R01), \$2,499,996 (\$588,672 at DU) (2014- 2019)

Broadening Participation in Engineering among Women and Latino/as: A Longitudinal, Multi-Site Study. Researcher: Patton Garriott (PI) in partnership with the University of North Dakota and the University of Missouri. Technical reviewer for MCE: Sylvia D. Hall-Ellis. National Science Foundation, HER Core Research, \$677,390 (\$69,992 at DU) (2014-2019)

Designing a Teacher Evaluation System to Improve Teacher Effectiveness for Culturally and Linguistically Diverse Learners. Research team: María del Carmen Salazar (PI), Jessica Lerner, and Kathy Green. Technical reviewer for MCE: Sylvia D. Hall-Ellis. University of Denver, Professional Research Opportunities for Faculty, \$29,988 (2014-2016)

Developing a College-Going Culture in Latina/O Families: Exploring the Influence of Funds of Knowledge on Family Outreach Programs. Researcher: Judy Marquez Kiyama. Technical reviewer for MCE: Sylvia D. Hall-Ellis. University of Denver, Professional Research Opportunities for Faculty, \$18,720 (2014-2016)

Assessment of Quality of Life in Neural Implantation Surgery for the Treatment of Parkinson's Disease. Researcher: Cynthia McRae. Technical reviewer for MCE: Sylvia D. Hall-Ellis. University of Denver, Office of Internationalization, \$3,967 (2014-2015)

Pura Vida: Cloud Forest, Curriculum and Cross-Cultural Study. Research team: Norma Hafenstein (PI) and Bruce Uhrmacher (Co-PI). Technical reviewer for MCE: Sylvia D. Hall-Ellis. University of Denver, Office of Internationalization, \$8,000 (2014-2015)

Online Course Development for Curriculum and Instruction. Researcher: Ruth Chao. Technical reviewer for MCE: Sylvia D. Hall-Ellis. University of Denver, Office of Teaching and Learning, \$3,000 (2014)

Online Course Development for Curriculum and Instruction. Researcher: María del Carmen Salazar. Technical reviewer for MCE: Sylvia D. Hall-Ellis. University of Denver, Office of Teaching and Learning, \$3,000 (2014)

Online Course Development for Curriculum and Instruction. Researcher: Jessica Lerner. Technical reviewer for MCE: Sylvia D. Hall-Ellis. University of Denver, Office of Teaching and Learning, \$3,000 (2014)

Online Course Development for Curriculum and Instruction. Researcher: Duan Zhang. Technical reviewer for MCE: Sylvia D. Hall-Ellis. University of Denver, Office of Teaching and Learning, \$3,000 (2014)

The Mathematics Education of African Americans, 1866 – 1954. Researcher: Nicole M. Russell. Technical reviewer for MCE: Sylvia D. Hall-Ellis. National Academy of Education, Spencer Foundation Postdoctoral Fellowship, \$55,000 (2014-2016)

Early Childhood Care and Education Study. Research team: Carrie Germeroth (PI), Melissa Mincic, and Douglas H. Clements. Technical reviewer for MCE: Sylvia D. Hall-Ellis. State of North Dakota, Department of Public Instruction, \$73,500 (2013-2014)

Graduate Level Specialty in Addiction Counselor Training with Emphasis on Integration of Native American Specific Content. Research team: Ruth Chao (PI) and Michael J. Faragher (Co-PI). Technical reviewer for MCE: Sylvia D. Hall-Ellis. The Galena Foundation, \$289,732 (2013-2016)

The Collecting Asian American and Pacific Islander Refugee Stories (CARS) Project. Researcher: Samuel Museus. Technical reviewer for MCE: Sylvia D. Hall-Ellis. University of Denver, Center for Community Engagement and Service Learning, \$15,000 (2014)

Parents in Transition: A Multiple Case Study of Parent and Family Orientation Programs. Researcher: Judy Marquéz Kiyama. Technical reviewer for MCE: Sylvia D. Hall-Ellis. University of Denver, Faculty Research Fund, \$1,500 (2014-2015)

The Sistah Network: Black Women Graduate Students Supporting and Retaining Each Other. Researcher: Nicole M. Russell. Technical reviewer for MCE: Sylvia D. Hall-Ellis. University of Denver, Faculty Research Fund, \$2,708 (2014-2015)

Evaluation of the Northeast Denver Babies Ready for College Program. Research team: Carrie Germeroth (PI), Melissa Mincic, and Douglas H. Clements. Technical reviewer for MCE: Sylvia D. Hall-Ellis. Mile High Montessori, \$9,922 (2013-2014)

Developing Teaching Expertise in K-5 Mathematics. Research team: Julie Sarama (PI) and Douglas Clements (University of Denver), in partnership with Timothy Boerst (PI), Meghan Shaughnessy, Deborah Ball, Hyman Bass (School of Education at the University of Michigan). Technical reviewer for MCE: Sylvia D. Hall-Ellis. National Science Foundation, \$449,827 (\$130,344 at the University of Denver) (2013-2015)

Early Learning Care and Education Study Program Grant for the State of North Dakota. Research team: Carrie Germeroth (PI), Melissa Mincic, and Sheridan Green. Technical reviewer for MCE: Sylvia D. Hall-Ellis. State of North Dakota Department of Public Instruction, \$73,500 (2013-2014)

Local Professional Learning Community for School Leaders. Research team: Susan Korach (PI), Kristina Hesbol, and Rebecca McClure. Technical reviewer for MCE: Sylvia D. Hall-Ellis. Education Development Center, \$10,950 (2013)

Healthy Eaters, Lifelong Movers 2: Implementing Evidence-Based School Environment, Policy, and Curricular Changes to Increase Opportunities for Healthy Eating and Physical Activity in Low Income, Rural Colorado. Research team: Elaine Berlansky, University of Colorado at Denver (PI), Nicholas Cutforth, University of Denver (Co-PI), and Allison Reeds. Technical reviewer for MCE: Sylvia D. Hall-Ellis. Colorado Health Foundation, \$3,103,108 (2013-2017)

Hughes Rare Books Library Room Renovation in the Sturm College of Law. Project team: Patti H. Marks, Sylvia D. Hall-Ellis, and Leigh Elliott. Mabel T. Hughes Charitable Trust, \$34,000 (2013-2014)

The Promise Center Partnership with the Marsico Institute for Early Learning and Literacy and the City and County of Denver. Research team: Karen Riley (PI), Douglas H. Clements (Co-PI), and Sheridan Green. Technical reviewer for MCE: Sylvia D. Hall-Ellis. The Piton Foundation, \$223,468 (2013-2014)

Center of Excellence for Problem Gambling. Research team: Ruth Chao (PI) and J. Mike Faragher. Technical reviewer for MCE: Sylvia D. Hall-Ellis. Colorado Department of Behavioral Health, \$68,021 (2012-2013)

United Way Implementation and Validation Review. Research team: Douglas H. Clements (PI), Amanda Moreno, and Sheridan Green. Technical reviewer for MCE: Sylvia D. Hall-Ellis. Mile High United Way, \$19,737 (2013)

Math/Science Partnership in Rural Districts. Research team: Kristen Bunn (PI, Eagle County Schools), Paul Michalec (Co-PI), and Alegra Reiber. Technical reviewer for MCE: Sylvia D. Hall-Ellis. Colorado Department of Education, Colorado's Mathematics and Science Partnership Program, \$750,000 (2013-2014)

Mathematics and Science Education of African Americans. Research team: Nicole Russell (PI), Sylvia D. Hall-Ellis, Steve Fisher (Penrose Library). Technical reviewer for MCE: Sylvia D. Hall-Ellis. University of Denver, Professional Research Opportunities for Faculty, \$29,994 (2013-2015)

Online Course Development for Curriculum and Instruction. Researcher: Nicole Russell. Technical reviewer for MCE: Sylvia D. Hall-Ellis. University of Denver, Office of Teaching and Learning, \$3,000 (2013)

Discourse and Opportunity: Undocumented Students and Higher Education Policy. Researcher: Ryan Gildersleeve. Technical reviewer for MCE: Sylvia D. Hall-Ellis. National Academy of Education, Spencer Foundation Postdoctoral Fellowship, \$55,000 (2012-2014)

An Anthropological Study of the Latino Graduation Ceremony. Researcher: Ryan Gildersleeve. Technical reviewer for MCE: Sylvia D. Hall-Ellis. Spencer Foundation, \$39,900 (2012-2013)

Fragile-X and Pharmaceutical Company: Clinical Trial of AFQ056. University of California – Davis Children's Hospital MIND Institute (Sacramento), Children's Hospital Denver, and Rush Children's Hospital at Rush University Medical Center (Chicago). Karen Riley, PI. Technical reviewer for MCE: Sylvia D. Hall-Ellis. Novartis Pharmaceuticals Corporation, \$394,206 (2012-2014)

Project Engage, Phase 2, a DAPRA Grant in partnership with Total Immersion Systems, Inc., and Texas A&M University. Research team: Karen Riley (PI) and Lyndsay Agans (Co-PI). Technical reviewer for MCE: Sylvia D. Hall-Ellis. U.S. Department of Defense, \$60,000 (2011-2013)

International School Psychology Practicum Exchange. Researcher: Gloria L. Miller. Technical reviewer for MCE: Sylvia D. Hall-Ellis. University of Denver, Center for Community Engagement and Service Learning, \$14,951 (2012-2013)

Online Course Development for Curriculum and Instruction. Research team: Bruce Uhrmacher (PI) and Norma Hafenstein (Co-PI). Technical reviewer for MCE: Sylvia D. Hall-Ellis. University of Denver, Office of Teaching and Learning, \$18,193 (2012-2014)

Writers in the Schools. Research team: Karen Riley (PI) and Amanda Moreno (Co-PI). Technical reviewer for MCE: Sylvia D. Hall-Ellis. Colorado Humanities, \$4,965 (2012-2013)

Learning Ecosystem Validation Grant. Research team: Karen Riley (PI), Lyndsay Agans, Kent Seidel, and Shimelis Assefa. Technical reviewer for MCE: Sylvia D. Hall-Ellis. Bill & Melinda Gates Foundation, \$315,000 (2012-2013)

Project Words of Oral Reading and Language Development (WORLD). Research team: Jorge E. Gonzalez (PI), Texas A&M University; Laura Saenz (Co-PI), University of Texas – Pan American; and, Sharolyn Pollard-Durodola (Co-PI), University of Denver. Technical reviewer for MCE: Sylvia D. Hall-Ellis. U.S. Department of Education, Institute of Education Sciences, \$53,354 (2012-2015); award \$640,718, transfer from Texas A&M University

Increasing the Efficacy of an Early Mathematics Curriculum with Scaffolding Designed to Promote Self-Regulation. Research team: Douglas H. Clements (PI) and Julie Sarama (Co-PI). Technical reviewer for MCE: Sylvia D. Hall-Ellis. U.S. Department of Education, Institute of Education Sciences, \$1,445,315 (2008-2014); award \$4,541,975, transfer from University at Buffalo, The State University of New York

Using Rule Space and Poset-based Adaptive Testing Methodologies to Identify Ability Patterns in Early Mathematics and Create a Comprehensive Mathematics Ability Test. Research team: Douglas H. Clements (PI) and Julie Sarama (Co-PI). Technical reviewer for MCE: Sylvia D. Hall-Ellis. National Science Foundation, \$323,791 (2010-2014); award \$1,194,944, transfer from University at Buffalo, The State University of New York

Comprehensive Postdoctoral Training in Scientific Education Research. Researcher: Julie Sarama (PI). Technical reviewer for MCE: Sylvia D. Hall-Ellis. U.S. Department of Education, Institute of Education Sciences, \$133,458 (2010-2014); award \$613,353, transfer from University at Buffalo, The State University of New York

Longitudinal Study of a Successful Scaling Up Project: Extending TRIAD. Research team: Douglas H. Clements (PI), Julie Sarama (Co-PI), and Abt Associates (Carolyn Layzer, Fatih Unlu, Laurie Bozzi, Lily Fesler, Alina Martinez, Cristofer Price, James van Orden). Technical reviewer for MCE: Sylvia D. Hall-Ellis. Institute of Education Sciences, \$384,940 (2011-2015; award \$1,250,286, transfer from University at Buffalo, The State University of New York

Early Childhood Education in the Context of Mathematics, Science, and Literacy. Research team: Julie Sarama (PI), Douglas H. Clements (Co-PI). Technical reviewer for MCE: Sylvia D. Hall-Ellis. National Science Foundation, \$990,020 (2010-2014; award \$2,285,228, transfer from University at Buffalo, The State University of New York

Early Childhood Clearinghouse Information Center Redesign. Research team: Karen Riley (PI) and Amanda Moreno (Co-PI). Technical reviewer for MCE: Sylvia D. Hall-Ellis. Office of the Lt. Governor of Colorado, \$12,000 (2012-2013)

Morgridge Rural Educational Leadership Initiative. Research team: Lyndsay Agans (PI), Linda Brookhart (Co-PI), Susan Korach, and Rebecca McClure. Technical reviewer for MCE: Sylvia D. Hall-Ellis. Morgridge Family Foundation, \$100,000 (2012-2014)

Center of Excellence for Problem Gambling. Research team: Patrick Sherry (PI) and J. Mike Faragher. Technical reviewer for MCE: Sylvia D. Hall-Ellis. Colorado Department of Behavioral Health, \$55,000 (2012-2013)

Intermodal Transportation Institute Research Initiatives. Researcher: Patrick Sherry. Technical reviewer for MCE: Sylvia D. Hall-Ellis. University Transportation Centers Program, Research and Innovative Technology Administration, U.S. Department of Transportation. \$600,000 (2012-2014)

Mile High United Way Social Innovation Fund Early Literacy Initiative. Gloria L. Miller, PI, Amanda Moreano, Kim Hartnett-Edwards, and Sheridan Green. Technical reviewer for MCE: Sylvia D. Hall-Ellis. Mile High United Way, \$89,992 (2012-2013)

International School Psychology Practicum Exchange. Researcher: Gloria L. Miller. Technical reviewer for MCE: Sylvia D. Hall-Ellis. University of Denver, Center for Community Engagement and Service Learning, \$1,000 (2012-2013)

Refugee Student Art Outreach. Researcher: Karin Ditttrick-Nathan. Technical reviewer for MCE: Sylvia D. Hall-Ellis. University of Denver, Faculty Research Fund, \$3,000 (2012-2013)

Resistance, Resilience, and Reciprocity: Centering the Voices of Black Doctoral Women with Faculty Aspirations. Researcher: Nicole M. Russell. Technical reviewer for MCE: Sylvia D. Hall-Ellis. University of Denver, Faculty Research Fund, \$2,965 (2012-2013)

- Assessing Learning through Student Notebooks*. Research team: Keith Miller, Nancy Sasaki, and Kathy Green. Technical reviewer for MCE: Sylvia D. Hall-Ellis. University of Denver, Professional Research Opportunities for Faculty, \$30,000 (2012-2014)
- International School Psychology Practicum Exchange*. Researcher: Gloria L. Miller. Technical reviewer for MCE: Sylvia D. Hall-Ellis. University of Denver, Office of Internationalization, \$2,000 (2012-2013)
- ELO in Colorado*. Research team: Cynthia Hazel and Duan Zhang. Technical reviewer for MCE: Sylvia D. Hall-Ellis. Colorado Legacy Foundation, \$150,000 (2012-2013)
- Creating Online LIS Courses*. Research team: Mary C. Stansbury (PI), Shimelis Assefa, Denise Anthony, Xiao Hu, and Krystyna Matusiak. Technical reviewer for MCE: Sylvia D. Hall-Ellis. University of Denver, Center for Teaching and Learning, \$15,000 (2011-2013)
- Maritime Piracy Seminar*. Researcher: Ved Nanda, The Nanda Center, Sturm College of Law. Technical reviewer for Sturm College of Law: Sylvia D. Hall-Ellis. Arsenault Family Foundation, \$15,000 (2012-2013).
- Early Childhood Librarianship: An Interdisciplinary, Experiential Learning MLIS*. Researcher: Mary C. Stansbury (PI). Technical reviewer for MCE: Sylvia D. Hall-Ellis. Laura Bush's 21st Century Librarians Program, Institute for Museums and Library Services, \$249,066 (2012-2014)
- Learning Ecosystem Planning Grant*. Research team: Karen Riley (PI), Lyndsay Agans, Kent Seidel, and Shimelis Assefa. Technical reviewer for MCE: Sylvia D. Hall-Ellis. Bill & Melinda Gates Foundation, \$281,217 (2011-2012)
- Advanced Service Learning Practitioner Faculty Grant*, Sylvia D. Hall-Ellis, University of Denver, Center for Community Engagement and Service Learning, \$400 (2011)
- Evaluating and Enhancing the EspeciallyMe Program*. Research team: Lori D. Patton and Nicole Russell. Technical reviewer for MCE: Sylvia D. Hall-Ellis. University of Denver, Center for Community Engagement and Service Learning, Public Good Fellowship Grant, \$24,780 (2012)
- Choosing Excellence: Let Every Child Bloom*. Research team: Shimelis Assefa (PI) and Mary C. Stansbury (Co-PI). Technical reviewer for MCE: Sylvia D. Hall-Ellis. University of Denver, Center for Community Engagement and Service Learning, Public Good Grant, \$7,657 (2012)
- K-8 STEM Content Specific Professional Development to Improve Elementary Student Achievement*. Research team: Kent Seidel (PI), Nicole Russell (Co-PI), Kimberly Hartnett-Edwards, Paul Michalec, Jeff Farmer, Keith Miller, Alegra Reiber, and Nancy Sasaki. Technical reviewer for MCE: Sylvia D. Hall-Ellis. Colorado Department of Education, Improving Teacher Quality Grant, (Title II ESEA), \$307,299 (2011-2012)
- Building a Better Principal Pipeline to Boost Student Achievement*. Researcher: Susan Korach. Technical reviewer for MCE: Sylvia D. Hall-Ellis. Denver Public Schools; a subcontract from the Wallace Foundation Grant, \$170,000 (2011-2017)
- Center of Excellence for Problem Gambling*. Research team: J. Mike Faragher (Co-PI) and Bobbie Vollmer (PI). Technical reviewer for MCE: Sylvia D. Hall-Ellis. Colorado Department of Behavioral Health, \$79,999 (2011-2012)
- An Exploration of Novice Teachers' Core Competencies: Impacts on Student Achievement, and Effectiveness of Preparation*. Research team: Kent Seidel (PI), Kathy Green (Co-PI), Kimberly Hartnett-Edwards, and Duan Zhang. Technical reviewer for MCE: Sylvia D. Hall-Ellis. Institute of Education Sciences, Effective Teachers and Effective Teaching, \$990,987 (2012-2015)

Project Engage, a DAPRA Grant in partnership with Total Immersion Systems, Inc., and Texas A&M University. Research team: Karen Riley (PI) and Lyndsay Agans (Co-PI). Technical reviewer for MCE: Sylvia D. Hall-Ellis. U.S. Department of Defense, \$49,964 (2011-2014)

User-centered Evaluation of Music Search Engines. Researcher: Xiao Hu. Technical reviewer for MCE: Sylvia D. Hall-Ellis. University of Denver, Faculty Research Fund, \$2,931 (2011-2012)

Educational Practicum in Vietnam and China to Promote the Inclusion of Young Children with Disabilities. Researcher: Gloria L. Miller. Technical reviewer for MCE: Sylvia D. Hall-Ellis. University of Denver, Office of Internationalization, \$5,000 (2011-2012)

Evaluation of Colorado's Enhancing Quality in Infant-Toddler (EQIT) Initiative. Research team: Virginia R. Maloney and Amanda Moreno. Technical reviewer for MCE: Sylvia D. Hall-Ellis. Buell Foundation, \$395,884 (2011-2013)

Creating Engaging Environments to Teach Pre-Algebra Mathematics to Elementary Students. Research team: Álvaro Arias, Mario López, María del Carmen Salazar, and Lyndsay Agans. Technical reviewer for MCE: Sylvia D. Hall-Ellis. University of Denver Interdisciplinary Grant, \$60,000 (2011-2012)

Morgridge Education Technology Accessible (META) Resource Project. Research team: Lyndsay Agans (PI) and Shimelis Assefa (Co-PI). Technical reviewer for MCE: Sylvia D. Hall-Ellis. Morgridge Family Foundation, \$36,000 (2011)

MCE Connect: A 21st Century Framework for Faculty Development. Research team: Bruce Uhrmacher (PI), Shimelis Assefa (Co-PI), Lyndsay Agans (Co-PI), Kimberly Hartnett-Edwards, Norma Hafenstein, Xiao Hu, Paul Michalec (Co-PI), María del Carmen Salazar (Co-PI), and Sandra Snyder-Mondragon. Technical reviewer for MCE: Sylvia D. Hall-Ellis. University of Denver, Center for Teaching and Learning, \$22,355 (2011-2012)

Parent Education and Parent Leadership and Advocacy. Research team: Virginia Maloney (PI) and Amanda Moreno, Marsico Institute for Early Learning and Literacy. Technical reviewer for MCE: Sylvia D. Hall-Ellis. Colorado Health Foundation, \$27,358 (2010-2011)

Intentional School Culture. Researcher: Cynthia Hazel. Technical reviewer for MCE: Sylvia D. Hall-Ellis. Denver Public Schools, \$38,040 (2010-2011)

Healthy Eaters, Lifelong Movers: Implementing Evidence-Based School Environment, Policy, and Curricular Changes to Increase Opportunities for Healthy Eating and Physical Activity in Low Income, Rural Colorado. Research team: Elaine Berlansky, University of Colorado at Denver (PI), Nicholas Cutforth, University of Denver (Co-PI), and Allison Reeds. Technical reviewer for MCE: Sylvia D. Hall-Ellis. Colorado Health Foundation, \$1,683,277 (2011-2014)

Second Life Learning Community. Research team: Don McCubbrey (PI), Sylvia D. Hall-Ellis (Co-PI), Walter LaMendola, and Paul Novak. University of Denver, Center for Teaching and Learning, \$13,000 (2010-2011)

Reintroducing the Value of Law Librarians to Academic and Public Librarians in Colorado through the Identification and Use of Emerging Technologies. Research team: Sylvia D. Hall-Ellis (Co-PI), Stacey L. Bowers (PI), and Christopher Hudson, in partnership with Denver Public Library, Arapahoe Library District, and the Colorado State Supreme Court Library. University of Denver, Center for Community Engagement and Service Learning, \$5,773 (2010-11)

Reintroducing the Value of Law Librarians to Public Librarians through the Identification and Use of Emerging Technologies and Resources. Research team: Stacey Bowers (PI) and Sylvia D. Hall-Ellis (Co-PI). American Association of Libraries, Wolters Kluwer Law & Business Grant Program, \$2,725 (2010-2011)

- Faculty Service Learning Pod.* Research team: María del Carmen Salazar and Nicholas Cutforth (Curriculum and Instruction Program), Frank Tuitt (Higher Education Program), Cynthia Hazel and Gloria Miller (Child, Family, and School Psychology Program), and Sylvia D. Hall-Ellis (Library and Information Science Program). University of Denver, Center for Community Engagement and Service Learning, \$8,000 (2010-2011)
- Lincoln Collaborative.* Research team: Antonio Esquibel (Principal, Lincoln High School), María del Carmen Salazar (Curriculum and Instruction Program), and Sylvia D. Hall-Ellis. School Improvement Grant, Denver Public Schools, \$375,000 (2010-2012)
- Future LEADers of America: Leaders III.* Research team: Denver Public Library (Kristen Svendsen, PI), the University of Denver (Sylvia D. Hall-Ellis), the Colorado Chapter of REFORMA (Orlando Archibeque), and the Colorado Association of Libraries (Martin Garner). Laura Bush's Recruiting Librarians for the 21st Century Program, Institute for Museums and Library Services, \$988,366 (2009-2012)
- Teaching for Success in the Library Environment: LIS 4030 in Library 2.0.* Research team: Deborah S. Grealy (PI) and Sylvia D. Hall-Ellis (Co-PI). University of Denver, Center for Teaching and Learning, \$ 9,350 (2009-10)
- Writing Group Faculty Grant,* Sylvia D. Hall-Ellis, University of Denver, Center for Community Engagement and Service Learning, \$750 (2008-2009)
- Collaborative Learning Faculty Grant,* Sylvia D. Hall-Ellis, University of Denver, Center for Teaching and Learning, \$1,500 (2008)
- Connecting Information Literacy to Learning.* Research team: Lori Micho, Merrie Valliant, Amanda Samland, and Sylvia D. Hall-Ellis. Colorado State Library, LSTA Discretionary Grant Program, \$19,548 (2008-2009)
- Law Librarianship Fellows Program.* Research team: Sylvia D. Hall-Ellis (PI), Stacey Bowers (Co-PI), and Christopher Hudson, Westminster Law Library. Laura Bush's 21st Century Librarians Program, Institute for Museums and Library Services, \$999,370 (2008-2012)
- Grant Writing in a Cooperative Learning Environment.* Sylvia D. Hall-Ellis. University of Denver, Center for Teaching and Learning, \$2,000 (2008-2009)
- Project Homeless Connect 6 Event Evaluation.* Research team: Sylvia D. Hall-Ellis and Duan Zhang. University of Denver Center for Community Engagement and Service Learning, \$9,785 (2008)
- Project Ecuador: International Learning Service Libraries – A Faculty Development Experience in Ecuador.* Sylvia D. Hall-Ellis, Office of Internationalization, University of Denver, \$600 (2007)
- Project Ecuador: International Learning Service Libraries – A Faculty Development Experience in Ecuador.* Sylvia D. Hall-Ellis, International Service Learning Office, University of Denver, \$400 (2007)
- Project Homeless Connect 5 Event Evaluation.* Research team: Sylvia D. Hall-Ellis and Duan Zhang. University of Denver Center for Community Engagement and Service Learning, \$1,000 (2007)
- Project Homeless Connect 4 Event Evaluation.* Research team: Sylvia D. Hall-Ellis and Duan Zhang. University of Denver Center for Community Engagement and Service Learning, \$4,595 (2007)
- Future LEADers of America: Leaders II.* Research team: Denver Public Library (Kristen Svendsen, PI), the University of Denver (Sylvia D. Hall-Ellis), and the Colorado Chapter of REFORMA (Orlando Archibeque). Laura Bush's Recruiting Librarians for the 21st Century Program, Institute for Museums and Library Services, \$988,518 (2007-2010)

Strategic Planning Assistance for the Denver Medical Library. Sylvia D. Hall-Ellis. Denver Medical Library, Inc., \$30,000 (2006-2007)

Destiny Software for JMAC Student Lab. Sylvia D. Hall-Ellis, gift from the Sagebrush Corporation, Minneapolis, Minnesota, \$10,000 (2006)

Libraries: Tools for Education and Development Worldwide: A Faculty Development Experience in France. Sylvia D. Hall-Ellis, Office of Internationalization, University of Denver, \$800 (2005)

Denver Public Library: Opportunities for Change. Sylvia D. Hall-Ellis, Colorado Community Based Research Network, \$2,000 (2005)

Future LEADers of America. Research team: Denver Public Library (Letty Icolari and Steve Taylor, PIs), Emporia State University (Jim Agee), and the University of Denver (Sylvia D. Hall-Ellis). Recruiting Librarians for the 21st Century Program, Institute for Museums and Library Services, \$670,315 (2005-2008)

American Association of University Professors Summer Institute Professional Development Grant. Sylvia D. Hall-Ellis, American Association of University Professors, \$300 (2005)

Beta Phi Mu Alumni Tea. Sylvia D. Hall-Ellis, gift from the Office of Alumni and Parent and Relations, University of Denver, \$2,000 (2005)

Spectrum Software for LIS Student Lab. Sylvia D. Hall-Ellis, gift from the Sagebrush Corporation, Minneapolis, Minnesota, \$5,000 (2005)

Developing Research Capacity in Community Organizations and Residents through Training and Technical Assistance. Nicholas J. Cutforth (PI) and Sylvia D. Hall-Ellis. Piton Foundation, \$25,000 (2005-2006)

Libraries: Tools for Education and Development Worldwide: A Faculty Development Experience in Argentina. Sylvia D. Hall-Ellis, Office of Internationalization, University of Denver, \$500 (2004)

Developing Research Capacity in Community Organizations and Residents through Training and Technical Assistance. Research team: Nicholas J. Cutforth (PI), Gary Lichtenstein and Sylvia D. Hall-Ellis, Piton Foundation, \$25,000 (2003-2004)

Increasing Spanish-Speaking and Hispanic Diversity among Library and Information Science Students at the University of Denver: Development of a Student Recruitment Model. Researcher: Sylvia D. Hall-Ellis (PI), Office of Multicultural Excellence, University of Denver, \$2,750 (2003-2004)

Collection Development Enrichment to Support the Cataloging & Classification Specialization and School Librarianship within the Library & Information Science Program at the University of Denver. Research team: Sylvia D. Hall-Ellis (PI) and Deborah S. Grealy. Women's Library Association, University of Denver, \$4,000 (2003)

Collection Development Enrichment to Support the Library & Information Science Program at the University of Denver. Research team: Deborah S. Grealy (PI) and Sylvia D. Hall-Ellis. Women's Library Association, University of Denver, \$4,000 (2001)

Wireless LAN for Library Education. Research team: Deborah S. Grealy (PI) and Sylvia Hall-Ellis. University of Denver, Center for Teaching and Learning, \$24,000 (2001-2002)

Upward Bound – A Program for South Texas Youth. Research team: Monte Churchill, Executive Director of Community Relations; Gary R. Saucedo, Outreach Coordinator; Raymond Hernandez, (PI) Associate Dean for Student Success; and Sylvia D. Hall-Ellis, South Texas Community College (McAllen, Texas). U.S. Department of Education, Office of Postsecondary Education, \$2,672,003 (1999-2003)

Write Now! Improving Elementary Students' Writing Skills. Research team: Caryl G. Thomason, Assistant Superintendent (PI); Karen Tankersley, Principal; and, Hal Anderson, Director of Technology, Cheyenne Mountain School District 12 (Colorado Springs, Colorado); and Sylvia D. Hall-Ellis. Colorado Department of Education, Educational Telecommunications Unit, \$189,453 (1999-2001)

Operation Quick Start -- Distance Learning in Rural Colorado. Research team: Randal Weigum, Technology Coordinator (PI); Bonnie Barns, Director of Federal Programs and Staff Development; and, Adam "Joe" Raskop, Executive Director, Southeastern Board of Cooperative Educational Services (Lamar, Colorado); and Sylvia D. Hall-Ellis. Colorado Department of Education, Educational Telecommunications Unit, \$400,000 (1999-2001)

Advanced Technological Training for Information Professionals for the 21st Century. Research team: Mario Reyna, Division of Business Director (PI) and Sylvia D. Hall-Ellis, South Texas Community College (McAllen, Texas). Phi Delta Kappa and the National Science Foundation, \$250,000 (1999-2001)

Working Connections – Training Information Technologies Professionals for the 21st Century. Research team: Mario Reyna, Division of Business Director (PI) and Sylvia D. Hall-Ellis, South Texas Community College (McAllen, Texas). Microsoft Corporation and the American Association of Community Colleges, \$1,147,775 (1999-2001)

The ROAD (Research Oriented Amplification of Development to Literacy) Program. Research team: Deborah J. Leong (PI), Metropolitan State University; Elena Bodrova, Metropolitan State University; Dmitri Semenov, Robert J. Marzano, and Sylvia D. Hall-Ellis, Mid-continent Regional Educational Laboratory (Aurora, Colorado). Hewlett-Packard Foundation, \$25,000 (1998-1999)

Press to Literacy. Research team: Deborah J. Leong (PI), Metropolitan State University; Elena Bodrova, Metropolitan State University; Dmitri Semenov, Robert J. Marzano, and Sylvia D. Hall-Ellis, Mid-continent Regional Educational Laboratory (Aurora, Colorado). The Denver Post and the Robert S. McCormick Foundation, \$49,818 (1998-1999)

International Telementor Center. Research team: David Neils, David B. Frost (PI), and Sylvia D. Hall-Ellis, Mid-continent Regional Educational Laboratory (Aurora, Colorado). Hewlett-Packard Philanthropy, \$100,000 (1998-1999)

America Reads: Providing Tutor Training for the America Reads Challenge. Research team: Louis F. Cicchinelli (PI) and Sylvia D. Hall-Ellis, Mid-continent Regional Educational Laboratory (Aurora, Colorado). U.S. Department of Education, Office of Educational Research and Improvement, \$306,000 (1998-1999)

Comprehensive School Reform. Research team: Louis F. Cicchinelli (PI), J. Timothy Waters, and Sylvia D. Hall-Ellis, Mid-continent Regional Educational Laboratory (Aurora, Colorado). U.S. Department of Education, Office of Educational Research and Improvement, \$285,000 (1998-1999)

Sustainable Energy Education (SEE) Program for Grades 4-8: Preparing Today's Youth for Lifelong Learning and Responsible Actions in Energy Conservation. Research team: Mary Gromko, Colorado Department of Education; Gene McCarthy, Rocky Flats Field Office, U.S. Department of Energy; Gina Kissell, National Renewable Energy Laboratory; and Barbara L. McCombs (PI), Janet L. Bishop, and Sylvia D. Hall-Ellis, Mid-continent Regional Educational Laboratory (Aurora, Colorado). State of Colorado Governor's Office for Energy Conservation, \$499,936 (1997-1999)

Review of Kansas Curriculum Standards in Mathematics and Language Arts. Research team: Robert J. Marzano

(PI), John S. Kendall, David B. Frost, and Sylvia D. Hall-Ellis, Mid-continent Regional Educational Laboratory (Aurora, Colorado). Submitted to the Kansas State Department of Education, \$25,903 (1998)

International Telementor Center. Research team: David Neils, John Kuglin, Chris Rapp, David B. Frost (PI), and Sylvia D. Hall-Ellis, Mid-continent Regional Educational Laboratory (Aurora, Colorado). Hewlett-Packard Company, \$54,752 (1998)

Genesis Mission: Education Public Outreach. Developed in partnership by the Jet Propulsion Laboratory, California Institute of Technology, Los Alamos National Laboratory, Lockheed Martin Astronautics, and the Mid-continent Regional Educational Laboratory (Aurora, Colorado). Research team: John T. Sutton (PI), Alice Krueger, Martha Henry, Greg Rawls, Shae Isaacs, Jeff Johnson, Deb Jordan, Arlene Mitchell, David B. Frost, Jana Caldwell, J. Timothy Waters, and Sylvia D. Hall-Ellis. National Aeronautics and Space Administration, \$139,700,000; subcontract award, \$4,750,000 (1997-2007)

North Dakota Mathematics Assessment Project. Developed in partnership by the North Dakota Department of Education and Mid-continent Regional Educational Laboratory (Mid-continent Regional Educational Laboratory). Research team: Ann Clapper, Clarence Bina, Greg Gallagher, North Dakota Department of Education; Don Burger (PI), Hillary Michaels, and Sylvia D. Hall-Ellis, Mid-continent Regional Educational Laboratory (Aurora, Colorado). U.S. Office of Education, \$1,618,214; subcontract award, \$389,076 (1997-2001)

Pacific Resources for Education and Learning Distance Education: Project Evaluation. Developed in partnership by the Pacific Educational Community, the Pacific Resources for Education and Learning (PREL), and Mid-continent Regional Educational Laboratory (McREL). Research team: John W. Kofel (PI), Executive Director, PREL; J. Timothy Waters, Executive Director; Joan Buttram, Robert Keller, and Sylvia D. Hall-Ellis, Mid-continent Regional Educational Laboratory (Aurora, Colorado). U.S. Office of Education, Star Schools Program, \$10,000,000; subcontract award, \$500,000 (1997-2002)

Identification of Bilingual Gifted and Talented Children: A Comprehensive School Grants for Bilingual Education. Developed in partnership by Hidalgo (Texas) ISD, Los Fresnos (Texas) CISD, Progreso (Texas) ISD, University of Texas – Pan American (Edinburg, Texas), and Education Service Center, Region One (Edinburg, Texas). Research team: Hilda Medrano, Dean, College of Education, University of Texas – Pan American; Linda Phemister (PI), Janie Navarro, and Sylvia D. Hall-Ellis, Education Service Center, Region One. U.S. Department of Education, Office of Bilingual Education and Minority Languages Affairs, \$1,670,633 (1997-2002)

Academics 2000: First Things First -- The Texas Goals 2000. Developed for Jim Hogg (Hebbronville, Texas) County ISD, Mirando City (Texas) ISD, and San Isidro (Texas) ISD. Research team: Hilda Medrano, Dean, College of Education, University of Texas - Pan American (Edinburg, Texas); Angie Lehmann, Amy Mares, Ellen Gonzalez (PI), and Sylvia D. Hall-Ellis, Education Service Center, Region One (Edinburg, Texas). Texas Education Agency, \$339,987 (1997-2000)

Southwestern Bell's Learning Communities Initiative. Developed for Tech Prep of the Rio Grande Valley, Inc. (Harlingen, Texas); the Center for Professional Teacher Development, University of Texas – Brownsville; Teach for America – Rio Grande Valley (McAllen, Texas); and Education Service Center, Region One (Edinburg, Texas). Research team: Patricia G. Bubb, Executive Director (PI), Tech Prep of the Rio Grande Valley; Martin Winchester, Executive Director, Teach for America – Rio Grande Valley; Aileen Johnson, Director, School of Education, University of Texas – Brownsville; and Sylvia D. Hall-Ellis. Southwestern Bell Foundation, \$100,000 (1997-1998)

Texas School to Work: Regional Implementation. Developed for Tech Prep of the Rio Grande Valley, Inc. (Harlingen), South Texas Community College (McAllen), Texas State Technical College (Harlingen), Texas Southmost College (Brownsville), Empowerment Zone of the Rio Grande Valley (Mercedes), Project VIDA (Weslaco), Youth Fair Chance (McAllen), and Education Service Center, Region One (Edinburg). Research team: Patricia G. Bubb (PI), Tech Prep of the Rio Grande Valley; Stephen Vassberg, Texas State Technical College; Ellen Trevino, Youth Fair Chance; Wanda Garza, Project VIDA; Leonardo Olivares, University of

Texas – Pan American; Michael Bell, South Texas Community College; and Sylvia D. Hall-Ellis. Texas Workforce Commission, \$4,250,000 (1997-2002).

Comprehensive Bilingual Education Grant for Hidalgo ISD and Roma ISD. Developed for Hidalgo (Texas) ISD, Roma (Texas) ISD, College of Education, University of Texas – Pan American (Edinburg, Texas), and Education Service Center, Region One (Edinburg, Texas). Research team: Tomas Thomas (PI), Director, Office of Bilingual Education and Sylvia D. Hall-Ellis. U.S. Department of Education, Office of Bilingual Education and Minority Languages Affairs, \$1,531,361 (1997-2002)

Lopez High School, Porter High School, Rivera High School, Central Middle School, and Perkins Middle School, Brownsville (Texas) Independent School District. Telecommunications Infrastructure Fund Board, \$1,473,611 (1997-1998)

Donna High School, Todd Middle School, and Solis Middle School, Donna (Texas) Independent School District. Telecommunications Infrastructure Fund Board, \$704,052 (1997-1998)

Memorial Middle School and Nellie Schunior Middle School, La Joya Independent School District (Texas). Telecommunications Infrastructure Fund Board, \$293,641 (1997-1998)

Martin High School, Christen Middle School, Cigarroa Middle School, Lamar Middle School, Laredo (Texas) Independent School District. Telecommunications Infrastructure Fund Board, \$1,200,000 (1997-1998).

Lasara Middle School, Lasara (Texas) Independent School District. Telecommunications Infrastructure Fund Board, \$246,210 (1997-1998)

Los Fresnos High School and Resaca Middle School, Los Fresnos (Texas) Consolidated Independent School District. Telecommunications Infrastructure Fund Board, \$500,000 (1997-1998)

Lyford Junior High School, Lyford (Texas) Independent School District. Telecommunications Infrastructure Fund Board, \$354,997 (1997-1998)

Travis Middle School, McAllen (Texas) Independent School District. Telecommunications Infrastructure Fund Board, \$269,139 (1997-1998)

Mission High School, Mission (Texas) Independent School District. Telecommunications Infrastructure Fund Board, \$297,010 (1997-1998)

Progreso High School, Progreso (Texas) Independent School District. Telecommunications Infrastructure Fund Board, \$300,000 (1997-1998)

San Perlita High School, San Perlita (Texas) Independent School District. Telecommunications Infrastructure Fund Board, \$293,490 (1997-1998)

Myra Green Junior High School, Raymondville (Texas) Independent School District. Telecommunications Infrastructure Fund Board, \$225,000 (1997-1998)

Rio Grande City High School, Ringgold Middle School, Gruella Middle School, Rio Grande City (Texas) Independent School District. Telecommunications Infrastructure Fund Board, \$809,934 (1997-1998)

Rio Hondo Junior High School, Rio Hondo (Texas) Independent School District. Telecommunications Infrastructure Fund Board, \$297,024 (1997-1998)

Roma High School, Roma (Texas) Independent School District. Telecommunications Infrastructure Fund Board, \$333,178 (1997-1998)

San Benito High School, Miller Jordan Junior High School, San Benito (Texas) Consolidated Independent School District. Telecommunications Infrastructure Fund Board, \$547,000 (1997-1998)

Santa Maria High School and Santa Maria Middle School, Santa Maria (Texas) Independent School District. Telecommunications Infrastructure Fund Board, \$400,000 (1997-1998)

Salvador High School, United Independent School District (Laredo, Texas). Telecommunications Infrastructure Fund Board, \$250,879 (1997-1998)

Weslaco High School, Cabaza Middle School, Cuellar Middle School, Weslaco (Texas) Independent School District. Telecommunications Infrastructure Fund Board, \$874,242 (1997-1998)

Principals' Assessment and Training Center. Developed for Education Service Center, Region One (Edinburg, Texas). Research team: Roberto Zamora, Leonel Barrera, William H. Parry, and Sylvia D. Hall-Ellis. Texas Principals' Leadership Initiative, Texas Association of Secondary School Principals, Texas Association of Elementary School Principals, and the Sid Richardson Foundation. \$461,439 (1996-1998)

The Texas Library Connection -- Integrating and Sharing Resources. Developed for Hidalgo County Library System (McAllen), Cameron County Library System (Brownsville), South Texas Community College (McAllen), the University of Texas - Pan American (Edinburg), University of Texas – Brownsville, and Education Service Center, Region One (Edinburg). Research team: William R. McGee, Coordinator, Hidalgo County Library System; Joe Garcia, Director, Cameron County Library System; Michael D. Bell, Library Director, South Texas Community College; Eleanor Folger Foster, University Library, University of Texas - Pan American; Jaime Vela (PI), Director of Instructional Technology and Media Services, Ron Pontius, Instructional Technology, and Fabiola Fuentes, Media Services, Education Service Center, Region One; and Sylvia D. Hall-Ellis. Office of Library Media Services, Technology Services, Texas Education Agency. \$8,000 (1996-1997)

Developing Leadership Communities for Improving Algebra I for All Students. Developed for a partnership of the Region One Statewide Systemic Initiative Team. Research team: Noel Villarreal (PI), Eduardo Cancino, and Sylvia D. Hall-Ellis, Education Service Center, Region One (Edinburg). Texas Statewide Systemic Initiative for Reform in Mathematics, Science and Technology Education to The Charles A. Dana Center for Mathematics and Science Education, The University of Texas at Austin. \$25,000 (1996-1997)

Academics 2000: First Things First -- The Texas Goals 2000. Developed for Edinburg (Texas) CISD. Research team: Hilda Medrano, Dean, College of Education, University of Texas - Pan American (Edinburg); Helen Jones, Director (PI), Gifted and Talented Education, Edinburg CISD; and Sylvia D. Hall-Ellis, Education Service Center, Region One (Edinburg). Texas Education Agency, \$750,000 (1996-2001)

Texas Teachers Empowered for Achievement in Mathematics (TEXTEAM) Institute for Algebra I. Developed for Hidalgo ISD, Jim Hogg (Hebbronville) County ISD, La Joya ISD, La Villa ISD, Lyford ISD, Mission CISD, Pharr-San Juan-Alamo ISD, Rio Hondo ISD, San Isidro ISD, San Perlita ISD, Santa Maria ISD, Santa Rosa, Sharyland ISD, Valley View ISD, Webb (Laredo) CISD, Weslaco ISD, and Zapata County (Zapata) ISD. Research team: Noel Villarreal (PI), Chuck McInteer, Ellen M. Gonzalez, Education Service Center, Region One (Edinburg); and Sylvia D. Hall-Ellis. Charles A. Dana Center for Mathematics and Science Education, University of Texas - Austin, \$15,975 (1996)

Community Learning Center for La Villa, Texas. Developed for Edcouch-Elsa Independent School District. Research team: Noe Gonzalez (PI), Assistant Superintendent, Edcouch-Elsa Independent School District, and Sylvia D. Hall-Ellis. Delta Region Subzone, Rio Grande Valley (Texas) Rural Empowerment Zone, \$325,000 (1996-1997)

Monte Alto (Texas) Community Learning Center. Developed for Monte Alto Independent School District. Research team: Homero A. Diaz (PI), Superintendent, Monte Alto Independent School District, and Sylvia D. Hall-Ellis. Delta Region Subzone, Rio Grande Valley (Texas) Rural Empowerment Zone, \$300,000 (1996-1997)

Community Learning Center for La Villa, Texas. Developed for La Villa Independent School District. Research team: Sam Gonzalez (PI), Assistant Superintendent, La Villa Independent School District; and Sylvia D. Hall-Ellis. Delta Region Subzone, Rio Grande Valley (Texas) Rural Empowerment Zone, \$325,000 (1996-1997)

Building Project for Taylor Elementary. Developed for Mercedes (Texas) Independent School District. Research team: Mrs. Denise Rivera, Librarian, and Eduardo Infante, Principal, Taylor Elementary School; Ismael S. Cantu (PI), Federal Programs Director, Mercedes Independent School District; and Sylvia D. Hall-Ellis. Delta Region Subzone, Rio Grande Valley (Texas) Rural Empowerment Zone, \$375,000 (1996-1997)

Border Education Network (BEN) - Distance Education through Cable Television. Developed for Edinburg (Texas) Consolidated Independent School District. Research team: Noe Torres (PI), Library Media Specialist, Magdalena Rosas, Library Media and Technology Coordinator, Edinburg Consolidated Independent School District; and Sylvia D. Hall-Ellis, Education Service Center, Region One (Edinburg). Edinburg (Texas) Consolidated School District, \$250,000 (1996-1997)

Multiservice One-Stop Open Enrollment Charter School. Developed for the Information Referral Resource Assistance, Inc. (McAllen, Texas). Research team: Pablo Perez and Aguié Pena (PI), Executive Director, Information Referral Resource Assistance, Inc.; Roberto Zamora and Sylvia D. Hall-Ellis, Education Service Center, Region One (Edinburg). Texas Education Agency, \$3,066,000 (1996-2001)

Project OK: A Community Youth Opportunities Grant for Summer, 1996. Developed for McAllen (Texas) Independent School District, St. Joseph the Worker Catholic Church, and the Office of Adult Education, Education Service Center, Region One. Research team: Father Bart Flatt, St. Joseph the Worker Catholic Church; Noe Calvillo (PI), Office of Adult Education; Maria Louisa Garcia, McAllen Independent School District; and Sylvia D. Hall-Ellis, Education Service Center, Region One (Edinburg). Texas Protective and Regulatory Agency through the Office of the Mayor, City of McAllen, \$350,000 (1996-2001).

Early Childhood: a Time of Discovery. Developed for a partnership of Lasara ISD, Rio Hondo ISD, San Perlita ISD, the School of Education, University of Texas - Brownsville, and Education Service Center, Region One (Edinburg). Research team: Hugo Rodriguez, Dean, School of Education, University of Texas - Pan American; Leonel Barrera and Jack Damron, Field Service Agents, Ellen M. Gonzalez (PI), Administrator for Student Instructional Services, Ruth Solis, Education Specialist in Special Education, and Sylvia D. Hall-Ellis, Education Service Center, Region One (Edinburg). Texas Education Agency, \$722,090 (1996-2001)

Innovative Gifted and Talented Programs for Early Childhood and Elementary Education Students. Developed for a partnership of Edinburg (Texas) CISD, the School of Education, University of Texas - Pan American (Edinburg), and Education Service Center, Region One (Edinburg). Research team: Hilda Medrano, Dean, School of Education, University of Texas - Pan American; Helen de la Garza (PI), Director of Elementary Curriculum and Instruction, Edinburg CISD; and Sylvia D. Hall-Ellis. Texas Education Agency, \$750,000 (1996-2001)

Reading Recovery in Early Elementary Grades. Developed for a partnership of La Villa (Texas) ISD the School of Education, University of Texas - Pan American (Edinburg), and Education Service Center, Region One (Edinburg). Research team: Hilda Medrano, Dean, School of Education, University of Texas - Pan American; Marcario Salinas (PI), Supervisor of Elementary Curriculum and Instruction, La Villa ISD; and Sylvia D. Hall-Ellis, Education Service Center, Region One. Texas Education Agency, \$750,000 (1996-2001)

Connected Mathematics Project for Middle and Junior High Students. Developed for a partnership of Michigan State University, The Charles A. Dana Center for Mathematics and Science Education, The University of Texas at Austin and Region One Statewide Systemic Initiative Team. Research team: Jack Damron, Chuck McInteer, Noel Villarreal (PI), and Sylvia D. Hall-Ellis, Education Service Center, Region One (Edinburg). National Science Foundation through Michigan State University to the Charles A. Dana Center at the University of Texas - Austin, \$539,610 (1996-1999)

Sharing Resources: Testing the Interlibrary Loan Potential of the Texas Library Connection -- Integrating Media Resources. Developed under the sponsorship of the Hidalgo County Library System (McAllen) and Education Service Center, Region One (Edinburg). Research team: William H. McGee, Hidalgo County System Coordinator; Fabiola Fuentes, Library Media; Ronald Pontius (PI), Instructional Technology, Education Service Center, Region One; and Sylvia D. Hall-Ellis. Library Media Services Program, Office of Technology Services, Texas Education Agency, \$25,000 (1996-1997)

State and Federal Adult Education JOBS Program. Developed for Education Service Center, Region One (Edinburg). Research team: Noe Calvillo (PI), Director, Adult Education Program, and Sylvia D. Hall-Ellis. Adult Education Program, Texas Education Agency, \$532,846 (1995-1996)

Creating Safe and Drug-Free Schools and Communities. Developed for a partnership of the Region One Consortium for Safe and Drug-Free Education Environments. Research team: Clara Contreras (PI), Health Specialist, and Sylvia D. Hall-Ellis, Education Service Center, Region One (Edinburg). Texas Education Agency, \$150,000 (1995-1996)

Developing Leadership Communities for Improving Mathematics Performance for All Students on Title I Campuses. Developed for a partnership of the Region One Statewide Systemic Initiative Team. Research team: Jack Damron, Chuck McInteer, Noel Villarreal (PI), and Sylvia D. Hall-Ellis, Education Service Center, Region One (Edinburg). Texas Statewide Systemic Initiative for Reform in Mathematics, Science and Technology Education to The Charles A. Dana Center for Mathematics and Science Education, The University of Texas at Austin, \$50,669 (1995-1996)

The Impact of Library Resource Centers on Academic Achievement in Selected Public Schools in South Texas. Sylvia D. Hall-Ellis (PI). Developed under the sponsorship of the Department of Library Science, College of Education and Applied Science, Sam Houston State University (Huntsville). Texas Association of School Librarians, Children's Services Round Table, and Young Adults Round Table (Austin, Texas), \$2,500 (1995)

School Library Media Specialists Fellowship Program. Sylvia D. Hall-Ellis (PI). Developed under the sponsorship of the Department of Library Science, College of Education and Applied Science, Sam Houston State University (Huntsville, Texas). U.S. Department of Education, HEA Title II-B, Library Education and Human Resource Development Program, \$44,000 (1995-1996)

Planning for Educational Technology. Research team: Ruth Ann Riggins (PI), Director of Library Media and Technology Services, Donna (Texas) Independent School District; Noe Torres, Education Service Center, Region One; Patricia G. Bubb, Tech Prep of the Rio Grande Valley, Inc; Michael D. Bell, South Texas Community College; and Sylvia D. Hall-Ellis, Sam Houston State University. Developed under the sponsorship of Donna (Texas) Independent School District, Education Service Center, Region One (Edinburg), Tech Prep of the Rio Grande Valley, Inc. (Harlingen), South Texas Community College (McAllen), and the Department of Library Science, Sam Houston State University (Huntsville). Funded through Infusion of Educational Technology Planning Grant Program (H.B. 18: Models). Texas Education Agency, \$18,000 (1993-1994)

The Impact of Library Resource Centers on Academic Achievement in Selected Public Schools in South Texas.

Sylvia D. Hall-Ellis (PI) and Mary Ann Berry. Developed under the sponsorship of the Department of Library Science, College of Education and Applied Science, Sam Houston State University (Huntsville). Sam Houston State University Research Enhancement Fund, \$7,500 (1993-1994)

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State Library of Iowa, \$294,000 (1986-1993)

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Iowa, \$5,000 (1985)

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of Pennsylvania, \$125,000 (1982)

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Appalachian Regional Commission, \$50,000 (1981)

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System (Binghamton), and the Southern Tier Library System (Corning). New York State Library, \$450,000 (1980-1985)

Faces of the Southern Tier: A Professional Photographer-in-Residence. New York State National Endowment for

the Humanities, \$25,000 (1980)

Literacy Program for Adults in Rural Upstate New York State: Program Implementation - Phase 2. Appalachian

Regional Commission, \$50,000 (1980)

Small Business Resources Center: A Pilot Project for Rural Public Libraries. New York State Library, \$50,000

(1980)

Media Programming: A Professional Development Program for Public Librarians in Upstate New York: A Program

in Allegheny, Chemung, Schuyler, Steuben, and Yates Counties. New York State Library, \$35,000 (1979)

Information and Library Resources for Inmates and Prisoners in Selected Upstate New York Facilities: A

Cooperative Program in Allegheny, Chemung, Schuyler, Steuben, and Yates Counties. New York State Library, \$25,000 (1979)

Library Resources for Homebound Adults in Upstate New York: An Outreach Program in Allegheny, Chemung, Schuyler, Steuben, and Yates Counties. New York State Library, \$40,000 (1979)

Literacy Program for Adults in Rural Upstate New York State: Program Initiation and Establishment - Phase 1. Funded by the Appalachian Regional Commission. Awarded to the Corning (New York) Public Library, \$50,000 (1979)

Information Reference Services to Homebound Adults. New York State Library, \$31,000 (1978)

Books-By-Mail Services to Homebound Adults. New York State Library, \$31,000 (1978)

System Headquarters Services and Programs for Public Libraries in District 10. Funded through Library Services and Construction Act Title I. Texas State Library and Historical Commission, \$880,000 (1976)

County Library Development Grant for Atascosita County. Funded through Library Services and Construction Act Title I. Texas State Library and Historical Commission, \$15,000 (1976)

Spanish Language Materials Collection Development Program. Texas State Library and Historical Commission, \$40,000 (1975)

Establishment of System Headquarters for Alamo Regional Library System (District 10) Headquartered at the San Antonio (Texas) Public Library. Texas State Library and Historical Commission, \$800,000 (1975)

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Colorado Community Based Research Network (Denver), Funding Research Associate, 2002.

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Southeastern BOCES (Lamar, CO). Distance Learning Curriculum Content Development Project. Proposal Development Consultant, 1998-2004.

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Telecommunications Infrastructure Fund Board Round #2 Application, 1997. Technical assistance to the following: La Villa (Texas) Independent School District; Mirando City (Texas) Independent School District; Monte Alto (Texas) Independent School District; San Isidro (Texas) Independent School District.

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La Joya (Texas) Independent School District; La Villa (Texas) Independent School District; Los Fresnos (Texas) Consolidated Independent School District; Progreso (Texas) Independent School District; Raymondville (Texas) Independent School District; Rio Hondo (Texas) Independent School District; San Benito (Texas) Independent School District; Sharyland Independent School District (Mission, Texas); Weslaco (Texas) Independent School District; Zapata (Texas) County Independent School District.

South Texas Community College (McAllen). Strategy Development to Meet the Technology Instructional Needs for Vocational, School-To-Work and Academic Programs, 1994-2000. Development Consultant.

Donna (Texas) Independent School District. Planning for the Infusion of Technology in Middle Schools Serving High At-Risk Students, 1994-1995. Research Associate.

Pettus (Texas) Independent School District. Planning for District-wide Automation in School Library Media Centers: Preparation of Data, and CD-ROM Hardware/Software Configuration Evaluation, 1994. Principal Investigator.

Fort Bend Independent School District (Sugar Land, TX). Planning for District-wide Automation in School Library Media Centers, Preparation of Data, and CD-ROM Hardware/Software Configuration Evaluation, 1994-1995. Principal Investigator.

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State Library of Iowa (Des Moines). The Iowa Locator Compact Disc to Support Multi-Type Libraries Resource Sharing including Database Design, Building, Production, and Distribution, 1986-1991. Project Director.

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State Library of South Dakota (Pierre). Statistical Sampling and Analysis of Multi-Institutional OCLC Archive Tape for Statewide Online Database Building, 1985-1986. Research Associate.

District of Columbia Public Library (Washington, DC). Planning Document for the Retrospective Conversion of Bibliographic Records and Automation Issues in the 1990's, 1984-1985. Research Associate.

State Library of Pennsylvania (Harrisburg). Database Development for High School Libraries, 1984-1985. Research Associate.

MINITEX (Minneapolis, MN). Workshops for Retrospective Conversion, Bar Coding, Library Statistics, and OCLC Serials Format, 1985. Presenter and Research Associate.

ABC Film Consortium (Altoona, Bellefonte, Johnstown, PA). Database Building, System Design, and Implementation of Online Film Booking System, 1983-1985. Database Manager.

Library Automation -- System Design & Implementation

Douglas County Library District (Castle Rock, CO). Library Automation Technical and System Performance Specifications, 2001.

Pharr-San Juan-Alamo Independent School District (Pharr, TX). Library Automation Technical and System Performance Specifications, 1997. Project Development Consultant.

Harlingen (Texas) Independent School District. Planning for District-wide Automation in Junior High School Library Media Centers: Preparation of Data, and CD-ROM Hardware/Software Configuration Evaluation, 1996. Principal Investigator.

Sharyland (Texas) Independent School District. Design and Construction of New Elementary School Library and Technology Resources Center, 1995-1996. Principal Investigator.

South Texas Independent School District (Mercedes, TX). Design and Construction of a New High School Library and Technology Resources Center, 1995-1996. Principal Investigator.

Citizens' Library (Washington, PA). Online Community Resources Files: Design and Implementation, 1984. Research Associate.

Altoona (Pennsylvania) Hospital. Integrated Online System Upgrade Study, 1984. Research Associate.

State Library of South Dakota (Pierre). Automation Plan and State Database Development, 1982-1983. Principal Investigator.

State Library of Pennsylvania (Harrisburg). COM Production and Preparation of the Technical Specifications Document, Procurement, and Distribution of Microcomputers in the Commonwealth of Pennsylvania, 1983-1984. Research Associate.

Altoona (Pennsylvania) Area Public Library. Integrated System (Circulation/Online Catalog) Study, 1982-1983. Principal Investigator.

COPSCAULD (Council of Pennsylvania State College and University Library Directors, Edinboro, PA). Design of Online Media Catalog, 1982. Principal Investigator.

Erie (Pennsylvania) County Library System. Operations Research and Design for Automated Circulation, Hardware Upgrade and Re-Retrospective Conversion, 1982. Research Associate.

Michigan Library Consortium (Lansing, MI). Tape Management System Design and Implementation, 1982-1984. Research Associate.

State Library of Pennsylvania (Harrisburg). Preparation of the Technical Specifications Document, Procurement and Distribution of Microfiche Readers in the Commonwealth of Pennsylvania, 1982. Research Associate.

Community College of Allegheny County, Allegheny Campus (Pittsburgh, PA). Integrated Systems Study, 1981. Principal Investigator.

Community College of Allegheny County, South Campus (West Mifflin, PA). Retrospective Conversion Training Program for Handicapped Students, 1981. Technical Director.

Southern Tier Library System (Corning, NY). OCLC Acquisitions Subsystem Evaluation, 1981. Principal Investigator.

South Central Reference and Research Council (Ithaca, NY). South Central Regional Delivery System, 1980. Principal Investigator.

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Cataloging & Bibliographic Database Building

Challenges, Choices, and Images K-12 Charter School, Denver Public Schools, 2007.

Denver Medical Library, Inc., 2006-2010.

Ricks Gifted and Talented School Library, 2005-

American Humane Society (Englewood), 2004-2006.

Fisher Early Learning Center Library, 2004-

Colorado Community Based Research Network (Denver), 2004-

Boulder Valley School District (Boulder), 2002-2003.

Douglas Public Library District (Castle Rock), 2001-2002.

Bibliographic Center for Research, Inc. (Denver). Original Cataloging, 2001-2003 & 1992-1993. Professional Cataloger. Libraries include Arapahoe Library District (Centennial); Clarke College (Clarke, IA); Kaiser Permanente Center for Health Research (Portland, KS); Douglas County Library System (Carson City, NV); Grinnell College (Grinnell, IA); Kansas State University (Manhattan, KS); Kansas State Library (Topeka, KS); McPherson College (McPherson, KS); Newman University (Wichita, KS); Montana Technical University (Helena, MT); Montana State Library (Helena, MT); University of Texas Southwest Medical Center Library (Dallas, TX); Community College of Southern Nevada (Las Vegas, NV); Pikes Peak Library District (Colorado Springs); Mesa Community College (Grand Junction); Coe College (Cedar Rapids, IA); Briar Cliff College (Sioux City, IA); Tri-Care Health Systems (Aurora); The Penrose-St. Francis Healthcare System (Colorado Springs); Westminster Public Library (Westminster); Lutheran Medical Center Medical Library (Wheat Ridge); American Heritage Center, University of Wyoming (Laramie, WY); National Wildlife Research Center Library (Lakewood); University of Colorado Health Sciences Center, Denison Memorial Library (Denver); Water Resources Library, Denver District Office, Bureau of Land Management (Lakewood); Mesa State Community College Learning Resources Center (Pueblo); Front Range Community College Learning Resources Center (Westminster).

Colorado Historical Society Library (Denver). Original Cataloging of Serials for Multi-Institutional Union Listing Project, 1993. Technical Services Associate. Institutional partners: Denver Art Museum, Denver Museum of Natural History Library, and Denver Botanical Gardens Library.

Arapahoe Library District (Centennial). Original Cataloging of Major Media, 1991.

Original Cataloging Projects: Davis and Elkins College (Elkins, WV), 1989-1990; Waldorf College (Forest City, IA), 1989-1990; Kennametal Corporation (Latrobe, PA), 1984-1985; Pennsylvania Public Libraries Film Center (Harrisburg), 1982-1985.

Retrospective Conversion Projects: North Central Regional Library Service (Mason City, IA), 1987-1988; Southeastern Library Services (Davenport, IA), 1986-1987; Virginia Theological Seminary (Alexandria), 1984-1985; California University of Pennsylvania (California, PA), 1984-1985; Kennametal Corporation (Latrobe, PA), 1984-1985; West Virginia University (Morgantown), 1983-1985; Altoona Area Public Library (Altoona, PA), 1983-1984; George Washington University (Washington, DC), 1983-1984; Indiana University of Pennsylvania (Indiana, PA), 1983-1985; Health Education Center (Pittsburgh), 1983-1984; Central Pennsylvania District Library Center (Bellefonte, PA), 1982-1985; Duquesne University Law School Library (Pittsburgh), 1982-1983; Allegheny County Law Library (Pittsburgh), 1982-1984; Calgon Technical Information Center (Pittsburgh), 1982; Dow Corning Corporation, Technical Information Center (Midland, MI), 1982-1983; Tri-System Public Library Retrospective Conversion Project (Binghamton, Corning, and Ithaca, NY), 1978-1981, Technical Project Director.

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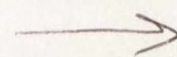
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EFFECTS OF VARIOUS PLANTERS ON EMERGENCE AND SEED DISTRIBUTION UNIFORMITY OF SUNFLOWER

A. Celik, I. Ozturk, T. R. Way

ABSTRACT. *In this study, four different type seeders were evaluated for seed spacing, depth uniformity, and plant emergence at three forward speeds (3.6, 5.4, and 7.2 km h⁻¹). The planter types were: no-till planter, precision vacuum planter, universal planter, and semi-automatic potato planter. The sowing uniformity of the horizontal distribution of seeds was described by using the multiple index, the miss index, the quality of feed index, and the precision in addition to the means and standard deviations of the sample methods. Uniformity of planting depth of seeds was described using the mean, standard deviation and the coefficient of variation of the sample methods. Plant emergence ratios were evaluated by mean emergence time, emergence rate indexes, and emergence percentage. The best seed spacing uniformity and seed emergence ratio were obtained with the no-till planter, and the best seed depth uniformity was obtained with the precision vacuum planter. Forward speed significantly affected only the mean emergence time ($P < 0.05$). As forward speed increased, mean emergence time decreased.*

Keywords. *Planters, Seeders, Sunflower, Seed distribution, Emergence.*

The main objective of seeding is to put seeds at a desired depth and spacing within the row. Uniform seed spacing and depth result in better germination and emergence and increase yield by minimizing competition between plants for available light, water, and nutrients (Griepentrog, 1998; Karayel and Ozmerzi, 2002). The quality of horizontal and vertical distribution of seeds is influenced by row spacing, sowing depth, soil conditions, seeder design, seed density, and operator skill (Griepentrog, 1998).

The mean spacing ($\bar{X}$), the standard deviation of the spacing between plants (SD), and the coefficient of variation (CV) are commonly used for describing seed spacing uniformity. The mean spacing is influenced by seed or plant density and longitudinal distribution. For common grain drills, a CV of 20% is an acceptable accuracy achieved by mechanical and pneumatic machines when they are performing well (Griepentrog, 1998).

The mean spacing and the standard deviation of the seed spacing are useful but do not completely characterize the distribution of plant spacing for single seed planters. The multiple index, the miss index, the quality of feed index, and the precision should be considered in addition to the mean and standard deviation of the seed spacing, because the

distance between plants within a row is influenced by a number of factors including multiple seeds dropped at the same time, failure of a seed to be dropped, failure of seeds to emerge, and the variability around the drop point (Kachman and Smith, 1995).

Karayel and Ozmerzi (2002) stated that the best sowing uniformity, the most uniform sowing depth, and maximum emergence percentage occurred when a precision seeder was used after preparing the soil with a moldboard plow, disc harrow, and roller. Different tilling conditions had no effect on the multiple index, the miss index, and the quality of feed index.

Jasa and Dickey (1982) showed that relative surface roughness, amount of residue present, level of preplant tillage, and tillage system were important factors affecting corn seed spacing uniformity in 100 Nebraska fields using nine brands and 35 models of planters. They also concluded that no-till planting could provide at least as uniform a seed spacing as other tillage systems and found that seed spacing uniformity was not affected by planter forward speed, which ranged from 4.8 to 11.2 km/h.

Panning et al. (2000) evaluated sugar beet planting performance for a precision planter designed for shallow planting of small seeds, a general purpose planter designed for row crops, and a vacuum metering general purpose planter designed for row crops that was equipped with three seed tube designs. In their field study, the most uniform seed spacing for each planter configuration occurred at the lowest speed, which was 3.2 km/h. For all planter configurations, the seed spacing uniformity decreased as the forward speed increased from 3.2 to 8.0 km/h. Seed spacing uniformity determined in laboratory tests was greater than, or equal to, seed spacing uniformity determined in field tests.

A sunflower planter was developed by attaching an inclined plate metering mechanism for larger seeds to an existing nine-row seed-cum fertilizer drill (Chauhan et al., 1999). Mean seed spacings were affected only slightly by forward speed, as the means were 28.6, 29.7, and 29.6 cm for forward speeds of 2, 3.5, and 5 km/h, respectively. The

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coefficients of variation were 6.5%, 5.9%, and 8.7% for the travel speeds of 2, 3.5, and 5 km/h, respectively, so the variation in seed spacing was lowest at the intermediate speed of 3.5 km/h, and greater at 2 and 5 km/h.

Effects of plant spacing uniformity on sunflower yield in Minnesota were determined by Robinson et al. (1982). Uniformly spaced single plants lodged the least, produced heads of lowest moisture content at harvest, gave the greatest seed yield, and greatest seed oil content. Yield reductions from uneven plant distributions ranged from 0 to 31% and averaged 10%.

An inclined plate planter was evaluated for metering peanut seeds using planting speeds of 1.6, 3.2, and 4.8 km/h (Chhinnan et al., 1975). As planter speed increased, the average seed spacing increased and the seed placement index increased, meaning the uniformity of seed spacing decreased.

The objectives of this study were to compare sunflower seed spacing and depth uniformity of four different types of planters and three forward speeds and to determine effects of planter type and forward speed on seed emergence under field conditions.

MATERIALS AND METHODS

This study was conducted at the Research and Application Land of General Directorate of Rural Services Erzurum Research Institute, Erzurum, Turkey. The experiment was designed as a randomized complete block with plots 40 m long and 10 m wide. Some physical properties of the experimental field are given in table 1. Four different types of planters and three forward speeds were considered as treatments and three replications were used. The four planter types were a precision vacuum planter (Hassia Unisem, Hassia Maschinenfabrik GmbH, Butzbach, Hessen, Germany), a no-till planter (Amazonen NT 250, Amazonen-Werke H. Dreyer GmbH & Co., Hasbergen, Germany), a universal planter (Amazonen D8-30 Special, Amazonen-Werke H. Dreyer GmbH & Co., Hasbergen, Germany), and a semi-automatic potato planter (locally manufactured in Turkey). Schematic drawings of the planters are shown in figure 1 and some characteristics of the planters are given in table 2. Except for no-till planting, preplanting tillage was performed using a rotary tiller after harvesting wheat.

No-till planters, precision vacuum planters, and universal planters are general-purpose planters designed for row crops. Semi-automatic potato planters are used by farmers in the study region for both potato and sunflower planting. The seed metering system on each planter was adjusted for a target seed spacing of 0.4 m in the row and 0.7 m between rows. The average vacuum level, hole diameter, and hole spacing in the metering disk for the vacuum planter was 6 kPa, 3.5 mm, and 12°, respectively. The planting rate was 5.3 kg ha⁻¹. The target seed depth was 40 mm for sunflower seeds.

Sunflower seeds were of the snack variety. The weight of 1000 seeds, purity, and the germination rate were 148 gm, 95%, and 96%, respectively. Each planter was operated at three forward speeds (3.6, 5.4, and 7.2 km h⁻¹). The lowest speed was recommended for best seed spacing uniformity, while the highest speed was generally preferred by producers (Panning et al., 2000).

Spacing measurements were performed on a 5-m length of row on at least four rows in each plot, after each plot was planted. Seed spacing was measured following both seeding and emergence. Soil was carefully removed from above the seeds with a flat knife and seed spacing and depth were then measured with a measuring tape. After plant emergence, the spacing was measured again. Seedling counts were made 10, 13, 16, 19, and 22 days after sowing, on 5-m lengths of row in four rows.

The multiple index, the miss index, the quality of feed index, the precision, and the mean and standard deviation of plant spacing were used to quantify the distribution of plant spacing. The multiple index (MULI) is the percentage of occasions where seed spacing was less than or equal to half of the theoretical spacing. The miss index (MISI) is the percentage of occasions where seed spacing was greater than 1.5 times the theoretical spacing. Quality of feed index (QTFI) is the percentage of occasions where seed spacing was more than half but no more than 1.5 times the theoretical spacing and is a measure of the percentage of single seed drops. Precision (PREC) is a measure of the variability in spacing between plants after accounting for variability due to dropping more than one seed at a time and not dropping a seed.

Mean emergence time (MET), emergence rate indexes (ERI), and percentage of emergence (PE) were determined using the following equations (Karayel and Ozmerzi, 2002);

$$MET = (N_1 T_1 + N_2 T_2 + \dots + N_n T_n) / (N_1 + N_2 + \dots + N_n) \quad (1)$$

$$ERI = S_{te} / MET \quad (2)$$

$$PE = 100\% \times S_{te} / n \quad (3)$$

where

$N_{1...n}$ = number of seedlings emerging since the time of previous count

$T_{1...n}$ = number of days after sowing

S_{te} = number of total emerged seedlings per meter

N = number of seeds sown per meter.

Data were analyzed using the SAS statistical software package (SAS Institute Inc., Cary, N.C.). The ANOVA procedure was used to perform the analysis of variance, which was appropriate for a randomized complete block design. Means were compared using Duncan's multiple range tests. Statistical significance was evaluated at the $P < 0.05$ level.

RESULTS AND DISCUSSION

Effects of planters and forward speeds on seed spacing uniformity, depth uniformity, and seed emergence ratios

Table 1. Soil physical properties for the 0- to 0.1-m depth range.

Physical Property	Value
Bulk density (Mg m ⁻³)	1.43
Porosity (%)	46.1
Moisture content (% d.b.)	17.8
Penetration resistance (MPa)	0.931
Textural class	Sandy clay loam
Soil particular size < 8 mm (%)	61.82

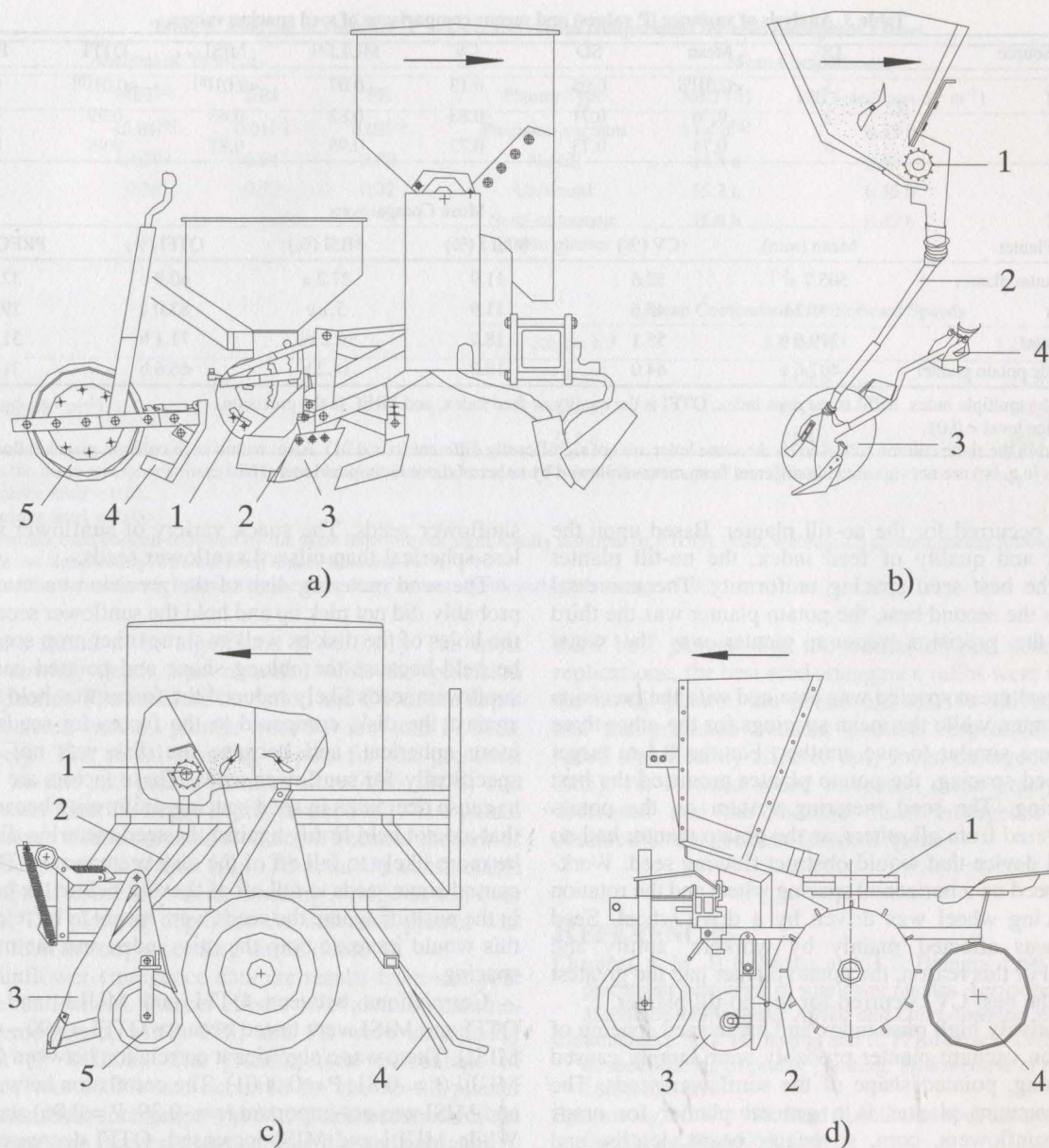


Figure 1. Side views of planters: (a) precision vacuum planter, (b) universal planter, (c) no-till planter, (d) semi-automatic potato planter (1-metering unit, 2-seed drop tube, 3-furrow opener, 4-coverer, 5-press wheel; arrow denotes direction of travel).

were evaluated considering all the parameters. The results of the statistical analysis are given in tables 3 to 5. The results of the analysis on seed spacing uniformity indicated that the planters' effect on the mean seed spacing, standard deviation, miss index, and quality of feed index were statistically significant ($P < 0.05$). On the contrary, coefficient of variation, multiple index, and precision were not influenced by the planter type. The effects of forward speed and forward

speed $\times$ planter interactions were not statistically significant for all parameters except MET. This lack of a significant effect of forward speed on seed placement is contrary to most literature and may have resulted from greater variability in the seed placement, compared to experiments reported in the literature. The smallest mean of the miss index, indicating the smallest percentage of seed spacings that were greater than the theoretical spacing, and the largest mean of quality of

Table 2. Specification of planters used for sunflower seeding.

Specification	Planter Type			
	Precision Vacuum (Hassia)	No-till (Amazonen)	Universal (Amazonen)	Semi-automatic Potato Planter
Number of rows	4	4	4	2
Spacing between rows (m)	0.70	0.76	0.70	0.70
Seed metering device	Seed cell wheel	Studded seed roller	Studded seed roller	Horizontal spacing wheel
Furrow opener type	Shoe	Hoe	Disc couler	Disc couler
Weight per row unit (kg)	188	350	93	60

Table 3. Analysis of variance (P values) and means comparisons of seed spacing values.

Source	DF	Mean	SD	CV	MULI ^[a]	MISI	QTFI	PREC
Planter (P)	3	<0.01 ^[b]	0.05	0.13	0.07	<0.01 ^[b]	<0.01 ^[b]	0.07
Speed (S)	2	0.76	0.71	0.83	0.83	0.63	0.99	0.85
P × S	6	0.74	0.73	0.73	0.95	0.81	0.98	0.86

Mean Comparisons

Planter	Mean (mm)	CV (%)	MULI (%)	MISI (%)	QTFI (%)	PREC (%)
Precision vacuum planter	505.7 a ^[c]	52.6	11.9	27.2 a	60.9 b	32.9
No-till planter	381.2 b	45.6	11.9	5.1 c	83.0 a	29.7
Universal planter	379.6 b	55.1	18.7	10.2 bc	71.1 b	31.4
Semi-automatic potato planter	407.6 b	64.0	19.3	14.2 b	66.6 b	31.9

^[a] MULI is the multiple index, MISI is the miss index, QTFI is the quality of feed index, and PREC is the precision.

^[b] Significance level < 0.01.

^[c] Means within the same column followed by the same letter are not significantly different ($\alpha = 0.01$). Also, within each column, means followed by two letters (e.g. bc) are not significantly different from means followed by either of those individual letters (b or c).

feed index occurred for the no-till planter. Based upon the miss index and quality of feed index, the no-till planter produced the best seed spacing uniformity. The universal planter was the second best, the potato planter was the third best, and the precision vacuum planter was the worst (table 3).

The largest mean spacing was obtained with the precision vacuum planter, while the mean spacings for the other three planters were similar to one another. For the 0.4-m target value of seed spacing, the potato planter produced the best mean spacing. The seed metering system on the potato planter differed from all others, as the potato planter had no mechanical device that would obstruct flowing seed. Workers placed seed on a horizontal spacing wheel and the rotation of the spacing wheel was driven by a drive wheel. Seed metering was affected mainly by workers' ability and durability. For this reason, the potato planter had the greatest CV while the best CV occurred for the no-till planter.

The relatively high miss index and mean seed spacing of the precision vacuum planter probably were largely caused by the oblong, pointed shape of the sunflower seeds. The precision vacuum planter is a general planter for crops including sunflowers, corn, soybeans, beans, lentils, and chickpeas. The seed metering disk that was used in the precision vacuum planter was recommended for use with various crop seeds and was not specifically for only sunflower seeds. Sunflower seeds are oblong and typically have one end that is more pointed than the other end. They are considerably less spherical than soybean seeds and are typically more oblong than corn seeds. Also, the sunflower seeds used in this experiment were of the snack variety, and they are typically longer and larger overall than oilseed

sunflower seeds. The snack variety of sunflower seeds are less spherical than oilseed sunflower seeds.

The seed metering disk of the precision vacuum planter probably did not pick up and hold the sunflower seeds against the holes of the disk as well as some other crop seeds would be held because the oblong shape and pointed ends of the sunflower seeds likely reduced the forces that held the seeds against the disk, compared to the forces for seeds that are more spherical, and because the disk was not designed specifically for sunflower seeds. These factors are expected to cause decreases in seed spacing uniformity because seeds that are not held firmly against the seed metering disk would be more likely to fall off of the disk prematurely. This likely caused some seeds to fall off of the disk before the holes were in the position where the seeds were meant to be released and this would increase both the miss index and the mean seed spacing.

Correlations between QTFI and MULI, and between QTFI and MISI were tested because $QTFI = 100 - (MULI + MISI)$. There was a significant correlation between QTFI and MULI ($r = -0.81$; $P = 0.0001$). The correlation between QTFI and MISI was not important ($r = -0.39$; $P = 0.06$) statistically. While MULI and MISI increased, QTFI decreased. QTFI, MULI, and MISI were calculated as proportions. Such data need transformations to make the distribution more symmetric. After applying a square root transformation to these parameters, statistical analysis was performed (Schabenberger, 1996).

While the seed depth uniformity was significantly affected by planter type, the forward speed and forward speed × planter interaction's effects on the depth were not significant. The mean and standard deviation of the sowing

Table 4. Analysis of variance (P values) and means comparisons of seed depth uniformity.

Analysis of Variance					Mean Comparisons			
Source	DF	Mean	SD	CV	Planter Type	Mean (mm)	SD (mm)	CV (%)
Planter (P)	3	<0.01 ^[a]	<0.01 ^[a]	0.07	Precision vacuum	58.0 b ^[b]	9.8 b	17.1
Speed (S)	2	0.29	0.79	0.79	No-till	48.5 b	11.5 b	23.8
P × S	6	0.76	0.69	0.78	Universal	33.6 c	12.4 b	41.3
Error	12				Semi-automatic potato planter	102.8 a	29.9 a	30.0

^[a] Significance level < 0.01.

^[b] Means within the same column followed by the same letter are not significantly different ($\alpha = 0.05$).

Table 5. Analysis of variance (P values) and means comparisons for seed emergence values.

Analysis of Variance				Mean Comparisons			
Source	MET ^[a]	ERI	PE	Planter Type	MET (d)	ERI (seedlings d ⁻¹ m ⁻¹)	PE (%)
Planter (P)	<0.01 ^[b]	0.01 ^[c]	0.02 ^[c]	Precision vacuum	14.4 d ^[d]	0.33 b	58.5 b
Speed (S)	0.02 ^[c]	0.64	0.89	No-till	14.8 c	0.55 a	86.7 a
P × S	0.38	0.52	0.72	Universal	15.3 a	0.35 b	67.5 b
				Semi-automatic potato planter	15.0 b	0.42 b	71.3 ab

Mean Comparisons for Forward Speeds			
	3.6 km h ⁻¹	5.4 km h ⁻¹	7.2 km h ⁻¹
MET (d)	15.0 a ^[e]	14.8 b	14.8 b
ERI (seedlings d ⁻¹ m ⁻¹)	0.38 a	0.43 a	0.42 a
PE (%)	72.5 a	71.4 a	69.2 a

^[a] MET is the mean emergence time, ERI is the emergence rate indexes, and PE is the percentage of emergence.

^[b] Significance level < 0.01.

^[c] Significance level < 0.05.

^[d] Means within each column followed by the same letter are not significantly different ($\alpha = 0.05$). Also, within each column, means followed by "ab" are not significantly different from means followed by "a," "b."

^[e] Means within the same row followed by the same letter are not significantly different ($\alpha = 0.05$).

depth were found to be significant ($P < 0.01$). The most uniform sowing depth was obtained with the precision vacuum planter. The standard deviation and CV of the depth of the precision vacuum planter were 9.8 mm and 17.08%, respectively. The actual planting depths for the precision vacuum, no-till, and potato planters were 45%, 21%, and 157% greater than the target depth, respectively. The potato planter caused a much greater seed depth because the pair of disks at the rear of the planter (fig. 1) deposited a considerable amount of soil above the seeds, forming a ridge of soil over the seeds. The planting depth for the universal planter was 16% less than the target seeding depth (table 4).

The sunflower emergence data are results from one year and three replications. Planter effects on evaluation parameters for emergence, MET, ERI, and PE were statistically important ($P < 0.05$). The greatest total percentage of emergence was 86.7% and occurred for the no-till planter while the smallest emergence was 58.5% and occurred for the precision vacuum planter. Planter forward speed was statistically important ($P < 0.05$) only for MET. While forward speed increased, MET decreased. Interactions between planters and forward speeds for MET, ERI, and PE were not important. The greatest total percentage of ERI was found with 5.4-km h⁻¹ speed while the smallest was found with 3.6 km h⁻¹. As forward speed increased, PE decreased (table 5).

CONCLUSIONS

The type of planter used for planting sunflower seed was found to be important in affecting the miss index, the quality of feed index, the mean seed spacing, the standard deviation, the mean emergence time, the emergence rate indexes, and the percentage of emergence ($P < 0.05$). The analysis of factors affecting seed spacing uniformity indicated that the best seed spacing uniformity results were obtained with a no-till planter. A universal planter was the second best, and a potato planter was the third best planter. Contrary to the seed spacing uniformity results, the best depth uniformity was obtained with a precision vacuum planter. The no-till planter was the second best and the potato planter was the

third best planter. For the results of one year and three replications, the best seed emergence ratios were achieved by the no-till planter, the potato planter, the universal planter, and the precision vacuum planter, respectively. Forward speed significantly affected only mean emergence time ($P < 0.05$). As forward speed increased mean emergence time decreased and the shortest mean emergence time was obtained at the greatest forward speed.

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CORN SEED SPACING UNIFORMITY AS AFFECTED BY SEED TUBE CONDITION

M. F. Kocher, J. M. Coleman, J. A. Smith, S. D. Kachman

ABSTRACT. Variation in corn seed spacing from a John Deere MaxEmerge™ Plus Vacumeter planter was evaluated on the University of Nebraska Planter Test Stand in a laboratory setting for two seed tube conditions (new or worn) with two examples of corn seed shape (round or flat). Seed spacing uniformity was measured using three seed spacing uniformity parameters: Coefficient of Precision (CP3), ISO Multiples index, and ISO Miss index.

Differences were detected in all three seed spacing uniformity parameters due to the seed tube condition. The new seed tubes had better seed spacing uniformity than the worn seed tubes, within each example of the seed shapes (round or flat) used in this experiment. For the seed used in this experiment, the round corn seed had better seed spacing uniformity than the flat corn seed, within each of the seed tube conditions (new or worn).

A recommended schedule for seed tube replacement to maintain seed spacing uniformity has not been developed, and more research in this area is needed. Currently, sugarbeet growers in western Nebraska use one of three options: a) test one of their seed tubes on a good planter test stand every year before sugarbeet planting season and replace all tubes when results indicate it will improve seed spacing uniformity to the desired level; b) feel the inside front surface of the seed tube every year before sugarbeet planting season and change seed tubes when the feel of the surface changes from a slick plastic to a very fine sandpaper; or c) replace seed tubes before sugarbeet planting season when they have planted over approximately 150 acres of corn per planter row with their current seed tubes.

Keywords. Corn, Planters, Seed drop tube, Seed shape, Seed spacing, Uniformity.

In 2003 in the United States, 31.6 million ha (78.1 million acres) of corn were planted for grain (USDA National Agricultural Statistics Service, 2003). Improving yields has been an important issue since the beginning of corn production. In recent years some research has focused on the uniformity of seed spacing as a way of improving yields. Nielsen (1996) indicated that improperly adjusted or malfunctioning planter mechanisms are the most frequent cause of uneven stand establishments in corn.

RELATIONSHIP OF CORN YIELDS TO SEED SPACING UNIFORMITY

Hoff and Mederski (1960) determined that adequate soil moisture was the most important factor for obtaining high

corn yields. Other factors proven to affect yields include plant population, the amount of sunlight the crop receives, and the amount of nutrients provided by the soil. Uniform seed spacing plays an important role in ensuring a crop receives adequate amounts of sunlight, nutrients, and moisture.

Staggenborg et al. (2004) determined that increased corn planting speed adversely affected plant spacing uniformity performance as measured by miss, multiple, quality of feed, and precision indices, and standard deviation of plant spacing in northeast Kansas. Despite the degradation in uniformity of plant spacing, corn yield remained unchanged for three of four location-years, and decreased by $0.094 \text{ t} \cdot \text{ha}^{-1}$ per $\text{km} \cdot \text{h}^{-1}$ ($2.4 \text{ bu} \cdot \text{acre}^{-1}$ per mile $\cdot \text{h}^{-1}$) as speed increased from approximately 7.2 to $11.3 \text{ km} \cdot \text{h}^{-1}$ (4.5 to $7 \text{ mile} \cdot \text{h}^{-1}$) in only one of four location-years of the experiment.

Krall et al. (1977) studied effects of within-row plant spacing variability on corn yield utilizing a planter to obtain nonuniform seed spacing and hand-planted seed to obtain uniform seed spacing. They also surveyed plant spacing variability in farmers' fields and determined the standard deviation of plant spacings ranged from 6.6 to 18.4 cm (2.6 to 7.2 in.). They selected a spacing standard deviation of 4 cm (1.6 in.) as a maximum spacing uniformity obtainable with mechanical planting. Using a regression line from the combined trials at St. John and Rossville over 1973-1974, they projected a yield increase of $0.22 \text{ t} \cdot \text{ha}^{-1}$ ($3.5 \text{ bu} \cdot \text{acre}^{-1}$) for corn planted with a spacing standard deviation of 4 cm (1.6 in.) rather than 6.6 cm , and $1.20 \text{ t} \cdot \text{ha}^{-1}$ ($19.3 \text{ bu} \cdot \text{acre}^{-1}$) for corn planted with a spacing standard deviation of 4 cm (1.6 in.) rather than 18.4 cm (7.2 in.). Nielsen (1996)

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determined uneven stand establishment in corn decreased yields between 0.44 and 0.94 t ha⁻¹ (7 and 15 bu acre⁻¹).

IMPROVING SEED SPACING UNIFORMITY

Nielsen (1995) planted corn at speeds of 6.4, 8.0, 9.7, and 11.3 km·h⁻¹ (4, 5, 6, and 7 mile·h⁻¹). Machine harvesting showed yield losses of at least 0.08 t·ha⁻¹ per km·h⁻¹ (2 bu·acre⁻¹ per mile·h⁻¹) increase in planting speed. Moody et al. (2003) used a John Deere MaxEmerge™ Plus row unit without furrow closing wheels to plant cotton seed. Measurements taken within the furrow indicated a direct correlation between the increase in standard deviation from 2.8 to 6.1 cm (1.1 to 2.4 in.) and the increase in travel speed from 4.8 to 9.7 km·h⁻¹ (3.0 to 6.0 mile·h⁻¹). Mowitz (1993) evaluated the effects of planting speed on corn seed spacing with John Deere 71 Flexi (plate), John Deere MaxEmerge™ 2, Kinze 2000, and White 6000 planter row units on a grease belt test stand. The results indicated a 10% to 13% increase in spacing error as speed increased from 6.4 to 11.3 km·h⁻¹ (3 to 7 mile·h⁻¹).

Jasa and Dickey (1982) investigated the effects of different tillage practices (plow-disk-disk, chisel-disk, disk-disk, and no-till) on corn seed spacing uniformity. Plant and seed spacing uniformity were measured two to four weeks after planting. On six of eight sites there were no differences among the coefficients of variation of seed spacing among the tillage systems (coefficients of variation of seed spacing ranged from 0.28 to 0.61 over these sites). On two of the eight sites, the coefficients of variation of seed spacing for the no-till tillage treatment (0.35 for site 4 and 0.62 for site 7) were significantly less than for the other tillage treatments (averages of 0.48 for site 4 and 0.67 for site 7). Mowitz (1993) reported that corn seed size (large or small) did not affect seed spacing uniformity, provided the correct plates and disks were used. Erbach et al. (1972) compared corn seed spacing uniformity from V-type runner and double-disk furrow openers with and without a seed tube. The standard deviation of plant spacing with the seed tube [4.4 cm (1.7 in.) with V-type runner, 4.7 cm (1.9 in.) with double disk opener] was significantly smaller than without the seed tube [6.0 cm (2.4 in.) with V-type runner, 6.5 cm (2.6 in.) with double disk opener]. Moody et al. (2003) found that the largest component of spacing variability was induced by the metering unit, and/or bounce of the seed in the upper half of the seed tube, above the OEM seed sensor.

COMPARISON OF LABORATORY AND FIELD SEED SPACING RESULTS

Panning et al. (2000) compared sugarbeet seed spacing uniformity for three planters (Franz Kleine Unicorn-3, John Deere 71 Flexi (plate), and John Deere MaxEmerge™ 2) measured with an opto-electronic system in laboratory tests and by carefully removing the soil to locate seeds in field tests. Seed spacing uniformity was reported using "CP3" or coefficient of precision, determined as the percent of actual seed spacings that were within ± 1.5 cm of the spacing for which the planter was mechanically set. Their results indicated CP3 values determined in laboratory tests [e.g. 78.5 for Franz Kleine Unicorn-3, and 68.3 for John Deere MaxEmerge™ 2 with an experimental metal seed tube, both at 5.6 km·h⁻¹ (3.5 mile·h⁻¹)] were better than, or equal to, CP3 values determined in field tests [e.g. 68.4 for Franz Kleine

Unicorn-3 and 40.8 for John Deere MaxEmerge™ 2 with an experimental metal seed tube, both at 5.6 km·h⁻¹ (3.5 mile·h⁻¹)]. They concluded that laboratory testing allowed determination of the maximum capability of the planter metering unit and seed tube combination to space seeds uniformly.

PLANTER MAINTENANCE AND ADJUSTMENTS

Planter maintenance and adjustments are extremely important in achieving seed spacing uniformity. Nielsen (1995), the Iowa Grain Quality Initiative (2003), and Deere and Company (2003) document typical problems in planter maintenance and adjustment.

The condition of the inside surface of the seed tube has received little research attention, but may also affect corn seed spacing uniformity. New seed tubes generally have a shiny inside surface (contacted by the seeds as they pass through the tubes) which feels smooth and slick to the touch. Worn tubes generally have a dull inside surface with many fine scratches that feels slightly rough, like a very fine sandpaper surface. In addition, different conditions of the inside surface of the seed tube (smooth or rough) may have different effects on the seed spacing uniformity for different seed shapes, such as round or flat.

OBJECTIVE

The objective of this study was to determine the effects of planter seed drop tube condition (new or worn) on seed spacing uniformity of a John Deere MaxEmerge™ Plus VacuMeter planter with the pneumatic option. Corn seed with round and flat shapes were used to obtain an indication of whether any effects from seed tube condition applied to both shapes.

PROCEDURE

Several decisions were made to limit the scope of the experiment to keep it to a reasonable level. Only one planter row unit was used and was of a planter model commonly used for planting row crops in the Midwestern United States. The planter row unit was in a used and well-maintained condition. The one seed plate used was the one recommended in the planter operator's manual for both of the corn seed shapes, sizes, and number of seeds per unit weight. The vacuum setting for the pneumatic metering option on the planter unit was evaluated just before the experiment was conducted and the setting determined to be most effective (lowest numbers of multiples and misses) for both seed shapes was 31.8-cm H₂O (12.5-in. H₂O). This vacuum setting was within the manufacturer's recommended vacuum range of 11- to 34-cm H₂O (4.2- to 13.5-in. H₂O) for the seed disk, depending on seed size. Several seed tube versions were used so inferences from the results would apply to more than one tube version. However, no comparisons among the seed tube versions were planned. Only one example of each of the two most commonly planted corn seed shapes (round and flat) were used, both of medium size, so the results of the study should not be inferred to apply to all round or flat corn seed of medium size.

The experimental design was a split plot design with the main plots arranged in a completely randomized design. The main plot treatment was the condition of the seed tube, new

or worn, with 14 replications for each of these two treatments. The subplot treatment was the shape of corn seed (round or flat). A total of 56 experimental test runs were performed using 1000 seeds per run (999 spacings), nominally. The sequence in which the seed tubes were tested was randomized. Round corn seed and flat corn seed were run through each tube in consecutive experimental test runs. For each tube, the sequence in which the seed shapes were tested with that tube was also randomized. Transient start-up effects for each test run were avoided by starting the test stand and allowing the planter to meter seed for about 10 s before data collection was initiated. The laboratory research was completed in a shop building with doors closed during test runs (to ensure that ambient light did not interfere with the optoelectronic seed spacing measurement system) at the University of Nebraska Panhandle Research and Extension Center located near Scottsbluff, Nebraska, in August 2003. Coleman (2004) can be consulted for additional details concerning this experiment.

TEST STAND SYSTEM AND PLANTER

The experiment was conducted using the University of Nebraska Planter Test Stand with an optoelectronic system to measure seed spacing (Kocher et al., 1998; Lan et al., 1999). The test stand held the planter row unit stationary over a horizontal conveyor grease-belt which was powered to move at the travel speed desired for the test run, thereby simulating normal forward travel of the planter. A sprocket-and-chain transmission between the grease-belt drive and the planter metering unit ensured the proper speed relationship was maintained between the planter metering unit and the grease-belt so the planter unit delivered the desired target seed spacing. Seeds falling onto the grease-belt stuck to the top belt surface for subjective visual confirmation that the desired target seed spacing was achieved.

All seed spacing data and results for this experiment were obtained using the optoelectronic system described by Lan et al. (1999) which consisted of a seed detection sensor with 24 "electric eyes" spaced 4 mm apart in a horizontal plane located below the bottom of the seed tube where the bottom of the furrow would be in a normal sugarbeet planting situation, and aimed from side-to-side, perpendicular to the direction of planter travel. Seeds passing through the seed detection sensor blocked one (or possibly two consecutive) electric eyes, indicating to the computer the front-to-back location where the seed dropped through the sensor and the time at which the seed dropped through the sensor. The computer used the time interval between consecutive seeds and the measured belt speed (simulated planter travel speed) to calculate the spacing between the seeds, and corrected that spacing based on the relative locations of where those seeds passed through the seed detection sensor.

The planter unit used was a Deere and Company MaxEmerge™ Plus VacuMeter (VacuMeter refers to the pneumatic metering option). The planter unit consisted of a seed box, a frame, the metering unit, and seed tube. No disc opener, furrow closer, or packer was installed on the planter row unit during the tests. The planter metering unit was in a used, well-maintained condition.

The seed tubes were classified as new (purchased from a local John Deere dealer) or worn (used by a farmer while planting). Some of the worn seed tubes were donated by a John Deere dealer who had replaced seed tubes for farmers.

The remaining worn seed tubes were obtained by contacting farmers and trading them two new tubes for two of their worn tubes.

Four different seed tube versions were used in the experiment. The first and oldest seed tube version was manufactured before planter monitors with seed tube sensors became popular. The length by width dimensions of the opening at the top of the tube where the seed enters the tube were 5.5 × 4 cm (2.17 × 1.57 in.) (John Deere Part No. A74932). Two of the new tubes and two of the worn tubes were of this version. The second seed tube version was manufactured with holes appropriate for installation of a seed tube sensor. The length by width dimensions of the opening at the top of the tube where the seed enters the tube were 5.5 × 3.6 cm (2.17 × 1.42 in.) (John Deere part No. A26183), smaller in width than the first tube version. Four of the new tubes and four of the worn tubes were of this version. The third and fourth seed tube versions tested were the largest versions used in these experiments. The length by width dimensions of the opening at the top of the tubes where the seed enters the tube were 7.5 × 5 cm (2.95 × 1.97 in.). Version three seed tubes were manufactured with a ramp above the top of the hole for the seed sensor in order to eliminate contact of the seed with the seed tube sensor (John Deere part No. A56784). This version of seed tube was the only one manufactured with a ramp. Eight of the new tubes and six of the worn tubes were version three tubes. The only difference between versions three and four was that version four did not have a ramp (John Deere part No. A54773). Two worn seed tubes were of this version. No new tubes of this version were used in the experiment as we only discovered that these two tubes did not have the ramp after testing was completed. During testing, seed tube sensors were inserted on all seed tubes that accommodated them. The sensor was used simply to fill the holes in the front and back of the seed tube at about mid-height of the tube and was not used to measure seed spacings for the experiment.

A standard corn seed disk (John Deere Part No. A50617) was used for the entire experiment with both the round and flat corn seeds as recommended by Deere and Company (2003). There were 30 cells in this disk with 3.6-mm diameter holes, allowing for a capacity of 1980 to 4410 seeds·kg⁻¹ (900 to 2000 seeds·lb⁻¹).

SEED

Two examples of corn seed shape (round and flat) were used to limit the scope of the experiment, and still obtain an indication of whether any effects from seed tube condition applies to spacing uniformity of seeds with different shapes. The two seed shapes and size were chosen to represent the size and shapes believed to be most commonly planted in the midwestern U.S. Jirdon Agri Chemicals, Incorporated (Morrill, Nebr.) processed the medium, round corn seed (variety JA2103 and lot number RJA – 6/05GC) with a seed count of 3590 seeds·kg⁻¹ (1630 seeds·lb⁻¹). High Cycle Seed Systems (Livingston, Wis.) processed the medium, flat corn seed (variety 7194RR and lot number JBA – 1/03FC) with a seed count of 4230 seeds·kg⁻¹ (1920 seeds·lb⁻¹). Seed that passed through the planter during one test run was not put back in the planter hopper for any other test run. Talc powder was not mixed with the seed for this experiment.

PLANTER TRAVEL SPEED AND SPACING DISTANCE

The travel speed selected for the experiment was 8.0 km·h⁻¹ (5.0 mile·h⁻¹). This speed was comparable to the average travel speed of a row crop planter suggested by ASAE Standards (2000), 9.0 km·h⁻¹ (5.5 mile·h⁻¹). Travel speed (grease-belt speed on the test stand) measured in the experimental test runs ranged from 8.1 to 8.35 km·h⁻¹ (5.03 to 5.35 mile·h⁻¹) with an average speed of 8.22 km·h⁻¹ (5.11 mile·h⁻¹).

Seed spacing was selected based on a population of 74,100 seeds·ha⁻¹ (30,000 seeds·acre⁻¹) with 76-cm (30-in.) row spacing. This resulted in a theoretical seed spacing of 17.70 cm (6.97 in.), and the sprocket selections available in the planter transmission allowed the target seed spacing to be set at 17.7 cm (6.97 in.).

METHOD OF ANALYSIS

Kachman and Smith (1995) determined the mean and standard deviation of seed spacings are not good descriptors of seed spacing uniformity. The three parameters used in this experiment to describe seed spacing uniformity were Coefficient of Precision (CP3), ISO Miss index, and ISO Multiples index. The Coefficient of Precision (CP3) is the percent of actual spacings that were within ±1.5 cm of the theoretical spacing (Smith et al., 1991; L’Institut Technique Français de la Betterave Industrielle, 1994; Coleman, 2004). The International Organization for Standardization (1984) Standard 7256/1 was the basis for the ISO Miss index and the ISO Multiples index. These parameters are defined relative to the theoretical spacing of the seed. Theoretical spacing is defined as the “spacing set on the control mechanism and stated by the manufacturer” (ISO, 1984). Spacing is defined as, “the distance between two successive seeds in the row” (ISO, 1984). A multiple is defined as “the presence of two seeds or more where there should only be one” (ISO, 1984). The ISO Standard counts all spacings less than one-half the theoretical spacing as multiples. A miss is defined as “the absence of a seed where there should be one theoretically” (ISO, 1984). The ISO Standard counts all spacings greater than 1.5 times the theoretical spacing as a miss. The ISO Multiples and Miss indices are expressed as percentages of the theoretical number (rather than the actual number) of seed spacings. Note that an improvement in seed spacing uniformity is indicated by larger numbers for CP3 and smaller numbers for the ISO Multiples and Miss indices.

DESCRIPTION OF STATISTICAL ANALYSIS

Analysis of variance was used to determine the significance level of each treatment factor combination. The three seed spacing uniformity parameters used were measured on a percentage scale and were analyzed using the untransformed scores and using an arcsine square root transformation. This transformation is recommended to stabilize variances in binomial distributions. The results from both analyses were similar. For simplicity only the results from the untransformed analysis are reported. For all tests conducted, a level of 5% was used to determine significant differences.

Table 1. Analysis of variance results, Type 3 Tests of Fixed Effects for the seed spacing uniformity parameters from a John Deere MaxEmerge™ Plus Vacumeter planter with new or worn seed tubes, and round or flat corn seed.

Source	Degrees of Freedom	CP3, F-Value (PR>F)	ISO Multiples Index, F-Value (PR>F)	ISO Miss Index, F-Value (PR>F)
Seed tube condition	1	45.28 (<0.0001)	18.57 (0.0002)	15.55 (0.0006)
Tube (Cond)	25			
Seed shape	1	236.57 (<0.0001)	717.13 (<0.0001)	13.20 (0.0013)
Seed tube condition *Seed shape	1	4.46 (0.0445)	0.33 (0.5734)	0.28 (0.6028)
Error	25			

Table 2. Least Square Means with standard errors for the seed spacing uniformity parameters of ISO Multiples index and ISO Miss index from a John Deere MaxEmerge™ Plus Vacumeter planter with new or worn seed tubes, and round or flat corn seed.

	New Seed Tubes	Worn Seed Tubes	Round Corn Seed	Flat Corn Seed
ISO Multiples index (%)	8.17 (0.545)	11.56 (0.566)	3.65 (0.456)	16.08 (0.456)
ISO Miss index (%)	2.11 (0.517)	5.05 (0.537)	2.93 (0.413)	4.23 (0.413)

Table 3. Least Square Means with standard errors for the CP3 seed spacing uniformity parameter from a John Deere MaxEmerge™ Plus Vacumeter planter with new or worn seed tubes, and round or flat corn seed.

Seed Tube Condition	Round Seed	Flat Seed
New	49.6 (1.13)	35.3 (1.13)
Worn	38.7 (1.13)	27.8 (1.13)

RESULTS AND DISCUSSION

The results of the analysis of variance are displayed in tables 1 through 3. These tables include the “Type 3 Test of Fixed Effects” and “Least Square Means” results. The Type 3 Tests of Fixed Effects tests the significance of the three effects of tube condition, seed shape, and the tube condition by seed shape interaction (SAS Institute, Incorporated, 1999). “Least Square Means are predicted population margins; that is, they estimate the marginal means over a balanced population” (SAS Institute, Incorporated, 1999).

As shown in table 1, both seed tube condition and seed shape had significant effect on all three seed spacing uniformity parameters. The analysis of variance showed the seed tube condition by seed shape interaction was significant only for the CP3.

The Least Square Means of the seed spacing uniformity parameters of ISO Multiples index and ISO Miss index for the treatments of new seed tubes and worn seed tubes, and round and flat seed are given in table 2. The results in table 2 show that seed spacing uniformity was better (lower ISO Multiples index and lower ISO Miss index) with the new seed tubes than with the worn seed tubes. Seed spacing uniformity was also better with the round corn seed used in the experiment than with the flat seed.

Table 3 gives the effects of each treatment combination of seed tube condition and seed shape on the Least Square

Means and standard errors of the CP3 seed spacing uniformity parameter. The combination of new seed tubes with the round seed had the best seed spacing uniformity in terms of the highest CP3 value of 49.6%. The combination of worn seed tubes with the flat seed had the worst seed spacing uniformity in terms of the lowest CP3 value of 27.8%. The results in table 3 show CP3 decreased by more than 20% (from 49.6 to 38.7 for the round seed, and from 35.3 to 27.8 for the flat seed) when changing from new seed tubes to worn seed tubes, within each seed shape. Similarly, table 3 shows that the round seed used in this experiment had better seed spacing uniformity (higher CP3) than the flat seed, within each seed tube condition.

DISCUSSION OF INTERACTION

Interaction between seed tube condition and seed shape occurred for the CP3 parameter of seed spacing uniformity in the analysis of variance (table 1). Additional tests for interaction were conducted, with the results from the analysis of variance illustrated in table 4. Three factors were utilized in calculating the interaction. Two factors included the seed tube condition and the seed shape with the third factor, experimental run, as a covariate. Each of the combinations was tested as well as the individual factors. The results showed that the three-way interaction (experimental run by seed tube condition by seed type) was significant. The reasons for the interaction of the experimental run with seed tube condition and seed shape treatment for the CP3 measure are not clear. One possible reason is a change in ambient air conditions during the time the test runs were conducted. Test

runs were conducted from 1:00 P.M. to 5:00 P.M., and then resumed at 9:00 P.M. and continued until midnight. The building in which the tests were conducted was not heated or cooled during this time of year and had a large overhead door that was opened and closed to move equipment in and out of the shop during the day, and a regular door that was open and closed for people to access the building. Consequently, the air conditions inside the building were very similar to the outside air conditions. During the afternoon hours, the average air temperature was 30.6°C (87.1°F) and the average relative humidity was 36.9%, as reported by the Scottsbluff, Nebraska station of the National Weather Service. During the evening hours the average air temperature was 19.8°C (67.7°F) and the average relative humidity was 73.5%. These changes in air conditions from warmer, drier air to cooler air

Table 4. Analysis of variance results, Type 3 tests of fixed effects for CP3, testing for interaction with new or worn seed tubes, and corn with round or flat seed.

Source	Degrees of Freedom	F-Value (PR>F)
Seed tube condition	1	82.43 (<0.0001)
Seed shape	1	529.89 (<0.0001)
Seed tube condition*Seed shape	1	13.91 (0.0010)
Experimental run	1	19.91 (0.0002)
Experimental run*Seed tube condition	1	3.08 (0.0921)
Experimental run*Seed shape	1	35.70 (<0.0001)
Experimental run*Seed tube condition*Seed shape	1	9.72 (0.0047)
Error	23	

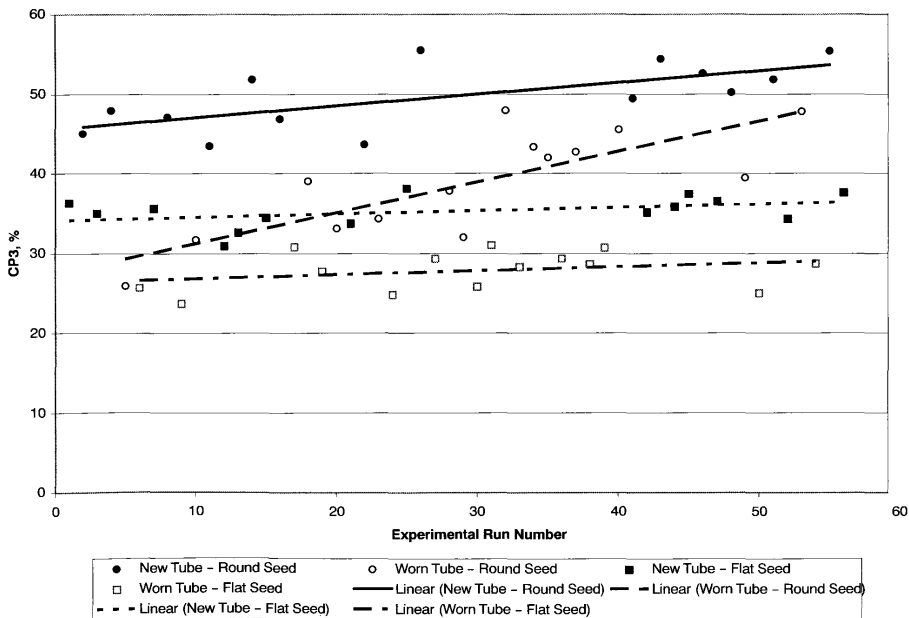


Figure 1. Interaction of coefficient of precision (CP3) and experimental run for a John Deere MaxEmerge™ Plus VacuMeter planter with new or worn seed tubes and round or flat corn seed.

with a higher moisture content may have resulted in the seed having a higher moisture content during the evening test runs (Equilibrium Moisture Content on a wet basis, $EMC_{wb} \approx 14\%$) than during the afternoon test runs ($EMC_{wb} \approx 9\%$), which may have affected seed properties related to bouncing or sliding of the seed on the inside surface of the seed tube. More research on this topic is needed.

For an additional investigation into the interaction, CP3 was plotted as a function of experimental test run number (order in which the experimental runs were conducted) for all four treatment combinations (fig.1).

Statistical testing showed the slopes of the lines for the treatment combinations with the round seed (new tube with round seed, and worn tube with round seed) were significantly different than zero, while the slopes of the lines for the treatment combinations with the flat seed were not. This means that the treatment combinations with round seed were the only ones that had significant interaction between CP3 and run number. Despite this interaction, it is clear that when making comparisons within each seed shape, new seed tubes had better seed spacing uniformity (higher CP3 value) than worn seed tubes. Likewise, within each seed tube condition, round seed had better seed spacing uniformity than flat seed.

Overall, and despite the interaction, the results showed that seed spacing was more uniform (higher CP3, lower ISO Multiples, and lower ISO Miss indices) with new seed tubes than with worn seed tubes for each of the two seed types used in this experiment (round and flat corn seed). Similarly, seed spacing was more uniform for the round corn seed than the flat corn seed used in this experiment for each of the seed tube conditions (new and worn).

This research has shown that in addition to the traditional pre-season planter maintenance and adjustment items, condition of the seed tube must be considered to achieve top seed spacing uniformity. At present, the only way to determine if the seed tubes on a producer's planter will give acceptable seed spacing uniformity is to conduct seed spacing testing with those seed tubes.

Recommended schedules for seed tube replacement to maintain top seed spacing uniformity are not currently available. Research is needed to determine the factors causing wear of seed tubes that affects seed spacing uniformity, and the rate of decline in seed spacing uniformity with these factors. Factors that should be investigated include: seed type (corn, soybeans, and sugarbeets), type of material used for the inside front surface of the seed tube, impact and abrasion of the seed on the front inside surface of the seed tube, and chemical reaction(s) between the seed coating(s) and the inside front surface of the seed tube.

Currently, sugarbeet growers in western Nebraska use one of three options to determine when to replace their planter seed tubes to maintain desired seed spacing uniformity. Some will test a seed tube along with their metering units every year before the start of the sugarbeet planting season. Others will feel the inside front surface of some of their seed tubes with their fingers every year before the start of the sugarbeet planting season and replace all their seed tubes when the surface starts feeling like very fine sandpaper instead of like a slick plastic surface. The remainder will replace seed tubes before the sugarbeet planting season after they have planted

approximately 150 acres or more of corn per planter row with their current seed tubes.

SUMMARY AND CONCLUSIONS

Uniform seed spacing distribution is an important factor in corn production systems. A previously-undocumented factor affecting corn seed spacing uniformity is the condition of the inside surface of the seed tube that the seeds contact as they travel through the seed tube, whether new (shiny and smooth) or worn (dull and slightly rough like a very fine sandpaper surface).

Seed spacing uniformity as represented by all three seed spacing uniformity parameters (CP3, ISO Multiples index and ISO Miss index) was better with the new seed tubes than with the worn seed tubes for a John Deere Max Emerge™ Plus VacuMeter planter row unit with the four versions of seed tubes tested in the laboratory with the University of Nebraska Planter Test Stand. All three seed spacing parameters also showed that the round seed used in this experiment had better seed spacing uniformity than the flat seed, within the same seed tube condition (new or worn).

A recommended schedule for seed tube replacement to maintain seed spacing uniformity has not been developed, and more research in this area is needed. Currently, sugarbeet growers in western Nebraska use one of three options: a) test one of their seed tubes on a good planter test stand every year before sugarbeet planting season and replace all tubes when results indicate it will improve seed spacing uniformity to the desired level; b) feel the inside front surface of the seed tube every year before sugarbeet planting season and change seed tubes when the feel of the surface changes from a slick plastic to a very fine sandpaper; or c) replace seed tubes before sugarbeet planting season when they have planted over approximately 150 acres of corn per planter row with their current seed tubes.

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