

The lost history of American veterinary medicine: the need for preservation*†

C. Trenton Boyd, MA, AHIP

See end of article for author's affiliation.

DOI: 10.3163/1536-5050.99.1.004

Objective: The objective of this study was to survey holdings of ephemeral veterinary literature.

Methods: WorldCat OCLC catalog, the Library of Congress online catalog, the US National Agricultural Library online catalog, and the *Dictionary Catalog of the National Agricultural Library, 1862–1965*, were used to determine current library holdings of materials published by veterinary schools that are no longer in existence and veterinary associations that are defunct, veterinary supply catalogs, veterinary house organs, patent medicine publications, and veterinary advertisements. Individual library catalogs were also

consulted. In addition, the practice of removing advertisements from bound volumes was examined.

Results: There are many gaps in the cataloged library holdings of primary source materials relating to the history of the education of veterinarians in the United States.

Conclusions: A proactive action plan needs to be designed and activated to locate, catalog, and preserve this primary source material of veterinary medicine for posterity.

INTRODUCTION

During the last half of the nineteenth century and into the mid-twentieth century, forty-one US veterinary schools, most of them private, ceased to exist [1]. Today, only twenty-eight veterinary schools are in existence in the United States, with the first of those established in 1879 [2, 3]. Eighteen of these schools had been established by 1959 [3]. During the period from 1973 to 1998, ten more veterinary schools were built. Veterinary scholars have asserted that, in the 1970s, James Herriot (James Alfred Wight) created such a phenomenal interest in veterinary medicine with his books that state legislatures were forced to build veterinary schools so their constituents could obtain a veterinary education [4]. Unlike medicine or agriculture, fields in which there are many more libraries, there are only a handful of veterinary libraries to preserve the publication history of the profession.

In addition, the literature of veterinary medicine, especially that of the United States, is a relatively new and small literature. The scientific journal literature of veterinary medicine was still developing into the mid-twentieth century. Much of the history of the practice of veterinary medicine in the United States is found in what is considered gray literature. House organs (defined as "a periodical issued by a business or other

* This is a significantly revised version of the essay that received the 2009 Medical Library Association Murray Gottlieb Prize.

† Portions of this paper were given in the presentation, "The Heritage of American Veterinary Medicine is Being Lost," in Positioning the Profession: The Tenth International Congress on Medical Librarianship/Sixth International Conference of Animal Health Information Specialists; Brisbane, Australia; 31 Aug–Sep 4, 2009 <<http://espace.library.uq.edu.au/list/author/Boyd%2C+C.+Trenton/>>.



Supplemental Tables 1, 2, 3, and 4 are available with the online version of this journal.

Highlights

- Veterinary libraries have failed to catalog or retain important primary veterinary source materials.
- Several types of veterinary gray literature, with individual pieces scattered across multiple kinds of libraries, are at high risk for loss from the historical record.

Implications

- Academic, veterinary, medical, and special librarians should be involved in efforts to preserve their institutional, local, and state materials; to identify and locate hidden collections of materials, both in uncataloged collections and in the hands of private collectors; and to mentor new librarians about their role in preserving the history of medicine.
- The results of this survey of primary source materials documenting US veterinary medical education suggest the need for a parallel study of medical education and other health professions education.
- The time is *now*, not only to digitize important scarce veterinary materials for both preservation and improved access, but also to archive present day institutional output (paper and electronic).

establishment for its employees, customers, and other interested readers, presenting news about the firm, its products, and its personnel" [5]), one of the types of gray literature, provide an excellent example of this situation. Their content can vary widely from merely touting the use of a company's products to having the quality of a refereed journal containing full-length scientific articles and other useful information. Several of the early journals were substantive and

contained much valuable information on the development of veterinary medicine in the United States and Canada. These journals were not indexed by any indexing service and are essentially an untapped resource for veterinary historians.

For veterinary medicine in the United States, the development of house organs came into being about 1900 and played an important role in the distribution of new information to practitioners, until about the 1950s. Dr. Louis A. Merillat in his book, *Veterinary Military History of the United States*, affirmed that "house organs of the present era are an attempt to supply the link that federal and state governments have failed to forge between research and practice" [6]. Dr. Merillat felt house organs had value because they put new research information into the hands of the practitioner, yet he felt that they should not try to usurp independent periodical literature and that their presence might hurt the success of legitimate periodicals. As late as 1950, there were at least nine major house organs that were helping to fill the void of independent US veterinary journals [7] (Figure 1). In at least two articles on the importance of house organs, specific veterinary house organs have been mentioned. Lederman, in her article "House Organs of Chemical Interest," cited *Lab-Fax Veterinarian* and *Veterinary SnapShots* [8]. Kronick, in his article "A Selected List of House-Organs for Bio-Medical Libraries," listed thirty-eight house organs, one of which one was the veterinary title *Allied Veterinarian* [9].

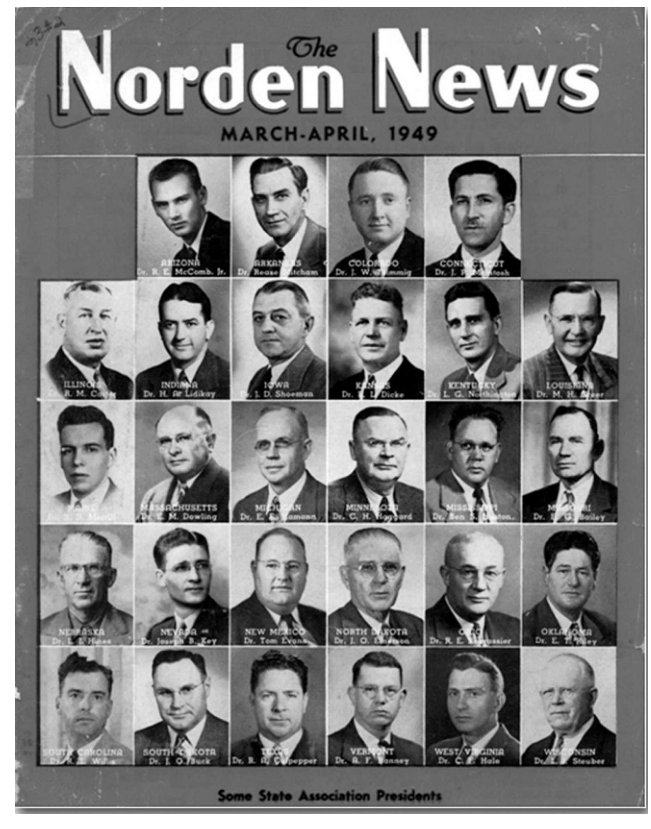
Other types of gray literature that are especially important in chronicling veterinary medicine are materials from veterinary schools, publications from all veterinary associations, veterinary supply catalogs, materials from patent medicine companies, and advertisements found in veterinary literature.

The loss of information on the history of veterinary advertising has occurred as it has in other subject disciplines [10]. Even as early as 1935, librarians began to recognize the problems of removing ads from journals. The Conference of Eastern College Librarians checked thirty-four libraries and published *A List of Periodicals Bound Complete with Advertising Pages in New England and New York City Libraries* [11]. Ellen Gruber Garvey made an important summary statement in her article, "What Happened to the Ads in Turn-of-the-Century Bound Magazines and Why":

Professionals in a position to preserve or rescue intact copies of turn-of-the-century magazines should be aware that such copies are rarer than a search on RLIN or OCLC would suggest. In binding, filming or scanning present day periodicals, libraries should recognize that even annoying ephemera like perfume ad cards and blow-in subscription cards may be of interest to future researchers, and worth preserving. [12]

An illustration of the importance of advertisements is revealed in a wonderful series of ads that Allied Laboratories published in *Journal of the American Veterinary Medical Association* in the early 1940s, "What the Veterinary Profession Means to Mankind." At least sixty ads were produced, emphasizing the

Figure 1
Veterinary house organ: Norden News 1949 Mar–Apr;23(2)



important role that veterinary medicine has played in helping mankind as well as the profession's help during the World War II effort. The ads contain information about the profession that cannot readily be found in other sources.

In a recent paper, Jaros et al. describe the importance of the gray literature to the study of veterinary medicine and relate concerns that much of this literature may no longer be available [13]. The objective of this study is to survey the extent to which these materials have been actively collected, retained, and made accessible in the United States. Library holdings for six types of ephemeral veterinary literature were examined: publications of defunct veterinary schools, publications of defunct veterinary associations, veterinary supply catalogs, veterinary house organs, patent medicine publications, and veterinary advertisements.

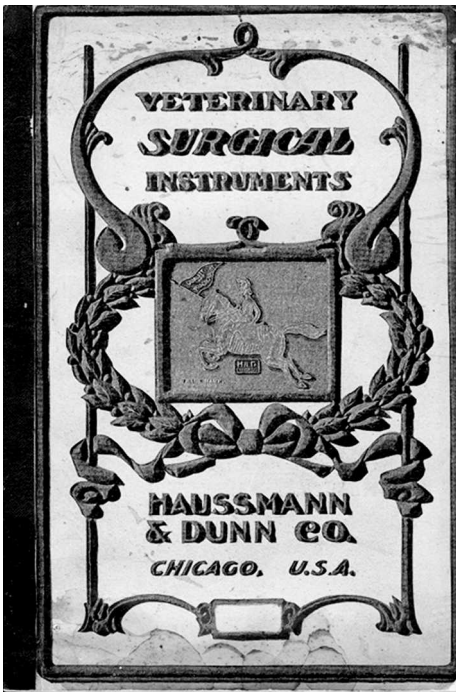
METHODS

Publications of defunct veterinary schools

A keyword search on the name of each of the forty-one defunct US schools was conducted in OCLC's WorldCat (which includes National Library of Medicine [NLM] items), the Library of Congress (LC) online catalog, the National Agricultural Library (NAL) online catalog, and the printed *Dictionary*

Figure 2

Veterinary supply catalog: Veterinary surgical instruments. 8th ed. Chicago, IL: Haussmann & Dunn; 1907?



Catalog of the National Agricultural Library, 1862–1965. The *Dictionary Catalog of the National Agricultural Library, 1862–1965*, was consulted because, unlike NLM, NAL has not done a full retrospective conversion of its pre-1966 holdings.

Publications of defunct veterinary associations

No source could be identified that provides a historical listing of the local, regional, and national veterinary associations and societies that have existed in the United States. The American Veterinary Medical Association (AVMA) does not maintain a list of defunct organizations, although the librarian was able to name a few associations that no longer exist.‡ A quick survey in the *American Veterinary Review* for names of associations from 1885 to 1900, including the names provided by the AVMA librarian, was therefore undertaken.

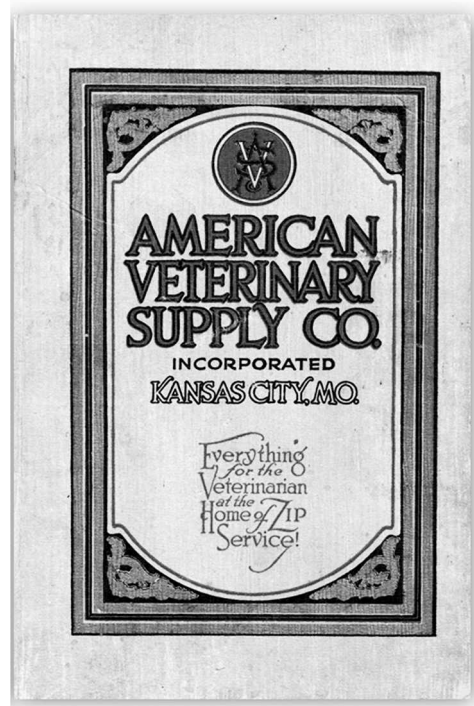
Veterinary supply catalogs

A list of US supply catalogs (Figures 2 and 3), regardless of date, was compiled from WorldCat, LC online catalog, and NAL online catalog using the subject headings “Veterinary Instruments and Apparatus—Catalogs,” “Veterinary Surgery—Instruments—Catalogs” and “Veterinary Medicine—Supplies—Catalogs.” In addition to searching on the

‡ As stated in email correspondence from Diane Fagen, head of Veterinary Medical Library at the American Veterinary Medical Association, 22 Oct 2008.

Figure 3

Veterinary supply catalog: catalog issued by American Veterinary Supply Co. 7th ed. Kansas City: American Veterinary Supply Co.; 1920



subject terms, keyword searches were performed on the names of known veterinary manufacturers and distributors as well as the terms “veterinary instruments,” “veterinary supplies,” and “veterinary catalogs.”

House organs

Because, to the best of the author’s knowledge, no list of veterinary house organs exists, an extensive research project was undertaken to compile a comprehensive listing of veterinary house organs by searching:

1. *Veterinary Serials: A Union List of Serials Held in Veterinary Collections in Canada, Europe and the U.S.A.*, produced in 1988 [14] to identify every veterinary-related title published by a pharmaceutical company or pet food company
2. *Dictionary Catalog of the National Agricultural Library, 1862–1965*, under the subject heading of “Veterinary Medicine”
3. *The Printers’ Ink Directory of House Organs* [15], a time-consuming project as there is no subject approach to the directory and it only lists those house organs currently being published
4. core lists in veterinary medicine and related fields [6–9]
5. the collection of the Zalk Veterinary Medical Library, University of Missouri–Columbia, especially for those house organs that began publication after 1988

Libraries' holdings for each title were determined using WorldCat; the printed *Dictionary Catalog of the National Agricultural Library, 1862–1965*; the NAL online catalog; and the LC online catalog. While OCLC provided holdings for many libraries, it was still necessary to consult the holding library's local online catalog to obtain issue-specific holdings. If a title had a title change, then the new title was counted as a unique title. This was done because the number of holding libraries frequently varied with the title changes.

After all of the holdings were gathered, each title was examined to see if a complete set could be assembled from all the holding libraries. The number of holding libraries excluded library holdings outside of the United States, because if digitization does occur, it would be easiest to work with libraries in the United States.

Patent medicine publications

To estimate how much of the literature of patent medicine was in libraries, the "Spotlight" feature columns in issues of *Veterinary Collectibles Roundtable* [16] were reviewed. Sixty of these have been focused on a specific veterinary medicine patent medicine company. Publications for each of these companies and, in some instances, the owners and specific products of the company were searched in World Cat, LC online catalog, NAL online catalog, and the *Dictionary Catalog of the National Agricultural Library, 1862–1965*.

Veterinary advertisements

It has been a common practice since before the turn of the twentieth century for libraries to remove covers and advertising from journals before binding. An informal survey was sent to the librarians at thirteen veterinary libraries with holdings of older veterinary journals to inquire about their binding practices.[§]

RESULTS

Publications of defunct veterinary schools

No publications of any kind could be found in the databases searched for 18 of the 41 defunct veterinary schools (Table 1, online only). There were a total of only 80 different publication records for the other 23

[§] Libraries surveyed were: T. S. Williams Veterinary Medical Library, Tuskegee University; Veterinary Medical Center Library, Colorado State University; Veterinary Medicine Library, University of Georgia; Veterinary Medical Library, Iowa State University; Veterinary Medical Library, Kansas State University; Veterinary Medical Center Library, Michigan State University; Veterinary Medical Library, University of Minnesota; Zalk Veterinary Medical Library, University of Missouri–Columbia; Flower-Sprecher Veterinary Library, Cornell University; Samuel and Marian Hodesson Veterinary Medicine Library, Ohio State University; William E. Brock Memorial Library, Oklahoma State University; Steven W. Atwood Library and Information Commons, University of Pennsylvania; Medical Sciences Library, Texas A&M University; and Animal Health Library, Washington State University.

schools. Of those 80 records found, 32 (40.0%) were owned by only 1 library (Table 2, online only). NAL held 18 (22.5%) of the 80 records, 10 (12.5%) were held by NLM, and 12 (15.0%) were held by LC. Of the records owned by only 1 library, 6 (18.8%) were found in veterinary libraries, 5 (15.6%) in NAL, 4 (2.3%) in LC, and none in NLM. Nearly 53.0% were found in other types of libraries, such as historical societies, state libraries, and academic libraries. Surprisingly, the LC online catalog yielded results that were not in World Cat, and therefore it was also searched for all other phases of this study.

Publications of defunct veterinary associations

The survey in the *American Veterinary Review* yielded the names of at least nineteen defunct associations, such as the Alumni Association of the American Veterinary College, Association of Veterinary Faculties of North America, Association of the Bureau of Animal Industry Veterinarians, and German Veterinary Association of New York. Searches for the compiled list of associations yielded cataloged records for only one: the Missouri Valley Veterinary Association.

Veterinary supply catalogs

The search yielded 77 records for supply catalogs, of which 13 were duplicate editions, dating from 1881 to 2004. Of the 64 catalogs, only 9 (14.06%) were held by more than 1 library (Table 3, online only). Forty-four of the 77 catalogs (57.14%) were held by veterinary libraries, with Zalk Veterinary Medical Library, University of Missouri–Columbia, holding 22 catalogs, half of all those held in veterinary libraries.

Veterinary house organs

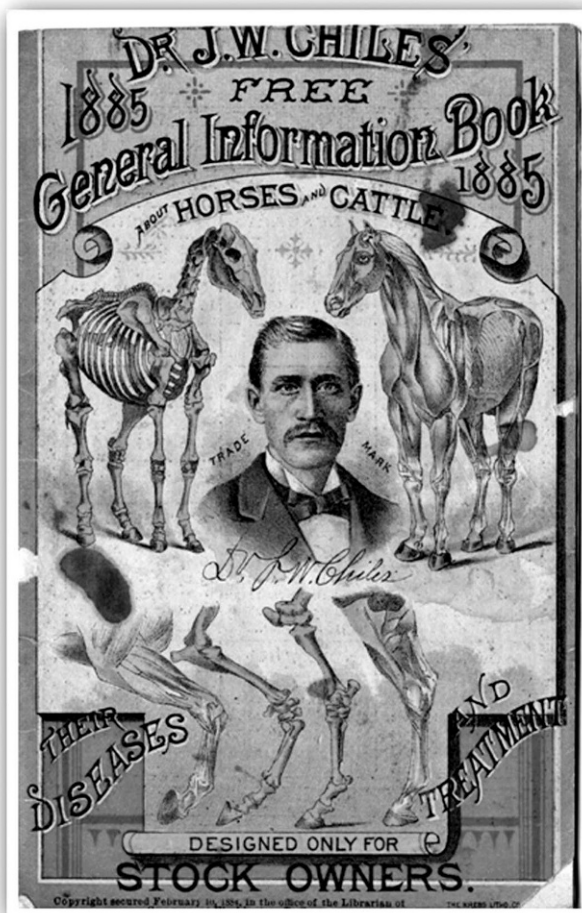
A total of 114 veterinary house organs were identified, although more might well exist (Table 4, online only). Of the 114 titles, there were 17 (15%) for which no library could be identified as having copies. Of the remaining 97 titles, there were 36 titles (37%) for which a complete set could not be assembled from among the holding libraries. A complete set of a very well-known house organ, *Norden News*, even with 26 holding libraries, could not be assembled. In addition, no library could be found that owned the 2 veterinary house organs that Lederman listed in her article on chemical house organs [8]. Thirty of the 97 titles (31%) were held by only 1 library. Of those titles for which a complete set was available, there were 6 titles that would require the cooperation of several libraries to compile the set. The study revealed that 52% of these titles identified were either totally or partially uncataloged; another 31% were owned by only 1 library.

Patent medicine publications

There were 3 or 4 major veterinary rare book collections in the United States, but even these collections had few, if any, patent medicine booklets

Figure 4

Veterinary patent medicine book: Dr. J. W. Chiles. 1885 general information book about horses and cattle. Dixon, IL: Dr. J. W. Chiles; 1884



in them [17, 18] (Figure 4). No holdings of any kind were found for publications from 19 of the 60 patent medicine companies. There were 316 unique items, with 887 holdings in libraries for the other 41 companies. Institutions with veterinary libraries held 195 (61.71%) of the items, and 183 (57.91%) of the items were held by only 1 library. If a company such as Dr. LeGear, Dr. Daniels, or Pratts had published several titles with multiple editions, then it was more likely that these titles could be found with several holdings attached. Even for these more prolific patent medicine producers, not all of their publications were found in the resources searched.

Veterinary advertisements

Twelve of the 14 surveyed veterinary librarians responded (86%). The responses revealed that a variety of practices have been followed, from removing both ads and covers, to removing covers but not ads, to removing back covers if they were blank. Some respondents said the removal was not done across the

Figure 5

Veterinary advertisement: What the veterinary profession means to mankind: from hayfield to hospital. J Am Vet Med Assoc. 1944 Feb;83(803):iii



board but varied from journal title to journal title (Figure 5). Some continued the practice until 1990. In this author's own institution, journal ads and covers were removed until 1960.

LIMITATIONS OF THE STUDY

The methodology employed in this study was limited by the sources of holdings information readily available for consultation, chiefly, the OCLC database and printed retrospective holdings catalog for the NAL and other printed resources.

DISCUSSION AND CONCLUSION

The survey amply demonstrates the gaps in cataloged library holdings of the ephemeral veterinary literature. Many of these materials contain information essential to the study of the history of veterinary medicine in the United States. There are no items cataloged for nearly 44% of the US veterinary schools that are no longer in existence and the remaining 23 schools are represented by only 67 different publications. Defunct veterinary associations are almost

totally absent from the bibliographic record, with only the Missouri Valley Veterinary Association being present through its bulletin and proceedings. House organs, the most likely of the ephemera to contain information of scientific value, although represented by more than 100 titles, are widely scattered across libraries and pose a significant challenge to any digitization and preservation effort. At least 83% of this veterinary scholarship and history is at high risk for loss. It is unclear exactly how scarce the remaining 17% of those titles found in multiple libraries are at present or how at risk they may become. Patent medicine materials, providing a socioeconomic view of the history of veterinary medicine, are relatively scarce, with more than half of their records being owned by only 1 library, which is frequently a local or state historical society. The fairly common practice, among even academic libraries, of removing advertisements and covers, leaves a huge void in the socioeconomic history of veterinary medicine in the United States. The publications of the 41 defunct veterinary schools are either scarce or nonexistent. The scattered nature of these holdings presents a special challenge to the access to and preservation of these materials.

It is incumbent upon librarians to be ever vigilant in collecting and preserving the output of the present day veterinary colleges. Academic, veterinary, medical, and special librarians should be involved in efforts to preserve their institutional, local, and state materials. The Special Collections Department, Parks Library, Iowa State University, has been fairly successful in soliciting records of veterinary associations since the late 1970s [19]. Because a mechanism is already in place, veterinary librarians could help grow the repository by either adding records of past associations as they are found or encouraging present day associations to deposit their records to the repository. Present-day supply catalogs, if not collected now, will suffer a similar fate as the early catalogs, which are scarce, popular amongst collectors, and frequently bring high prices when sold. Several of the house organs were important in their day and contain substantive information on the development of veterinary medicine in the United States. To have these titles digitally available and accessible through optical character recognition (OCR) capability would be of immense value to veterinary historians and genealogists.

It is not known how much early US veterinary literature or ephemera can still be found. There are most likely such materials in hidden collections in libraries and museums. Many of the types of items described in this article occasionally appear on eBay, and some are in private collectors' hands. Much of what is in private collections is unique and undocumented. A concerted effort should be made to purchase these items whenever they appear on eBay or through other resources. If a private collection is known, the librarian should cultivate a relationship with the owner in hopes that someday the owner will donate the collection to the library or make it available

for sale to the library instead of dispersing the collection to the unknown. Given the fragility of some of the material, it is important to store them in archives where they can be properly preserved.

Brown University and the University of Tulsa are sponsoring "Cover to Cover: The Modernist Journals Project" to locate cover-to-cover issues of thirty-five core titles critical to the study of Modernism so that they can be digitized. They have undertaken a project to create a database of libraries holding the titles and the content contained therein [20]. A similar project needs to be undertaken for veterinary journals.

In September of 2007, a group of seven veterinary medical librarians organized to form the Veterinary Archives Grey Literature Steering Group (known as V-Ags) with the express purpose of identifying, collecting, and preserving gray literature, hidden archives, and archival materials (past and present) pertaining to veterinary medicine. Among the goals of the organization is to mentor the next generation of veterinary librarians to make them aware of the early literature of veterinary medicine and how few copies exist of much of the materials [13].

Over the years, various types of veterinary materials have fallen below the radar of collection development librarians. Librarians have assumed other libraries were retaining the ephemeral materials examined or they were available in the national libraries, but this study reveals these assumptions are false. The time is ripe for veterinary librarians and other interested parties to start investigating ways to inventory and make known what is hidden in their archives. A database or a registry of all known items could be created. Perhaps libraries could work together to complete runs of journals where no one library has a complete run of a title. Items not owned by any library should be actively sought out. Unique, one-of-a-kind items should be immediately digitized and preserved for posterity. If no action is taken, many more items in the public realm will continue to be unknowingly destroyed. Librarians working individually, and in concert, can make a difference in recovering and preserving some of the heritage of veterinary medicine.

Librarians working in fields where currency of information is critical can lose sight of the longer view and broader perspective on the value of materials beyond their use as current information resources. Dr. Susan Jones, who holds a doctorate in history and a doctor of veterinary medicine degree and is the current cochair of the World Association for the History of Veterinary Medicine, summarizes the value of the types of ephemera this paper has examined:

These objects are crucial to our understanding of the history of veterinary medicine...through old journals and advertisements, we can understand the world in which they [veterinarians] lived and the concerns they had. Thus, material culture represents important historical evidence. [21]

ACKNOWLEDGMENT

Special recognition and gratitude must be given to Esther Carrigan, AHIP, associate dean and director, Medical Sciences Library, Texas A&M University. She envisioned a short five-minute panel presentation as becoming a potential MLA Murray Gottlieb Prize essay winner and a published paper in the *Journal of the Medical Library Association*. Without her encouragement, guidance, and moral support, the author would have never undertaken the study.

REFERENCES

1. American Veterinary Medical Association. Former veterinary medical institutions in the United States [Internet]. Schaumburg, IL: The Association 6 Jun 2009 [cited 3 Jun 2010]. <http://www.avma.org/myavma/member_resource_directory/former_us_vet_schools.pdf>.
2. American Association of Veterinary Medical Colleges. Veterinary medical schools in the United States [Internet]. Washington, DC: The Association [cited 3 Jun 2010]. <http://www.aavmc.org/students_admissions/vet_schools.htm>.
3. American Veterinary Medical Association. Accredited U.S. colleges of veterinary medicine [Internet]. Chicago, IL: The Association 2010 [cited 3 Jun 2010]. <http://www.avma.org/education/cvea/colleges_accredited/colleges_accredited.pdf>.
4. Lowe FM. He inspired a veterinary renaissance [letter to the editor]. *New York Times*. 4 Mar 1995.
5. Random house dictionary of the English language. 2nd ed., unabridged. New York, NY: Random House; 1987. p. 928.
6. Merillat LA. Veterinary military history of the United States. v.1. Chicago, IL: Veterinary Magazine; 1935. p. 336–7, 448.
7. Current veterinary publications. *North Am Vet*. 1950 Feb;31(2):74–5.
8. Lederman LF. House organs of chemical interest. In: *Searching the chemical literature*. *Adv Chem Ser*. 1961;4:104–11.
9. Kronick DA. A selected list of house-organs for bio-medical libraries. *Bull Med Libr Assoc*. 1950 Apr;38(2): 152–5.
10. Osborn AW. Binding. In: Osborn AW, ed. *Serial publications: their place and treatment in libraries*. 3rd ed. Chicago IL: American Library Association; 1980. p. 358–62.
11. A list of periodicals bound complete with advertising pages in New England and New York City libraries. Hanover, NH; 1935.
12. Garvey EG. What happened to the ads in turn-of-the-century bound magazines, and why. *Ser Libr*. 1999 May;37(1):83–91. DOI: 10.1300/J123v37n01_07.
13. Jaros J, Carrigan C, Boyd CT, Croft V, Fagen D, Moberly HK, Stephens G, Willard G. Saving the elusive past for the future: a case study in collaboration of veterinary libraries. *J Agric Food Info*. 2008;9(4):329–40. DOI: 10.1080/10496500802487925.
14. Veterinary Medical Libraries Section, Medical Library Association. *Veterinary serials: a union list of serials held in veterinary collections in Canada, Europe and the U.S.A.* 2nd ed. The Section; 1987–1988. 2 vols.
15. *The Printers' Ink directory of house organs*. New York, NY: Printers' Ink; 1944.
16. *Vet Collect Roundtable*. 1993 Fall;1(1)–2008 Aug;16(4).
17. Koch HC. Catalogue of rare veterinary books & allied subjects in animal husbandry in the Michigan State University Library [Internet]. East Lansing, MI: Michigan State University Libraries 2003 [updated 14 Jan 2004; cited 3 Jun 2010]. <<http://digital.lib.msu.edu/projects/vetmed/>>.
18. Smithcors JF. Five centuries of veterinary medicine: a short-title catalog of the Washington State University Veterinary History Collection. Pullman, WA: Washington State University; 1977. (Available from: <<http://www.wsulibs.wsu.edu/Holland/MASC/onlinebooks/vetmed/contents.htm>>. [cited 3 Jun 2010].).
19. Special Collections Department, Parks Library, Iowa State University. *Veterinary medicine and related collections guide* [Internet]. Ames, IA: The University 20 Jan 2010 [cited 3 Jun 2010]. <<http://www.lib.iastate.edu/spcl/collections/vetmed.html>>.
20. Stern H. Modernist journals project cover-to-cover initiative [Internet]. [rev.15 Apr 2009; cited 3 Jun 2010]. <<https://wiki.brown.edu/confluence/display/library/Modernist+Journals+Project,+Cover-to-Cover+Initiative>>. [For additional information, see also: Modernist journals project [cited 3 Jun 2010]. <<http://dl.lib.brown.edu:8081/exist/mjp/index.xml>>].
21. DiVita LJ. Veterinary antiques: a lesson in history, the profession, advertising, and collecting. *J Am Vet Med Assoc*. 2001 Nov 1;219(9):1194–5.

AUTHOR'S AFFILIATION

C. Trenton Boyd, MA, AHIP, boydt@missouri.edu, Head Librarian, Zalk Veterinary Medical Library, W218 Veterinary Medicine, University of Missouri–Columbia, MO 65211-5120

Received June 2010; accepted August 2010