Revisiting the Landscape of Literatures: Replication and Change in the Use of Subject Collections

Paul Metz

Circulation data from the Virginia Tech Libraries were analyzed to determine the extent of continuity or change between the author's study of the use of subject collections in 1982 and the present. Book circulation has declined, largely due to much less use by undergraduates. The overall profile of subject use has changed in ways traceable to changes in the population of active library users. Disciplinary groups who still rely on library monographs do so in ways strikingly similar to their behavior in 1982, and the findings strongly replicate the earlier findings that were most suggestive for library practice and the sociology of knowledge.

Scope and Background

In 1983, ACRL Publications in Librarianship published the present author's monograph, *The Landscape of Literatures*, a comprehensive study of the use of subject collections within one university, Virginia Tech (then generally referred to as VPI&SU, or Virginia Polytechnic Institute and State University).[1] Although supplemented by limited measures of the use of journals within the library and by comparative data from University of Nebraska, the bulk of the analysis was devoted to a snapshot of monographic use captured in a May 24, 1982, download of books in circulation. The focus throughout the study was on the question, "Who uses what?" and its implications for library practice and, secondarily, for the sociology of knowledge.

The present study replicates the original, again focusing on the use of monographs, as measured in this case during the spring of 2010. To repeat a large-scale study at the same institution after the passage of nearly three decades affords an opportunity either to support past findings with confirming longitudinal data or to present conflicting findings that would suggest either that change has taken place or that the data are unreliable in some way.

Replication is a particularly valuable opportunity in the case of *The Landscape of Literatures* (hereafter, *Landscape*), since as the first full-scale study of its type it was necessarily somewhat exploratory, taking a "let's see what we get" approach rather than framing the research around hypotheses based on past work. Although such research can be important and exciting, any such "data dredge" runs the risk that strong conclusions will follow from

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findings that merely reflect short-term trends, sampling error, or the like.

To avoid this risk, the present study was largely confined to reexamining the most significant original findings in light of the recent data. These will be restated at appropriate points in what follows. The only additions to the scope of the original analysis were an extension of the previous work on the effect of branch libraries, made possible by the rare opportunity to capitalize on a "natural experiment," and a brief look at the age distribution of the books in use within each discipline.

Research Previous to the Original Study and in the Intervening Years

The 1982 study built upon previous work in two main areas: 1) studies of library use and 2) an extensive literature in bibliometrics, particularly its use of citation links to trace dependency relationships among various fields of knowledge.

Ambitious library use studies had already been conducted by Fussler and Simon and by Allen Kent and his colleagues, of course.[2] These important works focused on the overall use of the collections and the inventory and economic implications for policy makers, but they did not attempt to trace user-book relationships at the disciplinary level.

The first attempts to bring library data to the "who uses what?" question at the subject level came from William McGrath et al. and from Stephen Bulick.[3] In 1979, McGrath presented the results of a two-year study of library circulation to undergraduate and graduate students at the University of Southwestern Louisiana. Borrowing the concept of "ethnocentricity" from Donald Campbell, who used the term to convey the extent to which researchers in a discipline focus on the specialized literature of the field, as opposed to drawing more broadly on works in potentially related disciplines, McGrath studied circulation records and found that students in music, English, and Spanish were highly ethnocentric in their library use at both the undergraduate and graduate levels. Geography, which almost inevitably draws on a variety of social and physical sciences, ranked low for both populations.

McGrath coined the term "supportiveness" to convey the obverse concept (that is, the extent to which a subject literature is used by, or supports, the work of nonspecialists). Again applying student records to the study of this concept, he found few similarities between undergraduate and graduate patterns though chemistry ranked high and education ranked low for both groups.

In his 1982 monograph, Stephen Bulick applied many of the same approaches to an admirably arduous reanalysis of the original Allen Kent "Pittsburgh" data. Arguing that the sociology of knowledge and the development and maintenance of library collections should be so closely related that the latter may be seen as the "operational extension" of the former, Bulick focused on the social sciences, whose boundaries he argued were generally more permeable than those of the physical sciences.[4] Following McGrath, he studied the ethnocentricity of various disciplines, concluding that economics, with its more developed disciplinary paradigm, was most ethnocentric with geography again being widely dependent on other literatures.

Even in 1982, the bibliometric literature studying the relationships among academic disciplines was too extensive to be reviewed in detail. Of the innumerable citation studies that had been conducted, the most salient for the *Landscape* analysis was Earle and Vickery's 1969 study, which made the counterintuitive claim that scientists were more dependent on the literature of technology than engineers and other technologists were reliant on the basic literatures of science.[5]

One need hardly mention that the bibliometric literature has exploded in recent years. The stupendous achievements of researchers such as Herbert Van de Sompel and Johan Bollen in capturing log data on hundreds of millions of user

navigations among scientific journals promise a complete transformation of our understanding of interdisciplinary relationships.[6] To this date, there has not been similar progress in the use of library data to trace disciplinary relationships: in fact, the current study is the first since 1982 of which the author is aware.

Although there has been too little dialogue between library use studies and other forms of bibliometric analysis, the work that has taken place in libraries and the recent breakthroughs analyzing users' "clickstreams" generally agree in showing that actual use of subject literatures in all fields is more interdisciplinary than citation patterns had ever suggested, and that the use of books, which generates relatively few citations in many disciplines, is more interdisciplinary than the use of journals. This latter realization follows logically from Derek J. de Solla's Price's argument that new understandings must be codified and "packed down" into more synthetic and basic forms before they become accessible to outsiders.[7]

Methods

The data for the present report were extracted via the Create Lists capability of Innovative Interface's Millennium Client. Lists were created at the item level. The search argument was simply to specify all patrons of the types of interest (for example, Faculty or Research Faculty) with one or more items checked out. Basic patron and bibliographic information was then downloaded to spreadsheets. Because recent library uploads of employee and student data had not been entirely successful, the university's online directory was consulted for the departmental affiliations of faculty and graduate students whose departments were not known to the system. Patrons who could still not be identified at this point were excluded from analyses of discipline-literature relationships.

Whereas in 1982 all data were collected on a single evening, the author's misunderstanding of the nature of the downloaded data required that data for other patron groups be gathered again after all cleanup on the faculty data had been completed. Accordingly, the data for faculty come from a download on February 12, while graduate student data come from March 5. About 15 percent of the books charged to graduate students on the first date had been returned by the second, and of course new books had been charged to graduate students—a relatively small source of inconsistency in the overall dataset, especially in light of the stability of findings that the discussion will reveal.

The actual analyses were straightforward. Where necessary, columns were added to make it easier to group data (social science faculty, books in the life sciences, QA1–73 and QA77–QA993 as mathematics in order to avoid sorts that would contain computer science). Data were then sorted—usually by department, with a secondary sort by call number to see the subject distribution of books charged each discipline.

Subjects were defined, and when necessary grouped into large subjects ("physical sciences"), according to the call number clusters reported on pages 8 and 9 of *Landscape*. Most readers will not need to consult this information, since the call number ranges for all subjects except the larger collations are shown in the presentation of most findings. The spreadsheet format turned out to be more informative and robust than the data reports for *Landscape* in that it was easier to see if a few patrons were driving what might otherwise seem to be a notable finding and in that the data are more amenable to reanalysis. For example, although business administration is defined as the call number range HE–HG, it would be easy in a later analysis to focus on user groups interested in finance, management, or other subfields.

Findings

User Populations and Use

Although the major interest in both studies has been "Who uses what subject lit-

eratures?" it is important not to overlook the more basic issue, "Who is using the library? Who checks out books?" This is a particularly interesting question when we are comparing patron behavior in pre- and post-Internet times.

As table 1 demonstrates, the number of items in circulation has declined dramatically, especially among undergraduates. Some small part of this decline in the total number of books in use can probably be attributed to changed library policies that now allow fewer renewals than before. Although the mean number of books charged to users in each class who do have books is virtually the same as in 1982, the number of active users and therefore the number of books in circulation has dropped dramatically. Faculty book use has been cut in half. The decline in books charged to undergraduates—from 19,292 in 1982 to 6,215 today—is actually a 4:1 decline in books per capita after we account for growth in undergraduate enrollments. Partly because of the increase in graduate enrollment, and partly because graduate students have retreated less than other user classes in their dependence on circulating materials, the graduate student populations' share of circulating books has grown from just over one-third to one-half.

While we should not be unduly depressed by these statistics (after all, the number of online information retrievals performed annually by Tech users has climbed from zero in 1982 to over three million searches and downloads today!), it is important that we understand them.

The arrival of the Internet almost certainly accounts for the drop in library circulations. This effect manifests itself in two distinct ways. Web sites such as Wikipedia, the CIA Factbook, PubMed, and a host of less reliable resources reduce the need to come to the library for basic information that might once have been sought in books.

Even within the library context, for many users the information that might once have required a book is now available within a library-sponsored online resource. Some of these resources will be ebooks, which in the case of the Virginia Tech Libraries are largely confined to 50,000 NetLibrary books from the first half of the 2000 decade, Safari Books, and 12,000 SpringerLink Ebooks, but most will be electronic journals.

That students in particular would switch, when possible, from books to ejournals is easy to credit if we remember that, in 1982, the use of a journal article required a manual subject search (often

TABLE 1
Patron Demographics and Library Activity, 1982 and 2010

User Group	Books/ Active Borrower 1982	Books/ Active Borrower 2010	Books Charged, 1982	Books Charged, 2010	% Books Charged, 1982	% Books Charged, 2010
Faculty	11.5	11.6	14,640	7,199	25.0%	22.1%
Graduate Students	8.7	7.9	21,233	16,354	36.3%	50.2%
Undergraduates	3.6	3.2	19,292	6,215	33.0%	19.1%
Staff	4.0	4.4	948	905	1.6%	2.8%
Other	3.0	4.9	2,435	1,900	4.2%	5.8%
			58,548	32,573	100.0%	100.0%

Notes: (1) Books charged, 1982 a very close approximation based on multiplying values reported in *The Landscape of Literatures*, Table 4, p. 12. The sum obtained this way, 58,548, is .00156 in excess of the actual 58,457 reported on Table 54, 114; (2) Based on Feb. 22 download, as opposed to Feb. 12 for most other analyses.

requiring reference help), a trip to the library stacks, and, in many cases, the expense, time, and frustration entailed in using a photocopier of dubious quality. In 1982 it was far easier for a student to obtain a book than an article; today, the reverse is true. Faculty themselves are not immune to the appeal of convenience, and many of their needs to understand a concept or method or to obtain a fact can be met by a full-text database such as ScienceDirect. But the need for extended argumentation that presents data and illustrations, together with the scholarly apparatus of bibliography, is still largely met by books in print.

In *Landscape* the argument was made that large-scale changes or differences in use—over time, between faculty and students, and by inference even between institutions—can usually be traced to changes or differences in the demographics of the active user population. If more humanities faculty are hired, use of history will increase; if students use the library less, use of the subjects in which their past use was disproportionately high will suffer. By and large it is these demographic differences, rather than the accumulation of micro-level differences in the ways that historians, mathematicians, and others work in Institution A or Institution B, or at Time One as vs. Time Two, that account for large-scale differences in the distribution of overall use across subjects.

Although the overall use of subject literatures changes slowly (in 1988 Metz and Litchfield found a correlation of .976 in subject use between the original 1982 results and data drawn five years later), it would be surprising if we did not see fairly dramatic changes over the course of twenty-eight years, and indeed we do.[8] Table 2 shows the distribution of use across the general subject areas in 1982 and 2010, first for faculty and then for all users. Faculty use of books in the humanities (the first three categories) has increased from 29.6 percent in 1982 to 39.4 percent today. Overall use shows similarly large increases in the proportional share attributable to history and other humanities, at the expense of economics and business. Another notable change has been a shift in overall use from the life sciences to the physical sciences.

As the following analyses will repeatedly show, library use by active users within individual disciplines appears to be highly stable over time. Explanations of large-scale changes in the subject mix of circulating materials must instead come about because the population of active users is changing. Two forces can account for this: changes in the user population and differential changes in the degree to which specific parts of that community rely on library monographs for their work.

Of the many ways in which Virginia Tech has changed since 1982, the ones most likely to help explain the shifts in use include deep cuts in agriculture and especially agricultural extension, a significant expansion of graduate education, and the broadening of graduate programs into fields outside Tech's still recognizable focus on science and applied disciplines. The last of these changes is especially notable, with significant growth in English graduate offerings and the inauguration of interdisciplinary degree programs in science studies and in "Social, Political, Ethical and Cultural Thought," the two of which accounted for 1,164 of the books charged to graduate students.

It also appears that disciplines have not all responded in the same ways to the digital age. Faculty in some areas appear to have retreated more from the use of library books than have other faculty, possibly due to a greater ability to find what they need in articles, Web sites, or preprints. Looking simply at the number of faculty users with at least one book, the numbers in English (72 in 1982, 49 now) and history (from 26 to 25) show much more persistence than those for faculty from the College of Agriculture and Life Sciences and the College of Business, whose numbers of active borrowers fell

from 134 to 42 and from 89 to 20, respectively. In recent years a growing share of the library's expenditures in support of business has been devoted to financial databases acquired via subscription, a shift in emphasis among the business community that has been remarked even in explanations of the recent economic downturn. This may help to explain the dropoff in library use by business faculty.

Regardless of why monographic use in other disciplines may have decreased so rapidly, the residue remains a larger than ever share of humanists and social scientists for whom the extended treatment represented by a good monograph remains indispensable.

Liberal arts faculty now account for 60 percent of faculty books, with the history and English faculty alone having risen from a 14 percent share of faculty books to about 24 percent.

Interdisciplinarity and the Variation among Disciplines and Literatures

The 1982 analysis of book use focused heavily on the measurement, analysis, and explication of interdisciplinary use. With particular emphasis on faculty as the users whose behavior would tell us the most about the inherent characteristics of each discipline, the study defined the subjects (call number ranges) that would be considered endogenous to each discipline and calculated the percentage of their overall use that could be attributed to those subject literatures by faculty in each field. The analysis first looked at supportiveness—the extent to which a literature is used by outsiders—and then at ethnocentricity, which also looks at who-what pairings, but from the perspective of the user rather than that of the literature.

The conclusion—the "takeaway lesson" of *Landscape*, if we are to judge by subsequent discussions—was that interdisciplinary use is very high. Indeed, it was found that "the majority of use of most subject literatures is by outsiders—that is, by readers with other specialties than those primarily associated with those literatures." The library was seen as an "unpredictable bazaar for the exchange of ideas," suggesting policies that emphasize "the integration of services, an opposition to arbitrary barriers to the flow of information, and the avoidance of narrow specialization."[9]

Just as interdisciplinary use was the main focus of *Landscape*, the main goal of

TABLE 2
Faculty and All Use of Materials, by General Subject Area, 1982 and 2010

Area	Faculty Use, 1982	Faculty Use, 2010	All Use, 1982	All Use, 2010	Change in % of All Use	Change in Relative Share of All Use
History	6.9%	11.3%	5.3%	7.6%	2.3%	43.7%
Language & Literature	14.7%	16.0%	11.0%	9.7%	–1.3%	–11.4%
Other Humanities	8.0%	12.1%	5.4%	8.4%	3.0%	56.1%
Economics and Bus. Admin.	9.0%	5.4%	10.9%	7.4%	–3.5%	–31.8%
Social Sciences	14.1%	19.0%	17.1%	18.2%	1.1%	6.2%
Physical Sciences	14.1%	11.2%	11.9%	14.4%	2.5%	21.1%
Life Sciences	12.5%	8.4%	12.8%	10.8%	–2.0%	–15.4%
Technology	9.3%	8.5%	13.1%	13.0%	–0.1%	–1.1%
Other	11.5%	8.0%	12.5%	10.4%	–2.1%	–16.6%

Note: Faculty data drawn February 12; other users drawn March 5, 2010.

TABLE 3
Supportiveness Analysis–Faculty Data for Literatures Selected as Having Very High or Very Low Scores in 1982

Group	Discipline	Call Numbers	Natural Constituency	Outside Prop., 1982	Outside Prop., 2010	Books Charged in Subject, 2010
High '82	History	C-F	History Department	0.84	0.68	767
High '82	Music	M	Music Department	0.80	0.77	60
High '82	Psychology	BF	Psychology Department	0.96	0.82	143
High '82	Sociology	HM–HX	Sociology Department	0.81	0.88	509
Low '82	Anatomy/ Physiology	QM–QP	Ag & Life Sci, Vet Med, Biology	0.29	0.51	71
Low '82	Architecture	NA	College of Arch & Urban Studies	0.22	0.07	153
Low '82	Botany	QK	Ag & Life Sci, Biology Dept	0.11	0.32	31
Low '82	Civil Engineering	TA–TC, TE–TG	Engineering exc CompSci	0.24	0.29	223
Low '82	Veterinary Med	SF600-SF1100	College of Vet Med	0.29	0.00	22

Note: Proportions are % users from outside natural constituency

the present research is to replicate, refute, or refine the original findings by examining contemporary data. With fewer books in patron hands, the data would not support a granular analysis of each discipline-to-subject pairs that had been analyzed in 1982. Instead, the decision was made, in advance of the analysis, to emphasis those literatures and disciplines (with enough books to warrant analysis) whose scores had been at the high and low end of scores measuring supportiveness and ethnocentricity.

Choosing high- and low-end literatures and disciplines is the best way to correct the effects of regression toward the mean. Past findings that merely reflected temporary phenomena, the penchants of particular heavy borrowers, or other "blips" should recoil severely toward the middle. Equally though, we can be more confident that findings that survive such reanalysis actually do reflect something inherent about the literatures and disciplines being studied.

The supportiveness scores of nine literatures are shown for faculty reading in both 1982 and 2010 in table 3. Three other subjects intended for restudy were not amenable to analysis, mainly due to university reorganization that made it impossible to identify user groups in a consistent manner. Despite some regression toward the mean in six of the nine cases (a relief in the case of psychology, where the original finding that the department accounted for only 4 percent of faculty use of class BF alarmed the author, who did not believe it himself until the online records of many individual borrowers had been checked), the 2010 data generally replicate the earlier findings in showing significant use by nonspecialists. Even after this moderate convergence toward

the middle, the four literatures that were most supportive in 1982 still hold that rank, and the literatures least supportive in 1982 still have relatively few borrowers from outside. The general finding of high supportiveness, and the specific claim that individual literatures will differ in this regard in consistent ways, are substantiated.

Although the term is value-laden, "ethnocentricity" remains the standard term for the degree to which specialists in a given discipline restrict their attention to the literature endogenous to that field. In revisiting this concept, the decision was again made to focus on faculty use of those literatures with fairly extreme scores. As was the case with supportiveness scores, the data in table 4 again showed regression toward the mean in a majority (six of eight) cases. Despite one exchange between disciplines in the top four and bottom four, with physics dropping to a lower score than psychology, the groupings remain reasonably intact and distinct from one another. Only in the case of mathematics is the majority of disciplinary use within the traditionally expected literature, so the data again clearly underscore the importance of interdisciplinary use.

This study emphasizes faculty use of materials because that is deemed most indicative of the inherent nature of academic disciplines. This should not detract attention from graduate students, who have already been shown to account for half the books in use at Virginia Tech. Indeed, graduate students, who lack large personal libraries or the resources to acquire them, who are often taking multiple courses that require more than textbook and laboratory work, and who have not yet forged the invisible colleges of colleagues who can informally share books or reprints with them, may well be the library's most significant stakeholders at doctoral-level institutions.

In the *Landscape* analysis, a fair bit of attention was paid to use by graduate students, but little to undergraduate use. In the current study, even less attention is paid to books charged to undergraduates than was the case in 1982, because there were simply too few books charged to undergraduates with declared majors to sustain real analysis.

Anyone who has enrolled in a strong graduate program will recognize the intensity with which graduate students are expected quickly to assimilate the

TABLE 4
Ethnocentricity Analysis—Faculty Data for Liberal Arts and Sciences Departments Studied in 1982

Group	Dept	Native Call #'s	% Use Native Materials, 1982	% Use Native Materials, 2010	Books Charged by Dept, 2010
High '82	Chemistry	QD	46.8%	37.3%	51
High '82	English	PE, PR, PS, PZ1–4	50.4%	41.4%	840
High '82	Mathematics	QA1–QA, QA77–QA993	68.4%	69.7%	188
High '82	Physics	QC	50.3%	29.1%	172
Low '82	Geography	G–GF	7.8%	13.5%	37
Low '82	Political Science	J	13.1%	21.5%	405
Low '82	Psychology	BF	10.5%	36.6%	71
Low '82	Sociology	GN–GT, HM–HX	37.1%	28.9%	305

TABLE 5
Faculty and Graduate Student Use of Endogenous Literatures, 1982 and 2010

Department, School, or College	Specialized Call #s	% Faculty Books	% Graduate Student Books	Difference
Aerospace Engineering	T–TS	51.5%	52.4%	0.9%
Architecture	NA	39.5%	48.9%	9.4%
Civil Engineering	TA–TC, TE–TG	33.3%	36.4%	3.1%
Electrical & Computer Engineering	QA74–QA76.9, TK	27.3%	48.7%	21.4%
English	PE, PR-PS, PZ1–4	41.4%	39.6%	–1.8%
Geosciences	QE	45.8%	43.5%	–2.3%
History	C–F	30.1%	41.4%	11.4%
Mathematics	QA1–QA73, QA77–QA993	69.7%	77.7%	8.0%
Physics	QC	29.1%	44.3%	15.2%
Political Science	J	21.5%	20.7%	–0.8%
Sociology	HM–HX	19.7%	39.1%	19.4%
School of Education	L	32.1%	34.6%	2.5%
College of Business	HE–HG	11.9%	30.6%	18.8%
Correlation between Faculty and Graduate Student Scores: **.84**				

Note: The analysis was restricted to disciplines with a fairly unambiguous specialized literature (leading to the exclusion of Science Studies, for example) and with at least 100 books charged to at least five borrowers within both faculty and graduate student groups. Departments were the preferred unit of analysis, but school or college was used when no department qualified and the larger group seemed not excessively heterogenous in its scope.

perspectives, core understandings, and research methodologies of their fields of study. It is probably for this reason (but secondarily that graduate students "don't have lives" and are less likely to read a novel, luxuriate in the latest John McPhee, or need *How To Avoid Probate*) that the 1982 data indicated that graduate students use library books in a more focused and specialized way than their faculty mentors.

The 1982 data showed remarkable congruence between faculty and graduate students. Disciplines behaved about the same as they did for faculty users—where faculty ethnocentricity was high, as in the case of mathematics, physics, or English—graduate student use was also very ethnocentric. Where faculty scores were low—as with geography or psychology—so were graduate student scores. But almost without exception, whatever difference existed between the two groups represented graduate students' narrower use of subject literatures.

The 2010 data presented in table 5 support exactly the same conclusions: fields that are high for one group are high for the other; fields that are low for one are low for both; and, where there is a significant difference, it is because the graduate students' use is more ethnocentric than is faculty use.

Harvesting a Natural Experiment—Branch Libraries and Use

The assumptions that we as librarians make, and such knowledge as we may possess, about "who uses what" have

obvious implications for administrative decisions about branch libraries. As described in *Landscape*, the goals that drive such decisions are "to divide collections cleanly and unambiguously… ; to place within each branch mutually supporting literatures; and not to divide between libraries materials which are related and which are apt be needed by the same persons."[10] We have historically used "educated guesswork" about this issue to establish many branch libraries in mathematics or business but very few in political science.

The highly centralized library structure of Virginia Tech in 1982—a large central library, with branches only in geosciences, veterinary medicine, and art and architecture—allowed the opportunity to compare usage patterns to those of a similar institution with a large number of branch libraries. The author's grant support from the Council on Library Resources (now CLIR) and the gracious cooperation of the library administration at the University of Nebraska made it possible to obtain faculty usage data from the latter institution, which was chosen for both its general similarity to Tech and its decentralized structure.

Faculty use of monographs at the two institutions was compared by examining, for a preselected subset of departments, whether the books charged to Virginia Tech faculty in each department represented a higher percentage of books that would fall *outside the subjects housed in the relevant University of Nebraska branch*, as compared to books charged at Nebraska to faculty from the same department. Not surprisingly, it was not possible to achieve perfect comparability between the departmental structures or bibliographic data from the two institutions, but every effort was made to do so and to introduce conservative bias to any decisions that were necessary to this end.

As had been expected, the Hokie faculty's use of library materials was more interdisciplinary than that of their Cornhusker counterparts in seventeen out of the twenty-two comparisons, a finding that would be statistically significant at the .01 level for any such set of binary comparisons. The conclusion, which was consistent with earlier work by Dougherty and Blomquist, was that, to some extent, "the structure of branch libraries does channel patron behavior."[11]

In 2003, Virginia Tech closed its Geosciences Branch Library, presenting the rare chance to harvest a "natural experiment," in which circumstance, rather than conscious design, manipulates the key independent variable of interest. The question naturally arose whether, subsequent to

TABLE 6
Apparent Effects of Closing a Branch Library on Interdisciplinary Use by Faculty and Graduate Students

	Supportiveness of QE Materials			
	Proportion of Materials Charged to Users Outside Geosciences			
	1982	**2010**	**Expected Change**	**Result**
Faculty	0.09	0.24	Should rise	As predicted
Graduate	0.21	0.33	Should rise	As predicted
	Ethnocentricity of Geosciences Users			
	Proportion of Charged Materials in Class QE			
	1982	**2010**	**Expected Change**	**Result**
Faculty	0.48	0.46	Should fall	As predicted
Graduate	0.50	0.44	Should fall	As predicted

consolidation of class QE materials back into Tech's main library, use by geoscientists, and use of geoscientific material, had become more interdisciplinary. Two measures—supportiveness and ethnocentricity—could be obtained for both faculty and graduate student records, allowing four tests in all.

Table 6 reports the result of those comparisons. All four changes are in the predicted direction. The decreases in the ethnocentricity of borrowers from Geosciences are trivial, but the increases in the percentage of class QE materials charged to both faculty and graduate student users from outside the discipline are dramatic. It would be interesting to know to what extent, as branch libraries have been closed around the country, readers from outside the discipline have benefitted, as seems to be the case at Tech.

Differences between Specialist and Outsider Use, and the Implications for Policy

Many libraries, especially in smaller, teaching-oriented institutions, rely on the teaching faculty for the majority of book selection. Faculty presumably do their best to build collections that will support current and anticipated needs for monographs, just as librarians do when they control selection. Since the evidence assembled in the *Landscape* analysis showed that the majority of faculty use for most literatures was by faculty outside the discipline, and that total faculty use was itself smaller than use by nonfaculty, it seemed wise to consider the possibility that specialized departmental faculty might be atypical users, not well qualified, despite their best intentions, to serve as surrogates for current and future users from outside their ranks.

By comparing the ways in which departmental faculty, other faculty, and nonfaculty users' borrowing of books were distributed within the various subfields' different subject areas, the *Landscape* analysis raised real questions about whether departmental faculty may be relied upon to build specialized collections that will adequately fulfill the needs of other users. In each of the fields under study—English and American literature, philosophy and religion, sociology and anthropology, history, engineering, and foreign languages—use by specialized faculty differed from the use of other faculty and nonfaculty users, who are in all cases the majority stakeholders by a wide margin.

The distributions of departmental faculty, other faculty, and other users were subject to chi-square tests. All but one of the twelve possible comparisons were statistically significant, usually at the .001 level. However, as was admitted in the original discussion, chi-square is an imperfect test because it assumes a greater independence of data points than can be accurately claimed when one individual can be responsible for many checkouts in a specialized area. The results were therefore considered as strongly suggestive but not conclusive.

The opportunity to retest data after a 28-year hiatus is particularly welcome in the case of *post hoc* explanations that were not fully amenable to statistical verification. To retest as rigorously as possible the idea that the interests of specialist faculty are nonrepresentative, the present analysis was confined to the same departments and subjects as had been studied before, with the exception of philosophy and religion where university reorganization had made replication impossible. The distribution of books charged to departmental faculty, other faculty, and nonfaculty users was studied across the same subfields as had been used before and reported in tables 27–32 of *Landscape*. Each of the analyses looked like that shown in table 7, which shows that, although English Department faculty borrow more books in English than in American literature, this preference is reversed for the other two groups whose total use so dramatically outnumbers theirs. That different constituencies come to the collection in English and American language and lit-

TABLE 7
Use of English Language and Literature by Faculty Insiders, Other Faculty, Other Users, 2010

	PE	PR Engl	PS Amer	PZ1–4	Total	% of All Use
English Faculty Use	10	191	146	1	348	17.4%
Other Faculty Use	9	78	95	4	186	9.3%
Other Patrons	100	535	813	13	1461	73.2%

Chi-Square English vs. other faculty: 7.59, 2 d.f., $p < .05$
Chi-Square English vs. nonfaculty patrons: 40.43, 2 d.f., $p < .001$

erature was made poignantly clear by the five graduate students from outside the English Department who had different copies or editions of *The Elements of Style* in their possession.

Space does not permit a full display of the remaining findings, but the essence of the replication has been captured in table 8, which reports the specific ways in which departmental faculty's library use was disproportionate relative to that of other users and the confidence level associated with each of the ten relevant comparisons (inside to outside faculty, inside faculty to other users, for all five disciplines including that reported above). The differences in other fields are less dramatic than in the literature example—for example, all users rely on sociology more than on anthropology, but for the sociology department, anthropology accounts for a substantially larger minority of total use. Remarkably, in each instance the use of specialized faculty deviated from that of others in the same qualitative ways in which it had differed in 1982. It is the author's opinion that this replication, which would have had but a remote chance to occur randomly, is the evidence on which the claim really stands.

Library Use in Bibliometric Studies

The focus of the present study is on the implications of what we can learn about "who uses what" for library practice. But, as Bulick pointed out, there is consider-

TABLE 8
Use of Select Literatures by Faculty Insiders, Other Faculty, Other Users, 2010

Faculty Department	Literature Disproportionately Favored by Departmental Faculty	Statistical Significance, Departmental vs. Other Faculty	Statistical Significance, Departmental Faculty vs. Other Users	% Total Use Attributable to Departmental Faculty
English	English Literature	0.05	0.001	17.4%
Sociology	Anthropology vs. Sociology	0.001	0.001	3.7%
History	American History	0.001	0.01	9.6%
Engineering	Civil Engineering	0.001	0.001	8.1%
Foreign Languages	Spanish & Portugese Language and Literature	0.001	0.001	20.4%

Note: Findings collapsed to save space but available from pmetz@vt.edu. Analyses follow the same call number distinctions as in Landscape.

able overlap between the sociological study of disciplines and library practice. Of course, the sociology of knowledge is in itself an important discipline; and, when librarians have findings that can contribute to its progress, they should enter the discussion, however far from their everyday concerns this takes them.

There are three key ways in which circulation data can contribute to our understanding of the nature of academic disciplines and the relationships among them. This account will address each of them briefly:

1. As Bulick has argued, the extent to which a discipline relies on its own literature—which has a negative connotation when we call it "ethnocentricity"—can be taken as a measure of its maturity and the progress it has made in developing an agreed-upon paradigm
2. Data on how one discipline uses another's literatures can be important markers in tracing the relationship between disciplines and the direction in which knowledge flows
3. The extent to which older or more recent publications account for use of a literature may reveal fundamental characteristics of disciplines

Paradigmatic Development and the Maturity of Disciplines

Borrowing from Talcott Parsons, Bulick distinguished between "analytical" disciplines, which evince a fundamental theoretical coherence and strong agreement about their subject matter and "synthetic" disciplines, which lack a central theoretical paradigm but rather apply an eclectic range of theoretical approaches to the specific topic of interest (for example, politics) that defines them. From Bulick's perspective, "ethnocentricity" is not a value-laden term but something synonymous with "disciplinary focus," a measure of agreement among practitioners that can be seen as evidence of a mature discipline with its own fundamental paradigm.[12]

Although this is not the place to enter into longstanding theoretical discussions about disciplinary paradigms, we can at least present data relevant to the points in question. In his 1982 monograph, Bulick maintained that the paradigmatic maturity of the social sciences under study could be inferred from their use of endogenous materials. By this standard he argued that economics, which ranked highest in such use, was the most mature discipline, with "some expectation for consensus on a body of disciplinary knowledge."[13] Geography was the least mature by the same measure, and anthropology, political science, and psychology were somewhere in between.

Although Virginia Tech has no separate department of anthropology, we have already seen from table 4 that geography relies less on its own literature than do political science, psychology, and sociology, and that this was true in 1982 as well. It remains only to determine if, as Bulick would suggest, economics has the highest rank. The current and 1982 studies defined classes HB–HD and HJ as endogenous for economics and found that the economics faculty relied on such materials for 55.9 percent of their borrowed books in 1982 and 38.3 percent in 2010. In both cases, this would give economics the highest ethnocentricity score among the social sciences in question. The data are thus completely consistent with what Bulick would have predicted.

Unidirectional Dependencies among Disciplines

Based on the belief that library circulation data have something to contribute to discussions about the relationships among academic disciplines that is not fully captured in citation data, the analysis presented in *Landscape* devoted attention to ongoing discussions about the nature of academic disciplines as these are revealed by citation practices. Of these, the most important was Earle and Vickery's assertion about the relationship between science and technology. The Earle and

Vickery argument that, contrary to stereotypical understandings, basic science actually relies more on technology than vice versa, was not at all sustained by the 1982 data. On the contrary, both faculty and graduate student data revealed that engineers (the operational definition for technology workers) relied much more heavily on the literatures of basic science than scientists relied on the engineering literature (class T).[14]

No one denies that modern science depends heavily on technology. Indeed, the "Employment Opportunities" homepage for the European Centre for Nuclear Research (CERN) indicates that "Surprisingly, only 2.5% of staff at CERN are research physicists; 33% are engineers and applied physicists and 33% are technicians and technical engineers."[15] But whether basic scientists cite, or much read, technology or simply use it is another matter, one that can lead to extensive discussion of citation as a social act and the considerations that motivate it.

The question here is what the use of library monographs reveals about the relationship between science and technology, and specifically whether the 2010 data show the same asymmetry, with technology much more dependent on basic science than vice versa, as was evident in 1982. In a word, the current data do replicate the finding, again calling Earle and Vickery's account into question and instead supporting the popular view of this relationship. The 2010 data are so close to the 1982 findings that only the new numbers will be reported here: whereas faculty in the sciences depend on technology for only 7.0 percent of their charged materials and science graduate students depend on technology for 6.1 percent of theirs, engineering faculty and graduate students depend on books in classes R through S for 29.1 and 34.0 percent, respectively. As in 1982, the dependence of engineering on basic science exceeds the reverse flow by a factor of about 4:1.

The analysis of faculty circulation statistics in *Landscape* included a brief discussion of the situation of history relative to the traditions and perspectives of the humanities and the life sciences. History related somewhat more closely to the social sciences than to the humanities as measured by department-subject relationships because historians had somewhat more social science than humanities books in use and because class C–F materials accounted for a marginally larger share of books held by humanities faculty than of books held by social scientists. On the other hand, correlation and contingency (chi-square) data for all faculty patrons regardless of departmental affiliation indicated that use of historical materials covaried more strongly with use of materials in language and literature or other humanities than with use of the social sciences.[16] That history should hold a halfway position more or less equally posed between the social sciences and the humanities is, like the relationship the

TABLE 9
Relationship of History to Other Disciplines, Faculty Use, 1982 and 2010

Departments	Literature	% Use, 1982	% Use, 2010
History	Language and Literature, Other Humanities	13.0	17.4
History	Social Sciences	17.2	29.1
Social Sciences	History	10.2	22.4
Language and Literature, Other Humanities Depts	History	9.2	11.5

Note: History's dependence on social science materials rises to 32.4 percent in 1982 and 32.9 percent in 2010 if economics and business administration are included.

data indicate between the hard sciences and technology, consistent with most observers' mental models.

Although it was not feasible to redo the correlation parts of the original analysis with the 2010 data, the use statistics suggest that the distance between history and the social sciences may be shrinking. The results for both time periods displayed in table 9 show that, while the mutual traffic between history and the humanities has changed only modestly since 1982, the exchange, in both directions, between history and the social sciences has increased dramatically. Naturally library circulation statistics from one institution can be no more than suggestive about such phenomena.

Age of Relevant Materials and the Nature of Disciplines

In every respect discussed so far, this study is a replication of 1982, intended to substantiate, negate, or elaborate on the original results. The one new topic introduced to the 2010 analysis was the age of the materials in use, and results in this one area are necessarily preliminary rather than replicative. The following analysis is restricted to faculty use of books for the familiar reason that this should generally be more revealing of the inherent characteristics of disciplines and literatures.

Knowledge about how old the materials in use within each discipline are is obviously valuable to libraries storing or weeding collections. It should also reflect on the nature of disciplines and literatures by showing how long contributions in a given area retain their usability before they are superseded or are no longer of interest. To calculate the ideal measure, half-lives of literatures, would require detailed information about the number of titles in each discipline added to the library's holdings over time, but the median age of titles in use at the time of the study may provide a useful substitute.

Because we have no baseline data to provide a comparison, any extended discussion of what the results show in table 10 would be necessarily speculative and *post hoc*, although it is worth noting that the results fail to support familiar assumptions that scientific materials always have the shortest half-lives. They are, however, consistent with a 1983 study by

TABLE 10
Median Age of Charged Materials, by Literature, Faculty Use, 2010

Call Number	Subject	Median Date
PQ	Romance Languages	1983
PR-PS	English/American Lit	1993
QC	Physics	1993
C–F	History	1995
QA not QA74–76	Mathematics	1995
QE	Geology	1995
K	Law	1996
N not NA	Art	1996
QD	Chemistry	1996
A–Z	All Books	1998
NA	Architecture	1998
L	Education	1999
T–TT	Engineering	1999
B–BD, BH–BJ	Philosophy	1999
BL–BX	Religion	1999
R	Medicine	2000
BF	Psychology	2001
HM–HX	Sociology	2001
J	Political Science	2001
S	Agriculture and Vet Med	2001
QH–QR	Life Sciences	2001
HB–HJ	Business/Economics	2002
M	Music	2002
QA74–76	Computer Science	2005

Note: There were over 100 books charged to faculty in every literature except geology (87 books), law (58), music (60), and computer science (49).

George Hodowanec in ranking foreign languages, English, mathematics, and the physical sciences within the six areas with the slowest apparent obsolescence.[17]

Summing Up

Overall, the results of the current study strongly replicate the findings from 1982: all five comparisons of insider to exogenous use, the rank orders of literatures in both their supportiveness and ethnocentricity, the narrower library use of graduate students, and the apparent effects of branch libraries are all highly congruent with the earlier findings. Even the fairly significant shifts in the overall use of subject literatures appear to result, as was argued in *Landscape*, not from micro-level changes in library use within the disciplines, but rather from demographic changes in the population of active library users.

It may be useful at this point to summarize the major conclusions of both studies:

1. Most large-scale changes or differences in the overall use of subject literatures can be attributed to changes or differences in the disciplinary makeup of the population of active users.

2. Library use patterns can shed light on the nature of disciplines and the relationships among them, building on and complementing bibliometric analyses based on citation measures. Even discounting for pleasure reading, they show a much wider range of literature use than citation studies have indicated.

3. Specialists use materials differently from outsiders, and this has implications for collection-building strategies.

4. Graduate students use libraries very much like faculty, but more narrowly.

5. To some degree, library branch structures channel and shape use.

Notes

1. Paul Metz, *The Landscape of Literatures: Use of Subject Collections in a University Library* (Chicago: American Library Association, 1983).

2. Herman H. Fussler and Julian L. Simon, *Patterns in the Use of Books in Large Research Libraries* **(**Chicago: University of Chicago, 1969); Allen Kent et al., *Use of Library Materials: The University of Pittsburgh Study* (New York: Marcel Dekker, 1979).

3. William E. McGrath et al., "Ethnocentricity and Cross-Disciplinary Circulation," *College and Research Libraries* 40 (Nov. 1979): 511–18; Stephen Bulick, *Structure and Subject Interaction: Toward a Sociology of Knowledge in the Social Sciences* (New York: Marcel Dekker, 1982).

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5. Penelope Earle and Brian Vickery, "Subject Relations in Science/Technology Literature," *ASLIB Proceedings* 21 (June 1969): 237–43.

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7. Derek J. de Solla Price, "Is Technology Historically Independent of Science? A Study in Statistical Historiography," *Technology and Culture* 6 (Autumn 1965): 553–68; the specific quote is on page 554.

8. Paul Metz and Charles Litchfield, "Measuring Collections Use at Virginia Tech," *College & Research Libraries* 49 (Nov. 1988): 501–13.

9. Metz, *The Landscape of Literatures*, 57.

10. Ibid., 96.

11. Metz, *The Landscape of Literatures*, 106; Richard M. Dougherty and Laura L. Blomquist, *Improving Access to Library Resources: The Influence of Organization of Library Collections, and of User Attitudes Toward Innovative Services* (Metuchen, N.J.: Scarecrow, 1974).

12. Bulick, *Structure and Subject Interaction.*

13. Ibid., 75.

14. Earle and Vickery, "Subject Relations in Science/Technology Literature."

15. European Centre for Nuclear Research, *Staff Employment Opportunities at CERN.* Available online at https://ert.cern.ch/browse_www/wd_pds?p_web_site_id=1&p_web_page_id=5835&p_no_apply=&p_show=N. [Accessed 31 May 2011>].

16. Metz, *The Landscape of Literatures*, 48–49, 76.

17. George V. Hodowanec, "Literature Obsolescence, Dispersion, and Collection Development," *College & Research Libraries* 44 (Nov. 1983): 421–43.

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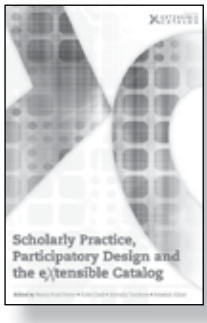

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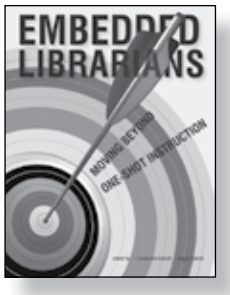

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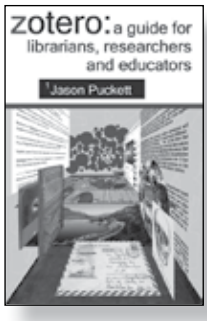

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