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ABSTRACT

This research extends the "Purdue studies" of research library growth, presenting results that include library statistical trends during a 35-year period, 1951-1985. It serves to update Purdue's 9-report series (1965-1973) and is a validation study of Purdue's growth forecasts, 28 of which were published in 1965, then revised in 1971. The research libraries considered here represent 58 "first tier" American research libraries that were members of the Association of Research Libraries (ARL) in 1964, when the Purdue studies began; all are members still. The results describe 35 years of growth and change in library holdings, volumes added, professional and non-professional staff size, and in three expenditure categories--salaries, materials and binding, and total, plus university/main campus total and graduate enrollments, and Ph.D. degrees awarded. Growth trends are reported for eight "composite" libraries that differ in size, i.e., the average or mean; the median, first quartile and third quartile; and four collection (or holdings) subgroups, the "large," "medium-large," "medium-small," and "small." Correlational findings also show the strength of relationship, year-by-year, among the study variables. Trends and forecasts of 28 variable-and-composite combinations are shown in 8 tables and 28 figures. Some estimates of future growth through 1990 are presented, together with suggestions for future research. Appended materials include a listing of the nine Purdue reports; a listing of National Center for Education Statistics (NCES) data source documents; correlations of 16 variables year-by-year from 1951 to 1985 presented in the form of a conversation between two fictitious library directors, one newly-appointed and the other (retiring; and a description of the composition of ARL subgroups based on 1985 data. (40 references) (Author/BBM)

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Research Library Trends, 1951-1980 and Beyond:

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A technical report of the
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Abstract

This research extends the "Purdue studies" of research library growth, presenting results that include statistical descriptions of library growth trends during a 35-year period, 1951-1985. It serves to update Purdue's nine-report series, published between 1965 and 1973, and serves also as a validation study of Purdue's growth forecasts, 28 of which were published originally in 1965, and then revised in 1971. The research libraries considered here represent 58 "first tier" American research universities which were members of the Association of Research Libraries (ARL) in 1964, when the Purdue studies began; all are members still.

The principal study results describe 35 years of growth and change in library holdings, gross volumes added, professional and non-professional staff size, and in three expenditure categories--salaries, materials and binding, and total, as well as university/main campus total and graduate enrollments, and Ph.D. degrees awarded. The trends are reported for each of eight hypothetical "composite" libraries that differ in size, i.e., the average or mean; the median, first quartile and third quartile; and four collection (or holdings) sub-groups, the "large," "medium-large," "medium-small," and "small." Correlational findings also show the strength of relationship, year-by-year, among the study variables.

In eight tables and 28 figures, the trends and forecasts of 28 variable-and-composite combinations are shown (e.g., Fig. 1 shows that the number of volumes held in the average composite library increased from .89 million volumes in 1951 to 2.80 million in 1980 and 3.18 million in 1985; it also shows that Purdue's original forecast for 1980 was 2.86 million and that its revised forecast was much higher, or about 3.2 million). In general, the trends reflect rapid growth in the libraries' collections, volumes added, expenditures, and staff size from 1951 through 1970 but show different or strikingly different trends, beginning in 1971. For example, between 1951 and 1970, the libraries' "volumes added" tripled (from 34.8 thousand to 107 thousand), then plateaued or declined through 1982 and increased each year since; in 1985, it averaged 93.8 thousand. The libraries' collections or "volumes held" appear now to be growing in linear fashion, not parabolically, as before. Nevertheless, in 1985 the average collection was 3½ times as large as it had been in 1951. Also, after 1970, increases in library staff size stopped and staff size then remained stable for a decade, although some recent increases are now apparent. All three library expenditure categories show large increases--about 22-fold--during the 35-year period, which correspond to repeated annual increases of about 9%; however, when these expenditures are re-computed as "constant dollars," they show that growth stopped in 1971 or 1973 and did not begin again until 1982.

Some estimates of future growth through 1990 are presented, together with several suggestions for further research.

AMENDMENTS TO

Research Library Trends, 1951-1980 and Beyond: An Update...

(Second Printing, November, 1988)

by Seibert, Kuenz, Games, and Gregg

• The Introduction, below (pp. 1-16), might have mentioned McCrum's . . . Standards for a College Library[1], primarily because statistics in the book's Second Edition predate by three years Rider's 1940 article on growth. The relevance of McCrum's statistics to the study of research library growth should not be exaggerated, but they do make interesting reading. In Section III, "Book Collection: Size," McCrum cites several expert opinions concerning collections and also lists the student enrollments, plus the 1918 and 1934 collection statistics of 72 colleges. Enrollments range from Bennington's 165 students and University of the South's 221 to Creighton's 1931 and Baylor's 2209. Collections range from non-existence in 1918 (e.g., Bennington) to Amherst's 191,243 and Wesleyan's 185,864 volumes in 1934. In discussing these numbers, McCrum notes that "seventy-two libraries are listed, of which 31 have doubled or more than doubled in sixteen years. As many as 6 of these have tripled, 2 have quadrupled, and 4 have quintupled" (p. 27).

In Section VII, McCrum presents and briefly discusses seven college library budgets, followed in Section VIII by budget "Relations and Percentages." Interestingly, the libraries' expenditures tend to be a little more (or less) than 5% of the institution's expenditures, which is a fair approximation of current percentages (Cummings, 1986, p. 14) and they tend to allot about half of the funds to salaries and a third to materials and binding, which also fits well with current experience. At the other extreme, a library that provided "Budget B" to McCrum reported departmental book budgets that include Astronomy's $9.82, Bacteriology's $33.15, Geography's $26.08, and History's $667.20 (pp. 70-71). And "Budget D" includes: "Library staff (21 members) salaries . . . $36,405.00 . . . 109 student assistants, not all working at once . . . [$]2597.56," but excluding "$874 paid to student assistants by NYA" (p. 73).

• Appendix C': In this report's first printing, Appendix C, pp. 141-177, presents 35 16 x 15 correlation matrices, one for each year, 1951 through 1985, correlations that are also summarized in Table 13, p. 108. For this printing, Table 13 is retained, but the original Appendix C is replaced by an "experimental" Appendix C', an invented dialogue based on approximately 600 genuine medians presented in Table 6, p. 31, and on the corresponding trends presented in Figs. 6-10, pp. 57-65. Dialogue participants are "Thoreau Memorial University's" new Director of Libraries and her predecessor, and their conversation covers almost 40 years of library and campus history, as well as some likely future developments. The medians and trends they discuss are based on 58 ARL members' annual statistics. From 1951 to 1987, Thoreau's (the median) enrollment increased from 9-10,000 to 24,000+; graduate enrollment from 15-1600 to 4900; annually conferred Ph.D.'s from 64 to 280 (the 1975 peak was 336); library staff from 70 to 240; expenditures from $350,000 to $10.67 million, i.e., 30-fold; and the collection or holdings from 620,000 to 2.6 million volumes (in 1994, 3.1 million are likely). Until 1971, Thoreau prospered, then until 1983 it faltered, but some recent signs suggest recovery. The trends and numbers are real and not atypical; the rest is fictional. (Nevertheless, at least one ARL member has a statistical record that closely approximates Thoreau's.)

• A central, if not the central, Purdue finding was that research libraries were growing at a rate that would, on the average, double their collections in about 17 years, a rate that of course corresponds also to a quadrupling in 34 years. By coincidence, the results presented below encompass 34 years of growth and they also show, for eight composite libraries (see Tables 5-12), that when their 1985 collections are stated as multiples of their 1951 collections, they are: 3.56, 4.03, 4.64, 4.34, 2.91, 4.17, 4.06, and 4.88. Coincidence or not, six of the eight composite libraries have been equalling or exceeding a 17-year doubling rate.

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[1] McCrum, B. P. (1937). An Estimate of Standards for a College Library (2nd ed., rev.). Lexington, VA: Journalism Laboratory Press, Washington and Lee University.

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Acknowledgments

Of those whose encouragement and cooperation have contributed to this work, first and foremost is the late Jack Moriarty, who was for a quarter century Director of Libraries at Purdue. Jack recognized the value of library growth/library trend studies about 23 years ago* and he remained consistently supportive of the "Purdue studies" that then followed and that now provide the foundation for this work. Without his encouragement and his legendary wisdom and wit, those studies, if they had materialized at all, would surely have been less substantial and much less fun. His suggestions launched the work and his support sustained an effort that has outlived him.

We are grateful also for the help of Oliver Dunn and Keith Dowden, both now retired from Purdue's Libraries, whose suggestions and recollections have helped this work to resume and proceed. Nevertheless, their best efforts and our own failed to locate the accumulated data that had been the basis of the Purdue studies, until--finally--we discovered that Maurice Marchant of Brigham Young had an intact copy that he had used in his own earlier research (1975) and that he was willing to share. We are grateful to him for sparing us the labor of re-creating about 15,000 data entries, and his cooperation has made it possible for this work to be reinstated much more rapidly than it otherwise could. (We also owe a similar debt to Dick Lyders of the

* His published "comments" on Rider's landmark study (Moriarty, 1945) could be said to show that his views on growth studies took shape much earlier. Even though he expressed some reservations about Rider's proposed solution to growth problems, i.e., the micro-card, he obviously liked the book--Rider's book--and the study it presents.

Houston Academy of Medicine-Texas Medical Center Library, who provided access to the excellent collection of medical school library statistics that he and a committee he chairs collect and publish [see, e.g., Lyders, 1986]. Those statistics are to be incorporated in future studies.)

In addition to the Purdue data, this work has required many recent statistics, primarily from 1973 through 1985, as well as some additions and revisions of the earlier data. To accomplish this, we were and are fortunate to have the cooperation of Kendon Stubbs, of the Alderman Library, University of Virginia; Maxine Sitts, Alex Lichtenstein, and others at ARL headquarters; and Vance Grant and Tom Snyder, National Center for Educational Statistics. Their help has been and is exceptional. Kendon and Vance deserve a further and special recognition because, in addition to the many statistics that they provided, both are also rare and near-encyclopedic sources of perspective and statistical history. We owe a similar, special debt to John C. "Kit" Reid, University of Missouri-Columbia, and formerly/briefly at Purdue. In this work, as in the past, he has been a patient and versatile counselor with computing skills to match.

And we also express appreciation for the consideration and support of the National Library of Medicine and colleagues at the Library. Their support is essential to the revival of this work and to rebuilding the momentum of studies that were dormant for more than a decade. Momentum has been regained and the first fruits of the renewed effort are presented below.

W.F.S.

Preface

It has been almost fourteen years since the ninth and last issue of the "Purdue study" series was published (see Appendix A)* and, in the eventful years since then, no comparable studies of library statistical trends have appeared. Events during those years included tightened budgets and other significant changes in research and higher education funding; intervals of recession and economic inflation; turnabouts in university enrollment, in graduate education, and in demand for holders of advanced degrees; and a multitude of developments in library automation and information technology. It is widely assumed that these events are affecting long-term library trends significantly and, in some respects, negatively. But, whatever the effects, it is important that developments during the period be thoroughly examined, and this work was undertaken with that in mind.

The first of the Purdue reports appeared in 1965 and began an annually updated series that ended in 1973. Without exception, trends described in the series show growth much like that which Rider had foreseen (1944) almost 20 to 30 years earlier. His principal conclusion his "bombshell" (Clapp, 1964, p. 1), or his "ominous predictions" (Garrison, 1966, p. 170) were that, since library collections appeared to have doubled in size about every 16 years and over many years, that growth was likely to continue in the future (1944, p. 11). Purdue presented evidence that collections were "only"

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* For convenience, later references to the Purdue study reports will indicate only the year of publication and, where necessary, the page number(s), for example, "(Purdue, 1967, p. 43)."

doubling, on the average, in about 17 years (1965, p. 21), not in 16, although libraries with smaller collections were growing relatively more rapidly and those with larger collections more slowly than those averages indicate. But, to complicate matters, other evidence supported an expectation that collections would/should grow even more rapidly (1965, pp. 20, 49) because, if growth in "volumes added" were to continue, as seemed likely, the accumulated volumes could yield collections that had doubled in about 12½ years; in 16 or 17 years, the accumulations could produce collections that were about 2½ times, not two times, the then-current average.

The Purdue studies not only traced collection trends and acquisitions but also library staffing and some expenditure trends, plus the parent universities' total and graduate enrollments, and their Ph.D. "output" statistics. Originally, Purdue's data spanned the years 1951 through 1964 and were the basis for forecasts that extended several trends through 1980. Later updates eventually added data through 1972 and (ironically, as it has turned out) also added new and, typically, more optimistic forecasts in 1971 (Purdue, 1971, pp. 9-10), basing these on data that extended from 1951 through 1970, a period marked by rapid growth. The irony, as we shall see, is that recent trend lines for library acquisitions, staff size, and to a limited extent, expenditures show that 1971 marked the beginning of different and more difficult times.

Before 1971, regular and rapid increases in all library statistics are apparent, but just after that, acquisitions plateaued, then declined by one-fourth; staff size plateaued and remained virtually unchanged for

a decade or more; and expenditures were briefly slowed before resuming rapid growth (Seibert, Games, Kuenz, and Gregg, 1986).

In addition to tracing a variety of library and university trends and forecasting the future course of 28 selected trends, Purdue reports two other types of analyses: annual rankings of the 58 libraries, based on collection size, on gross volumes added, and on total operating expenditures, and year-by-year correlations of each variable or statistic with every other.

The completion of the present study marks the end of a second beginning. For the future, some additional analyses involving the present data are planned, but three other data sets are also available to form the basis for other studies. Through cooperation that is acknowledged above, we have access to statistics representing almost 50 additional academic members of ARL; 12 non-academic/independent members, including NLM; and 125+ medical school libraries in the U.S. and Canada. In all, approximately 250 libraries are represented in data that cover time spans ranging upward from a few years to 35 years, and with each passing year, its volume should increase perhaps three to ten percent, depending on the data set considered. Equally important is the fact that the "traditional" variables described and analyzed below can be supplemented by other promising variables or indices. These include other library variables, such as current serial title counts, interlibrary loan statistics, and library age; university variables, such as faculty size, Federal or total grant and contract funding levels, and number of Ph.D. fields that are active or authorized; economic variables such as the ratio of library-to-university expenditures, and publication price indices; and social or "other"

measures, such as demographic indices descriptive of the postsecondary student population, indices of scholarly publishing, or others that may be sensitive to activities in research or higher education.

Introduction

If any one thing could be said to characterize the literature on library growth, it is a persistent and sometimes anguished ambivalence, and except for obvious problems, if any one person could be the patron saint of authors in the field, it is "Fiddler's" Tevye of Anatevka. On the one hand, library growth is described as rapid, accelerating, daunting, and destined to remain that way. But on the other hand, authors often recognize the uncertainties that underlie the prediction, so they hedge by noting that indefinite continuation of such growth is impossible, and besides, the statistics used to measure growth are not well defined and hence, their results cannot be trusted (e.g., Piternick, 1977). So, in much of the literature, authors appear to be agreeing and disagreeing with themselves and each other, more or less at the same time.

Rider came first and, in a brief article (1940), he presents statistics that later also formed the basis for his book (1944). In four tables and one figure, both publications record and summarize collection growth in the same four groups of American colleges and universities: universities dating from 1831, universities dating from 1876, colleges dating from 1831, and women's colleges. Much of the article's text calls attention to the observed doubling periods of the libraries' collections, with such comments as "these ten great early university libraries doubled themselves not every twenty but every sixteen years" (p. 8), and "our college and university libraries have, on the average, taking them as a whole, doubled in size in about every fifteen years" (p. 9), or "[it is] almost axiomatic: unless a college or

university is willing to be stagnant. . . . it seems to be inevitable that it must double its library in size every fifteen or twenty years" (p. 11). But after arguing the case for rapid and continuing growth, Rider's last page includes:

> Whether college libraries must continue to grow at the rate that they have, and in the way that they have, rests primarily upon exceedingly complex questions of educational method and policy. (1940, p. 11)

Unstated but unescapable is the conclusion that, since the "exceedingly complex questions" were as yet undecided, then future growth rates were also.

Four years later, Rider (1944) begins his book with:

> It was not realized until a few years ago that [research libraries] were, on the average, actually doubling in size every sixteen years. And . . . this [parabolic growth] was not in any sense a recent phenomenon: all our research libraries had grown at this rate, without substantial deviation either upward or downward, ever since they began in this country, over three centuries ago. (p. 3)

He repeats the "sixteen year"* phrase eighteen times through page 16 and emphasizes his point with: "universities of this age-group [i.e., founded since 1849] have doubled in size, not every sixteen years, but every nine and one-half years!" (p. 6); and "it seems . . . that, ever since college and university libraries started in this country, they have, on the average, doubled in size every sixteen years" (p. 8); and "so far as we have figures available, neither library [Harvard and Yale], in even a single generation in its long history, has deviated substantially from our established 'doubling' rate of research library growth" (p. 11); and

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* Between 1940 and 1944, Rider seems to have concluded that the best estimate of an average doubling period was sixteen years, although he earlier mentioned various figures, mostly in the fifteen to twenty year range.

> Growth has continued, without any significant change of rate . . . for over thirty decades, and at a rate so uniform over so many years, and so uniform in so many different libraries that it might almost seem as though some natural law were at work. (pp. 15-16)

But Rider (1944) also expresses reservations concerning future growth prospects, beginning with the second paragraph of Chapter 1:

> Now, when anything is growing parabolically, there obviously is going to come a time when some sort of impasse begins to impend very rapidly indeed. And it is evident, when one considers the statistics, that American research libraries are fast approaching this particular point in the curve of their history. (p. 3)

He then presents twelve pages of statistics and comment that support belief in rapid growth but follows with: "nevertheless, if research librarians were asked categorically whether they thought doubling every sixteen years was going to continue indefinitely, most of them, like the writer, would probably answer 'no'" (p. 16). Thus, Rider, like others who followed, goes to the brink of concluding that trends from the past describe trends for the future but then draws back, although not so completely that he can avoid concluding Chapter 1 with: "librarians and educators cannot look to the outside world for any solution to their problem of research library growth. If they do, they are surely going to be overwhelmed. They must find a solution themselves" (p. 19).

There is ambivalence in Metcalf's writings also but for reasons that are generally opposite to those of other authors, who seem to lean toward belief in a continuation of past growth but who stop short of unvarnished commitment. Metcalf leans away. In a letter to Rider, he wrote: "it is perfectly true that for the past two or three generations, we have been unwilling to face the growth of the future. . . . But I am convinced that a turn in the road has come. Curves of that kind have to change some time" (see Rider, 1944, p. 16). Similarly, in his review of

Rider's book, he writes:

> Mr. Rider . . . has converted many librarians to the thesis that since libraries have been doubling every sixteen years for the past three centuries, there is reason to believe they will continue to do so. The reviewer takes the stand, however, that the turn of the road was reached even before the great depression of the 1930's; that the second World War has made the turn an abnormally sharp one and that the future growth of our large libraries, taken as a group, will be more by arithmetical progression than by geometrical[*]. (Metcalf, 1945, p. 170)

But, ten years later, in "Facing the Consequences of Growth" (Metcalf, 1955), parts of the article read like words from a convert.

After citing some of Harvard's statistics:

> . . . We occupy twelve million cubic feet of space, costing more than $470,000 annually. . . . Our needs for space increase every year. . . . We have nearly six million volumes and pamphlets. . . . Fifteen thousand persons cross our thresholds daily . . . and it sometimes seems that every book [ever printed] is wanted or will be wanted by some reader (p. 118);

he then adds:

> Let me warn you: where Harvard is today in size and costs, Yale will be tomorrow, figuratively speaking; California, Chicago, Columbia, Illinois, Michigan, and Minnesota will be there the next day[**]; and many others will arrive the day after that. It may be later than many of us think. (p. 118)

In a brief article, "Rider Revisited," Axford (1962) considers "whether or not there is a direct and clear-cut relationship between the size and rate of acquisition of the library and the quality of

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* The evidence that Metcalf's conclusion was premature, at least, can be seen in Purdue's Figs. 1, 14, and/or 17 (e.g., 1965, pp. 21, 34, 37) or in the current versions of those figures, presented below.

** Two quick calculations provide a crude credibility test for one of Metcalf's (1955) estimates, and show that, when his words were published, California-Berkeley and the other five libraries that are grouped with it had collections that averaged 2.14 million volumes, compared to Harvard's then-current 5.83 million. Thirty years later, in 1985, their collections averaged 5.60 million, which, incidentally, reflects a 162% increase, and represents a doubling period just greater than 22 years. Whatever else these figures mean, they do not invalidate the warning.

education offered by the university" (pp. 345, 347), as Rider had indicated. He then presents evidence that, of 25 academic libraries with book stocks in 1960 that exceeded one million volumes, 20 appeared in Berelson's (1960) "most mentioned" list of 22 well-regarded graduate institutions. From this, Axford concludes that "Rider's emphasis on the relationship between rate of growth of the university library and the overall quality of the educational program is still essentially correct" [emphasis added] (p. 347). Note, though, that Axford's 25 libraries were selected because of their collection size, not their rate of growth, and in fact, their growth rates were shown to vary widely, but no analysis was offered that related these to "quality." Piternick later noted Axford's "debatable conclusions" (1963, p. 227), then proceeded to show that data nearly identical to Axford's revealed no significant correlation between growth rate and educational quality rankings but did reveal large positive correlations between collection size and quality (two coefficients, based on 1946 and 1960 holdings data, were .76 and .87). Interpreting these results, he also cautions against the conclusion that there are causal connections between the variables, and describes instead how other factors could underlie and give rise to the correlations.

Turning now to the Purdue studies (see Appendix A), many contents of those nine reports are devoted to description and to the extension/forecasting of specific growth trends, so specific that, in 28 instances, a forecast could be used to determine a precise, expected level of a given variable for any year, from 1965 through 1980 (see, e.g., Purdue, 1965, p. 21). Nevertheless, the Purdue studies also hedge these forecasts, indicating why they might be increased as well as

decreased. In discussing its curve-fitting/forecasting procedures, the authors say: "It is recognized that no provision is made for an eventual deceleration of growth" and

> . . . although some of the fitted curves, when extended some years beyond 1980, indicate inconceivably high levels, there is little basis for expecting an early deceleration in library growth. In short, the records of growth since 1951, including the most recent years, and the unfaltering growth of even the largest libraries, indicate that this growth will not soon decelerate. Upper limits are not apparently being reached and it seems unlikely that they will even be approached during the fifteen years immediately ahead. (1965, p.20)

Then, to support the argument that its forecast of average collection growth was probably conservative, Purdue analyzes the implications of observed acquisition* trends, as follows:

> On an annual basis, this [prediction that 1980 collections will average 2.86 million volumes] suggests that average acquisitions during the next sixteen years will be about 86,000 volumes. On the average, the ARL libraries are already acquiring 70,000 volumes and the prospects for continuing and substantial increases are great. It seems very likely that the average rate of acquisition will surpass 86,000 volumes in 1966-67.[**] This, plus the clear probability of continuing increases in acquisition rate, make the VH [collection size] prediction of 2.86 million volumes seem unreasonably low. As an alternative to this apparently low figure, it is possible to accumulate the predicted acquisitions (VA) for the next sixteen years, then to add these to the VH figure for 1963-64. When this is done, the VH prediction for 1980 is found to be 3.75 million. (1965, p. 49)

Using the same rationale, Purdue also explains that the predicted median collection for 1980 should increase to "approximately three million volumes, rather than 2.3 million." Then, the last paragraph on the topic includes: "a review of the reasons for and against the alternative VH predictions leads the writers to favor the larger

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* "Acquisitions" refers here to the variable that is more accurately called "gross volumes added."

** In fact, the 1966-67 VA average was 93,625; one year earlier, it just managed to "surpass 86,000," and was 86,070.

estimates . . . [and] simple arithmetic will lead to the conclusion that VH predictions which are based only on recent VH data err in the direction of under-estimation" (p. 50).*

Later, in the seventh of Purdue's nine reports (1971), 28 revised forecasts were added to the original 28 "fitted curve" forecasts, although not because of any apparent ambivalence. Instead, during the six years following creation of the original forecasts, data representing those years had accumulated and the "new curves based on 20 years [of] data were determined in the same manner as the originals (i.e., both curves are parabolas that best fit the data)" (p. 9). In general and in comparison with the original fitted curves, the new forecasts: 1) yielded moderately increased estimates of future collection size; 2) had little or no effect on estimates of future "volumes added," except for smaller libraries; 3) estimated future expenditure levels that would be moderately or considerably higher than originally estimated; and 4) tended to estimate future professional staff size at higher levels than originally. In the last two Purdue reports (1972, 1973), both sets of forecasts are retained, and they are incorporated also in the presentation of Figs. 1-28, below.

Leach (1976) undertook a partial reexamination of the Rider and Purdue studies and his article abstract states that "this study . . . discredits the validity of Rider's hypothesis, notes the limitations of

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* A friend has noted that the reasoning just quoted treats "gross" volumes added, or VA, as if it were "net" volumes added, or $VH_{year\ n}$ minus $VH_{year\ n-1}$. Logically, these should be two non-equivalent variables; however, one author (W.S.), who was involved in data collection and in preparing the first five Purdue reports, recalls that the early Purdue data seemed to show repeated instances of net equalling gross VA and this led to an assumption of practical equivalence.

the Purdue study growth-rate figures, and tentatively identifies the collection size level past which growth-rate deceleration begins" (p. 531). However, inconsistencies prompt serious doubts concerning each of these claims. Concerning Rider's "hypothesis," Leach argues without data, yet data are essential to show that collections either did or did not grow as Rider had indicated. Moreover, in summarizing selected Purdue findings, Leach's argument is undermined when he notes that: "these figures seem to substantiate the accuracy of Rider's hypothesis" and he then cites, in apparent approval, two reviewers whose positions agree with this. The first of these, Garrison (1966), wrote that "the chief impression the reader gains from an examination of the [Purdue] report is that Fremont Rider was, in general, correct in his ominous predictions" (p. 170). The second reviewer, Talmadge (1966), is quoted as follows: "this absorbing work might well have been dedicated to the late Fremont Rider," then Talmadge adds that the growth of even the fourteen largest libraries, as reported by Purdue, was not an "essential undermining of Rider's thesis" (p. 319). Thus, contents of Leach's text contradict the article's abstract.

The "limitations of [Purdue's] growth-rate figures" to which Leach refers are that the actual growth of an individual library is not likely to match closely the growth of a statistical composite library, so "for that [individual] library the utility of the composite figure . . . is diminished" (1976, p. 538). The implication given is that librarians should be cautioned against treating a composite's trends as a recipe for an individual library to follow; however, Purdue did not recommend such treatment and instead recommended against it, as follows: "these analyses may be regarded as suggestive of events within individual

libraries, although the course of growth for the individual library is rarely as regular as that of a group" (1965, p. 75).

Third and finally, Leach notes the relatively low growth rates generally associated with larger libraries and states "that the size level of 3 million volumes is the threshold beyond which a deceleration in the rate of collection growth can be expected" (1976, p. 539). However, he then proceeds to note that Chicago, Cornell, and California-Berkeley, as well as Toronto, violate the stated principle, so the "inverse relationship" between collection growth "and collection size can be suspended," which is to say that the threshold effect is present, except when absent.

Three years after the Purdue studies ended, Drake, an author of Purdue's ninth and final report, published "Forecasting library growth" (1976), followed one year later by Academic research libraries: A study of growth (1977). The earlier article describes and discusses alternative forecasting methods and includes a sample forecast that is based on an equation from Baumol and Marcus (1973, p.94). When the equation is applied to a set of Purdue data, the prediction it yields is that Purdue's total library operating expenditures in 1975 would be $1.129 million, but Drake then reports that "actual operating costs . . . will be more than double the projected figure" (1976, p.58).*

Drake's second report (1977) is from the same source as the original Purdue series and is essentially a sequel to that earlier series but with important modifications. Data for the study span the years from 1966 through 1975 and are derived from 62 ARL members,

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* ARL statistics record Purdue's 1975 library operating expenditures as $2.811 million.

including the 58 libraries represented in the Purdue studies (and in this present study), plus Connecticut, Georgetown, McGill, and Toronto. In Table 1 and its accompanying figures, annual median values for total expenditures, salaries and wage expenditures, staff size, collection growth rates, and some related variables are shown, then the corresponding data for each individual library are presented in tables and figures numbered 2 through 63. Library rankings for the years 1971 through 1975 are presented, as well as Fall, 1974 university enrollments. Compared to Purdue's earlier studies, Drake's two principal omissions are "quantitative predictions" of future growth and Purdue's four library subgroups, "Large" to "Small," which had been based on the 58 libraries' 1962-63 collection size (see also Table 3 and Appendix D, below). Predictions were omitted because "reliable projections of library growth necessitate a detailed and careful analysis of many factors to determine which elements affect library growth" and this could not be done "within reasonable time and cost constraints" (p.2). The four subgroups were omitted "because libraries within each group have experienced different growth rates and patterns resulting in internal inconsistencies" (p.2).

Concerning these omissions and the reasons given for them, we would suggest that the goal in forecasting is valid "projections of . . . growth," and that reliability is, technically, necessary but not sufficient in achieving validity. Secondly, although libraries in Purdue's four size subgroups had "experienced different growth rates . . . ," as Drake indicates, data she presents in Table 64 also show that, when the libraries are ranked according to their 1975 collection size, 41 of the 58 libraries, or 71 percent, remain in the subgroup to

which they were originally assigned (see also, Appendix D).

A recent study by Seibert (1985) briefly examines the fate of a few Purdue forecasts and, as a refinement to Rider's simpler methods, applies curve fitting to his two principal data sets. The results can be summarized by saying that fitted curve forecasts are shown to work well at times, apparently--or usually--with respect to collection and expenditure growth but not in predicting growth of "volumes added." The article's three figures present evidence of three collection growth trends, together with curves fitted to several of their earlier data points. Each of the trends has the appearance of smoothness or consistency but not necessarily of successful predictability, and it is fair to say that one of the three predictions succeeds; another succeeds moderately well, considering the 150 year span with which it deals; and a third fails because it underestimates the remarkable growth that in fact occurred. In Fig. 1, which is a simpler version of Fig. 1, below, Seibert shows that Purdue's original prediction of the average 1980 collection (1965, p.21) was in error by only 2.5 percent 16 years after its creation. The second figure demonstrates that, even when past growth yields a prediction of continuing parabolic growth, that prediction can prove to be too conservative. The third figure shows that, for 150 years, the collections of several older university libraries seem to have continued on a smooth course of parabolic growth, seemingly unaffected by the new technologies and other historical developments that might have altered the course. The article concludes more with frustration than ambivalence, noting that "results continue to imply that future growth will produce collections that common sense must deny. For this conflict to be resolved, growth rates must eventually

decelerate--but when, and how can we foresee it?" (p. 23).

In two recent articles, Molyneux (1986a, 1986b) argues against the common conclusion that library growth is exponential, and he begins the first article with these words:

> The present study contends that library growth has not been modeled well and that no successful method of projecting growth has been developed. In order to predict the future size of libraries a model of library growth has to be formed that can be projected. The process of modeling involves accurately describing the growth observed over a period and from this description forming an understanding of the processes at work. When this understanding has been formed, a mathematical model can be developed that incorporates the description of growth observed in the past and the understanding of the processes at work. The resulting mathematical model is what can be projected into the future. (p.6)

To test the practical value of this advice, we suggest that the reader replace those words that refer to library growth with others that refer to some other unexplained phenomenon, such as "the courting behavior of Trobriand Islanders," then re-read Molyneux's text otherwise verbatim.

Molyneux fails to recognize that the forecasts in question necessarily rely on methods that are only correlational, and that correlations can yield predictions that may or may not be useful, but they cannot establish the presence of causal connections between variables. To verify that this is so, consider the case of two timepieces (any two operating wristwatches will do) from which we will take, say, 50 simultaneous readings tomorrow afternoon. We record and correlate the paired readings, producing a coefficient that will be at least .95. With a coefficient this large, we can create a scheme to predict rather accurately the time shown on one from the time on the other, but we would not conclude that the action of one causes action in the other. Instead, we accept that some unexamined, underlying causes

are operating on both (or perhaps we only become suspicious about underlying causes later, after one watch stops).

The article's other problems include: 1) reliance in four tables and in text on hypothetical growth data that have unknown validity and that can (mis)behave however their inventor chooses (pp. 10-12); 2) the undocumented assertion that "the most common error in the literature is assuming exponential growth between widely separate years" (p. 13); 3) absence of stated criteria for deciding "that no successful method of projecting growth has been developed" (p. 6); 4) erroneous description of the Purdue studies' "stated purpose" (p. 21); and 5) the incredible statement that "it is strange that no writer has discussed the implications of exponential growth" (p. 26), when, to cite one famous 43 year-old estimate, "the Yale Library will, in 2040, have approximately 200,000,000 volumes, which will occupy over 6,000 miles of shelves. Its card catalog--if it then has a card catalog--will consist of nearly three-quarters of a million catalog drawers . . . ." (Rider, 1944, pp. 12-13).

We now consider Molyneux's second recent article (1986b), the abstract of which begins with: "The results of a study on the growth of ARL libraries since 1962/63 are shown to argue against the commonly held notion that library growth is an exponential phenomenon" (p. 211). For reasons that are given below, this statement must be challenged. To do this, we would note, first, that since the time of Fremont Rider, "library growth" studies have referred primarily and directly to the course of research library collection growth over some substantial period of years, and Keyes Metcalf to the contrary notwithstanding, much evidence, including that from "large" libraries, has revealed

accelerating, curvilinear growth (e.g., Purdue, 1965, p. 37). Whether the relatively recent and current growth continue essentially as before has not been established, but a credible answer to the question requires, at a minimum, something like the following evidence: 1) authentic research library collection statistics; 2) that span a sequential series of recent years; 3) that are derived from a rationally chosen group of several libraries; and 4) that inferential statistics--or informed colleagues--indicate are devoid of significant curvilinear trend.

Instead, Molyneux presents only the following: 1) in Table 1, the same hypothetical collection and "volumes added" data that appear in Tables I and II of the previous article; 2) in Table 2, the 1983/84 collection data of 17 or 20 libraries in three ARL subgroups, together with the mean, median, and summed volumes for each group; 3) in Table 3, the 1983/84 mean, median, and summed volumes of ARL's 105 academic member libraries; 4) in Figure 1, four plots showing the average year-by-year gross volumes added by ARL libraries identified in Tables 2 and 3; and 5) in Figure 2, four similar plots that show net volumes added by the same ARL library groups.

Note that the evidence in his Table 1 is hypothetical, not authentic, and it thus establishes nothing concerning actual collection growth. Then note that his Tables 2 and 3 present authentic collections data, but because they report only one year, 1983/84, they lack sequence and they thus lack relevance to questions of growth. And note, too, that his Figs. 1 and 2 do present authentic, sequential data but none that refers to library collections. Instead, the data refer to "volumes added," a marginally relevant, a distant, or a tangential measure that

does not translate readily or surely into conclusions concerning collection growth. Thus, the absence of authentic, generalizable, sequential collections data not only undermines the argument, it is also perplexing because the relevant "collections" data are exactly as accessible as the marginally relevant "additions" data that Molyneux presents.

The forerunner of ARL's annual Statistics, the "Gerould/Princeton" statistics, was a series of compilations that include annual statistics of 60 academic libraries and that extend, in some cases, from 1907-08 through 1961-62. The collected data include variables similar or identical to those that ARL continues to collect: volumes held, volumes added, materials and binding expenditures, etc., and until recently, these compilations had apparently not been brought together between two covers. Now, thanks to Molyneux (1986c), ARL, and various collaborators or contributors, the statistics have been assembled and organized and they represent a unique and accessible record of academic library growth during the early part of this century. Molyneux has appended recent ARL statistics to those of Gerould/Princeton, so that portions of the data extend through 1983-84.

For present purposes, Molyneux's chapter 4 is of most interest. Entitled "Library growth from 1907/08 to 1983/84," the chapter consists largely of plots that show "increase in volumes . . . as a percent [:] 1907/08-1983/84," for each of 49 individual libraries, as well as averaged over a group of twelve libraries. The highest average, 9.1%, was in 1913/14 and the lowest, 3.0%, was in 1982, and during three years of World War II, 1943-45, the averages were 3.5, 3.2, and 3.3. During the large majority of years, collections increased between four and six

percent. In four appendices, Molyneux also lists the data sources consulted, and the discrepancies found when alternative sources were compared.

Finally, we should note that a brief and preliminary report of the present research was prepared for distribution to those attending the April-May 1986 ARL meeting (Seibert, Games, Kuenz, and Gregg, 1986), and its results consist of preliminary versions of Figs. 1-10, below. In discussing these results, the authors mention that acquisition increases had stopped "about 1970 or shortly afterward," that the total expenditures "1984 average is $9.58 million, which represents a 20-fold increase of the 1951 level," and also represents average annual increases of about nine percent, and that both professional and non-professional staff size had shown "no evident increase since 1970 or 1971" (pp. 9-11). It should be noted too that the forerunner and counterpart of that brief and preliminary report is one that was prepared for distribution at the July 1965 ARL meeting. It consisted largely of the then-current versions of Figs. 1-28, below, and is published in the meeting's minutes (Moriarty, 1965).

Procedures

In most significant respects, the present study procedures are the same as those described by Dunn, Seibert, and Scheuneman 22 years ago in the first of the Purdue reports (1965, pp. 5-9). Then, the three principal types of analyses were: 1) determination of library growth trends and the forecasting of 28 selected trends; 2) year-by-year ranking of the libraries, based on each of three selected variables; and 3) year-by-year correlations between all variable pairs. This study-and-update omits the year-by-year rankings*, but it analyzes data from the same group of 58 academic research libraries that were the basis of those earlier studies (see Table 1), analyzes the same twelve library and university statistical variables (Table 2), supplementing these with others that are ratios between two variables (e.g., "PINC"= VA/VH, "BKR"=BX/TX; see Table 2a); describes trends in terms of the same eight "composite" libraries (Table 3)**, and reports correlations among the expanded/supplemented set of variables.

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* Annual rankings are omitted because their inclusion would only duplicate the more complete rankings that have been a part of the annual ARL Statistics reports since 1968-69.

** Purdue's eight hypothetical, composite libraries were created because the first, i.e., the "average composite," is "substantially influenced by the size of a few extremely large libraries, particularly Harvard, Yale, Illinois, and some others . . . [and so does] not reflect a thoroughly typical state of affairs" (1965, p. 7). The seven other composites are defined in ways that minimize such distortion, and they report statistics that, in reality or in effect, describe more homogeneous library subgroups. They also seem to facilitate the comparisons that readers are inclined to make between conditions or trends in a library they know well and those in a statistically similar composite.

Table 1

Names and Identification Numbers of the 58* ARL Academic Libraries

1 Boston U.	31 Nebraska
2 Brown	32 New York U.
3 California, Berkeley	33 North Carolina
4 California, Los Angeles	34 Northwestern
5 Southern California	35 Notre Dame
6 Chicago	36 Ohio State
7 Cincinnati	37 Oklahoma
8 Colorado	38 Oregon
9 Columbia	39 Pennsylvania
11 Cornell U.	40 Pennsylvania State
12 Duke	41 Pittsburgh
13 Florida	42 Princeton
14 Florida State	43 Purdue
15 Harvard	44 Rochester
16 Illinois	45 Rutgers
17 Indiana	47 Stanford
18 Iowa	48 Syracuse
19 Iowa State	49 Temple
20 Johns Hopkins	50 Tennessee
21 Vanderbilt (formerly Joint U.)	51 Texas A&M
22 Kansas	52 Texas
23 Kentucky	53 Utah
24 Louisiana State	54 Virginia
25 Maryland	55 Washington (Seattle)
26 Mass. Institute of Tech.	56 Washington (St. Louis)
27 Michigan	57 Washington State
28 Michigan State	58 Wayne State
29 Minnesota	59 Wisconsin
30 Missouri	60 Yale

* Note that there is no #10 or #46, due to intentional omission of Connecticut and St. Louis U. from the original group.

Table 2

The Twelve Statistical Variables: Names, Abbreviated Names, and Brief Definitions*

Variable Name	Abbrev. Name	Brief Definition
Volumes Held	VH	Number of volumes held in the library collection.
Volumes Added	VA	Number of (gross) volumes added to the collection.
Book, Periodical & Binding Expenditures	BX	Expenditures (US$) to acquire books, periodicals, other library materials, and for binding.
Total Expenditures	TX	Total operating expenditures (US$), including BX, SX, and "other" operating expenditures.
Salaries Expenditures	SX	Expenditures (US$) for salaried library staff, student wages, other personnel expenditures; normally does not include fringe benefits.
Entering Professional Salary	LPSP	Entering annual salary paid (US$) or that would be paid to a professional librarian with no creditable experience.
Wages Expenditures	WX	For 1951-62 ONLY, expenditures (US$) for student assistants or other hourly wage employees; since 1963, merged into SX, above.
Professional Staff Size	PSS	Number of professional staff, full-time equivalents (FTE).
Non-professional Staff Size	NPSS	Number of non-professional staff, full-time equivalents (FTE).
Total Student Enrollment	TENR	Total number of students enrolled in degree-credit programs, fall term/semester
Graduate Enrollment	GENR	Number of students enrolled for advanced/graduate degrees, fall term/semester; does not include "first professional" degree students in medicine, law, etc.
Ph.D. Degrees	PHD	Number of Ph.D. and similar doctoral degrees (Ed.D., D.B.A., D.Mus., etc); does not include "first professional" doctorates in medicine, law, etc.

* The ARL definitions of the first nine variables are given in Stubbs and Buxton (1981). The three remaining definitions are based on fall enrollment and "earned degree" reports of the National Center for Educational Statistics (see listing in Appendix B).

Table 2a

Five Supplementary Variables/Ratios: Names, Abbreviated Names, and Brief Definitions

Variable Name	Abbrev. Name	Brief Definition
Percentage Increase	PINC	Volumes added (VA) divided by volumes held (VH).
Materials Expenditure Ratio	BKR	Materials and binding expenditures (BX) divided by total operating expenditures (TX).
Volumes Added per Graduate Student	VAPG	Volumes added (VA) divided by graduate enrollment (GENR).
Graduate Student Ratio	GRDR	Graduate enrollment (GENR) divided by total enrollment (TENR).
Cost/expenditures per student	CXPS	Total operating expenditures (TX) divided by total enrollment (TENR).

Table 3

The Eight Hypothetical Composite Libraries: Names, Abbreviated Names, and Defining Features

Composite's Name	Abbrev. Name	Defining Features
Average	Av	Each descriptive statistic for all 58 libraries was averaged for each year, 1950-51 through 1984-85. This composite library is composed of the average values calculated for each year.
Median	Mdn	Each descriptive statistic, for all 58 libraries was rank-ordered each year. This composite has statistics that would place the library midway between the 29th and 30th rank on each statistic; it is the hypothetical 50th percentile library.
First Quartile	Q1	Using the ranking information employed for the Mdn composite, Q1 was also prepared. Its statistics place it always at the 25th percentile in each ranking of the 58 libraries.
Third Quartile	Q3	As with the Mdn and Q1, the Q3 is based on rankings. Its descriptive statistics place it always at the 75th percentile in each ranking of the 58 libraries.
Large*	Lge	The 58 libraries' reported collections for 1962-63 were the basis for defining this library (and the three that follow). For this composite, the 14 libraries with the largest collections were identified and their average characteristics were then calculated for each year.
Medium-Large*	M-Lge	This composite was defined in essentially the same way as the Lge, above, except that it is based on averages for the 15 libraries with 1962-63 collections just smaller than those of the 14 largest libraries.

Table 3 (Continued)

Medium-Small*	M-Sml	This composite follows next in line after the M-Lge, above. It is based on averages calculated for the 15 libraries with 1962-63 collections just smaller than those in the M-Lge group.
Small*	Sml	This composite is based on averages calculated for the 14 libraries that had the smallest collections in 1962-63.

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* The 14 "large" libraries are California, Berkeley; California, Los Angeles; Chicago; Columbia; Cornell U; Harvard; Illinois; Indiana; Michigan; Minnesota; Pennsylvania; Princeton; Stanford; and Yale.

The 15 "medium-large" libraries are Brown; Duke; Iowa; Johns Hopkins; Louisiana State; Missouri; New York U.; North Carolina; Northwestern; Ohio State; Texas; Utah; Virginia; Washington, Seattle; and Wisconsin.

The 15 "medium-small" libraries are Southern California; Cincinnati; Colorado; Florida; Vanderbilt (Joint U.); Kansas; Kentucky; Massachusetts Institute of Technology; Michigan State; Oklahoma; Oregon; Pittsburgh; Rutgers; Washington, St. Louis; and Wayne State.

The 14 "small" libraries are Boston U.; Florida State; Iowa State; Maryland; Nebraska; Notre Dame; Pennsylvania State; Purdue; Rochester; Syracuse; Temple; Tennessee; Texas A&M; and Washington State.

Note: To satisfy our own curiosity and that expressed by others, 1985 ARL data were used to re-create the four subgroup composites. When this was done, the numbers of libraries that remained in the subgroup to which they were originally assigned were: "large," 11 of 14; "medium-large," 8 of 15; "medium-small," 9 of 15; and "small," 11 of 14. The composition of these "new" subgroups is shown in Appendix D. It should be emphasized, however, that the new subgroups were not used as a basis for any statistical analyses reported below.

Where the present procedures differ from those of the Purdue studies, this is due largely to the more efficient data collection and data analysis procedures and to the greater volume/quantity of data to be analyzed. Data collection for the Purdue studies involved much year-by-year or even piece-by-piece collection and depended on a variety of sources (1965, pp. 81-82), but now, most of the data is from two primary and one additional, "generic" source. The first source is Maurice Marchant, Brigham Young University, who provided a copy of the Purdue data, spanning the years 1951-1972. Then, the more recent ARL library data were provided by Kendon Stubbs, University of Virginia (who serves also as consultant/member of ARL's Committee on Statistics). These recent data extend back to 1962, and thus they overlap the Purdue/Marchant data for ten years. To maintain continuity and consistency with the Purdue studies, however, and when given a choice between these two sources, we have relied first on the Purdue/Marchant data. Finally, the additional or supplementary enrollment and Ph.D. degree "output" data are taken from published reports and staff files at the National Center for Educational Statistics (for a listing of the reports, see Appendix B).

When data collection and entry were near completion, the data file consisted of twelve statistical variables spanning 34 years and representing each of 58 research libraries (one more year, 1985, has been added since), for a total of approximately 24,000 entries. While the file was being developed, its contents were periodically reviewed for credibility and for omissions, and steps were taken to resolve whatever problems were found. Precise records of these problems were not kept, but recorded notes and recollections support the judgment that

the data revealed only relatively minor problems, the most common of which were erratic or implausible year-to-year changes in a university's reported total or graduate enrollment. The typical solution was to refer again to published sources or, if necessary, to contact appropriate campus authorities. Similarly, when problems were seen in a library's statistics, we referred to published sources or contacted ARL staff or Kendon Stubbs in an effort to resolve the problem. If it remained unresolved, we occasionally opted to enter interpolated data, but this was a solution of last resort; an estimated five percent of the entered data are interpolations.

A Perspective on the Data

Approximately 24,000 numerical entries provide the data for this study and, even though many hours were spent in assembling and checking data and in resolving discrepancies, we recognized that, if error-free data became the goal, the task would be interminable. Eventually we decided that a point of diminished returns had been reached and that efforts should be directed to the data analysis and report preparation phases of the work. There are, no doubt, some unresolved and undetected discrepancies present in the data, but we believe these to be minimal and, when or if found, they can be regarded as Kruskal (1981)* suggested, when he wrote that "a reasonably perceptive person, with some common sense and a head for figures, can sit down with almost any structured and substantial data set or statistical compilation and find strange-looking numbers in less than an hour" (p. 508).

The important strengths of the data are that they represent a systematic, 35-year record reflecting the size and, in a sense, the power of a large, stable group of the most re-cognized and established research libraries in America. The time span covered by the data, the variety and detail reflected by the variables, and the significance of the represented institutions make the record unique.

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* The Kruskal paper was the R. A. Fisher Memorial Lecture, presented at the 1978 Joint Statistical Meetings, San Diego.

Data analyses were jointly planned by the authors and executed by one author (P.G.), using computer facilities and SAS statistical programs (SAS Institute, 1985) available to him. Then, because many of the current analyses repeat work reported in earlier Purdue reports, two of the authors (W.S. and M.K.) undertook to compare and "validate" the new results against the older, published results, and in doing this, found two general but minor problems. The first was that, following the first Purdue report (1965), the next three reports (1966, 1967, 1968) present medians, as well as first and third quartiles, that differ slightly from those of the new analyses, and this now seems traceable to a minor procedural change in calculations done for the three Purdue reports. The second concerns correlational analyses involving the "wages expenditure" or WX variable. The newly calculated correlations often differed from those Purdue reported, which we attribute to a "missing data" error in the original calculations. Before the collecting of WX statistics ceased in 1962, library reporting practices were at times irregular or spotty, and this appears to have prompted the errors.

The steps taken to collect, review, revise, and analyze the data are sufficient to produce credible but not immutable results. However, a high order of data precision is not only unattainable, it is also and usually not necessary because both the magnitude and the variability of most variables are so large. The larger variables, e.g., library holdings (VH), total expenditures (TX), and salaries expenditures (SX), are so large and, among the 58 libraries, so highly variable that they could probably be rounded and recorded to the nearest ten thousand without introducing any practical, adverse effect on findings. It does

not matter, for example, whether Purdue's and Rochester's 1984 salaries expenditures are recorded as $3,275,969 and $3,114,233, respectively (as they are), or as $3.28 and $3.11 million; the discrepancies introduced by such rounding are between one- and two-tenths of a percent. Moreover, we suggest that the adoption and use of rounded statistics could provide helpful reminders that the precision of the data should not be exaggerated.

Results

The libraries that provide the data for this work represent most academic members of ARL in 1964, the year when the Purdue studies began; however, five then-current members were omitted "due to incompleteness of available data" (Purdue, 1965, p. 57). To estimate the role of the libraries and their 58 parent universities in American graduate research and education, see Table 4.

Table 4

Graduate Enrollment and Doctoral Degrees

	Graduate Enrollment			PH.D. Degrees Awarded		
YEAR	U.S. Total	ARL/Purdue 58		U.S. Total	ARL/Purdue 58	
	NO.	NO.	%	NO.	NO.	%
1950-51	235000*	152876	65.1	7338	6358	86.6
1954-55	241665	143479	59.4	8840	7494	84.8
1959-60	304265	177755	58.4	9829	8113	82.5
1964-65	534295	225279	42.2	16467	12617	76.6
1969-70	754421	292652	38.8	29866	20563	68.9
1974-75	960659	294259	30.6	34083	21325	62.6
1979-80	1069749	307818	28.8	32615	18707	57.3
1984-85	1114184	323550	29.0	32943	18218	55.3

* Estimate based on 1949-50 and 1951-52 data; 1950-51 data are unavailable.

The contents of Table 4 demonstrate that the 58 ARL universities were the dominant U.S. centers of graduate research and education thirty or more years ago and that this national role has declined gradually through the years. However, the decline is a result of large increases in the national statistics, not of decreases at the 58 universities. Nationally, 1985 graduate enrollments were nearly five times greater than those in 1951 and the Ph.D. degrees awarded were 4.5 times greater, but during this same 35-year period, graduate enrollments at the 58 universities doubled and the Ph.D. degrees that they awarded had nearly tripled. These same trends, stated simply and mnemonically, mean that, in 1951, each of the 58 universities, on the average, accounted for about 1% of U.S. graduate students and 1.5% of the Ph.D. degrees awarded, whereas in 1985, they accounted for .5% and 1%, respectively.

The statistical trends of the eight hypothetical composite libraries (see Table 3) are summarized in Tables 5-12. For each statistic and each composite library, statistical values are shown for every year, 1951 through 1985*. To read the tabular statistics, note, for example, Table 5, which shows that in 1951 the average library collection (VH) was 893,567 volumes and in 1985 this had increased to 3,178,962. Similarly, the "volumes added" (VA) statistic increased during this same period from 34,805 to 93,832, but note also that VA reached a peak in 1970, then plateaued and declined for twelve years, to a low point in 1982; since then, three successive increases have added 13,000 volumes to the annual average.

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* An exception is the WX (wages expenditures) statistic, which was not collected and reported after 1961-62.

Table 5

The Average (Mean) ARL Library, 1951-1985

YEAR	VH	VA	BX	SX	LPSP	WX	PSS	NPSS	TX	TENR	GENR	PHD	PINC	BKR	VAPG	GRDR	CXPS
51	893567	34805	146001	251986	2796.8	37511.6	44.07	649.86	459375	12016.3	2486.28	109.62	.0464	.3352	22.045	.1952	044.32
52	928052	34443	150783	261799	3025.2	43379.7	43.71	651.10	478930	10878.4	2260.44	114.41	.0449	.3241	22.379	.1995	050.01
53	960292	35899	165431	291611	3160.5	43606.7	43.16	650.80	524381	10708.5	2283.77	121.05	.0457	.3194	25.090	.2025	055.68
54	1012654	37949	170281	308921	3220.3	47306.9	44.43	652.31	559116	10781.4	2409.10	131.94	.0448	.3220	25.952	.2026	057.58
55	1047702	40392	179067	327560	3397.9	46521.3	45.73	654.08	584730	11492.9	2473.78	129.20	.0443	.3178	24.348	.2006	057.83
56	1080472	43571	189444	349380	3608.2	51835.7	46.35	655.83	623074	12095.7	2536.91	127.94	.0441	.3176	24.742	.2042	059.43
57	1124653	40243	216065	375432	4013.2	60940.0	49.03	657.55	662835	12674.2	2681.38	129.25	.0416	.3262	23.550	.2071	061.86
58	1157562	42127	244067	432474	4132.2	66276.3	50.10	661.09	785416	13067.0	2766.95	127.63	.0415	.3249	23.476	.2046	069.03
59	1202197	45241	265816	471312	4403.6	72555.1	52.35	664.74	861325	13421.2	3000.29	132.60	.0442	.3218	23.452	.2183	074.01
60	1255310	49015	308571	513324	4559.6	78363.1	53.08	666.70	952214	14084.8	3064.74	139.87	.0441	.3304	22.748	.2163	076.99
61	1307739	52500	356007	561670	4805.0	91624.3	54.11	672.16	1061934	15148.9	2825.95	148.74	.0453	.3413	26.070	.1813	081.82
62	1389650	58081	397542	630223	5021.7	95219.4	56.03	677.62	1188945	15940.0	2976.71	162.10	.0481	.3418	26.299	.1849	087.74
63	1454037	66287	447633	709640	5215.1	.	59.46	684.97	1320899	16877.8	3161.55	175.37	.0501	.3472	26.097	.1872	093.71
64	1490586	69890	517144	892196	5515.6	.	64.17	692.17	1502211	18305.1	3502.95	194.20	.0505	.3501	24.637	.1990	100.60
65	1574830	79329	626186	994151	5753.6	.	67.86	103.80	1738069	19500.2	3884.12	217.53	.0552	.3580	25.361	.2129	109.81
66	1650978	86070	672639	1142019	6046.2	.	73.09	117.73	1949291	21375.9	4201.19	234.10	.0572	.3573	25.999	.2124	118.15
67	1739632	93625	826638	1286089	6341.1	.	77.66	130.27	2303461	21420.6	4504.96	260.94	.0595	.3714	25.504	.2241	138.46
68	1804622	103912	919698	1465659	6908.7	.	62.13	136.58	2582928	21053.6	4724.33	285.68	.0638	.3709	26.211	.2332	152.12
69	1893511	101241	996071	1658875	7134.6	.	65.51	150.41	2866922	21646.8	4888.34	318.94	.0592	.3626	25.386	.2351	168.34
70	1998032	107024	1153784	1878376	7553.8	.	66.79	159.82	3268594	22207.3	5045.72	354.53	.0586	.3621	25.561	.2424	186.39
71	2079093	105778	1160782	2034381	8021.5	.	80.12	164.18	3439578	22382.5	5080.62	368.96	.0568	.3460	25.111	.2401	192.28
72	2156618	105424	1117320	2154048	8271.9	.	80.51	167.50	3526033	22542.1	5007.88	380.65	.0524	.3288	24.526	.2356	197.29
73	2253280	106864	1239184	2310208	8545.5	.	87.15	167.34	3846320	23143.9	4917.55	390.20	.0510	.3363	25.354	.2260	209.29
74	2328292	97258	1366394	2494074	8783.1	.	88.10	172.13	4209349	23390.4	4931.79	371.50	.0446	.3363	23.022	.2272	224.94
75	2406567	94370	1431173	2716306	9356.4	.	88.34	170.82	4564314	24016.9	5073.43	367.67	.0423	.3209	22.084	.2282	240.72
76	2477378	94520	1559824	2882550	9378.9	.	87.05	169.98	4887395	25179.9	5292.20	355.29	.0417	.3343	22.093	.2280	249.85
77	2558322	94485	1662756	3097351	10344.3	.	86.79	169.22	5259674	24730.5	5310.97	336.94	.0394	.3283	21.957	.2325	269.94
78	2643723	94758	1854679	3312023	10698.1	.	88.37	172.48	5709382	24875.6	5406.36	324.05	.0380	.3378	22.003	.2325	290.07
79	2741063	95456	2089264	3574668	11462.8	.	88.40	178.58	6263833	24822.8	5312.72	329.06	.0367	.3417	22.218	.2304	319.59
80	2786903	88586	2233009	3821514	12136.7	.	87.46	176.25	6754435	25243.8	5307.21	322.53	.0335	.3431	20.576	.2279	342.32
81	2853687	83818	2438782	4172863	13242.9	.	87.20	180.17	7393671	25730.9	5359.36	322.01	.0305	.3415	19.088	.2267	369.43
82	2926606	80765	2637005	4587185	14248.8	.	87.05	175.05	8128994	25810.0	5374.67	319.64	.0287	.3309	17.904	.2268	406.19
83	3017337	88557	2917307	4870846	14242.3	.	88.25	174.98	8810834	25570.9	5372.40	311.22	.0306	.3418	19.608	.2293	445.18
84	3089538	89484	3129678	5176739	15151.4	.	89.53	175.70	9527601	25633.1	5449.05	319.84	.0299	.3402	19.471	.2318	486.57
85	3178962	93831	3412629	5607067	16877.2	.	93.03	178.86	10383305	25623.8	5578.45	314.10	.0306	.3430	19.398	.2358	512.77

Table 6

The Median (50th Percentile) ARL Library, 1951-1985

YEAR	VH	VA	BX	SX	LPSP	WX	PSS	NPSS	TX	TENR	GENR	PHD	PINC	OKR	VAPG	GRGR	EXPS
51	615963	29440	108653	179966	2780.0	30238.5	34.00	035.00	350870	10092.5	1654.0	64.0	.0426	.3283	15.554	.1608	038.54
52	642154	29487	114710	183300	3000.0	31693.0	33.00	031.39	354322	9075.0	1482.0	75.0	.0383	.3150	18.554	.1632	041.39
53	664457	30646	121261	190962	3200.0	31969.0	34.25	032.94	370446	9075.5	1478.0	90.0	.0388	.3236	19.047	.1548	048.55
54	691753	34350	136904	223358	3245.0	32721.5	33.50	035.19	434052	9364.5	1604.5	93.5	.0395	.3161	20.364	.1538	050.00
55	732266	31360	140893	231668	3400.0	34724.0	34.50	039.25	458160	10176.5	1715.5	88.0	.0393	.3116	20.738	.1511	048.39
56	758568	34400	155316	252562	3600.0	36650.0	35.00	042.00	476544	10181.5	1694.0	95.5	.0400	.3072	20.870	.1436	048.44
57	804578	33999	177728	268116	4000.0	40900.0	38.75	043.04	563249	10699.0	1877.5	95.5	.0409	.3056	19.526	.1449	051.35
58	824545	38400	204339	324000	4200.0	46575.0	39.14	045.94	633512	11190.5	1953.0	92.5	.0389	.3198	18.876	.1504	050.03
59	862921	42730	245893	359720	4400.0	49399.0	41.84	048.64	698149	11264.5	2011.5	94.0	.0400	.3175	19.985	.1686	058.45
60	917256	42785	261118	389342	4567.0	49654.0	41.75	051.75	767104	12875.0	2029.0	107.5	.0431	.3137	17.534	.1757	059.50
61	965131	45283	308068	400568	4806.0	59897.0	42.50	056.50	842016	13670.5	2153.0	107.5	.0444	.3366	20.474	.1520	062.41
62	1031781	50463	338616	465692	5052.0	68095.0	44.50	058.75	931653	14443.5	2343.0	123.0	.0449	.3372	22.601	.1553	070.20
63	1089903	58576	394555	613713	5200.0	•	47.50	066.29	1072618	15206.0	2539.0	116.5	.0492	.3470	22.685	.1559	070.97
64	1091397	60384	452887	717700	5500.0	•	51.64	072.59	1214948	16000.5	2602.5	136.5	.0483	.3534	21.281	.1629	078.60
65	1146553	69741	510264	819761	5800.0	•	55.50	084.25	1455411	17096.5	3090.5	171.5	.0503	.3510	20.841	.1775	082.80
66	1219432	74430	595478	907495	6000.0	•	61.00	096.50	1582758	18553.5	3209.0	177.0	.0547	.3540	21.948	.1783	078.73
67	1277422	79752	707233	1037992	6700.0	•	64.00	106.75	1871480	18738.0	3531.0	198.0	.0565	.3780	22.681	.2050	097.24
68	1317756	88965	808820	1114172	6800.0	•	67.50	109.50	2065865	18818.0	3903.5	224.0	.0583	.3832	23.605	.2172	109.71
69	1403523	90773	850668	1314797	7182.0	•	72.50	124.00	2296034	19391.0	3911.5	235.5	.0553	.3599	22.335	.2166	119.46
70	1471248	94314	1051471	1561444	7500.0	•	73.00	136.50	2738877	20126.0	4139.5	293.0	.0504	.3611	20.560	.2267	129.00
71	1559958	96770	1099198	1595776	8000.0	•	73.00	134.50	2921248	20602.0	4170.5	307.0	.0518	.3457	21.041	.2204	131.64
72	1638256	90123	1042842	1735519	8150.0	•	74.00	141.00	3150626	21201.5	4143.5	322.0	.0464	.3283	18.533	.2207	134.14
73	1692334	89153	1174477	1920491	8500.0	•	74.50	140.50	3228855	21721.5	3991.5	323.5	.0442	.3347	19.392	.2051	141.61
74	1747468	84497	1186340	2077412	8800.0	•	72.00	140.50	3246803	21209.5	4074.0	320.0	.0428	.3373	19.782	.1965	154.74
75	1812504	86364	1228043	2310185	9300.0	•	72.00	144.00	3751960	22458.0	4179.0	336.5	.0393	.3338	18.198	.1997	160.69
76	1862816	89105	1338491	2343598	9950.0	•	73.50	131.50	4025167	23060.5	4203.5	315.0	.0395	.3369	18.029	.1989	172.31
77	1959908	91042	1477411	2490218	10275.0	•	73.50	132.00	4423036	22496.5	4333.5	300.5	.0380	.3217	18.471	.1969	188.06
78	2011651	79600	1589163	2707069	11000.0	•	76.00	142.50	4906150	23735.0	4491.0	295.5	.0369	.3239	17.284	.2045	211.10
79	2085787	81581	1778481	2990953	11500.0	•	76.00	146.00	5450114	23535.5	4391.5	303.5	.0342	.3294	17.996	.1978	231.62
80	2156293	74708	1960235	3287402	12000.0	•	77.00	146.00	5863371	24064.5	4330.5	293.0	.0328	.3262	17.284	.2034	233.39
81	2223167	73628	2339758	3586757	13062.5	•	76.00	151.00	6356856	24522.0	4330.0	295.5	.0296	.3355	14.597	.1984	253.05
82	2262449	67672	2377338	3929714	14000.0	•	78.00	151.50	6924944	24630.0	4581.0	289.5	.0278	.3291	13.683	.1987	277.09
83	2336576	75911	2521407	4064372	14000.0	•	78.00	148.50	7642585	24919.0	4679.5	283.5	.0304	.3321	14.732	.1953	303.12
84	2407611	70084	2701232	4356316	15000.0	•	79.50	147.50	8144233	24850.0	4759.0	296.0	.0301	.3358	14.617	.1962	331.83
85	2480145	81557	3115614	4675444	16500.0	•	82.00	150.00	8827285	24398.0	4919.0	280.0	.0302	.3416	15.553	.2008	350.93

Table 7

The First Quartile (25th Percentile) ARL Library, 1951-1985

YEAR	VH	VA	BX	SX	LPSP	MX	PSS	NPSS	TA	TENR	GENR	PHD	PTMC	BKR	VAPB	GRBR	EXPS
51	423385	16334	82660	131914	2600	17820.0	23.00	024.00	235821	8804	944	34	.0333	.2869	10.224	.1200	024.00
52	452773	18596	87218	141400	2810	17570.0	24.00	025.00	246866	8512	925	32	.0326	.2769	12.241	.1243	031.08
53	481600	19589	87038	150900	3000	18415.0	25.00	026.00	275864	8317	895	40	.0321	.2823	10.484	.1207	032.11
54	523213	20363	95099	158083	3000	23966.0	25.00	026.00	287264	8203	873	52	.0307	.2814	12.215	.1190	032.27
55	552171	21081	100064	164768	3200	21886.0	26.00	027.15	303749	7836	834	48	.0278	.2769	13.524	.1186	033.83
56	577175	22977	105779	182174	3400	21997.0	26.50	030.50	334199	7046	987	52	.0309	.2743	12.454	.1185	034.01
57	606405	23409	115163	203433	3720	20475.0	28.00	030.00	368698	7206	1080	52	.0329	.2851	12.338	.1225	035.44
58	630527	25348	122760	229878	3900	28088.0	28.00	033.50	426382	7291	1106	48	.0332	.2837	12.579	.1180	040.26
59	647016	25056	141070	265515	4200	31505.0	29.50	039.00	459475	7743	1134	55	.0319	.2822	12.320	.1221	042.45
60	696830	29326	173300	298059	4420	36997.0	30.50	039.00	532194	8513	1418	57	.0325	.2930	10.913	.1318	045.75
61	742939	28772	197143	297439	4625	40816.0	33.00	039.00	582961	9008	1250	60	.0327	.3014	13.321	.1158	044.70
62	771949	34006	215132	362429	4806	43039.0	36.00	044.00	683633	9524	1300	69	.0345	.2984	15.124	.1207	047.09
63	833750	42867	267711	405869	5000	.	39.00	051.00	781271	10391	1400	89	.0401	.2993	10.109	.1209	051.13
64	822500	41985	288113	521339	5280	.	41.00	058.50	850186	11044	1790	93	.0395	.3125	15.526	.1325	052.52
65	853623	51666	316882	569400	5600	.	41.00	064.00	985408	10735	1903	110	.0402	.3079	14.908	.1366	056.09
66	924381	62000	383775	669046	5800	.	44.00	076.79	1145956	13266	2252	136	.0473	.3092	14.731	.1401	056.20
67	1000877	64107	481057	772958	6048	.	46.00	079.00	1363264	12469	2334	140	.0452	.3220	14.957	.1475	060.00
68	1033238	62304	561421	883748	6700	.	49.00	092.00	1570977	13959	2473	158	.0466	.3220	17.040	.1596	062.15
69	1092054	63851	677170	1009401	.000	.	52.00	101.00	1839170	12867	2645	184	.0441	.3201	16.959	.1632	066.55
70	1191210	63958	724284	1130668	7300	.	54.00	100.00	2108122	14034	3035	210	.0454	.3233	15.358	.1665	101.08
71	1178985	67127	712526	1205399	7800	.	53.00	104.00	2251759	14007	3031	220	.0437	.2939	15.213	.1598	104.31
72	1210649	63092	717475	1259420	8000	.	52.00	105.00	2188581	14932	2912	237	.0391	.2871	14.479	.1541	110.09
73	1244471	60384	859386	1310396	8150	.	53.00	104.00	2384066	14052	2920	220	.0382	.2945	14.924	.1508	114.12
74	1351715	59073	947563	1401567	8500	.	52.00	107.00	2681433	14933	3149	232	.0352	.3017	14.755	.1505	118.38
75	1426816	57206	1001759	1608365	9000	.	54.00	103.00	2933932	13094	2770	230	.0329	.2939	13.017	.1537	120.39
76	1534498	60000	1120071	1703225	9300	.	52.00	107.00	3039083	13390	2925	217	.0322	.2909	12.316	.1477	122.90
77	1446011	55877	1099103	1849000	9700	.	54.00	110.00	3309771	15329	3230	222	.0303	.2873	12.367	.1504	132.62
78	1565000	60038	1235562	1924000	10080	.	55.00	110.00	3551548	13903	3302	200	.0281	.2928	12.708	.1620	147.34
79	1636208	54336	1349000	2033020	10500	.	54.00	114.00	3867513	16117	3474	199	.0294	.2987	10.941	.1588	165.65
80	1671414	53050	1596041	2193932	11000	.	54.00	113.00	4307617	16404	3470	202	.0281	.3102	10.634	.1522	173.53
81	1709201	48446	1742019	2400440	12500	.	56.00	117.00	4837295	16432	3518	209	.0251	.3058	10.017	.1503	184.53
82	1804502	46537	1849773	2722169	13300	.	57.00	108.00	5290734	16420	3490	202	.0233	.2990	10.010	.1404	213.10
83	1847736	53113	2002871	2957942	13300	.	58.00	109.00	5538336	15703	3442	191	.0250	.3018	11.305	.1521	220.08
84	1919415	54508	2195084	3114233	14000	.	62.00	110.00	6160833	15982	3702	208	.0250	.3075	11.237	.1504	228.15
85	1962733	56384	2357820	3303522	16000	.	64.00	116.00	6520045	16484	3706	179	.0250	.3043	11.045	.1529	230.03

Table 8

The Third Quartile (75th Percentile) ARL Library, 1951-1985

YEAR	VH	VA	BX	SX	LPSP	WX	PSS	NPSS	TX	TENR	GENR	PHD	PINC	BKR	VAPG	GRDR	EXPS
51	973277	43949	176859	287856	3000	45028	51	056.79	542645	15766	3143	165	.0588	.3839	26.856	.2421	053.17
52	1011153	42802	186719	298596	3270	49634	46	055.27	585596	14020	2911	159	.0526	.3536	28.676	.2392	064.06
53	1050755	45506	206652	362010	3100	50537	49	056.00	636248	14885	2869	178	.0550	.3542	31.643	.2271	067.34
54	1095284	45696	200057	372484	3490	57779	50	053.[illegible]0	651712	14774	2881	178	.0528	.3532	34.982	.2466	066.99
55	1132128	50448	210595	417709	3600	61475	50	062.50	7[illegible]0264	15795	3059	171	.0540	.3560	33.318	.2409	068.86
56	1166295	47746	223283	449578	3800	67266	49	062.59	755035	17017	3166	187	.0508	.3610	31.607	.2418	066.29
57	1229572	48333	246872	456382	4200	67712	50	069.00	798014	17573	3417	176	.0481	.3671	26.884	.2474	067.29
58	1301075	52798	327820	480125	4400	77750	52	076.00	919461	16991	3436	185	.0510	.3548	31.420	.2306	079.47
59	1372051	55866	331908	534503	4678	73177	55	086.29	999244	17759	3649	182	.0516	.3465	28.088	.2698	078.16
60	1429431	57066	351858	598766	40[illegible]	89[illegible]38	61	081.79	1103667	18442	3921	199	.0547	.3514	29.498	.2772	084.82
61	1481175	65943	417724	672085	5364	106142	62	0[illegible]3.07	1315658	19152	3566	213	.0552	.3750	36.064	.2169	085.78
62	1540063	75122	457713	767140	5750	107641	[illegible]	101.39	1471035	21223	4030	224	.0584	.3814	35.962	.2323	091.62
63	1[illegible]72672	76284	577510	908000	5700		72	111.79	1640500	22316	4178	231	.0586	.3990	35.853	.2299	098.69
64	1664774	77555	603266	1062851	5700	.	75	120.00	1855000	24867	4326	271	.0593	.3895	28.772	.2520	105.17
65	1771900	89886	[illegible]92648	1710144	[illegible]	.	81	133.[illegible]	2110586	26346	5253	312	.0701	.3970	29.210	.2624	136.37
66	1845069	106647	[illegible]4[illegible]328	1361512	62[illegible]	.	80	1[illegible]9.54	2443921	26285	5640	336	.0673	.3939	32.299	.2595	133.24
67	1945271	111527	1045007	1548321	6500	.	85	[illegible].09	2933370	29145	6288	361	.0740	.4033	31.480	.2685	143.92
68	2075615	132281	[illegible]99905	1841472	7100	.	92	164.00	3439482	28863	6057	402	.0759	.4061	31.422	.2734	166.97
69	217[illegible]	126[illegible]7[illegible]	1299576	2017548	7290	.	94	184.00	3599268	29054	6752	431	.0709	.4100	30.390	.2731	203.61
70	2239[illegible]58	13[illegible]7	1447641	2180645	7800	.	100	198.00	3753657	30657	6939	439	.0737	.3965	30.991	.2927	222.30
71	2411724	130801	[illegible]449[illegible]	2387024	820[illegible]		103	196.00	4068426	30366	7506	453	.0664	.3736	27.468	.2793	231.34
72	2511[illegible]	[illegible]29638	1532745	2631364	8500		107	2[illegible]3.00	4475897	26947	7297	481	.0625	.3666	27.883	.2777	243.31
73	2654[illegible]	[illegible]	1578704	3004750	8900	.	113	205.00	[illegible]7136	30187	6949	531	.0595	.3611	28.634	.2613	232.45
74	27[illegible]	1[illegible]7795	1823453	3200275	9177	.	116	218.[illegible]	5489061	31[illegible]86	7079	497	.0520	.3666	28.612	.2560	271.11
75	297[illegible]	113625	1796450	3332488	9800	.	107	2[illegible]6.00	5827763	30576	7077	469	.0495	.3603	26.099	.2513	305.35
76	3132863	117316	1910173	3854557	10500	.	112	2[illegible].0[illegible]	6333271	33236	7[illegible]7	481	.0483	.3671	27.686	.2556	311.66
77	3236182	110666	1917540	4118158	10900	.	112	218.00	6731168	3[illegible]921	7335	449	.0443	.3605	25.522	.2578	333.30
78	3[illegible]71519	122[illegible]	2347366	45227[illegible]	113[illegible]	.	114	223.00	7436[illegible]75	3[illegible]684	7147	437	.0461	.3678	26.029	.2629	381.65
79	3[illegible]7[illegible]184	[illegible]31	268361	4[illegible]7503	[illegible]	.	[illegible]	235.00	8387456	31704	6675	435	.0418	.3674	28.002	.2668	388.03
80	363[illegible]	1198[illegible]	286[illegible]807	140[illegible]79	1280[illegible]	.	116	[illegible]38.00	[illegible]708959	32976	7692	424	.0379	.3710	23.118	.2651	434.19
81	3456127	1051[illegible]	295427	5[illegible]46336	13950	.	108	[illegible]27.00	8954832	33[illegible]78	7067	424	.0352	.3741	21.917	.2632	468.03
82	3945397	1059[illegible]	30[illegible]1832	5[illegible]3257	15000		104	228.00	9417[illegible]41	33766	6941	418	.0331	.3674	23.477	.2707	499.11
83	4037[illegible]78	121501	[illegible]547700	6056263	15000	.	105	22[illegible].00	1034529[illegible]	32827	6920	413	.0349	.3730	25.028	.2658	591.89
84	4127798	11[illegible]4[illegible]	[illegible]695538	6567337	16000	.	108	22[illegible]	11234674	33109	6[illegible]36	417	.0340	.3697	25.347	.2660	621.82
85	4729107	113187	4232445	7682662	17500	.	109	229.00	1[illegible]971026	33014	7215	398	.0355	.3762	23.843	.2700	693.01

Table 9

The Large ARL Libraries, 1951-1985

YEAR	VH	VA	BX	SX	LPSP	WX	PSS	NPSS	TX	TENR	GENR	PHD	PINC	BKR	VAPG	GRDR	EXPS
51	1956399	59653	272813	512711	2758.3	67046	84.67	102.35	896673	15240.4	3625.23	233.64	.0345	.3107	21.64	.2699	71.346
52	2014473	59618	281851	534253	2945.0	92589	84.22	108.37	946356	13929.6	3202.38	235.14	.0344	.3019	23.29	.2639	78.949
53	2064105	57197	314661	590025	3060.7	84937	86.57	103.38	1029447	13471.4	3369.31	230.35	.0338	.3109	22.29	.2864	89.185
54	2176506	64113	318136	626076	3252.0	91931	84.05	107.85	1080957	13414.8	3915.00	252.64	.0331	.3029	23.66	.2953	93.981
55	2232976	70887	326255	657696	3476.3	97759	86.82	110.65	1129689	13786.2	4005.29	243.35	.0363	.2945	24.74	.2951	95.385
56	2280884	69004	343369	698159	3714.7	106361	88.07	112.02	1207015	14058.5	4046.21	237.21	.0351	.2912	24.61	.3030	102.509
57	2345331	68835	380750	754146	4056.0	116991	93.42	116.20	1321904	15408.2	4218.29	227.00	.0324	.2995	23.37	.2993	107.585
58	2405860	72784	416667	856160	4314.3	142951	94.68	121.45	1494085	15706.0	4413.86	241.78	.0348	.2933	24.1	.3024	118.784
59	2507103	76685	435209	920351	4476.0	155811	99.87	122.62	1609445	16132.5	4769.07	248.78	.0348	.2826	22.99	.3276	127.206
60	2601578	84982	534173	988924	4742.3	168870	99.13	123.74	1793439	17311.1	4688.07	263.92	.0352	.3075	23.71	.2938	130.590
61	2684785	89693	622902	1105997	4867.3	182874	99.77	135.43	2001076	18383.9	4436.64	280.78	.0362	.3179	26.76	.2596	142.570
62	2824193	97265	690268	1227254	5150.5	205706	104.02	144.47	2245736	19298.1	4409.50	295.64	.0400	.3169	28.92	.2550	154.926
63	2932926	115791	778575	1548427	5277.2	.	108.52	154.02	2479619	20360.5	4728.43	310.64	.0425	.3218	33.15	.2642	166.058
64	3009319	122050	900191	1696834	5538.3	.	116.27	165.50	2784068	21390.8	5343.79	342.64	.0431	.3295	29.95	.2874	181.556
65	3156284	142703	975034	1874411	5722.3	.	125.05	188.45	3038987	22444.2	5747.07	374.21	.0470	.3223	31.19	.3010	192.424
66	3278373	142343	1143245	2178486	6000.6	.	134.41	215.34	3599949	23926.0	6093.29	397.21	.0462	.3270	31.41	.3042	223.842
67	3414441	148380	1273449	2408651	6325.6	.	142.17	233.72	4036708	24575.6	6418.36	439.35	.0460	.3198	29.60	.3080	254.563
68	3532708	168250	1363516	2708929	6894.3	.	146.78	238.71	4454554	23071.5	6570.14	471.57	.0515	.3177	33.56	.3199	274.308
69	3680409	162988	1505796	3054680	7222.9	.	150.00	261.50	4956188	23574.0	6754.64	517.42	.0478	.3115	32.01	.3211	301.609
70	3839558	176846	1722149	3388483	7643.7	.	152.07	267.78	5577370	23690.4	6876.36	540.35	.0494	.3146	31.81	.3379	339.134
71	3996387	172844	1702491	3608883	8040.1	.	148.50	267.64	5781460	23446.2	6677.29	560.71	.0464	.2956	34.18	.3238	348.021
72	4144940	174412	1616637	3816001	8177.9	.	148.07	277.92	5886940	23174.5	6509.93	576.71	.0427	.2794	33.84	.3185	356.437
73	4277211	155367	1725761	4061785	8543.0	.	146.64	275.50	6300448	23910.6	6531.43	590.50	.0383	.2779	31.45	.3131	375.588
74	4405064	159527	1953786	4341359	8908.3	.	147.92	282.50	6958127	23928.7	6552.86	564.14	.0373	.2869	31.29	.3139	403.383
75	4537748	150040	2124032	4718793	9569.0	.	149.35	286.14	7591537	24490.1	6591.00	531.64	.0346	.2853	30.03	.3086	432.766
76	4663842	142509	2281101	5102502	10357.4	.	147.07	287.64	8173630	25420.9	6795.29	533.28	.0317	.2831	27.63	.3115	457.424
77	4744360	142467	2428155	5337388	10806.9	.	142.64	270.64	8649609	25102.8	6609.00	503.64	.0310	.2827	28.35	.3050	489.648
78	4864528	146218	2589232	5688609	11463.1	.	144.42	272.78	9197577	24685.7	6743.50	486.42	.0307	.2862	31.49	.3026	513.776
79	5032047	145808	2994746	6023866	12020.6	.	142.28	288.64	10043210	24464.7	6685.50	494.35	.0293	.3000	28.74	.3065	566.847
80	5046387	136778	3274486	6373863	12787.6	.	138.07	268.00	10911143	24906.5	6623.07	460.78	.0278	.3030	27.11	.3032	614.793
81	5166261	135050	3556849	6974797	14134.2	.	139.14	286.00	11852535	25222.3	6710.79	469.07	.0265	.3034	25.53	.3052	661.099
82	5309317	132553	3769464	7720629	15301.8	.	136.85	275.50	12958201	25217.7	6633.79	461.57	.0255	.2946	24.54	.3036	715.607
83	5488345	143317	4148104	8151144	15121.9	.	138.35	275.28	13952929	24941.1	6694.29	445.78	.0268	.3011	27.02	.3112	768.210
84	5571466	147303	4548070	8581127	16086.6	.	141.07	271.21	15269325	25070.7	6686.64	471.42	.0272	.3026	28.05	.3098	856.274
85	5689574	155128	4827351	9545830	18043.2	.	146.14	276.50	16501580	25290.9	6931.43	453.14	.0281	.2961	27.72	.3127	892.168

Table 10

The Medium-Large ARL Libraries, 1951-1985

YEAR	VH	VA	BX	SX	LPSP	WX	PSS	NPSS	TX	TENR	GENR	PHD	PINC	BKR	VAPG	GRDR	CAPS
51	756315	32246	136610	217468	2705.7	34789.4	39.10	45.84	410009	12337.9	3127.93	109.40	.0438	.3355	22.508	.2123	43.750
52	787867	32558	134362	226589	2933.3	38095.9	38.45	44.03	418477	11407.1	3055.00	113.93	.0426	.3249	23.909	.2226	50.130
53	824143	36594	145075	252828	3046.1	40408.6	39.92	40.41	400907	10854.3	2672.47	126.06	.0454	.3197	29.038	.2170	56.058
54	867303	35748	150269	263052	3110.0	42664.9	39.46	45.65	478492	10945.3	2664.07	133.46	.0422	.3217	26.343	.2199	57.024
55	900751	35367	161106	281500	3296.6	45972.2	40.04	45.07	513705	11617.4	2707.47	134.13	.0409	.3224	24.945	.2073	56.406
56	937711	37594	155912	300110	3537.1	45040.5	38.58	48.77	540582	12011.5	2670.67	128.93	.0433	.3165	25.621	.2017	56.837
57	981193	38964	136873	304129	3871.3	52540.3	41.11	48.92	565332	12536.6	2765.00	133.73	.0403	.3225	23.532	.2032	58.851
58	1015342	40497	236428	361362	4032.1	55645.6	40.96	52.08	689485	12875.3	2832.33	123.20	.0410	.3435	27.393	.1937	66.396
59	1056439	43141	274233	396476	4398.7	60324.5	42.70	56.75	778751	13510.4	3087.00	131.13	.0420	.3459	26.539	.2038	71.442
60	1108803	45981	320155	441386	4467.4	66102.5	45.34	60.79	866491	13930.2	3152.57	135.26	.0423	.3570	28.337	.1980	77.080
61	1164440	51704	369319	470854	4725.0	71863.5	47.10	66.14	970273	15326.7	2869.21	140.66	.0445	.3633	30.789	.1790	81.351
62	1277481	57948	411418	555917	4912.0	77503.5	49.42	69.07	1103680	16238.9	3056.67	157.00	.0455	.3603	30.103	.1757	85.536
63	1335103	66718	443583	675581	5083.7	.	51.75	75.34	1200482	16917.1	3199.27	174.23	.0504	.3707	33.007	.1759	90.339
64	1339660	72376	517298	784151	5541.6	.	55.01	79.85	1365520	19034.6	3590.47	189.06	.0544	.3533	29.852	.1550	92.675
65	1441118	75585	748772	874035	5818.9	.	59.48	96.25	1722842	20106.7	3892.07	210.60	.0531	.3655	28.838	.1937	106.948
66	1494613	86842	622348	973561	6018.9	.	62.10	97.22	1703575	22334.1	4138.07	226.20	.0584	.3651	29.061	.1930	130.528
67	1596739	94287	860558	1115005	6223.3	.	66.70	113.55	2112072	20384.3	4376.07	254.66	.0583	.3933	27.082	.2181	127.03[illegible]
68	1646704	99063	882532	1243375	6920.7	.	70.06	117.56	2248374	20657.1	4064.73	277.46	.0558	.3781	26.334	.2249	135.317
69	1737460	93893	874895	1380355	7183.7	.	73.33	131.05	2398184	21327.7	4752.53	309.20	.0546	.3532	25.842	.2279	144.353
70	1847013	96310	1120041	1572319	7571.7	.	74.85	141.40	2847091	21994.5	4835.03	347.13	.0525	.3796	25.477	.2290	162.506
71	1903873	95766	1182290	1760141	8032.3	.	75.53	148.60	3112284	22540.4	4903.93	376.55	.0511	.3547	24.273	.2268	169.140
72	1994182	98952	1055312	1836756	8259.5	.	75.30	152.00	3079873	22827.3	4833.27	377.33	.0487	.3370	23.290	.2213	170.613
73	2108956	120137	1225851	2056289	8551.6	.	77.80	145.00	3516063	23460.6	4889.13	392.93	.0522	.3514	29.035	.2205	185.591
74	2172159	90177	1343076	2264327	8788.5	.	78.93	155.60	3884650	23872.2	4930.47	370.36	.0408	.3502	22.627	.2200	200.085
75	2261760	94713	1425734	2427832	9390.2	.	79.26	148.00	4140883	24219.5	5027.33	362.53	.0404	.3496	23.059	.2233	215.463
76	2347606	97950	1613920	2585610	9964.1	.	77.53	151.00	4564495	25059.7	5224.13	348.00	.0405	.3589	24.396	.2217	225.281
77	2476330	104292	1740142	2812171	10171.0	.	78.13	165.40	4994902	24359.4	5283.53	318.13	.0406	.3509	26.498	.2368	244.501
78	2569552	100006	1833291	3069203	10950.1	.	82.20	163.80	5420942	24313.1	5467.60	309.26	.0378	.3425	24.076	.2363	263.743
79	2680045	104869	2003426	3351072	11729.9	.	82.66	169.66	6017283	24911.0	5504.47	317.06	.0380	.3407	26.528	.2341	296.077
80	2766741	95564	2283170	3518892	12246.8	.	83.00	170.53	6483364	25465.5	5479.37	313.93	.0339	.3583	24.343	.2249	313.753
81	2820859	87852	2521757	3962876	13373.9	.	85.46	171.13	7210488	26115.3	5458.93	303.00	.0303	.3551	22.721	.2231	339.335
82	2896165	83546	2306700	4359729	14358.0	.	86.86	170.13	8069208	25923.5	5565.07	307.93	.0283	.3539	20.099	.2209	384.358
83	2982697	85829	3219103	4668409	14424.7	.	86.33	171.45	8849773	26759.5	5590.07	289.06	.0294	.3662	20.656	.2222	412.905
84	3067516	91091	3375905	5003737	15293.3	.	89.40	172.93	9504583	26947.7	5694.20	294.60	.0271	.3607	20.744	.2245	444.580
85	3156717	93464	3691349	5394226	15659.3	.	94.40	176.86	10401615	26971.5	5937.73	304.06	.0310	.3592	20.412	.2355	477.264

Table 11

The Medium-Small ARL Libraries, 1951-1985

YEAR	VH	VA	BX	SX	LPSP	MX	PSS	NPSS	TX	TENR	GENR	PHD	PINC	BKR	VAPB	BKDR	CAPS
51	529514	28046.1	97054	192386	2728.8	31279.6	27.86	27.03	292803	10737.0	1799.23	52.40	.0545	.3321	21.469	.1697	32.059
52	563494	28444.6	102269	154015	3065.1	29017.7	27.46	28.80	303990	9736.5	1592.47	56.06	.0520	.3254	22.973	.1760	30.942
53	591745	32254.2	117649	131516	3228.5	28931.8	26.56	29.54	340875	9716.7	1721.53	65.60	.0556	.3364	27.678	.1769	46.056
54	621694	33316.1	119009	191519	3127.5	33360.9	28.80	30.42	358817	9959.3	1643.30	70.06	.0541	.3306	29.396	.1657	41.037
55	657097	34630.5	127964	206451	3310.2	33407.5	29.69	32.48	392307	10682.2	1781.37	69.46	.0530	.3230	26.873	.1673	42.317
56	684786	33001.2	142719	221283	3539.7	36581.8	31.83	33.26	420860	11475.5	2011.80	73.93	.0490	.3375	24.804	.1824	41.597
57	725591	32319.1	155686	251173	4082.9	39397.0	33.18	35.82	470397	12067.9	2123.37	83.20	.0450	.3310	22.656	.1805	43.217
58	765004	33792.2	171789	294435	4146.3	44977.6	35.52	40.20	558074	12414.3	2204.07	71.46	.0451	.3391	22.539	.1838	45.907
59	763954	33723.5	205543	325321	4520.2	46482.2	37.08	42.86	509977	12046.2	2331.80	78.26	.0438	.3343	20.747	.1929	52.985
60	804879	38850.6	223272	355448	4636.3	48724.9	38.85	45.42	602795	12965.7	2461.40	80.40	.0479	.3369	19.941	.1960	55.734
61	846485	42242.3	243034	382139	4891.2	55047.3	38.29	47.74	716823	14015.0	2256.80	89.26	.0505	.3412	25.386	.1653	58.900
62	890495	44491.2	269336	419516	5036.8	60433.6	40.12	51.34	792940	14550.9	2322.00	100.73	.0501	.3421	25.385	.1665	60.368
63	945550	49630.5	298780	526172	5196.2	•	42.82	59.17	888659	15413.7	2501.13	112.60	.0525	.3388	26.312	.1695	64.352
64	983268	49954.1	347874	603723	5531.1	•	45.77	62.58	1065694	16404.1	2874.23	134.03	.0506	.3407	20.913	.1806	69.757
65	1025527	57112.7	407170	680416	5753.0	•	45.73	64.84	1154440	17452.6	3404.87	153.60	.0535	.3524	19.328	.2038	73.904
66	1073113	65102.5	482156	780259	6197.9	•	52.60	78.15	1339580	19415.3	3676.07	170.56	.0541	.3587	21.587	.2025	80.973
67	1129286	72237.8	591370	874535	6405.7	•	55.22	85.29	1584157	20471.9	3971.73	188.33	.0540	.3723	23.093	.2054	92.989
68	1171743	75639.9	717328	1043222	6847.3	•	59.06	94.13	1893407	19741.1	4101.33	208.80	.0637	.3763	22.038	.2161	112.574
69	1246919	78699.7	800336	1187144	6958.6	•	61.13	105.53	2170645	20672.1	4214.33	235.80	.0621	.3767	22.389	.2122	126.807
70	1334784	83156.2	874119	1345231	7382.9	•	62.53	108.60	2392983	21845.0	4487.00	279.20	.0612	.3660	23.376	.2158	129.585
71	1405940	84440.7	955751	1457542	7839.5	•	62.60	114.13	2507226	21945.5	4591.87	286.60	.0589	.3411	20.516	.2215	135.332
72	1434110	76513.6	889751	1503683	8339.1	•	64.73	116.00	2567261	22549.9	4594.47	301.66	.0523	.3331	18.187	.2220	142.133
73	1520238	79713.9	1017296	1627014	8493.9	•	66.40	121.46	2890432	22711.7	4500.67	314.00	.0509	.3485	19.072	.2117	147.498
74	1583837	74434.7	1062148	1778336	8619.0	•	67.46	122.46	3123645	22891.3	4657.07	295.33	.0461	.3371	18.125	.2163	159.417
75	1633331	70851.5	1117193	1971368	9175.7	•	68.40	125.00	3427320	23825.4	4895.33	310.06	.0429	.3283	16.727	.2180	170.316
76	1642173	72682.7	1167565	2006191	9471.5	•	66.13	117.33	3535138	25106.5	5241.93	289.86	.0439	.3331	17.614	.2184	70.422
77	1720377	70452.0	1275251	2242659	10229.7	•	69.20	120.66	393208	408.1	5231.27	283.00	.0404	.3250	15.861	.2245	191.062
78	1799239	72870.8	1559793	2395368	10607.3	•	69.80	122.40	4397725	24645.7	5281.33	263.33	.0398	.3479	15.698	.2240	207.306
79	1859319	73092.1	1726484	2673888	11107.9	•	71.53	127.26	4865841	24582.1	5002.20	267.86	.0386	.3480	16.401	.2159	227.096
80	1898107	65768.5	1757462	2876497	11647.0	•	71.86	134.00	5180245	24914.6	5087.00	264.60	.0344	.3404	14.574	.2176	243.751
81	1949623	59680.1	1934300	3133224	12880.9	•	67.33	133.13	5673231	25106.9	5173.60	267.46	.0301	.3407	12.450	.2199	267.495
82	1974923	56024.1	2108210	3430976	13858.5	•	68.13	128.46	6290237	24775.9	5152.33	267.33	.0285	.3392	12.417	.2208	301.773
83	2033244	64936.3	2285357	3678222	13867.3	•	68.60	128.60	6797848	24419.9	5085.33	264.20	.0316	.3400	14.396	.2218	330.561
84	2091117	63653.7	2420851	3873195	14843.9	•	69.46	131.33	7204954	24417.0	5154.07	267.06	.0304	.3418	13.920	.2248	350.334
85	2150036	64008.7	2635159	4125410	16824.9	•	72.80	131.73	7946575	24279.5	5152.73	258.26	.0297	.3391	14.011	.2259	385.635

Table 12

The Small ARL Libraries, 1951-1985

YEAR	VH	VA	BX	SX	L.SP	WX	PSS	NPSS	TX	TENR	GENR	PHD	PINC	BKR	VAPB	GROR	EXPS
51	367847	19941.6	89981	134425	2974.6	20346.2	26.17	25.27	253440	9762.6	1452.93	47.14	.0605	.3544	22.534	.1350	31.011
52	382429	17716.0	89287	141910	3158.5	21872.3	26.23	25.32	263919	8484.0	1250.14	56.71	.0500	.3396	19.261	.1394	34.954
53	397222	17761.4	89207	152710	3313.2	22733.8	27.16	25.95	283937	8637.6	1247.43	65.78	.0474	.3105	20.710	.1365	38.539
54	419230	19316.1	98801	166686	3402.5	24629.3	26.87	27.35	300979	8821.0	1235.93	75.28	.0496	.3320	23.589	.1309	38.881
55	438380	20211.4	105959	176525	3522.5	25452.8	27.94	29.67	321427	9734.6	1433.21	73.78	.0489	.3306	23.097	.1344	38.434
56	456969	21294.1	110794	190631	3660.1	28238.1	28.21	31.35	344176	10277.6	1425.50	75.50	.0486	.3238	22.790	.1314	38.250
57	485261	21513.4	122492	206250	4046.2	30253.2	30.10	31.41	379344	10715.6	1631.64	76.07	.0460	.3270	19.342	.1412	39.361
58	503670	22144.8	135665	232341	4056.7	34005.9	30.95	32.76	423084	11311.4	1653.43	78.42	.0448	.3215	19.585	.1381	42.597
59	523006	28384.6	151981	258874	4219.8	35750.0	31.53	38.85	473120	11444.5	1854.86	76.21	.0564	.3220	23.533	.1519	46.105
60	548555	27191.1	161949	283951	4413.5	39212.4	32.72	39.64	512919	12215.8	1993.64	84.50	.0507	.3177	18.803	.1545	46.101
61	578422	27097.4	195893	330683	4747.4	43378.0	32.93	41.49	569335	12939.5	1778.64	89.07	.0479	.3411	19.056	.1313	48.297
62	610107	33599.2	226777	337490	5006.2	48871.6	34.65	46.93	647794	13749.9	2159.71	99.78	.0567	.3463	20.578	.1443	52.142
63	647383	34166.7	275360	435373	5350.7	.	36.57	53.85	754312	14921.6	2251.86	108.50	.0537	.3563	19.686	.1413	56.386
64	677115	36424.6	315294	512388	5448.6	.	40.55	63.75	877404	16474.4	2242.00	115.14	.0538	.3547	18.541	.1389	61.208
65	725176	48297.5	380655	578302	5715.6	.	43.10	69.23	1018781	17607.4	2526.14	136.78	.0647	.3704	22.682	.1550	69.729
66	810258	51436.1	460211	673324	5956.6	.	45.52	81.04	1215160	19899.9	2840.92	147.42	.0631	.3767	21.034	.1467	71.174
67	869381	61010.0	595557	787778	6413.1	.	48.95	92.94	1485956	20392.4	3208.38	167.07	.0693	.3987	22.043	.1622	83.321
68	921269	74995.4	732523	906735	6976.0	.	55.14	100.21	1754955	20866.9	3609.86	191.00	.0805	.4104	23.522	.1695	90.346
69	966589	71302.0	825895	1064765	7174.6	.	60.21	108.57	2025866	21106.0	3889.71	220.00	.0725	.4017	21.486	.1815	105.299
70	1031420	74253.9	921212	1267415	7627.6	.	60.28	126.50	2349587	21340.5	4039.50	257.35	.0716	.3868	21.733	.1900	120.133
71	1070768	76422.5	922853	1371751	8185.9	.	59.21	131.07	2447311	21617.6	4196.93	263.64	.0709	.3772	21.859	.1907	122.366
72	1116452	74315.2	928264	1462440	8307.3	.	58.71	129.14	2541838	21595.5	4028.71	272.78	.0660	.3649	21.184	.1824	125.859
73	1169385	73229.6	1004621	1562678	8596.9	.	59.92	132.28	2770198	22501.1	3780.57	279.35	.0625	.3653	21.994	.1682	134.615
74	1216434	67023.9	1095105	1659809	8828.0	.	60.21	131.64	2971496	22870.8	3606.50	262.00	.0542	.3699	20.422	.1601	142.685
75	1259004	64360.0	1080548	1821079	9311.7	.	58.42	129.07	3166112	23531.7	3796.07	270.92	.0514	.3469	18.840	.1642	151.199
76	1324817	66257.5	1200864	1919706	9852.6	.	59.64	128.21	3395970	25144.3	3916.14	255.21	.0508	.3606	18.881	.1614	153.709
77	1357933	61747.0	1229628	2078603	10190.1	.	59.07	129.28	3586552	25297.9	4127.71	256.50	.0455	.3531	17.265	.1682	161.952
78	1407191	61126.4	1454635	2177731	10589.0	.	58.85	135.07	3935575	25379.5	4116.14	245.07	.0437	.3734	17.3	.1675	180.377
79	1460182	58980.1	1581587	2330159	10999.1	.	59.00	134.14	4246462	25344.4	4067.21	252.21	.0408	.3778	17.304	.1659	196.006
80	1501302	56293.3	1647284	2498778	11678.4	.	58.35	135.92	4574789	25696.2	4042.29	255.57	.0379	.3698	16.429	.1627	206.105
81	1544925	54130.1	1772328	2731244	12598.9	.	58.42	134.42	4974402	26520.9	4100.29	253.78	.0353	.3659	15.865	.1594	219.234
82	1596152	51862.4	1889298	2936240	13496.9	.	57.71	129.78	5333939	26317.1	4149.79	247.14	.0324	.3585	14.791	.1628	232.053
83	1637827	57743.3	2040246	3085257	13569.1	.	58.50	128.14	5808643	26160.4	4124.36	250.78	.0345	.3583	16.660	.1630	259.568
84	1700944	57620.4	2206929	3254365	14393.6	.	59.64	130.71	6299081	26089.9	4264.86	251.85	.0331	.3548	15.431	.1693	282.884
85	1794540	59524.8	2532280	3483838	15990.1	.	60.14	133.85	6855981	25952.9	4232.36	245.00	.0335	.3767	15.754	.1698	307.654

Also, as in the Purdue reports, 28 selected trends are shown graphically in Figs. 1-28. (Here, but not in the Purdue reports, an explanatory note precedes the figures and Purdue's forecasting equations follow.) Each figure presents data from 1951 through 1985, and their principal contents are as follows:

Figs. 1-5, Average composite VH, VA, TX, BX, and PSS.

Figs. 6-10, Median composite VH, VA, TX, BX, and PSS.

Figs. 11-13, First quartile composite VH, VA, and TX.

Figs. 14-16, Third quartile composite VH, VA, and TX.

Figs. 17-19, Large composite VH, VA, and TX.

Figs. 20-22, Medium-large composite VH, VA, and TX.

Figs. 23-25, Medium-small composite VH, VA, and TX.

Figs. 26-28, Small composite VH, VA, and TX.

The expenditure statistics for total operating expenditures (TX); salaries (SX); and books, periodicals, and binding (or "materials and binding," BX) all show large increases during the 1951-1985 period, with average increases that exceed 22-fold, and that correspond to repeated annual increases of about nine percent. The nature and extent of this growth can be seen in Figs. 3 and 4, 8 and 9, and in six other TX figures (nos. 13, 16, 19, 22, 25, and 28) or in the expenditure columns of Tables 5-12. The figures show clearly, as the tabular statistics do not, a brief interruption of growth, beginning in 1971. Before that, expenditures had increased regularly and rapidly, but then the increases slowed or reversed (see, e.g., Figs. 9 and 13); however, by 1973 or 1974, increases had begun again and they have continued since. Since the increases include growth to compensate for economic inflation, as well as real funding increases, to estimate inflation's effects, the

expenditure averages were adjusted/recalculated so that all could be expressed as "constant" 1984 dollars. To accomplish this, TX and BX averages were adjusted using factors derived from GNP* data and SX were similarly adjusted using CPI* data (see Appendix E). Both the actual and the adjusted TX, SX, and BX averages are shown in Fi~ 29.

A Note on the Reading and Interpretation of Figs. 1 through 28

In Figs. 1 through 28, the physical arrangement and graphic symbols remain constant throughout and they are largely self-explanatory, but please note the following:

- Because all Purdue reports present forecasts that extend only through 1980, Figs. 1-28 symbolize this with an "open" vertical space between 1980 and 1981, with "suggestive" arrowheads on the fitted curves, and with the appended 1981-1985 data points shown as distinctive open triangles.
- In the upper left-hand "box" of each figure:
  - o "Original prediction . . ." was first published in 1965.
  - o "Revised prediction . . ." was first published in 1971.
  - o "Realized value . . ." is calculated from 1980 ARL data.
- In most figures, two smooth curves are clearly visible. The earlier curve (1965) is a solid line from 1951 through 1964 and a broken line through 1980. The later curve (1971) begins at 1971 and extends through 1980; it typically begins and ends at levels above the earlier curve.
- Equations for the fitted curves in Figs. 1-28 are presented on pp. 103-104, immediately following Fig. 28.

* GNP = Gross National Product (U.S. Dept. of Commerce, 4/4/86); CPI = Consumer Price Index (U.S. Dept. of Labor, 4/22/86). The year 1984 was chosen as the base year and expenditures for all other years were then multiplied by the appropriate indexing factor.

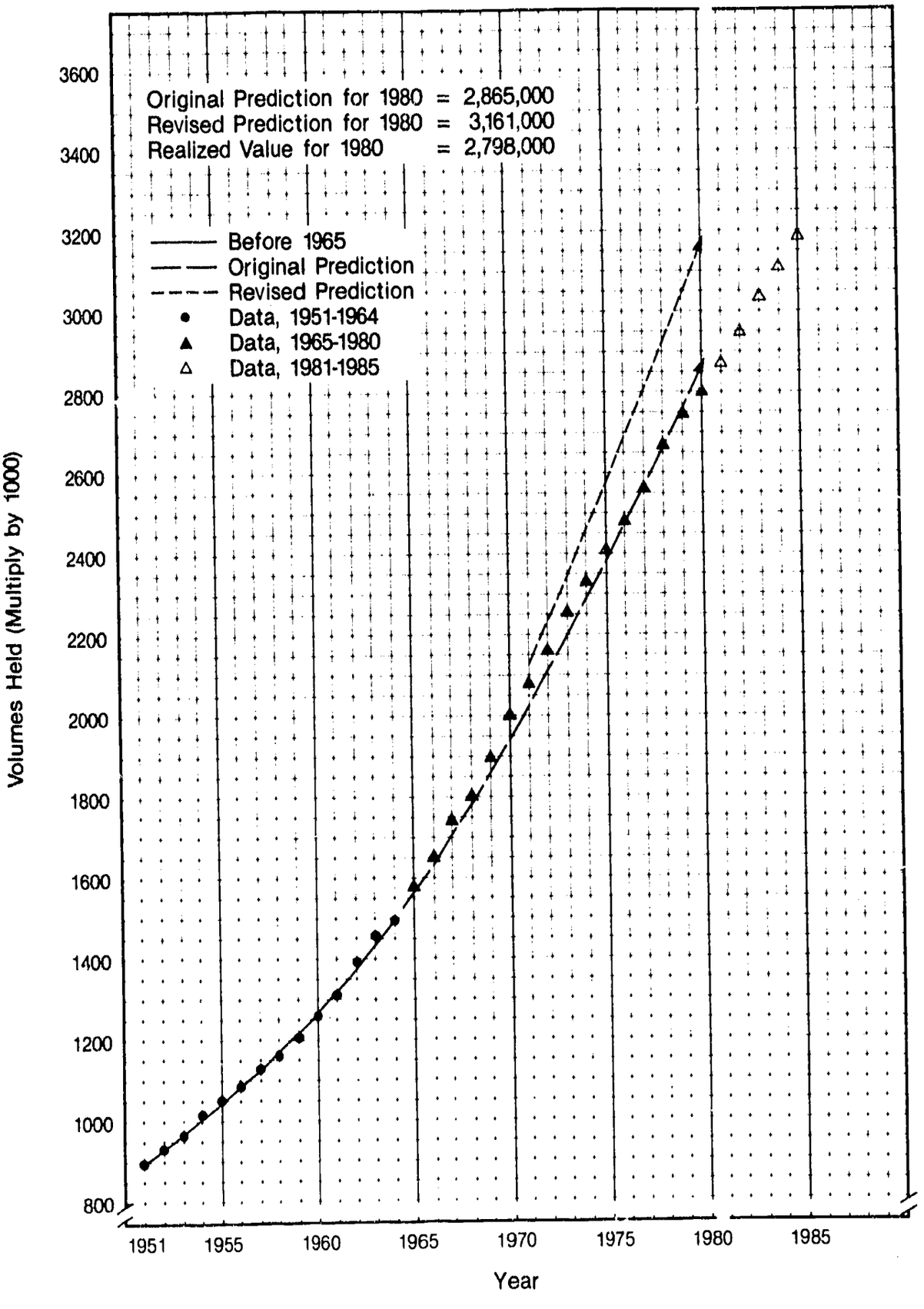

Figure 1. **The Past and Predicted Growth of Volumes Held in the Average (Mean) ARL Library, 1951-1980 (Data Through 1985 Appended)**

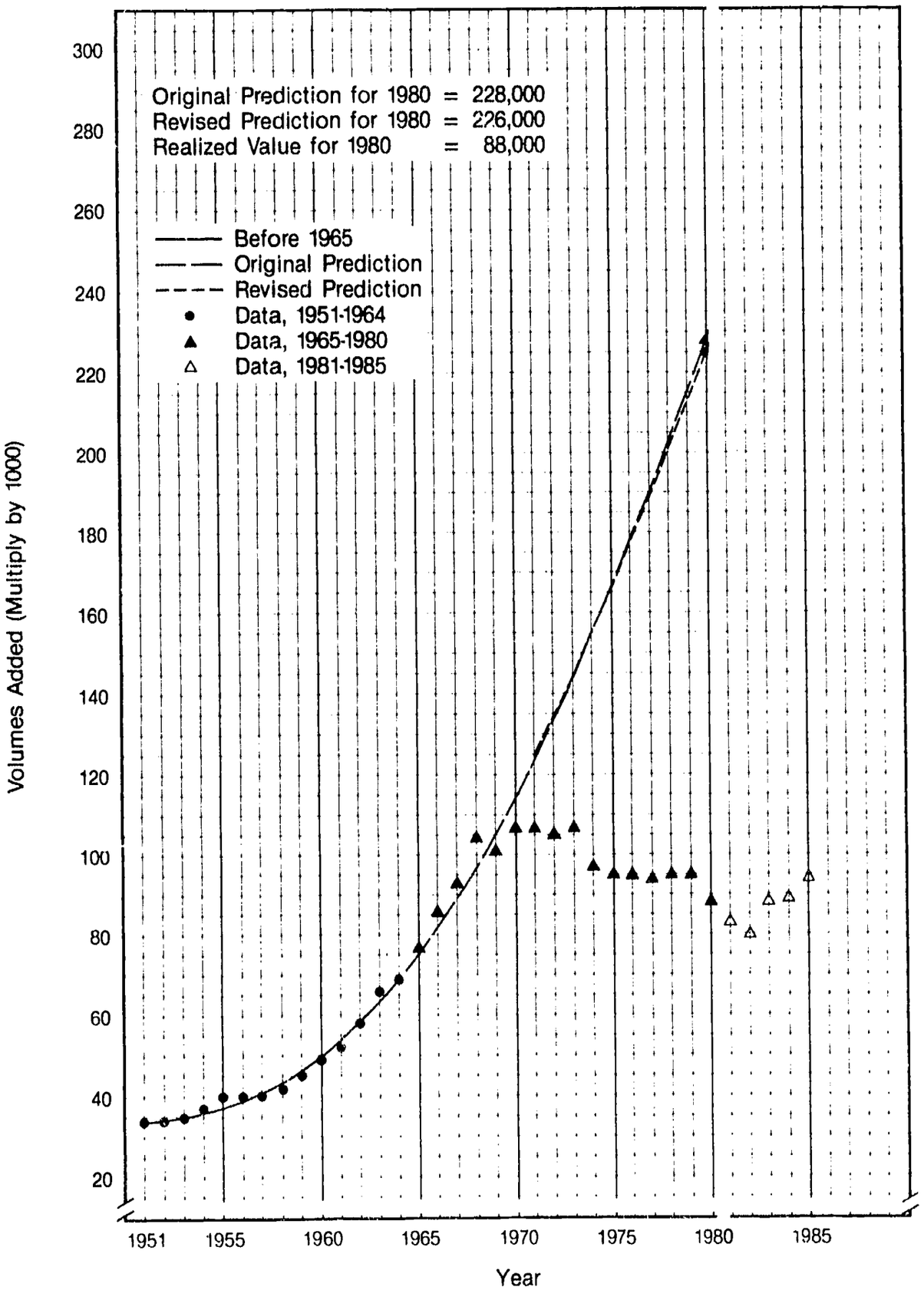

Figure 2. **The Past and Predicted Growth of Volumes Added in the Average (Mean) ARL Library, 1951-1980 (Data Through 1985 Appended)**

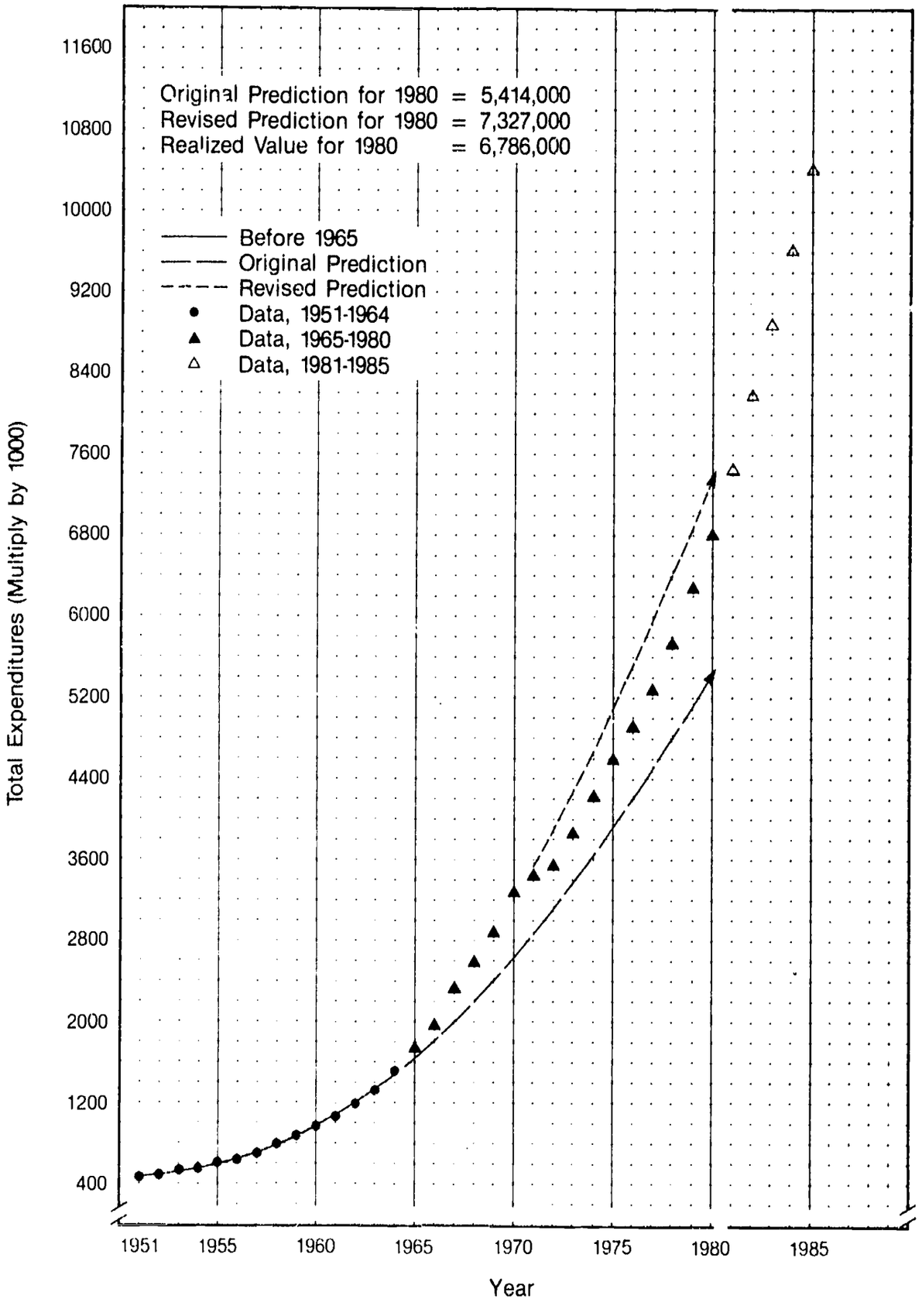

Figure 3. **The Past and Predicted Growth of Total Library Operating Expenditures in the Average (Mean) ARL Library, 1951-1980 (Data Through 1985 Appended)**

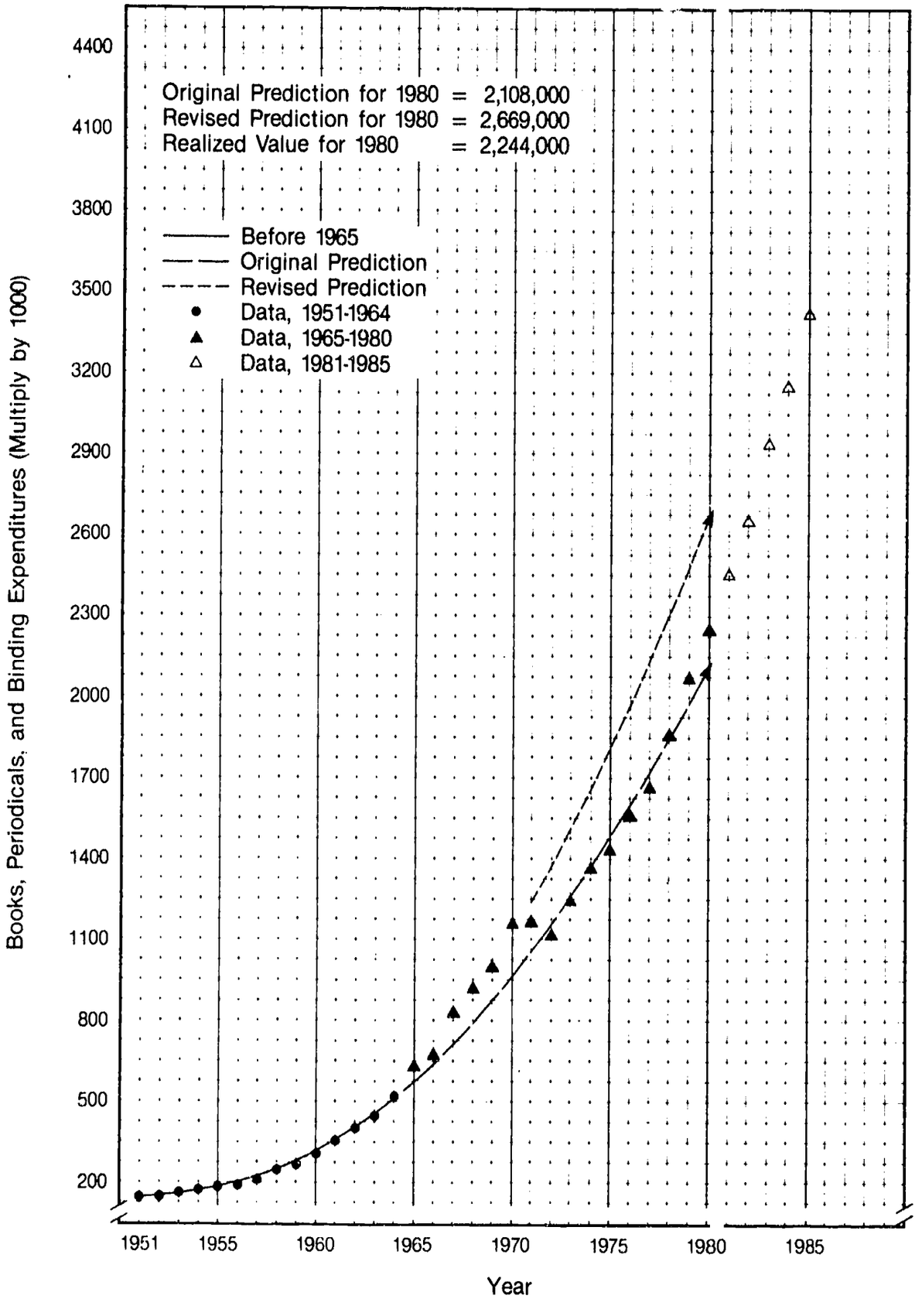

Figure 4. **The Past and Predicted Growth of Books, Periodicals, and Binding Expenditures in the Average (Mean) ARL Library, 1951-1980 (Data Through 1985 Appended)**

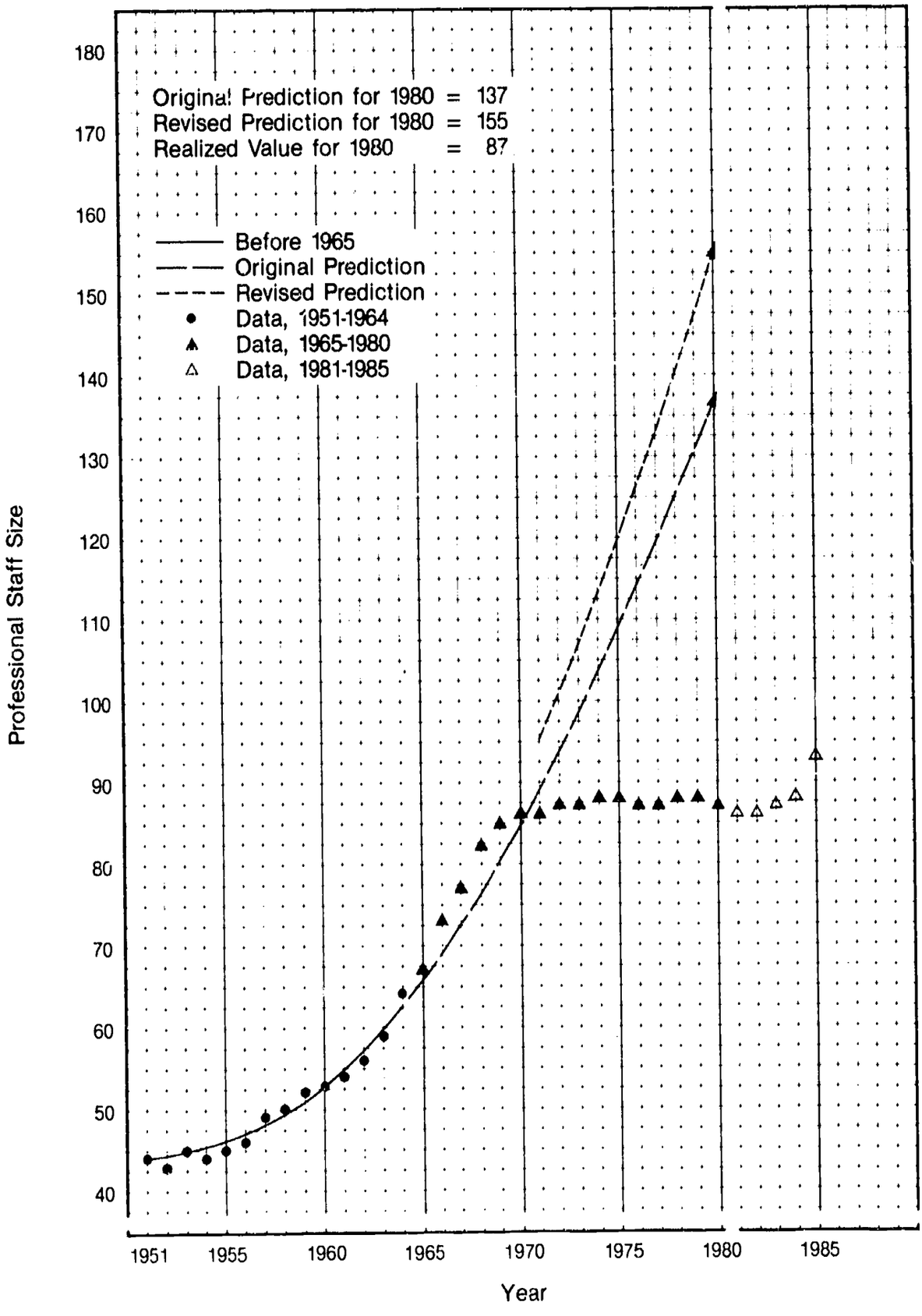

Figure 5. **The Past and Predicted Growth of Professional Staff Size in the Average (Mean) ARL Library, 1951-1980 (Data Through 1985 Appended)**

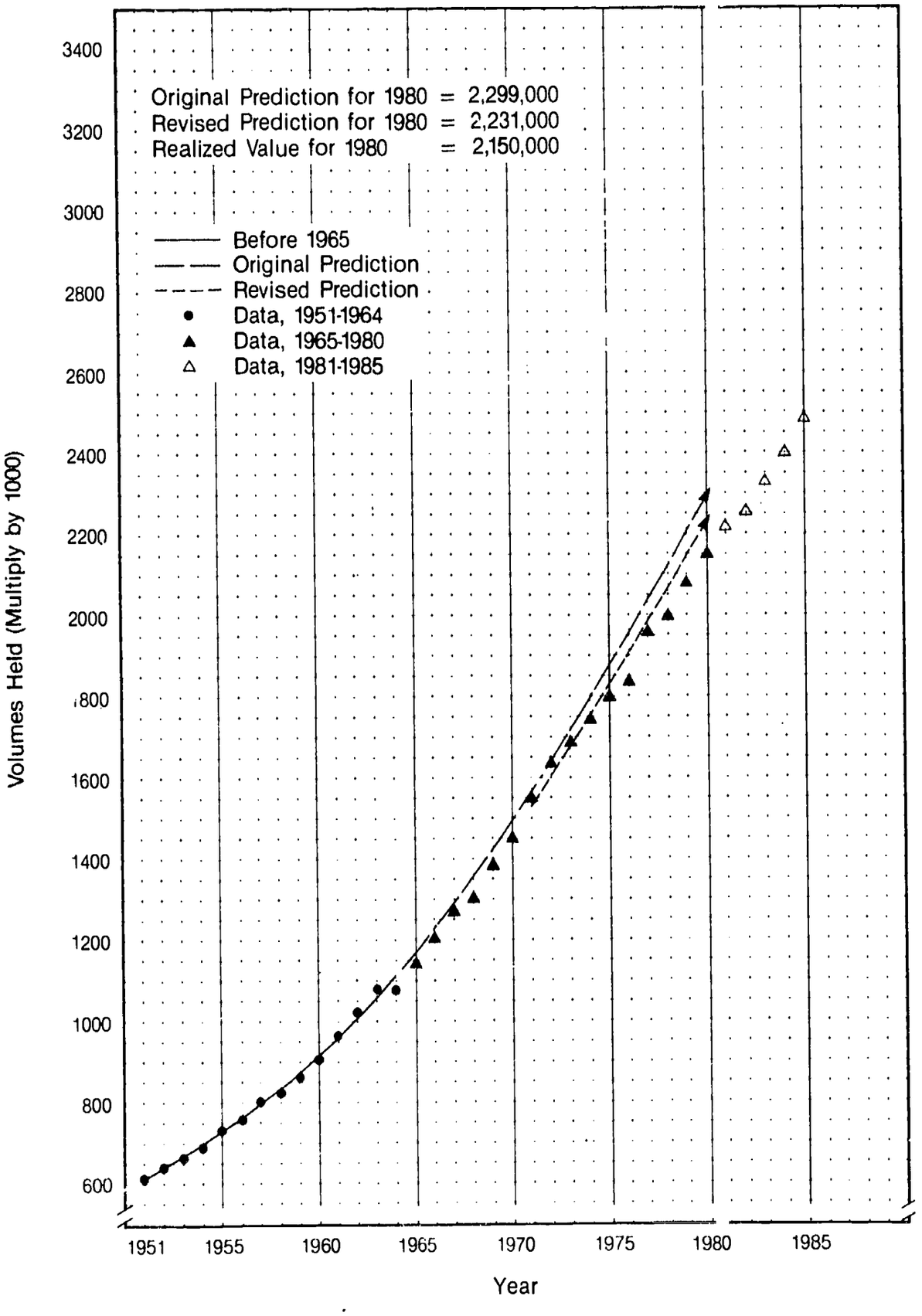

Figure 6. **The Past and Predicted Growth of Volumes Held in the Median (50th Percentile) ARL Library, 1951-1980 (Data Through 1985 Appended)**

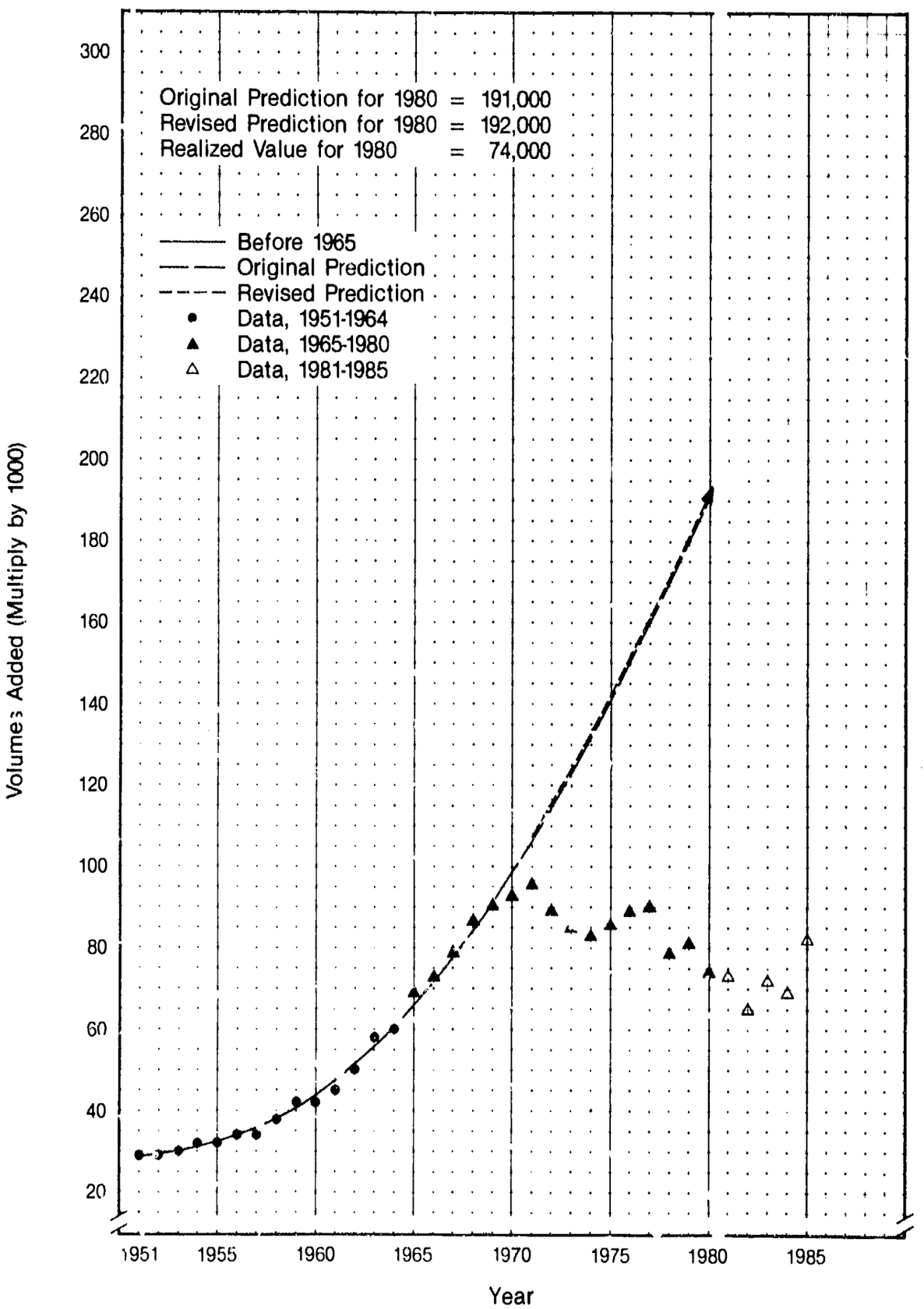

Figure 7. **The Past and Predicted Growth of Volumes Added in the Median (50th Percentile) ARL Library, 1951-1980 (Data Through 1985 Appended)**

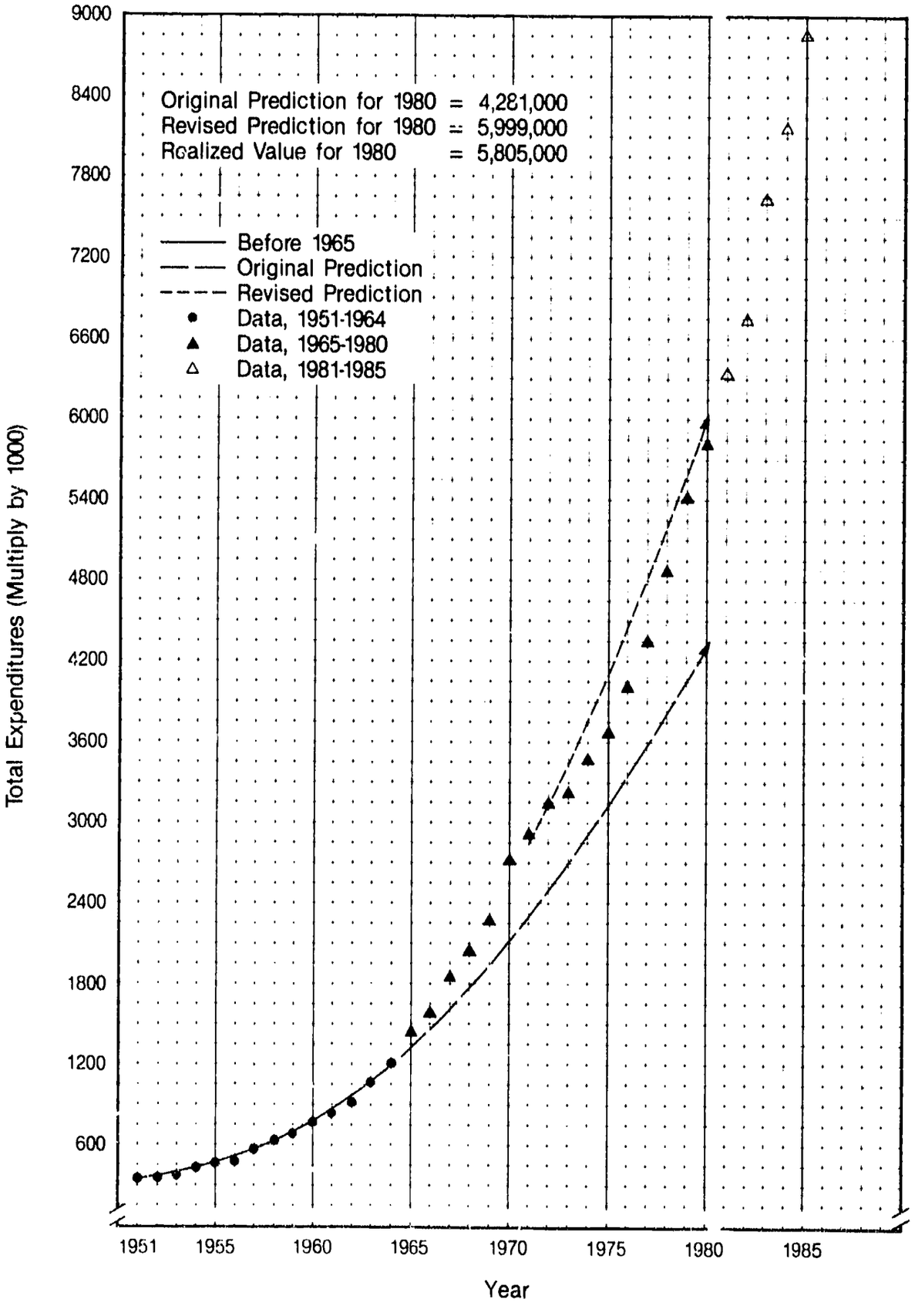

Figure 8. **The Past and Predicted Growth of Total Library Operating Expenditures in the Median (50th Percentile) ARL Library, 1951-1980 (Data Through 1985 Appended)**

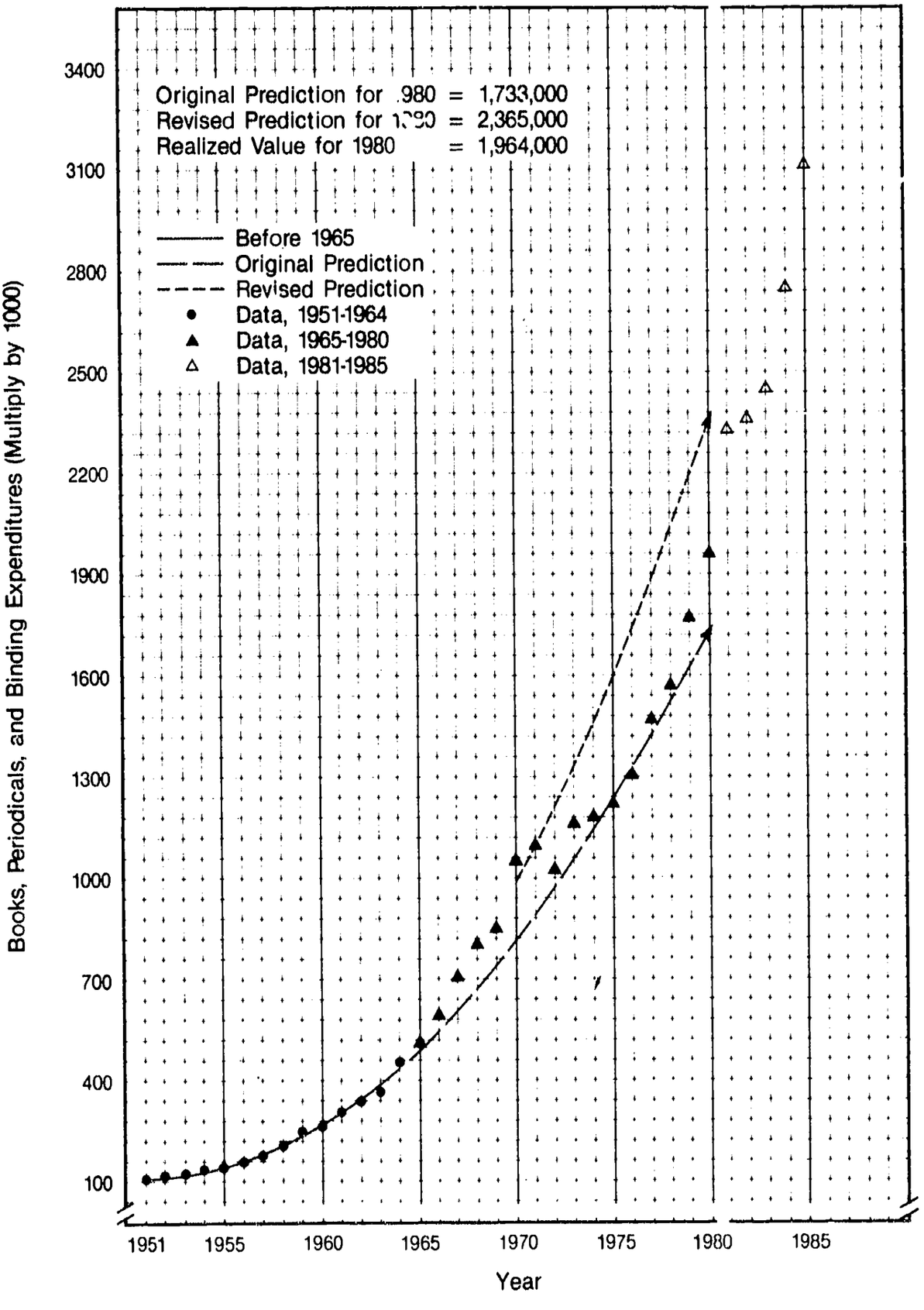

Figure 9. **The Past and Predicted Growth of Books, Periodicals, and Binding Expenditures in the Median (50th Percentile) ARL Library, 1951-1980 (Data Through 1985 Appended)**

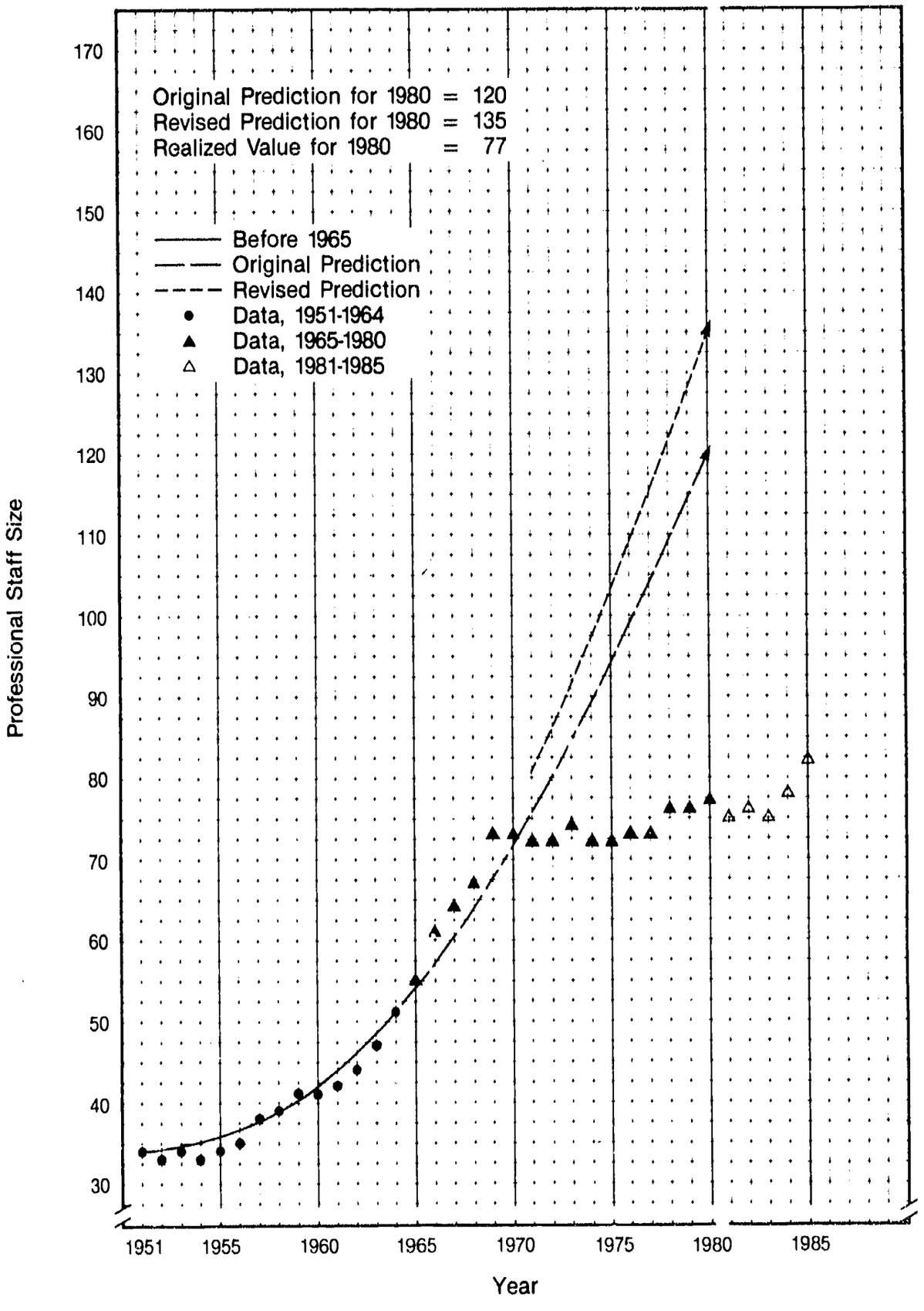

Figure 10. **The Past and Predicted Growth of Professional Staff Size in the Median (50th Percentile) ARL Library, 1951-1980 (Data Through 1985 Appended)**

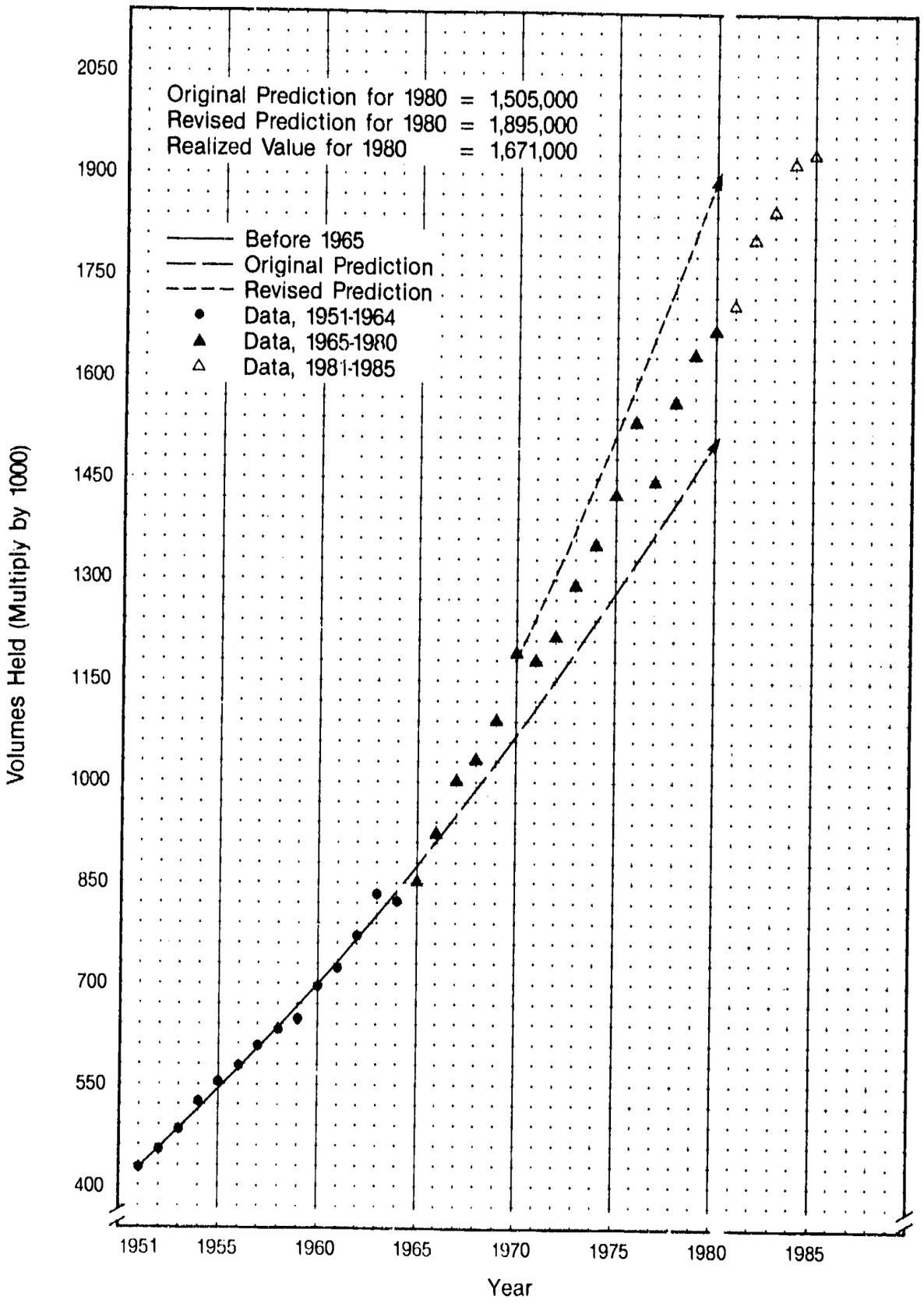

Figure 11. **The Past and Predicted Growth of Volumes Held in the First Quartile (25th Percentile) ARL Library, 1951-1980 (Data Through 1985 Appended)**

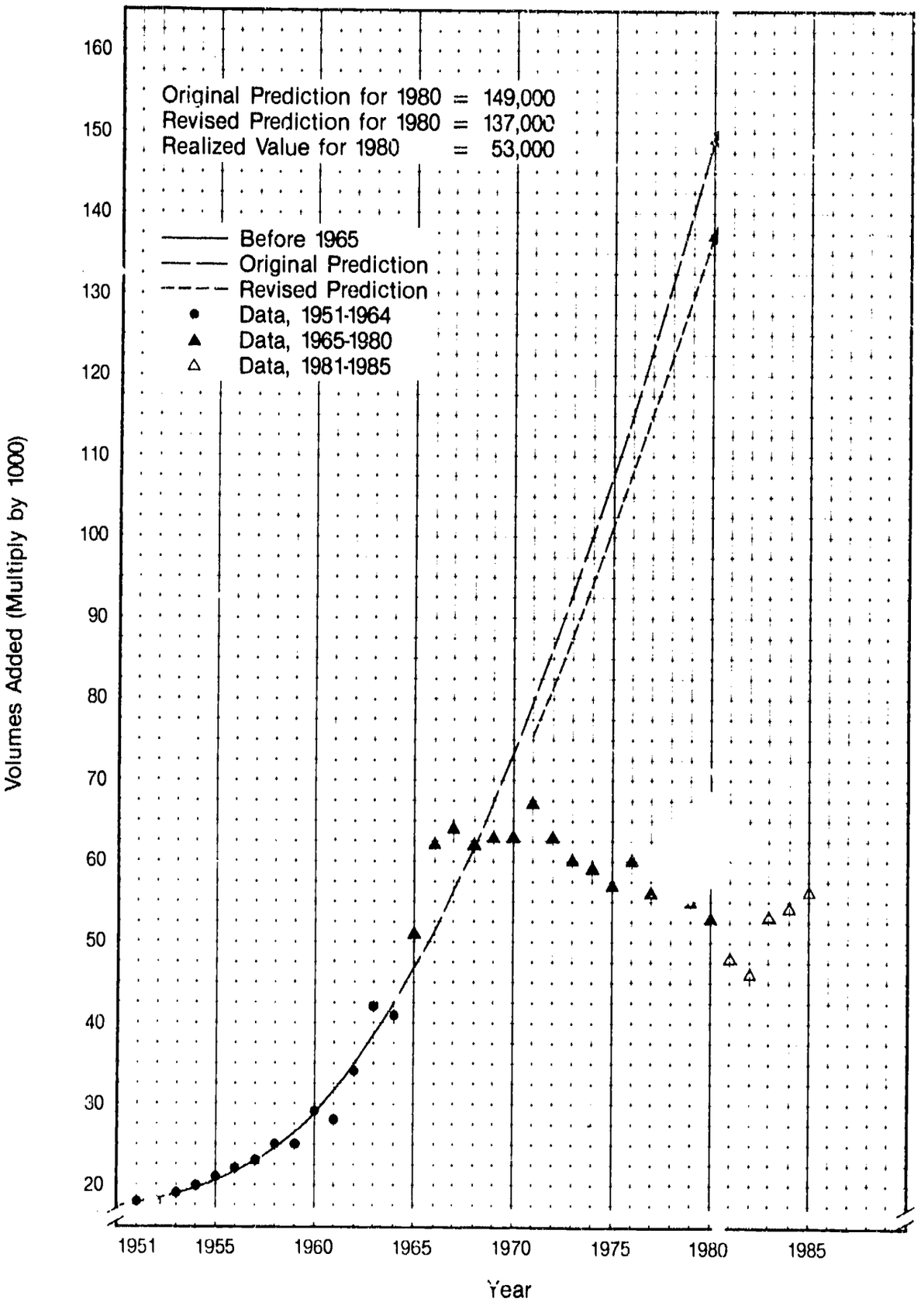

Figure 12. **The Past and Predicted Growth of Volumes Added in the First Quartile (25th Percentile) ARL Library, 1951-1980 (Data Through 1985 Appended)**

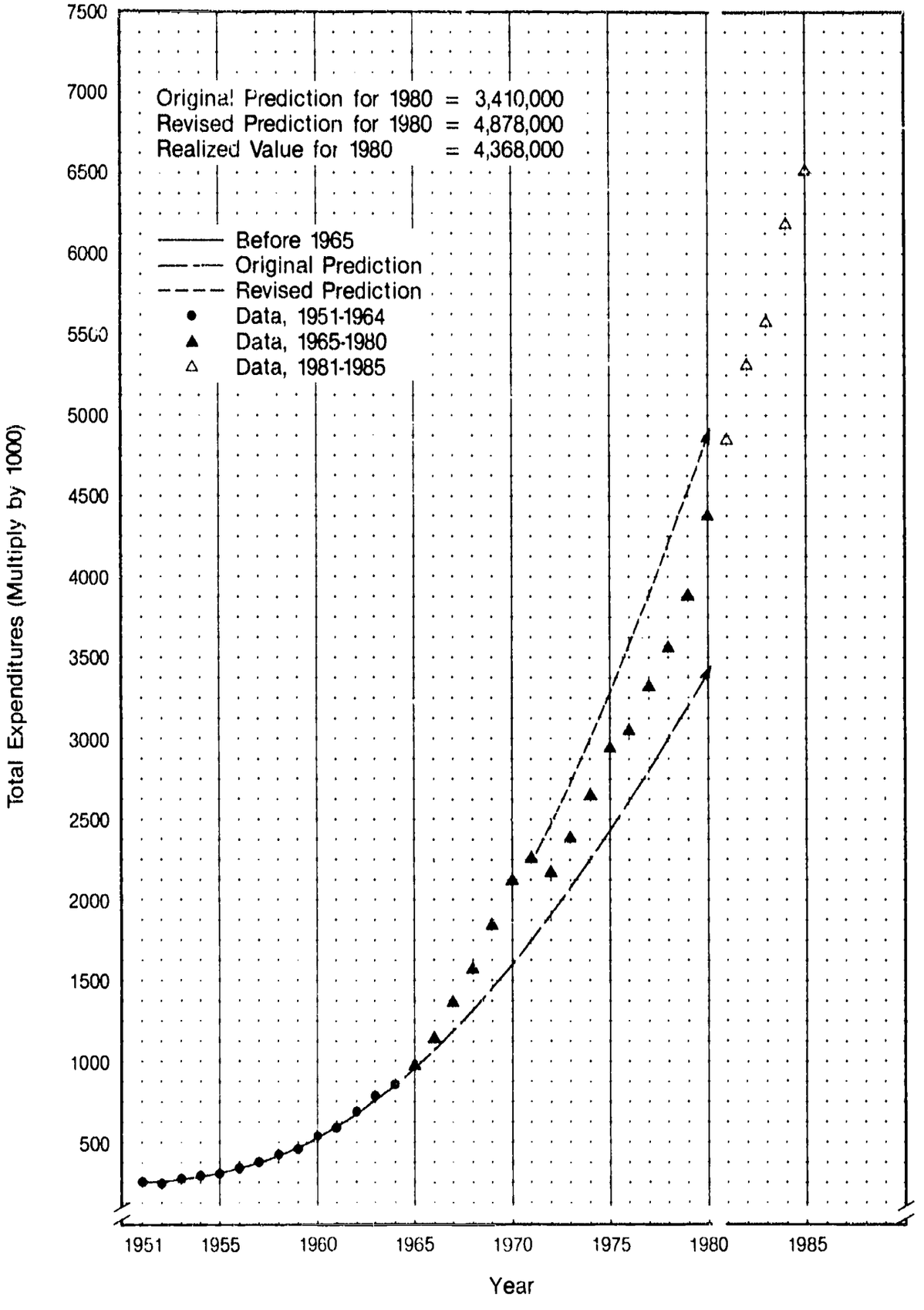

Figure 13. **The Past and Predicted Growth of Total Library Operating Expenditures in the First Quartile (25th Percentile) ARL Library, 1951-1980 (Data Through 1985 Appended)**

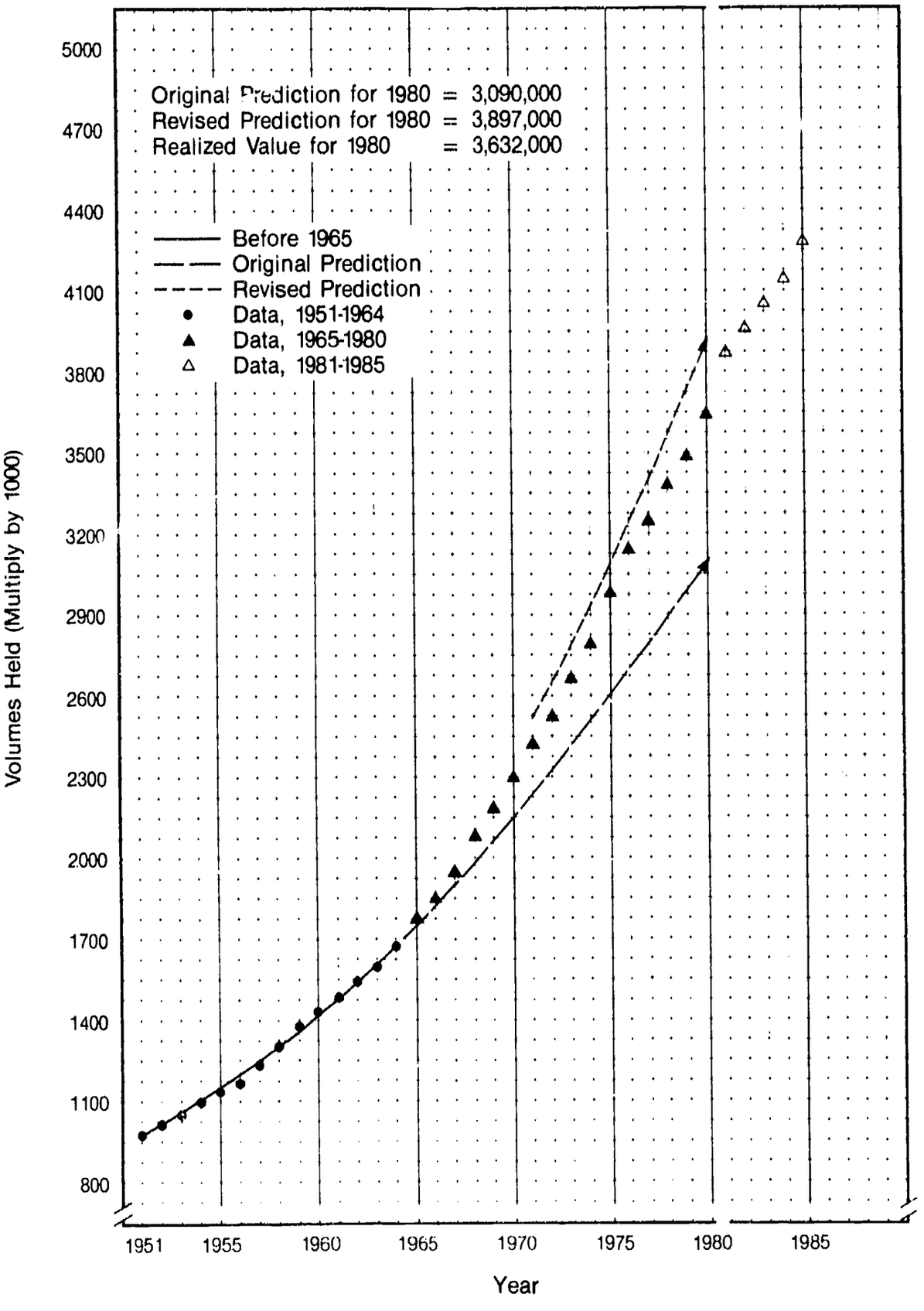

Figure 14. **The Past and Predicted Growth of Volumes Held in the Third Quartile (75th Percentile) ARL Library, 1951-1980 (Data Through 1985 Appended)**

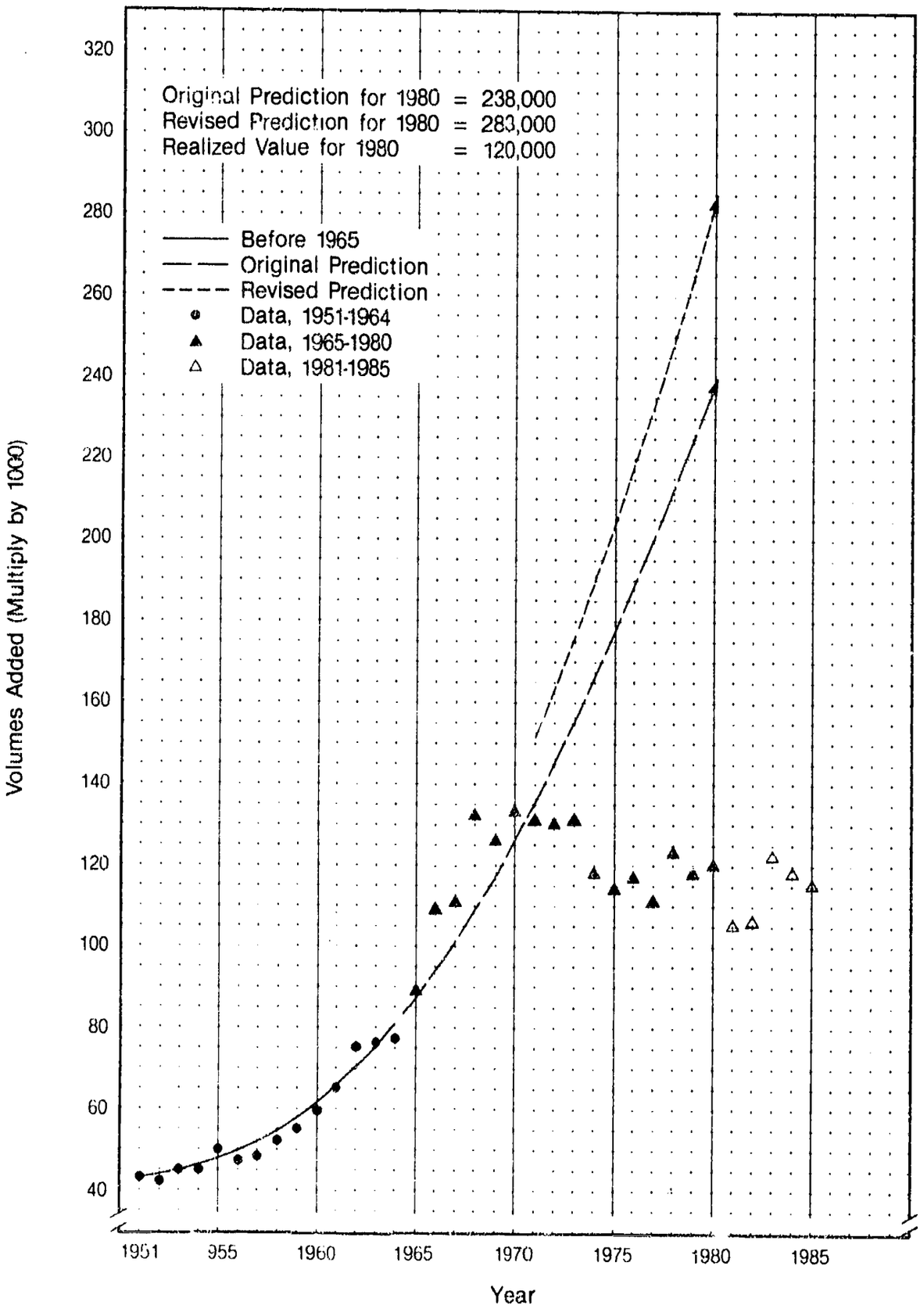

Figure 15. **The Past and Predicted Growth of Volumes Added in the Third Quartile (75th Percentile) ARL Library, 1951-1980 (Data Through 1985 Appended)**

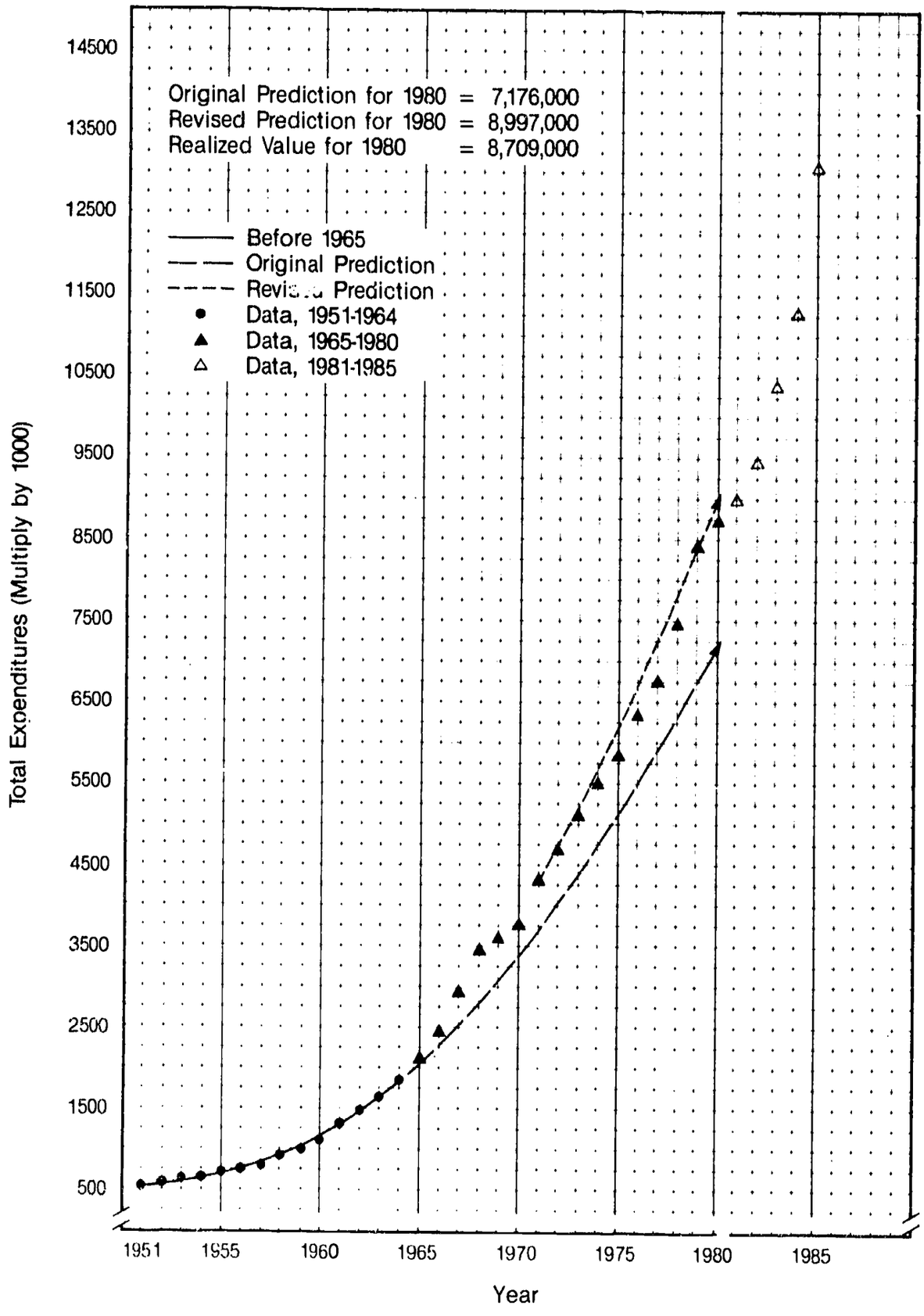

Figure 16. **The Past and Predicted Growth of Total Library Operating Expenditures in the Third Quartile (75th Percentile) ARL Library, 1951-1980 (Data Through 1985 Appended)**

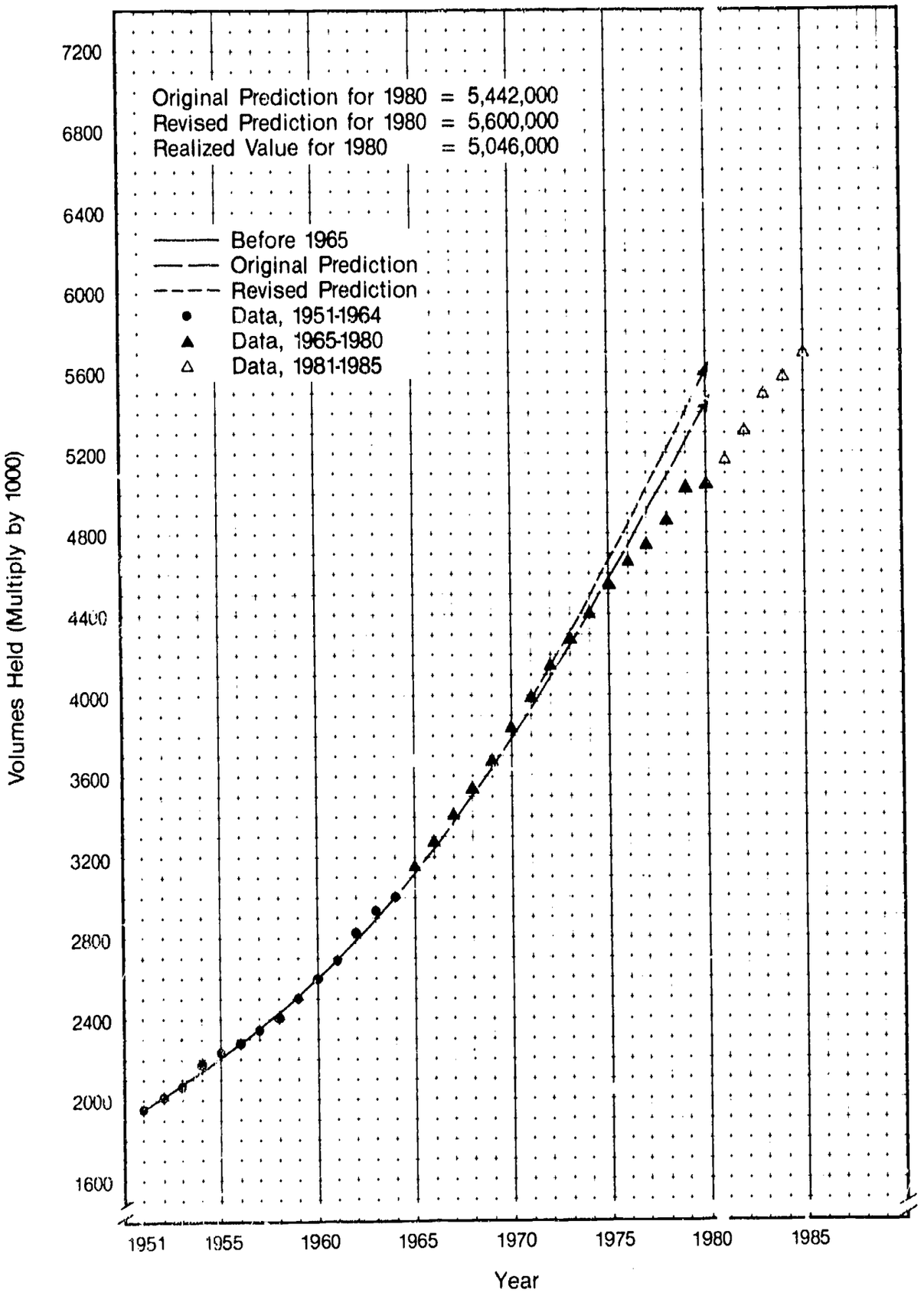

Figure 17. **The Past and Predicted Growth of Volumes Held in the Large ARL Libraries, 1951-1980 (Data Through 1985 Appended)**

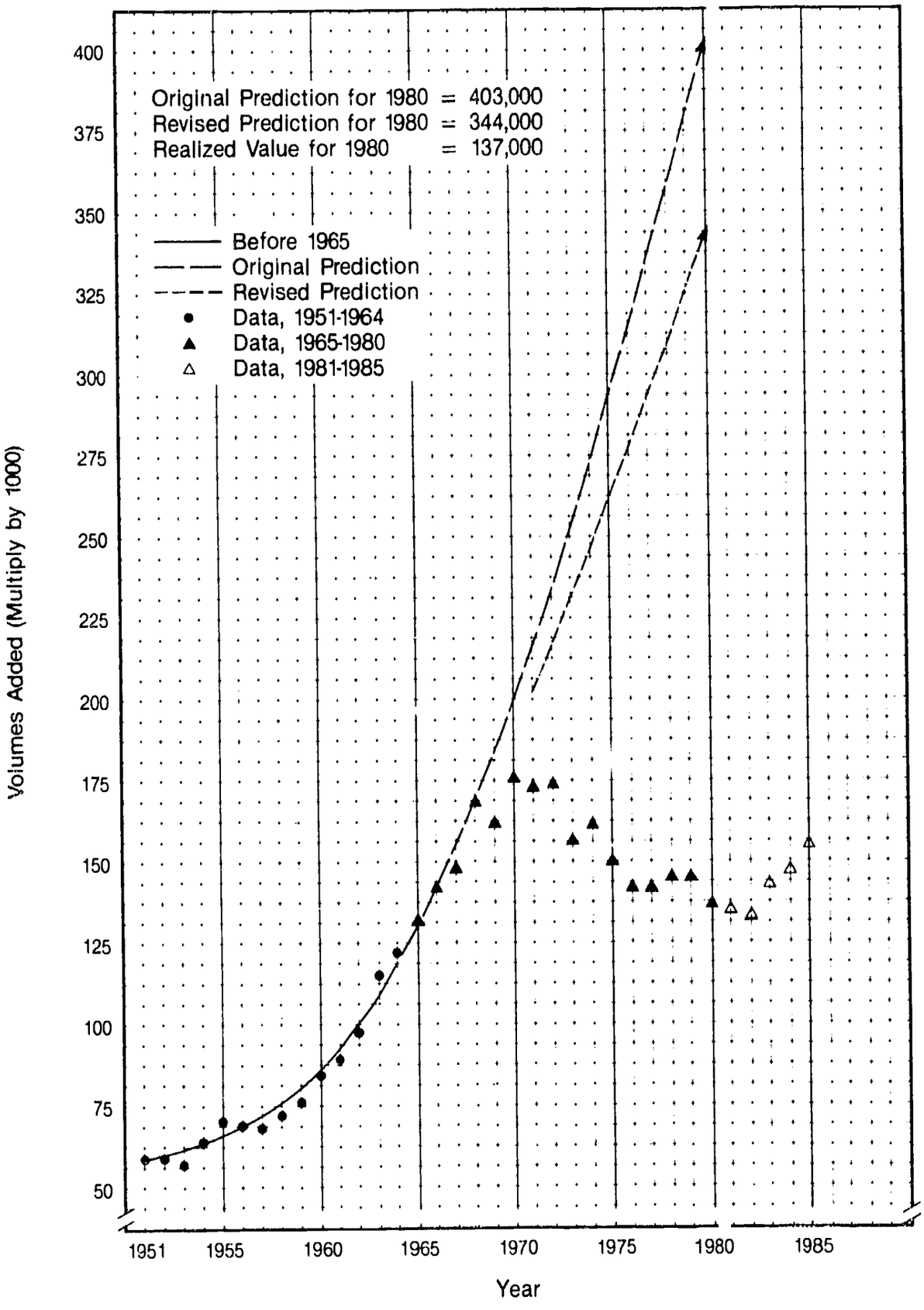

Figure 18. **The Past and Predicted Growth of Volumes Added in the Large ARL Libraries, 1951-1980 (Data Through 1985 Appended)**

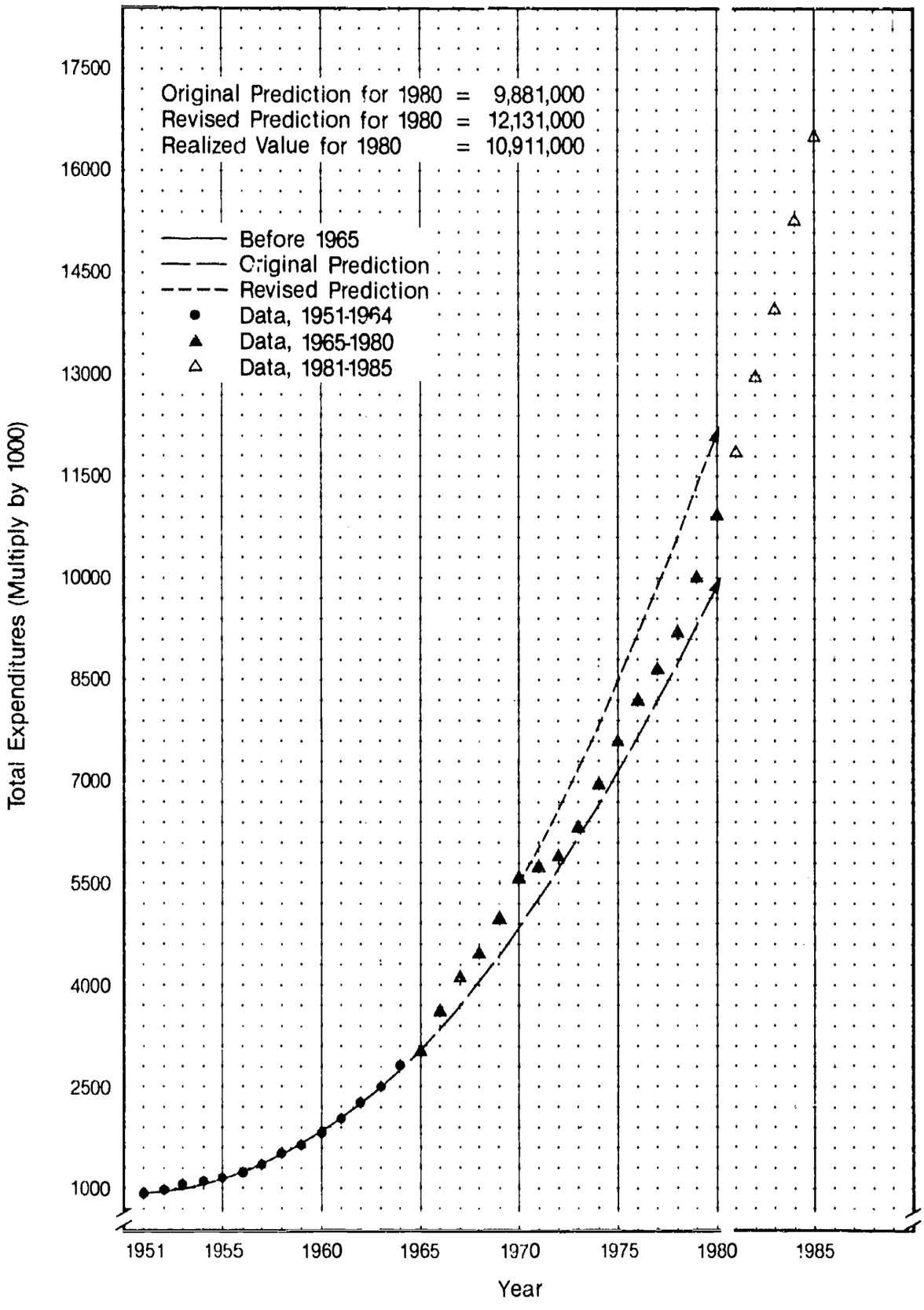

Figure 19. **The Past and Predicted Growth of Total Library Operating Expenditures in the Large ARL Libraries, 1951-1980 (Data Through 1985 Appended)**

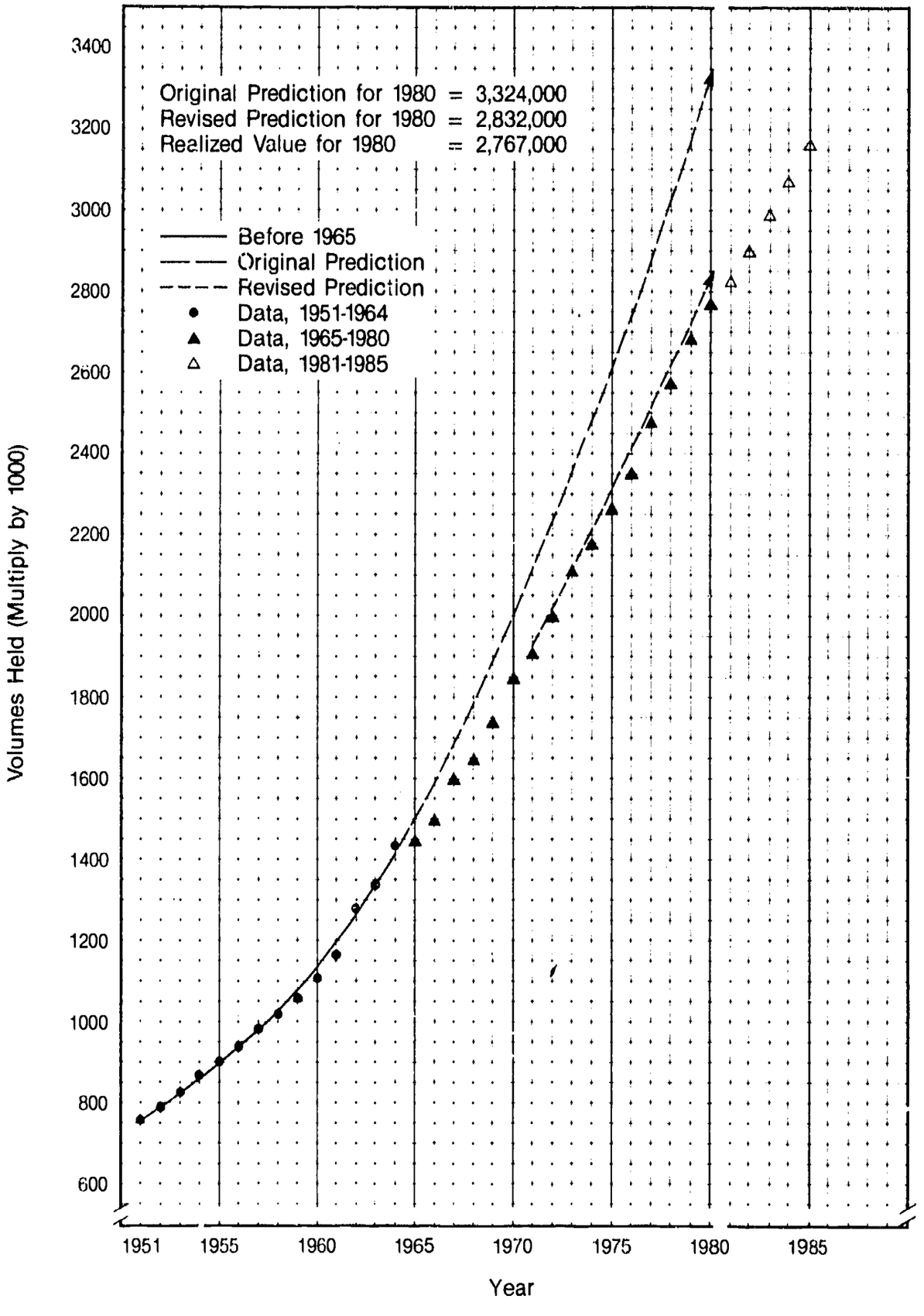

Figure 20. **The Past and Predicted Growth of Volumes Held in the Medium-large ARL Libraries, 1951-1980 (Data Through 1985 Appended)**

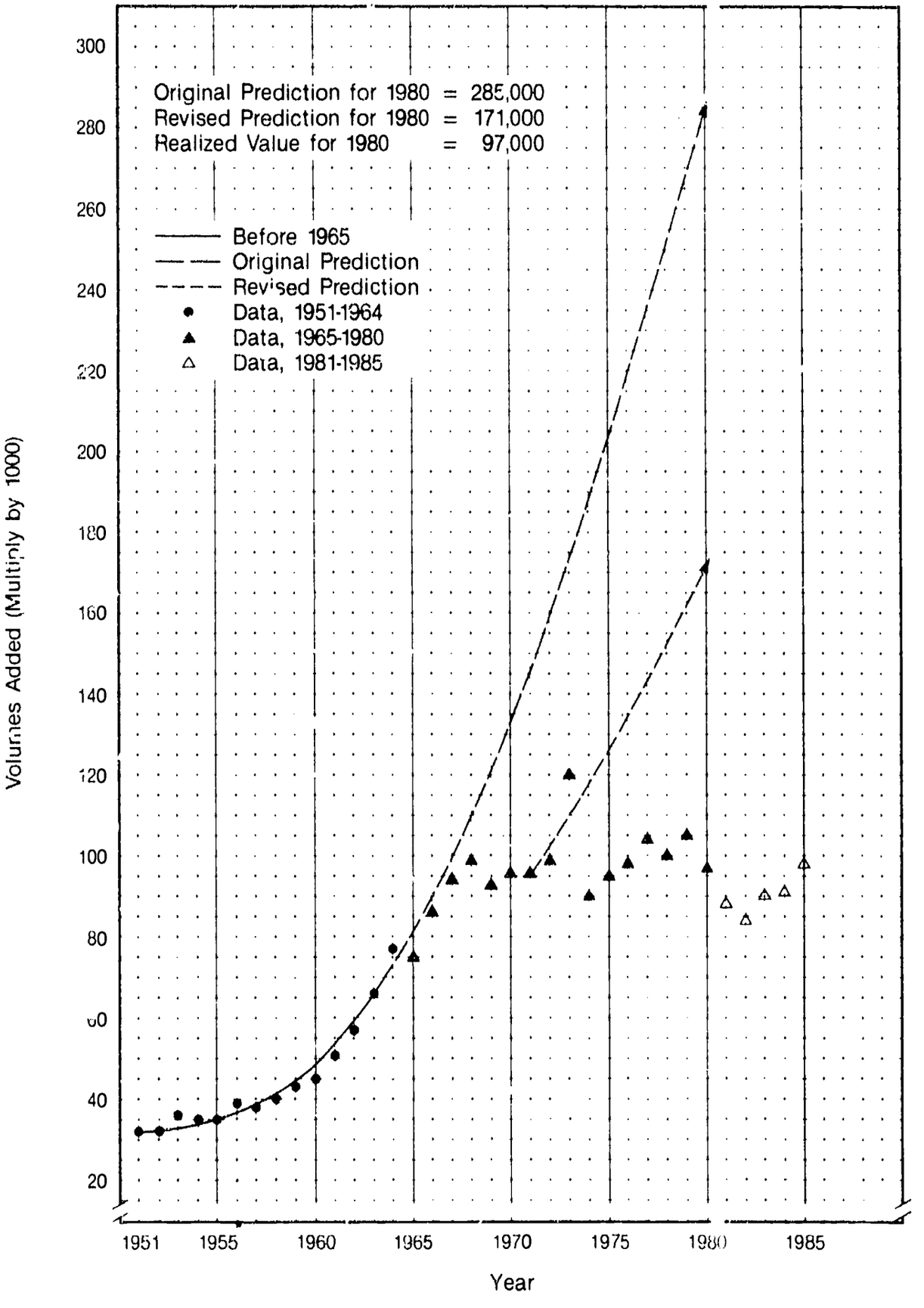

Figure 21. **The Past and Predicted Growth of Volumes Added in the Medium-large ARL Libraries, 1951-1980 (Data Through 1985 Appended)**

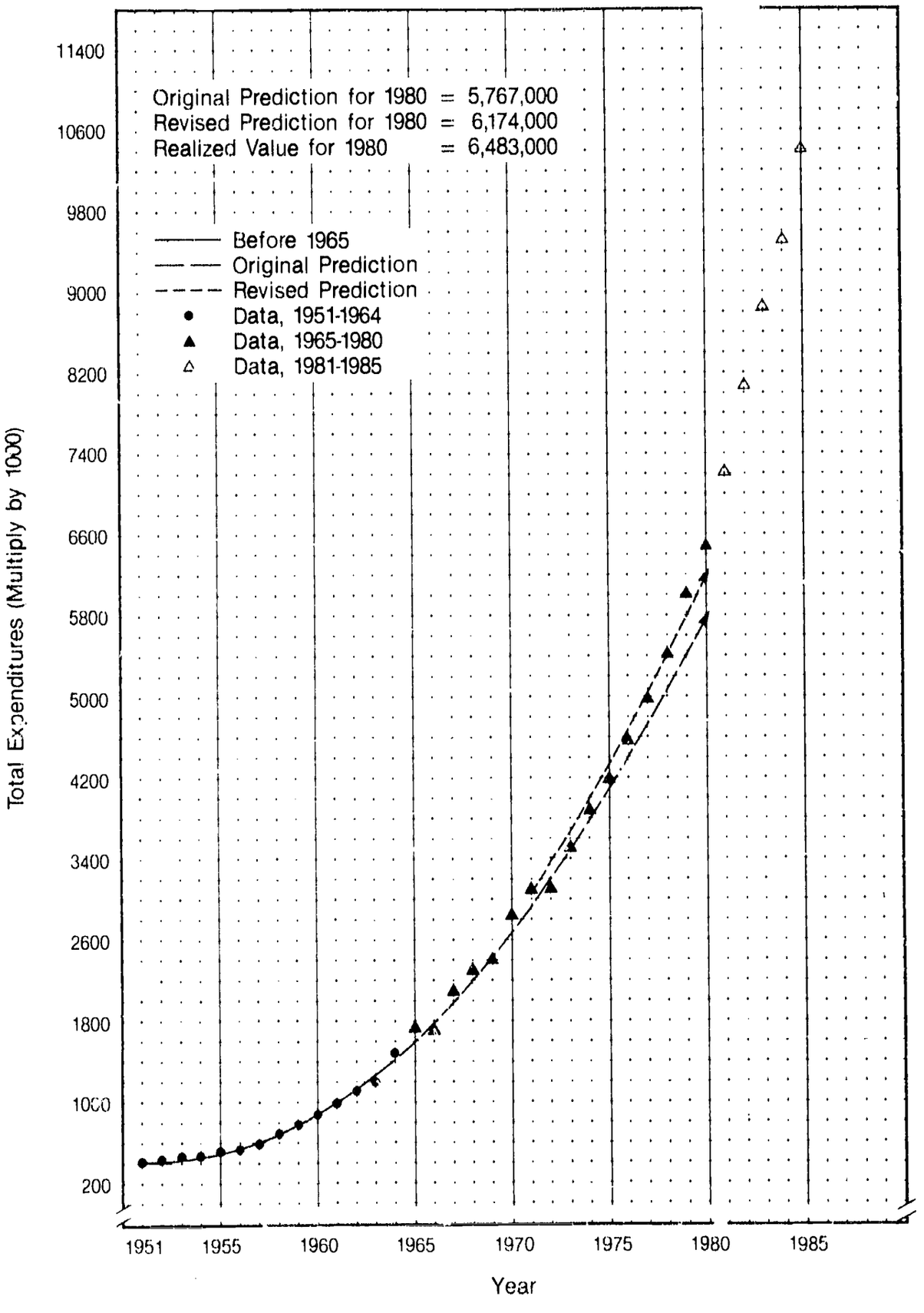

Figure 22. **The Past and Predicted Growth of Total Library Operating Expenditures in the Medium-large ARL Libraries, 1951-1980 (Data Through 1985 Appended)**

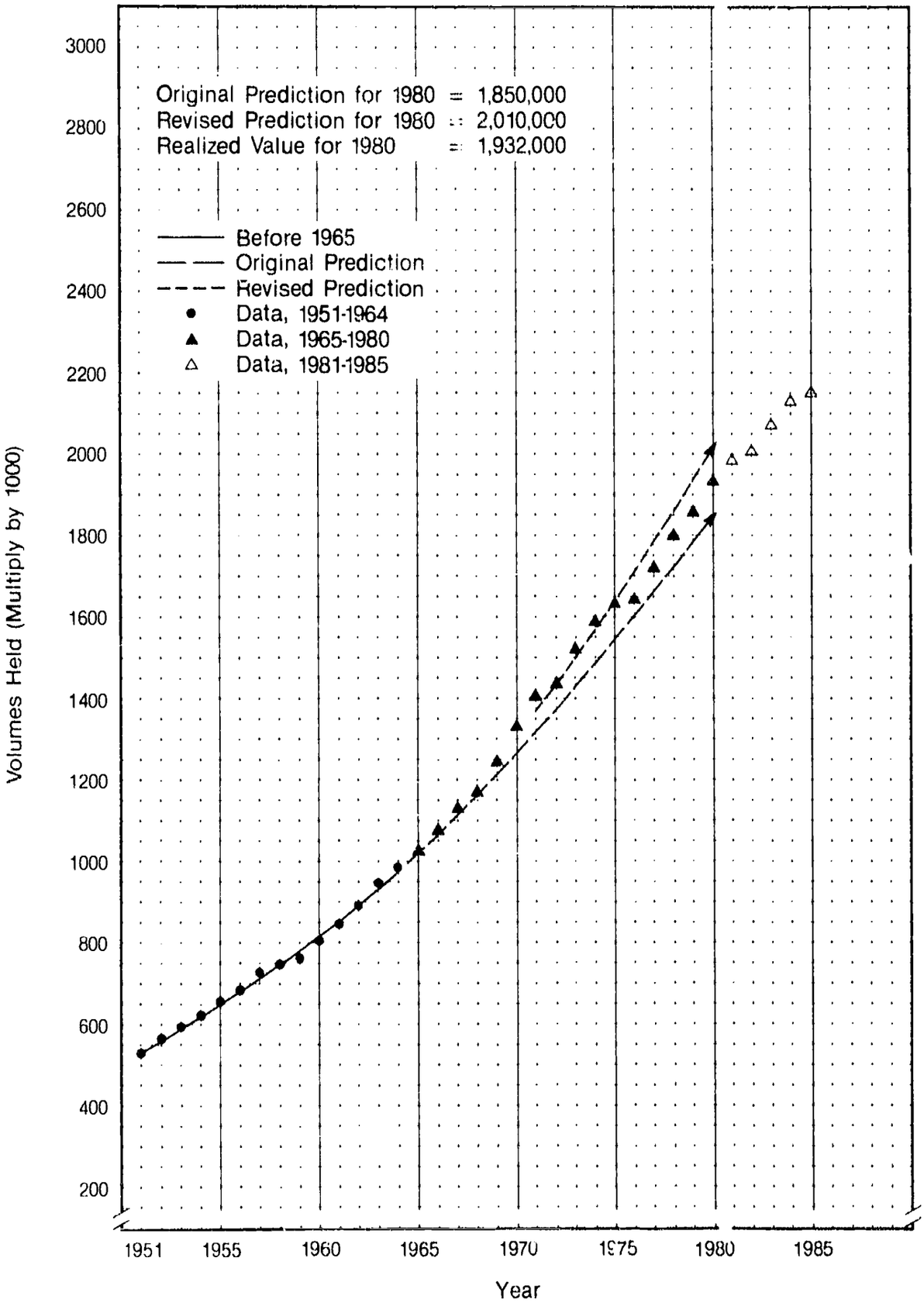

Figure 23. **The Past and Predicted Growth of Volumes Held in the Medium-small ARL Libraries, 1951-1980 (Data Through 1985 Appended)**

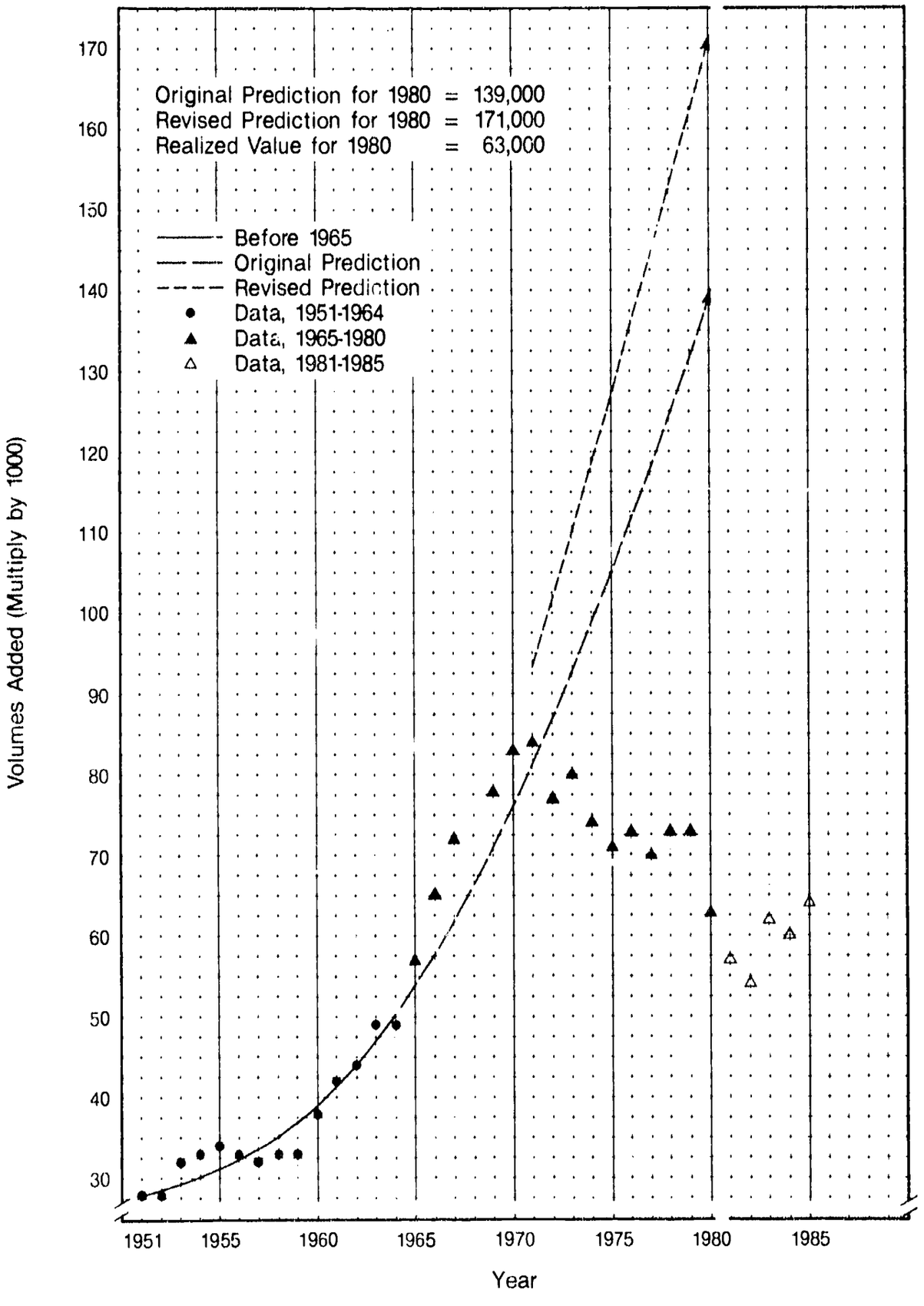

Figure 24. **The Past and Predicted Growth of Volumes Added in the Medium-small ARL Libraries, 1951-1980 (Data Through 1985 Appended)**

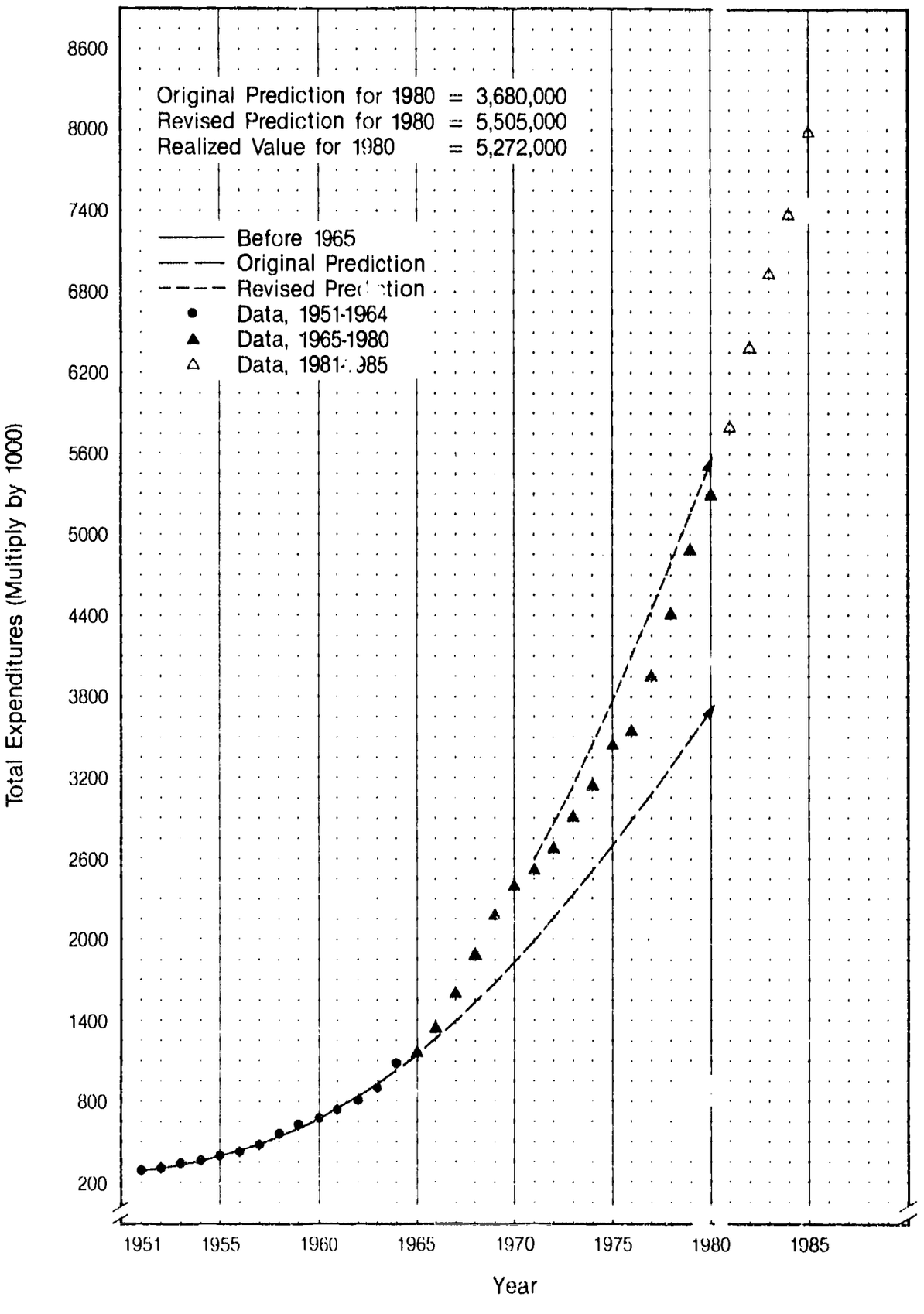

Figure 25. **The Past and Predicted Growth of Total Library Operating Expenditures in the Medium-small ARL Libraries, 1951-1980 (Data Through 1985 Appended)**

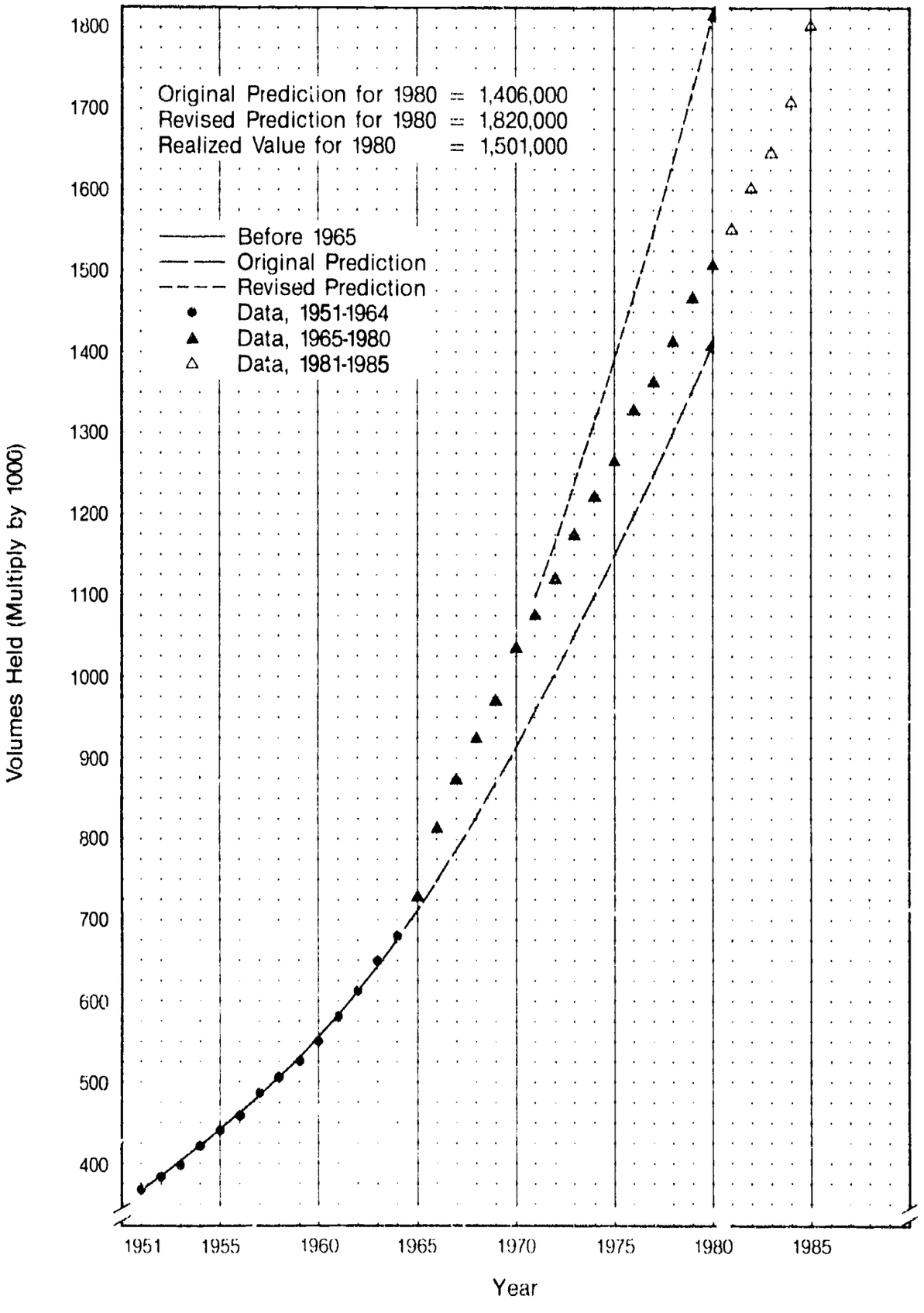

Figure 26. **The Past and Predicted Growth of Volumes Held in the Small ARL Libraries, 1951-1980 (Data Through 1985 Appended)**

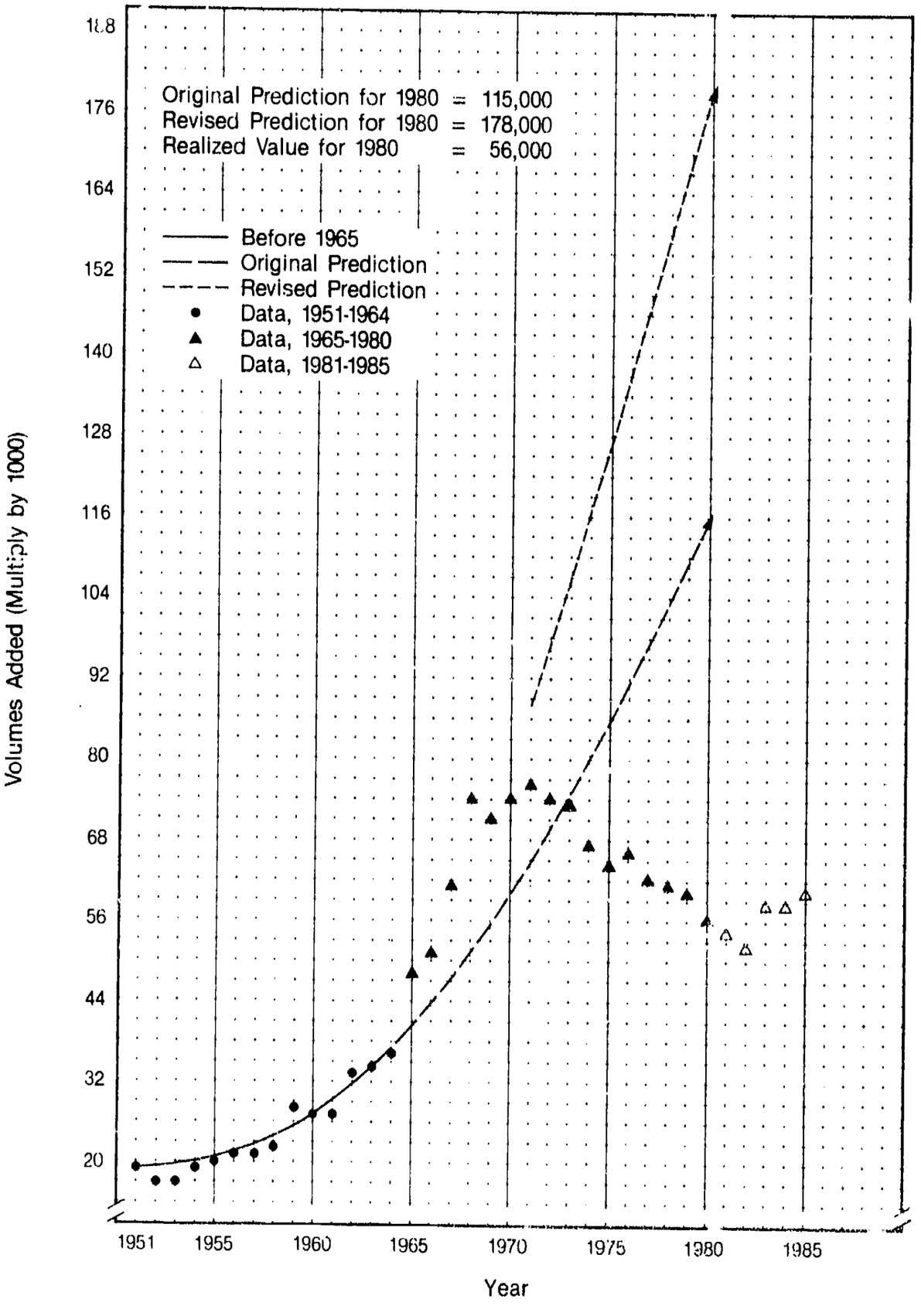

Figure 27. **The Past and Predicted Growth of Volumes Added in the Small ARL Libraries, 1951-1980 (Data Through 1985 Appended)**

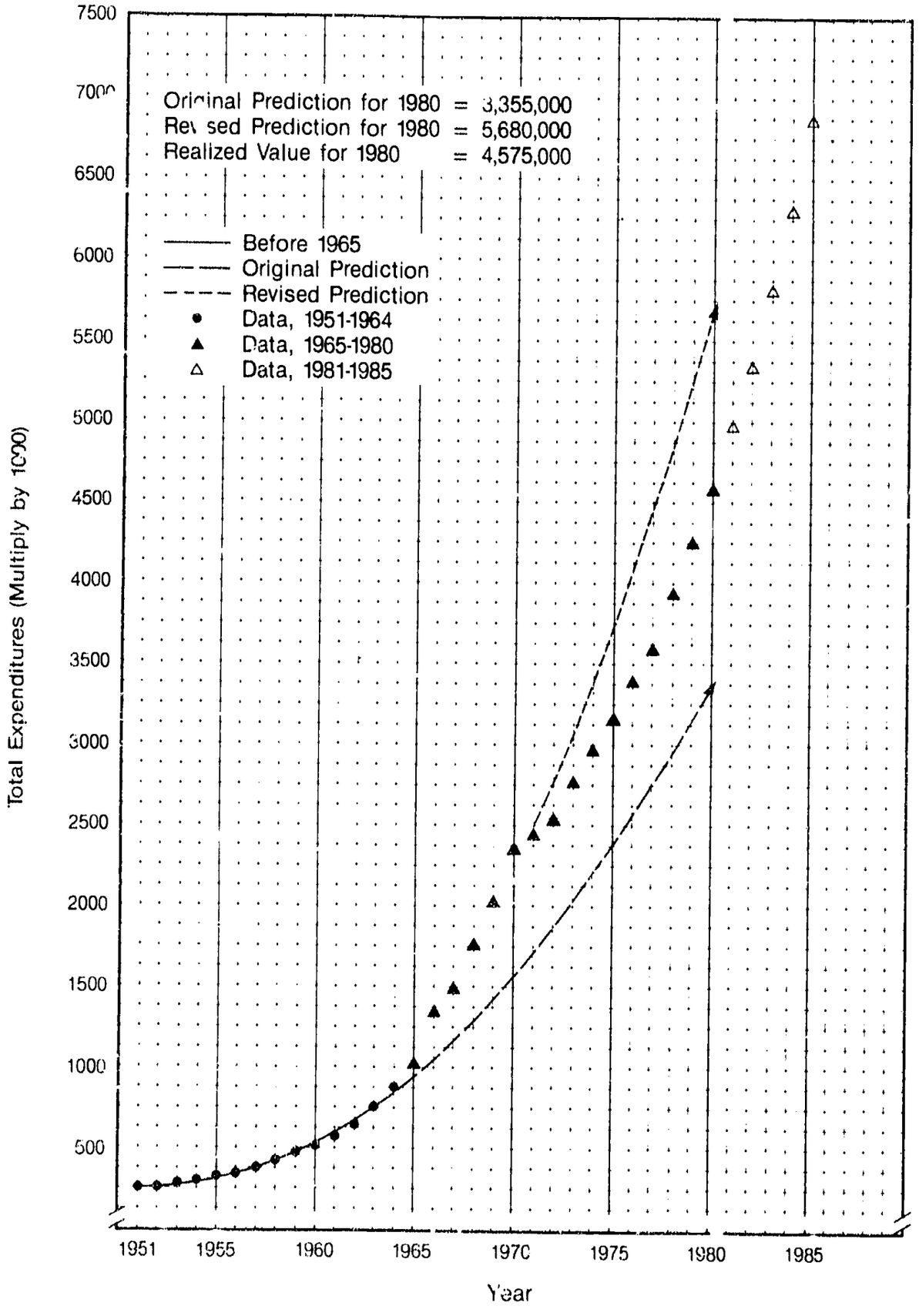

Figure 28. **The Past and Predicted Growth of Total Library Operating Expenditures in the Small ARL Libraries, 1951-1980 (Data Through 1985 Appended)**

PREDICTION EQUATIONS FOR FIGURES 1-28

Figure 1.	ORIGINAL:	$\hat{Y} = 874046.25 + 25597.64X + 1358.69X^2$
	1971, REVISED:	$\hat{Y} = 891699.60 + 17912.45X + 1924.06X^2$
Figure 2.	ORIGINAL:	$\hat{Y} = 37145.75 - 1235.91X + 253.13X^2$
	1971, REVISED:	$\hat{Y} = 35761.02 - 863.08X + 240.36X^2$
Figure 3.	ORIGINAL:	$\hat{Y} = 482354.17 - 10366.18X + 5824.60X^2$
	1971, REVISED:	$\hat{Y} = 617402.72 - 65233.73X + 9629.54X^2$
Figure 4.	ORIGINAL:	$\hat{Y} = 164354.91 - 10442.53X + 2507.80X^2$
	1971, REVISED:	$\hat{Y} = 201294.84 - 25818.86X + 3603.15X^2$
Figure 5.	ORIGINAL:	$\hat{Y} = 44.09 - .19X + .11X^2$
	1971, REVISED:	$\hat{Y} = 44.74 - .53X + .14X^2$
Figure 6.	ORIGINAL:	$\hat{Y} = 593929.88 + 20431.54X + 1214.17X^2$
	1971, REVISED:	$\hat{Y} = 592368.21 + 21522.46X + 1103.33X^2$
Figure 7.	ORIGINAL:	$\hat{Y} = 30626.90 - 674.16X + 201.26X^2$
	1971, REVISED:	$\hat{Y} = 29867.90 - 478.80X + 196.15X^2$
Figure 8.	ORIGINAL:	$\hat{Y} = 348644.11 - 1955.17X + 4433.98X^2$
	1971, REVISED:	$\hat{Y} = 469654.50 - 51062.51X + 7845.53X^2$
Figure 9.	ORIGINAL:	$\hat{Y} = 115099.81 - 4254.09X + 1939.09X^2$
	1971, REVISED:	$\hat{Y} = 160818.09 - 22665.24X + 3204.24X^2$
Figure 10.	ORIGINAL:	$\hat{Y} = 33.37 - .12X + .10X^2$
	1971, REVISED:	$\hat{Y} = 34.21 - .53X + .13X^2$
Figure 11.	ORIGINAL:	$\hat{Y} = 401911.88 + 26295.53X + 349.00X^2$
	1971, REVISED:	$\hat{Y} = 432437.28 + 14251.91X + 1149.71X^2$
Figure 12.	ORIGINAL:	$\hat{Y} = 19936.75 - 731.04X + 168.11X^2$
	1971, REVISED:	$\hat{Y} = 17432.35 - 36.81X + 133.83X^2$
Figure 13.	ORIGINAL:	$\hat{Y} = 267901.07 - 12813.28X + 3918.60X^2$
	1971, REVISED:	$\hat{Y} = 383761.06 - 58164.84X + 6931.73X^2$
Figure 14.	ORIGINAL:	$\hat{Y} = 929455.05 + 36401.63X + 1187.36X^2$
	1971, REVISED:	$\hat{Y} = 980323.26 + 14677.90X + 2751.69X^2$

Figure 15.	ORIGINAL:	$\hat{Y} = 44680.64 - 780.81X + 240.79X^2$
	1971, REVISED:	$\hat{Y} = 46540.66 - 1734.60X + 321.01X^2$
Figure 16.	ORIGINAL:	$\hat{Y} = 607566.76 - 27129.28X + 8203.07X^2$
	1971, REVISED:	$\hat{Y} = 729535.07 - 77920.97X + 11783.13X^2$
Figure 17.	ORIGINAL:	$\hat{Y} = 1922365.89 + 44320.01X + 2433.29X^2$
	1971, REVISED:	$\hat{Y} = 1931680.44 + 40289.63X + 2733.05X^2$
Figure 18.	ORIGINAL:	$\hat{Y} = 63234.21 - 2250.13X + 452.75X^2$
	1971, REVISED:	$\hat{Y} = 58052.40 - 283.60X + 327.16X^2$
Figure 19.	ORIGINAL:	$\hat{Y} = 948271.74 - 18697.93X + 10548.75X^2$
	1971, REVISED:	$\hat{Y} = 1105258.32 - 82759.62X + 15009.94X^2$
Figure 20.	ORIGINAL:	$\hat{Y} = 758670.09 + 13124.85X + 2412.63X^2$
	1971, REVISED:	$\hat{Y} = 731421.46 + 25245.35X + 1492.01X^2$
Figure 21.	ORIGINAL:	$\hat{Y} = 37486.97 - 2372.51X + 353.60X^2$
	1971, REVISED:	$\hat{Y} = 30291.67 + 411.75X + 170.13X^2$
Figure 22.	ORIGINAL:	$\hat{Y} = 452562.90 - 25424.01X + 6751.$ [illegible] ^{2}
	1971, REVISED:	$\hat{Y} = 477252.03 - 35932.94X + 7526.$ [illegible]
Figure 23.	ORIGINAL:	$\hat{Y} = 514982.65 + 23023.80X + 715.55X^2$
	1971, REVISED:	$\hat{Y} = 528561.27 + 17844.49X + 1050.97X^2$
Figure 24.	ORIGINAL:	$\hat{Y} = 30451.83 - 482.06X + 136.98X^2$
	1971, REVISED:	$\hat{Y} = 31860.71 - 1175.61X + 193.96X^2$
Figure 25.	ORIGINAL:	$\hat{Y} = 300464.68 - 1839.01X + 3816.64X^2$
	1971, REVISED:	$\hat{Y} = 440149.51 - 57116.57X + 7531.01X^2$
Figure 26.	ORIGINAL:	$\hat{Y} = 356038.10 + 12188.06X + 759.97X^2$
	1971, REVISED:	$\hat{Y} = 381935.04 + 1171.26X + 1559.26X^2$
Figure 27.	ORIGINAL:	$\hat{Y} = 18789.66 - 343.46X + 118.00X^2$
	1971, REVISED:	$\hat{Y} = 22057.99 - 1846.83X + 235.10X^2$
Figure 28.	ORIGINAL:	$\hat{Y} = 282451.28 - 14317.30X + 3892.30X^2$
	1971, REVISED:	$\hat{Y} = 445557.86 - 80737.43X + 8508.76X^2$

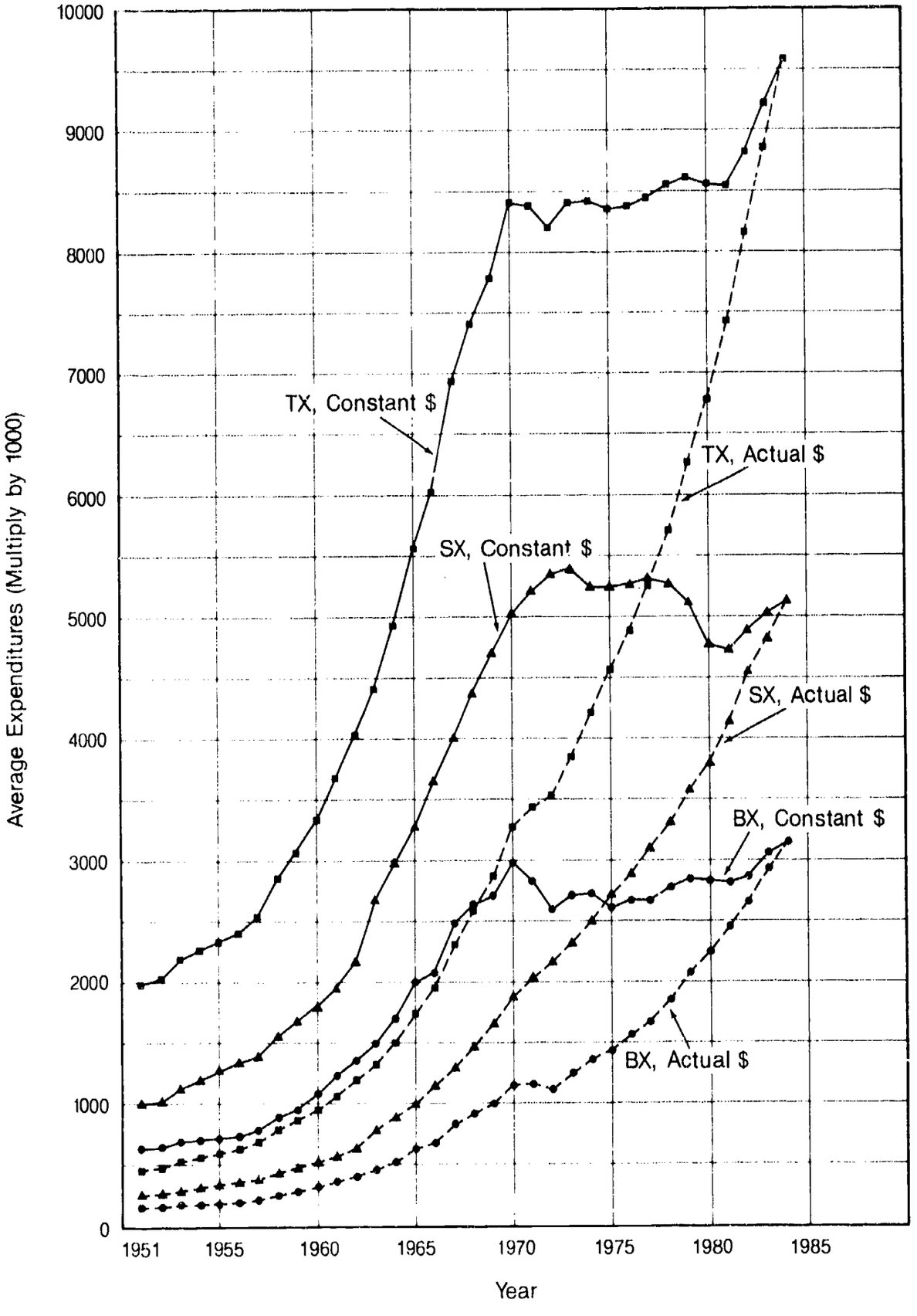

Figure 29. **Actual and "Constant 1984 Dollar" Expenditure Averages (Means) for BX, SX, and TX, 1951-1984 (SX Adjusted with CPI Data; BX and TX Adjusted with GNP Data)**

In Fig. 29, it is apparent that, although the expenditures averages increased fairly rapidly and steadily throughout the 1951-1984 period, the adjusted, constant dollar expenditures show one trend before 1971 and a different trend after; from early in the 1970's until a decade later, the constant dollar expenditures either declined or experienced only small increases.

Finally, note that the professional (PSS) and non-professional (NPSS) staff size trends have two particularly striking features. As Table 5 or Fig. 5 show, the PSS average increased each year until 1970, doubling in size, then remained practically unchanged until 1985; for twenty years between 1951 and 1970, PSS increased regularly, but for fourteen years after that, virtually no increases are seen. In Table 5, the NPSS averages show a similar trend, increasing from approximately 50 in 1951 to 160 in 1970, then remaining practically unchanged during the years that followed. However, as Table 5 also shows, the relationship or ratio between PSS and NPSS changed markedly during the last 30 or 35 years. Initially, during the early 1950's, the two averages were approximately equal, both in the range from about 45 to 50, but by 1970 NPSS had grown to be approximately twice as large as PSS, and that ratio has held since.

For each year, 1951-1985, the 17 variables named and defined in Table 2 and 2a were intercorrelated. The resulting correlations are presented in Appendix C, and are summarized in Table 13, below, which also is similar to Purdue's more abbreviated Table 9 (e.g., 1965, p.59). In Table 13, three entries in each cell represent the highest, median, and lowest obtained correlation between the two named variables. Note, for example, in the upper left-hand cell that "volumes held" (VH) and

Table 13

Summary of Variable Intercorrelations*

	CXPS	GRDR	VAPG	BKR	PINC	PHD	GENR	TENR	LPSP	TX	NPSS	PSS	WX	SX	BX	VA
VH	756	594	441	-010	-222	702	415	196	397	914	924	932	627	911	868	898
	642	447	278	-386	-379	643	355	095	096	877	884	888	476	874	783	822
	528	317	-073	-564	-472	577	180	044	-271	783	748	794	300	786	449	527
VA	706	487	624	150	625	762	570	406	454	923	882	898	725	908	934	
	441	331	336	-218	127	639	383	254	135	854	797	831	587	840	851	
	205	108	123	-424	-087	406	183	147	-112	604	471	582	548	554	494	
BX	638	443	371	553	201	744	488	436	536	964	913	923	806	928		
	493	258	179	-058	-035	631	376	339	176	928	805	862	733	872		
	323	086	-106	-312	-227	481	191	151	-065	819	471	512	612	538		
SX	613	546	314	-207	-008	795	606	474	608	991	935	967	854			
	520	422	102	-466	-209	755	507	316	217	983	910	945	788			
	462	258	-193	-635	-333	686	348	182	-063	920	870	908	533			
WX	432	544	-125	-104	091	711	733	529	398	882	753	826				
	376	367	-167	-317	-041	633	522	436	258	826	614	749				
	233	294	-237	-422	-132	405	455	315	145	658	545	539				
PSS	578	492	336	-150	-051	784	575	467	460	957	941					
	504	377	141	-405	-201	727	478	331	145	941	877					
	446	247	-177	-584	-288	597	292	122	-177	874	744					
NPSS	711	640	442	-195	-051	794	599	510	459	937						
	586	484	196	-405	-220	688	454	171	197	910						
	464	244	-178	-564	-347	583	288	089	-145	834						
TX	625	507	314	044	006	759	537	424	607							
	542	379	169	-357	-156	714	467	316	223							
	487	243	-152	-572	-287	673	289	189	-031							
LPSP	334	306	131	142	379	482	436	461								
	-061	054	-108	-191	060	219	269	268								
	-364	-277	-380	-605	-365	-058	015	112								
TENR	345	303	-238	134	353	626	810									
	-497	-245	496	-111	201	513	673									
	-603	-371	-589	-338	-104	436	579									
GENR	030	756	-373	-187	155	787										
	-171	480	-486	-354	005	722										
	-260	393	-573	-517	-245	400										
PHD	306	557	-060	-182	129											
	181	456	-161	-383	-161											
	040	283	-348	-578	-366											
PINC	-162	-028	485	533												
	-280	-243	079	309												
	444	-430	-155	059												
BKR	103	-224	365													
	-217	-422	069													
	-430	-574	-122													
VAPG	778	062														
	636	-111														
	311	-451														
GRDR	564															
	487															
	265															

* Decimal points are omitted. Upper coefficient is the highest annual correlation obtained; middle coefficient is the median of those obtained; lower coefficient is the lowest obtained.

"expenditures per student" (CXPS) are summarized as 756, 642, and 528, i.e., half of the VH and CXPS correlations were above and below .642, but none was above .756 nor below .528.

In reading Table 13, bear in mind that correlations among the expenditure variables, TX, SX, and BX are especially subject to the effects of "experimental dependence," and the resulting "artifactual" correlations are bound to be high because the variables are linked, by definition; the size of SX and BX is controlled by TX, and the SX + BX sum largely determines TX. Thus, one expects that such "part-whole" correlations will be high and, in fact, the median correlation of SX and TX is .983, while the BX and TX median is .928.

Other correlations worth noting are those involving enrollments (TENR and GENR) and PHD, on the one hand, and VH, TX, or other library variables, on the other. Generally, the pattern is that TENR shows little relationship to library variables, GENR shows higher or moderate relationships, and PHD shows substantial or "interesting" relationships. For example, consider those cases in which VH is correlated with TENR, GENR, and PHD; the respective medians are .095, .355, and .643. The pattern of relationships is similar when TENR, GENR, and PHD are correlated with TX, PSS, or NPSS.

Finally, note that the PINC and BKR variables often or typically correlate negatively with other variables. (PINC is defined as VA divided by VH, and BKR as BX divided by TX.) The VAPG, volumes added per graduate student, and CXPS, or library expenditures per student, also exhibit several negative correlations.

Discussion

In 1971, abrupt changes began to affect several primary, well established growth trends* and they mark the beginning of what must have been a uniquely challenging decade. Inflation must be suspected as the principal underlying influence, but it seems doubtful and too simple that inflation could be solely responsible. The extent of the observed changes on the seven primary variables, in approximate descending order, is: VA; PSS and NPSS; expenditures (BX, SX, and TX); and VH. The "volumes added" or VA variable, which had tripled during the 1951-1970 period (Fig. 2), stopped growing in 1971, then began a decline that reached its low point in 1982. But, even with three recent and successive increases, VA remains below its 1970-1973 average of 105-107,000 volumes and much farther below the 1980 levels that Purdue's fitted curves had forecast. Figs. 2 and 7 also support two related points: for about six years, 1965-1970, Purdue's original VA forecasts were reasonably accurate, and then, when the 1971 forecasts appeared, their predictions closely matched the originals; however, within a few years, none of these forecasts bore any resemblance to the emerging trends. Their earlier and apparent agreement, as well as the earlier validity, were irrelevant.

Both the professional (PSS) and the non-professional (NPSS) staff size also grew rapidly from 1951 through 1970 (e.g., Fig. 5 and Table 5), but again, growth stopped in 1971 and there was then no important

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* In part, these changes have been noted earlier and described by others, including Drake (1977, p. 5), Cummings (1986, p. 20), and Molyneux (1986c, pp. 106-107).

change in either variable through the 1970's and into the 1980's. During the twenty years prior to 1971, NPSS had more than tripled, and PSS had doubled, so that their ratio, which was originally near one-to-one, is now two-to-one, i.e., 90+ professionals to almost 180 non-professionals, on the average. Also, Purdue's original PSS forecasts (Figs. 5 and 10) were initially too conservative, under-estimating somewhat the increases that occurred during the 1965-1970 period; however, from 1971 onward, neither the original nor the revised forecasts match the trend that emerged. (NB: Purdue made no forecasts concerning NPSS growth.) It is not yet clear whether PSS and NPSS have begun a new upward trend but the odds seem to favor this, primarily because a decade and more of library growth, including growth in expenditures (e.g., Figs. 3, 4, and 29), and the recent resumption of VA growth (e.g., Fig. 2), create both a need and the possibility of additional staff.

The long and not quite uninterrupted series of expenditure increases (e.g., Figs. 3 and 8) has been similar to the rapid increases that Purdue had forecast and, in that sense at least, they were expected, but even so, results like those that appear quite uniformly in the several TX, SX, and BX tabulations and figures are difficult to comprehend. Even in Fig. 29, where "constant dollar" adjustments provide an attempt at controlling inflation's effects, expenditures show an approximate five-fold increase between 1951 and 1984, the large majority of this occurring before 1971. And with no adjustment, as in Fig. 3, average TX increases from a 1951 level of $.459 million to a 1985 level of $10.383 million, which is 22.6 times as large. Consider, too, that the summed 1951 expenditures of all 58 libraries were $26.6

million, but in 1985 Harvard alone reported expenditures of $25 million, while three other large libraries reported TX that was in the $22-24 million range, and the summed 1985 expenditures of all 58 libraries exceeded $600 million.

The rule-of-thumb that can account for such increases is simply to add nine percent per year to a current or base number. It is a rule that fits the 1973-1985 period well, that overestimates the very small increases of 1971 and 1972, underestimates the double-digit increases of the 1960-1970 period, and has mixed or intermittent validity for the 1951-1959 period. If the rule applies through 1990, the TX average will exceed $15 million; through 1993, $20 million; and through 1998, $30 million, and this would be all too reminiscent of Metcalf's warning, cited earlier: "where Harvard is today in size and costs, Yale will be tomorrow, figuratively speaking; California, Chicago, Columbia, Illinois, Michigan, and Minnesota will be there the next day; and many others will arrive the day after that. It may be later than many of us think" (1955, p.118).

The prospect that the TX average will soon exceed $20 million will surely prompt skeptical response and it should, since its principal basis is a simple rule that homogenizes all years and all of the 58 libraries. Nevertheless, the rule is based on a large volume of data and, as summarized in Fig. 3, the data are powerfully suggestive. Thus, a $20 million average might be rationalized, either for 1993 or near then because, first, the average collection, by increasing at the current rate of approximately three percent per year, will then be four million volumes, or 4.5 times its 1951 average; VA can (will?) exceed 100,000 volumes, which represents a tripling of its 1951 level; and

total staff size will surely at least equal its 1985 level of 270 (full-time equivalents), which again represents a tripling of the 1951 level--and represents expenditures that customarily account for something over half of all operating expenditures. Secondly, a $20 million TX is as reasonable as--or no more unreasonable than--the many other short-run increases that are already recorded, during both good times and bad. And finally, but no less importantly, Baumol and Marcus have concluded:

> that the observed behavior of costs of library operations and of related activities cannot be considered a chance occurrence. The trends arise at least in part out of the nature of the technology involved and hence they can be expected, with a considerable degree of confidence, to continue for the foreseeable future (1973, p. 63).

In the fourteen years since those words were published, new technologies have played expanding roles in library operations, but they have not reached levels that require immediately revised expectations.

The trend shifts that began together in 1971 are surely not simple coincidence and they are not too obviously interconnected, so we regard them as an invitation to speculate. The shifts to be considered and interpreted are those best seen in VA (Fig. 2); PSS (Fig. 5); NPSS (Table 5); and the TX, BX, and SX expenditures, both before "constant dollar" adjustment (Figs. 3 and 4, Table 5) and after (Fig. 29). In each case, the trend for 20 years before 1971 was markedly different from the one that followed; for 20 years, all variables experienced similarly rapid growth but after that their trends differ. The most affected variable seems to be VA, which did not increase or decrease from 1970 through 1973, then it decreased twice, held nearly constant from 1975 through 1979, and decreased again in 1980, '81, and '82, before beginning the recent series of increases. This pattern and the

related BX patterns of Figs. 4 and 29 suggest that the libraries began something like a rearguard action about 1971, in an effort to stave off VA decreases. For a few years, the action generally succeeded, but then VA was forced down in the mid-1970's and again in the early 1980's. Then, in 1983, the new series of increases began, and its timing was--or happened to be--that it lagged one year behind the end of a four-year period (1978-1981) of severe inflation, years during which the Consumer Price Index increased 9.0, 13.4, 12.5, and 8.7 percent.

The PSS and NPSS variables both show that staff increases stopped in 1971 and that staff size remained practically unchanged for more than a decade afterward, although salaries expenditures (SX) continued to increase rapidly. However, when SX is presented in "constant dollars," as in Fig. 29, the increases continue only through 1973, then SX plateaus or declines through 1981. The two things that these patterns suggest are, first and obviously, that inflation after 1973 was such that it apparently neutralized or absorbed the several substantial SX increases that were made between 1974 and 1981. But secondly, both the adjusted and unadjusted BX variable behave differently than SX, beginning in 1971; in relative terms, it appears that SX fared better than BX, which might be explained like this: When library directors realized that expenditure increases would be curtailed, they decided against further staff increases, took steps to protect the current acquisition levels, and allocated available funds disproportionately to staff salaries.* The allocations to salaries could be justified on the

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* One indication of this is that, before 1971, SX was usually 54 to 57.9 percent of TX; during three years it was lower and three others, somewhat higher, but in 1971-73 it was 59.1, 61.1, and 60.1 percent. Also, since 1973, it has declined to current levels of 53 or 54 percent.

grounds that staff welfare and morale are crucial and that the curtailment of funding increases and the inflation pressures were likely to be temporary--which all recent history seemed to support--so that their effects on collections could and would be tolerated for a short period.* It appears that for three years, the purchasing power of staff salaries continued to increase, but in 1974, when inflation was about eleven percent, purchasing power declined, then declined further in 1979, 1980, and 1981, when inflation rates were again high (Fig. 29).

At a glance, the TX increases in Fig. 3 show only two apparently difficult years, 1971 and 1972, when annual increases were less than might be expected; however, when TX is presented in "constant dollars," as in Fig. 29, the picture is completely different. There, it appears again that 1971 marked the beginning of a new period that lasted, in this case, through 1981, after which, as indicated above, inflation rates were much lower.

Concerning VH, if trends that are seen in VA (e.g., Fig. 2) and in other variables, post-1971, were to continue long enough, they would inevitably have a visible effect on collection growth, but VH also is a more "resilient" variable than the others, and its trend is better insulated against short-run and small-scale changes in other trends. Unlike other variables, it is difficult to imagine circumstances in which average VH declines and it is no easier to imagine that VH could achieve a balanced state, one that shows neither increases nor decreases. (De Gennaro, 1982, and Baumol and Blackman, 1983, are convincingly doubtful that electronic technologies will force an early

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* We have it on good authority that the reality was probably not as orderly or impersonal as this suggests.

change in this outlook.) On examination, Fig. 1 seems to show that the parabolic or curvilinear growth of VH, through the early 1970's, has been essentially linear for the last several years, and especially since 1980. Formerly, when VH was growing parabolically, VA represented about 4.5 to six percent of VH (e.g., in 1968, an especially "good" year, VA was 6.38 percent), but recent percentages are barely half as large (e.g., in 1982, its "worst" year, VA was 2.87 percent). Parenthetically, since about the time of Fremont Rider, and certainly since the Purdue studies appeared, it has been suspected or realized that larger libraries tend not to double as rapidly as smaller ones, and this provides some limited basis for expecting that these 58 libraries, with a current VH average that is well beyond three million volumes, should not grow as they did when VH averaged only two million, in 1970, or one million, in 1954. But, ambivalently and on the other hand, the observed inverse relationship between VH and growth rate is only a correlation and a tendency, so the most that should probably be said is that the recent decline of the VA percentage is consistent with some earlier indications.

What the Future May Hold

Although some library trends have been consistent enough to allow credible forecasts to be made by relatively simple means, other trends have not been so cooperative, as Figs. 2 and 7 or 5 and 10 demonstrate, which also suggests that the time for long-range forecasts may have passed. For the shorter range of five years beyond 1985, almost two of which have already passed but are not yet in the public record, it seems likely that VH will continue a practically linear series of increases,

arriving near or perhaps beyond 3.6 million volumes. To reach 3.6 million, the net VA will need to average 84,000 volumes, 1986 through 1990, and this seems a reasonable, if not quite a conservative figure. Except for 1981 and 1982, the gross VA average has exceeded 84,000 volumes every year since 1965, and it has shown increases during each of the three most recent years.* Further increases are likely because expenditures, including BX, are continuing to increase, inflation seems to have eased, and several libraries that are recognized leaders continue or have resumed adding volumes at a prodigious rate** (see also, Fig. 18). Alternatively, it can also be argued that, since VH has a recent pattern of increases that approximate or exceed three percent per year, the continuation of such increases is reasonable to assume and would result in a 1990 VH average somewhere between 3.65 and 3.7 million volumes.

Concerning TX, BX, and SX, we earlier discussed the fairly apparent fact (e.g., see Fig. 3) that expenditures have been increasing, on the average, at a rate of about nine percent per year, and it is also true that with only trivially small adjustments, this rule-of-thumb applies equally to all three expenditure variables. So, by applying the rule through 1990, TX will average just less than $16 million; SX will be

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* To account for the fact that net VA is usually--but not invariably--smaller than gross VA, the 84,000 volume net figure, above, should be multiplied by about 1.2, which then means that the libraries' reported gross VA may need to average 102,000 volumes, 1986 through 1990, for VH to reach 3.6 million volumes.

** In 1985 four of the 58 libraries added at least 200,000 volumes, seven added at least 150,000, and 21 added at least 100,000. These numbers suggest two things: that the proposed or alternative means to effective service are having little effect on the collecting habits of leading libraries, and that others will probably follow this lead whenever resources permit.

50-55 percent as large, or about $8.4 million; and BX will be almost a third, or $5.0 million.

And finally, the PSS and NPSS data provide hints concerning their developing trends, but not much more. Nevertheless, as suggested above, the data give no basis for expecting a decline in staff size and none for expecting growth like that of the 1960's. Of the two remaining possibilities, no growth and some modest growth, some signs appear to favor the latter, primarily because there seems to be an accumulated need arising from the fact that staff size was stable for a dozen years, while collections increased fifty percent and while repeated expenditure increases were largely or totally absorbed by inflation. Now, and since 1982, some or much of the inflationary pressure has apparently eased (Fig. 29), VA has begun to increase, and some staff increases have been recorded. Barring severe new pressures, similar to those that began in 1971, staff increases seem likely during the next few years; others may find reason to estimate either the size or duration of such increases, but the presently available signs and trends are, we think, not convincing on either point.

Some Further Studies

Among many future studies that the present work suggests, some that seem promising include work that would lead to the development and implementation of validated procedures to measure libraries' information technology resources and activity. Technological systems and their role in libraries have been expanding, coincidentally, since the Purdue studies began and they now represent average costs estimated to be seven or eight percent of library operating expenditures (M. K. Sitts,

personal communication, December 1, 1986). Also, there is no dissent from the view that this expansion will continue for the foreseeable future, resulting, some believe, in revolutionary change, not just in selected library operations but in the concept or definition of what libraries in a "paperless society" will be (e.g., Giuliano, 1979, Lancaster, 1978). But whether the results are revolutionary or are something less, the systematic measurement and analysis of automation trends, like the traditional measurement of other library trends and dimensions, could contribute to understanding and to library planning.

Two sets of related investigations have promise also, and they would seek, in the first case, to refine and validate measures of library performance or "output" that might serve initially to supplement the traditional "capacity" measures. Traditionally, the size of collections, addition of volumes, serial subscriptions, staff size, and other measures have provided reasonable indices of capability and, by inference, library service. But as technological developments continue, and if/when these reach levels that are significantly higher than at present, they will require that their contributions to service be gauged by new and non-traditional means, the development of which has barely begun (see Kantor, 1984).

A second study series might be directed at understanding the processes by which operational changes are adopted by library constituencies. It is an understatement to say that some current--and longstanding--constituent attitudes do not favor significant change in research libraries, and that these attitudes can lead to difficult transitions in the adoption of new procedures and technologies. Because of this, there should be value in developing better understanding, e.g.,

of the nature of constituents' readiness and resistance to change, of the influence that research and scholarly traditions have in advancing or retarding the adoption of information technologies, and of system attributes and institutional stategies that affect the adoption process. Ideally, significantly improved procedures and their related technologies would be embraced by faculty, graduate students, library staff, and other constituencies, but realistically, more gradual and more modest levels of acceptance must be expected.

The scope of the work that may be required to ensure successful adoptions is partially revealed by the fact that, at "typical" research universities, it can be expected that the libraries' faculty constituents will number 1000 to 2000 or more; graduate students will be a few times more numerous, with average enrollments of 5000 to 6000, of whom 200 to 300 or more will complete a Ph.D. during a given year; library staff may number a few hundred; and undergraduate enrollments will be in the range from a few or several thousand to several tens of thousands.* So, on the evidence that constituent numbers are generally large and on the reasonable assumption that constituents' technological readiness is low, while their attitudes toward traditional forms of written communication are correspondingly favorable, continuing and effective efforts to teach and persuade will need to accompany the expanding applications of technology.

Other or further studies based in part on the existing data could also examine questions concerning, first, the existence or

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* Approximately a third of this study's 58 research universities report recent and stable main campus enrollments of graduate, undergraduate, and "first professional degree" students that are in the range from about 29,000 to 35,000.

confirmability and then the nature of library "personalities." In the earlier growth studies, especially those of Rider and Purdue, libraries were selected and grouped on the basis of their size, age, "gender," or other evident characteristics, and although these a priori schemes may continue to be as useful as any, alternatives may also exist. Experience with library and university data has created suspicions that libraries have "personalities," that these may be reasonably stable over the years, and that they might provide a useful basis for grouping libraries and describing their similarities. Examples of some personality trait names that at times seem to apply to libraries' observed behavior are: steadfast/persevering, energetic/active, affluent, technological, precocious, etc. Whether the available data, supplemented with other institutional data and factor analyzed, would lend support to the suspicions or, if they should, whether the results would contribute to understanding and to planning, is uncertain but plausible.

Finally, the correlations among variables that are summarized in Table 13 and more completely presented in Appendix C might be considered an under-utilized resource that would come into its own if the "right" questions were asked of it. So far as we know, attempts to exploit such a resource are thus far limited to the work of Baumol and Marcus (1973) and to some preliminary work of Gordon Fretwell, University of Massachusetts-Amherst. Fretwell studied the prediction/predictability of professional staff size (PSS), based on its correlation with VH, TX, and other variables (personal communication, March 31, 1986). In any event, observed correlations involving library variables are usually stable over several or many years and they not only confirm some

expected and strong relationships (e.g., in 1980, VH correlated with VA, BX, SX, TX, PSS, and NPSS at the level of .86 to .90), but they also reveal certain plainly artifactual relationships, such as the 1980 correlation of TX with SX and BX at the level of .99 and .95. However, some correlations also confirm relationships that are more difficult to anticipate, including the fact that TENR and VH formerly correlated about .20--in 1955, r was .208--and that the strength of this relationship has declined gradually over the years to a present level near .05--in 1980, r was .047. Also, graduate enrollment, GENR, and VH typically correlate in the .30 to .40 range--in 1980, r was .336, with annual fluctuations that form no clear pattern. And the PHD and VH variables typically correlate in the .59 to .69 range--in 1980, r was .628. These and other relationships among the variables have no automatic or universal value, but the presence among them of reasonably stable, non-artifactual relationships that are of fair or large magnitude indicate that they are a potential basis for some practically useful estimates and predictions.

Some Closing Thoughts Concerning Forecasts, Fitted Curves, and Ambivalence

There are recurring questions concerning Purdue's forecasting methods and some apparent contradictions that they produced. For example, it is not always clear how Fig. 1 could have predicted VH growth which would result in a 1980 average of 2,865,000 volumes, even though Fig. 2, one page away, presented a similarly derived and similarly credible prediction that VA would reach a 1980 average of 228,000 volumes (Purdue, 1965, pp. 21-22). Both predictions could not

be right. Even if the VA numbers had been discounted to allow for differences between net and gross additions to the collection, which they were not, their sum over the years would result in collections much larger than Fig. 1 predicted. Purdue considered "reasons for and against the alternative predictions" (1965, p.49) and stated its preference for "the larger estimates." This meant, among other things, that the 1980 VH was supposed to average approximately 3,750,000 volumes, not 2,865,000. For six years, or for only six years, that preference seemed intelligent, perhaps prescient, but since 1971 there has been less and less to recommend it.

Such discrepancies arise from the criteria and processes of least squares curve fitting, which, when conditions are "right," can seem uncanny and prophetic, but when they are not, may seem blind or stupid. In either case, all that any of the Purdue forecasts represents is the finding of an equation to describe a parabola that passes near enough to each known data point that the vertical distances between the line and each point, when squared and summed, are at a minimum. The three human judgments that preceded these calculated, least squares solutions were, first, that the data revealed curvilinear, not rectilinear growth and should be projected accordingly; also, that second-order polynomial equations would be employed and fitted to the data; and third, that forecasts extending through 1980, but not beyond, would be described and discussed. The rest was accomplished by calculations, except that human judgment entered again, once the VH versus VA contradictions were recognized.

It seems almost plausible now to argue that Purdue should have significantly discounted the VA forecasts, as in Figs. 2 and 7, not

simply for the reason just given, but because the history of VH growth was better known, thanks to Fremont Rider; because VH was and is a measure that behaves more consistently or more dependably over time, and perhaps because it is a more prominent or central variable. Also, it might have been recognized that, if VA were to average almost 230,000 volumes per year, as predicted, this would strongly imply that some large libraries would need to add twice that many, or nearly a half million volumes, and not just as a fluke, but regularly.

All of this might have weighed against the mistaken belief in VA's continued acceleration, but in the midst of so many remarkable trends, disbelief is difficult to sustain.

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Appendix A

Listing of the Nine "Purdue Study" Reports, 1965-1973

The first of the Purdue reports appeared in 1965 and set the pattern for eight annual updates that came later, the last in 1973. All are based on annual statistics of 58 academic research libraries and their parent universities, and the reports present three kinds of analyses and results. The centerpiece of each report is a series of trend analyses, based on eight "composite" libraries of differing size; these trends trace the statistics of growth from 1951 through 1964 and, in selected cases, project the trends forward to forecast growth through 1980. A second set of analyses determine year-by-year rankings of the 58 libraries, based on their holdings, volumes added, and operating expenditures, and the third set are year-by-year correlations of the variables.

The first report analyzes data that span the years 1951 through 1964, then each later report adds data summaries that represent the most recent year. Also, the sixth report, published in 1971, and the two that followed, include a set of 28 new forecasts, based on data that extend from 1951 through 1970. A brief history and overview of the nine reports is given in the Preface.

The nine reports are:

Dunn, O. C., Seibert, W. F., & Scheuneman, J. A. (1965). The past and likely future of 58 research libraries, 1951-1980: A statistical study of growth and change. Lafayette, IN: Purdue University, University Libraries and Audiovisual Center.

Dunn, O. C., Seibert, W. F., & Scheuneman, J. A. (1966). The past and likely future of 58 research libraries, 1951-1980: A statistical study of growth and change (2nd issue). Lafayette, IN: Purdue University, University Libraries and Audiovisual Center.

Dunn, O. C., Seibert, W. F., & Scheuneman, J. A. (1967). The past and likely future of 58 research libraries, 1951-1980: A statistical study of growth and change (3rd issue). Lafayette, IN: Purdue University, University Libraries and Audiovisual Center.

Dunn, O. C., Seibert, W. F., & Scheuneman, J. A. (1968). The past and likely future of 58 research libraries, 1951-1980: A statistical study of growth and change (4th issue). Lafayette, IN: Purdue University, University Libraries and Audiovisual Center.

Dunn, O. C., Seibert, W. F., & Scheuneman, J. A. (1969). The past and likely future of 58 research libraries, 1951-1980: A statistical study of growth and change (5th issue). Lafayette, IN: Purdue University, University Libraries and Audiovisual Center.

Dunn, O. C., Klimoski, R. J., & Tolliver, D. L. (1970). The past and likely future of 58 research libraries, 1951-1980: A statistical study of growth and change (6th issue). Lafayette, IN: Purdue University, University Libraries and Audiovisual Center.

Dunn, O. C., Mount, R. M., & Tolliver, D. L. (1971). The past and likely future of 58 research libraries, 1951-1980: A statistical study of growth and change (7th issue). Lafayette, IN: Purdue University, University Libraries and Audiovisual Center.

Dunn, O. C., Tolliver, D. L., & Tolliver, R. S. (1972). The past and likely future of 58 research libraries, 1951-1980: A statistical study of growth and change (8th issue). Lafayette, IN: Purdue University, University Libraries and Audiovisual Center.

Dunn, O. C., Tolliver, D. L., & Drake, M. A. (1973). The past and likely future of 58 research libraries, 1951-1980: A statistical study of growth and change (9th issue). Lafayette, IN: Purdue University, University Libraries and Audiovisual Center.

Appendix B

NCES Data Source Documents

Data Year	Source Document
1951:	1950 Fall Enrollment in Higher Educational Institutions. Federal Security Agency, Office of Education. Circular No. 281. November, 1950.
	Statistics of Land-grant Colleges and Universities Year Ended June 30, 1951. Federal Security Agency, Office of Education. Bulletin 1952, No. 2.
	Earned Degrees Conferred by Higher Educational Institutions 1950-1951. Federal Security Agency, Office of Education. Circular No. 333. February, 1952.
1952:	1951 Fall Enrollment in Higher Educational Institutions. Federal Security Agency, Office of Education. Circular No. 328. November, 1951.
	Statistics of Land-grant Colleges and Universities Year Ended June 30, 1952. U.S. Department of Health, Education, and Welfare, Office of Education. Bulletin 1953, No.1.
	Earned Degrees Conferred by Higher Educational Institutions 1951-1952. Federal Security Agency, Office of Education. Circular No. 360. December, 1952.
1953:	1952 Fall Enrollment in Higher Educational Institutions. Federal Security Agency, Office of Education. Circular No. 359, November, 1952.
	Statistics of Land-grant Colleges and Universities Year Ended June 30, 1953. U.S. Department of Health, Education, and Welfare, Office of Education. Bulletin 1954, No.8.
	Earned Degrees Conferred by Higher Educational Institutions 1952-1953. U.S. Department of Health, Education, and Welfare, Office of Education. Circular No. 380. December, 1953.
1954:	1953 Fall Enrollment in Higher Educational Institutions. Federal Security Agency, Office of Education. Circular No. 382. USGPO, 1954.
	Resident, Extension, and Adult Education Enrollment in Institutions of Higher Education November, 1953. U.S. Department of Health, Education, and Welfare, Office of Education. Circular No. 414. October, 1954. USGPO, 1954.
	Earned Degrees Conferred by Higher Educational Instititions 1953-1954. U.S. Department of Health, Education, and Welfare, Office of Education. Circular No. 418. December, 1954.

1955: 1954 Fall Enrollment in Higher Educational Institutions. Federal Security Agency, Office of Education. Circular No. 419. USGPO, 1955.

Resident, Extension, and Adult Education Enrollment in Institutions of Higher Education: November 1954. U.S. Department of Health, Education, and Welfare, Office of Education. Circular No. 454. September, 1955. USGPO, 1955.

Earned Degrees Conferred by Higher Educational Institutions 1954-1955. U.S. Department of Health, Education, and Welfare, Office of Education. Circular No. 461. December, 1955.

1956: Opening (Fall) Enrollment in Higher Educational Institutions 1955. U.S. Department of Health, Education, and Welfare, Office of Education. Circular No. 460. December, 1955. USGPO, 1956.

Resident, Extension, and Adult Education Enrollment in Institutions of Higher Education: November 1955. U.S. Department of Health, Education, and Welfare, Office of Education. Circular No. 454. September, 1955. USGPO, 1955.

Earned Degrees Conferred by Higher Educational Institutions 1955-1956. U.S. Department of Health, Education, and Welfare, Office of Education. Circular No. 499. May, 1957.

1957: Opening Enrollment in Higher Educational Institutions, Fall 1956. U.S. Department of Health, Education, and Welfare, Office of Education. Circular No. 496. January, 1957. USGPO, 1957.

Resident, Extension, and Adult Enrollment in Institutions of Higher Education: November 1955. U.S. Department of Health, Education, and Welfare, Office of Education. Circular No. 493. December, 1956. USGPO, 1957.

Statistics of Land-grant Colleges and Universities Year Ended June 30, 1957. U.S. Department of Health, Education, and Welfare, Office of Education. Circular No. 541. USGPO.

Earned Degrees Conferred by Higher Educational Institutions 1956-1957. U.S. Department of Health, Education, and Welfare, Office of Education. Circular No. 527. April, 1958. USGPO, 1958.

1958: Opening Enrollment in Higher Educational Institutions, Fall 1957. U.S. Department of Health, Education, and Welfare, Office of Education. Circular No. 518. January, 1958. USGPO, 1958.

Resident, Extension, and Adult Education Enrollments in Institutions of Higher Education: First Term, 1957-58. U.S. Department of Health, Education, and Welfare, Office of Education. No. OE-54000. Circular No. 593. July, 1959. USGPO, 1959.

Earned Degrees Conferred by Higher Educational Institutions 1957-1958. U.S. Department of Health, Education, and Welfare, Office of Education. Circular No. 570. May, 1959. USGPO, 1959.

1959: Opening (Fall) Enrollment in Higher Education, 1958: Institutional Data. U.S. Department of Health, Education, and Welfare, Office of Education. Circular No. 544. November, 1958. USGPO, 1959.

Statistics of Land-grant Colleges and Universities Year Ended June 30, 1959. U.S. Department of Health, Education, and Welfare, Office of Education. No. OE-50002-59. Circular No. 639. USGPO.

Earned Degrees Conferred by Higher Educational Institutions 1958-1959. U.S. Department of Health, Education, and Welfare, Office of Education. OE-54013. Circular No. 636. USGPO, 1961.

1960: Opening (Fall) Enrollment in Higher Education, 1959: Institutional Data. U.S. Department of Health, Education, and Welfare, Office of Education. No. OE-54003. November, 1959. USGPO, 1959.

Total Enrollment in Institutions of Higher Education First Term, 1959-60. Basic Data. U.S. Department of Health, Education, and Welfare, Office of Education. No. OE-54025. USGPO, 1962.

Enrollment for Advanced Degrees Fall 1959. U.S. Department of Health, Education, and Welfare, Office of Education. No. OE-54019. Circular No. 648. USGPO, 1961.

Earned Degrees Conferred 1959-1960. Bachelor's and Higher Degrees. U.S. Department of Health, Education, and Welfare, Office of Education. No. OE-54013-60. Circular No. 687. USGPO, 1962.

1961: Opening (Fall) Enrollment in Higher Education, 1960: Institutional Data. U.S. Department of Health, Education, and Welfare, Office of Education. No. OE-54003-60. Circular No. 637. USGPO, 1960.

Enrollment for Advanced Degrees Fall 1960. U.S. Department of Health, Education, and Welfare, Office of Education. No. OE-54019-60. Circular No. 674. USGPO, 1963.

Earned Degrees Conferred 1960-1961. Bachelor's and Higher Degrees. U.S. Department of Health, Education, and Welfare, Office of Education. No. OE-54013-61. Circular No. 721. USGPO, 1963.

1962: Opening (Fall) Enrollment in Higher Education, 1961: Institutional Data. U.S. Department of Health, Education, and Welfare, Office of Education. No. OE-54003-61. USGPO, 1961.

Enrollment for Advanced Degrees Fall 1961. U.S. Department of Health, Education, and Welfare, Office of Education. No. OE-54019-61. Circular No. 725. USGPO, 1964.

Comprehensive Report on Enrollment in Higher Education First Term 1961-62 and Summer Sessions 1961. US Department of Health, Education, and Welfare, Office of Education. No. OE-54032. Circular No. 743. USGPO, 1964.

Earned Degrees Conferred 1961-1962. Bachelor's and Higher Degrees. U.S. Department of Health, Education, and Welfare, Office of Education. No. OE-54013-62. Circular No. 719. USGPO, 1963.

1963: Opening (Fall) Enrollment in Higher Education, 1962: Institutional Data. U.S. Department of Health, Education, and Welfare, Office of Education. No. OE-54003-62. USGPO, 1962.

Enrollment for Advanced Degrees First Term 1962-63. Final Report. U.S. Department of Health, Education, and Welfare, Office of Education. No. OE-54019-63. Circular No. 738. USGPO, 1964.

Earned Degrees Conferred 1962-1963. Bachelor's and Higher Degrees. U.S. Department of Health, Education, and Welfare, Office of Education. No. OE-54013-63. Circular No. 777. USGPO, 1965.

1964: Opening (Fall) Enrollment in Higher Education, 1963: Institutional Data. U.S. Department of Health, Education, and Welfare, Office of Education. No. OE-54003-63. Circular No. 728. USGPO, 1963.

Resident and Extension Enrollment in Institutions of Higher Education Fall 1963. U.S. Department of Health, Education, and Welfare, Office of Education. No. OE-54000-63. USGPO, October, 1965.

Earned Degrees Conferred 1963-1964. U.S. Department of Health, Education, and Welfare, Office of Education. No OE-54013-64 Misc. No. 54. USGPO, 1966.

1965: Opening Fall Enrollment in Higher Education, 1964. U.S. Department of Health, Education, and Welfare, Office of Education. No. OE-54003-64. Circular No. 762. USGPO, 1964.

Enrollment for Master's and Higher Degrees, Fall 1964. U.S. Department of Health, Education, and Welfare, Office of Education. No. OE-54019-64. USGPO, 1966.

Earned Degrees Conferred 1964-1965. Bachelor's and Higher Degrees. U.S. Department of Health, Education, and Welfare, Office of Education. No. OE-54013-65. USGPO, 1967.

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Appendix C

Pearson Product-moment Correlations of Sixteen Variables, Year-by-year (1951-1985)

The contents of Appendix C (described below) are omitted from this second printing of . . . Library Trends . . . . They can be found on pp. 141-177 of the report's original copies.

Sixteen of the seventeen study variables that are defined/described in Tables 2 and 2a were intercorrelated year-by-year (the WX variable is omitted). The results are presented in the 35 Pearson r matrices of this Appendix and these same results are summarized in Table 13, above. The mean values for each variable each year are presented in Table 5, above.

From 1968 through 1985, all correlations are based on n's of 58; for the earlier years, 1951 through 1967, because of missing data, n is 51, 51, 50, 52, 52, 53, 54, 53, 53, 52, 52, 52, 57, 58, 57, 56, and 57.

Appendix C'

A RATIONALE FOR THIS APPENDIX

In the fall of 1987, after the . . . Library Trends . . . report had been published and after our initial feelings of relief and satisfaction faded, we began to wonder how research librarians would react to it. Would they be interested, as we hoped, in the intriguing things we thought we'd found? We had found and described two decades of rapid, pervasive growth, from 1951 through 1970, followed immediately by ten or twelve years of retrenchment and struggle (but not of genuine austerity and budget cuts, as some have claimed), then followed by signs that growth might be returning. In less than forty years, many collections had quadrupled; staff size had quickly tripled, then plateaued; "volumes acquired" had quickly tripled, declined by 25%, then recently reversed that trend with some modest increases. As these things were happening, expenditures were increasing 30-fold.

As we speculated about the effects that the report might have, we realized that, of the librarians we've come to know during years of close association, few have much interest in statistical studies. Thus, few seemed likely to seek out a 181-page statistical report, then devote some hours to its many tables and figures. In short, we realized that the things we thought we'd found were likely to be ignored. Then, in an "AHA!" experience, we realized also that many librarians we know are interested not only in libraries and librarianship, but in academic and intellectual matters, and in fiction. So, based on that and an abundance of statistical results, we decided to create Thoreau Memorial U. and two library staff.

Statistically, Thoreau is completely faithful to the contents of Table 6 (see p. 31, above), and coincidentally, its statistics strongly resemble those of the University of Kansas. Finally, we will mention that one of the earliest reasons for creating a Thoreau was that "its" trends, the trends in Table 6, quite consistently parallel the trends in Tables 5 and 7-12 or in their corresponding figures. Thus, Thoreau and/or Table 6 appear to represent a credible "generic" research library.

AN ACADEMIC RESEARCH LIBRARY, PAST AND FUTURE, AS IT MIGHT HAVE BEEN, MAYBE WAS, AND COULD BE

THE PLACE: In the offices, General Library, Thoreau Memorial University, N. Thoreauville, CT 06719.

THE TIME: About June 15, 1987, mid-morning.

THE CHARACTERS: **Diane J. Hershey**, age 41, newly arrived/newly appointed Director of Libraries, recruited to Thoreau from a major midwestern university (and M.S.L.S., 1971; Ph.D., 1975),
and
Keith R. Herrmann, age 68, Thoreau's departing/retiring Director of Libraries and a staff member since 1950 (and M.L.S., 1947).

D.J.H. and **K.R.H.** are seated opposite, across a small conference table, with coffee cups and a few notebooks, folders, and printouts before them, as their conversation begins:

D.J.H.: I appreciate your taking the time to help me orient myself to the Libraries and the campus. You have seen so much of the modern history written here, you've written quite a bit of it yourself, and by now you must qualify as Thoreau's foremost participant-observer. Besides, for these times, your career is surely unique; there can't be another director around who's spent nearly an entire professional lifetime looking after one research library, starting young and ending as an elder statesman. For me, this is a rare opportunity and I do appreciate it.

K.R.H.: My pleasure, Diane. Glad to be asked. For me, this is a satisfying way to conclude almost 37 years here, but besides, I'll still get a dozen weeks, maybe more, up at Moosehead before a freeze is likely, and that's a lot more than I've managed during any other summer. Where would you like to start?

D.J.H.: I want to learn whatever the time permits about developments you've witnessed here and the future you'd expect to follow from them. In these last few months, I must have read several hundred pages of task force and committee reports, estimates, consultant studies, and other things from here, but I still find it difficult to fit the many pieces together and understand where Thoreau will be and needs to be ten or fifteen years from now; where has it been heading? That still seems hazy.

K.R.H.: Altogether, I suppose we've sent or given you nearly a thousand pages, but it could have been several times that, and you'd still be wondering. Anyone who does otherwise is not . . . wise. Wise or prudent. My first suggestion--you could call it a prejudice--is that, if you find someone who doesn't wonder, who sees it all clearly, watch out. Look at that person's pedigree; better yet, check the rationale and the evidence they're offering, very carefully. I think that precaution can't be overdone, and that's

mostly because large vocabularies and familiarity with a lot of esoteric methods are so common in our world. It seems to me that, usually, in professional matters, vocabularies are used more carefully and correctly than methods are, but in so many of their combinations, abstract terms and borrowed methods are used to generate insights that are more apparent than real. They make a contribution less often than they make a name for the authors. And my further advice is not to overlook the role of self-confidence. There's an abundance of that here and on other campuses, and I have a petrified suspicion that it causes too many things to be hatched before they have incubated quite long enough. Some choose to mark this down to creativity, and it <u>is</u> that too, but it's still a mixed blessing.

If you disagree, I hope you'll say so, or just change the subject. Don't let me barnstorm. That'd be no help to you.

D.J.H.: No, it wouldn't, but I don't disagree, either. What I would say, though, is that your feelings seem stronger than I'd expected. Not bitter, I suppose, and not anti-intellectual, either, but something like both. I'm curious to know what's behind them, what your reasons are. You got burned, maybe?

K.R.H.: You bet I did; there are other reasons, too, but being blind-sided in '71, like many others were, then having to pick a path through the rest of the decade was hard to take. I was past fifty when it all began and I'd had a lot of experience running this place; thought I could handle most things. I wasn't some guy who could welcome being caught short, so the experience of the '70's left scars I haven't been able to shed. No connection of course, but wasn't 1971 also the year of your degree?

D.J.H.: My master's, yes. That's when I became a bona fide member of the profession. You remind me, too, that my classmates and I were more than a little surprised that openings were so scarce when we finished. No one mentioned to us that there might be a problem; the class of '70 and the earlier classes seemed to do just fine, but for us it was different. Some of my classmates--good students, too, not marginals--gave up the search after three or four months and found something else to do. But you know, it's on my c.v., I got a job that was fairly decent; it gave me experience and a little more than eight thousand dollars, so I took it, but only for a year. Halfway through the year, I already knew I had to make up my mind: either fish or cut bait. There were things I wanted to do, and I began to see they weren't about to happen on their own, not the way things were heading.

Earlier, when I was still working on my master's, I'd thought that returning to grad school would be a good idea someday or under some conditions, but in the conditions that were developing, I figured it was a case of "Why not?" and "Let's get on with it." I was fairly sure I'd enjoy the challenge because I've always enjoyed school, and the other risks seemed small. As it turned out, I was right on both counts. Besides, I doubt I would have been a finalist here, much less selected to succeed you, without that second union card.

K.R.H.: I don't know about that, only that it didn't matter in my case, years ago, but I can say that the conditions that helped you decide to go

back to school are a part of what interests me about 1971. That year turned out to be difficult for many of us, newcomers, old-timers, and in between --at my age, I was probably an "in between," a young old-timer. Anyway, not only the librarians among us, but journeyman academics and others saw that conditions on campus had changed, POOF!, and not for the better. Worse yet, we know now that it was just the beginning of ten or twelve hard years that were going to follow, and that could come again, with no more warning than before. But having said that, I really don't have the foggiest what was behind it or what triggered the thing, and because of that, I've thought several times that if I were a young man, I'd go back for a doctorate, and for a dissertation I'd investigate--I would try to find out--what it was that went to work on the field just as the '70's began, and the forces, maybe the same ones--but I wouldn't bet on it--that continued to affect us and that made things hard for the rest of the decade, or even a while beyond.

When you look at the record of the 1950's and the '60's, it's clear as can be that Thoreau had twenty years of real good times, and we weren't alone in that. Except for some isolated cases, every director I know can report the same series, the same string of good years, although some don't like to admit it. And my judgment, biased of course, is that directors, most of us, are rational, reasonable, intelligent folk; however, we can also be awfully superstitious about admitting to too much good fortune. But Diane, I can't hide the fact that, during those twenty good years, we reached the point where we were adding about 96 or 97 thousand volumes a year, not 29 or 30 thousand, as we had during my first year here, working in Selection and Acquisition; we doubled the professional staff, too, from 33 or 34 to 72 or 73; and the non-professional staff increased from maybe 34 or 35 to about 135, so their numbers practically quadrupled. You'll find out, if you add up the numbers, that our total staff in 1971 was almost 210 f.t.e.'s, a tripling since 1950. Right now, it's about 240 or a bit more, so the staff has grown during the last sixteen years, but not nearly enough, and there's real need now to recruit several more. Check the last few annual reports and you'll also see that every year since 1982 or '83, we've been adding volumes at an increasing rate again, after at least ten years of mostly, also sharply, declining acquisitions. But in spite of all the problems, it's still a fact that we've now got 1.1 or maybe 1.2 million volumes we didn't have sixteen years ago. True enough, Thoreau's collections haven't doubled, the way Rider generally thought research collections would, because he'd observed quite a few that had, or did. But Diane, for me, 2.6 million volumes, and everything that comes with them, are an ample responsibility, and I wouldn't want to push those numbers higher or faster than they just naturally need to go. I know directors who'd disagree with this, but collections that double in sixteen years are an honor I can forego. Even as it is, you still have good reason to expect three million volumes here in 1992, and you'll see the '71 collection doubled about two years later. So, instead of a growth rate that matches Rider's magical sixteen years, you can expect to get there, to reach 3.1 or 3.2 million, in about twenty three, or so it seems.

D.J.H.: Keith, what is "seems" supposed to mean? What do you suppose the chances are that Thoreau's collections will go from the present level--a little more than 2.6 million, isn't it?--to 3.1 or 3.2, and in seven years? What I'm really wondering is: I know and you certainly know that there's

still some space and some shelving available in Emerson and Bio Sciences, but there is precious little that's available anyplace else that I recall. Our room for growth, at least in present space, is severely limited. And you're suggesting an additional half million volumes. By 1994? What kind of a prospect is this? Highly likely? Worst case? Fifty-fifty?

K.R.H.: In one degree or another, the future's always "iffy," so it's no cinch that Thoreau will tally, let's say, 3,150,000 volumes and dutifully report that number to ARL in the late summer or the fall of 1994, but I think it's only barely conceivable that my guess could be mistaken by more than a year. At least 80 percent of the volumes in question are here already, so we're actually only considering how soon the next 18-20 percent get here, and seven years is what experience very nearly dictates. I'd rationalize it this way: Not only are we talking about just 18 or 20 percent, but we also don't need to spend time wondering about next year's growth; that's as near to predestined or foreordained as anything can be, so the time span in question is six, not seven years, beginning with the '89 fiscal year and ending in '94. I'd say, conservatively, you'll add 85 thousand volumes next year--gross, not net volumes--and conservatively again, you'll have holdings of about 2.7 million. So then, the real question is: After fiscal '88, what kind of growth do you need in order to reach 3.1 million by 1994? Arithmetic says, if you maintain an average net growth of about 67 thousand volumes, the prophesy has to be confirmed; same logic as two plus two. And Diane, 67 thousand is a modest figure for this place. It's a few thousand less than we've tallied every year since our recovery started in 1982-83, and it's about ten thousand less than our peak, back in the late '60's. There's another thing that nobody of sound mind can overlook: With you in charge here, newly appointed and selected from a field of strong candidates, the Provost will inevitably be supportive. You have a perfect right to say, as Churchill did--although not quite correctly--that you're not in office to preside over the dissolution of the Empire. If anything, the opposite's true.

D.J.H.: That last part is especially good to hear, again and often. You may know this, but the Provost gave me essentially that same assurance when she called to offer the job, and I have no doubt about her sincerity, either. Also, she and the deans I've talked to have already outlined several ideas that indicate some active years ahead, so I expect and I'll probably need to plan toward acquisitions that start in the 80 thousands, and maybe higher, rather than lower. Now, where were we?

K.R.H.: No matter. Let me just remind myself and you, too, of something that isn't obvious at first, but it seems clear enough when we think about it: Our spending during the growth years had to increase a lot more rapidly than any of the other, or any of the separate increases might suggest, because that money not only had to cover the original complement of staff, plus all the added staff and their salaries, and do this competitively; but it had to cover acquisitions that came to be three times the numbers we'd known back in the early '50's; and it had to look after a collection that grew to be a million-five, rather than 620 or 630 thousand volumes. On top of that, it had to counteract the accumulating and compounding effects of inflation during twenty of the twenty-five postwar years. If you'll pardon a small digression, did you know that Harvard, in 1900, had less than 600 thousand; they had a smaller collection then than we had here in the early

'50's? Rider's Table D reports something like 560 thousand volumes for Harvard; that's a statistic we could chew on for hours, if we had more time. How could it be that they were that size then and almost twenty times larger now? If that were a blueprint for Thoreau, I wouldn't . . .

D.J.H.: When you say twenty times, you're saying they have current collections that total eleven million volumes or something like that, right? It seems to me that the last time I took any notice, they were about ten million, so that must have been several years ago now, although it certainly seems more recent.

K.R.H.: Yeah, had to be several; Harvard has 11.2 or maybe 11.3 million volumes, "even as we speak," and its '87 acquisitions are surely somewhere in the range near 200 thousand, probably more but maybe a bit less. I'd also guess that this year, as in the other recent years, they and Illinois, Berkeley, UCLA, maybe Texas and Toronto, and one or two others will all report anywhere from about 190 to 225 or 250 thousand volumes added to the collections. Theirs is a different league than ours. But anyway, with Harvard's recent growth, or what I recall of it, I'd guess they probably tallied 10 million volumes along about 1980.

D.J.H.: I hadn't realized that they were already beyond the eleven million mark, and I certainly would have guessed they were at ten million more recently than 1980, but you obviously follow those things more closely than I do.

If you don't mind, though, let's get back to Thoreau. Tell me more about how the spending increases developed around here; while the staff and the acquisition rates were both tripling, what happened with the dollars? Their increases were not nearly as simple as three times three, I'm certain of that.

K.R.H.: You're right, not simple, but they still came close to the three times three you suggest; it's pure chance or astrology, though. By 1970, just before the hard times descended on us, we were spending about 2.7 million dollars, and that was about seven-and-a-half or eight times, but not nine times, the dollars we spent twenty years earlier. The increases that moved us up to 2.7 million were fairly steady and usually accelerating. Year by year, we were ratcheting up, up, up with increases that seem really modest now; you know, 40 or 50, then 60 or 80 thousand a year. Then, by the late 1960's, we were requesting and getting annual increases of 2 or 3 or even 400 thousand; and now, or recently, they're nearly a million and still growing.

Don't breathe a word, please, but there was a time, back when I was a novice in this business, and I tried to find some reasonable and satisfying way to partition our spending into parcels, so that I could say what part of it and what part of every increase was a result of people increases, plain inflation, raw competition, territorial expansion, new technology, lousy decisions, and so on, but I never succeeded, probably because it wasn't a very bright thing to attempt in the first place.

D.J.H.: Pardon my saying so, but I think I won't try to argue that one --and I'll not tell, either.

K.R.H.: I guess--I hope--it was just one of those innocent things that seemed like a good idea at the time; I don't have a better excuse. As long as I'm confessing, though, I'll add a thing that sounds like an excuse, but isn't. You already know that I got blind-sided in '71, but I also know I wasn't the only one--and we both know, too, that misery still loves company. Of those of us who went through the 1950's and the '60's on this campus and a lot of others, the great majority, right up until the end of it, didn't see what was coming. So far as I can tell, all our librarian and academic colleagues were in the same boat.

In 1971--maybe a bit earlier for some libraries and later for others--we were all hit broadside; we were simply unprepared. After all the good years, we'd gotten a mindset that prepared us for more of the same. Who wouldn't have? So for a while, many of us imagined our problems were the problems that come with an imposed austerity, or that's how we talked about it, but it's obvious now, and it has been for several years, that spending here at Thoreau and at most research libraries was increasing every year. Certainly, we never got everything we wanted, never got all the things we were trying to promote, but still it's a fact that we spent only about 2 3/4 million in 1970 to operate these libraries, and 3 3/4 million in 1975, almost exactly; then we spent nearly 5.9 million in 1980. With increases like those, there must be a better word than austerity. During eleven years, spending doubled, and then some. And from those recent things we've sent and you've seen, you know that last year's total was about 9.7 million. I also expect that when the 1986-87 accounting is complete, in a couple of months or so, you'll see a total that's close to 10 2/3 million. Let me know, and if I've missed the mark by one percent, I owe you lunch.

D.J.H.: I'll take that as a bet, even though I sense I'll probably lose this one, but that's OK. I'll want or I'll need to talk to you about then, so I'll get something, even if I lose.

K.R.H.: Fine with me. Diane, let me tell you, if I hadn't lived through thirty-odd years here and looked repeatedly for original solutions to a string of problems--with help from an awfully good staff--and prepared hundreds of justifications, but then in the end still had to adopt a bunch of compromises and delays that were the best "out" we could find, I know I'd be as shocked as anyone to realize that we now spend at least thirty dollars for every dollar we spent when I first set foot in this place, or actually, in what's now the Emerson Wing. When I think of all that money and the struggles we had to get some of it, I get a roguish comfort from the realization that, however much I sometimes envy Harvard's collections and its other resources, I'm just as happy not to have to find three dollars there for every dollar that Thoreau--which is now you--has to find, but that is just what the ARL and the old Gerould/Princeton statistics tell us. While our spending has gone from 350 thousand to near eleven million, Harvard has gone from maybe 1.5 or 1.6 to something like 34-35 million. Perhaps that thought can comfort you, too.

D.J.H.: I'm not so sure. They must know how to do it there or they wouldn't be where they are, in more than one sense. For me, I intend to succeed here and I'm determined that I will, but I can't yet point to a record that constitutes proof. Meanwhile, I think I'd rather consider or remember that you and others who aren't Hercules, and don't claim to be,

have still kept up with the work and presided over libraries that have grown and changed in ways that nobody could foresee when you or any of the others were appointed. Also, if Thoreau's Libraries weren't now in fairly good shape, I admit that I'd be much less interested in this job. I want to be challenged, not overwhelmed. I'll also confess that I don't understand how you accomplished what you've done here, so I couldn't mimic you, even if I wanted to, but somehow you've managed to find ways to meet the challenges and still keep the Libraries on an even keel, and I intend to do the same. I expect I'll have to invent a good deal of whatever's needed as I go along, but that must be what you've done, too.

K.R.H.: Absolutely. I can't tell you how many times I've left here in the evening and realized on the way home that we'd done something that day, we'd accomplished or we'd decided something that I couldn't have imagined, much less described and done, at breakfast time. It's exhilarating. Also frightening.

D.J.H.: You sound like you'll miss it, though.

K.R.H.: No question. But I'm hoping Moosehead will help to fill the void. Moosehead's powerful medicine, at least for me it is.

D.J.H.: Earlier, when you said you were broadsided in 1971, you didn't say much about the climate on campus, either before '71 or afterwards. I wish you could help me understand whatever it was that prompted the growth here and at the other campuses and libraries during those first 20 or 21 years, from about 1950 or '51 on. How do you explain the contradictions in the record, too? On one hand, it's telling us the 1950's and the '60's were a time of unusual prosperity and the '70's were are regarded as a time of higher education retrenchment. You also describe the '70's as a time of austerity or at least of great difficulty, but then you say that funding in the '70's, at Thoreau and apparently at many other libraries, increased by a factor of two, or maybe more. How do you make sense out of that, and how much of it can be understood in terms of inflation, declining enrollments and declining revenues, or some other factors?

K.R.H.: So here we are! I knew we'd have to come to this and that I shouldn't try to kid you. And that's no ethical brag. It's realism. You're too bright, and I'm not glib enough to get away with much quackery. The plain truth is, I can recall and describe a lot more than I can explain, so the best I can offer is some things I know, some of what happened, and some hunches that may or may not sound like explanations. You're the judge. I hope you'll bear in mind, though, that our fortunes have usually reflected the University's fairly closely. I don't have perfect recall for every year since 1950, far from it, but in many or maybe in most years, we've gotten about 3.6 to 3.8 percent of the University's educational and general funds. As the University prospered, the Libraries did too, but no one ever handed us keys to the vault. Even so, we still think we're the heart of the University, but we're smart enough not to try peddling that notion at budget time. We could get about the same reaction, if we wanted it, by dragging our fingernails down a blackboard, perpendicular. It'd get attention, but no respect.

Let me back up 37 years and start at the beginning; I'll start with the earliest history I got to know around here. When I arrived on this campus in the fall of 1950, there were still some veterans around--World War II veterans--and the enrollments here were about as large as they'd ever been, slightly more than ten thousand students, with perhaps 16-1700 grad students included. A few of those veterans were my age, some even older, but the majority were some years younger, probably nearer the age your father was then. But because of their presence and their numbers, for a year or two right after the war, the average Freshman here was a little older than the average Senior, an odd development, but not uncommon at the time.

D.J.H.: My father is a veteran, one of that group; he'd been a Staff Sgt., 96th Division, Army, and I guess he was one of the million or so who couldn't or wouldn't have gone to college, if not for the G.I. Bill. We've discussed it often and he's still grateful for the chance it gave him. The whole family is.

K.R.H.: I might have guessed. There must be thousands of stories like your father's and your family's. The veterans and the G.I. Bill helped put us on the map, too. Anyway, back then, we were less heavily committed to graduate work than we are now, but we still had some respectable M.A., M.S., and Ph.D. programs, and that first year here, in 1950-51, we probably graduated 60 or 65 Ph.D.'s. You can also tell from that that the era of big science and large-scale research funding hadn't arrived yet. Then, a couple of years later, most of the veterans were graduated and gone, and enrollments declined slightly, then they started moving up and by the mid-60's they had doubled, up somewhere around 18-19 thousand, and including at least 3000 graduate students--just about twice the number we used to have. I think 175 to 200 new Ph.D.'s went out of here each year during that period, which sounds impressive, I suppose, but this was nowhere near our peak. During the last part of the '60's, our enrollment continued to climb, grad enrollment included, and by 1971 we graduated about 305 or 310 Ph.D.'s, but even that was not the peak. That came four years later, in 1975, which again was "your" year, the year of your Ph.D. Correct? Thoreau awarded 335 or 340 doctorates that year, many in fields we didn't support when I arrived here. Offhand, I can't say how many, but we and the Grad School have fairly good records on all that, if or when you need to know.

D.J.H.: It's not a matter of "if," and the "when" is likely to be real soon now, before the first fall meeting of the Grad Council, and it's because of those two or maybe three doctoral programs that look like they may be on their way out. If they're going to expire, I want to understand what that does to our commitments, and I'm hoping for some kind of a windfall.

K.R.H.: My suggestion would be to tell Ione or Ferd what you'd like to have. They'll almost read your mind, and they'll get the work done promptly and as thoroughly as you want. They're excellent professionals, both of them, with personalities that remind me of two cellos. Clear, confident, and wise. Hard to decide whether it's their range or their depth that's most impressive.

D.J.H.: Great; I appreciate the suggestion. Any idea which one could fit it in and get it done between now and about mid-July?

K.R.H.: Either one. I've known them both for almost twenty years and have never seen either one beg off or back away. I know you wouldn't exploit them, but they're so good, you'll be tempted. Believe me.

Was I reminiscing about enrollments and Ph.D.'s? Must have been. Well anyway, during that first 25 years around here, enrollments went from 9-10 thousand to 22-23 thousand, the Grad School went from 16-17 hundred to about 42 hundred, and the new Ph.D.'s from less than 70 during that first year to more than 330 at the peak. Since we hit the peak, a dozen years ago now, we've dropped to something like 280. Most major campuses have dropped, too, but in percentage terms, the national trend is a lot different from what we see at the "majors." In fact, judging from some things I've seen, there must be campuses somewhere that are going directly counter to the trend, and graduating more doctorates now than they did five, ten, or twelve years ago. Nationally, since that peak year in '72-73, the drop-off in new Ph.D.'s has been just about five percent, not 15 or 16, like Thoreau's; or 22-25 percent, like Cornell's, Columbia's, and Michigan's; or 40-50 percent, like Chicago's, Duke's, and Harvard's. So, the conclusion's inescapable: The established and the big-time campuses, and the fairly well established ones, like Thoreau, have cut back substantially or drastically, but the national statistics barely hint at that, so there have to be other campuses somewhere that are taking up most of that slack.

We cut back the way we did because of reductions in the available support, in demand, and just generally, in justification for new doctorates in the numbers we'd been generating. It was decided here that the University had to respond, although some faculty--younger ones mostly, working to get established--were not real happy about it. During the "boom" years, we grew and others did because there was a young population to be served, there was broad support and encouragement to serve them, the country's research enterprise and the campuses were expanding fast, and they were absorbing large amounts of new talent. Here, like other places, we were working both sides of the street; we created demand by growing and created supply to help fill it. Maybe we grew, too, because the momentum got so great it sustained itself. There was a lot of good feeling about what the colleges and universities were doing and could do.

Although we cut back on the Ph.D.'s coming out of here, our total and our grad enrollments have behaved differently. Both have been allowed to stabilize somewhere near the peaks they reached in the mid-70's. Total enrollment's been holding somewhere between 23 and almost 25 thousand since 1975 or '76, and in that same period, grad enrollments have increased slowly, going from about 42 hundred to 49 hundred. But some things have changed so much, it's hard now to reconstruct how they were. Diane, during those first 12 or 15 years, when I took a walk on campus--like I still do--I could safely assume that, of the students I saw, about one in seven was a grad student, and in the earlier years, I recognized and even knew many of them. But for almost twenty years now, that ratio's been two in nine or one in five, and I know an embarrassingly small number of the ones I meet. Nowadays, the task is so much larger, memory's poorer, and I guess it's a generational thing, besides. Quite a few have PC's or they've got access to terminals, too, so maybe they don't come see us so much anymore. But I'm digressing again . . . .

D.J.H.: Maybe it seems that way to you, but it's good background for me, and I appreciate it. The developments in the Libraries take on more meaning and different meaning when you fold in the other things that were happening here and when you fill in some of the human side.

K.R.H.: Well, good. I obviously like it too. Always did, even when it was only current events, but the danger is that I'll slip over the edge and begin to sound exactly like one of Sam Clemens' garrulous old people. If you'll let me, though, I'll risk that just long enough to describe a piece of related history that got published back in the early '70's, a thing by Wolfle and Kidd--AAUP Bulletin, probably. They reviewed doctoral training in the U.S. and they said the first Ph.D. was awarded at Yale, our Ivy League neighbor to the south, in 1861. Then, during the next 109 years or so, at least 340 thousand Ph.D.'s were awarded nationwide, but they said too that over half of those belonged to the last nine or ten years of the period. Imagine! Then they summarized some published predictions of how many new doctorates were expected during the '70's, estimates that ranged from about 370 to 520 thousand. So now, if you check the NCES statistics, you can see that, even with big cutbacks here and elsewhere, the ten-year total for the '70's was still about 330 thousand, or just a little less than the most conservative estimates had predicted, which suggests to me that for more than a decade, the universities were graduating a large surplus of Ph.D.'s, present company excepted, of course, and that the production built up a momentum that's been very difficult to affect or regulate.

But, coming back to the campus here: During the big growth years, before 1971, I found that getting funds was one of the easiest parts of this job. Back then, if we failed to get an almost automatic increase of ten percent, we thought we'd been shorted. The more difficult part was finding and persuading enough good people to come here and help us staff this place, while we continued to expand our coverage, as we had to, and to move out and colonize new territories. Space modification and space planning were another nearly constant task, but that's also something you never put aside for long, then or now. Even in ordinary times, growth requires major construction or some equivalent solution every dozen years or so, as you already sense, or know.

D.J.H.: Space, people, money. People, money, space. Money, space, people. Cycling and alternating, something like a fugue, an administrative fugue, isn't it?

K.R.H.: It is, and like juggling, too; keep a couple of things in the air and one thing in hand, but be careful not to dwell on anything longer than you must. If you get distracted or lose the rhythm, you might lose it all.

For a time, when the big task was to find staff, we recruited at most schools this side of the Mississippi; we raided, but of course we were raided; and we came fairly soon to a stage where the staff was distinctly tilted toward the nonprofessional side, by almost two-to-one. It's still nearly that. Composition of the staff had been right at one-to-one originally, when I came here, but we couldn't recruit the people to keep it like that, and now, in most of the recent years, I doubt we could afford to. As it is, we've never spent less than 52 or 53 percent of our total on salaries and wages

--not counting fringes--but on top of that, the competition that makes and defines a seller's market, and commitments we'd already made, pushed that figure up to 58 or 59 percent during part of the 1960's and early '70's, but didn't peg it there. And Diane, if you haven't heard it already, I need to tell you that some of the worthies you'll deal with here still don't want to recognize that a library is an inherently labor-intensive place, even or still now, in the proclaimed age of automation. They think we should do a great deal more with "systems" and not add staff to this so-called empire. They also skip over the fact that, before automation or information tech came along, they--or their campus ancestors--had other reasons, that were equally unconvincing, to me anyway.

So, with salaries and wages that always consume a full or a generous half of our dollars, we've also consistently spent a third on materials and binding, some years slightly more or slightly less, and that leaves maybe 12-13 percent of our money for everything else. These days, that amounts to a million-three or a million-four, but it's not and never was enough to send us in headlong pursuit of every automated system we discovered or could imagine. Still, I've had no reason to regret that. Instead, I view it as some others don't, and the least controversial part is the view that books, journals, and print-in-general are not yet endangered; they remain far and away the first order of business, and they will for the foreseeable future. As far as I'm concerned, this is exactly the same expectation that explains why a half dozen of the largest and most respected ARL libraries find it necessary to add 200 thousand volumes a year or even more. How else could you explain it?

D.J.H.: I know what you mean. At that level, their acquisitions must translate into expenditures of several million dollars; more than five million, but less than ten, I would guess. It wouldn't make sense to spend that kind of money, if there were workable alternatives. And of course, the logic's the same at any level, ours included. What's the current figure here? About 3.5 million, or is it more?

K.R.H.: I'd guess it's 3.7, binding included, but you'll have the 1987 figures soon and can see for both of us. And the way we got to that figure, whatever it turns out to be, was something like this: We tried to take care of the staff first, then we eked out everything we could for acquisitions--plus the bit that goes for binding--<u>then</u> we proceeded to see what we could accomplish with the rest. Lately, one way or another, we've been spending something more than five percent of the total on automation, but we've always found, too, that larger commitments were more than we could manage; too many things demand those same dollars. I can't guess how technology and the other demands may look a few years from now. The potentials and the incentives will change, but who knows how? A Cray in every closet, maybe? Anyway, my suggestion, or the attitude I've operated with, is: Before moving to adopt things that're new and major, assess whether the faculty is ready or ready to get ready for them; with a dful of exceptions, they're still not ready for fiche or microfilm.

Look at Thoreau's faculty roster and you'll see that we've got almost 1250 faculty in all three ranks, and nearly two-thirds of them are tenured, so they're likely to be around here for years to come, or at least until academic mobility returns, which isn't imminent. Actuarial intuition, if there is

such, says to me that about half of the people on the faculty right now will probably spend the rest of their careers here, which could mean twenty or twenty five more years. As a group, they're still fairly young, somewhere around 48 or 50 years old, on the average, and there's no shortage of recognized and aspiring producers among them, so their research and teaching interests are likely to be in evidence for years to come. If you can believe that, then you may look around here in 2007 and see 625 faces that you got to know and were helping to serve in 1987. Since I don't expect to be here then, I can afford to say that I expect those survivors will still be contributing to the literature and using it very much as they are now, as their mentors did before them, theirs before them, and as they've all been recognized and promoted for doing. If the academic reward system changes much, this prophesy could end up looking pretty silly, which to my mind is like the astrophysicists looking silly when the sun rises in the west. We all must take some risks.

D.J.H.: Keith, why is it that so much of what you describe comes out in the form of numbers: enrollments, expenditures, percentages, and rates of increase; plus calendar years or fiscal years, f.t.e.'s, holdings, and acquisitions? About the only thing you missed was the G.I. Bill; you didn't call it P.L. 346, as Dad always has. If you have reservations about the accuracy or the worth of the numbers, they're not apparent to me. I'm curious to know how a word-person, which is what most of us are--and I sense that you are, too--comes to rely so much on numbers. Are the statistics from here and the other campuses as descriptive and dependable as you seem to say? The majority view that I keep hearing differs quite a bit from yours.

K.R.H.: I'll say something about dependability, but ought to say first that institutional statistics are an acquired taste, like anchovies or Danish blue or other things we used to avoid, even before sodium and cholesterol gave us reasons, but they're also more. They are an important part of the reality we've got to deal with, and I contend that they're necessary for understanding. Besides, they can be both sword and shield in battle. The last time I was accused of uncontrolled spending, I had figures to show that our per-student expenditures for this year will be near 425 dollars and, if this seemed high, just consider that there are at least a half dozen places on or near the East Coast, none very far away, that were spending no less than twice, even three times as much per-student. I could and I did show too that we rank right in the middle of Thoreau's peer group; half spend more and half spend less, and there's never any doubt around here which half we consistently, consciously identify with. You and I both know well enough--but we don't necessarily have to advertise the fact--that expenditures-per-student are not an ideal statistic, since total enrollments have a lot to do with the statistic, but much less to do with the library. Philosophically and empirically, it makes more sense to consider grad enrollments or, better yet, to consider the number of doctorates or doctoral level programs we need to support. Those matter more, but aren't ideal either; nothing is.

There's another statistical case in point that involves the staffing situation. Our staff numbers show we've only been able to add a few f.t.e.'s in the last twelve or fifteen years--about 25 since 1973--but we have more responsibilities, including a lot more geography and 900 thousand more volumes to superintend, than we had then. Statistically, just ten percent

of the staff has been added since '73, but virtually every other thing around here has increased much more than that. It's perfectly obvious, too, that the payoff from arguing this case is still incomplete, but there's good, maybe excellent, reason to think that the requests you make will be treated with attention and respect.

D.J.H.: I hope you're right, but at least the problem's not new to me. At INU, we had a very similar situation, although there, as you can imagine, it's on a smaller scale.

K.R.H.: Here, the tight situation with staff, recruiting, and pay is one of the two big legacies of 1971 and the years that followed; the other was the protracted and, for too long, the intractable problem with declining acquisitions. In 1970, when we were still prospering, we added about 94 thousand volumes, gross, and in '71, about 96 or so, then we lost ground almost every year through 1982, when we only managed a little less than 68 thousand. The recovery since then has restored much of that loss, so I estimate that the 1986-87 figure will be at least 90 thousand, or about the same as the figure for 1969. Looking back over all the years, I think we can see now that for about twenty years we had the resources and we could acquire things rapidly enough to satisfy most of the faculty's serious requests most of the time; and now, after more than ten years of struggle and frustration, we're almost back to the point we first reached in '69. We can meet most needs again--but we can't recover any of the lost ground, and that's a pain.

D.J.H.: I won't press you to talk about other regrets or pains, if you'd rather not, but if you really don't mind, I'm sure I can learn more from autopsies than I can from your successes, especially any of the easier ones, before 1971. As much as I'd like it, I don't expect to see those conditions revived for my benefit, so the successes that came with them don't have very much instructional value for me. Besides, in the marketplace, a failure should have extra value, based on scarcity, like an antique does. There are lots of successes advertised, but not many ads for failures, so it must follow, they're a scarce commodity.

I'm kidding, and I shouldn't.

K.R.H.: Diane, if I can't be philosophical about it now, I'm wasting what may be the last chance I'll get. The fact is, like anyone who's been at it as long as I've been--or was--my mistakes include some lulus, but the other problem is that I often don't know with any clarity what the lesson or the moral was. There were decisions, though, 15-16 years ago that still come back to bother me, so I'll tell you a little about them. First and foremost, in 1971, when we saw that the budget wouldn't cover the increases we'd planned, I put a hold on recruiting, and that's how Thoreau became one of the many places that couldn't hire you or any of your classmates; we downgraded projects and gave 'em lower priorities--and a lot were just consigned to oblivion; we began canceling duplicate subscriptions; and we trimmed other orders as fast as we could. I thought then that we could trim things like that and live with the consequences for a year or two, if we had to, but in the meantime, we couldn't afford to unsettle the staff and risk losing good people who would have to be replaced right away. We committed heavily to keeping salaries in line, even a little ahead of it,

and almost sixty percent of our spending went for salaries and wages. That wasn't normal, but neither were the pressures, and I expected they'd ease soon, because all of my experience told me that. If I'd been a hard-nose and sent several staff down the plank, I don't know if that would've helped. Maybe, but I'd have felt lousy. As a matter of fact, I still don't feel great about any of it, or much wiser, either.

So . . . , then the pressures continued, and they increased, and I had a mess on my hands. We managed to hang on and we weathered 1971 and '72, then after that, even though we got our funds increased pretty steadily again, increases that amounted to 2, 3, or even 400 thousand--just about 7 to 10 percent--this was never enough to compensate. And while acquisitions were sliding a few thousand each year--first from the mid-90's down to the 80 thousands, then into the 70's, and finally the high 60's, before we got them turned around in 1982-83--we were in no shape to think about adding staff, regardless of the needs we had. Those funding increases never overcame our problem, but I still can't see that inflation is the explanation. Materials costs and cost increases are perennial problems, but we always managed to live with them, and for a long time we even prospered.

I'm not denying that inflation's a part of our 1970's problem, but I just can't say how large a part, because good, generalizable cost figures are so darn hard to get; too much of what I find is anecdotal. What's it mean, anyway, if some respected, highly specialized Swedish or Czech journal jumps its rates 89 percent in one year? No one can generalize from that kind of thing. But salary money's different; it at least should mesh with the Consumer Price Index reasonably well, so we ought to be able to use CPI to estimate whether the salaries we're paying have gained or lost much. Still, when I've reviewed Department of Labor's CPI data for the '70's, and I've done it more than once, they not only give no comfort, they don't generate much insight, either. From year to year, the CPI inflation gauge is all over the place. The worst years were 1974, '75, and '79, when CPI increased about nine to eleven percent a year--and 1980 was worse still--but the other years range between maybe 3.3 and 7.7. Problems around here were a lot more constant than that, and that's something I wish I could understand and explain.

I shouldn't take any more time trying to describe the '70's, since it must be evident now that I don't understand more than I've already tried to say. Our funds were always increasing; we held onto the staff we had, but could only add a few; salaries went up fifty percent, or a shade more than that, but the money bought a little less in '80 than in 1970; and during most of the time, our acquisitions were dropping at a rate that's unpleasant to recall. Inflation surely played a role there, but I don't think it triggered the problem, because officially, inflation in '71 was only about 4.3 percent and in '72 it was maybe 3.3--both are modest numbers--and relevant, too, because salaries accounted for 57 or 58 cents out of every dollar we were spending. But in spite of all that, 1971 and '72 were really bad years. So it's still my opinion that the decade won't be understood until someone who's qualified and interested makes a thorough study of the times. You've done your dissertation and I'm too old to start one, so I guess we'll have to rely on somebody else. If you know any candidates, I'd like to meet them. Seriously.

Shall we quit now or do you still want to discuss statistics and dependability?

D.J.H.: I'd like to hear your views, although I suspect already that we come at these things differently. To me, the very idea that Thoreau or Illinois or any other library could claim to know that it had 2,549,483 or 7,000,170 volumes in its collections or that the university could know that its fall enrollment was, say, 24,615 or any other precise number is, to be as charitable as I can, not frightfully convincing. Even if there were no status connotations involved in things like collection size and current acquisitions--or I really should say especially in collection size and acquisitions--anyone would still have to doubt. The pretense of precision is just that, pretense.

K.R.H.: You'll get no argument from me, Dr. Hershey, but even if I disagreed, I wouldn't proselytize. I think you're saying, too, and I'd agree again, that whatever's true of one statistic at one time may not be true of others or other times; the counting of staff and of volumes added, for example, present different sorts of questions. And when expenditures and inflation or enrollments are considered, the accounting problems are different still. But I'd also observe that whoever challenges credibility, based on their finding a few dubious or even demonstrably incorrect statistics among many, fails at the task. You can't generalize from that kind of evidence; nevertheless, challenges like that sometimes appear. A second thing to say is that schemes to avoid quantifying provide no relief; impressions are no substitute. It's too easy for them to shift this way or that, even while the state-of-the-universe remains unchanged. Lord Kelvin said it better, of course: When you can measure and express in numbers, you know something, and when you cannot, the knowledge is of a meager and unsatisfactory kind. Alongside that, why don't we recognize too that the levels of precision required for work in the sciences have no practical value or relevance for our work? The sciences need precision to determine what happened and when, to make and defend choices between closely competing or rival accounts, but cryin' out loud, if we could know precisely what a volume was, precisely how many are in Thoreau's collections, and precisely how to tally and convert "X" reels of microfilm or "X" fiche, or maps, or tapes, or documents into some "volumetric" equivalent, the practical effect on decisions would be nil.

I may be showing my age or battle scars, but I'm convinced that resistance to statistics is often based, shall we say, on the statistics' "low coefficient of malleability." Once we've bought in to using statistics, they will sometimes direct us toward non-preferred conclusions, or in some "worst cases," they may even rule out a result we think we'd prefer. So, for someone who'd like to dodge or blunt those consequences, challenges and subtle stuff are not bad tactics; better to cast doubt early than run the risk of some future awkwardness.

There's a parallel case to ours in the University's instructional program; at least I think there is. About fifteen years ago, Thoreau and many other places adopted and began expanding the use of instructional ratings, mostly if not exclusively in undergraduate courses. I'm one who thinks Thoreau's adopted system is a good one, although not because students' ratings have impeccable validity, anymore than many institutional statistics, or new

housing "starts," or the Consumer Price Index have, but they are informative nevertheless and they're as worthy as any of the several imperfect alternatives. Some of the faculty heartily condemn the ratings and, so far, when they're given the work of Sullivan, Marsh, Centra, McKeachie, or the others in the field, it doesn't seem to faze them. If that isn't a matter of tactics, I don't understand. None of us will ever know what a great teacher, great economic prospects, or a great library are. Not precisely. We have to deal with approximations.

D.J.H.: That's more like it. We're much nearer agreement than I thought.

K.R.H.: Your last note would be a good one to end on, but let me just add one final thing. Earlier, you asked how a word-person got a taste for numbers. Well, for me, that taste got whetted years ago, when my mentor--"Mr. M," he was to most of us--just happened to mention the discrepancy between the popular campus conception of an academic library and a fundamental reality of all these places. Popularly, they're thought of as havens or tranquil harbors--maybe shrines or sanctuaries would be better words--of the mind, the spirit, the creative vapors, or any of the airy, gossamer things that float around like puffs of smoke or maybe like Typha latifolia spores. But the reality is that this place, just like every other academic library, exists to provide access to the collection; the collection's in the stacks; and structurally, stacks have to be designed and constructed to handle live loads of 150 pounds to the square foot, the same structural specs that apply to a heavy manufacturing facility. Diane, if it ever gets too quiet around here, you could set up a machine shop in those stacks. Now I'll confess that for a while, I found that notion hard to accept, but I checked it with Robin, and you can check it with any structural engineer. They'll tell you there's nothing ethereal about any of it; they probably won't say "ethereal," but that's what they'll mean.

Enough? May I rest my case?

D.J.H.: No further questions. Thank you again. Enjoy Moosehead, and when you get back to town in the fall, please give me a call. We should know by then who owes lunch to whom.

K.R.H.: Thanks. I will. And good luck; Thoreau is fortunate to have you here, and I know you'll do well.

Pages 160 through 178 are omitted from this Second Printing.

Appendix D

Subgroups Based on 1985 Data

The Purdue study reports define and name four ARL subgroups that are determined directly from the libraries' 1962-63 VH, or collection size. The subgroups include 14 "large," 15 "medium-large," 15 "medium-small," and 14 "small." Libraries comprising each subgroup are listed in Table 3, above.

When 1984-85, rather than 1962-63, VH data are used to re-create the four subgroups, their composition is as follows:

The 14 "large" libraries are California, Berkeley; California, Los Angeles; Chicago; Columbia; Cornell U; Harvard; Illinois; Indiana; Michigan; Stanford; Texas; Washington, Seattle; Wisconsin; and Yale.

The 15 "medium-large" libraries are Duke; Iowa; Johns Hopkins; Kansas; Michigan State; Minnesota; New York U.; North Carolina; Northwestern; Ohio State; Pennsylvania; Pennsylvania State; Pittsburgh; Princeton; ard Virginia;

The 15 "medium-small" libraries are Brown; Southern California; Colorado; Florida; Kentucky; Louisiana State; Massachusetts Institute of Technology; Missouri; Oklahoma; Rochester; Rutgers; Syracuse; Utah; Washington, St. Louis; and Wayne State.

The 14 "small" libraries are Boston U; Cincinnati; Florida State; Iowa State; Maryland; Nebraska; Notre Dame; Oregon; Purdue; Temple; Tennessee; Texas A&M; Vanderbilt (Joint U.); and Washington State.

Appendix E

Inflation Factors (Columns 3 and 5) Used in Fig. 29*

Column 1	2	3	4	5
Year	Consumer Price Index (CPI-U) 1967=100	Inverted and 1984=1.00	GNP Implicit Price Deflator 1982=100	Inflator 1984=1.00
1984	311.1	1.000	108.1	1.000
1983	298.4	1.043	103.8	1.041
1982	289.1	1.076	100.0	1.081
1981	272.4	1.142	94.0	1.150
1980	246.8	1.261	85.7	1.261
1979	217.4	1.431	78.6	1.375
1978	195.4	1.592	72.2	1.497
1977	181.5	1.714	67.3	1.606
1976	170.5	1.825	63.1	1.713
1975	161.2	1.930	59.3	1.823
1974	147.7	2.106	54.0	2.002
1973	133.1	2.337	49.5	2.184
1972	125.3	2.483	46.5	2.325
1971	121.3	2.565	44.4	2.435
1970	116.3	2.675	42.0	2.574
1969	109.8	2.833	39.8	2.716
1968	104.2	2.986	37.7	2.867
1967	100.0	3.111	35.9	3.011
1966	97.2	3.201	35.0	3.089
1965	94.5	3.292	33.8	3.198
1964	92.9	3.349	32.9	3.286
1963	91.7	3.393	32.4	3.336
1962	90.6	3.434	31.9	3.389
1961	89.6	3.472	31.2	3.465
1960	88.7	3.507	30.9	3.498
1959	87.3	3.564	30.4	3.556
1958	86.6	3.592	29.7	3.640
1957	84.3	3.690	29.1	3.715
1956	81.4	3.822	28.1	3.847
1955	80.2	3.879	27.2	3.974
1954	80.5	3.865	26.3	4.110
1953	80.1	3.884	25.9	4.174
1952	79.5	3.913	25.5	4.239
1951	77.8	3.999	25.1	4.307

* The CPI-U data in Col. 2 are from the U.S. Dept. of Labor and are based on a 1967 index equal to 100. The GNP Implicit Price Deflator data in Col. 4 are from the U.S. Dept. of Commerce and are based on a 1982 index equal to 100. For use in Fig. 29, both CPI-U and GNP were recalculated with magnitudes in reverse order and with 1984 equal to 1.00, as shown in Cols. 3 and 5. Data sources are shown in the Reference list.

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16. Abstract (Limit: 200 words)

This research extends the "Purdue studies" of research library growth, presenting results that include library statistical trends during a 35-year period, 1951-1985. It serves to update Purdue's nine-report series (1965 through 1973) and is a validation study of Purdue's growth forecasts, 28 of which were published in 1965, then revised in 1971. The research libraries considered here represent 58 "first tier" American research universities that were members of the Association of Research Libraries (ARL) in 1964, when the Purdue studies began; all are members still.

The results describe 35 years of growth and change in library holdings, volumes added, professional and non-professional staff size, and in three expenditure categories --- salaries, materials and binding, and total, plus university/main campus total and graduate enrollments, and Ph.D. degrees awarded. Growth trends are reported for eight "composite" libraries that differ in size, i.e., the average or mean; the median, first quartile and third quartile; and four collection (or holdings) sub-groups, the "large," "medium-large," "medium-small," and "small." Correlational findings also show the strength of relationship, year-by-year, among the study variables.

Some estimates of future growth through 1990 are presented, together with suggestions for further research.

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