# From Binkley to Bush[1]

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INSOFAR as documentary reproduction was concerned, the decade 1936-1946 might appropriately be termed from Binkley to Bush. In 1936 the late Dr. Robert C. Binkley had just published his challenging article "New Tools for Men of Letters" in the *Yale Review*,[2] and was engaged in seeing the new edition of the *Manual on Reproducing Research Materials*[3] through the press. In 1946, Dr. Vannevar Bush has just published his equally significant article "As We May Think" in the *Atlantic Monthly*,[4] to have it abridged with speculative illustrations in *Life Magazine*[5] and later appear in a volume of collected essays entitled *Endless Horizons*.[6]

It would perhaps be difficult in present day academic life to find two men whose fields of specialization were further apart. Dr. Binkley, working in the humanities, was a research scholar, historian and teacher of note, while Dr. Bush, one of the leaders in science at Massachusetts Institute of Technology, subsequently became the Director of the Office of Scientific Research and Development and later of the Carnegie Institution of Washington. He is a scientist of the first rank, an inventor and an administrator. Basically, however, the thinking and achievements of these two men are closely related—so closely in fact as to form almost the textbook illustration of the universality of knowledge.

"New Tools for Men of Letters" was in essence a brief statement of the conclusions formulated by Dr. Binkley as an outgrowth of his work as Chairman of the Joint Committee on Materials for Research. This Committee, sponsored by the Social Science Research Council and the American Council of Learned Societies, was organized to investi-

[1] Paper presented at the 61st annual meeting of the American Historical Association, New York City, December 28, 29 and 30, 1946.

[2] *Yale Review*, Vol. 24, pp. 519-537, (1945).

[3] Binkley, Robert C., *Manual on Reproducing Research Materials*, Edwards Brothers, Ann Arbor, 1936.

[4] *Atlantic Monthly*, Vol. 176, pp. 101-108, July, 1945.

[5] Bush, Vannevar, "As We May Think", *Life*, Vol. 19, No. 11, pp. 112 et. seq.

[6] ——— *Endless Horizons*, Public Affairs Press, Washington, D.C., 1946.

gate advances in technology that might be applicable to the humanities. Its first chairman was Dr. Solon J. Buck, now Archivist of the United States, and Treasurer of the American Historical Association. Dr. Binkley at that time was the Executive Secretary. A *Manual on Methods of Reproducing Research Materials* that was actually a working outline was issued in 1931. Only a small number of copies were printed and it may be noted in passing that bibliographically speaking, this first manual has become one of the extreme rarities. When Dr. Binkley succeeded to the Chairmanship of the Committee, his full energies were devoted to the preparation of a second edition of the *Manual* which was completed and issued in 1936. Its 207 pages represent an intelligent and meticulous survey of scientific methods of arranging, reproducing, and using data with emphasis on scholarly applications. The *Manual* has become classic in the field, Dr. Binkley's summary article, "New Tools for Men of Letters" is a point of departure for constructive thinking.

No better expression of Dr. Binkley's major premise can be found than his initial sentence, "There is taking place in the techniques of record and communication a series of changes more revolutionary in their possible impact upon culture than the invention of printing." The telegraph, the telephone, radio, teletype, television, methods of textual and pictorial reproduction by photography, near-print, textual duplication through the hectograph, the mimeograph, the multigraph, offset printing, and finally the then comparatively unknown technique of microphotography were discussed and evaluated. The comparative novelty of Dr. Binkley's opinions on research in the humanities with emphasis on techniques, that were then and even now are relatively uncommon, has obscured his penetrating analysis of the growing formalization of research in the humanities. While the scientist may spend months or even years in mastering the tools of his trade, in the humanities similar study for like purposes is so uncommon as to become noteworthy. The use of the microscope, the slide rule, the microtome, photomicrography, the mastery of the art of assembling chemical and physical equipment, even the manipulation of the chemical balance and related studies are eagerly embarked upon by the budding scientist. The fledging scholar tends to secure his acquaintanceship with the library, library processes, manuscripts, paleography, syllography, epigraphy, numismatics, and related topics fortuitously or even casually. Only in the field of languages is much attention devoted to conscious preparation. The student scientist or scholar who receives planned instruction in methods of note taking, organization and presentation, is a fortunate member of a microscopic minority.

Dr. Binkley, as a practicing scholar, historian and teacher fully

appreciated the potential value of aids to scholarship that were being overlooked, almost as it were viewed with distaste, from the classic ivory tower. He knew first hand the emphasis placed on production and said "A research scholar must publish or be regarded by his university as a drone." He knew too that the reservoir of recorded information had grown so vast and the means of tapping it were so inadequate that a new approach was essential. Thus he concluded that an investigation of the entire mechanics of historical scholarship from all aspects including the gathering of information, arrangement, use, and finally dissemination was a proper, in fact a necessary, study for scholars in the humanities.

Dr. Vannevar Bush is one of the foremost scientists of the country. It might even be said that he is a scientist of the scientists, with almost a blind spot in the field of the humanities. He too was confronted with the problems of documentation, not precisely in the same sense that Dr. Binkley encountered them, for emphasis in the sciences is always upon the latest and most current advances and contributions. He felt the need for systematization of knowledge in order that it could be tapped instantly and at will. As all scientists are at least in part inventors, Dr. Bush at MIT built experimental machinery designed to accomplish the desired result. He drew upon at least in analogy the vast mechanical brain with its miles of complicated electric wiring, thousands of electronic tubes, and associated devices that can solve in a relatively short time problems that would require the complete energies of a corps of mathematicians for a period of weeks or months. Mechanics, mechanisms, and fringe advances in many fields are a part of the stock in trade of the scientists. Dr. Bush in his article "As We May Think" envisages new ways to extend recorded knowledge through photography, methods of reducing the written record to manageable size and mechanical means of recording, possibly through the use of sound reproductions. He even visualizes a mechanical secretary capable of typing from dictation, and a thinking machine or a method of mechanical calculation that could resolve problems and produce correct answers with almost unheard of efficiency. He has projected a system for data organization to the end that files of information can be searched mechanically with non-objective stimuli, that is to say, a data file would be so arranged that it can be sorted by machine in precisely the same way that the human brain picks up a relevant trail through the association of ideas.

Dr. Bush has gone so far as to suggest actual machines that in laboratory form at least can perform some of these tasks satisfactorily, and has pointed out developments that show promise of being reduced to working actualities. That his motivation comes from, and his work is

directed to, the physical sciences is evident, but it is equally true that Professor Bush's thinking applies in the same degree to the humanities.

There is always a noticeable space between the leaders of a movement and the led, for if there were no followers, however valuable the thoughts, plans, and deeds of the leaders might be, they would be ineffective as if surrounded by a vacuum. Before Binkley and after Bush there have been many significant and in some cases unacademic and unscientific uses of the techniques and some of the methods that these two men developed, applied and enunciated. Individually, many of the developments are commonplace; collectively, they represent a decade of progress.

These ten years have seen scientific aids to learning develop and expand on many fronts. Probably the most spectacular development has been in the field of microphotography. The material implementation of microphotographic techniques has been rapid and effective. Rotary and flatbed cameras capable of fast and economical operation have been produced by several manufacturers. Processing equipment, from primitive hand methods, has been mechanized. Processing machines are now the rule rather than the exception; printers, auxiliary equipment, and finally reading machines are available in several models at various price levels. The reading machine situation, although adequately covered, is still something of a sore point, for the better machines cost about $450 and as a result are usually found in small numbers in libraries and institutions, not in the hands of the ultimate consumer. Smaller readers, specifically the one perfected by the Committee on Scientific Aids to Learning, were made available to individual scholars at a low figure; several thousand are now in use.

As the machines and the know-how to use them efficiently have been provided, many activities of profound interest to the humanities have been originated and carried through. Possibly the least publicized but in the long run the most effective, has been the establishment of services for copying individual materials to order. Most of the great libraries and archival institutions and many of the smaller ones are now ready to supply facsimile reproductions of their holdings in the form of microfilms at nominal rates. One of the early projects in reproducing a scholarly reservoir of material was that originated by Mr. Eugene G. Power, known as the English Books Project, wherein early English books listed in Pollard and Redgraves' bibliography were reproduced for a number of the larger research libraries. Brown University sponsored an endeavor to mine the resources of the vast Medina Library for the benefit of scholars in all the Americas. Newspaper files in great numbers have been reproduced individually or collectively partly to

preserve the texts that were in danger of progressive disintegration and partly to make files of certain key papers available in many localities. The Library of Congress has taken the lead in the newspaper copying program, and its resources have been immensely enriched thereby. In the field of manuscript reproduction, equally great steps have been taken. The National Archives in Washington originated and carried through a program of great potential significance to present and future historians. The File Microcopy Program is an effort to bring the resources of the National Archives in the form of microfilm facsimilies to the scholar wherever he may be located. Complete series of documents, often amounting to 100 or more volumes, have been reproduced as master negatives with introductory notes. Positive copies are available at cost, for by underwriting the cost of the negative the National Archives has made the purchase of the positives convenient and economical. To date there are 106 completed File Microcopies, amounting in all to 1,842 rolls of microfilm. The subject matter is extremely diverse; census schedules, lighthouse letters, land grant information, diplomatic dispatches, consular papers, territorial papers, Indian Affairs letterbooks, records of the Russian American Fur Company, documents of the Office of Engineers relating to internal improvements, and many others. The complete manuscript holdings of the Naval Records and Library amounting to 1,564 rolls of microfilm are also on file in the National Archives.

Of far greater scope and more universal application within the humanities was the enterprise organized under the direction of Dr. Waldo G. Leland of the American Council of Learned Societies, to reproduce manuscript materials in English depositories that were menaced by contingencies incident to World War II. With a generous grant of funds from the Rockefeller Foundation, a Committee on Microcopying Manuscripts in English Depositories headed by Mr. Keyes D. Metcalf, Director of Libraries of Harvard University, undertook the task. A subcommittee directed by Dr. Herbert A. Kellar provided a monumental want-list in an incredibly short time. A contract was entered into with University Microfilms for the production of the film, and in England, work went forward immediately in libraries, archives, and on occasion in abandoned mines and other isolated repositories whence the originals had been evacuated for safety. To date, between five and six million pages have been reproduced and brought to America. An important and integral part of the plan, the listing and cataloging of the films, is going forward at the University of Michigan. The results will be published by the Modern Language Association. The negatives are being deposited in the Library of Congress and reproductions can be furnished by then in the usual way.

Manuscripts, newspapers, and books therefore are being reproduced in large numbers. There is in fact a union list of microfilms issued by the Philadelphia Bibliographical Center and Union Catalog. The latest publication of this group, Supplement No. 4, 1945,[7] raises the total of listed entries to 16,386, and an entry may be a single volume or a long series.

While microfilm has received considerable emphasis there have been equally significant contributions along similar but somewhat divergent lines. One of the most interesting examples has been the work of Mr. Albert Boni, of Readex Microprint, who evolved a method of combining microphotography with conventional printing to produce 100 pages of text in reduced facsimile on each side of a 6x9 inch sheet of paper. His initial trial publication included the compendious bibliographies of Sabin, Evans, Harrisse, and Church that are complete in a slip case the size of a thin octavo volume. Through the activity of a committee of the American Historical Association headed by Mr. Edgar L. Erickson, Mr. Boni was engaged to reproduce the "British Sessional Papers", about 5,800 volumes in all, amounting to some four million pages. Although seriously handicapped in his work by the war, Mr. Boni has according to last reports made considerable progress in the reproduction of negative matrices and has delivered the first five years to subscribing institutions. A specialized reflex reader, known as the Readex, is used to read the miniature prints.

In 1944, Mr. Fremont Rider, Librarian of Wesleyan University, brought together a most interesting and thought-provoking series of essays in a book entitled "The Scholar and the Future of the Research Library".[8] After demonstrating that research library holdings tend to double in bulk each 16 years, Mr. Rider projected his statistics into the future, and drew some startling conclusions on space requirements, to say nothing of the accessibility of recorded knowledge. He proposed a solution through the reproduction of entire texts at high reduction on the back of conventional library cards, in the belief that the physical bulk of storage could be reduced to manageable dimensions. The Rider microcard was received with mixed enthusiasm by librarians, scholars and technicians. It is still being studied and a few experimental cards, together with a machine to read them, have been made. Mr. Rider's book is well worth more than a casual glance, for in it will be found much food for thought and considerable cause for alarm.

A further series of developments of equally great potential significance can be loosely grouped together for purposes of discussion under

[7] *Union List of Microfilm,* Supplement 4 (1945), Philadelphia, 1946, 144 pp. (mimeographed).

[8] Rider, Fremont, *The Scholar and the Future of the Research Library,* New York City, Hadham Press, 1944.

the term miniature facsimile. This somewhat anomalous term is intended to describe processes of documentary reproduction in reductions not greater than five linear diameters. Dr. Bendikson, at the Huntington Library, some fifteen years ago became interested in so-called economy photostats to bring reproductions within a price bracket compatible with scholarly financial resources. More recently Edwards Brothers, applying the technique of miniature facsimile to publication, brought out the depository set of printed cards issued by the Library of Congress to July 1, 1942. The Library of Congress Catalog of Printed Books, as published in about 160 volumes, contains almost two million standard catalog cards reduced approximately one-third yet readily useable without mechanical aid. Further experimentation in this field resulted in the experimental publication of a standard journal in the same format. There is even now being readied for the market a miniature photocopying machine, whose products will approximate 70x90 mm. paper sheets.

Documentary reproduction technology for scholarship during the period under discussion became technology in warfare, as the utmost energies of the nation were concentrated on survival. Microphotography and other methods were assigned new tasks. New fields and developments were fully exploited. It would require far more time than is available even to list the major uses made of photographic duplication during the war. A few random examples, however, may be of interest. Everyone, whether gladly or no, was exposed to V-Mail. As an expedient, it served its purpose, not ideally perhaps but in the main satisfactorily. As a proving ground for mechanized microphotographic techniques, V-Mail will exert a profound influence in the future. Coupled with V-Mail was the unpublicized but equally important Official Mail Service, and there remain valuable files of official documents on microfilm to be consulted by historians in the future. With the capitulation of the Axis microphotography again was employed to reproduce and bring to the United States seized enemy documentation in huge quantities. Of the myriad aircraft and ship plans, instruction books, parts manuals, and other materials reproduced on microfilm for operational use during the war, little need be said. Of the work of the Office of Censorship, some thirteen million pages of documents on microfilm representing censorship intercepts are stored under Presidential seal in the National Archives in Washington. Private records, business communications, and security documents were microfilmed throughout the war. In espionage, certainly, a laboratory process was exploited by the enemy through the famous microdot, described by Mr. J. Edgar Hoover in a recent issue of the *Reader's Digest*.[9] Other textual and pictorial materials were produced for instructional purposes using techniques

[9] Hoover, J. Edgar, "The Enemy's Masterpiece of Espionage" *Reader's Digest,* 48, pp. 1-6.

originally devised for microphotography. The vast files of data of all types, photographs, maps, catalog cards, manuscripts and printed sources required for World War II that in truth was as much a war of papers and photographs as of bullets were assembled, sifted, digested, and used by strategical planning agencies in large part through the use of microfilm and other facsimiles.

There has been a return to pre-war standards and ideas, libraries are restaffing and re-equipping their microfilm facilities. Long dormant projects are being taken off the shelf, dusted and set in working order. With the influx of GI students into the universities, the educational program is becoming more and more demanding. As the student bodies change intellectual complexion from the more or less casual undergraduate of prewar days to the more mature and earnest GI student, more research and better research is necessary in order to maintain instruction at a high level. Business and industry have well laid plans and insofar as microphotography is concerned are developing uses and applications that have little or no connection with scholarly desires and requirements. Equipment is becoming more and more specialized and with increasing specialization, modern theory and practices are moving away from scholarly and academic needs. There is no use blinking at the fact that however vocal scholarship may be, and however large microphotography may loom in the minds of scholars, the real work in terms of quantity is being done elsewhere, in business, in industry and in the government.

Somewhere, scholarship has lost the ball.

There has been much lip service on the part of scholars to microphotography and allied techniques and too little real understanding of them and their proper use. Articles have been written pro and con, projects have been organized and carried through. Real contributions have been made in many quarters, but the integration of scientific aids to learning is only beginning. The scholar of today is confronted and confounded by oceans of documentation. To bring his tiny bark into safe harbor, he must avail himself of every possible aid that the mind of man can devise. These aids themselves are so numerous that to master them is a career in itself. Intelligent guidance and assistance must be provided to the beginning scholar and should be placed at the service of those who are already more mature.

The scholar or the scientist is not nearly so uncomplaining and abstracted as he is frequently pictured. If nothing else, World War II has demonstrated the need for a close link between reality and research. In the humanities, the library is the laboratory. In the sciences, documentary research has come to be fully as important as laboratory

research. Library and documentation policies therefore are of vital interest to both, yet it is surprising to find neither scholars nor scientists in the main devoting any serious attention or efforts to these problems. The rare scholar or scientist who interests himself is, alas, the uncommon exception. In a university, there are faculty or departmental advisory groups, and there are library committees. In the broader field of professional associations, there are committees beyond count or computation. Too often the duties and responsibilities of membership and participation are regarded as purely nominal and if undertaken at all are executed perfunctorily. Can this attitude be a reflection of our system of training scholars and scientists? Is it a part of the fetish of the advanced academic degree as a teaching or research prerequisite? Too frequently a degree becomes an end in itself, little more than a union card for teaching. The seminar system with the preparation of reports and finally a dissertation, if unsupplemented, is often woefully deficient in teaching beginning scholars or scientists how to conduct research. The only practical instruction that many students receive in the matters of note taking, or arrangement, and even of presentation, comes from contact with the official academic sponsor, the professor who engages to supervise the emergence of the butterfly from the cocoon. Usually there is a lag, sometimes of 20 or 30 years, between the student days of the professor when he learned from his professor the basis of his own system. There may be a few required courses in methodology, but often these are cursory and most, to say the least, are uninspiring. At this precise point, the formative period, there should be in every institution a specialized course of instruction required of all graduate students in every discipline. The use of the library and its tools should be stressed. Microreproduction as a tool for research and possibly as a vehicle of publication or communication should be explored. At this time, while the student is developing his own methods of research, he should be brought into contact with all known scientific and library aids to learning. The effort will be rewarded in many diverse fields. Should the student enter business or industry, he will have knowledge that can be widely applied. The same situation will prevail for law, medicine, engineering, or virtually any profession, trade, or occupation. Finally, if the student decides to devote himself to an academic career, he will possess the background for maximum utilization of the resources of our present civilization.