

MICROPHOTOGRAPHY--A LAY APPRAISAL

At once a paradox. Swamped by the printing press we are, nevertheless, pushing resolutely to tap new sources of supply. On this or any afternoon a single metropolitan newspaper will release more than ten million folio pages. No library on earth can hope to command one day's output of the world. Our Government has recently completed a huge Archives building in Washington, well knowing, however, that there is already on hand enough material to fill the structure twice over. Words constitute humanity's supreme accomplishment in a half million or more years of divergence from the beast, but it is a drastic attainment. Once talking, we must talk ourselves out before the primordial silence whence we came is regained--with comprehension. We caught it late, but caught it hard. The entire range of our western literature from the first European name till now occupies less than one per cent of our cultural era, but from the time when, around 1870, we turned eyes from cotton and flax to trees for paper, the jig was up so far as corraling output was concerned.

But if no one person or institution can grasp the total, yet bird's-eye views must be got if our explorations are to have any degree of direction. Hence, a multitude of bibliographical undertakings, whether of listing, selective, reviewing, or digestive character, have cropped out. We have recently seen how the biological field alone is supporting more than a score of abstracting journals, while even railway news stands are alive with pocket-sized digests of one sort or another.

If then we are at such desperate grip with the products of one machine, what can be the excuse for trying to bring another into play?

For see: Commercial publishers want an edition of 2000 in order to make a profit; forswearing gain, a university or other philanthropy may proceed with from 750 to 1000 copies in ordinary pricing, perhaps with 500 at higher rates or by subsidy; but we are still not satisfied and summon cameras, which drop the edition to 250 or less by the photo-offset process, or through microphotography now hit bottom with an edition of one.

Why such deadly persistence?

Well, there are several reasons but one that dominates. The Great Riddle lures us irresistibly on. We are born curious and stay curious to the end. We want to know. Our years are few. Mountain and valley persist with little change through eons of time. Our fellow creatures of earth, air, and sea perish without trace. But a spark disturbs our clod unrestingly, generation after generation, we turn questing eyes on the sphinx that sits without and lurks within, nor take we "no" for an answer. Like gods, it is our function to inquire and our glory to understand. "In a successful society," as I have written elsewhere, "the satisfaction of bodily needs would sink to the level of stoking the furnace, while energy would turn to the adventure of probing our regal heritage on and off the earth, in the universe and beyond, in the impalpabilities of consciousness and lower. He would be king among us who could drive the deepest salient into the unknown."

But staring is of no avail. The mystery will not be uncovered by one charge no matter how cleverly laid. The approaches are multitudinous and ultimate truth infinitely far. In other words, we have had to give up encyclopedism and turn specialist. The strategy then is to mass the power of like specialists the world over, that they may the sooner break through and unite with neighboring groups to achieve new syntheses. The process of advance is thus a series of hypotheses tested by experimental analyses, and, if lucky, rewarded by fresh insight.

Here and there a particularly discerning mind or peculiarly sensitive imagination may descry tendencies from afar and hasten junctures with an incisive phrase.

The pattern of these approaches to ultimate truth is good everywhere and lies at every elbow. Men of like kind need not live together, therefore, in order to get ahead, though conferences are helpful. What they need is common records. These are the maps of ground already covered and carry the hints of likely progress.

High strategy patently calls for an intelligence service of the first rank and utmost mobility of forces. Which being interpreted means that, if sound brains and pure hearts are to prevail, we must prove able on short notice to concentrate the world's knowledge of a given situation in the hand that can with it drive the deepest salient into the unknown.

Any such marshalling of records for either a particular or a sustained purpose may mean gathering materials from far and near, abundant or unique, printed or manuscript, files, individual books, single chapters, or articles in journals. They should arrive promptly and economically, deploy easily, and clear with speed.

In this service the printing press has toiled for five centuries. It, too, has long known photography and commanded its aid, particularly since the substitution of the dry plate for the wet in the middle of the last century. This use increased with the displacement of glass by film and, when the latter by two jumps reached the ink without setting of type, prices took a lively tumble. Finally, for more than thirty years the direct use of sensitized paper, instead of either glass or film, with the image set right again by a prism, has been a familiar and valuable provision under the trade name of photostat.

But the newcomer makes far larger claims despite its diminutive size. In fact, it is that

diminution below legibility that gives the process its distinction. Let's follow it along.

A banker started it and thereby rode to fortune. He wanted facsimiles of the depositors' checks. The Recordak Rotary camera employing 16 mm. safety film was the answer. The texts are shot as fast as they can be put into the hopper and the film is read in a self-contained projector. Any loose material up to standard letter size can be accommodated thus. Business makes large use of the device.

It is capable of important service to libraries, as witness three spectacular examples.

The NRA and AAA Hearings amounting to some 300,000 pages were run off for about a dozen libraries at a little over \$400 a set, or one seventh of a cent a page, while a set by hectograph (a perishable medium) was quoted at \$6,000 and a printed edition would call for an outlay of a half million dollars.

Again, in Philadelphia and Cleveland the process was employed as the means of securing a union card catalog of all libraries in those respective regions. Here each catalog was filmed; the films were assembled at a center, and from them, as read in projectors, cards were typed. Discarding duplicates, after noting all placements on the single card retained, ended in a catalog good for the city. In this scheme 5000 cards get on 100 feet of film, which costs \$2.75 including processing. About three such reels can be done by a single operator per day. The average rate of transcribing by typewriter was 160 a day in Cleveland. Filming, 15,000 cards a day; typing, 160! These cameras are not sold but rented at \$30 a month. Similarly the two projectors designed for this purpose rent for \$2.50 or \$5.00 a month according as mere identification or actual reading is required--Recordak, models 6 and 8 respectively.

In the third case the typewriter is omitted and the film itself used as the catalog. Thus, at The National Archives the index to the Veterans'

Administration records numbering 2,600,000 cards was filmed at a cost of \$2,000, as against \$26,000 to \$75,000 by any other method, and the librarian reports the film easier to consult than the original. Here guides were secured by inserting at intervals of a hundred cards black sheets carrying each a large white numeral, which thus catches the eye in a flash as the reel whirls through the projector. To the same end, the stroboscope has been applied--a prism riding above the film and thus magnifying a single line steadily on passing pages, and at least two other guiding devices have received patents, though they are not yet brought to production. A much larger project of the same sort is the filming of the 34,000,000-card index to the 1900 census, which will take fifty square feet of floor space instead of 7,000 as now. In both these instances it is to be noted that the record is closed and the problem of interfilming does, therefore, not arise, though in recent months there has been some experimentation with a current file and the maintenance of even the Library of Congress Depository on film has been suggested.

It is clear, thus far, that there is distinct advantage in resort to film in cases of sheets of moderate size in bulk and of card catalogs closed.

If, however, the new record is again not film but cards, stiff competition is at once encountered. The Philadelphia and Cleveland cases are odd owing to the availability of WPA labor. The films need not have been transcribed on cards by typists. Card prints could have been taken from the film, with greater accuracy certainly. The Folmer Graflex Corporation has recently worked out an estimate of about three cents a card for the combined filming and printing operations. Compare twenty typed cards an hour. But this photographic cost will certainly fall with the introduction of automatic action in enlargers through the contemplated addition of a film-advancing mechanism. Compare again the current

rate of ten cents a 6" x 8" paper print from 35 mm. film offered by Bibliofilm Service.

Three cents is also the cost per card with the photostatic machine known as the Dexigraph, in the Yale Law Library, where, incidentally, curling of cards and difficulty of typing on such stock are reported by Librarian Hicks as substantially conquered, though these headings are paler than the text. Yale was pioneer in this mode through having thus reproduced its main catalog of a million cards in the exodus to Sterling Memorial. This unique camera has had quite a progeny, the latest of which possesses a cradle and handles bound volumes.

This Dexigraph direct paper print is full size, but it need not be. Film tends to dominate the stage at the moment, but sensitized paper in miniature prints has its advantages and these are sure of recognition before long. The standard photostat is a slow, costly, and not very flexible machine. It can reduce but two diameters, that is, to quarter size (one-half height, one-half width). But Dr. Bendikson has adapted the Huntington Library instrument to reduce 3.4 diameters or to nearly one-twelfth size. In this case a text seven inches high would come down to two inches instead of the usual three and one-half inches. If, further, as he points out, such negatives were gathered and a positive of the group taken without further reduction, twelve pages could be got very easily on a 5" x 8" card and read in entire comfort with ordinary hand or desk lenses. Realizing the possibility of paper as well as film, the Graflex company plans in due season to provide their Photorecord camera not only with spools for 35 mm. film but with 70 mm. paper magazines as well. When that is done, then users will have the choice of one-inch film texts to be read by projection and two-inch paper ones managed by light magnifying glasses. It will be an even choice, since paper costs one fourth as much as film. It may very well prove that the paper copies will be

preferred in inter-library service and field work except in long runs and large sizes where economy of materials is necessary. And this says nothing about lower reductions on paper and reading by reflection in Balopticon fashion, upon which research has much work still to do. Keep an eye, therefore, on paper.

This by no means exhausts the card competitors of projection prints from films. Thus, in certain libraries the photo-offset is employed. Such cards carry no emulsion, of course. Others use the Multigraph or Set-O-Type, a few the Mimeograph, and, naturally, in the case of two or three copies the typewriter is still employed. A new device of marked promise has appeared in recent weeks--the so-called Multigraph Duplicator. Here the text is typewritten with a special ribbon directly on the printing mat and reproduction follows immediately in the manner employed in photo-offset but without the preliminary photographic procedures. The mat is either of paper, aluminum, or zinc. The operation is simple, swift, and economical, the copy excellent, and the machine not costly.

Thus, it will appear that the newcomer in his first offering, namely, to reproduce loose material has a runaway of it if he keeps to film. But when he turns off paper prints therefrom he meets stiff challenge in several quarters till at least he can mechanize his enlarger. He will be wise to take out insurance against defeat by adding a 70 mm. paper magazine to his pack and thus inaugurate a travelling miniature photostat service in the medium reduction range at the price of film. That would make a famous day.

The next essay was again with loose sheets, but large ones this time, especially newspapers. To this also was the Rotary camera applied, though in a bigger model, holding the leaves in place by suction and substituting 35 mm. film for 16. Technical success of high order has been scored by the Recordak Corporation. By now some forty American

newspapers have come to try the new medium and the list is steadily extending.

This is a development of exceptional importance. For all the admitted deficiencies of the daily press, it constitutes the people's only diary and is, therefore, absolutely invaluable for the history of the times. Students of social development working in the next century will place their main reliance for an understanding of our times on these contemporary diaries. For proof look at what we will today pay for a single number of a Colonial newspaper:

To	1749	\$9.00
	1750 - 59	8.00
	1760 - 69	7.00
	1770 - 75	6.00
	1776 - 79	5.00
	1780 - 89	4.00
	1790 - 1800	3.00

while for photostat copies we are grabbing up every available stretch at thirty cents to sixty cents a page. Nothing in the way of record would be so greatly prized by scholars anxious to ascertain the genesis of that outstanding tragedy in American history, the Civil War, as the full stock of the leading newspapers during the quarter of a century antecedent to its outbreak. But there is no library in the country where this is to be had. A true account waits on piecing out this fabric from all available fragments the country over. There must be no such thing as our failing the oncoming generations in the matter of our troubled century's record.

At this juncture the offer of film to preserve is most welcome. The offer should be accepted without delay by every newspaper publisher in America. The issue in this case is plainly preservation or dust, for wood-pulp will not survive. The film does more than save life--it saves space as well,

for storage is reduced fully ninety per cent. A single rotary camera will handle about 18,000 pages a day. Copies are furnished in duplicate, cut, and interfiled. The present charge for the master negative is eleven cents a film foot, which accommodates eight pages, and five or six cents for the positive. Libraries can secure their copies at the latter rate. The average cost of five newspapers on film from Buffalo, Chicago, Dallas, Detroit, and New York respectively was just under \$90 for 1936. This is very close to being the cost of the pulp edition when bound, and of course far below that of a rag paper issue (cf. \$170 for the New York Times).

A striking use of this same camera is found in the U. S. Census Bureau's project of filming all its population records from 1790 to date, that is, in that high percentage of cases where the bindings must be removed to capture all the text.

The third venture was into bound volumes, large and small. Here mechanization of cameras has proceeded far enough to require in the best instruments only pressure of button and turning of pages after one focusing. Textual level is maintained by cradles, which in the case of oversized volumes shift back and forth electrically. An average quotation is three cents a shot, or, except in oversized volumes, one and one-half cents per page, plus a service charge or a minimum total. Better quotations are given on big jobs. Thus, Edwards Brothers contract to furnish at a half cent a page to advance subscribers all the books printed in English up to 1550, estimated to cover 400,000 pages, to be supplied fifteen libraries in four years. Similarly the Recordak Corporation has agreed to provide a negative and a positive of two Illinois bound newspaper files, 1880-1915, amounting to 200,000 pages, for \$3,500, which comes to about the same rate for the positive. So also The New York Times of 1914-1918 for \$433.74. Unfortunately, these highly mechanized cameras are expensive to build, in fact

are built by hand, and are not in the market but either execute contracts at home or rent for \$250 a month for the first two months, \$200 each for the next two, and \$175 monthly thereafter. But the Photorecord recently released to sale for \$265 does represent as high a degree of mechanization as is consistent with portability and it carries ambitions for further refinement.

Such are the offers of the taking instrument to date. While there is a lot of bad film floating about and consequent need of a certifying agency, this cannot be charged to high-grade cameras or competent technicians. More than a score of libraries have taken the plunge and experimentation is lively.

Two questions remain to be answered before judgment can be expressed. Will film last, and can it be used comfortably?

Certainly it is not as tough as a book and hands should be kept off the emulsion, but given a reasonably humid atmosphere and decent treatment it should last as well as the best paper, for there is nothing in good acetate cellulose to deteriorate and the image is chemically stable. But there will be abuses and breakage, we may be sure. Time alone will tell us how long it will take to settle down into smooth running. Dust, we know, cannot do films any good. It should be unknown in the laboratory and at least kept out of the cabinet in which the rolls are maintained. But metallic particles are in the air of reading rooms and one speck grinding down so minute a text might ruin it. Users must learn, therefore, to exorcise these microscopic devils automatically before starting the film coil to unwind through the projector.

And this brings us to the question of reading. The new Committee on Scientific Aids to Learning is concerned about this and has three nationally known scientists investigating eyestrain in this case. It hopes to fix standards.

Anybody would prefer having a new book in his hands to reading it on a screen. Motion picture addicts need not be told that the living original is clearer cut than the copy. Light outside a window is brighter than in the room. The film and every penetrated lens, diverting prism, or reflecting mirror occurring in the path between lamp and screen rob the light. On the other hand we do not read in open sunlight but in shade, and so experimentation is active to secure even diffusion on the screen, the proper intensity, and the comfortable tint. Success in these particulars may be expected. No projector can attain popularity unless it is kind to eyes. But in the end two things will still remain true. One is that no good text will ever appear as sharply defined as under direct magnification against a light or white background. This gives paper miniatures a life. The other is that it will never be as handy to put on a film as to pick up a book. A good text, I said. With a faded, stained, or bulky one, however, the film copy may be much the more comfortable to read, for proper photography will filter out the defacements, and the projector will cancel the weight.

Within a month, we have seen one difficulty subsiding. At last we are going to have reading machines in the price range of typewriters, so that libraries can make wide distribution of them and their films. And these new instruments, selling initially for \$75.00, will be good for wall projection also, and thus available in classroom instruction as well, and they will have provision for making photographic prints by substituting such a frame for the viewing screen. These new reading machines will have their limitations and so there will be uses for higher priced instruments in cases of high reduction. When a 24,000-page, 4,000-cubic-inch, 100-pound encyclopedia can be put on 1 1/2 lbs. of film occupying 200 cubic inches, or when a skillful operator, working two and one-third hours, can get

5,600 sheets on 100 feet of 16 mm. film which costs \$2.75, processing included, we are apt to demand a machine to read them. But it is good to know that the predominant type of films in most libraries can now be accommodated with reading aids we can all afford.

Are we not ready now for the verdict?

We prefer the original, if excellent, to a copy if we can afford it. Ah, but that's a big if. A jury is due all the evidence. So is a scholar or scientist and his countrymen. No library can acquire all or house it. Even if it had unlimited money and space, it still could not succeed, for masses of desirable material are hopelessly out of print or exist in unique archival copies, public or private. Microphotography offers the best present hope of completeness in a specialty at a cost that can be borne. This is its supreme gift.

It saves, too, the present possession that's threatened with deterioration or injury. This is notably the case with newspapers of the wood-pulp period. And filming in this case renders a third outstanding service in its vast saving of storage space. This ability to contract at command may inaugurate a custom of thus retiring books that have outlived their usefulness and so exert an effect on building plans of the future. The National Archives has decided to film great quantities of purely informational material and keep only 10 per cent of the originals for samples.

Thus this new skill enables a strategist to mobilize total power with speed, compact it into narrow space, and keep it primed for advance.

Two momentous consequences follow. First, a given institution can have a greater number of complete special collections than ever before and with care these may be made in sufficiently related fields to gather a telling force over a wide sector. The institution might take its character from that sector. So with others, to fill out a national strategy.

The other consequence is the ability of the individual specialist, who leaves such a training center and takes this new skill along, to maintain himself anywhere and know that he is part of every advance.

Not in five centuries has so gallant a figure appeared on the frontiers of record. He winds a horn destined to be heard round the earth, summoning to joyous entries upon rich regions as yet untrod by man. The ancient Oxford University Press regains its lost titles through his valiant riding, soon to be followed by the youthful University of Chicago Press, thanks to the Library's lift. Once more may the city dweller's shallow abode give welcome to great spirits faring, and radio wins a new ally to bring the world to country doors. The author's shadow is clipped and sent forth living while he sits at home in television. The world contracts, sharpens its vision, and understanding follows.

A paradox, yes, but like Browning's in Rabbi Ben Ezra, it comforts while it mocks.

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