RESUSCITATION FROM ASPHYXIA

While this use of carbon dioxide was developing in surgery, there has been a parallel development in another field. Carbon monoxide is the chief poisonous constituent of illuminating gas and of automobile exhaust gas. It owes its toxicity to the fact that it combines with the hemoglobin of the blood, displacing oxygen and thus inducing asphyxia, even though the victim is breathing vigorously. Haldane had showed that the combination of carbon monoxide with hemoglobin is reversible. The logical treatment appeared therefore to be inhalation of oxygen. Experience showed, however, that this treatment is not very effective and that it is less and less effective the severer the gassing. This was rather a puzzle, until Dr. H. W. Haggard and I found the reason. It is that, during the development of asphyxia, the victims—our victims were dogs—overbreathe excessively and develop an acapnia that depresses both respiration and circulation profoundly. Oxygen is then ineffective, because an inadequate amount is drawn into the lungs. As soon as we knew this, the solution of the problem became clear. We replaced oxygen with a mixture of carbon dioxide and oxygen: at first, 5 per cent. carbon dioxide, and now 7 or 8 per cent. And we devised and introduced a suitable inhalator. As a result this treatment is now so generally used and is so effective in saving life that the mortality from accidental asphyxiation in all our large cities is greatly diminished, and in many communities suicide by means of carbon monoxide is much less popular than formerly.

From the use of carbon dioxide diluted with oxygen for the treatment of carbon monoxide asphyxia another application has now developed. The same treatment has proved effective in the resuscitation of the newborn. The saving of life that can thus be achieved amounts to at least one baby out of every three or four that now die: one in every hundred births: in other words, a saving of more than one per cent. of all human lives. It was by the use of this inhalational treatment that Dr. Dafoe established the respiration of the Dionne quintuplets.

THE FALLACY OF ACIDOSIS[2]

I have here attempted to sketch in twenty minutes the work of more than thirty years. In the early years my proposals met with vigorous opposition, based on a false conception of the function of carbon dioxide in the body. In recent years the administration of carbon dioxide, particularly to the newborn, has been even more vigorously opposed because it contravenes one of the main doctrines of biochemistry—the dogma of acidosis. According to that dogma, all the conditions now treated with carbon dioxide involve an acute acidosis; and inhalation of carbon dioxide should—theoretically—intensify the acidosis. So vigorously have some biochemists urged this objection that they seem almost to think it sinful to save life, if the method of resuscitation involves a violation of the dogma of acidosis.

In answer, I would point out that what is now commonly called acidosis—in the sense of an intoxication by excess of acid—is more correctly conceived as a form of acapnia; for it is relieved by inhalation of carbon dioxide. In my opinion the present conception of acidosis is one of the "veils of ignorance and wrong thought" that still hides from physiology and biochemistry the true nature of the process through which the vast majority of all lives end: the process of asphyxia in its two phases—deficiency of oxygen and deficiency of carbon dioxide.

MICROPHOTOGRAPHIC DUPLICATION IN THE SERVICE OF SCIENCE

By WATSON DAVIS

DIRECTOR OF SCIENCE SERVICE, WASHINGTON, D. C.

As one of its science research aid activities, Science Service has organized a Documentation Division for the development of microphotographic duplication mechanisms, and the experimental operation of two services in scientific documentation: Bibliofilm Service, in cooperation with the Library of the U. S. Department of Agriculture, and the auxiliary Publication Service, operated in cooperation with scientific journals.

Microphotographic duplication consists of making reduced-size photographs, as when a typewritten or printed page is photographed on a frame of 35 mm motion picture film. In 1925 the late Dr. Edwin E. Slosson, first director of Science Service, and the writer became interested in applying microphotographic duplication to scientific literature and publication, following a suggestion from Dr. F. G. Cottrell. Unsuccessful attempts were made at that time to enlist the cooperation of photographic and optical concerns.

[2] For literature, see Y. Henderson: *Bull. N. Y. Acad. Med.*, 11: 11, 639–656, November, 1935; *The Lancet*, July 27, 1935, p. 178; *Am. Jour. Physiol.*, 114: 2, 261–272, January, 1936; SCIENCE, 79: 2057, 508–510, June 1, 1934; *Journal of A.M.A.*, 101: 261–266, July 22, 1933; *ibid.*, 103: 750–754, September 8, 1934, and 103: 834–837, September 15, 1934.

Microphotographic duplication, both as an idea and practically, is not new. Perhaps the first use was in the early days of photography when Dagron made in 1870 remarkable reductions of printed dispatches upon photographic film so that intelligence could be carried by pigeons out of Paris, then besieged by the Germans.[1]

In recent years, thanks to motion picture apparatus and miniature cameras of the Leica type, a considerable amount of copying of manuscript and book material upon film has been done at the Library of Congress (Rockefeller Project A), Yale University, New York Public Library and elsewhere. There has been some commercial development of copying upon film for record purposes, as for bank checks and legal records.

In 1933 and 1934 discussions were held by circulation of memoranda and conferences looking toward the use of microphotographic duplication in connection with scientific literature. One result was the establishment in November, 1934, of Bibliofilm Service in the Library of the Department of Agriculture through cooperation of Miss Claribel R. Barnett, librarian, Dr. R. H. Draeger, of the U. S. Naval Medical School, who provided mechanisms, and Dr. Atherton Seidell, of the National Institute of Health. Bibliofilm Service copied upon 35 mm film material in the library, substituting microfilm for loan of the books and journals.

In July, 1935, following conferences, the interest of Francis P. Garvan, president of the Chemical Foundation, was obtained and a Chemical Foundation grant of $15,000 was made available, with the result that the Documentation Division of Science Service was formed.

Since cameras, reading devices and other mechanisms for microphotographic duplication were not commercially available, it was necessary to engage in a mechanism development program. In this the primary cooperation of the U. S. Naval Medical School was obtained, with the result that Dr. Draeger, whose camera was being used by Bibliofilm Service, took charge of the mechanisms development. In this work cooperation has also been obtained from the U. S. Bureau of Census, the Works Progress Administration, the Library of Congress, etc. Through cooperation with the U. S. Department of Agriculture, a microphotographic duplication laboratory was installed in the Library of the U. S. Department of Agriculture for the use of Bibliofilm Service, for testing mechanisms and for applying microphotographic duplication to other phases of scientific literature. Science Service assumed operation of Bibliofilm Service on January 1, 1936. Resources are in hand for continuing mechanism development through June 30, 1936, and operation of Bibliofilm Service and the Publication Service through March 31, 1937.

The mechanisms being developed consist of:

(1) Camera for copying typescripts, books, photographs, etc., upon 35 mm film* (in use).

(2) Supplementary apparatus for camera, such as book holder for camera,* film container, etc. (models completed).

(3) Reading machine—about size of typewriter, producing large-sized, easily readable image of 35 mm microfilms (model completed).

(4) Microfilm viewer—a small monocular optical device for reading 35 mm microfilms a line at a time, suitable for inspecting film or for use while traveling. Will sell for about a dollar. (Design completed.)

(5) Projection printer—automatic device for producing photocopies (enlargements upon paper) from 35 mm microfilm negatives* (under design).

(6) Developing and processing apparatus for 35 mm microfilm and paper projection prints* (in use and under design).

* Primarily intended for use in microphotographic laboratories.

Commercial production of these mechanisms is in prospect. One interesting fact is that Bibliofilm Service has operated thus far without adequate reading devices being readily obtainable, several hundred thousand pages of microfilm having been distributed to be read by means of makeshift apparatus, such as dissecting microscopes, movie or slide film projectors or hand lenses.

Microfilm is being produced at a cost to the user of about a cent a page. An enlargement of about 5 to 10 diameters is necessary for easy reading of microfilms, and optical aid is therefore required. For reading without optical aid, photocopies about 6″ × 8″, made by projection from microfilm negatives, are supplied at a cost of about five cents a page.

Bibliofilm Service copies to order material in the Library of the U. S. Department of Agriculture. Order blanks and complete details of Bibliofilm Service are available. Eventually it is hoped to be able to extend Bibliofilm Service to other libraries, thus making more of the literature of science available to scientific research workers.

The Publication Service is intended to break the log jam that now dams scientific publication in many fields, making it possible to put into the realm of accessible scientific literature material of all sorts that can not now be printed because of economic factors. It should also make available valuable research data that now go unrecorded. This service is auxiliary to the present established channels of scientific publication and it is designed to aid and not to hinder scientific journals. Editors of scientific journals would act as

[1] L. Bendikson, *Library Journal*, February 15, 1935.

intermediaries between the authors of papers and the Publication Service.

The procedure for publication of scientific material that does not now have complete or prompt issuance is as follows:

(1) Editors of journals or institutions deposit typescripts of those papers or portions of papers they can not publish promptly or completely. They publish abstract, summary or short paper, including statement that additional text, illustrations, tables, etc., are available upon request from Science Service if document number is stated and price remitted.

(2) Document is assigned a number by Science Service and on receipt it is microphotographed on 35 mm film master negative. Original of document would then be deposited in another location as a safeguard.

(3) Scientists know of availability of document from notice in scientific journal. When and if copy of document is ordered, 35 mm negative is used to make microfilm print or photocopy (projection print) as required.

Microphotographic duplication fills a gap in the present methods of reproduction of scholarly or intellectual material. It is economical for making copies when only one to perhaps 25 copies at a time are needed. One important phase of the method of publication outlined is that a document will be continuously "in print," as the negative can be used to make a copy on demand at any time.

Detailed discussions of various phases of microphotographic duplication are contained in documents issued by Science Service. Literature will be sent on request to Science Service, 2101 Constitution Ave., Washington, D. C.

OBITUARY

ARTHUR J. WEED

ARTHUR J. WEED, of the University of Virginia, Charlottesville, died suddenly on April 15. His interest in seismology was developed at the Weather Bureau, where, as a mechanician, he did the principal work of construction on the Marvin seismograph. Later he built an inverted pendulum seismograph and installed it at the Rouse Physical Laboratory of the University of Virginia where it has continued in operation to the present time and furnished useful data on many earthquakes.

Mr. Weed also designed the Weed strong motion instrument of which eleven have been installed by the Coast and Geodetic Survey in various places in California.

Mr. Weed had the remarkable record of having attended every one of the widely scattered meetings of the Eastern Section of the Seismological Society of America, which have ranged from Ottawa, Canada, to Columbia, South Carolina. He also attended the last meeting of the Seismological Society of America at St. Louis, Mo. At the time of his death he was treasurer of the Eastern Section of the Seismological Society of America.

In the passing of Mr. Weed, the science of seismology has lost one who has given much thought to instrumental problems, an active worker and a true friend.

N. H. HECK

AGNES POCKELS

AGNES POCKELS died on November 21, 1935, at the age of seventy-three years.

Born in Venice in 1862, of German parents, in a period when the ordinary avenues of higher education were hardly accessible to a woman, the lively interest in science which she early developed was forced to seek its outlet in self-education mainly by the aid of books. At the age of nineteen she made her first important experiment in the observation of surface phenomena and in the following year devised the simple means of measuring the relation between surface tension and surface area which has become a most important scientific tool in the hands of such investigators as Lord Rayleigh, I. Langmuir, R. Marcelin and N. K. Adam. She published fourteen papers, the first in 1891, the last in 1926, dealing with surface tension, the spreading of liquid films and the angle of contact. In 1931 the Kolloid Gesellschaft awarded her the "Leonard Prize" and the Technische Hochschule of Braunschweig awarded her the degree of "Dr. Ing. E. h." Her life work has been described by Professor Wo. Ostwald in the *Zeitschrift,* vol. 58, page 1 (1931). Her achievements have earned the admiration of all those who have had occasion to learn of them.

HARRY EAST MILLER

RECENT DEATHS

ALBIN HERMANN BEYER, since 1920 professor of civil engineering at Columbia University, died on April 19. He was fifty-five years old.

DR. ALBERT MOORE BARRETT, professor of psychiatry at the University of Michigan and director of the Michigan State Psychopathic Hospital, died on April 2 at the age of sixty-four years.

DR. THEODORE CLINTON TAYLOR, associate professor of organic chemistry at Columbia University, died on April 20 at the age of forty-four years.