TRANSACTIONS

OF THE

PHILADELPHIA

ACADEMY OF SURGERY

VOLUME XXIV

1926-1927-1928

PHILADELPHIA
PRINTED FOR THE ACADEMY
1929

NOTICE

The plan of publishing the monthly program by title only, adopted in 1925, has been followed in the present volume. In addition, the location of the contributions in the ANNALS OF SURGERY is indicated beneath each title. The annual addresses for 1926, 1927 and 1928, and the papers read at the Semicentennial Anniversary Meeting are printed in full. This volume is printed without cost to the Academy, through the courtesy of Messrs. J. B. Lippincott & Company, publishers of the ANNALS OF SURGERY.

CALVIN M. SMYTH, JR.,
Recorder.

LIPPINCOTT PRESS, PHILADELPHIA

CONTENTS

CONSTITUTION AND BY-LAWS

(As Amended to 1929.)

CONSTITUTION

ARTICLE I

The name of the Society shall be "THE PHILADELPHIA ACADEMY OF SURGERY," and it shall consist of Fellows and Honorary Fellows.

ARTICLE II

The objects of the Academy shall be the Cultivation and Improvement of the Science and Art of Surgery, the Elevation of the Medical Profession, the Promotion of the Public Health, and such other matters as may come legitimately within its sphere.

ARTICLE III

The Officers of the Academy shall consist of a President, two Vice-Presidents, a Secretary, a Treasurer, a Recorder, a Council, a Business Committee, and Trustees of the S. D. Gross Prize Fund and Library.

ARTICLE IV

The Officers, with the exception of the Trustees of the S. D. Gross Prize Fund and Library, who shall be appointed by the President every fifth year, shall be elected by ballot each year, and shall be eligible for re-election. The term of office of the President shall not exceed two years.

ARTICLE V

Honorary Fellows, to the number of thirty, may from time to time be elected. They shall not be eligible for election as Officers.

ARTICLE VI

The Candidate for admission as a Fellow must be a graduate of a reputable Medical School, not less than twenty-eight (28) years of age, practising his profession in the City of Philadelphia or within 30 miles of the City, and must have earned some reputation as a practitioner of Surgery, a Teacher, an Author, or an original Investigator.

ARTICLE VII

Any Fellow having complied with the requirements of the Constitution and By-Laws, may resign his Fellowship by presenting at a stated meeting a communication to that effect, with the Treasurer's certificate that he is not indebted to the Academy, and such resignation shall become valid on acceptance by the Academy.

Any violation of the regulations of the Academy, and of the Code of Medical Ethics adopted by it, shall be punished by reprimand, suspension, or expulsion.

ARTICLE VIII

The Academy shall be governed by the Code of Ethics adopted by the American Medical Association.

ARTICLE IX

NON-RESIDENT FELLOWS

Upon request, any Fellow in good standing, who may remove from the City of Philadelphia, to reside at a distance exceeding thirty miles, from the City, may be made a Non-Resident Fellow of the Academy, by recommendation of the Council and a two-thirds vote of the Fellows present at any regular meeting of the Academy.

BY-LAWS

SECTION I

MEETINGS

The stated meetings of the Academy shall be held at eight-fifteen o'clock P.M., on the first Monday of each month, except June, July, August and September. The date of any stated meeting may be changed at the discretion of the Council by giving notice to the Fellows at least two (2) weeks before the meeting.

SECTION II

SPECIAL MEETINGS

A special meeting may be called at any time by the President, and it shall be his duty to do so upon the requisition, in writing, of any three Fellows.

SECTION III

QUORUM

For the transaction of ordinary business any number of Fellows shall, at any meeting, constitute a quorum. For elections, for changes in the Constitution and By-Laws, for ordering assessments, or for the appropriation or expenditure of any sum of money exceeding twenty-five dollars ($25.00), or for any other business affecting the interests of the Academy, or of its individual Fellows, ten (10) Fellows shall be required to be present.

SECTION IV

DUTIES OF OFFICERS—PRESIDENT AND VICE-PRESIDENTS

The President shall preside at the meetings, regulate debates, sign Certificates of Fellowship, approve bills ordered to be paid by the Academy, appoint committees, not otherwise provided for, announce the results of elections, and perform all other duties pertaining to his office. The Vice-Presidents shall assist the President in the discharge of his functions, and in his absence preside in the order of seniority.

SECTION V

SECRETARY

The Secretary shall keep the minutes of the meetings of the Academy, notify the Fellows of the meetings, announcing on the notices the business to be transacted, with the names of candidates for Fellowship under consideration by the Council and those to be balloted for by the Academy, attest all official acts requiring certificates in connection with, or independently of the President, notify the Officers and Fellows of their election, acquaint newly elected Fellows with the requirements of the By-Laws concerning admission, receive the signatures of newly elected Fellows, take charge of papers not otherwise provided for, shall keep in his custody the seal of the Academy, and affix it to any documents or papers that the Academy may direct.

SECTION VI

TREASURER

It shall be the duty of the Treasurer to receive all moneys and funds belonging to the Academy, unless otherwise provided for; he shall pay all bills when properly ordered at the instance of the Academy, collect all dues and assessments as promptly as possible, and present an annual account for audit.

SECTION VII

RECORDER

The Recorder shall receive all papers read before the Academy, and, as a member of the Business Committee, take charge of their publication. He shall submit proof copies of all papers and discussions to authors, or to those taking part in discussions, before their publication, for examination and revision.

SECTION VIII

COUNCIL

The Council shall consist of six Fellows, including the President, First Vice-President, Secretary and Treasurer. It shall be its duty to report on all nominations for Fellowship; it shall act as a Board of Censors, and shall consider any business referred to it by the Academy. It shall hold meetings for the transaction of routine business upon notice from the Secretary and special meetings shall be held on the call of the President or on the call of any two (2) of its own number.

SECTION IX

TRUSTEES OF THE S. D. GROSS PRIZE FUND AND LIBRARY

At the stated meeting in February every fifth year, three Fellows shall be appointed by the President to serve for five years, or until their successors are appointed, as Trustees of the S. D. Gross Prize Fund and Library. It shall be the duty of the Trustees to keep charge of the Fund, to attend to its safe investment, and to submit a report at each annual meeting of the Academy of their work during the year, which shall be entered upon the minutes of the Academy. The Trustees shall have, on behalf of the Academy, charge of the S. D. Gross Library, which is, in accordance with the will of the Testator, in the custody of the College of Physicians of Philadelphia. They shall each year make such additions to the collection of Surgical Books in the Library as may be deemed advisable, and as the funds contributed to the care and support of the Library may permit. They shall have charge of the distribution of the S. D. Gross Prize. It shall be their duty to publish in the Medical journals the conditions on which the prize is offered, to receive all essays submitted for competition, and, upon approval of their decision by the Academy, to make award of the Prize to the successful competitor.

SECTION X

BUSINESS COMMITTEE

The Business Committee shall consist of three Fellows, including the Recorder. It shall have charge of the scientific business of the meetings, it shall be its duty to provide for the presentation of papers and discussions of subjects for each meeting, it shall arrange, at such times as it may deem proper, for the discussion of scientific subjects by the Fellows of the Academy, and it shall, when authorized by the Academy, invite members of the profession, resident or non-resident, to read papers before the Academy, or to present topics for discussion. It shall act as a committee on publication, and shall present at the annual meeting a report of the work done during the year, which shall be entered upon the minutes of the Academy.

SECTION XI

ADDRESS IN SURGERY—APPOINTEE

There shall be appointed by the President at the stated meeting in February in each year, a Fellow whose duty it shall be to deliver at a stated meeting of the year following an address in Surgery.

SECTION XII

ELECTION OF OFFICERS

The Officers of the Academy shall be nominated at the December meeting of each year, and elected at the January meeting. The election shall be by ballot, and a majority of all those present shall be necessary to a choice.

SECTION XIII

PROPOSALS FOR FELLOWSHIP

Proposals for Fellowship shall be in writing signed by three (3) Fellows with a letter from each vouching for the character of the candidate. The nominations shall be referred to the Council, who shall report on the same at the second stated meeting after that at which the nominations were made. The notice of the meeting succeeding that at which the nominations were made shall contain a list of those nominated for Fellowship, and the date upon which the Council will act upon the same.

SECTION XIV

ELECTION OF FELLOWS

Election of candidates for Fellowship who have been reported upon by the Council may take place at any stated meeting, and shall be by ballot, and a two-thirds vote of those present shall be necessary to an election.

A candidate for Fellowship failing to obtain the requisite number of votes in his favor, may not be again nominated before the expiration of two years.

SECTION XV

SIGNING THE CONSTITUTION

Every person elected to be a Fellow shall pay the initiation fee and shall sign the Constitution and By-Laws. No person shall acquire the rights of Fellowship unless he makes payment of the initiation fee and signs the Constitution and By-Laws within three months of his election.

SECTION XVI

INITIATION FEE

Every Fellow shall, on admission, pay an initiation fee of ten dollars.

SECTION XVII

ANNUAL DUES

There shall be an annual assessment of seven dollars, to be paid within three months after the meeting in January. Fellows elected in November or December shall not be subject to the annual assessment for that year. The annual assessment for non-resident Fellows shall be two dollars.

SECTION XVIII

Any Fellow in arrears for one year, being notified of the fact by the Treasurer, in writing, and not paying his dues within two months thereafter, shall forfeit his Fellowship; and it shall be the duty of the Treasurer to notify the Academy of such forfeiture, which shall be entered on the minutes, and the name stricken from the list of Fellows. The notice aforesaid shall contain a copy of this section.

SECTION XIX

INVITED GUESTS

Any Fellow may invite any medical man in good standing to a meeting of the Academy, and every such visitor shall be introduced to the President, and by the President to the Academy, and his name entered upon the minutes. The President may invite any such person to participate in the discussions; but all invited guests shall withdraw from the meeting when matters relating to the private calendar are under consideration.

SECTION XX

ESSAYS, REPORTS AND PAPERS

All papers read before the Academy shall be considered its property, and shall be delivered to the Recorder at the time of their presentation.

Every Fellow shall be entitled to one copy of every publication of the Academy.

SECTION XXI

SEAL AND CERTIFICATE OF FELLOWSHIP

The Academy shall have a distinct seal, as well as a Certificate of Fellowship, to a copy of which, signed by the President and Secretary, every Fellow shall be entitled.

SECTION XXII

ORDER OF BUSINESS

I. Scientific Proceedings:
   1. Reading of the minutes of the proceedings of the last meeting.
   2. Admission of new Fellows, and introduction of invited guests.
   3. Reports of committees on scientific business.
   4. Reading of papers.
   5. Verbal communications.

II. Private Business:
   1. Reading of the minutes of the last meeting.
   2. Unfinished business.
   3. New business.
   4. Reports of committees on private business—Annual reports.
   5. Election of Officers.
   6. Election of Fellows.
   7. Adjournment.

SECTION XXIII

RULES OF ORDER

The proceedings of the Academy shall be conducted under the usual parliamentary rules of order.

SECTION XXIV

ALTERATIONS OF THE CONSTITUTION AND BY-LAWS

No part of the Constitution or By-Laws shall be amended, altered, or repealed, except at a stated meeting subsequent to the one at which a notice to that effect, signed by two Fellows, shall have been given, and then only by a vote of three-fourths of the Fellows present.

SECTION XXV

The President shall appoint at the November meeting each year a committee on nominations consisting of three Fellows. It shall be the duty of said committee to report at the December meeting proposals for nominations for the offices of President, two Vice-Presidents, Secretary, Treasurer, Recorder, Council, and Business Committee.

Report of this committee, however, shall not exclude any other proposals for nominations for above offices.

LIST OF OFFICERS, 1929

President

ASTLEY P. C. ASHHURST, M.D.

Vice-Presidents

GEORGE P. MULLER, M.D.
JOHN SPEESE, M.D.

Secretary

HUBLEY R. OWEN, M.D.

Treasurer

WILLIAM B. SWARTLEY, M.D.

Recorder

CALVIN M. SMYTH, Jr., M.D.

Business Committee

DeFOREST P. WILLARD, M.D.
WALTER ESTELL LEE, M.D.
With the Recorder

Council

DAMON B. PFEIFFER
CHARLES F. MITCHELL

Trustees of the Samuel D. Gross Prize and Library

WILLIAM J. TAYLOR, M.D.
JOHN H. JOPSON, M.D.
EDWARD B. HODGE, M.D.

PHILADELPHIA ACADEMY OF SURGERY

FOUNDED APRIL 21, 1879
INCORPORATED DEC. 27, 1879

OFFICERS

1879

Temporary Chairman.....ADDINELL HEWSON
Temporary Secretary.....J. EWING MEARS
Temporary Treasurer.....WILLIAM HUNT
Temporary Recorder.....JOHN B. ROBERTS

PRESIDENT

ELECTED		ELECTED	
1880	SAMUEL D. GROSS	1910	ROBERT G. LECONTE
1884	D. HAYES AGNEW	1912	GWILYM G. DAVIS
1891	WILLIAM HUNT	1914	JOHN H. GIBBON
1895	THOMAS G. MORTON	1916	CHARLES H. FRAZIER
1898	DEFOREST P. WILLARD	1918	EDWARD MARTIN
1902	RICHARD H. HARTE	1920	GEORGE G. ROSS
1904	HENRY R. WHARTON	1922	JOHN H. JOPSON
1906	JOHN B. ROBERTS	1924	EDWARD B. HODGE
1908	WILLIAM J. TAYLOR	1926	CHARLES F. MITCHELL
	1928 ASHLEY P. C. ASHHURST		

VICE-PRESIDENTS

ELECTED		ELECTED	
1880	D. HAYES AGNEW	1908	G. G. DAVIS
1880	R. J. LEVIS	1910	JOHN H. GIBBON
1884	SAMUEL W. GOSS	1912	CHARLES H. FRAZIER
1889	JOHN H. PACKARD	1914	EDWARD MARTIN
1891	WILLIAM W. KEEN	1916	GEORGE G. ROSS
1891	J. EWING MEARS	1918	JOHN H. JOPSON
1898	JOHN ASHHURST, JR.	1919	H. C. DEAVER
1900	RICHARD H. HARTE	1920	JOHN H. JOPSON
1900	HENRY R. WHARTON	1920	EDWARD B. HODGE
1902	JOHN B. DEAVER	1922	CHARLES F. MITCHELL
1904	JOHN B. ROBERTS	1924	A. P. C. ASHHURST
1905	WILLIAM J. TAYLOR	1926	A. P. C. ASHHURST
1906	ROBERT G. LECONTE	1926	GEORGE P. MULLER
	1928 JOHN SPEESE		

SECRETARY

ELECTED		ELECTED	
1880	J. EWING MEARS	1905	JOHN H. GIBBON
1885	J. HENRY C. SIMES	1909	CHARLES F. MITCHELL
1893	THOMAS R. NEILSON	1915	GEORGE P. MULLER
1896	WILLIAM J. TAYLOR	1920	J. STEWART RODMAN
	1922 HUBLEY R. OWEN		

CORRESPONDING SECRETARY

ELECTED
1880 THOMAS G. MORTON
Office abolished after 1889 by amendment to By-Laws.

TREASURER

ELECTED
1880 WILLIAM HUNT
1891 WILLIAM G. PORTER
1904 JAMES P. HUTCHINSON
ELECTED
1911 EDWARD B. HODGE
1920 DUNCAN L. DESPARD
1922 WILLIAM B. SWARTLEY

RECORDER

ELECTED
1880 JOHN B. ROBERTS
1881 DEFOREST P. WILLARD
1884 C. B. G. DENANCREDE
1884 J. EWING MEARS
1891 LEWIS W. STEINBACH
ELECTED
1902 JOHN H. GIBBON
1905 JOHN H. JOPSON
1915 JOHN SPEESE
1920 HENRY P. BROWN, JR.
1922 J. WILLIAM BRANSFIELD
1926 CALVIN M. SMYTH, JR.

LIBRARIAN

ELECTED
1880 OSCAR H. ALLIS
Office abolished after 1889 by amendment to By-Laws.

PATHOLOGICAL HISTOLOGIST

ELECTED
1880 SAMUEL W. GROSS
Office abolished after 1889 by amendment to By-Laws.

COUNCIL

ELECTED
1880 JOHN ASHHURST, JR.
1880 JOHN H. BRINTON
1894 WILLIAM B. HOPKINS
1895 HENRY R. WHARTON
1898 THOMAS R. NEILSON
1900 W. JOSEPH HEARN
1902 ROBERT G. LECONTE
1906 THOMAS R. NEILSON
1910 J. CHALMERS DACOSTA
ELECTED
1920 CHARLES F. MITCHELL
1922 GEORGE G. ROSS
1922 JAMES H. BALDWIN
1923 WILLIAM J. TAYLOR
1924 JOHN H. JOPSON
1924 JOHN SPEESE
1925 EDWARD B. HODGE
1926 DAMON B. PFEIFFER
1927 CHARLES F. MITCHELL
With President, Vice-President, Secretary and Treasurer.

PUBLICATION COMMITTEE

ELECTED
1880 JOHN H. PACKARD
ELECTED
1880 WILLIAM W. KEEN
With the Recorder.
Office abolished after 1894 by amendment to By-Laws.

BUSINESS COMMITTEE

ELECTED
1895 WILLIAM J. TAYLOR
1895 DEFOREST P. WILLARD
1896 RICHARD H. HARTE
1897 ROBERT G. LECONTE
1900 G. G. DAVIS
1902 JOHN H. JOPSON
1905 GEORGE G. ROSS
1908 FRANCIS T. STEWART
1914 JOHN SPEESE
ELECTED
1916 W. E. LEE
1916 MORRIS BOOTH MILLER
1917 DAMON B. PFEIFFER
1917 A. P. C. ASHHURST
1919 A. BRUCE GILL
1919 J. STEWART RODMAN
1920 ARTHUR BILLINGS
1922 DAMON B. PFEIFFER
1924 DEFOREST P. WILLARD
1928 WALTER E. LEE
With the Recorder

COMMITTEE ON SAMUEL D. GROSS PRIZE FUND AND LIBRARY

1884–1891
D. HAYES AGNEW
SAMUEL W. GROSS
J. EWING MEARS
SAMUEL ASHHURST
WILLIAM HUNT

1892–1893
J. EWING MEARS
SAMUEL ASHHURST
WILLIAM HUNT
JOHN ASHHURST, JR.
WILLIAM W. KEEN

TRUSTEES OF THE SAMUEL D. GROSS PRIZE FUND AND LIBRARY

1894
J. EWING MEARS
JOHN ASHHURST, JR.
WILLIAM W. KEEN
With Samuel Ashhurst and William Hunt to serve with them on distribution of the prize.

1895–1899
J. EWING MEARS
JOHN ASHHURST, JR.
WILLIAM W. KEEN

1900–1901
WILLIAM W. KEEN
J. EWING MEARS
J. CHALMERS DACOSTA

1902–1904
WILLIAM J. TAYLOR
WILLIAM L. RODMAN
JOHN B. ROBERTS

1905
WILLIAM J. TAYLOR
RICHARD H. HARTE
DEFOREST P. WILLARD

1910
WILLIAM J. TAYLOR
RICHARD H. HARTE
JOHN H. GIBBON

1915
WILLIAM J. TAYLOR
JOHN H. JOPSON
EDWARD B. HODGE

1920
WILLIAM J. TAYLOR
JOHN H. JOPSON
EDWARD B. HODGE

1925
WILLIAM J. TAYLOR
JOHN H. JOPSON
EDWARD B. HODGE

ACTIVE FELLOWS OF THE PHILADELPHIA ACADEMY OF SURGERY

1910. Alexander, Emory Graham, M.D., F.A.C.S.., 337 South Eighteenth Street. Assistant Professor of Surgery, University of Pennsylvania; Surgeon to the Episcopal Hospital, St. Christopher's Hospital, Abington Hospital, Philadelphia Hospital for Contagious Diseases.

1906. Ashhurst, Astley Paston Cooper, A.B., M.D., F.A.C.S., 257 South Sixteenth Street. Professor of Clinical Surgery, University of Pennsylvania; Surgeon to the Episcopal Hospital and to the Philadelphia Orthopædic Hospital and Infirmary for Nervous Diseases.

1917. Baldwin, James Harvey, A.M., M.D., F.A.C.S., 1426 Pine Street. Surgeon to the Methodist Hospital.

1928. Bates, William, B.S., M.D., F.A.C.S., 2029 Pine Street. Assistant Professor of Surgery, Graduate School of Medicine, University of Pennsylvania; Assistant Surgeon to Babies' Hospital.

1922. Beltran, Basil R., A.M., M.D., F.A.C.S., 2109 Locust Street, Surgeon to the Misericordia Hospital and St. Mary's Hospital.

1915. Billings, Arthur E., M.D., 2020 Spruce Street. Assistant Professor of Surgery, Jefferson Medical College; Assistant Surgeon to Jefferson Hospital; Surgeon to the Pennsylvania and Bryn Mawr Hospitals.

1898. Boger, John A., A.M., M.D., F.A.C.S., 2213 North Broad Street. Senior Surgeon to the Stetson Hospital.

1928. Bothe, Fredrick A., M.S., M.D., Medical Arts Building, Sixteenth and Walnut Streets. Assistant Surgeon to the Presbyterian Hospital, Assistant Instructor in Surgery, Graduate School of Medicine, University of Pennsylvania.

1921. Boykin, Irvine M., M.D., Elkins Park. Associate Surgeon to the Episcopal Hospital; Instructor in Surgery, University of Pennsylvania; Associate in Surgery, Graduate School of Medicine, University of Pennsylvania.

1921. Bransfield, John William, M.D., F.A.C.S., 2025 Walnut Street. Surgeon to St. Agnes' Hospital and St. Vincent's Hospital.

1919. Brown, Henry P., Jr., B.S., M.D., F.A.C.S., 2134 Spruce Street. Surgeon to the Pennsylvania Hospital, and Chief of Out Patient Clinic; Associate Surgeon to the Presbyterian Hospital; Associate in Surgery Graduate School of Medicine, University of Pennsylvania; Instructor in Surgery, Medical School, University of Pennsylvania.

1923. Buzby, B. Franklin, A.B., M.D., F.A.C.S., 414 Cooper Street, Camden, New Jersey. Orthopædist, Cooper Hospital, Camden, New Jersey; Consulting Orthopædist, Camden County Tuberculosis Sanitarium; Instructor in Surgery, University of Pennsylvania.

1907. Carmany, Harry S., M.D., F.A.C.S., 366 Green Lane, Roxborough, Pennsylvania. Surgeon to the Memorial Hospital, Roxborough; Associate Surgeon to the Episcopal Hospital; Surgeon to the Dispensary of the Episcopal Hospital.

1909. Carnett, John B., M.D., 2012 Spruce Street. Professor and Vice Dean of Surgery Graduate School of Medicine, University of Pennsylvania; Visiting Surgeon to Graduate and Howard Hospitals and to the Radiological Department of the Philadelphia General Hospital.

1919. Crossan, Edward T., M.D., 257 South Sixteenth Street. Associate Surgeon to the Episcopal Hospital; Assistant Surgeon to the Orthopædic Hospital and Infirmary for Nervous Diseases; Assistant Instructor in Surgery, University of Pennsylvania.

1922. Davis, Warren B., M.D., F.A.C.S., 135 South Eighteenth Street. Oto-Rhino-Laryngologist, St. Agnes' Hospital; Instructor in Surgery, Jefferson Medical College; Assistant Surgeon to the Frankford Hospital.

1890. Deaver, John Blair, M.D., F.A.C.S., Sc.D., LL.D., 1634 Walnut Street. Surgeon-in-Chief to the Lankenau Hospital; Emeritus Professor of Surgery, University of Pennsylvania.

1898. Deaver, Harry C., M.D., F.A.C.S., 337 South Eighteenth Street. Visiting Surgeon to the Episcopal Hospital; Surgeon-in-Chief to the Kensington Hospital for Women; Surgeon to the Children's Hospital of the Mary J. Drexel Home.

1916. Dorrance, George Morris, M.D., F.A.C.S., 2025 Walnut Street. Surgeon to St. Agnes' Hospital; Consulting Oral Surgeon to the University Hospital and Philadelphia General Hospital; Professor Maxillo-Facial Surgery, Thomas Evans Institute, University of Pennsylvania.

1928. Downs, T. McKean, M.D., 6013 Green Street. Assistant Surgeon to the Pennsylvania Hospital, Germantown Hospital and Bryn Mawr Hospital.

1921. Eliason, Eldridge Lyon, A.B., M.D., F.A.C.S., Sc.D., 326 South Nineteenth Street. Surgeon to the University of Pennsylvania, Howard, Philadelphia General and Delaware County Hospitals; Professor of Clinical Surgery, University of Pennsylvania School of Medicine; Associate Professor of Surgery, Graduate School of Medicine, University of Pennsylvania; Consulting Surgeon, Lebanon Sanitarium and Burlington County Hospitals.

1909. Elmer, Walter, G., B.S., M.D., F.A.C.S., 1801 Pine Street. Professor of Orthopædics in the Graduate School of Medicine, University of Pennsylvania; Clinical Professor of Orthopædic Surgery in the Woman's Medical College of Pennsylvania; Visiting Orthopædic Surgeon to the Philadelphia General Hospital, the Graduate Hospital of the University of Pennsylvania, the Hospital of the Woman's Medical College, and the Jewish Hospital; Visiting Surgeon to the Pennsylvania Training School for Feeble-Minded Children at Elwyn.

1929. Englerth, Louis D., M.D., F.R.C.S. (Edin.)., F.A.C.S., 4912 Frankford Avenue. Surgeon to the Frankford Hospital; Assistant Surgeon to St. Joseph's Hospital; Consulting Surgeon to the Grandview Hospital, Sellersville, Pennsylvania.

1926. Flick, John B., M.D., 1608 Spruce Street. Assistant Surgeon to the Pennsylvania Hospital and the Bryn Mawr Hospital; Chief Clinical Assistant in Surgery, Jefferson Hospital; Demonstrator of Clinical Surgery, Jefferson Medical College.

1898. Frazier, Charles Harrison, M.D., F.A.C.S., Sc.D., 133 South Thirty-sixth Street. John Rhea Barton, Professor of Surgery, University of Pennsylvania; Chief of Neurosurgical Service, University Hospital.

1899. Gibbon, John H., M.D., 1608 Spruce Street. Professor of Surgery in the Jefferson Medical College; Surgeon to the Pennsylvania Hospital; Consulting Surgeon to the Bryn Mawr Hospital.

1914. Gill, A. Bruce, A.B., M.D., The Lenox, Thirteenth and Spruce Streets. Professor of Orthopædic Surgery, Medical School, University of Pennsylvania; Professor of Orthopædic Surgery, Graduate School of Medicine, University of Pennsylvania; Surgeon to the Philadelphia Orthopædic Hospital and Infirmary for Nervous Diseases; Orthopædic Surgeon to the Presbyterian Hospital; Chief Surgeon to the Widener Memorial Industrial Training School for Crippled Children; Consulting Surgeon to St. Edmond's Home for Crippled Children.

1928. Gilmour, William R., A.B., M.A., M.D., Central Medical Building. Associate Professor Operative Surgery and Surgical Anatomy at Women's Medical College; Instructor in Applied Anatomy. University of Pennsylvania; Attending Surgeon, Woman's College Hospital; Assistant Surgeon, Methodist Episcopal Hospital and North Eastern Hospital.

1902. Girvin, John H., M.D., F.A.C.S., 2120 Walnut Street. Gynæcologist to the Presbyterian Hospital; Associate Professor of Gynæcology, Graduate School of Medicine, University of Pennsylvania; Consulting Gynæcologist, Home for Incurables.

1925. Grant, Francis Clark, A.B., M.D., 133 South Thirty-sixth Street. Assistant Professor of Neurological Surgery, School of Medicine, University of Pennsylvania; Associate in Surgery, School of Medicine, University of Pennsylvania; Associate in Neurosurgery, Graduate School of Medicine, University of Pennsylvania; Consulting Neurosurgeon to the Children's Hospital; Visiting Neurological Surgeon to the Abington Memorial Hospital; Consulting Surgeon to the Chestnut Hill Hospital and Visiting Neurological Surgeon to the Philadelphia General Hospital.

1913. Hearn, William P., M.D., F.A.C.S., 2119 Spruce Street. Surgeon to the Philadelphia General Hospital; Assistant Surgeon to the Jefferson Hospital.

1922. Herman, J. Leon, B.S., M.D., Medical Arts Building, Sixteenth and Walnut Streets. Associate Surgeon, Pennsylvania Hospital, in charge of Urology; Urologist to the Methodist Hospital.

1890. Hewson, Addinell, A.B., M.D., F.A.C.S., 326 South Fifteenth Street. Professor of Anatomy and Histology, Temple University, Dental School; Surgeon to the Memorial Hospital, Roxborough, Philadelphia, Pennsylvania.

1925. Hinton, Drury, M.D., F.A.C.S., 1826 Pine Street. Assistant Surgeon to the Howard and Delaware County Hospitals; Instructor in First-Aid, Physical Diagnosis and Health Examination, Department of Physical Education, University of Pennsylvania.

1905. Hodge, Edward B., A.B., M.D., 2019 Spruce Street. Surgeon to the Presbyterian and Germantown Hospitals; Associate Surgeon to the Pennsylvania Hospital; Surgeon-in-Chief Chester County Hospital.

1898. Hutchinson, James P., A.B., M.D., Media, Pennsylvania. Consulting Surgeon to the Pennsylvania Hospital and the Methodist Episcopal Hospital.

1915. Ivy, Robert Henry, M.D., DD.S., F.A.C.S., 1503 Medical Arts Building, Sixteenth and Walnut Streets. Professor of Maxillo-Facial Surgery, Graduate School of Medicine, University of Pennsylvania; Plastic Surgeon to the Hospital of the Graduate School of Medicine; Oral Surgeon to the Episcopal Hospital; Consulting Plastic Surgeon to the Children's Hospital; Consultant in Maxillo-Facial Surgery, Walter Reed General Hospital, Washington, D. C.

1922. John, Rutherford L., M.D., 256 South Twenty-first Street. Instructor in Surgery, University of Pennsylvania Medical School; Associate Surgeon, Orthopædic Service, Episcopal Hospital; Assistant Surgeon, Philadelphia Orthopædic Hospital and Infirmary for Nervous Diseases; Orthopædist, Chief of Orthopædic Dispensary, St. Christopher's Hospital for Children.

1915. Jones, John F. X., B.S., A.M., M.D., F.A.C.S., 1737 Chestnut Street. Surgeon to St. Joseph's Hospital, Misericordia Hospital and St. Agnes' Hospital.

1900. Jopson, John Howard, M.D., F.A.C.S., 1824 Pine Street. Professor of Clinical Surgery, Medical Department, University of Pennsylvania; Professor of Surgery, Graduate School of Medicine, University of Pennsylvania; Visiting Surgeon to the Presbyterian Hospital and the Hospital of Graduate School of Medicine, University of Pennsylvania; Consulting Surgeon to the Children's Hospital, Shriner's Hospital, Norristown State Hospital and Philadelphia Home for Incurables.

1914. Keene, Floyd E., M.D., F.A.C.S., 133 South Thirty-sixth Street. William Goodell, Professor of Gynæcology, University of Pennsylvania.

1910. Kelly, James A., A.M., M.D., F.A.C.S., 1900 South Rittenhouse Square. Visiting Surgeon to St. Mary's Hospital, St. Joseph's Hospital and Misericordia Hospital; Associate Professor of Surgery, Graduate School of Medicine, University of Pennsylvania.

1913. Klopp, Edward J., M.D., F.A.C.S., 1611 Spruce Street. Assistant Professor of Surgery, Jefferson Medical College; Surgeon to the Pennsylvania, Delaware County and Memorial Hospitals; Assistant Surgeon to the Jefferson Hospital.

1914. Laws, George Malcolm, B.S., M.D., 1907 Spruce Street. Associate Gynæcologist to the Presbyterian Hospital; Assistant Professor of Gynæcology, Graduate School of Medicine, University of Pennsylvania.

1910. Lee, Walter Estell, M.D., F.A.C.S., 905 Pine Street. Professor of Surgery, Graduate School of Medicine, University of Pennsylvania; Surgeon to the Pennsylvania, Germantown, Children's, Bryn Mawr Hospitals and the Hospital of the Graduate School, University of Pennsylvania.

1899. Loux, Hiram R., M.D., F.A.C.S., Medical Arts Building, Sixteenth and Walnut Streets. Professor of Genito-urinary Surgery, Jefferson Medical College; Attending Genito-urinary Surgeon, Jefferson Medical College Hospital; Surgeon to the Philadelphia General Hospital.

1900. Martin, Edward, A.M., M.D., F.A.C.S., Ph.D., LL.D., 135 South Eighteenth Street. Professor of Surgical Physiology, University of Pennsylvania.

1929. McCarthy, Patrick Andrew, M.D., Central Medical Building. Instructor in General Surgery and Anatomy, Jefferson Medical College of Philadelphia; Assistant Surgeon to the Philadelphia General Hospital; Staff, St. Mary's and Clark Hospitals; Assistant Surgeon, Out-Patient Department, Jefferson Medical College Hospital.

1917. Mencke, J. Bernhard, A.B., M.D., 1816 Spruce Street. Assistant Surgeon to the Lankenau Hospital; Surgeon to the Northwestern General Hospital.

1915. Merrill, William Jackson, A.B., M.D., F.A.C.S., 2009 Spruce Street. Orthopædic Surgeon to the Children's Hospital and to the Germantown Hospital.

1904. Mitchell, Charles F., M.D., 2003 Pine Street. Surgeon to the Pennsylvania Hospital, Bryn Mawr Hospital and Germantown Hospital; Consulting Surgeon to the Chestnut Hill Hospital.

1906. Muller, George P., M.D., F.A.C.S., 1930 Spruce Street. Professor of Clinical Surgery, University of Pennsylvania; Surgeon to the University and Misericordia Hospitals.

1921. Murphy, Eugene C., M.D., F.A.C.S., 1841 South Broad Street. Surgeon to St. Agnes' Hospital; Attending Specialist in Surgery to the United States Public Health Service.

1902. Mutschler, Louis H., M.D., F.A.C.S., 1625 Spruce Street. Surgeon to the Episcopal Hospital.

1905. Nassau, Charles F., M.D., LL.D., F.A.C.S., 1710 Locust Street. Associate Professor of Surgery, Jefferson Medical College; Assistant Surgeon, Jefferson Medical College Hospital; Surgeon to St. Joseph's Hospital; Chief Surgeon to Frankford Hospital; Surgeon to Girard College; Consulting Surgeon to Pottstown Hospital, Pottstown, Pennsylvania; Consulting Surgeon to Newcomb Hospital, Vineland, New Jersey.

1890. Neilson, Thomas R., A.M., M.D., F.A.C.S., 1937 Chestnut Street. Surgeon Emeritus to the Episcopal Hospital; Emeritus Professor of Genito-urinary Surgery in the University of Pennsylvania; Consulting Surgeon to St. Christopher's Hospital for Children.

1921. Outerbridge, George W., A.B., M.D., 1927 Spruce Street. Associate Professor of Gynæcology, Graduate School of Medicine, University of Pennsylvania; Assistant Gynæcologist and Obstetrician, Methodist Hospital; Gynæcologist, Abington Hospital, Abington, Pennsylvania.

1915. Owen, Hubley R., M.D., 319 South Sixteenth Street. Professor of Clinical Surgery, Woman's Medical College; Instructor in Surgery, Jefferson Medical College; Surgeon, Philadelphia General Hospital; Attending Surgeon, Woman's College Hospital; Assistant Surgeon, Orthopædic Hospital; Chief Surgeon, Bureaus of Police and Fire of Philadelphia.

1912. Pfeiffer, Damon B., A.B., M.D., F.A.C.S., 1822 Pine Street. Surgeon to the Methodist Episcopal and Abington Hospital; Associate Surgeon, Presbyterian Hospital; Assistant Surgeon, Lankenau Hospital; Assistant Professor of Surgery, Graduate School of Medicine, University of Pennsylvania.

1919. Piper, Edmund B., B.S., M.D., F.A.C.S., 1936 Spruce Street. Professor of Obstetrics, University of Pennsylvania; Professor of Obstetrics, Graduate School of Medicine, University of Pennsylvania.

1916. Randall, Alexander, M.A., M.D., F.A.C.S., Medical Arts Building, Sixteenth and Walnut Streets. Professor of Urology, School of Medicine, University of Pennsylvania; Consulting Urologist to the Germantown Hospital; Urologist to the Chestnut Hill Hospital.

1924. Ravdin, Isador S., B.S., M.D., Medical Laboratories, University of Pennsylvania. J. William White Professor of Research Surgery, University of Pennsylvania, School of Medicine.

1928. Robbins, Frederick Ross, B.S., M.D., 258 South Eighteenth Street. Assistant Surgeon to the Pennsylvania Hospital, Graduate Hospital, Children's Hospital and the Bryn Mawr Hospital.

1913. Rodman, John Stewart, M.D., F.A.C.S., Medical Arts Building, Sixteenth and Walnut Streets. Professor of Surgery, Woman's Medical College; Surgeon-in-Chief, Woman's Medical College Hospital; Attending Surgeon to Bryn Mawr Hospital; Associate Surgeon, Presbyterian Hospital.

1928. Rothschild, Normann S., M.D., 235 South Fifteenth Street. Assistant Professor of Surgery, Graduate School of Medicine, University of Pennsylvania; Associate Surgeon, Graduate Hospital; Surgeon to Northern Liberties Hospital.

1913. Rugh, J. Torrance, A.B., M.D., Medical Arts Building, Sixteenth and Walnut Streets. Professor of Orthopædic Surgery, Jefferson Medical College; Clinical Professor of Orthopædic Surgery, Woman's Medical College of Pennsylvania; Orthopædic Surgeon to the Jefferson Hospital, to the Methodist Episcopal Hospital, to the Philadelphia General Hospital, to the Montgomery Hospital of Norristown, and to the North American Sanatorium of Atlantic City, New Jersey; Consulting Orthopædic Surgeon to the Philadelphia Lying-in Charity Hospital, to the West Philadelphia Hospital for Women, to the Pennsylvania State Institution for Epileptics and Feeble-Minded, Spring City, Pennsylvania, to the New Jersey State Institution for Feeble-Minded and Epileptics, Vineland, New Jersey, and to the Pottstown Hospital, Pottstown, Pennsylvania.

1920. Ryan, William John, A.B., M.D., F.A.C.S., Medical Arts Building, Sixteenth and Walnut Streets. Attending Surgeon to St. Mary's Hospital; Attending Surgeon to St. Vincent's Hospital.

1929. Seelaus, Henry K., M.D., 3015 North Broad Street. Surgeon to St. Mary's Hospital; Assistant Surgeon to the Philadelphia General Hospital; Demonstrator of Clinical Surgery, Jefferson Medical College.

1903. Siter, E. Hollingsworth, M.D., F.A.C.S., Medical Arts Building, Sixteenth and Walnut Streets. Visiting Genito-urinary Surgeon to the Philadelphia General Hospital; Associate in Genito-urinary Surgery, University of Pennsylvania; Surgeon-in-Charge Genito-urinary Clinic, University of Pennsylvania Hospital.

1922. Shallow, Thomas A., M.D., F.A.C.S., 2045 Walnut Street. Assistant Professor of Surgery, Jefferson Medical College; Visiting Surgeon Philadelphia General Hospital; Assistant Surgeon Jefferson Medical College Hospital.

1924. Smyth, Calvin M., Jr., M.D., F.A.C.S., 257 South Twenty-first Street. Assistant Professor of Surgery, University of Pennsylvania, Graduate School of Medicine; Associate Surgeon to the Methodist Episcopal and Abington Memorial Hospitals.

1909. Speese, John, M.D., F.A.C.S., 1832 Spruce Street. Associate Professor of Surgery, Graduate School of Medicine, University of Pennsylvania; Surgeon to the Children's Hospital and to the Presbyterian Hospital.

1911. Stellwagen, Thomas C., Jr., M.D., 220 South Sixteenth Street. Chief Clinical Assistant in the Out-patient Surgical Department of the Jefferson Medical College Hospital.

1919. Swartley, William Blaine, M.D., 6002 Greene Street, Germantown. Surgeon to the Germantown Hospital; Surgeon to the Chestnut Hill Hospital; Instructor of Anatomy, Jefferson Medical College.

1890. Taylor, William J., M.D., 1825 Pine Street. Attending Surgeon to the Philadelphia Orthopædic Hospital and Infirmary for Nervous Diseases; Consulting Surgeon to St. Agnes' Hospital; The West Philadelphia Hospital for Women and to the Woman's Hospital.

1911. Thomas, B.A., M.D., F.A.C.S., 1900 Spruce Street. Professor of Urology, Graduate School of Medicine, University of Pennsylvania; Genito-urinary Surgeon to the Presbyterian Hospital.

1911. Thomas, T. Turner, M.D., F.A.C.S., 2009 Spruce Street. Associate Professor of Applied Anatomy and Associate in Surgery in the University of Pennsylvania.

1915. Thomas, W. Hersey, M.D., F.A.C.S., Medical Arts Building, Sixteenth and Walnut Streets. Professor of Genito-urinary Surgery in Temple University; Genito-urinary Surgeon to the Philadelphia General Hospital, the Samaritan Hospital and the Garretson Hospital.

1928. Wagoner, George W., M.D., 2008 Walnut Street. Consulting Surgeon, Woman's Hospital; Attending Orthopædic Surgeon, Bryn Mawr Hospital; Clinical Surgeon, Philadelphia Orthopædic Hospital and Infirmary for Nervous Diseases; Associate in Orthopædic Surgery, Graduate School of Medicine, University of Pennsylvania; Associate in Pathology, School of Medicine, University of Pennsylvania.

1928. Walkling, Adolph A., M.D., 2808 Girard Avenue. Assistant Surgeon to the Pennsylvania Hospital; Clinical Assistant at the Jefferson Hospital; Demonstrator of Fracture Dressing at Jefferson Medical College.

1928. WEEDER, S. DANA, M.D., 6110 Greene Street, Germantown. Assistant Surgeon to the Germantown Hospital; Assistant Surgeon to the Chestnut Hill Hospital; Instructor in Anatomy, University of Pennsylvania Medical School; Instructor in Anatomy, University of Pennsylvania Graduate School of Medicine.

1902. WHITING, A.D., M.D., 333 South Eighteenth Street. Associate Surgeon, Lankenau Hospital; Associate Professor of Surgery, Graduate School of Medicine, University of Pennsylvania.

1919. WILLARD, DEFOREST P., M.D., 1729 Spruce Street. Professor of Orthopædics, Graduate School of Medicine, University of Pennsylvania; Orthopædic Surgeon, Graduate School Hospital, Orthopædic Hospital, Shriner's Hospital, Bryn Mawr Hospital, Chestnut Hill Hospital and Delaware Hospital.

1898. WOOD, ALFRED CONARD, M.D., F.A.C.S., 2035 Walnut Street. Assistant Professor of Surgery, University of Pennsylvania; Surgeon to the Howard Hospital, and Philadelphia General Hospital.

NON-RESIDENT MEMBERS

1908. SWEET, J. E., A.M., M.D., Sc.D., F.A.C.S. Cornell University Medical School, New York City. Professor of Surgical Research, Cornell University, School of Medicine.

1923. WELLS, J. RALSTON, M.D., Woolworth Building, Daytona Beach, Florida. Visiting Surgeon to the Halifax District Hospital, Daytona Beach, Florida.

HONORARY FELLOWS

ELECTED		DIED
1881.	SIR JAMES PAGET, London, England.....December	30, 1899.
1881.	THEODORE BILLROTH, Vienna, Austria.....January	5, 1894.
1881.	BERNHARD VON LANGENBECK, Berlin, Germany.....September	30, 1887.
1881.	WILLARD PARKER, New York, N. Y.....April	25, 1884.
1881.	LEWIS A. SAYRE, New York, N. Y.....	1900 or 1901.
1881.	MOSES GUNN, Chicago, Illinois.....November	4, 1887.
1881.	JOHN T. HODGEN, St. Louis, Mo.....April	28, 1882.
1881.	W. W. DAWSON, Cincinnati, Ohio.....February	16, 1893.
1881.	T. G. RICHARDSON, New Orleans, La.....May	26, 1892.
1881.	J. COLLINS WARREN, Boston, Massachusetts.	1927.
1881.	W. T. BRIGGS, Nashville, Tennessee.....June	13, 1894.
1881.	CHRISTOPHER JOHNSTON, Baltimore, Md...October	11, 1891.
1881.	D. W. YANDELL, Louisville, Ky.....May	2, 1898.
1898.	MAURICE H. RICHARDSON, Boston, Mass...July	31, 1912.
1898.	GEORGE M. STERNBERG, Washington, D. C. November	3, 1915.
1898.	CHARLES W. MCBURNEY, New York, N. Y. November	7, 1913.
1898.	NICHOLAS SENN, Chicago, Illinois.....January	2, 1908.
1898.	THEODORE F. PREWITT, St. Louis, Mo.....October	17, 1904.
1898.	L. MCLANE TIFFANY, Baltimore, Md.....October	23, 1916.
1898.	NATHANIEL P. DANDRIDGE, Cincinnati, Ohio.	1910.
1898.	ROSWELL PARK, Buffalo, N. Y.....February	15, 1914.
1898.	ROBERT F. WEIR, New York, N. Y.	1927.
1898.	FREDERICK S. DENNIS, New York, N. Y.	
1900.	W. H. A. JACOBSON, London, England.	
1900.	THEODORE KOCHER, Berne, Switzerland....July	27, 1917.

ELECTED		DIED
1900.	VINCENZ CZERNY, Heidelberg, Germany.... October	3, 1916.
1906.	WILLIAM J. MAYO, Rochester, Minn.	
1906.	DUDLEY P. ALLEN, Cleveland, Ohio..... January	6, 1915.
1906.	ROBERT ABBE, New York, N. Y.	1928.
1906.	C. B. G. DENANCREDE, Ann Arbor, Mich... May	6, 1921.
1907.	JOHN C. MUNRO, Boston, Mass..... December	6, 1910.
1908.	J. EWING MEARS, Philadelphia, Pa..... May	28, 1919.
1909.	LEWIS STEPHEN PILCHER, Brooklyn, N. Y.	
1916.	W. W. KEEN, Philadelphia, Pa.	
1920.	HENRY R. WHARTON, Philadelphia, Pa..... December	1925.
1927.	JOHN CHALMERS DACOSTA, Philadelphia, Pa.	
1929.	D'ARCY POWER, London, England.	
1929.	ALBIN LAMBOTTE, Esneux, Belgium.	
1929.	HENRI HARTMANN, Paris, France.	
1929.	TH. TUFFIER, Paris, France.	
1929.	JOSEPH GUYOT, Bordeaux, France.	
1929.	GEORGES JEANNENEY, Bordeaux, France.	
1929.	F. DE QUERVAIN, Berne, Switzerland.	
1929.	BERKELEY MOYNIHAN, Leeds, England.	
1929.	HARVEY CUSHING, Boston, Mass.	
1929.	EDWARD W. ARCHIBALD, Montreal, Canada.	
1929.	JOHN M. T. FINNEY, Baltimore, Md.	
1929.	EVARTS GRAHAM, St. Louis, Mo.	
1929.	ELLSWORTH ELIOT, JR., New York City, N. Y.	
1929.	RUDOLPH MATAS, New Orleans, La.	
1929.	DEAN D. LEWIS, Baltimore, Md.	
1929.	EUGENE H. POOL, New York City, N. Y.	
1929.	GEORGE W. CRILE, Cleveland, Ohio.	
1929.	EDWARD STARR JUDD, Rochester, Minn.	
1929.	DALLAS B. PHEMISTER, Chicago, Ill.	

FELLOWS DECEASED SINCE LAST PUBLICATION

DIED	
1927.	JOHN GOODRICH CLARK
1927.	JOSEPH SPELLISY
1927.	EDWARD E. MONTGOMERY

WINNERS OF THE SAMUEL D. GROSS PRIZE

1895. "Inquiry into the Difficulties Encountered in the Reduction of Dislocations of the Hip."—Dr. Oscar H. Allis, Philadelphia, Pa.

1902. "Treatment of Certain Malignant Growths by Excision of the External Carotids."—Dr. Robert H. W. Dawbarn, New York, N. Y.

1905. "The Biology of the Micro-organisms of Actinomycosis."—Dr. James Homer Wright, Boston, Mass.

1910. "An Anatomical and Surgical Study of Fractures of the Lower End of the Humerus."—Dr. Astley P. C. Ashhurst, Philadelphia, Pa.

1915. "Surgery in the Treatment of Hodgkin's Disease."—Dr. John Lawrence Yates, Milwaukee, Wis.*

1920. "Some Fundamental Considerations in the Treatment of Empyema Thoracis."—Dr. Evarts A. Graham, St. Louis, Mo.

1925. "The Surgery of Pulmonary Tuberculosis."—Dr. John Alexander, Saranac Lake, N. Y.

* This essay has never been published by the author as required under the terms of the award.

LIST OF FELLOWS WHO HAVE DELIVERED THE ANNUAL ADDRESS

1881. S. D. Gross.
1882. D. Hayes Agnew.
1883. William Hunt.
1884. John H. Brinton.
1885. John H. Packard.
1886. R. J. Levis.
1887. J. Ewing Mears.
1888. C. B. G. deNancrede.
1889. John B. Roberts.
1890. DeForest P. Willard.
1891. William G. Porter.
1892. T. G. Morton.
1893. C. W. Dulles.
1894. W. B. Hopkins.
1895. John B. Deaver.
1896. James M. Barton.
1897. Thomas R. Neilson.
1898. O. H. Allis.
1899. William J. Taylor.
1900. None.
1901. H. R. Wharton.
1902. J. M. Spellissy.
1903. R. G. LeConte.
1904. G. G. Davis.
1905. J. Chalmers DaCosta.
1906. Richard H. Harte.
1907. Edward Martin.
1908. Charles H. Frazier.
1909. John H. Gibbon.
1910. Astley P. C. Ashhurst.
1911. John H. Jopson.
1912. George G. Ross.
1913. William L. Rodman.
1914. Alfred C. Wood.
1915. Francis T. Stewart.
1916. Edward B. Hodge.
1917. J. Edwin Sweet.
1918. None.
1919. None.
1920. John G. Clark.
1921. J. Torrance Rugh.
1922. George P. Muller.
1923. W. Estell Lee.
1924. Robert H. Ivy.
1925. John Speese.
1926. Damon B. Pfeiffer.
1927. Emory G. Alexander.
1928. Edward J. Klopp.

TRANSACTIONS
OF THE
PHILADELPHIA ACADEMY OF SURGERY

Meeting of January 4, 1926, in Cadwalader Hall, College of Physicians. The President, Dr. Edward B. Hodge, in the Chair.

SCIENTIFIC PROGRAM

Exhibition of Patients.

Dr. Calvin M. Smyth, Jr.
Vol. LXXXIII, No. 4, p. 569.
Carcinoma of the colon in a patient aged 22 years.
Discussed by Doctors Pfeiffer and Jopson.

Dr. Basil R. Beltran.
Vol. LXXXIII, No. 4, p. 571.
Strangulated hernia in infants with report of a case in a child 19 days old.
Discussed by Doctor Jopson.

Dr. Henry P. Brown, Jr.
Vol. LXXXIII, No. 4, p. 573.
Case of pseudo-pancreatic cyst.
Discussed by Doctor Pfeiffer.

Case Reports.

Dr. W. Estell Lee.
Vol. LXXXIII, No. 4, p. 568.
Bilateral pathologic dislocation of the elbow joint due to Charcot's Disease.
Discussed by Doctors Hodge, Mitchell and Buzby.

Dr. Calvin M. Smyth, Jr.
Vol. LXXXIII, No. 4, p. 569.
Carcinoma of the stomach in a patient aged 23 years.

Dr. Addinell Hewson.
(Not published.)
1. Case of persistent duodenojejunal pouch enclosing entire small intestine. Lantern slides and pictures.
Discussed by Doctors Brown and Ashhurst.
2. A case of simulating Hirschsprung's Disease.

The volume and page number following the name of the author refers to the location of the article in Annals of Surgery.

Papers.

Dr. I. S. Ravdin.
Vol. LXXXIII, No. 6, p. 807.

Retroperitoneal tuberculous lymphadinitis with demonstration of a case. Lantern Slides.
Discussed by Doctors Willard and Owen.

Annual Conjoint Meeting with the New York Surgical Society, February 10, 1926, at the Jefferson Hospital. Dr. Edward B. Hodge, in the Chair.

SCIENTIFIC PROGRAM

Dr. Fielding O. Lewis.
(By invitation.)
Vol. LXXXIII, No. 5, p. 732.

Total laryngectomy by the one stage operation.
Discussed by Doctor Carl Eggers.

Dr. Charles H. Frazier.

Review of results of nerve anastomosis in treatment of recurrent laryngeal paralysis.
Discussed by Doctor Eugene Poole.

Dr. John B. Flick.
(By invitation.)
Vol. LXXXIII, No. 6, p. 737.

A case of tularemia.

Dr. Hiram R. Loux.
(Not published.)

Bilateral renal calculus.
Discussed by Doctor Edwin Beer.

Dr. Thomas A. Shallow.
(Not published.)

1. A specimen in which an abdominal testicle was removed.
2. Dermoid tumor of the spinal cord.
Discussed by Doctor Hubley R. Owen.

Dr. Edward J. Klopp.
Vol. LXXXIII, No. 5, p. 733.
(Not published.)

1. Amputation of both breasts for carcinoma.
2. Imperforate anus.
Discussed by Doctors Willy-Meyer and McWilliams.

Dr. DeForest P. Willard.
(Not published.)

End result in supracondylar fracture of humerus.

Dr. John H. Gibbon.
(Not published.)

1. Osteochondroma of the fibula.
2. Hemorrhage following gastro-jejunostomy.
Discussed by Doctors Lewisohn, Douglass and Gerster.

Dr. Emory G. Alexander.
Vol. LXXXIV, No. 3, p. 461.

Report of a case of spreading gangrene of the skin and subcutaneous tissue following an operation for appendicitis with abscess.

Dr. J. Stewart Rodman.
Vol. LXXXIII, No. 5. p. 732.

A case of syphilis of the stomach. Presentation of patient.

Dr. J. B. Carnett.
(Not published.)

Intercostal neuralgia as a cause of abdominal pain and tenderness.
Discussed by Doctor Whipple.

Dr. John B. Deaver.
Vol. LXXXIII, No. 6, p. 782.

Fæcal fistula.

Meeting of March 4, 1926, at the University Hospital. Dr. Charles F. Mitchell, in the Chair.

SCIENTIFIC PROGRAM

Dr. Albert E. Bothe
(By invitation.)
Vol. LXXXIV, No. 1, p. 57.

Hypernephromata. Experimental and clinical research. Lantern Slides.
Discussed by Doctors Pfeiffer, Crossan and Outerbridge.

Dr. Alexander Randall.
Vol. LXXXIV, No. 1, p. 120.

A new method for the drainage of the urinary bladder.

Dr. Floyd E. Keene.
Vol. LXXXIV, No. 1, p. 121.

Sampson's cyst. Lantern slides.
Discussed by Doctors Outerbridge and Pfeiffer.

Dr. Elridge L. Eliason and
Dr. L. K. Ferguson
(By invitation.)

Exhibition of patients with liver abscesses.
Discussed by Doctors Chambers (by invitation) Brown and Ashhurst.

Dr. Eldridge L. Eliason.
Vol. LXXXIV, No. 1, p. 116.

Liver and subdiaphragmatic abscess.
Lantern slides.
Discussed by Doctors Pancoast, Ashhurst and Jopson.

Dr. George P. Muller.
Vol. LXXXIV, No. 1, p. 95.

1. Exhibition of cases of cholecystoduodenostomy by a new method.
2. Carcinoma of ampulla of Vater. Exhibition of patient one and one-half years after operation.

Dr. Isador S. Ravdin and
Dr. Leon Jonas.
(By invitation.)
Vol. LXXXIV, No. 1, p. 37.

Blood calcium and phosphorous content in fractures and diseases of bone.
Discussed by Doctor Jonas (by invitation).

Dr. Charles H. Frazier.
Vol. LXXXIV, No. 1, p. 51.

A system of control and treatment in the toxic goitre.

Dr. L. K. Ferguson.
(By invitation.)

Exhibition of new aspirating devices.

Meeting of April 5, 1926, in Cadwalader Hall, College of Physicians. The President, Dr. Charles F. Mitchell, in the Chair.

SCIENTIFIC PROGRAM

Exhibition of patients and
Case reports.
Dr. A. Bruce Gill.
Vol. LXXXIV, No. 3, p. 451.

1. Severe comminuted fracture of lower end of radius.
2. Comminuted fracture shaft of humerus.
3. Pathological fracture of humerus in child two months of age.
4. Dislocation of first metatarsal.
5. Transplantation of upper end of fibula to replace head of humerus.
6. Fusion of tibia and fibula for ununited fracture of tibia.
Discussed by Doctors Willard, Jopson and Theodore Orr (by invitation).

Lantern Demonstrations.
Dr. J. Edwin Sweet and
Dr. R. C. Weimer.
(By invitation.)
Vol. LXXXIV, No. 3, p. 455.

Some physicochemical factors in the formation of gall stones.

Annual Oration (for 1925).
Dr. John Speese.
Vol. LXXXIV, No. 4, p. 477.

The Treatment of Blood Dyscrasias Associated with Splenomegaly.

Meeting of May 3, 1926, in Cadwalader Hall, College of Physicians. The President, Dr. Charles F. Mitchell, in the Chair.

SCIENTIFIC PROGRAM

Exhibition of patients.
Dr. Temple Fay.
(By invitation.)
Vol. LXXXIV, No. 3, p. 456.

Case of intracranial division of glossopharyngeal nerve combined with cervical rhizotomy for pain in inoperable carcinoma of the throat.
Discussed by Doctors Frazier, Ashhurst and Fay.

Dr. Irvine M. Boykin.
Vol. LXXXIV, No. 3, p. 459.

1. Complete thyroidectomy for myxomatous goitre; transient recurrent laryngeal paralysis.
2. Sarcoma of the prostate.
Discussed by Doctors Jopson and Boykin.

Papers.
Dr. Robert H. Ivy and
Hilda Melching, R. N.
(By invitation.)

Recent experiences with ether-oil colonic anaesthesia.
Discussed by Doctors Frazier and Lee.

Dr. Fredrick A. Bothe.
(By invitation.)
Vol. LXXXIV, No. 4, p. 465.

Alkalosis.
Discussed by Doctors Hodge, Pfeiffer, Gill, Ashhurst, Mitchell and Owen.

Dr. William J. Ryan.
Vol. LXXXIV, No. 4, p. 567.

Omental Cysts.

Dr. Francis S. Chambers. (By invitation.) Vol. LXXXIV, No. 4, p. 608.	An operation for the stabilization of paralytic club feet. Discussed by Doctors Gill, Elmer, Willard, Chambers and Ashhurst.
Dr. Benjamin Lipshutz. (By invitation.) Dr. Clarence Hoffman. (By invitation.) Vol. LXXXIV, No. 4, p. 525.	Renal arterial variations and extraperitoneal abdominal nephrectomy.

Meeting of October 4, 1926, in Cadwalader Hall, College of Physicians. The President, Dr. Charles F. Mitchell, in the Chair.

SCIENTIFIC PROGRAM

Exhibition of patients.

Dr. Astley P. C. Ashhurst.	Extirpation of pigmented mole of face and plastic operation for repair. Discussed by Doctor Dorrance.

Exhibition of Specimen.

Dr. J. Leon Herman.	Tuberculosis of testis.

Case Reports.

Dr. Robert H. Ivy. Vol. LXXXV, No. 1, p. 27.	Two cases of hyperostosis of the condyloid process of the mandible. Discussed by Doctor Muller.
Dr. W. Harold Storm. (By invitation.) Vol. LXXXV, No. 1, p. 129.	Gastric tetany with alkalosis relieved by hypertonic salt solution. Discussed by Doctors Ashhurst and Jopson.
Dr. Hubley R. Owen and Dr. Helen Ingleby. (By invitation.) Vol. LXXXV, No. 1, p. 132.	A case of papillary adeno-carcinoma arising in a cyst of the neck. Discussed by Doctor Pfeiffer.

Papers.

Dr. Astley P. C. Ashhurst. Vol. LXXXV, No. 1, p. 89.	The mortality in appendicitis. Discussed by Doctor Muller.

Dr. George P. Muller and Dr. Thomas J. Ryan. (By invitation.)	On the use of the Russell apparatus in the treatment of fracture of the shaft of the femur, with exhibition of cases. Discussed by Doctors Muller, Pfeiffer, Rugh and Ashhurst.
Dr. William P. Hearn and Dr. Louis H. Clerf. (By invitation.) Vol. LXXXV, No. 1, p. 54.	Post-operative massive collapse of the lung. Discussed by Doctors Ravdin, Smyth, and Clerf.

Meeting of November 1, 1926, in Cadwalader Hall, College of Physicians. The Vice President, Dr. Astley P. C. Ashhurst, in the Chair.

SCIENTIFIC PROGRAM

Case reports.

Dr. J. Stewart Rodman. Vol. LXXXV, No. 2, p. 288.	1. Obliterative endoaneurismorrhaphy in a popliteal aneurysm, giving end result. 2. A case of persistent skin ulceration of the upper arm and chest following axillary adenitis. Discussed by Doctor Klauder (by invitation).
Dr. James H. Baldwin. Vol. LXXXV, No. 2, p. 288.	Foreign body in the bladder.
Dr. Damon B. Pfeiffer. Vol. LXXXV, No. 2, p. 290.	A case of recurrent hæmatemesis with splenomegaly, cholecystitis and appendicitis. Discussed by Doctors Deaver, Ashhurst, Pfeiffer and Eiman.

Papers.

Dr. James H. Baldwin and Dr. William R. Gilmour. (By invitation.) Vol. LXXXV, No. 2, p. 161.	A study of gas gangrene with report of cases. Discussed by Doctor T. A. Shallow.
Dr. Verne G. Burden. (By invitation.) Vol. LXXXV, No. 2, p. 239.	Surgical pathology of the gallbladder. Discussed by Doctor Deaver.

Meeting of December 6, 1926, in Cadwalader Hall, College of Physicians. The President, Dr. Charles F. Mitchell, in the Chair.

SCIENTIFIC PROGRAM

Demonstrations.

Dr. John B. Carnett.
Vol. LXXXV, No. 3, p. 475.

1. Satisfactory method of local anæsthesia with ethyl chloride.
2. Chronic strain of the lumbar spine and sacro-iliac joints.

Papers.

Dr. Elridge L. Eliason and Dr. L. K. Ferguson. (By invitation.)
Vol. LXXXV, No. 4, p. 565.

End results in gall bladder surgery.
Discussed by Doctors Hinton, Muller and Eliason.

Dr. Kenneth E. Appel. (By invitation.)
Dr. Selling Brill. (By invitation.)
Vol. LXXXV, No. 4, p. 502.

The intradermal test for the determination of post-operative water metabolism.
Discussed by Doctors Muller and Brill.

REPORT OF SECRETARY FOR YEAR 1926

During the year 1926 there were held eight regular meetings and one conjoint meeting with the New York Surgical Society. The latter being held in Philadelphia on February 10, 1926 at 2 P.M. The scientific meeting was held in the Amphitheatre of the Jefferson Hospital and the dinner was held at the Racquet Club. The March Meeting of the Academy of Surgery was a clinical meeting held in the Amphitheatre of the University of Pennsylvania Hospital.

The average attendance at the regular meetings was twenty-six Fellows and twenty guests. There was one specimen exhibited; twelve patients presented; fifteen cases reported and seventeen papers read; and one apparatus exhibited.

The following were elected to Fellowship; Dr. John Flick and Dr. Benjamin Lipshutz.

The annual oration was delivered by Dr. Damon B. Pfeiffer.

Respectfully submitted,
Hubley R. Owen, M.D.
Secretary.

Meeting of January 3, 1927, in Cadwalader Hall, College of Physicians. The President, Dr. Charles F. Mitchell, in the Chair.

SCIENTIFIC PROGRAM

Case reports.

Dr. John W. Bransfield.
Vol. LXXXV, No. 5, p. 778.

1. Bilateral congenital dislocation of the hip—bloodless reduction.
2. Congenital absence of 4th thoracic vertebra—treated by bone graft.
3. Fracture of the os calcis—nail fixation.

Discussed by Doctors Hodge, Gill, Jopson, Ashhurst and Willard.

Dr. Thomas A. Shallow.
Vol. LXXXV, No. 5, p. 782.

Two cases of arterio-venous aneurism.
Discussed by Doctors Jopson and Shallow.

Dr. Damon B. Pfeiffer.
(Not published.)

Chronic gastric ulcer perforating into the spleen—death from hemorrhage.

Papers.

Dr. Ralston Wells.
Vol. LXXXV, No. 5, p. 757.

Further observation on spinal anæsthesia with anhydrous cocain in 500 cases.
Discussed by Doctor Rodman.

Dr. Ernest G. Williamson. (By invitation.)
Vol. LXXXV, No. 5, p. 659.

Suppurative pericarditis in children.
Discussed by Doctors Brown, Bransfield, Ashhurst, Jopson, Rodman and Deaver.

Meeting of February 7, 1927, in Cadwalader Hall, College of Physicians. The President, Dr. Charles F. Mitchell, in the Chair.

SCIENTIFIC PROGRAM

Case reports.

Dr. A. Bruce Gill.
Vol. LXXXV, No. 6, p. 915.

1. Three cases of spondylolisthesis operated upon.
2. Cases illustrating epiphyseal disturbance during adolescence.

Discussed by Doctors Elmer and Tillotsen (by invitation).

Dr. Eldridge L. Eliason.
Vol. LXXXV, No. 6, p. 915.
Two case reports of osteochondritis juvenilis femoris.

Dr. Edward Klopp.
Vol. LXXXV, No. 6, p. 916.
Post-operative stricture of the common bile duct.
Discussed by Doctors Deaver and Klopp.

Dr. J. Stewart Rodman.
Vol. LXXXV, No. 6, p. 919.
Acute intestinal obstruction with special reference to several unusual cases.
Discussed by Doctors Elmer and Pfeiffer.

Papers.

Dr. Isador S. Ravdin.
Vol. LXXXV, No. 6, p. 873.
Primary ulcer of the jejunum.
Discussed by Doctors Jopson and Ravdin.

Dr. William B. Swartley.
Vol. LXXXV, No. 6, p. 886.
Mesentric cysts.

The Annual Conjoint Meeting of the Philadelphia Academy of Surgery and New York Surgical Society was held at the Academy of Medicine, New York, on February 9, 1927.

SCIENTIFIC PROGRAM

Dr. Allen O. Whipple
(of New York)
Vol. LXXXV, No. 6, p. 922.
1. Cirrhosis with omentopexy and splenectomy—6 years follow up.
Discussed by Doctors T. Turner Thomas, John Speese, Willy Meyer and A. P. C. Ashhurst.
2. Ruptured aneurism of femoral artery.
Discussed by Doctors Thomas Shallow and Hubley R. Owen.

Dr. Edwin Beer
(of New York).
Vol. LXXXV, No. 6, p. 927.
1. Diverticulum of the bladder with ureter emptying into same; excision and plastic insertion of ureter in bladder.
Discussed by Doctors Leon Herman and Edwin Beer.
2. Papillary carcinoma of kidney pelvis; aseptic nephrourtetrectomy with excision of bladder wall and ureteral orifice.

Dr. Alfred S. Taylor
(of New York).
Vol. LXXXV, No. 6, p. 932.
1. Tumor of acoustic nerve.
Discussed by Dr. Thomas Shallow.
2. Extradural tumor—cervical region—hemilaminectomy.
Discussed by Dr. Samuel Ellsberg.
3. Cauda equina neuritis.
Discussed by Doctor A. P. C. Ashhurst.

Dr. John Douglass
(of New York).
Vol. LXXXV, No. 6, p. 937.
Carcinoma of the descending colon, illustrating dilatation of the cæcum.
Discussed by Dr. John H. Jopson.

Dr. Richard Bolling
(of New York).
Vol. LXXXV, No. 6, p. 938.
1. Megacolon—2 cases.
2. Tuberculosis of the caecum.
3. Carcinoma of the sigmoid in a young adult.
Discussed by Dr. Damon B. Pfeiffer.

Dr. John Erdmann
(of New York).
Vol. LXXXV, No. 6, p. 722.
Tumors of the caecum.
Discussed by Doctors George B. Muller and Joseph Blake.

Meeting of March 7, 1927, in Cadwalader Hall, College of Physicians. The President, Dr. Charles F. Mitchell, in the Chair.

SCIENTIFIC PROGRAM

Exhibition of patients.

Dr. Hubley R. Owen and
Dr. Searle Lanyon.
(By invitation.)
Vol. LXXXVI, No. 1, p. 129.
Case of appendicitis with failure of descent of cæcum.
Discussed by Doctor Owen.

Dr. John H. Jopson.
Vol. LXXXVI, No. 1, p. 134.
Cases of carcinoma of the rectum operated upon by Jones' Method.

Case reports.

Dr. Lloyd B. Greene.
(By invitation.)
Vol. LXXXVI, No. 1, p. 130.
A case of uretro-colonic fistula.
Discussed by Doctor Herman.

Dr. Hubley R. Owen and
Dr. Patrick A. McCarthy.
(By invitation.)
Vol. LXXXVI, No. 1, p. 133.
Primary pulmonary actinomycosis. Secondary involvement of chest wall and spinal cord.
Discussed by Doctors Dorrance and Speese.

Annual Oration (for 1926).
Dr. Damon B. Pfeiffer.
Vol. LXXXVI, No. 1, p. 374.
The principles underlying the surgery of carcinoma of the rectum.

Meeting of April 4, 1927, in Cadwalader Hall, College of Physicians. The President, Dr. Charles F. Mitchell, in the Chair.

SCIENTIFIC PROGRAM

Exhibition of Patients.
Dr. J. Torrance Rugh.
Vol. LXXXVI, No. 3, p. 449.
Plastic operation for total paralysis of upper extremity following infantile paralysis.

Case reports.
Dr. Henry P. Brown, Jr. and Dr. D. W. Kingsley. (By invitation.)
Vol. LXXXVI, No. 3, p. 450.
A case of infection of the pleural cavity and blood stream with Baccillus Welchi.
Discussed by Doctors Brown and Hodge.

Dr. Eldridge L. Eliason.
Vol. LXXXVI, No. 3, p. 452.
1. Perforated jejunal ulcer complicated by left renal calculus.
2. Perforated jejunal ulcer following a perforated duodenal ulcer.

Dr. Hubley R. Owen.
Vol. LXXXVI, No. 3, p. 451.
A case of spontaneous rupture of gall bladder into duodenum.

Papers.
Dr. Emory G. Alexander and Dr. William H. Crawford. (By invitation.)
Vol. LXXXVI, No. 3, p. 362.
Multiple giant cell tumors.
Discussed by Doctor Bromer.

Dr. George M. Boyd. (By invitation.) (Not published.)
Obstetrics before and after Lister.

Dr. W. Estell Lee. (Not published.)
The practice of surgery at the Pennsylvania Hospital from 1751 to 1927.

Meeting of May 2, 1927, in Cadwalader Hall, College of Physicians. The President, Dr. Charles F. Mitchell, in the Chair.

SCIENTIFIC PROGRAM

Papers.
Dr. George L. Carrington. (By invitation.)
Vol. LXXXVI, No. 4, p. 505.
Some factors and end results in the experimental surgery of the œsophagus.

Dr. Benjamin A. Thomas.
Vol. LXXXVI, No. 4, p. 563.
Vital factors in the management of prostatic obstruction. Lantern slides.

Dr. Emory G. Alexander.
Vol. LXXXVI, No. 5, p. 765.
Perforation of the gall bladder.
Discussed by Doctors Jopson and Ashhurst.

Dr. Francis C. Grant.
Vol. LXXXVI, No. 4, p. 485.
Chronic subdural haematoma.
Discussed by Doctors Rodman and Ashhurst.

Dr. Walter Estell Lee and Dr. William McClennhan. (By invitation.)
Vol. LXXXVI, No. 5, p. 792.
The surgical treatment of burns with the report of two cases complicated with Curling's ulcers of the duodenum. Moving pictures.

Meeting of October 10, 1927, in Cadwalader Hall, College of Physicians. The President, Dr. Charles F. Mitchell, in the Chair.

SCIENTIFIC PROGRAM

Exhibition of Patients.
Dr. Alfred C. Johnson. (By invitation.)
Splenectomy for acquired hemolytic icterus.

Dr. W. H. Crawford. (By invitation.)
Splenectomy for purpura hemorrhagica.
Discussed by Doctors Cottrell and Ashhurst.

Case Reports.
Dr. Eldridge L. Eliason.
1. Case of traumatic rupture of the duodeno-jejunal junction.
Discussed by Doctor Boykin.
2. Case of bullet wound of iliac vein.
Discussed by Doctor Eliason.

Dr. L. Kraeer Ferguson. (By invitation.)
Vol. LXXXVII, No. 1, p. 133.
Acute hemorrhagic pancreatitis with unusual symptoms.
Discussed by Doctors Pfeiffer, Ashhurst and Ferguson.

Dr. John B. Flick.
Vol. LXXXVII, No. 1, p. 134.
Unilateral bronchiectasis treated by thoracoplasty.
Discussed by Doctor Clerf (By invitation).

Paper.

Dr. Irvine M. Boykin. — Abdominal wounds. Their making and closure.
Vol. LXXXVII, No. 1, p. 74. — Discussed by Doctors Eliason, Ashhurst, Muller and Boykin.

Meeting of November 7, 1927, in Cadwalader Hall, College of Physicians. The President, Dr. Charles F. Mitchell, in the Chair.

SCIENTIFIC PROGRAM

Exhibition of Patients.

Dr. Damon B. Pfeiffer. — Ovarian cyst with spontaneous rupture and massive intraperitoneal hemorrhage.
Vol. LXXXVII, No. 2, p. 307.

Case Reports.

Dr. Lloyd B. Green. (By invitation.) — Two cases of traumatic rupture of the urinary bladder in young children.
Vol. LXXXVII, No. 2, p. 307. — Discussed by Doctor Baldwin.

Dr. S. Dana Weeder. (By invitation.) — An unusual case of suture of the tendons and nerves of both wrists.
Vol. LXXXVII, No. 2, p. 309. — Discussed by Doctors Jopson, Dorrance, Pfeiffer, Owen and Weeder.

Dr. Calvin M. Smyth, Jr. — 1. Hernia into lesser peritoneal cavity following gastroenterostomy.
Vol. LXXXVII, No. 2, p. 312. — 2. Reduction "en bloc" of strangulated hernia.
Discussed by Doctors Jopson and Pfeiffer.

Dr. Selling Brill. (By invitation.) — Case of pernicious anemia with splenectomy.
Vol. LXXXVII, No. 2, p. 314. — Discussed by Doctor Muller.

Dr. George P. Muller. — Plastic of face and jaw following excision for carcinoma.
Vol. LXXXVII, No. 2, p. 316. — Discussed by Doctors Ivy and Dorrance.

Paper.

Dr. Charles H. Frazier. — Colonic anæsthesia in operations on the brain and spinal cord.
Vol. LXXXVII, No. 2, p. 161. — Discussed by Doctors Grant and Ivy.

Meeting of December 5, 1927, in Cadwalader Hall, College of Physicians. The President, Dr. Charles F. Mitchell, in the Chair.

SCIENTIFIC PROGRAM

Case Reports.

Dr. Paul A. Loefflad. (By invitation.) — A case of hæmophilia.
Vol. LXXXVII, No. 4, p. 593.

Dr. K. P. A. Taylor. (By invitation.) — A case of undescended testicle—Torek operation.
Vol. LXXXVII, No. 4, p. 594. — Discussed by Doctors Jopson, Ashhurst and Taylor.

Dr. Robert H. Ivy. — 1. Case of traumatic defects of mandible and chin, restored by transplants from ilium, tibia, costal cartilege and fascia lata.
Vol. LXXXVII, No. 4, p. 596. — 2. Correction of unilateral deformity of mandible.
Discussed by Doctor Davis.

Dr. J. Leon Herman. — A case of left hydronephrosis complicated by acute collapse of the right lung following nephrectomy.
Vol. LXXXVII, No. 4, p. 600. — Discussed by Doctors Mitchell and Pfeiffer.

Papers.

Dr. Henry P. Brown, Jr. — Extra-uterine pregnancy.
Vol. LXXXVII, No. 4, p. 581.

Dr. Warren B. Davis. — A study of 425 consecutive hare-lip and cleft palate cases.
Vol. LXXXVII, No. 4, p. 536.

SECRETARY'S REPORT FOR YEAR 1927

During the year 1927 there were held eight regular meetings of the Philadelphia Academy of Surgery and the conjoint meeting with the New York Surgical Society.

The meeting with the New York Surgical Society was held on February 9th, 1927, at the Academy of Medicine, New York City. Thirty-one Fellows of the Philadelphia Academy of Surgery were present and between sixty and sixty-five guests.

The average attendance at the regular meetings was twenty-four Fellows and twenty-nine guests.

During the year there were thirty-one cases reported with forty-one discussions; seventeen papers read with twenty-five discussions; five presentations of patients with three discussions; and one exhibition of a specimen.

The following died during the year:

Dr. John G. Clark
Dr. Joseph Spellissy
Dr. Edward E. Montgomery.

Dr. Ernest G. Williamson was elected to Fellowship.

Dr. Francis O. Allen resigned.

The following Fellows having removed from Philadelphia were elected to Non-Resident Fellowship:

Dr. J. Edwin Sweet
Dr. J. Ralston Wells.

Dr. J. Chalmers DaCosta was elected to Honorary Fellowship.

The annual oration was delivered by Dr. Emory G. Alexander.

Respectfully submitted,

Hubley R. Owen, M.D.,
Secretary.

Meeting of January 16, 1928, in Cadwalader Hall, College of Physicians. The President, Dr. Charles F. Mitchell, in the Chair.

SCIENTIFIC PROGRAM

Exhibition of Patients.

Dr. Francis C. Grant.
Vol. LXXXVII, No. 5, p. 779.
Two cases of successful removal of brain tumor.

Dr. Hubley R. Owen.
Vol. LXXXVII, No. 5, p. 783.
Chancre complicating a lacerated wound of the hand.

Case Reports.

Dr. Elridge L. Eliason.
Vol. LXXXVII, No. 5, p. 783.
1. A case of acute sigmoiditis.
2. A case of choledochoduodenostomy.
3. A case of repair of common duct.

Discussed by Doctors Jopson and Mitchell.

Papers.

Dr. Alexander Randall.
Vol. LXXXVII, No. 5, p. 785.
The genesis, morphology and surgery of prostatic middle lobe hypertrophy.
Discussed by Doctors Ashhurst and Mitchell.

Dr. Thomas A. Shallow.
Vol. LXXXVII, No. 6, p. 811.
Congenital cranio-spinal defects with associated surgical conditions.

Annual Conjoint Meeting with the New York Surgical Society, February 6, 1928, at the Hospital of the University of Pennsylvania, Dr. Astley P. C. Ashhurst, in the Chair.

SCIENTIFIC PROGRAM

Dr. Torrance Rugh.
Vol. LXXXVIII, No. 1, p. 129.
Exhibition of patient showing ankylosis between the scapula and the ribs following injury.
Discussed by Doctor Bancroft, of New York.

Dr. Astley P. C. Ashhurst.
Vol. LXXXVIII, No. 1, p. 131.
Two patients showing result of operation for undescended testicle by Ombredanne's method.
Discussed by Doctors Stetten, Torek and Mathews, of New York.

Dr. Robert H. Ivy.
Vol. LXXXVIII, No. 1, p. 134.
1. Exhibition of patient showing burn scars of chin; restoration by tube pedicle flap from back.
2. Exhibition of patient showing bone graft of lower jaw after resection for tumor.

Discussed by Dr. Semkin, of New York.

Dr. John H. Jopson.
Vol. LXXXVIII, No. 1, p. 135.
Exhibition of patients showing gastric ulcers treated by the Balfour method.
Discussed by Doctors Lewishon, Whipple and Bancroft, of New York, and Doctors Gibbon and Jopson, of Philadelphia.

Dr. Charles H. Frazier. Vol. LXXXVIII, No. 1, p. 1.	Bilateral operations for pituitary lesions.
Dr. Warren B. Davis. Vol. LXXXVII, No. 4, p. 536. Vol. LXXXVIII, No. 1, p. 140.	A résumé of a study of four hundred and twenty-five consecutive harelip and cleft-palate cases. Lantern slides. Discussed by Doctors Mathews and Beekman, of New York, and Doctors Dorrance, Hewson and Davis, of Philadelphia.
Dr. Benjamin A. Thomas. Vol. LXXXVIII, No. 1, p. 142.	Case report of ureterocele in a child, necessitating cystotomy, nephroureterectomy and resection of the bladder. Discussed by Doctors Delatour and Beer, of New York.
Dr. George P. Muller. Vol. LXXXVIII, No. 1, p. 48.	The results of gastrostomy in œsophageal cancer. Discussed by Doctors Meyer, Torek and Lilienthal, of New York.
Dr. Elridge L. Eliason. Vol. LXXXVIII, No. 1, p. 65.	Mortality factors in acute appendicitis. Lantern Slides. Discussed by Dr. Morris K. Smith, of New York.
Dr. John B. Deaver. Vol. LXXXVIII, No. 1, p. 118.	Closure of prostatic bed following prostatectomy. Discussed by Doctors Jennings and Beer, of New York.
Dr. Walter E. Lee; Dr. Louis Clerf; Dr. Gabriel Tucker.	Moving-picture demonstration—post-operative massive atalectasis; clinical and experimental.

Meeting of March 5, 1928, in Cadwalader Hall, College of Physicians. The President, Dr. Astley P. C. Ashhurst, in the Chair.

SCIENTIFIC PROGRAM

Presentation.

Dr. Edward Crossan. Vol. LXXXVIII, No. 2, p. 304.	Specimen showing fracture of the tibia and fibula necessitating amputation of the leg.

Case Reports.

Dr. John H. Jopson. Vol. LXXXVIII, No. 2, p. 297.	Results in supracondylar fracture of the femur. Discussed by Doctors Sherman, Ashhurst and Jopson.
Dr. Benjamin F. Buzby. Vol. LXXXVIII, No. 2, p. 266.	End results in carpalectomy. Discussed by Doctor Mumford.
Dr. Damon B. Pfeiffer and Dr. Calvin M. Smyth, Jr. Vol. LXXXVIII, No. 2, p. 304.	Results in fracture of the neck of the femur treated by the Whitman method. Discussed by Doctor Smyth.
Dr. Henry P. Brown and Dr. Adolph Walkling. (By invitation.) Vol. LXXXVIII, No. 2, p. 299.	Results in fractures of the os calcis. Discussed by Doctors Gurd, Speed, Allison, Cotton and Wilson.

Papers.

Dr. Kellogg Speed (of Chicago, Ill.). (By invitation.)	Unhappy results in the treatment of fractures.
Dr. Fraser B. Gurd (of Montreal, P.Q.). (By invitation.)	Treatment of fractures involving the ankle joint.

Meeting of April 2, 1928, in Cadwalader Hall, College of Physicians. The President, Dr. Astley P. C. Ashhurst, in the Chair.

SCIENTIFIC PROGRAM

Exhibition of Patient.

Dr. James A. Kelly. Vol. LXXXVIII, No. 5, p. 938.	Fracture of the humerus with musculo-spiral nerve injury.

Case Reports.

Dr. Donald C. Geist. (By invitation.) — Intestinal polyposis—report of a case involving the transverse colon.

Dr. James Cancelmo. (By invitation.) Vol. LXXXVIII, No. 5, p. 941. — Primary adeno-carcinoma of the jejunum.

Paper.

Dr. Richard T. Ellison. (By invitation.) Vol. LXXXVIII, No. 5, p. 947. — Heliotherapy in extra-pulmonary tuberculosis of children. Discussed by Doctors Brown, Elmer, Owen and Ellison.

Annual Oration (for 1927).

Dr. Emory G. Alexander. Vol. LXXXVIII, No. 5, p. 801. — Suppurative pericarditis from the surgical viewpoint.

Meeting of May 14, 1928, in Cadwalader Hall, College of Physicians. The President, Dr. Astley P. C. Ashhurst, in the Chair.

SCIENTIFIC PROGRAM

Presentation of Patients.

Dr. Harvey M. Righter. (By invitation.) and Dr. Henry K. Seelaus. (By invitation.) Vol. LXXXVIII, No. 6, p. 1097. — Primary tumor of gastro-hepatic omentum.

Dr. James H. Baldwin. Vol. LXXXVIII, No. 6, p. 1096. Dr. George M. Dorrance. — 1. Case of fracture of the leg. 2. Case of tumor of the shoulder. Three cases of cancer of the floor of the mouth and tongue.

Case Reports.

Dr. Thomas A. Shallow. Vol. LXXXVIII, No. 6, p. 1100. — 1. A case of von Recklinghausen's disease, involving the peripheral nerves. 2. A case of multiple tumors of the brain, due to same disease. Discussed by Doctor Grant.

Dr. Bernard B. Neubauer. (By invitation.) Vol. LXXXVIII, No. 6, p. 1104. — 1. Musculo-spiral nerve paralysis associated with spiral fracture of the humerus. 2. Management of cranial defect. Discussed by Doctor Rodman.

Papers.

Dr. Albert E. Bothe. (By invitation.) Vol. LXXXVIII, No. 6, p. 1028. — Primary extrarenal hypernephroma. Discussed by Doctors Pfeiffer and Ashhurst.

Dr. George M. Dorrance and Dr. James K. McShane. (By invitation.) Vol. LXXXVIII, No. 6, p. 1007. — Cancer of the floor of the mouth and tongue.

Meeting of October 1, 1928, in Cadwalader Hall, College of Physicians. The President, Dr. Astley P. C. Ashhurst, in the Chair.

SCIENTIFIC PROGRAM

Case Reports.

Dr. George W. Wagoner. Vol. LXXXIX, No. 1, p. 122. — Two cases of bone sarcoma simulating tuberculosis. Discussed by Doctor Willard.

Dr. Eldridge L. Eliason. Vol. LXXXIX, No. 1, p. 125. — 1. Puncture wound of the pleura and pericardium with recovery. 2. Intestinal obstruction secondary to a fractured pelvis.

Paper.

Dr. T. Turner Thomas. Vol. LXXXIX, No. 1, p. 108. — Mechanism of fractures and dislocations in the elbow region. Lantern Slides. Discussed by Doctors Ashhurst, Brown and Thomas.

Meeting of November 5, 1928, in Cadwalader Hall, College of Physicians. The President, Dr. Astley P. C. Ashhurst, in the Chair.

SCIENTIFIC PROGRAM

Presentation of Patient.

Dr. Walter G. Elmer. Vol. LXXXIX, No. 2, p. 304. — Spindle cell sarcoma of the foot three years after operation. Discussed by Doctors Ryan, Dorrance, Jopson and Ashhurst.

Case Reports.

Dr. Hubley R. Owen and Dr. Searle Lanyon. (By invitation.) Vol. LXXXIX, No. 2, p. 300. — Osteitis fibrosa cystica. Discussed by Doctor Ashhurst.

Dr. Hubley R. Owen and Dr. Helen Ingleby. (By invitation.) Vol. LXXXIX, No. 2, p. 302. — Epstein's nephrosis simulating tuberculosis. Discussed by Doctor Willard.

Dr. Francis C. Grant. (Not published.) — Brain Tumor. Discussed by Doctors Frazier and Grant.

Dr. Damon B. Pfeiffer. Vol. LXXXIX, No. 2, p. 305. — Empyema and suppurative pericarditis with thoractomy and pericardiotomy. Discussed by Doctors Jopson, Muller and Ashhurst.

Paper.

Dr. Henry P. Brown. Vol. LXXXIX, No. 2, p. 209. — Perforation of peptic ulcer. Observation of one hundred cases at the Pennsylvania and Presbyterian Hospitals. Discussed by Doctors Mitchell, Muller, Owen, Klopp, Alexander, Nassau, Boykin, Ryan, Ashhurst and Brown.

Meeting of December 3, 1928, in Cadwalader Hall, College of Physicians. The President, Dr. Astley P. C. Ashhurst, in the Chair.

SCIENTIFIC PROGRAM

Case Reports.

Dr. John O. Bower. (By invitation.) Vol. LXXXIX, No. 3, p. 465. — Stenosis of the common bile duct with marked distension of the gall bladder in a child 21 months of age.

Dr. John B. Flick. Vol. LXXXIX, No. 3, p. 468. — Enterotomy for intestinal obstruction. A report of three cases. Discussed by Doctors Pfeiffer, Dorrance, Brown, Crossan, Ashhurst and Flick.

Paper.

Dr. Walter G. Elmer. Vol. LXXXIX, No. 3, p. 328. — Surgical technique. Discussed by Doctors Willard and Ashhurst.

SECRETARY'S REPORT FOR YEAR 1928

During the year 1928 there were held seven regular meetings of the Philadelphia Academy of Surgery and one Joint meeting with the New York Surgical Society.

The meeting with the New York Surgical Society was held on February 8, 1928 at 2:15 P.M. in the Medical Amphitheatre of the University of Pennsylvania Hospital.

The average attendance at the regular meetings was twenty-four fellows and twenty-three guests.

During the year there were twenty-five cases reported with twenty-eight discussions; eleven papers were read with twenty-five discussions; there were seven presentations of patients with five discussions; and one exhibition of specimen.

The following were elected to Fellowship during the year:

Dr. William Bates.
Dr. George Wagoner.
Dr. William R. Gilmour.
Dr. Fredrick A. Bothe.
Dr. Norman S. Rothschild.
Dr. Frederick Ross Robbins.
Dr. T. McKean Downs.
Dr. S. Dana Weeder.
Dr. Adolph A. Walkling.

The annual oration was delivered by Dr. Edward J. Klopp.

Respectfully submitted,

H. R. Owen, M.D.,

Secretary.

ANNUAL ADDRESS FOR 1926

THE PRINCIPLES UNDERLYING THE SURGERY OF CARCINOMA OF THE RECTUM*

By Damon B. Pfeiffer, M.D.
of Philadelphia, Pa.

There is no major operation of surgery concerning which there still exists such a divergence of opinion and method as in carcinoma of the rectum. This year (1927) we begin the second century of the development of the subject for it was in 1826 that Lisfranc first performed the operations which entitle him to rank as the father of major surgery of the rectum. It is true that Paget in 1739 first amputated the rectum for cancer, but his attempt, disappointing in its result, led to no development. Lisfranc's operation, still known by his name, consisted in liberation of the lower segment of the rectum through elliptical incisions encircling the anus, the bowel being amputated above the tumor. The progress of the operation for many years consisted chiefly in efforts to increase the exposure and enlarge the limits of excision. Lisfranc himself in later cases split the mobilized rectum in order to determine the upper limits of the growth. Denonvilliers added an incision posterior to the anus reaching to the tip of the coccyx. Verneuil and Kocher excised the coccyx and gained room for resection and anastomosis in suitable cases, thus preserving the sphincter function. Dieffenbach made two incisions, one anterior, the other posterior to the rectum in the midline which were deepened to the level of the tumor above which point the bowel was mobilized, excised and its upper segment brought down to the cleft perineum which was repaired to preserve the sphincter. The results of these and other modifications, however, were such that English surgeons stoutly maintained the advantage of colostomy which merely prolonged life and made it more comfortable. The French held to rectotomy and the Germans practiced ablation when the growth was low enough to be accessible. Franks remarked that the indication for operation depended much more on the nationality of the surgeon than upon the condition of the patient.

The great stimulus to more radical surgery came with Kraske's paper in 1885, describing a method of approach by removing the coccyx and a portion of the sacrum. This afforded opportunity for extensive removal of the rectum and perirectal tissues. High lying growths could now be reached and even the lower sigmoid could be mobilized. Kraske held to the advisability of preserving the sphincter when not directly involved by the growth. He practiced anastomosis of the upper segment with the lower, but later finding that the line of suture usually gave way posteriorly, he contented himself with making a partial anastomosis anteriorly, leaving the posterior portion to be closed by a plastic procedure at a later stage. When anastomosis could not be made, a sacral or gluteal anus was made. Kraske's proposals imme-

*The Annual Oration in Surgery, before the Philadelphia Academy of Surgery, March 7, 1927.

diately gained many adherents. Various technical modifications followed rapidly, giving names to a confusing multiplicity of operations. To a great extent these operations owed their claim to special name to a modification of the means of approach. Kraske removed a portion of the sacrum along a curved line beginning on the left side at the level of the third foramen and terminating at the left cornu. Hochenegg's resection of the sacrum began at the same point as Kraske's, but crossed the midline, curving downward to end at the right cornu. Bardenheuer sectioned the sacrum transversely at the level of the third foramen. Rose carried his incision in a curved line with convexity above, including the third foramen. As a result of the disturbances of innervation of these high sections, Heinecke and Levy devised plastic sections of the lower sacrum, the fragments being reflected like a hinge and replaced after the operation was concluded. Zuckerkandl and Wolfler incised the soft tissues to left and right, respectively, of the coccyx and sacrum and avoided division of the bone.

Other modifications concerned the treatment of the bowel. Maunsell and Weir devised a method of telescoping the mobilized bowel through the anus and making an anastomosis outside the body, after which the line of suture was again reduced through the anus. Hochenegg perfected his "durchziehungsmethod" in which the superior end of the rectum or lower sigmoid is drawn through the anal canal, the mucosa of which has previously been removed. This obviates the necessity of making an anastomosis by suture, with its frequent complications due to separation of the ends or later stricture at the line of union.

The distinguishing characteristic of the German school lay in its development of the inferior or sacral method of approach and adherence to the principle of conserving the sphincter, providing it be uninvolved and the upper bowel sufficiently mobile to reach the perineum. Failing in this a sacral or gluteal anus would be established. They have therefore avoided a preliminary colostomy except in cases of obstruction. Laparotomy has met with little favor except in those cases where special difficulties existed due to height of growth or fixity or evidence of obstruction.

Let us now consider the results of the classical sacral operations. For this an abundance of material is available, but when analyzed there are few homogeneous series because of the many variations in technic by different operators and by the same operator at different periods. The greatest consistent series is that of Hochenegg, whose early and sustained interest in the problem has resulted in an experience of over 1500 cases, 800 of which were subjected to operation. Mandl's exhaustive analysis of this material contains a wealth of observations on all aspects of the condition. The combined operation has been steadfastly rejected except for a few cases absolutely inoperable from below. In his hands therefore this procedure has had a prohibitive mortality and poor results. The series is all the more useful in assessing the possibilities and results of low excision. There were 508 radical operations, an operability of 66.7 per cent. Four hundred and sixty-one cases were

treated by radical sacral operation, of which 234 were one-stage amputations with sacral anus and 205 resections with reëstablishment of continuity. Of the amputations, 33 died (14.1 per cent.). 161 patients were followed. Sixty-seven lived over three years. Mandl calculates the end results on the basis of traced patients which must be corrected to make them comparable to our figures which are based on total numbers, counting untraced patients as dead. This corrected result shows 24.3 per cent. three-year "cures," or deducting primary deaths, 33.3 per cent. Data given is insufficient to calculate five years survivals, but 10 cases died of recurrence between three and five years. Of 205 resections 18 died (8.78 per cent.). One hundred and thirty-eight cases were traced for three years. Fifty-eight were living without recurrence (23.4 per cent.) or, deducting primary deaths, 31 per cent. three-year "cures."

Another great collection of figures is from the Breslau clinic reported by Eichhoff. This comprises 1021 cases, of whom 610 were accepted for treatment and only 326 submitted to radical operation, an operability of 31.9 per cent. Although this clinic has adhered to sacral removal, the series lacks homogeneity in many respects, as it stretches from the year 1879 through the régime of Fischer, Von Mikulicz, and the rest of Küttner's predecessors. A great variety of procedures were employed. Of the 326 radical operations, 79 died as a consequence of operation (24 per cent.). Eighty-seven were alive and well at the end of three years (26.7 per cent.), or excluding primary deaths (35.6 per cent.). These are high figures but the very low operability must be borne in mind. Küttner's "vorlagerungsmethod" which is now in use in this clinic consists in liberating in the usual manner by the sacral approach, the bowel and its surrounding tissue which is allowed to remain *in situ* until the following day when amputation or resection, as the case may demand, is performed. This second stage is simple and usually done without anæsthesia. Küttner has had 44 cases with primary mortality of 22.7 per cent. The end results he claims are superior but as yet no comparable figure can be obtained.

The most recent champion of the perineal approach is Lockhart-Mummery, who is a proselyte from the combined method which he formerly advocated. His chief reason for shifting his position was the mortality of the combined procedure. He has returned to the plan of preliminary colostomy and exploration followed in a week or so by perineal amputation. In 1925, Gabriel reported 143 cases operated upon in St. Mark's Hospital, London, by this method during the period from 1910 to 1924. The operability rate was 44 per cent. The primary mortality 15.4 per cent.

The tabulation of cures is as follows:

	3 year cures	5 year cures
Figures based on total number operated.....	23.5% (20 of 85)	24% (15 of 63)
Figures based on survivals	28.5% (20 of 70)	28.0% (15 of 54)

A large number of statistics of end results of the sacral method are available. Most of them are old and many must be corrected to make them justly comparable. These selected series are representative of the best that the sacral method has to offer.

During the development of the sacral method of attacking rectal growths another trend became apparent. In fact, even before Kraske's report, Koenig excised a high lying growth by the combined method, first opening the abdomen, establishing a colostomy and then amputating the bowel from below. His patient died. The operation was performed in 1882, but the case was not published until 1888 by Hildebrand. Czerny, often credited with the first combined operation, dealt, not with a cancer of the rectum, but with a growth of the sigmoid. He attempted extirpation through the perineum, but finding this impossible he opened the abdomen, resected the growth and made an anastomosis. His patient also died. The case was not published until 1893 and in reality is not entitled to credit as a combined operation for cancer of the rectum.

Gaudier, of Lille, in November, 1895, and Chalot, in December, 1895, carried out combined operations beginning with laparotomy. Both established an abdominal anus and mobilized the pelvic colon in the first stage. Chalot in addition tied the superior hemorrhoidal artery within the abdomen in order to control hemorrhage during the perineal stage. Both operations were completed in one seance and both patients perished. Gaudier's case died on the fifth day, apparently of pneumonia, and Chalot's case, of renal insufficiency. In August, 1896, Gaudier successfully operated by the combined method upon a woman aged thirty-five. She lived eight months and died of recurrence.

The next operative success was that of Boeckel in November, 1896. He began the operation as a Kraske and found it impossible to complete it from below. He therefore opened the abdomen, divided the colon, made an iliac anus, liberated the lower segment and returning to the sacral route, easily completed the removal. To close the defect in the peritoneum he turned the uterus backward and fixed it to the sacrum.

Quénu now made himself the champion of the combined abdomino-perineal type of operation. In October, 1896, he operated successfully upon a woman of fifty years and separated the perineal from the abdominal stage of the operation by an interval of six days. This is the first instance of the two-stage operation which has of late years been extensively employed in various forms. He did much to standardize and popularize the combined operation, and it is generally known by his name. He emphasized the importance of asepsis and good hæmostasis. In order to assure the latter, he advised preliminary ligation of the internal iliac arteries, but this step has now been abandoned in most quarters as unnecessary.

The combined operation became the accepted French method as the sacral procedure was favored in Germany. Kraske in 1900 admitted the utility of preliminary laparotomy in certain cases and a few German surgeons

as Kirschner, Schmieden and Fischer, Hofmeister, Gulecke, Finsterer and a few others have favored the combined operation. The majority led by Hochenegg, Von Eiselsberg, Kulenkampf, Poppert and Clairmont, have stood by the sacral procedure which still remains distinctively the German method. It is true also that a few French surgeons such as Savariaud favor the low approach, but the weight of opinion of such men as Tuffier, Schwartz, Hartmann, Pauchet and Cuneo is for the combined operation with certain exceptions dictated by the age or condition of the patient. In general, therefore, national lines of division still hold in the choice of operation.

England and America have wavered, though tending in general toward the French methods. In England, Miles is the protagonist of the combined method. In America, Blake, Lusk, Tuttle, Jones and Coffey have favored combined excision. Many surgeons both in England and America, however, have continued to practice the sacral operations, particularly those whose work in this field is limited to the occasional case. The Mayo Clinic which formerly practiced both operations with apparent preference for the combined procedure has been strangely silent for a number of years, but from report and personal observations seem to be following the Lockhart-Mummery method at present, which consists of a two-stage operation with exploration and colostomy at the first seance followed in a week or so by perineal excision.

In the presence of such a diversity of opinion and practice, what are we to conclude? First, it is evident that we are not yet oriented and that standardization belongs still to the future. It does not mean, however, that certain principles have not become clear and that the lines of progress have not been forecast. Of what value are statistics? They are of the greatest value in establishing the fact that carcinoma of the rectum is the most amenable to cure of all internal cancers. Many cases are now on record of long survival after removal of undoubted carcinoma. Hochenegg's first case of sacral removal lived thirty-two years and died of intercurrent disease. Blake in 1925 showed two cases alive and well sixteen and seventeen years, respectively, after combined operation. Cripps reported a case surviving over thirty years after an operation which to-day would be considered incomplete. Like instances could be multiplied. No other variety of internal cancer can show comparable figures.

But we are still groping for the best operation.

It is not possible as yet to settle the matter by the statistical method. The reason for this is the complexity of the factors involved. A great cause of erroneous impressions has been the failure to realize fully the extraordinary variability in the degree of malignancy shown by cancer of the rectum. In a considerable percentage the growth proceeds slowly. Permeation is gradual and it has long been a matter of comment that many growths form metastasis late or sometimes never. Among fifty-eight cases dying from cancer of the rectum, Oehler found 34 with no demonstrable internal metastasis. McVay recently restudied this point in 100 cases dead of cancer of the rectum. Fifty-three per cent. showed no involvement of the regional

glands, 30 per cent. slight involvement and 17 per cent. marked involvement. Age seemed to play no noteworthy rôle in the distribution of these groups. It is of interest that the smaller, deeply ulcerating growths furnished a greater proportion of metastasis than larger growths with a tendency to grow into the lumen. The application of these studies to clinical purposes must be made guardedly since it is evident to anyone familiar with such researches that it would be impossible to avoid overlooking minimal metastatic deposits. Still it is significant and quite different from the state of affairs in cancer in most other areas of the body.

In Hochenegg's series 150 patients were treated by colostomy alone. Seventy-two and five-tenths per cent. of these died within a year, but 10 per cent. were still living after two years and 5 per cent. after three years. One case survived twelve and one-half years. In the Breslau clinic reported by Eichhoff 167 patients were subjected to colostomy for inoperable cancer. Sixty-two per cent. died within the first year, 6 per cent. lived longer than three years and three patients died in the seventh year. Wells reported a case which ran for seventeen years from the first operation, having been operated upon three times for local recurrence during that period.

Even more remarkably, Mandl lists among the survivors of operation without demonstrable recurrence or metastasis for five to fourteen years, ten cases in which the growth was not completely removed according to gross and microscopic evidence. Two of these cases were of the colloid variety of carcinoma which, it is well known, are often sluggish, relatively benign growths. Hochenegg, however, has not been able to establish any histologic criteria of the degree of malignancy in his huge series. MacCarty and Kehrer have studied 102 cases dead of recurrence in an attempt to correlate longevity with type. The factors selected to indicate body resistance and growth energy were lymphocytic infiltration, fibrosis, hyalinization and differentiation. They found that where all these factors were present in a growth the average survival was three times as long as when none of the factors was present. In general, however, the study bears out Hochenegg's experience that no histological variety can be regarded as universally benign or malignant but cures and failures are well distributed in all groups.

Lockhart-Mummery has recently laid stress on age as an index of the degree of malignancy. It has long been known that in general, cancer in the young is more rapid in its development and fatal outcome than in advanced years. Phifer, in a collected series established the truth of this idea. Lockhart-Mummery states that he has no record of any patient under thirty years of age treated for cancer of the rectum who has not died from prompt recurrence, no matter how drastic the operation or other treatment had been. He doubts whether it is worth operating on such cases. While admitting the force of this contention, it is worth noting that in the Breslau series of 1021 cases there were forty-five cases under thirty years of whom only thirteen were operable. Two can be considered cures, having survived fifteen and twenty-seven years, respectively. Hochenegg also had an experience

of thirty cases under thirty years and on the basis of several permanent cures advises against absolute pessimism. The great majority of the cases fortunately are in the fourth, fifth, and sixth decades. The youngest patient was reported by Rowntree, aged ten years. Bernouille's was eleven. There are several of twelve years and the age incidence slowly increases up to forty, when it abruptly rises, falling again promptly around seventy.

Sex has no apparent influence on degree of malignancy. Men are subject to this disease more often than women, almost in the ratio of two to one. Pregnancy does not appear to heighten the virulence of the condition. Indeed, Hochenegg's experience has been more favorable in cases discovered during pregnancy. The duration of the growth and its character when first observed may give some indication of its malignancy. Miles came to the conclusion that by the time three-fourths of the circumference of the rectum had been involved, the growth was more than a year old and that penetration of the wall of the bowel occurred before one-half of its circumference was involved. This, like all general statements, is subject to many exceptions. Mention has already been made of the fact that the size of the growth bears no necessary relation to the existence of metastasis outside of the bowel. In fact, the relation is more likely to be inverse. Seeing these patients as we do now, only after well-marked symptoms have been present for some months, a large growth protruding into the lumen is of better prognostic import than a small excavated growth which is more often accompanied by glandular or hepatic metastasis. Perirectal infiltration and fixation of the growth is also not a certain sign of the extent of cancerous infiltration as has been noted by many authors since these conditions may be a result of inflammation secondary to ulceration and infection. Following colostomy and relief of infection, the mass itself may shrink and become movable and favorable for removal.

In the presence of these variables one may well shrink from dogmatism not only in the individual case, but in generalities. Were it possible to obtain criteria of malignancy the immense significance would be apparent in prognosis, the evaluation of reported cures and in the selection of suitable operation. In the absence of such criteria we must recognize this great variability in assessing the results of operation. Such knowledge will serve to minimize the value of isolated instances of survival. I have in mind a personal observation of a woman still living twenty years after a simple Lisfranc operation for a very early cancer of the anal canal, of another case alive and well five years after cauterization of a huge inoperable mass involving the ampulla. Such cases and small series for this reason have little bearing on the problem of the best operation for the greatest number.

It would be logical to suppose that the ideal plan of operation in cancer of the rectum would be the same as that which has yielded the most satisfactory results in the surgery of other varieties of cancer, namely, the widest possible bloc excision of tissue in immediate relation to the growth together with the tissue carrying the regional lymphatic vessels and glands. This ideal of inclusion of the efferent lymphatics has given rise to much research, to

various conclusions and to sharp differences as to the appropriate operation to be employed. The investigations of Mascagni, Sappey, Quénu, Gerota, Boulay, Cuneo and Marcille are well known. Miles in his excellent studies has well summarized the previous work on the lymphatics. He divides them into intramural and extramural systems. The intramural lymphatics are those of the rectal walls and are divided into two chief plexuses, one in the submucous tissue and the other between the two muscular coats. These communicate by short radiating vessels with each other and with the peripheral lymph sinus situated between the rectal wall and the perirectal fat. According to Miles the longitudinal spread in the wall is of very limited extent. Handley, however, maintained that special methods showed in certain cases deposits of cancer cells in the wall of the bowel as far as five inches distant from the growth. His results have been much criticized, but recently Winkler has demonstrated that certain cases undoubtedly do show extensions in the submucosa for a distance of four to six inches and that their extension while usually upward may be in the reverse direction. Sifting the evidence it would seem that in the overwhelming majority of cases, Miles, who merely restated the old conviction, is correct, but that in a small number there is unquestionably a considerable spread in the wall of the bowel itself.

A more complicated problem is presented by the extramural lymphatics. Again quoting Miles, " from the anorectal glands which are scattered over the surface of the rectum, efferent vessels pass in three directions—downward, laterally and upward. Those from the anal canal cross the ischiorectal fossa, pass through Alcock's canal and terminate in the internal iliac glands. Those from the lower part of the ampulla traverse a plexus situated between the levator ani and the recto-vesical fascia, enter a gland near the obturator vessels and thence pass to the internal iliac glands, whilst those from the upper part of the ampulla accompany the superior hemorrhoidal vessels behind the rectum to enter the retro-rectal glands from whence they proceed along the line of origin of the pelvic mesocolon to the glands grouped at the origin of the left common iliac artery. From the uppermost ano-rectal glands also lymph-vessels pass to the paracolic glands situated along the mesenteric border of the pelvic colon." From this description he proceeds to define these zones of spread with the anatomical structures involved. (1) The zone of downward spread including the peri-anal skin, the ischiorectal fat and the external sphincter muscle; (2) the zone of lateral spread comprising the levator ani muscle, the retro-rectal lymph-nodes, the internal iliac glands, the base of the broad ligament; (3) the zone of upward spread, which he considers the most important of the three, embracing the pelvic mesocolon and adjacent parietal peritoneum, the paracolic lymph-glands and the groups of glands situated at the bifurcation of the left common iliac artery. Upon this anatomical foundation Miles postulates his ideal operation, a combined operation beginning with laparotomy in order to deal with the zone of upward spread, intra-abdominal liberation of this entire area and the greater portion of the zone of lateral spread, the establishment of an abdomi-

nal anus and finally the removal from below of the zone of downward spread and, as the dissections meet, of the mobilized portions above. It is a beautifully conceived procedure developed after the idea of the French school led by Quénu and Hartmann. Unfortunately he does not give his figures of operability which plays such a rôle in mortality, but the death rate is high as follows (reported in 1920):

	Operation mortality	
First series	42 cases	40%
Second series	19 cases	26.3%
Third series	11 cases	18.1%

Owing to the war seventeen of the forty-eight patients who survived the operation could not be traced. Sixteen were alive and well for periods varying from six to eleven years. Percentage of cures by total operations, 21.4 per cent.; by survivals, 33.3 per cent. In the face of these excellent results the serious and valid criticism of Miles' operation was its high mortality. In the hands of those who attempted the procedure with less experience, it showed an immediate mortality of not less than 50 per cent. It is impossible to popularize such a deadly form of treatment. It is worth noting here that the data used by Miles in working out his zones of spread along the lymphatic efferents have been modified and extended in some respects by recent researches of Villemin, Huard and Montagnè (1925). They have shown that each of the parts of the rectum corresponds to a distinct lymphatic territory having its own collectors and that these collectors can be divided into two groups independent, the one from the other. Owing to the surgical significance of this observation they recommend abandoning the old anatomical division of the rectum for a simpler division on the basis of lymphatic distribution. The lowest value of Houston is at the level of the cul-de-sac. Above this the rectum is partly covered with peritoneum and is to be known as the pelvic or upper rectum (haut rectum). Below the valve is the perineal or lower rectum (bas rectum). The arteries, veins, lymphatics, and nerves of the upper rectum are all in origin or destiny abdominal. The blood and lymph supply of the lower rectum is mixed in its distribution only the smaller portion being derived from the abdomen, the remainder as also its nerves, coming from without. Lymphatic injections in the lower rectum spread upward to the last valve of Houston, but never beyond, leaving the rectum at that level. Injections above the valve spread downward but are arrested at the valve. There is no such limitation at the rectosigmoid junction. The lymphatic efferents are divided into three groups corresponding to the three arteries of supply. The superior division following the superior hemorrhoidal vessels reaches the abdominal group of glands. The two divisions corresponding to the inferior and middle hemorrhoidal artery, pass chiefly to the perineal, parietal and pelvic groups of collectors but, important to note, separate channels exist to the inguinal glands and to the intra-abdominal glands. This lower system of collectors therefore is never filled by injections from the upper rectum, but the abdominal glands may be filled

from the lower rectum. Their deduction is that cancer of the upper rectum should be removed by an operation exclusively abdominal; secondly, cancer of the low rectum should be removed by abdomino-perineal operation. In the abdominal stage the ligation of the inferior mesenteric artery should be placed above the origin of the superior left colic artery since trunks are demonstrable leading from the lower rectum directly to the glands at this point. These glands must be considered therefore as part of the first barrage concerning which Cuneo says "as long as this is not passed by the growth, surgical intervention is still possible. This obstacle forced, the dissemination of cancerous elements renders impossible all radical operations." The possible application of these observations must be given serious consideration not only, however, with reference to ultimate cure, but in relation to the question of mortality raised by Miles' statistics of the ideal operation. In the attempt to ameliorate this handicap and retain the advantages of complete excision, several two-stage operations were devised. It has been noted above that Quénu in his first combined operation separated the perineal from the abdominal stage by an interval of six days. Procedures were devised by W. J. Mayo, Dahlgren, Coffey and others. Some of these methods carried the first stage to the point of severing the pelvic colon and its circulation completely from their upper connections, after which the pelvic peritoneum was sutured above these structures which were packed down into the pelvis for removal at the second stage several days later. Coffey attempted to make use of the invagination method by drawing the upper bowel down through the rectum and leaving it for removal later. By whatever procedure this was attempted, however, it was found that gangrene occurred in a large proportion of the cases and a very fatal infection of the huge denuded space resulted with high mortality. Mayo simplified the plan by confining the abdominal procedure to an exploration and a colostomy. Subsequently the rectum was removed with great safety by the sacral route. He later elaborated the intra-abdominal stage by tying the superior hemorrhoidal artery and the vascular arch. In order to avoid gangrene the sides of the pelvis and the middle sacral artery were left untouched. Chalot had tied the superior hemorrhoidal in one of the earliest operations in order to diminish hemorrhage in the second stage which, however, was carried out immediately. Quénu practiced ligation of both internal iliacs. Even with these precautions Mayo had a case of perforation of the bowel due to vascular insufficiency. The difficulties due to circulatory causes had engaged the attention of the Germans, especially in their desire to preserve the function of the sphincter. Gangrene of the segment of the bowel brought down to the perineum was frequent and failure of anastomosis in part at least was the rule. Infection of the pelvic space or peritonitis largely due to this complication furnished the greater part of the immediate mortality. The much quoted research of Sudeck gave the rational explanation. He showed that the superior hemorrhoidal artery is for all purposes an end artery. It is, however, connected at some point with the anastomosing arcade of the descending colon and sig-

moid. It follows therefore that the vitality of the upper rectum will be lost if the superior hemorrhoidal be tied below the point of entrance of the anastomosis with the marginal arcade, but will be maintained if the ligature be applied above that point. This is the so-called critical point. Rubesch pointed out that the important anastomosing branch sometimes enters the left primary branch of the superior hemorrhoidal artery instead of its main trunk. In this case ligation of the hemorrhoidal artery immediately above this point would leave half the upper rectum unsupplied, and the critical point would be above the bifurcation of the superior hemorrhoidal. Whenever in the course of the two-stage operation it is necessary to settle this point, it should be determined by study of the area of anastomosis which varies in individual cases or, in case of difficulty in fatty mesentery or unusual arrangement, the ligation should be made at least as high as the beginning of the superior hemorrhoidal or above the origin of the last sigmoid artery. So far as is known, ligation at the promontory will always conserve the blood supply of the rectum. These observations have been amply confirmed by Rehn, Manasse, Quénu, Archibald and Mondor. The latter objects to the emphasis placed upon the critical point, declaring with truth that a critical area should be considered which includes not only the point of ligation of the artery, but the mesocolon containing the vascular arch. It is obvious that the arch must be respected wherever the ligature be placed, since the nourishment of the bowel then depends on a single source of supply through the mesenteric arcade. In the one-stage amputation it is unnecessary to consider this vascular arrangement, but in the two-stage operation, or in any procedure which aims at restoration of the pelvic rectum or even in the establishment of a sacral anus, it is quite necessary to respect these conditions in order to avoid gangrene in the neighborhood of the rectosigmoid junction. This applies also to any operation which would resect the sigmoid within the abdomen and leave the distal portion as a blind pouch. In order to fulfil the requirements of the combined excision it is necessary to resect at least the lower sigmoid mesentery containing the superior hemorrhoidal artery in order to remove the abdominal lymph vascular tract. It remains to be seen whether this is sufficient in all cases. The studies of the lymphatics above quoted, as also clinical observations of Jones, Moynihan and others, indicate that in some instances at least the section of the blood and lymph supply must be at a higher level. At all events it is a minimum requirement to remove the bifurcation of the superior hemorrhoidal with its neighboring tissues. This is called by Mondor on account of the confluence of the blood and lymph supply at this point, "the hilum of the rectum."

Daniel Fiske Jones in 1915 published his modification of the two-stage abdomino-sacral method which permitted wide removal with great safety. The sigmoid and descending colon are mobilized and the inferior mesenteric tied just below the left colic branch. The peritoneal flaps are reflected from the mesentery of the lower sigmoid and rectum. The whole pelvis is dissected from the promontory above and the ureters laterally. The bladder is

freed anteriorly. The upper rectum and sigmoid are thus detached from their intra-abdominal connections, are held forward, and the peritoneum sutured behind the bowel and close about it. If the sigmoid is to be brought down to the perineum the abdomen is closed. Otherwise an abdominal anus is made high in the sigmoid. A week or so later the coccyx is removed and the perineal amputation or resection completed. Jones has always been reluctant to preserve the sphincter because of the danger of incomplete removal of the disease. In 1922, he was able to report ninety-two abdominoperineal operations with twenty-three three-year "cures," a percentage by number of operations of 25 per cent. and by survivals of 40 per cent. The mortality in his series was largely in the early cases before the method described had been worked out. He had performed an increasing number in one-stage as familiarity with the procedure increased. In the last eighteen combined operations there had been no immediate mortality. This low mortality was obtained in a group with the operability figure of 60 per cent.

In the same year (1922) Coffey presented a detailed and beautifully illustrated plan of combined operation which has attracted much attention. Impressed with the importance of the upper zone of spread he has adopted the abdominal anus as a routine. Through an abdominal incision the lower sigmoid is detached and together with the upper rectum is completely mobilized. The freed tissue is then disposed of, either by evaginating it through the anus, or by amputating a portion of it if the growth is high, in which case the lower segment is closed and allowed to remain. If evagination cannot be accomplished because of stricture or excessive mass of the liberated tissue, the latter is cut away before the lower segment is inverted and closed. The pelvic peritoneum is then repaired. Drainage of the potentially infected pelvic space is accomplished through the vagina in the female and in the male by placing a large suprapubic drain which is isolated from the abdominal cavity by drawing over it posteriorly the lateral peritoneum from the sides of the pelvis and bladder, thus constructing a tubular drainage area to the surface emerging at the lower angle of the wound. At the second stage the lower rectum is speedily removed through the vagina in the female or the posterior perineum in the male. He reports thirty-seven cases with two deaths (5.4 per cent.). End results are not yet obtainable. If one might venture to predict the outcome, we would prophesy an undue percentage of ultimate failures due to insufficient removal of the downward and lateral zones of spread. However, we believe that the mortality would not be materially increased by wider excision at the second stage, and it is the merit of this operation that it has shown as had Jones that a complete intra-abdominal procedure is not incompatible with low primary mortality.

It is unfortunate that the French surgeons who have been using the combined method for years have not shown equal pains and persistence as the Germans in collecting their end results, but such seems to be the case.

Scarcely a single point of advantage is alleged by advocates of the one type of operation but is resisted by denial or the presentation of offsetting

factors by those in the opposite camp. Perhaps we can best come to some sort of agreement by stating those points concerning which there is almost unanimous consent.

(1) In spite of the many instances of low malignancy and late metastasis observed in cancer of the rectum, permanent cures have increased in number *pari passu* with wider ablation of related tissue.

(2) There is no debate concerning the liability to metastatic involvement of the upward zone of spread in a certain percentage of cases.

(3) From the sole standpoint of cure, therefore, there is excellent reason for including this area in the bloc to be removed.

(4) Complete removal of this area in most cases can be carried out only by the aid of previous intra-abdominal mobilization.

(5) Those who do not practice consistent and complete removal of this zone limit their procedures for other reasons than those which have to do with permanent cure, *e.g.,* mortality, morbidity, wider applicability, less frequent necessity for abdominal anus and a feeling that their results are practically as good.

We have already considered the difficulties of statistical estimate of comparative mortality. In the one-stage operation the danger of shock is undoubtedly greater in the combined than in the sacral operation. On the other hand, the danger of infection immediately subsequent to operation is greater in the latter. Practically all considerations of post-operative deaths in the low operations show that more than half of the fatalities are due to infection of the pelvic space or to peritonitis. To this number might fairly be added a certain proportion of deaths due to vascular, heart and lung complications. Probably not less than 75 per cent. of all deaths are infective. The greater security in aseptic technic by the combined method should and does obviate or mitigate a large proportion of these infections. By the two-stage method infection as a serious factor is largely abolished, whether the operation be of the complete or limited type. Naturally by the limited type in which the abdominal procedure is practically only a colostomy, the mortality is lower. This is Lockhart-Mummery's platform and restricts the argument to the actual advantage to be derived from the more complete operation which must wait on further experience. There is no question, however, even in Lockhart-Mummery's mind, that if the complete procedure could be performed with equal safety the end results would be superior. If it be objected that Miles' present mortality of 18 per cent. is too high, it suffers little by comparison with the mortality of the foremost German surgeons performing the radical sacral operation and is lower than that of many. Also the lowest mortalities achieved in any reasonably large series are those of Coffey and Jones who employ the combined method. It seems clear that the attainment of a low mortality by the combined method rests (1) on the use of a rational, well-standardized method and sufficient experience to carry it through without unnecessary delay or avoidable accident and (2) on the exclusion of those cases who would be unsuitable for any severe procedure whether by reason of

age, obesity or debilitated condition. To overload the operation with those who cannot endure it and to deny those who can endure it, the added security which it affords is equally unwise.

The morbidity of the complete operation, whether combined or sacral, is high owing to the large pelvic space which does not permit of healing by first intention. Here the advantage is distinctly with the two-stage operations on account of greater freedom from severe primary infection.

It is unnecessary to review to a surgical audience the question of colostomy. By all except the German surgeons it has been decided that an abdominal anus is preferable to an uncontrolled sacral opening. The preservation of the sphincter is not a point of contest between the two types of operations since the continuity can be restored equally well, if not more safely, by a previous abdominal mobilization as by the sacral route. It is true, however, that most surgeons who are sufficiently impressed with the necessity for wide excision to prefer the combined method are rarely willing to preserve the sphincter with its essential surrounding tissue and nerves, because of the danger of recurrence.

The permanent results of the newer operations must wait. I regret that my own cases are too few and recent to add. Enough is known to warrant the belief that the percentage of cures will be increased. Certainly wider excision could not decrease the prospect of cure. It is our belief that the radical combined operation will win the day and that the perineal or sacral operations will be restricted to cases unable to endure the more exacting procedure.

Körte stated that this operation is the most difficult in surgery. Chalier and Mondor reply that it is only necessary to learn it.

REFERENCES

Chalier et Mondor: Cancer du Rectum, Paris, 1924.
Coffey: Annals of Surgery, 1922, vol. ii, p. 500.
Eichhoff, E.: Surgery of the Rectum, Beitr. z. klin. chir., vol. cxxv, pp. 17–44, 1922
Gabriel: Brit. J. Surg., vol. xii, 1924–1925, p. 466.
Hochenegg: See Mandl.
Jones: Annals of Surgery, 1922, vol. ii, p. 386.
Jones: J. A. M. A., 1915, vol. lxv, p. 757.
Lockhart-Mummery: London, Lancet, vol. i, January 3, 1920.
McVay: Annals of Surgery, 1922, vol. ii, p. 755.
Mandl: Deutsche Zeitschrift für Chirurgie, vol. clxviii, 1922, p. 145.
Mondor: International Clinics, vol. iv, s. 28, p. 260.
Miles: Brit. Med. J., November 13, 1920, p. 729.
Quénu et Hartmann: Chirurgie de Rectum, Paris, 1895.
Villemin, Huard et Montagnè: Revue de Chirurgie, vol. lxiii, 1925, p. 39.

ANNUAL ADDRESS FOR 1927

SUPPURATIVE PERICARDITIS FROM THE SURGICAL VIEWPOINT *

By Emory G. Alexander, M.D.

of Philadelphia, Pa.

surgeon to the episcopal hospital, assistant professor of surgery in the university of pennsylvania

This paper is based upon a study of the literature and a series of cases under my care at the Episcopal Hospital, and one at the Abington Memorial Hospital. It will deal with the subject of suppurative pericarditis from the surgical standpoint.

Pericarditis was known to the early writers on natural philosophy, although we have no record that Hippocrates was familiar with it. We find that Galen (131–201 A.D.) noted it in animals and characteristically made the bold deduction that man could likewise suffer from the disease.[1, 2] But centuries elapsed between these first recorded descriptions of the disease and even the suggestion of an operation for the relief of a particular form of it; for it was not until 1649 that Riolan[3] first advocated pericardiotomy for the relief of pericardial effusion, his plan being to trephine the sternum, and from this date down to 1819 numerous authorities were courageous enough to suggest and even to recommend the operation of pericardiotomy, one advocating a certain approach, another a different one, but we know of no successful operation throughout this period of one hundred and sixty-nine years. Thus, Senac,[4] 1749, described pericardial effusion and recommended incision into one of the left intercostal spaces for its relief. Morgagni,[5] 1761, appreciating the dangers resulting from the accumulation of fluid in the pericardium, hoped for an improvement in diagnostic means which would warrant resorting to paracentesis for its relief. Corvisart,[6] 1806, argued that the diagnostic difficulties presented unsurmountable obstacles to the employment of any such measures. Even after Corvisart,[7] 1811, published the modest Auenbrugger's discovery of precordial bulging and increased cardiac percussion dulness as a point in diagnosis, the diagnostic stumbling blocks stimulated Laennec,[8] 1819, to wield his powerful influence in the argument against paracentesis. In his immortal "Traité de l' auscultation" the very year, by the way, in which he invented the stethoscope, he advised Riolan's plan of trephining the sternum. His clinical assistant, Collin (1824), interpreted the friction rub previously described by Laennec as "the squeak of the leather of a new saddle under the rider," but wrongly ascribed it to dryness of the sac.[9]

The involved problems of diagnosis, however, were not the only barriers to the early employment of surgical means of treating pericarditis. From the earliest times the heart was regarded with a certain superstitious awe, and

* Annual Oration in Surgery, read before the Philadelphia Academy of Surgery, April 2, 1928.

there was no doubt a certain degree of inherited apprehension which prevented any unnatural interference with an organ, enjoying the reputation which had been its own since Aristotle taught the doctrine of the primacy of the heart. Pioneers in this field probably treated the heart with superstitious deference, and would naturally hesitate long before interfering in any way with the "central abode of life and the soul." [10]

For these reasons it is not surprising, then, to find that it was not until 1819 that the first successful pericardiotomy was performed. It is true that Desault,[11] as early as 1798, attempted by surgical means to evacuate what he thought was a pericardial sac full of pus, but he was unsuccessful because his diagnosis was wrong. Larrey,[12] likewise, met with failure when he performed an operation for the same purpose by a different route, namely, the left costo-xyphoid.

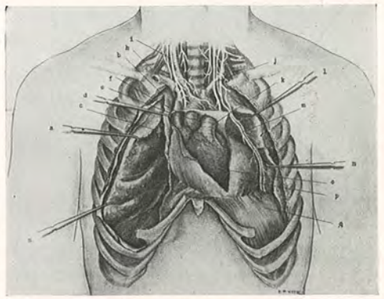

Fig. 1.—"Bickham's Operative Surgery," vol. iv, Fig. 3261, p. 2. Courtesy W. B. Saunders and Co., Philadelphia.

For many years *paracentesis* seemed to hold favor among surgeons (Jowett,[13] 1827; Skoda and Schu [14]), and this was practiced by the Russians in their large and remarkable experience in hemopericardium, during an epidemic of scurvy in Cronstadt and the Baltic provinces.[15] In isolated instances, however, surgeons were known to *incise* the pericardium. Thus, Hilsman,[16] as early as 1844, was the first to perform pericardiotomy in a case of suppurative pericarditis, the type with which we are dealing in this paper. He incised the fourth interspace and evacuated several tumblerfuls of pus, keeping the wound patent subsequently by daily probing, with a successful result; and von Langenbeck [17] operated in two similar examples of this disease in 1850. Patients suffering from non-suppurative pericarditis were operated upon many years before, however. For example, Romero,[18] of Barcelona, performed the first successful pericardiotomy in 1819, having secured recoveries in two patients out of three operated upon for non-suppurative pericardial effusion.

After Trousseau and Lesague [19] gave the weight of their influence to the discussion, enough cases began to accumulate to warrant collecting them in the literature; thus Günther,[20] 1861, found records of twenty-two punctures; Roger, [21] 1875, culled fourteen from the French literature, and Roberts,[22] 1876, found forty-one cases to which he added thirteen new ones; Kindenberg [23] brought the total to sixty-five in 1879, and West [24] to seventy-nine in 1883. Delorme and Mignon [25] collected records of eighteen incisions and sixty-two punctures in 1895. Since then Roberts [26] (1897), Porter [27] (1900), Eliot [28] (1909), Rhodes [29] (1915), and Pool [30] (1921), have collected the

recorded cases of pericardiotomy for suppurative pericarditis. To Rhodes' group of eighty-six, Pool [30] added sixteen cases from the literature and one of his own, nine of the seventeen cases recovering. This brought Rhodes' statistics to a total of 103 cases, with fifty-four recoveries and forty-nine deaths.

I have endeavored in this paper to collect the reported cases from the literature since those given by Pool in 1921, together with several presented for the first time in this communication. I have performed pericardiotomy for suppurative pericarditis successfully in two out of three cases, and a fourth time by mistake in a case of cardiac decompensation from valvular disease. This brings the above total to 106 cases of suppurative pericarditis, with fifty-six recoveries and fifty deaths. In the cases collected from the literature since 1921, I have found records of fifteen recoveries and five deaths, making the grand total of seventy-one recoveries and fifty-five deaths.

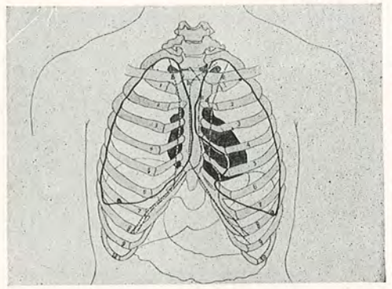

FIG. 2.—"Bickham's Operative Surgery," vol. iv, Fig. 3260, p. 2. Courtesy W. B. Saunders and Co., Philadelphia, Pa.

It is interesting to pause a moment to note the prominent part played by Philadelphians in the history of pericardial surgery. One of our own members the late Dr. John B. Roberts,[31] who occupied the President's Chair in this Academy in 1906, was one of the chief American contributors. In 1876, while an interne, he searched the shelves of the Pennsylvania Hospital Library for records of pericardiocentesis, later publishing the fruits of his labor. From that time till 1923, he not only contributed valuable communications on this and related subjects, but invented and used a practical trocar for performing pericardiocentesis with a minimum of danger. The distinguished retiring President of the College of Physicians, Dr. Hobart A. Hare,[31] performed experiments in 1886–1887 showing that the deleterious effects of hemopericardium were due to distention of the sac; and, more recently an important contribution to this subject has been presented by Wood and Bradley.[32]

The incidence of suppurative pericarditis is not excessively low. Its clinical frequency is given by Klose and Strauss [33] as one in every 6,000 of clinical disease, but this probably varies. Thus, there were found only three cases of suppurative pericarditis in 37,130 patients treated at a general hospital handling 6,114 bed and 31,016 dispensary cases in the year 1925–1926,[34] although Stone [35] noted purulent pericarditis in 15.5 per cent. of 300 patients dead of pneumonia, a figure higher than the generally accepted average.

Perhaps this variation in figures, of which the above is only an example, has its explanation in the parallel fluctuations in the number, nature and severity of the complications of pneumonia, for it is this latter disease which

furnishes us with a considerable portion of pericarditis (34 per cent. of Preble's cases occurred in pneumonia,[36] the *greatest* proportion being of the purulent form). It should not be surprising, therefore, to find that, like the mobile statistics of pneumonia, those for pericarditis reflect similar notable variations and apparent contradictions. Rheumatic fever and chorea (in which suppuration is thought by some to follow the dry or plastic stage in certain instances) are perhaps of even greater importance in the etiology of pericarditis, but they occupy a far inferior rank if only suppurative cases are considered. On this point the statistics are conflicting. Preble,[36] for example, finds rheumatic fever associated with 28.36 per cent. of pericarditis cases as opposed to 34 per cent. for pneumonia, while Sears [37] noted inflammatory rheumatism in 51 per cent. of his 100 cases, and a history of previous rheumatic infection in forty others. Osler,[38] on the other hand, found pericarditis in 6 per cent. of 330 cases of rheumatic fever, and in nineteen of seventy-three chorea necropsies, while Zinn [39] observed pericarditis in 10 per cent. of 1000 cases of rheumatism, and Sibson,[40] in sixty-three of 326. These, of course, did not all progress to the purulent stage, but some idea of the proportion of suppurative cases to those of mere effusion is given by Hedblom [41] who reports 21 per cent. of purulent cases in 100 effusion autopsies at the Mayo Clinic for the period of 1910–1922. It is clear from the above that the two outstanding diseases with which pericarditis is associated are pneumonia and rheumatic fever.

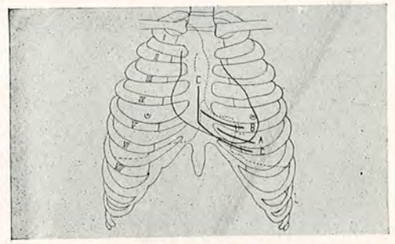

FIG. 3.—"Bickham's Operative Surgery," vol. iv, Fig. 3265. Courtesy W. B. Saunders and Co., Philadelphia.

But suppurative pericarditis may be secondary to a variety of *other infections,* such as tuberculosis,[42] septic processes (especially of bone and puerperal fever),[43] gonorrhœa;[44] and it may also occur in fevers like scarlatina [45] as well as in typhoid fever.[36] Sinnhauer [44] lists cases complicating meningitis, malaria, erysipelas, and leukemia; syphilis is a rare cause.[46] One might expect to find this complication more frequently in double or right-sided pneumonia, since pneumonia on the left side is encountered less often,[47] and the bilateral disease is more severe and should therefore be expected to give a higher incidence of complications; but writers differ on this point. Chatard [48] found that right-sided pneumonias are more apt to be followed by pericarditis, but Preble [36] maintains that the danger is greater in the left-sided affection. Observers are surprised and often embarrassed to find that they have overlooked purulent pericardial exudates, as terminal complications of gout, chronic nephritis, arteriosclerosis, scurvy, pleurisy, aneurism, diabetes, and various other chronic illnesses, including certain types of hepatic cirrhosis.[49] It is perhaps to the insidiousness of these curious terminal manifestations that the

disease owes the reputation given it by Osler,[50] as probably the most commonly overlooked serious disease. In such instances, it is not found because it is not sought for, as a rule. Some of these latent cases are tuberculous.

Tuberculosis, however, is usually secondary, extending from mediastinal or tracheo-bronchial lymph-nodes, lungs, pleuræ, or as part of a general miliary infection or polyserositis.[42] It is not a common cause. For example, Hedblom [42] states that Wells found only eight cases of tuberculous pericarditis in 1048 autopsies, while Metcalf noted pericardial involvement in only 5 per cent. of cases of active tuberculosis. Primary Koch's infection is much less frequent than secondary, for this same author says that Willgk found only eleven in 1317 autopsies, and that Thym noted 5.3 per cent. primary in ninety-four tuberculous pericarditis cases, while Osler reports seven primary in 275.

Secondary inflammation of the pericardial sac by extension from neighboring structures also occurs, though rarely, as in exceptional cases of pneumonia, especially in children and alcoholics, simple pleurisy (rare), purulent myocarditis, aortic aneurism (rare), malignant endocarditis, from mediastinal glands, bones of the thorax, and even from the abdominal viscera.[49]

The chief cause of primary pericarditis is external trauma, as in Fischer's case [51] of a patient who was thrown forward, striking his chest against the steering wheel of an automobile, although the pericardium occasionally may be infected by injury from within, such as perforation of the subjacent œsophagus,[52] or rupture of the stomach, as in Osler's case [38] of malignancy. Many so-called idiopathic cases are doubtless tuberculous, and others spring from tonsillitis.[53] That this disease is sometimes evanescent is shown by the frequency with which evidence of long standing past inflammation is found at autopsy in the guise of trivial adhesions or "milk spots" [54] in unsuspected cases. Ewart [53] has studied latent and ephemeral effusions which failed to attract attention because their small bulk did not elicit pain or provide conspicuous physical signs.

Pneumococci, Koch's bacillus, Bacillus pyocyaneus, B. Welchi, and various other pyogenic cocci and bacilli have been isolated from cases of purulent pericarditis.

No age group, not even in fetal life, is exempt from the disease, but the greatest frequency is between the sixth and twenty-fifth years.[33] As might be expected from its relationship with other diseases, pericarditis affects children more frequently than adults, and males more often than females (five times as often in males after the fourteenth year).[33] Pneumonia is responsible for most cases of pericarditis, not only in the age group under four years, but of *purulent* pericarditis at any age.[47]

McCallum's brief description of the pathology of pericarditis is so clear that I can do no better than to quote liberally from his book, as follows [55]:

> "Sometimes only a thin film of fibrin is exuded on the pericardial surfaces without effusion of fluid (dry pericarditis). In that case a loud creaking or rubbing sound is made by each movement of the heart. If, then, fluid appears in excess, the surfaces are held apart, and the sound is lost or cut short." When fibrin is present, "or even when the fluid is pus-like, . . . one may observe that, through motion of the heart, the fibrin is beaten into compact ridges which run, roughly speaking, in certain transverse and oblique lines, "like those left by the waves on a sandy beach at low tide." "The heart is given a very shaggy appearance by this process."
>
> "If a very great deal of fluid be exuded into the pericardial cavity, the sac is gradually dilated and will accommodate a large amount—far more than could be forced into it suddenly." "There comes a time, however, when the heart is greatly embarrassed by this fluid because it can no longer expand properly to receive the blood."

If recovery ensues it is by the formation of chronic adhesions. Close inspection will reveal the presence of tubercles in cases of tuberculous infection, where the adhesions are apt to be unusually dense.

The physical signs of pericardial effusion depend upon disturbed anatom-

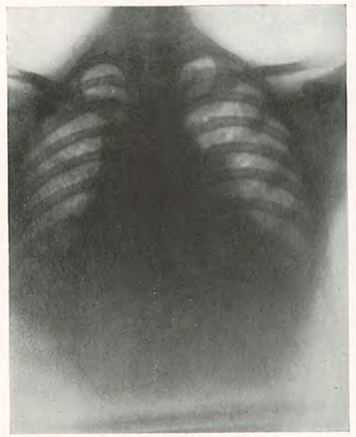

FIG. 4.—Case I, J. L. before operation.

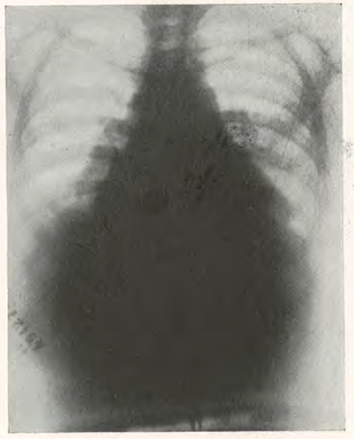

FIG. 5.—Case I, J. L. after operation.

ical and physiological relations resulting from the accumulation of fluid in the sac. Muffled heart sounds are characteristic, especially if these grow progressively more feeble following a gradually disappearing friction rub. This rub is presumed to vanish because the rough parietal and visceral layers of the sac whose frictions have generated it, have been separated by the intervening fluid, although the heart is usually found in contact with the anterior chest wall, even in massive effusions.[56] An accumulation of 750 c.c. may cause the disappearance of all traces of friction rub, even at the base and apex where frictions usually linger longest, while on the other hand, the rub might still be heard in the presence of as much as a litre.[57] These sounds occasionally are so elusive as to escape detection entirely, especially in the purulent variety.[47] In the typical case, just as a friction rub disappears simultaneously with the accumulation of fluid in the sac, so does it reappear again as the fluid diminishes.

Increase in the area of precordial percussion dulness with alterations in its shape are among the most trustworthy diagnostic signs, although too much emphasis is probably placed on the occurrence of the pyriform shape in this area.[49] Displacement of the dull area with change in posture was noted by Skoda, and is regarded by Shattuck as of some clinical value, but Robey fails to corroborate this.[49] Rotch,[58] a former Philadelphian, for whom the Rotch sign is named, refers to extension of cardiac dulness in the fourth and fifth interspaces on the right near the sternum, a corollary to the classic obtuse cardio-hepatic angle, the sign of W. Ebstein,[59] although Williamson's [56] experimental studies failed to verify the former.

Christian [60] found signs due to pulmonary compression in 73.5 per cent.

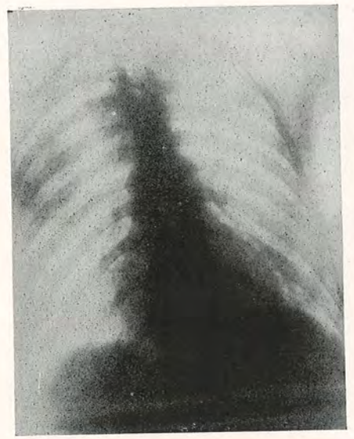

FIG. 6.—Case II, K. S. before operation.

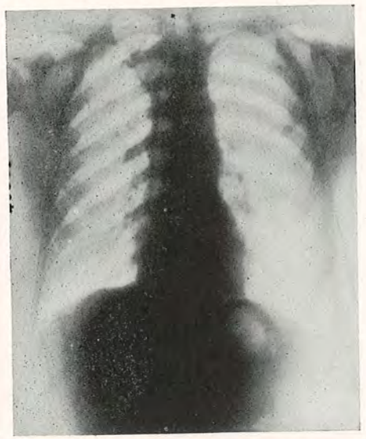

FIG. 7.—Case II, K. S. after operation.

of his cases. Dulness at the angle of the left scapula with bronchial breathing (Bamberger) and other signs simulating consolidation are often elicited; diminished respiratory expansion on the left also belongs to this group of compression signs. Ewart [61] described the invariable appearance, as a result of effusion into the pericardium, of "a patch of dulness of definite size, shape and situation at the posterior thoracic base, and its disappearance step by step with that of the fluid—this area is localized in the interval between the tenth and twelfth ribs close to the spine." It is sometimes possible to palpate the first rib on the left as far inward as the sternal articulation, in cases where the left clavicle has been raised from the underlying rib as a consequence of great respiratory activity in the upper part of the chest, embarrassed by a large effusion (Ewart's first rib sign).

Children are apt to show precordial bulging with enlargement of the entire left chest and prominence of the interspaces; while pressure exerted below through the diaphragm gives rise to swelling in the epigastrium. Downward

displacement of the liver, especially the left lobe, is regarded as the most constant early sign by Williamson,[56] who states that a 500 c.c. to 600 c.c. effusion causes a 2.5 cm. displacement.

Gradual diminution of the cardiac impulse may not always be present, for the heart often remains in contact with the anterior chest wall. On the other hand, the apex beat will be found to lie an undue distance medial to the left border of dulness, which is very sharply defined. Occasionally the apex beat, instead of disappearing, will extend as a wavy impulse through two or three interspaces.

A profusion of other signs have been described, but most of these are of more academic than of practical interest. To this class belongs the pulsus paradoxus, flushing of the face and neck with distention of the veins, and early accentuation of the pulmonic second sound.[49] Pulsation of the cervical vessels is sometimes as striking as that seen in aortic regurgitation (Stokes, Huchard). Fluctuation can never be elicited, probably because of the rigidity of the chest wall. Hoover's sign [57] is seen at times, limited to the lower left chest in extensive effusions, and if the effusion is purulent, the overlying chest wall may become œdematous. Some cases show a tender spot over the apex when this is pressed with the finger, and most patients seek relief by sitting up and leaning forward, a characteristic posture. Sibson [40] long ago emphasized the importance of suspecting pericardial effusion in those cases showing dulness extending above the third rib, as no other condition is said to present this sign so often.

Cardiac arrhythmias probably owe their origin partly to reflexes from distention of the sac, for Heitler [62] was able to induce irregularities in animals by mechanical and electrical stimulation of the pericardium; and Kuno [63] pointed out "the mechanical influence of fluid in the pericardium on the function of the heart." The effect of general toxemia, as well as of local myocarditis, should not be overlooked as contributing to the probable cause of arrhythmias, as brought out by the electro-cardiographic studies of Yager.[64]

This leads naturally to a consideration of the rôle played by instruments of precision in the diagnosis of purulent pericarditis. The use of these is subject to the same limitations as a good clinician's five senses in the diagnosis of this difficult disease. The very multiformity of the pathognomonic signs and symptoms should arouse one's suspicions of the difficulties to be expected in diagnosis, and the electro-cardiograph, X-ray, and polysphygmograph, are not exempt from the infallibility of purely human methods. Taussig [66] (1914) pointed out the inspiratory exaggeration of the dicrotic notch seen in polysphygmograms, but there is nothing specific about the electro-cardiographic tracing of a case of purulent pericarditis [64] (at least nothing of this nature has as yet been discovered as far as I am aware), although such tracings may show secondary effects due to pressure toxemia and involvement of the heart muscle.

Typical röntgenograms, like typical physical signs, are easily diagnosed, but the typical cases are rare. Standard text-books on X-ray diagnosis

describe the findings somewhat as follows: They point out that the water-bottle-shaped shadow shifting with change of position of the patient is seen in no other condition except pericardial effusion. Obliteration of the normal heart shadow with widening of its base is also suggestive. Lateral views show a change in shape of the triangle formed by the posterior border of the heart, the diaphragm, and the spine, the space behind the so-called "pericardial ligament" being obliterated in most cases. Faintness or absence of pulsation may be brought out by fluoroscopic examination. These signs, of course, are not always quite satisfactorily interpretable, but the main difficulty is a clinical one and lies in the actual performance of the examination necessary for a good view. As a rule, when we rely upon the X-ray for clinching the diagnosis, the patient is too sick to be able to coöperate; nor indeed, would it be justifiable in most instances to subject him to the necessary manipulations for either a fluoroscopic examination or for securing plates with a lateral view. Furthermore, the character of the fluid cannot be determined by X-ray.

The symptoms of this disease are legion, and in my opinion relatively unimportant because they are so apt to be misleading. The diagnosis must rest, not so much on symptoms, as on physical signs. Pain is not often present, but authors present widely different views on this point. Capps,[67] in a recent experimental and clinical study, concludes that the presence of pain with pericarditis usually indicates the involvement of tissues outside the pericardium, especially the pleura. Upper abdominal pain may have its explanation in the liver displacement noted previously, though its occurrence is scarcely to be wondered at, considering the proximity of the diaphragm and structures beneath it to the pericardium. Fussell and Kay [68] have pointed out the occasional possibility of confusing appendicitis and pericarditis and offer a possible explanation. More frequently, perhaps, than actual pain, patients suffer from a sense of precordial oppression, and tenderness over this region of the chest has already been noted. Piersol, in his anatomy, suggests that this occurs because of the connection between the upper intercostal nerves and the ganglia and nerves of the intercostal plexus.

Dyspnœa is usually quite marked, and there may be other symptoms referable to pressure on neighboring structures from distention of the sac, as dysphagia, aphonia, cough, and pupillary changes similar to those seen in aneurism. Irritation of the phrenic nerve may cause hiccough, paroxysmal eructations, or vomiting.[69]

The general symptoms of fever, rigor, etc., need scarcely be discussed.

Diagnosis is made certain only by the finding of pus, either by exploratory puncture or by incision; but a probable diagnosis can be reached from a careful consideration of the etiology, the course of the fever, the cardiac muscle symptoms, poor general condition, precordial œdema, with high leucocyte count,[29] together with the help of the X-ray. Possibly the chief point in the diagnosis is to suspect the occurrence of purulent pericarditis in all febrile conditions, and to attempt to rule out the disease by failing to elicit any of its

signs. Only by persistent alertness in this respect can a clinician diminish this fruitful source of most embarrassing surprises at the autopsy table.[33]

The treatment of purulent pericarditis is drainage. Whether this should be accomplished by means of multiple punctures (10.4 per cent. cures), intercostal incision (37 per cent. cures), or wide exposure (56.6 per cent. cures) is not a matter of choice to the surgeon.[33] In the face of such statistics a conscientious man is compelled to resort to wide exposure. We will therefore proceed to a discussion of the operative surgery of suppurative pericarditis.

It will be unnecessary to review the anatomy of the field under consideration, except insofar as certain points have a practical bearing on the operation.

Fig. 8.—Case III, R. C. before operation.

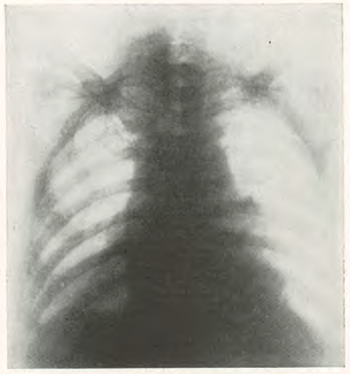

Fig. 9.—Case III, R. C. after operation.

The accompanying figure (Fig. 1) shows the pericardium with its relations in sufficient detail. Recall that the sac lies in direct contact with the chest wall below the lowest segment of the body of the sternum, and in front of the fifth and sixth costal cartilages, and a portion of the seventh. Allowing for variations, the projection of its lower limits forms a plane inclined downward toward the left, passing through the middle of the xyphoid process. It terminates 5 or 6 cm. from the sternal margin on the left, and its extent from the right border of the sternum is 2 cm.[33] Any plan of operation designed to drain the sac must be influenced by these relations of its diaphragmatic portion, as well as by the position of the overlapping anterior margins of the pleuræ (Fig. 2). While normally the anterior margin of the left pleura lies quite close enough to the sternum to render itself liable to accidental wounding during an operation here,[70] its wide variation in position makes this danger even greater, despite the fact that the pleura is reputed to move outward under the influence of a distending pericardium, or, in other instances, is said to be obliterated in the danger zone by inflammatory agglutination of its surfaces.[30]

In view of the above facts, it is advisable to make the incision for drainage to the left of the sternum as low down as possible, for two reasons, first, because the lowermost point of the pericardium lies toward the left, and second, because the sac is more likely to be uncovered by the overlapping pleura on this side.

Many operations have been devised in accordance with these principles. Kocher,[71] as well as Voinitsch,[72] resected the sixth costal cartilage, and also the two above in some cases (Fig. 3). Delorme [25] resected the fifth and sixth costal cartilages. Removal of part of the sternum together with the attached

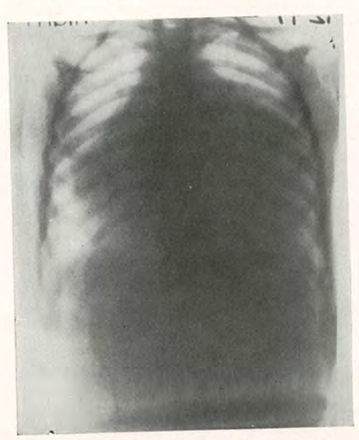

FIG. 10.—Case IV, M. G. before operation.

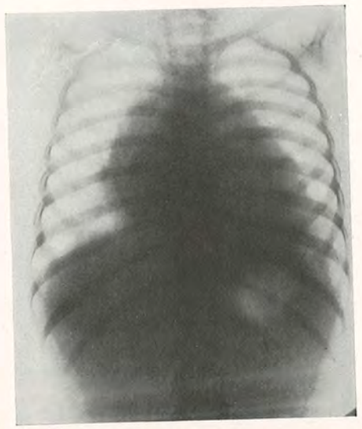

FIG. 11.—Case IV, M. G. after operation.

sixth and seventh cartilages was the method adopted by Voinitsch [72] and Rehn [73]; a trap-door skin flap resection of the seventh cartilage was made by Mintz,[74] and the costoxyphoid angle approach through Larrey's space [75] has also been advised. The epigastric route through the diaphragm from below (Allingham) [76] can scarcely be recommended for drainage of purulent discharges (Coutts and Rowlands [77]). Pool [30] uses an S-shaped incision in the soft parts to resect the seventh, sixth and fifth costal cartilages. He points out that incision in the pericardium should be vertical to avoid striking the pleura; and that wide exposure is necessary to secure dependent drainage and to guard against the danger of encapsulation of the pus. I have found excision of the fifth and sixth costal cartilages alone to be sufficient in my own cases.

Most authorities agree that local anæsthesia is indicated. In their order of appearances, the structures met with as the incision is made are skin, fascia, the pectoralis major muscle, external intercostal membrane, cartilage and internal intercostal membrane. The internal mammary artery is either drawn outward or cut between ligatures, after which the M. triangularis

sterni is seen. On opening this the pleura will be exposed if it is in the field. Writers recommend that it should be pushed outward, although the experience of Dr. John Klopp at the autopsy table leads me to believe that this is quite difficult, as he has found the pleural margins and pericardium to be quite adherent and scarcely separable without damaging one or the other. Fortunately I have not encountered the pleura in my series of operations.

The next structure to appear is the pericardium. Before handling this in any way, it should be anæsthetized locally, as dangerous reflexes are sometimes set up by stimulation of the pericardium. [62, 67, 69] The pericardium is then incised vertically, using the same technic as is commonly employed in opening the peritoneum. Care must be exercised to prevent rapid gushing forth of pus, for the structures involved are very sensitive to pressure changes. Exploration of the entire cavity should be performed gently with the finger, as loculated collections are apt to be overlooked otherwise. In one of my cases I was surprised to find a second welling forth of pus from behind the heart after I had just finished mopping up what appeared to be the entire contents of the sac. While the heart is surprisingly tolerant to foreign bodies, and although some operators have used them with success, nevertheless it would appear that stiff rubber drainage tubes should not be employed. The well known tendency of these drainage wounds to close too early necessitates the employment of some sort of drainage material, and because of its pliability, I have found "rubber tissue" quite satisfactory. This should be carried up behind the heart.

Pool recommends irrigation with Dakin's solution, post-operatively, but other authorities [33] advise only normal saline solution, if any irrigant at all is employed. I have not used either in my own practice. Posture will aid materially in securing proper drainage. The importance of care in dressing to prevent secondary infection is paramount.

I shall not discuss the general measures in the treatment, except to say that the use of Small's serum [77] against the streptococcus of rheumatic fever might prove of value in rheumatic cases, although its originator makes no such claim for it.

Cases of chronic suppuration may require subsequent extirpation of the sac, and should post-infectious adhesions develop, cardiolysis may be of benefit later. This whole question, however, of end-results is one in need of detailed study.

Case I in my series illustrates the great difficulty in diagnosis. Operation seemed quite obviously necessary in this instance, yet we found at operation that we had been mistaken in the diagnosis and that we were dealing with a dilated heart. Six months after the patient's discharge from the hospital he was quite ill, with evidence of marked cardiac decompensation and a fatal prognosis was given.

The frequency with which empyema is associated with suppurative pericarditis cannot fail to strike one. This combination is abundantly illustrated in the series of cases appended, including one fatal case of my own (R. C.). Norris and Landis [57] point out the frequency with which pericarditis occurs

secondary to streptococcic empyema, and this may account for some cases. Others, I have little doubt, are due to secondary infections of the pleura at operation, as the separation of the latter from the pericardium is quite difficult judging from observations at the autopsy table.

CASE REPORTS

Case I.—J. L., white, male, age eighteen years, admitted to the Episcopal Hospital, May 13, 1927, service of Dr. James Kay.

Chief Complaint.—Dyspnœa, substernal pain, and painful joints.

History of Present Illness.—This young man was admitted to the hospital with a history of having been in perfect health until three weeks before admission. At that time, while riding in a street car, he noticed when he arose from his seat that both knees and ankles were stiff, but he went about his day's work as usual without further difficulty. That same evening, however, he was seized with a sudden, dull aching pain over the entire sternum, occurring simultaneously with dyspnœa. Later that night he had definite chills followed by a fever (Temperature 101° F.) and he became so ill that he had to go to bed, where he remained until shortly before he was discharged from the hospital. The next day all of the above symptoms remained, but in addition he experienced very severe pain in both knees, and in the ankles, these joints becoming tender, red, hot and swollen; and continued so for one week. Subsequently he had dull aching pains, much less severe, in both shoulders, the wrists and elbows, but these were fleeting in character. The dyspnœa and substernal pain diminished somewhat as the joint symptoms disappeared, but did not absolutely cease. No respiratory, gastro-intestinal nor genito-urinary symptoms.

Past Medical History.—He does not recall the diseases of childhood, but states that he never had diphtheria, scarlatina or typhoid fever. Three years previously he had an acute febrile attack, accompanied by pain similar to the present, but confined to the knees and ankles and which kept him in bed for two weeks. Following this he had a tonsillectomy and adenoidectomy performed, and has had no similar attacks until the present. He never had chorœa. He denies and gives no direct evidence of venereal infection, and has never had any cardiac, respiratory, genito-urinary nor gastro-intestinal symptoms. His weight has been stationary. He has never had any operations, other than mentioned above, and no severe injuries.

Family History.—Has no bearing on the case.

Social History.—The patient was born and raised in Philadelphia, where he is an average factory worker in a Kensington textile mill. He denies the use of alcohol and tobacco, and has regular hours for sleep and meals. His living conditions are good for those of a man in his station of life.

Physical Examination.—May 13, 1927. The patient was an anemic looking young white adult, sitting up in bed, with body bent forward, evidently in great respiratory distress.

The scalp, ears, nose and face were normal. No petechiæ, hæmorrhages, œdema, nor any discoloration were found about the eyes, and the pupils were normal in all respects. There was no evidence of pyorrhœa, but several teeth were carious. Tonsillar fossæ were empty and the throat clean.

The thorax was found to be of the long narrow type, and the respiratory rate rapid (31 per minute), and shallow. No bulging of the interspaces was seen and there was no asymmetry. Percussion note, voice sounds, vocal fremitus and breath sounds were normal except in the lower third of the left chest in the mid-axillary line, where the classic signs of fluid were elicited, as well as similar signs in the lowermost 5 cm. of the right chest posteriorly. The heart rate was seventy-four per minute. The apex beat was seen and felt in the fifth interspace 10 cm. to the left of the mid-sternal line, measured circumferentially, which corresponds to the mammary line. The right border lay 3.5 cm. from the mid-sternal line. Heart sounds were distant, but a friction rub was not detected, although

a systolic apical murmur and a double aortic were heard. The abdomen and extremities presented nothing of importance.

Owing to the size and shape of the area of precordial dulness, a tentative diagnosis of pericardial effusion was made and this was confirmed by an X-ray examination performed by Dr. Ralph S. Bromer. So certain were all concerned that this boy was suffering from purulent pericarditis that operation was performed without delay under local anæsthesia (1 per cent. novocaine) by Dr. E. G. Alexander. The incision, 10 cm. long, was made along the left border of the sternum, resecting about 5 cm. of the fifth and sixth costal cartilages. The M. triangularis sterni was then divided, and the pericardial sac anæsthetized and opened in a longitudinal direction. No fluid was found, but a tremendously enlarged heart was noted as the cause of the mistake in diagnosis. The wound was then closed in layers without drainage.

The boy's post-operative course was like that of the average acute rheumatic fever case and he left the hospital in one month with a normal temperature and no joint symptoms, but with a "decompensated" heart. Six months later he was found to be in very bad condition, with marked anasarca, dyspnœa and cyanosis, and a grave prognosis was given.

Case II.—K. S., white, male, age twenty-five years, admitted to the Episcopal Hospital, November 18, 1926, service of Dr. Ross V. Patterson.

The onset occurred five days previously and was sudden, being manifested by pain in the upper left chest, followed by a chill and high fever. Cough and rusty sputum then followed, and finally the patient became delirious. He was so ill from the very first that he had to take to his bed and remain there.

About one year previously he is said to have suffered from an attack of acute lobar pneumonia, since which time his health has remained good.

Physical examination revealed typical signs of lobar pneumonia in the right upper lobe; there was a fever of 103.8° F. The heart was enlarged (apex beat in the sixth interspace 3 cm. external to the mid-clavicular line) and its sounds were described as being somewhat distant, but no adventitious sounds were noted, nor was there anything which might lead to a suspicion of pericarditis. A diagnosis of acute upper right lobar pneumonia was made.

The day after admission the patient's temperature dropped from 104° F. to 99° F., and because of the general improvement it was surmised that the sudden fall represented a crisis. The next day, however, the temperature had risen once more to 103° F. and the respirations remained rapid (thirty-four per minute), and consequently empyema was sought for but not found. On November 23, 1926, Dr. Ross V. Patterson made the following note, in part: "Heart—impulse slight or absent; the area of deep dulness encroaches upon the superficial and Traube's space is obliterated. An area of dulness replaces the cardio-hepatic angle. Heart sounds distant. Impression—pericarditis with purulent effusion."

The above diagnosis of effusion was confirmed by X-ray, and pericardiotomy was performed the following day by Dr. E. G. Alexander. Under local (1 per cent. novocaine solution) anæsthesia, an incision was made along the left border of the sternum about 10 cm. long, with its centre over the fifth interspace. Through this incision the costal cartilages of the fifth and sixth ribs were excised for about 5 cm. peripherally to the costo-chondral junctions and the M. triangularis sterni separated. The pericardium was then infiltrated with novocaine and incised in a longitudinal direction parallel to the skin incision, whereupon about 100 c.c. of turbid fluid was allowed to escape. This proved to be pus, but no organisms were isolated. The recovery was uneventful, and the man, when last interviewed (December 23, 1927) was found to be in excellent physical condition, presenting no evidence of cardiac disease. He works as an electrician every day and has no physical incapacity whatsoever.

Case III.—R. C., white, male, age forty-four years, admitted to the Episcopal Hospital, February 18, 1926, service of Dr. John B. Carson.

Nineteen days previously this man was stricken with acute lobar pneumonia, and was treated for it at home by his family physician until the latter advised the family that hospitalization was necessary because of the probable development of empyema.

Physical examination on the day of admission revealed a very sick patient, presenting a "septic appearance." He showed signs of fluid at both pulmonary bases posteriorly, more marked on the left. The exact position of the apex beat could not be determined, as it extended as a wavy impulse throughout the precordial interspaces; there was an obtuse cardio-hepatic angle as well as extension of the cradiac dulness toward the left and upward as high as the second interspace. The sounds were muffled, but regular, and there were no adventitious sounds, shocks nor thrills. The white blood count was 24,320 per cu. mm., polymorphonuclear leucocytes predominating. The patient's fever proved to be of the septic type, ranging between 98° F. and 103° F. Dr. Ralph Bromer examined the patient röntgenologically and reported a typical shadow of pericardial effusion. On the basis of these findings a diagnosis of suppurative pericarditis was made and confirmed at operation, performed February 18, 1926, by Dr. E. G. Alexander.

Under local anæsthesia (1 per cent. novocaine) an incision was made and carried along the left border of the sternum a distance of 12 cm., with its centre over the sixth costo-chondral junction, exposing the latter. About 6 cm. of the fifth and sixth cartilages were then removed and the underlying triangularis sterni divided, exposing the tense pericardium heaving beneath it. A small needle was then inserted into the sac and about 20 c.c. of thin, sanguino-purulent fluid withdrawn into a syringe. The pericardium was then infiltrated with 1 per cent. novocaine and incised longitudinally, whereupon 60 c.c. of a similar fluid was allowed to escape slowly. An attempt to raise the pericardium between hæmostats was unsuccessful because the latter could not be made to pick up the tense sac. The aspirated fluid contained pus cells, but no organisms were found in the smear or culture. A No. 16 soft rubber catheter was then introduced behind the heart and through it 340 c.c. more of a similar fluid was withdrawn through a syringe. This catheter was then allowed to remain *in situ,* being anchored by silkworm gut sutures to the skin. Two small strips of iodoform gauze were placed in the incision on either side of the catheter and the wound was then closed around these by through and through silkworm gut sutures (interrupted). The patient was placed in a warm bed and returned to his room in fair condition, having withstood the operation quite well. He was given morphine sulphate gr. 1/6, and atropine sulphate gr. 1/150 by hypodermic injection just before operation and again several hours later; and in addition took tincture of digitalis (B. and W.) Mxx, q.4.h., alternating with spiritus frumenti f℥iss q.4.h.

Directly after the operation a second röntgenogram of the heart was taken by Doctor Bromer, who noted a marked decrease in the density of the shadow, which was evidently thrown by the pericardial sac, as within it could be distinguished the outline of the heart. The catheter could be seen in the film.

February 19, 1926.—The patient's temperature, which was 102° F. before operation fell to 98° F., but his condition remained only fair. The tube and gauze were removed from the wound. Signs of fluid now present in the lower two-thirds of the left chest. Dyspnœa marked and cyanosis set in.

February 20, 1926.—X-ray of the chest by Dr. Ralph Bromer confirmed the presence of fluid in the left chest and also showed a small amount in the right chest. The pericardium was thought to contain fluid as yet undrained. The temperature again rose to 102° F. after having been normal directly after the pericardiotomy. The left chest was then aspirated through the seventh interspace in the mid-scapular line and 90 c.c. of thick greenish flakey pus obtained.

February 21, 1926.—Thoracotomy without rib resection performed at the same point as aspiration the day before, and a rubber tube placed in for drainage; similar pus was obtained. This was found to contain a diplococcus pneumoniæ, not typed.

February 23, 1926.—As the drainage from the pericardial wound had stopped, this was dilated by spreading with the open jaws of a hæmostat, and a rubber tube was inserted. White blood count 27,200. Polymorphonuclear leucocytes 82 per cent.

March 1, 1926.—Several attempts were made since the preceding note to facilitate drainage from the pleura and pericardium, but these were not successful. Tube then removed from the pericardium. The general condition became worse and the physical signs remained unchanged.

March 4, 1926.—The pericardial wound has practically healed. Tube removed from the chest. No drainage. Condition poor. Temperature has been of the septic type, its limits ranging between 98° F. and 103° F. Nausea and some vomiting at times.

March 12, 1926.—Gradually progressing weakness, otherwise no change.

March 15, 1926.—The old pleural wound was opened again and a catheter inserted. No drainage obtained, nor did thoracentesis performed in several locations yield any pus.

March 17, 1926.—X-ray by Dr. Ralph Bromer shows collection of pus in the posterior mediastinum. Other collections have diminished.

April 1, 1926.—The patient's condition grew progressively worse since the last note and death ensued this morning.

Autopsy Findings.—Acute suppurative pericarditis; acute empyema thoracis, left; acute lobar pneumonia, right, with marked bilateral pulmonary congestion. No organisms were isolated from the pericardium, but the diplococcus pneumoniæ (type not determined) and staphylococcus aureus were obtained from the left pleura by culture, both from the specimens at previous operation and from the autopsy.

Case IV.—M. G., white, female, age six years, admitted June 17, 1927, to the Abington Memorial Hospital into the service of Dr. Sumner Cross, having been referred there by her family physician, Dr. E. E. Sprenkel, with a provisional diagnosis of pericardial effusion.

Chief Complaint.—Dyspnœa.

History of Present Illness.—The child had been well until seven days before her admission, when she developed a frontal headache and sore throat, followed by fever (temperature 104° F.) and rapid pulse (160 per minute). Three days before admission she began to show a septic type of temperature, and in spite of treatment she did not improve. She was admitted to the hospital with a temperature of 101° F. (mouth), respiratory rate 60, and a pulse rate of 150 per minute.

She has had dyspnœa since the onset but no œdema or cardiac pain. No other symptoms of note were elicited from the mother's history.

Past Medical History.—She never had rheumatic fever nor chorœa, and only one attack of tonsillitis. She has had no operations or severe injuries.

Family History.—Irrelevant.

Social History.—Living conditions are good.

Physical Examination.—Reveals a very alert, pale, dyspnœic, white female, of six years. The head, including the ears, eyes, nose and face show nothing abnormal. The tonsils are large and give evidence of acute inflammation; cyanosis of the lips is quite marked. No abnormal pulsations, rigidity or adenopathy were noted in the neck, and examination of the lungs reveals nothing of note.

Heart.—The apex beat was seen and felt in the sixth interspace 2.5 cm. lateral to the mid-clavicular line on the left. The impulse was quite diffuse. On percussion the left border of the heart was 8 cm. to the left of the mid-sternal line and the right 4 cm. to the right in the fourth interspace. No shocks, thrills, nor precordial bulging were present, and the rhythm was normal. The rate was 150 per minute; sounds of the heart were of good quality and normal in intensity, but at the apex were both a systolic and a diastolic murmur, the former of which was transmitted to the left axilla. The pulmonic second sound was of greater intensity than the second aortic.

Abdomen.—Liver dulness extended from the fifth rib to 4 cm. below the right costal border in the mid-clavicular line, and the liver was tender.

Extremities.—No abnormalities noted, except pulmonary anthropathy and cyanosis of the nail beds.

Genitalia, rectum and spine were normal.

X-ray by Dr. Donald Gulick showed an increase in the area of heart shadow not suggestive of pericardial effusion.

June 20, 1927.—The patient had a very uncomfortable night, suffering from dyspnœa and cough. X-ray shows no change.

June 22, 1927.—Paroxysmal attacks of coughing and dyspnœa occurred, during which pallor and cyanosis increased, and the child perspired freely. The sputum was blood tinged.

June 23, 1927.—X-ray showed a definite increase in the size of the heart shadow, which now presented a triangular shadow and was very suggestive of pericardial effusion.

Pericardiotomy was accordingly performed by Dr. E. G. Alexander, under local (1 per cent. novocaine) anæsthesia. An incision 8 cm. long with its centre over the fifth interspace, was carried down the left border of the sternum, over the fifth and sixth costo-chondral junctions. About 4 cm. of each of these cartilages were excised and the triangularis sterni fibres separated, bringing the pulsing pericardial sac into view. The latter was then infiltrated with 1 per cent. novocaine solution and incised carefully between hemostats in a longitudinal direction. About 50 c.c. of turbid fluid was permitted to escape slowly. This proved sterile on culture, but contained pus cells and erythrocytes in abundance; no organisms were found in the smear. The wound was then closed at its upper end only, allowing the lowermost portion to remain open for drainage, and sterile dressings were applied. The patient withstood the operation well and was returned to her room in no worse condition than when she left it. Recovery was rapid and uneventful, and at the last report, eight months later, the child was in good health and able to take dancing lessons.

CASES FROM THE LITERATURE SINCE 1921

No. 1, 1926.—(Death). Avierinos, F., and Turries, J.: Arch de Malad. du Coeur, 1926, vol. xix, pp. 670-675.

Italian laborer, forty-four years of age, admitted to hospital with ill-defined febrile affection, complaining of pain in right hypochondrium and dyspnœa of eighteen days' duration. The onset occurred with severe precordial pain, radiating only to the upper left arm. The right hypochondriac pain being present only the past four days. Vertigo, sweating and fever have also been prominent.

Physical Examination.—Signs of left pleural effusion with muco-purulent expectoration for the past twenty-four hours. Examination of the heart showed precordial dulness increased to right and left. After a diagnostic exploratory puncture, pericardiotomy was performed. At operation very fetid, gassy pus escaped, and a drain was inserted. Fifty cubic centimetres of anti-gangrene serum polyvalent were then administered intra-muscularly and the wound closed. Death two hours later.

Autopsy.—Showed fistulous connection between pericardium and left bronchus, through which the patient was able to expectorate pus.

No. 2.—(Not reported by Pool, 1921). Adyne-Curran, W. J. P., Jr.: Roy. Army Med. Corps, London, 1918, vol. xxx, p. 599. Gunshot wound in the precordium; pyopericardium with gas infection.

O. W., age twenty-two years, admitted to the hospital October 9, 1916, with a wound, of entrance only, over the ninth rib, in the left posterior axillary line, having been wounded September 27, 1916.

Physical Examination on October 14, 1916, showed normal precordial dulness, which on October 15, 1916, changed to complete obliteration of the precordial dull area. X-ray showed distention of the pericardial sac, and a diagnostic needling was decided upon, using 2 per cent. novocaine for local anæsthesia. Gas was found to escape through the canula, thereby tending to confirm the previous clinical diagnosis of gas bacillus pericarditis. Pericardiotomy was then performed under local anæsthesia, first excising the sixth costal

cartilage, whereby eight ounces of foul yellow pus was allowed to escape from the sac. A rubber drain was placed and the wound closed loosely about this. Convalescence was complicated by the development of pleural effusion and also phlebitis (arm). It was necessary to enlarge the draining wound under ether about twelve days post-operatively. The patient was then discharged to England in good condition February 2, 1917, and has been reported as improving since then, though his wound was still draining.

No. 3.—(Recovery). Bransfield, J. W.: Annals of Surgery, 1924, vol. lxxix, p. 203. Pericardiotomy for suppurative pericarditis.

Male, age eighteen years, complaining of pain in the left chest and dyspnœa, with a history of having run a scissors blade through the left chest two days previously. Examination showed abscess pointing over the ninth rib in the left nipple line, but incision of this failed to give expected relief of dyspnœa after evacuation of two ounces of pus. X-ray then revealed pericardial effusion confirmatory to physical signs of same. Eight days after admission pericardiotomy performed under local anæsthesia (resection of fourth costal cartilage) and one ounce fluid obtained (Staphylococcus aureus). Fluoroscopy performed at once showed that there was no doubt about distention of the pericardium, so that the patient was returned to the operating room and under general anæsthesia had resection of the fifth and sixth costal cartilages. Half pint of fluid escaped this time (Staphylococcus aureus).

Post-operative treatment consisted in daily irrigations with normal saline solution for two weeks, with drainage, after which Dakin's oil was used. By the fourth week the temperature was normal, and the patient was out of bed the fifth week. Examinations at three week intervals for four months subsequently failed to reveal any disturbance of the heart, and the X-rays were normal.

No. 4, 1924.—(Death). Despard, D. L., reports the following case in discussing the above paper by Bransfield:

Man with a history of bronchitis or broncho-pneumonia past three months. X-ray revealed a dilated pericardium. Local anæsthesia. Incisions along the left border of the sternum between the fourth and seventh costal cartilages. Dakin's tubes were inserted. Two or three days later the patient's temperature rose and death ensued.

Autopsy Findings.—Chronic suppurative pericarditis; tuberculous adenitis, peribronchial.

No. 5, 1924.—(Death). Dufour, H. and Baruk, H.: Bull. et Mem. Soc. Med. d'Hop de Paris, 1924, vol. xlviii (3 S.), p. 744.

A patient showing septicæmia for fifteen days, followed by signs of pericardial effusion. Past twenty-four hours developed cough and fetid expectoration. Pericardiotomy performed seventeenth day of illness followed by death. Autopsy showed purulent pericardial effusion which had existed side by side with gangrenous infection of both lungs. The authors present evidence for their opinion that this represents a case of blood stream infection attacking both pericardium and lung.

No. 6, 1924.—(Recovery). Hall, A. J., and Townrow, V.: Brit. M. J., 1924, vol. ii, p. 1148. Purulent pneumococcic pericarditis; pericardiotomy; recovery.

Male, age seventeen years, developed an acute pain in the left chest anteriorly. Three days later he became very ill and signs of pericarditis were noted. Temperature 102.8, pulse 120, respiration 40. Increase in the area of cardiac dulness, with the apex beat an undue distance medial to the left edge of dulness, together with gradually disappearing friction rub. Three hundred cubic centimetres of sero-fibrinous straw-colored fluid was withdrawn through a needle placed in the fifth interspace 4.5 cm. to the left of the sternum and pneumococci were isolated from this. On the ninth day a second paracentesis was performed and 200 c.c. of a similar fluid withdrawn. Later, under local anæsthesia, pericardiotomy was performed, excising 2.5 cm. of the fifth left costal cartilage and inserting a drainage tube behind the heart. Later, a left pyothorax was drained. The patient recovered. The authors consider paracentesis as of value in tiding patients over an unfavorable condition so that operation may follow with less risk.

No. 7, 1921.—(Recovery). Hedblom, C. A.: Surg. Clin. N. Am., 1921, vol. 1, p. 1411. Primary tuberculous pericarditis.

Male, age thirty-six years. Onset occurred eleven months previously (May 1, 1921) with fever, sore throat and loss of weight.

This was followed by an attack of bilateral phlebitis (legs) accompanied by night sweats, chest pain, and chronic non-productive cough. Later dyspnœa and cyanosis developed.

Physical examination showed diminished expansion on the left side of the thorax, obliteration of the cardio-hepatic angle, and distant heart sounds. No murmurs. No arrhythmias noted, but the vessels of the neck became suffused when the patient occupied the recumbent posture. Blood pressure 108–88 mm. mercury. X-ray showed a large cardiac shadow. A total of 2500 c.c. of fluid were removed by tapping the pericardium, the first of these being clear, but the last purulent. Pericardiotomy was then performed with liberation of 2000 c.c. of fluid, and the wound was closed without drainage. The fluid gave a smear positive for Koch's bacilli, but the guinea-pig inoculation was negative. Two months later, a recurrence set in, as noted by symptoms and X-ray. Pericardiotomy was again performed and 2000 c.c. of fluid removed. The wound of the soft parts was closed without drainage, but this time the pericardium was left open. The discharge gradually became thicker, and finally, four months after admission, the patient was discharged in poor condition.

No. 8, 1926.—(Death). Leys, D.: Lancet, vol. ii, 1926, p. 1004. A peculiar case of pneumopyopericardium.

Male, age eleven years, admitted to the hospital, March 9, 1925, complaining of pain in the left shoulder and vomiting, both of one week's duration. Physical examination showed equivocal signs of pericardial effusion. On March 15, the patient made a striking change for the worse, and an X-ray showed gas and fluid in the pericardium. Operation was then performed, excising portions of the fourth and fifth ribs through a horizontal incision in the left nipple line, exposing and then opening the pericardium. A large amount of very foul pus escaped which on culture proved to contain a hæmolytic streptococcus, with B. mucosis capsulatis and a gas forming anaërobe. The boy survived the operation for one week, discharging a large amount of pus throughout.

Autopsy showed a sinus connecting the pericardium with an œsophageal diverticulum to which latter a caseous tracheal lymph gland was adherent.

No. 9, 1925.—(Recovery). Wood, A. C., and Bradley, W. N.: Atlantic M. J., 1925, vol. xxvii, p. 436.

White male, age four years, nine months old, admitted April 8, 1923, with a history of having had rubeola three weeks previously, followed by fever, cough and pain in the abdomen and lumbar region. Physicians at the patient's home made a diagnosis of probable empyema following broncho-pneumonia, for the child became distinctly worse just before he was hospitalized, and showed signs which led to this diagnosis. X-ray April 9 showed a shadow in the left chest, which led to an exploratory puncture, April 12, 60 c.c. of serum was withdrawn through a needle in the seventh interspace posterior axillary line, and pus was obtained from a needle placed in the second interspace just outside the nipple line.

April 17, as the patient's condition failed to improve, despite the establishment of drainage five days previously, the exploratory needle was again inserted into the depths of the wound and this time drew pus from the pericardial sac, as it was found to swing simultaneously with the heart beat.

An X-ray showed probable pericardial effusion and operation was performed April 21.

Ether anæsthesia. Resection of 4 cm. of the third rib reveals a bulging tumefaction, the pus-distended pericardial sac. This was opened and 250 c.c. of yellow pus was evacuated. The sac was then irrigated with warm saline solution. No drainage tubes were inserted at operation but the wound was kept patent by divulsion and the sac irrigated with Dakin's solution.

April 25.—A drainage tube was inserted, to remain a few days.

May 3.—Practically no discharge. Condition good.

May 12.—Wound has been healed. Heart sounds, rhythm and dulness normal.

No. 10, 1924.—(Death). Brooks, R.: Lancet, 1924, vol. ii, pp. 319-20.

Male, age eleven years, admitted with acute osteomyelitis of the left femur, seven days' duration. Operated at once. Eight days later no sign of improvement, which led to examination of the chest and revealed the presence of pleural effusion, which was tapped. Turbid fluid obtained, sterile in forty-eight hours. Pus ten days later (Staphylococcus aureus). Pericardiotomy. Death. Post-mortem: Abscess of myocardium and pus in pericardium.

No. 11, 1924.—(Recovery). Brooke, R.: Lancet, 1924, vol. ii, pp. 319–20.

Male, age twelve years, acute osteomyelitis of fibula of twenty-four hours' duration. Immediate operation. Fourteen days later amputation became necessary because his progress was poor. On the twenty-first day a metastatic abscess developed over the left humerus; seven days later a friction rub was noted, gradually disappearing subsequently. Cardiac dulness increased simultaneously; twelve hours later pericardiocentesis followed by pericardiotomy. A rubber drainage tube was left *in situ*. Staphylococcus aureus was isolated from the pus which came a few hours later. Recovery uneventful.

No. 12, 1924.—(Recovery). Brooke, R.: Lancet, 1924, vol. ii, pp. 319–20.

Male, age eleven years, developed acute osteomyelitis of the right tibia, for which he was operated upon; eight days later a friction rub was detected. On the twelfth day the pericardium was tapped and turbid fluid obtained (Staphylococcus aureus). Pericardiotomy. Recovery uneventful.

No. 13, 1923.—(Recovery). Gamberini, C.: Arch. Ital. di Cœur, 1923, vol. vi, p. 619.

Male, age seven years, presented evidence of suppurative pericarditis, confirmed by pericardiocentesis. Subsequent frequent multiple punctures were unsuccessful and pericardiotomy was performed with excellent result, except for slight thoracic deformity.

No. 14, 1921.—(Recovery). Rouvillois, H.: Bull. et Mem. Soc. de Chir. de Paris, 1921, vol. xlvii, p. 1117. Tuberculous pericarditis treated and cured by pericardiotomy without drainage.

No. 15, 1926.—(Recovery). Westerborn, A.: Upsala Täkaref. Fork., 1926, vol. xxxi, pp. 609–622.

S. E., sixteen years of age, was admitted to the hospital, March 28, 1926, with a history of pain beneath the right nates and a fever. On admission his temperature was 40.3° C., and physical examination revealed the presence of a carbuncle beneath the right nates, and which was incised the following day. On the fifth day a pericardial friction rub was detected, and five days later there were signs of pericardial effusion, confirmed by X-ray. Yellowish pus containing staphylococci was removed on April 7 and again on April 17 and May 5. On May 8 a pericardiotomy with drainage was performed under local anæsthesia, using the left costo-xyphoid angle incision with resection of the sixth and seventh costal cartilages. During the operation the left pleura was wounded. Convalescence was complicated by pleural effusion, but on July 31 the man was discharged cured.

Nos. 17 and 18.—(Recovery). Bressot: Lyon Chir., 1925, vol. xxii, p. 747, reports two cases of tuberculous pericarditis treated by pericardiotomy.

No. 19, 1921.—(Recovery). Duguet: Bull. et Mem. Soc. de Chir. de Paris, 1921, vol. xiv, p. 1111. A report of a case of tuberculous pericarditis treated successfully by pericardiotomy.

No. 20, 1927.—(Recovery). Ramond, L., and Weill-Spire, R.: Bull. et Mem. Soc. Méd. d. Hóp. de Paris, 1927, vol. xliii, p. 1163.

REFERENCES

[1] Robey, William H., Jr.: Am. Jour. Med., La., 1917, vol. cliii, p. 529.

[2] Beck, Claude S., and Moore, Richmond L.: Arch. Surg., 1925, vol. xi, pp. 555–577.

[3] Riolan, J.: Enchieridium anatomicum, etc., Paris, 1648, vol. liv, p. 3. (Cited by Terrier, F., and Reymond, E.: Chirurgie du coeur et du pericarde, Paris, 1898, p. 1.)
[4] Senac: Traité de la structure do coeur, de ses action et de ses Maladies, Paris, 1749, I, vol. ii.
[5] Morgagni, G. (J) B.: De sedibus et causis Morborum per anatomen Indagtis, Lovanii, E. Typographica Academica, 1756, Tomus Primus, Epist. 16. (Cited by Beck and Moore, p. 2.)
[6] Corvisart, J. N.: Essai sur les Maladies Organiques du Coeur, Paris, 1806, p. 50.
[7] Corvisart, J. N.: Essai sur les Maladies et les lesions Organiques du coeur et des gros Vasseaux, Edit. 2, Paris, 1811.
[8] Laennec, Rene, T. H.: Traité de l'auscultation mediate et de Maladies du Poumon et du coeur, Paris, 1819, 4th edit., t, vii, p. 410.
[9] Tice: Practice of Medicine, Prior & Co., Hagerstown, Md., vol. vi, p. 209.
[10] Garrison, F. H.: History of Medicine, 3rd edit., Saunders, Phila., 1924, p. 243.
[11] Desault, Pierre-Joseph: Oeuvre Chirurg. Bichât, Paris, 1798, vol. ii, p. 304.
[12] Larrey, Dominque, Jean: Chir. chirurg., Paris, 1829, vol. ii, p. 291. Bull. d. soc. Med., 1810, "Sure une blessure du pericarde suivie d'hydro-pericard."
[13] Jowett: Cited by Gunther, Siegmund: Lehr E. Vonden blutigen Operationen am Menschlichen Körper, Leipzig, 1861, p. 102.
[14] Skoda and Schu.: Cited by Trousseau. Arch. gen. de Méd. 1854, vol. ii, p. 519.
[15] Terrier, F., and Reymond, E.: Chirurg. du coeur et du pericarde, Paris, 1898.
[16] Hilsman, F. H.: Über die Paracentese die Perikardiums, Kiel, 1875 (Inaugural Dissertation).
[17] Von Langenbeck, Bernhard: Vorlesungen über Chirurgie, Berlin, 1888, August Hirschwald, Z.449.
[18] Romero: Cited by Baizeau. Gaz. de méd. et de chir., Paris, 1868, p. 565 (Memoire sur la ponction du pericarde au point de vue chirurgical).
[19] Trousseau, A., and Lesague, C.: Arch. gén. de Méd., 1854, vol. ii, p. 513.
[20] Günther, Siegmund: Lehre von den blutigen Operationen am menschlichen Körper, Leipzig, 1861.
[21] Roger, M.: Cited by Terrier and Reymond (l.c.).
[22] Roberts, J. B.: Cited by Terrier and Reymond (l.c.).
[23] Kinderberg: Cited by Terrier and Reymond (l.c.).
[24] West: Cited by Terrier and Reymond (l.c.).
[25] Delorme, E., et Mignon: Rev. de Chir., Paris, 1895, vol. xv, pp. 797–987.
[26] Roberts, J. B.: Am. Journ. Med. Sci., 1897, vol. cxiv, p. 642.
[27] Porter: ANNALS OF SURGERY, 1909, vol. xxxii, p. 769.
[28] Eliot: ANNALS OF SURGERY, 1909, vol. xlix, pp. 60–142.
[29] Rhodes: ANNALS OF SURGERY, 1915, vol. lxii, p. 660.
[30] Pool, E. H.: ANNALS OF SURGERY, 1921, vol. lxxiii, p. 393.
[31] Roberts, J. B.: Arch. Surg., 1923, vol. vi, p. 101.
[32] Wood, A. C., and Bradley, W. N.: Atlantic Med. Jour., 1925, vol. xxviii, p. 436.
[33] Klose, H., and Strauss, H.: Arch. f. klin. Chir., 1922, vol. cxix, p. 467.
[34] Hosp. of the P. E. Church in Phila., Report of Board of Managers, 1926.
[35] Stone, Willard J.: Jour. A. M. A., 1919, vol. lxxiii, pp. 254–258.
[36] Preble, Robert B.: Jour. A. M. A., December 17, 1901, vol. xxxvii, pp. 1510–1513.
[37] Sears: Med. and Surg. Reports of the Boston City Hospital, April 22, 1897.
[38] Osler, William, and McCrae, Thomas: The Principles and Practice of Medicine, 9th edit. A. Appleton and Co., N. Y. and London, 1920, p. 753.
[39] Zinn, W.: Therap. der Gegenwart, 1909, L. N. F. 11, p. 409.
[40] Sibson, Francis: Reynold's System of Medicine, London, 1877, vol. iv. pp. 186–437. (Pericarditis.)
[41] Hedblom, C. A.: Minn. Med., 1922, vol. v, p. 40.
[42] Hedblom, C. A.: Surg. Clin. N. Amer., 1921, vol. i, p. 1411.

[43] Brooke, R.: Lancet, 1924, vol. ccvii, p. 319.
[44] Sinnhauer: Die Erkrankungen des Hirzbeutels und ihre Behandlung, Berlin, 1911.
[45] Ker, C. B.: Infectious Diseases. A Practical Text-Book, Oxford Pub., 1920, 2nd edit., p. 122.
[46] Stokes, John H.: Modern Clinical Syphilology. Saunders and Co., Phila., 1926, p. 820.
[47] Stevens, A. A.: The Practice of Medicine. Saunders and Co., Phila., 1923, p. 66 and p. 700.
[48] Chatard, J. A.: Johns Hopkins Hosp. Bull., 1905, vol. xvi, p. 334.
[49] Robey, William H., Jr.: Am. Jour. Med. Sci., 1917, vol. cliii, p. 529.
[50] Osler and McCrae, l.c., p. 758.
[51] Fischer, M. McC.: Minn. Med., 1926, vol. ix, pp. 453–456.
[52] Borie and Lebert: Bull. et Mem. Soc. Méd., Hôp. de Paris, 1915, vol. xxxv, p. 1042.
[53] Ewart, W.: Tr. Clin. Soc. Lond., 1897–1898, vol. xxxi, pp. 97–108. Also Lancet, London, 1896, vol. ii, pp. 1446–1448.
[54] The author is aware that some authorities prefer a different explanation of the significance of these.
[55] McCallum, W. G.: A Text-book of Pathology, 1922. W. B. Saunders Co., Phila., p. 232.
[56] Williamson, C. S.: Arch. Int. Med., 1920, vol. xxx, p. 206.
[57] Norris, G. W., and Landis, H. R. M.: Diseases of the Chest and the Principles of Physical Diagnosis. W. B. Saunders Co., Phila., 1920, p. 659. Also p. 598.
[58] Rotch, T. M.: Bost. Med. and Surg. Jour., 1878, vol. xcix, pp. 389–421.
[59] Ebstein, W.: Arch fur path. Anat., 1893, vol. cxxx, pp. 418–443.
[60] Christian, H. A.: Jour. A. M. A., 1918, vol. lxxi, pp. 419–422.
[61] Ewart, W.: Brit. Med. Jour., 1896, vol. i, pp. 717–721. Same, 1897, vol. i, p. 185.
[62] Heitler: Med. Klin., 1910, vol. vi, p. 974.
[63] Kuno, Y.: J. Physiol., London, 1917, vol. li, pp. 221–234.
[64] Gager, Leslie T.: Arch. Int. Med., 1924, vol. xxxiii, pp. 449–458.
[65] Tice, J.: Practice of Medicine, vol. vi, p. 215.
[66] Taussig, A. E.: Tr. Ass'n. Am. Phys., Phila., 1914, pp. 535–546.
[67] Capps, Joseph A.: Arch. Int. Med., 1927, vol. xl, pp. 714–725.
[68] Monographic Medicine. D. Appleton & Co., London and N. Y., 1917, vol. ii, p. 880 (Article by Barker, Lewellyn.)
[69] Harrigan, A. A., Am. Surg., 1913, vol. lvii, p. 367.
[70] Kocher: Chir. Operations—Lehr, 1907.
[71] Voinitsch: Rev. de. Chir., 1898, vol. xviii, p. 993.
[72] Rehn: Arch. f. klin. Chir., 1907, vol. lxxxiii.
[73] Mintz: Zent. f. Chir., 1904, vol. xxxi, p. 519.
[74] Bickham: Operative Surgery, vol. iv, p. 19.
[75] Allingham: Lancet, 1900, vol. i, p. 693. Brit. M. J., 1904, vol. i, p. 106.
[76] Coutts and Rowlands: Brit. M. J., 1904, vol. i, p. 9.
[77] Small, James: Personal communication to the author. Doctor Small doubts whether his serum would be of use in such cases. He has, so far (February 1, 1928) been unable to isolate the organism from the pericardium in any case, and doubts whether suppurative pericarditis is a sequel of true rheumatic fever.

ANNUAL ADDRESS FOR 1928

SURGERY IN BREAST TUMORS; PROBLEMS CONCERNING DIAGNOSIS AND TREATMENT *

By Edward J. Klopp, M.D.
of Philadelphia, Pa.

This subject was selected for the Annual Oration because many of the Fellows of the Philadelphia Academy of Surgery have done much to increase our knowledge, improve our technic and enhance the results in breast surgery. In fact every member except those who are directing their efforts to keep us on our feet, those who endeavor to clear our minds and stabilize our bodies, those who remove obstruction from our excretory channels and, at least one, who keeps our jaws in motion, are interested in, but discouraged with, surgery in malignant breast tumors. It was expected that by collecting a fairly large group of cases of "tumors" of the breast from two well-established hospitals something could be learned that would be of assistance in making early and correct diagnoses and secure better results. Follow-up systems in these institutions have not been established sufficiently long to be of material value. The records also leave much to be desired. The operations were done by thirty-five surgeons, and many of the patients were private which may account for the omission of some desirable information in the hospital histories.

The laboratory work, with the exception of a few brief intervals, was done by excellent men. Opinions on tissue diagnosis were often obtained from other sources. Not infrequently the pathologists did not agree. Again, the same slides examined by different men in the same laboratory would differ in the diagnosis, or the report would be so worded that a surgeon with a moderate knowledge of pathological histology might suspect totally different tumors.

In May of 1924, the writer [12] operated upon a woman for simultaneous bilateral mammary cancer. The patient was presented February 10, 1926, at a joint meeting with the New York Surgical Society, an account of which appeared under the Transactions of the Academy of Surgery, May, 1926. The breasts were removed by the Stewart technic at a twelve-day interval. One was examined by the director of the hospital laboratory, the other by an assistant. There was sufficient dissimilarity in the reports to make one suspect unlike carcinomas, whereupon the director was requested to examine both specimens. He reported them as being identical, both adenocarcinoma suggestive of duct origin. The axillary nodes were not involved. She wrote that she was in splendid health on May 2, 1929.

Quoting from Bland-Sutton [26] "the breast is so open to observation that

* Read before the Philadelphia Academy of Surgery, May 7, 1929.

it is the organ from which the knowledge of the natural history of cancer was primarily derived." In regard to this Rindfleisch pertinently remarks: "The tumors of the female mammary gland have been so often, and already at so early a period, the subject of earnest histological investigation, that in this we might not improperly call the mammary gland the nurse of pathological histology." One would think that the pathology of the breast could be so simplified that errors in histological diagnosis should not occur. We owe much to McFarland [15] who has endeavored to remove the haze from the nomenclature of some of the benign breast tumors. In an effort to study the more common fibro-epithelial tumors, to observe the differences between adenofibromata and fibro-adenomata he assembled from five large hospitals about 300 tissues that had been indexed under thirty-three different names. Some of these were not tumors at all. To read his conclusions will stimulate one to read his paper:

"1. Two hundred and eighty-nine cases, supposed to be benign fibro-epithelial tumors of the female breast, were studied clinically and pathologically, for the purpose of harmonizing and simplifying the nomenclature.

"2. One hundred and five of them, described under no less than thirty-three different names, were found to be periductal fibromata.

"3. One hundred and forty-seven, described under much the same names, showed no histological indication of being tumors, or in any way related to them, but were simply mammary gland tissue, either normal, or in some condition of involution.

"4. A system of nomenclature that permits tumors and non-tumors to be given the same names is too faulty to be continued.

"5. As all of the tumors resolved themselves into varieties of a single well-characterized genus, it would be well to call them all by the same name, and that recommended as most appropriate is Warren's choice, periductal fibroma.

"6. In all but seven cases there was no difficulty in separating the tumors from the non-tumors.

"7. The research having been conducted upon material collected from five large, first-class hospitals, where it had been studied by many different pathologists, may be regarded as fairly representative of pathological tissue work as commonly conducted in hospitals.

"8. The mistake of calling non-tumor tissues by names belonging to tumors, may have been the result of overzealousness on the part of the pathologists to coöperate amicably with the surgeons.

"9. There are anatomical and physiological mammary disturbances of the breast that may occasion 'lumps' that have no relation to tumors, and the surgeons should be informed, and not led to believe that they have removed tumors when none existed.

"10. Pathology must remain confused both in theory and application unless its terminology be so relieved of ambiguity as to be easily understood."

It has been clearly demonstrated by Cheatle,[3] Fraser,[7] Wainwright,[16]

and others, that sections cut from the whole breast are less likely to lead to error in diagnosis than if a small section of the tumor be examined. Sectioning whole breasts undoubtedly will aid pathologists to correct former and present misconceptions as to benign and malignant lesions. Several recent papers by Cheatle [3] definitely indicate the term "chronic mastitis" a misnomer. He states that nodularity and lumpiness often palpated anteriorly in breasts of women between the ages of thirty and forty-five, and especially after lactation, being due to the thickening of the ligamenta suspensoria of Sir Astley Cooper which are attached to the skin. The branches contain lobules of fat. If the skin is undercut, the cutaneous attachments divided, the nodularity will disappear. Unfortunately an early carcinoma may be masked by this condition.

Nearly all papers dealing with carcinoma of the breast stress early diagnosis. Teachers of surgery and textbooks on surgery must inform students and doctors how a diagnosis of early malignancy is made, if it can be done. When the röntgenologist fails to detect an early lesion of the stomach or bowel, and he often does, the surgeon will criticize him. Finally, when the patient vomits blood or has an obstruction there may be a re-check and the surgeon will blame the röntgenologist for losing an operable, and perhaps a curable, case. The surgeon cannot lean on the X-ray department to diagnose a breast tumor. Textbooks contain photographs of carcinoma of the breast, showing the tumor which may be so large as to deform the gland, with retracted nipple, skin involvement, axillary node involvement, and statistics showing far and wide metastases. All of this is necessary and impressive. However, we should exert ourselves more to recognize the disease before it has reached the stage when chance for cure has been decidedly diminished.

Most carcinomas are discovered inadvertently by finding a lump. There are other symptoms which should be observed by all persons. At puberty and often at the menstrual period there may be pain or discomfort. Lancinating pain at one point which appears at irrespective times or differs in character from previous pain or discomfort is looked upon by Cheatle [6] as suspicious of carcinoma. The earliest case of carcinoma of the breast he operated upon had no other symptoms; there was no demonstrable lump, microscopy revealed a focus of carcinoma which had begun to invade the surrounding fat. A discharge of blood or serum should also be looked upon with suspicion. Localized nodularity, or a definite hard lump in the gland, probably will continue to be our chief diagnostic symptom.

Carcinoma mastitoides, or carcinoma of the lactating breast, very likely is the most malignant, fortunately infrequent, tumor of the breast. The majority of these tumors are diagnosed abscess. A professor, not of surgery, but one who operated when the opportunity presented itself, made four long radiating incisions, practically cutting the breast into quarters, for carcinoma mastitoides in late pregnancy. The woman did not live to see her child born. General practitioners and obstetricians particularly should keep the picture

of this lesion in mind. Inflammatory carcinoma of the breast reported by Burton J. Lee [14] and Tannebaum probably differs from lactation carcinoma. In a list of twenty-eight cases, fourteen had never lactated. The clinical phenomena are similar. None of these cases occurred during pregnancy or lactation. To diagnose carcinoma mastitoides we quote from a previous paper. "The [11] disease is seen during the childbearing period (sometimes in the latter months of pregnancy, but more often in the early months of nursing), prior to forty years of age, and at the height of physiological activity. It begins as a localized area of induration, which extends rapidly and soon involves the entire breast. The localized 'stony-hard' nodule is conspicuously absent. The skin early assumes a dusky red or purplish-red color. It becomes brawny, feels hot, of the 'pigskin' variety, is fairly well marginated, and appears to be attached to the underlying structures. The previously pendulous breast is firm, increases rapidly in size, and projects like that of a virgin. Pain is not so severe as one would suppose from the appearance of the breast. There is no fluctuation, and but moderate tenderness. The nipple shows no retraction in early stages. The axillary glands may or may not be palpable. The involved skin not infrequently extends well beyond the breast, and the other breast may become involved early. In fact, several cases of simultaneous invasion have been reported.

"The onset in suppurative mastitis is acute, pain often is intense, and tenderness is marked. The skin is bright red and becomes dusky as inflammation progresses. It is never brawny, and fluctuation usually can be determined. There is definite elevation in temperature and leucocytosis. The differential count nearly always shows an increase in the polynuclear cells. In carcinoma, the temperature is normal or slightly elevated. The leucocytes may be slightly increased, and the differential count frequently shows an increase in the mononuclear cells. The diagnosis should be made without section for histological study as has been suggested."

In a paper recommending exploratory incisions in cancer of the breast Fitzwilliams [7] says this about early cancer of the breast: "There is not a single sign of malignancy and nothing even to bring malignancy to mind. There is an indefinite something and undefined thickening. Diagnosed in this stage is the only time we can almost guarantee a cure to a patient." Anything having the characteristics of malignancy he does not consider as early carcinoma. All the signs and symptoms of cancer of the breast are due to extension of growth. This must occur.

From published statistics it is estimated that 80 per cent. of breast tumors are malignant, 20 per cent. are innocent. If one compares recent statistics with those of the past twenty-five years it will be noted that the number of innocent tumors coming to operation have increased in ratio with the malignant tumors. Gibbon's [9] analysis of his last two hundred cases showed that 45 per cent. were benign. Approximately 38 per cent. of the cases collected from the records at the Pennsylvania Hospital since 1901 were benign, and 46 per cent. of those from the Jefferson Hospital since June, 1920. The latter

corresponding with Gibbon's cases. Apparently more attention has been given in recent years to benign growths. If this is true an occasional early carcinoma should be found. We can no longer say that the chances of a breast tumor being malignant are three to one.

Exploratory submammary incision with excision of the suspected tumor should be done in all doubtful cases. This can be accomplished satisfactorily and safely with the endotherm knife. The writer has had no experience with frozen section reports. He prefers to rely on macroscopic evidence. Should there still be uncertainty about the diagnosis the wound can be closed in the proper manner and wait for a fixed specimen report. Seldom will the operator have his opinion reversed by the pathologist.

Attempts have been made to grade the degree of malignancy in carcinoma; histologically by Broders, Greenough and others, and clinically by Lee [13] and Stubenbord. Histological grading is of no value to the surgeon before or during the operation. Lee and Stubenbord use the age, lactation, rate of growth and extent of disease as weighting factors, subdividing each factor into gradation factors, apparently with a considerable degree of accuracy. All surgeons have considered the weighting factors without any mathematical values. One should add obesity and heritage. There is sufficient evidence that a person with a bad familial history of carcinoma must ofttimes be placed in the group of bad prognosis. The fact remains that a benign growth requires excision and a malignant growth the most thorough operation the surgeon is capable of performing.

There are numerous well-standardized operations for amputation of the breast. A surgeon should do the operation he likes best if it permits of wide excision of fascia as advocated by Handly. We believe in removal of the pectorals with few exceptions. The transverse elliptical incision of Stewart has met our requirements in all but two cases. A recent case—a large fibroma in the upper hemisphere, regarded clinically as a fibrosarcoma. The other a large, slow-growing, fixed carcinoma extending high toward the shoulder. In both of these the incision was oblique extending toward the axilla. It has been our custom to undermine the lower flap well over the rectus abdominalis, incise the fascia and dissect it upward toward the breast. Then the upper flap is reflected, and the axilla cleaned out. It is desirable to have an X-ray of the chest before operating for malignancy.

Pre-operative X-ray treatment according to Wood has little to recommend it. Experiments in animals have shown that the lymphatics cannot, but terminal arterioles can, be closed by the X-ray. Therefore, to use X-ray preliminary to operation on the assumption that it will make operation safer by closing the lymphatics is wrong if we believe in the spread of cancer by the permeation method. On the other hand, if we accept the embolic theory it may be of value. That metastasis does occur through emboli in the vascular system seems plausible. We have noticed infection more often where X-ray was employed pre-operatively.

Since the routine post-operative X-ray treatments there have been decidedly less local recurrences in our cases. Local recurrences seem to respond fairly well to the X-rays. We believe in excising these when it is feasible—in the absence of metastasis and a limited number of tumors.

Concerning reëxcision of recurrent tumors it may be of interest to recall a case of S. D. Gross [10] reported in his "System of Surgery" published in 1864. An unmarried woman, aged forty-four, had a partial excision of the left breast for a soft tumor in 1857. In 1859 she came under the care of Doctor Gross when he removed the entire breast. In September, 1861, he performed the twenty-third and last operation. Altogether fifty-four tumors were removed. Recurrences were at or near the former cicatrix, usually within a few weeks. The sixth tumor removed was examined microscopically by Doctor Packard and diagnosed encephaloid of the mamma. She was well three years after the last operation. We have on two occasions excised recurrent tumors.

Statistics are fallacious because of the discrepancies of histological reports and different methods used in assembling cases. Ashhurst [1] properly states that when a large clinic reports statistics on carcinoma a table should be used which is comparable to the scheme employed by Greenough and Simmons. Their five-year cures thus presented 1918–1920. This we consider a fair average. As stated before, we are not prepared to give a correct estimate of our five-year cures. Our personal records are also lacking in this respect. The private patients average 34 per cent. of five-year cures. Ward patients fall far below this figure.

Greenough's statistics show marked improvement as time went on. Technic has been improved since 1894. Have the results been commensurate with the technic?

Let us compare the results of carcinoma of the colon of recent years with good technic for resection with those of carcinoma of the breast with good technic for radical amputation. It is obvious that the advance made in colon surgery has outshadowed the advance in breast surgery. Therefore, in order to obtain better end results it is evident that it cannot be accomplished by refined technic alone. The case records reviewed included the breast tumors at the Pennsylvania Hospital from 1901 to January, 1929. Very few were found prior to 1905. Approximately fifty cases concerning which there were either operating room records or laboratory reports, the histories could not be found. There were histories and laboratory reports of 450 tumors during that time of which 278 (62 per cent.) were malignant, in thirty-four of these the treatment was not stated or the operation was not described. There were 172 (38 per cent.) benign tumors.

The records at the Jefferson Hospital were collected from June, 1920, to January, 1929. There were 431 tumors; of these 234 (54 per cent.) were malignant of which twenty-four were not operated upon, and in five the treatment was not described. There were 197 (46 per cent.) benign tumors.

Total malignant tumors of both hospitals were 512, of these six were

sarcomas, a trifle more than 1 per cent. A recent textbook on surgery states that "sarcomas constitute about 10 per cent. of the tumors of the mammary gland."

The records of 881 tumors were examined, of this number 114 were personal cases. The laboratory reports of all of the latter were reviewed. 50 per cent. of these were malignant. The large proportion of the benign tumors of our personal cases we believe is due in a measure to the fact that nearly 70 per cent. were private. The Jefferson Hospital has proportionately a much larger private service than the Pennsylvania Hospital which may in part account for the higher percentage of benign tumors. Furthermore, we did not include cases from the Jefferson Hospital prior to 1920. It would seem that patients with suspected breast tumors are more likely to apply for advice. However, there is a fallacy to offset this somewhat. The average duration of malignant tumors in the cases at the Pennsylvania Hospital was 9.92 months; Jefferson Hospital 11.84 months.

It has been suggested by pathologists and surgeons that the pathological diagnosis of malignant tumors should be so worded that the surgeon and radiologist could recognize the type and virulency of the tumor. Certain types respond favorably to radiation.

In going over the pathological reports of our own cases it was interesting to note the description of these tumors. Those of vast experience would describe the specimen macroscopically and microscopically with accuracy and detail and frequently express an opinion whether or not it was very malignant, then simply put down the diagnosis "carcinoma." Often, however, no mention was made of the axillary glands. All specimens about which there was any doubt were sent to other pathologists for opinions. We believe that all of the pathological specimens were studied with interest and care and in very few cases would the diagnosis be changed if the slides were submitted to other pathologists. It would be highly desirable to have detailed description and uniform and simplified diagnoses.

That the pathologists should be supplied with more accurate data is obvious. MacFarland gave excellent reasons for careful notes.

Two cases, one not included in the cases reviewed, strongly suggest that "enucleation" of a supposedly benign tumor is insufficient. An able surgeon enucleated a benign tumor from a woman's breast forty-five years of age. A competent pathologist reported it as benign. Within twelve months there was a recurrence beneath the scar with metastasis. The breast tumor was excised for verification of the diagnosis: it was carcinoma.

The other case, a woman fifty years of age, had a fibroma excised and examined by a reliable pathologist who confirmed the diagnosis. Within six months there was a recurrence. Shortly the breast had the appearance of a rapidly-growing scirrhus. The first slides were examined by other pathologists and the diagnosis was confirmed. Following a radical amputation the tumor was examined which proved to be scirrhous carcinoma. These cases indicate that it is safer to excise the segment of the breast containing the benign tumor. The carcinomatous cells probably were close to the innocent growth.

In two of our personal cases unnecessary radical amputation was done; one for diffuse cystic mastitis in which carcinoma was suspected; the other proved to be multiple fibromata which had been diagnosed clinically as fibrosarcoma. The pathologist, a young man, had the specimens examined by one of wide experience who said there was no evidence of malignancy. They both suggested that we follow the case carefully.

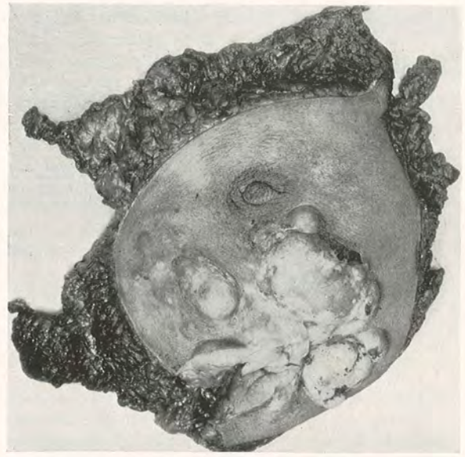

Fig. 1.—Multiple fibromata. Diagnosed clinically as fibrosarcoma. Radical operation May 11, 1928. Well July 15, 1928.

On one occasion we erred by excising a growth believing it to be benign but on incision it appeared to be malignant. The laboratory reported it scirrhous carcinoma. The patient was operated upon for a mixed tumor of the parotid gland. As she came to the operating room our attention was called to the breast tumor. A hurried examination was made and it was thought to be a benign tumor. The patient was told later that the tumor was malignant and amputation was advised. She declined. X-ray treatments were given. There has been no recurrence in seven years. Of the fifty-seven personal cases, fifteen were diagnosed pathologically mastitis. Probably some of these were operated upon unnecessarily. Again, several diagnosed clinically mastitis were reported cystadenoma.

My thanks are due to the staffs of both hospitals for permitting us to examine the records, and especially to Dr. Alan Parker who gathered the data.

CONCLUSIONS

1. Recent records indicate that more benign breasts are operated upon than formerly. This should lessen the incidence of carcinoma.
2. Pathologists should endeavor to standardize and simplify the nomenclature of benign and malignant breast tumors. Special training is desirable.
3. Suspected benign tumors should not be enucleated but the section containing the tumor should be excised.
4. Amputation of the breast leaves a bad deformity. Let us reserve the operation for definite indications and then do it thoroughly.

REFERENCES

[1] Ashhurst, Astley P. C.: Surgery in Malignant Disease. Nelson Loose-Leaf Living Surgery, vol. ii, p. 189.
[2] Bland-Sutton, Sir John: Tumors, Innocent and Malignant, 7th edition, p. 305.
[3] Cheatle, G. Lenthal: "Chronic Mastitis," "Cysto-adenoma" and Adenoma of the Breast. Arch. of Surg., vol. xvii, pp. 535–560, October, 1928.
[4] Cheatle, G. Lenthal: The Formation and Treatment of Fibro-adenomas of the Breast. Arch. of Surg., vol. xiii, pp. 617–622, November, 1926.
[5] Cheatle, G. Lenthal: "Chronic Mastitis:" Its Fallacy and Danger of Its Clinical Signs. Brit. Med. Jour., vol. i, pp. 5–9, January 3, 1925.
[6] Cheatle, G. Lenthal: Important Early Symptoms in Diseases of the Breast. Brit. Med. Jour., vol. ii, pp. 47–48, July 9, 1927.
[7] Fitzwilliams, D. C. L.: Importance of Exploratory Incision in Cancer of Breast. Brit. Med. Jour., vol. i, pp. 953–956, May 23, 1925.
[8] Fraser, John: A Study of the Malignant Breast by Whole Section and Key Blood Section Methods. Surg. Gynec. and Obst., vol. xlv, pp. 266–286, September, 1927.
[9] Gibbon, John H.: Benign Tumors of the Breast. Atlantic Med. Jour., vol. xxix, pp. 526–528, May, 1926.
[10] Gross, S. D.: System of Surgery, 3rd edition, vol. ii, p. 186.
[11] Klopp, E. J.: Carcinoma of the Lactating Breast. Atlantic Med. Jour., vol. xxix, pp. 520–522, May, 1926.
[12] Klopp, E. J.: Simultaneous Bilateral Mammary Cancer. Annals of Surgery, Trans. Phila. Acad. of Surg., vol. lxxxiii, p. 733, May, 1926.
[13] Lee, Burton J., and Stubenbord, John G.: A Clinical Index of Malignancy for Carcinoma of the Breast. Surg. Gynec. and Obst., vol. xlviii, pp. 812–814, December, 1928.
[14] Lee, Burton J., and Tannenbaum, N. E.: Inflammatory Carcinoma of Breast, Surg., Gynec. and Obst., vol. xxxix, pp. 580–595, November, 1924.
[15] McFarland, Joseph: Adenofibroma and Fibro-adenoma of the Female Breast. Surg., Gynec. and Obst., vol. xlv, pp. 729–746, December, 1927.
[16] Wainwright, Jonathan M.: Certain Principles of Breast Surgery, Illustrated by Sections Showing Approximately the Entire Breast. Atlantic Med. Jour., vol. xxxi, pp. 625–629, June, 1928.
[17] Wood, Francis Carter: Annals of Surgery, vol. lxxxi, p. 559, February, 1925.

THE SEMICENTENNIAL ANNIVERSARY
OF THE FOUNDING OF THE
PHILADELPHIA ACADEMY OF SURGERY

HELD MONDAY, APRIL 22, 1929, IN MITCHELL HALL OF THE COLLEGE OF PHYSICIANS OF PHILADELPHIA

The President, Dr. Astley P. C. Ashhurst, spoke as follows: On the evening of Monday, April 21, 1879, at the invitation of Dr. Samuel D. Gross, there met at his residence, southeast corner 11th and Walnut Streets, Philadelphia, the following surgeons, who may be regarded, with him, as the

FOUNDERS OF THE PHILADELPHIA ACADEMY OF SURGERY

Samuel D. Gross, M.D., LL.D., D.C.L., Oxon.; D. Hayes Agnew, M.D., LL.D.; Richard J. Levis, M.D.; Addinell Hewson, M.D.; Thomas G. Morton, M.D.; William H. Pancoast, M.D.; John H. Packard, M.D.; John H. Brinton, M.D.; J. Ewing Mears, M.D.; Samuel W. Gross, M.D. Dr. Addinell Hewson acted as Temporary Chairman, and Doctor Mears as Secretary.

Subsequent informal meetings were held in April, May, June, October, November and December, 1879, at which other surgeons were present, and in the autumn of the year application was made for a Charter, by the following:

CHARTER MEMBERS OF THE PHILADELPHIA ACADEMY OF SURGERY

Samuel D. Gross, D. Hayes Agnew, Addinell Hewson, John H. Brinton, J. Ewing Mears, Thos. G. Morton, Samuel W. Gross, Oscar H. Allis, John H. Packard, Richard J. Levis, Charles T. Hunter, Wm. H. Pancoast, H. Lenox Hodge, John Ashhurst, Jr., De Forest Willard, Samuel Ashhurst, John B. Roberts, William W. Keen, William Hunt.

A Constitution and By-Laws having been adopted, and the Charter granted, under date of December 27, 1879, the Philadelphia Academy of Surgery commenced its honorable career. The original Charter, with its signatures, is on exhibition on the table to the left of the platform; and, at the right of the platform, are exhibited books written or edited by these Charter members. An inspection of this collection will reveal the capacity, the industry and the pedagogical abilities of these surgeons of a past generation.

Doctor Gross, the founder, announced, at the meeting of May 3, 1880, that he wished to offer a Prize, to be awarded every third year under the

auspices of the Academy, the amount to be $250. Subsequently, by bequest, he established the Samuel D. Gross Prize of the Philadelphia Academy of Surgery, to be awarded every fifth year "to the writer of the best original essay, not exceeding one hundred and fifty printed pages, octavo, in length, illustrative of some subject in Surgical Pathology or Surgical Practice, founded upon original investigations; the candidates for the prize to be American citizens." The amount of the award is now $1500. Under this bequest seven awards have been made up to the present, and all but one of the recipients have complied with the provision established by the testator that the essay to which the prize has been awarded shall be published in book form by the competitor who receives the prize.

Doctor Gross also bequeathed to the Academy his personal library; this, known as the Samuel D. Gross Library of the Philadelphia Academy of Surgery, was, in the year 1884, placed on permanent deposit with the Library of the College of Physicians of Philadelphia. From the very beginning it has been the custom of the Academy to hold its meetings in one of the rooms of the building of the College of Physicians, and the care taken of our Library by the Librarian of the College, Mr. Charles Perry Fisher, and by the successive Library Committees of the College. has amply justified the Academy in having thus permanently secured such efficient custodians of its valuable collection of books. Additions to the Gross Library have been made from time to time, by gifts of books and money from members of Doctor Gross's family, and by funds provided by vote of the Fellows of the Academy. According to the last Report (1928) of the Library Committee of the College of Physicians, there were at that date a total of 3755 volumes in the Gross Library. Those volumes which comprised Doctor Gross's original library are kept in the Gross Library room on the ground floor of the building in which we are now meeting; accessions are housed in stacks, along with volumes of the College library.

Doctor Gross, himself a "self-made man," set high value upon education, upon study, research, and upon teaching. It has been questioned whether he was really a great *surgeon;* but the commanding position which he occupied in the surgical profession not only of this country, but in most of the countries of Europe as well, is recognized to this day. It was to his foresight, to his power for organization, to his limitless enthusiasm for the profession of surgery, and his determination to see it established in this country upon a sure and lasting foundation that we owe not only the existence of the Philadelphia Academy of Surgery, but also that of the larger and still more influential national society, the American Surgical Association. By natural right he became the first president of both these societies.

It is partly because we, of the Philadelphia Academy of Surgery, have inherited from Gross a view of broad horizons, but also partly because they

are our friends, that we have invited three distinguished American Surgeons —one each from the North, the South, and the West—to take the major part in our program of this Semicentennial Meeting.

ACUTE ŒDEMA OF THE PANCREAS

Dr. Edward Archibald, of Montreal, Canada, read a paper with the above title as follows:

I have to speak today on the subject of a certain phase of pancreatitis, which has not been much studied. It was brought to my notice through experimental work upon the etiology of acute pancreatitis. Perhaps it can be introduced in no better way than by relating the protocols of two experiments.

Cat 258.—I had introduced a tiny cannula into the pancreatic duct, through the opened duodenum. Upon allowing a small amount of clean gall-bladder bile, obtained by aspiration of the cat's own gall-bladder, to run into the pancreatic duct, watching at the same time the body of the pancreas, I was amazed to see with what rapidity the pancreas became congested and œdematous. Within a half minute one could observe the beginning of œdema, and within five minutes the greater part of the head and body of the organ was swollen, apparently to about half again its normal size, as the result of an acute, glassy, yellowish œdema, across which one could see running congested vessels. It looked almost translucent. The thin capsule of the pancreas was stretched out tightly as an almost transparent film.

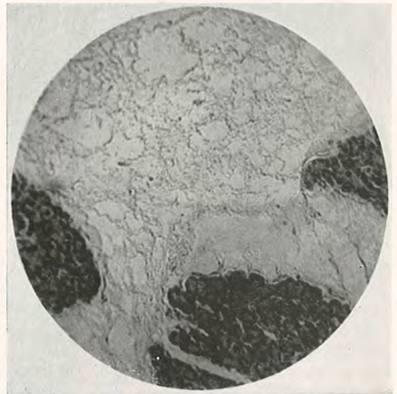

Fig. 1.—Cat 258. Note the very greatly widened spaces of the stroma, indicating œdema. Also in the three small islands of pancreatic tissue, otherwise normal, one can make out slight but definite separation of the tubules from each other as part of the same œdematous reaction.

Now, upon removing, after five or ten minutes, a cross section of the swollen œdematous area (See Fig. 1), and examining it microscopically, I found exactly the histological changes that the gross appearances suggested. The normal spaces of the stroma, interacinar as well as interlobular, stood out clearly under the microscope and were enormously widened. The vessels were choked with red cells, and one could also see some increase of white cells. Here and there one could find small extravasations of blood. In certain areas, not by any means in all (I speak now of the general run of similar experiments), one could see a change in the parenchymal cells. Either in the centre or in some other part of the group of cells forming an acinus, one could find areas of beginning necrosis, and this might be represented by no more than a cooked appearance of the protoplasm of a few cells, or might even be a definite necrosis of considerable extent. But in this specimen, in which clean, normal bile was used, necrosis was conspicuous, on the whole, by its absence, while œdema and congestion dominated the picture.

A few days later, I reopened the animal, and was amazed to find hardly a trace of the original œdema. Upon section and examination under the microscope (see Fig. 2), one could see the persistence still of a mild œdema, but on the whole the acini were densely packed together. One could see small collections of lymphocytic infiltration; some leucocytosis in the vessels, chronic congestion, but otherwise the gland seemed normal.

FIG. 2.—Cat 258. There can still be seen the evidence of slight œdema between the tubules, but the stroma has become practically normal. These microphotographs represent fairly the general look of the whole section.

Here, then we had before us a concrete fact: the fact that clean bile which had invaded the pancreas would cause an acute reaction, stopping, on the whole, short of necrosis, and that, in spite of the presumed fact of activation of pancreatic ferments by the bile, the process would not go on to what we call, in the human, acute pancreatic necrosis; on the contrary, that the inflammatory out-pouring of plasma could be reabsorbed in a few days, leaving the pancreas practically normal.

Cat, March, 1929.—Gall-bladder exposed, cystic duct ligated and cut between ligatures. Duodenum opened opposite the papilla, and cannula inserted into the common duct. In the course of the next hour and a half, two cubic centimetres of a pale yellow, watery bile were obtained. Upon this a twenty-gauge cannula was inserted without difficulty into the pancreatic duct. The cannula was large enough to permit an easy flow of the liver bile just obtained into the duct without the use of any pressure, the syringe barrel acting practically as a funnel. One and a half cubic centimetres of the bile in this way ran into the pancreas by gravity, during the next three minutes, so that any mechanical lesion of the pancreas through excessive pressure of the injection could be excluded. There resulted an immediate glassy œdema, involving the body chiefly, and the head also to a minor degree. The last inch of the tail remained free.

FIG. 3.—Cat of March, 1929. Another example of intense œdema, which, under this low power, can only be seen in the stroma.

A section was taken from the body for microscopical examination. The picture is seen in the accompanying microphotograph (Fig. 3), which shows an extraordinary degree of œdema, most marked between the lobules, but also present between the acini inside the lobules.

On the sixth day after operation the abdomen was reopened and the pancreas

examined. The glassy œdema had quite disappeared, and there remained but little of the general swelling of the organ. Another piece was removed for microscopical examination, and the picture of the histological section corresponds with the gross appearance. The lobules are now set close together, œdema has disappeared, and in particular cell necrosis is conspicuous by its absence. (See Fig. 4.)

These observations, I may say, have many times been repeated, and one was able finally to arrive at the conclusion that when bile was not infected, whether it was mixed with mucus from the gall-bladder or came from the common duct as liver bile, unmixed with mucus, its entrance into the pancreatic duct was not likely to cause more than this acute pancreatic œdema, with congestion, which was capable of subsiding, and usually did subside completely within a relatively short time. On the other hand, if the bile were infected, whether mixed with mucus or not, it was likely to cause a much more intense effect upon the pancreas, chiefly in the way of extensive necrosis of parenchymal cells, considerable extravasation of blood, marked leucocytosis, and often secondary bacterial infections. Concerning these graver lesions I do not wish at this time to speak. My subject rather is the lighter forms of acute pancreatic œdema, undergoing prompt resolution; and my thesis, which I may as well state now, is this: That in the human there does occur an analagous condition to that described in the animal; that this condition is almost certainly due to the entrance of bile into the pancreatic duct under abnormal circumstances, and that the œdema in like manner may subside rapidly. The hypothesis assumes further that this pathological condition constitutes the most probable explanation available for many of those attacks of more or less severe epigastric pain, which are met with so frequently in clinical practice, and which remain unexplained, at least to the satisfaction of the careful medical man. Such attacks are set down rather vaguely, and have been set down in the same way for hundreds of years, to indigestion, gastric upset, gastritis, neurosis or neuralgia of the stomach, intestinal dyspepsia, indiscretions of diet, and so on. They have been set down also, in late years, to some trouble in the gall passages, usually to stone. For the most part, subsiding as they do within twenty-four to forty-eight hours, the true diagnosis remains undiscovered. The patient may have many such attacks, and comes to speak familiarly, sometimes tolerantly, of his "indigestion." Naturally, patients suffering from these

FIG. 4.—The legend of Figure 2 applies equally to this section

comparatively transient symptoms are not brought to operation. Even when the diagnosis is made of abdominal colic, it is the rule to temporize, to give morphine hypodermically, and to wait until the attack has passed off. The attack does pass off, and when operation is performed in the interval, for presumed recurring attacks of gall-stones, the surgeon finds frequently, it is true, the expected gall-stones, *and* a normal pancreas. Naturally the pancreas seems normal, and probably is normal; the œdema has disappeared and there is nothing left to show that the organ, no longer than three or four days previously, was perhaps twice its normal size, and filled with a glassy œdema.

And another explanation of this failure to recognize the pancreatic change will doubtless suggest itself to you. Take that unfortunately large group of cases in which an exploratory laparotomy for undiagnosed acute abdominal conditions is done, and the wound is closed without the discovery of any satisfying lesion. Consider particularly the enormous number of rules of thumb operations for supposed appendicitis, in so many of which the removal of a normal-looking appendix constitutes the only reward (of the spirit, I mean), and to the patient a most dubious consolation for the distress of operation. May we not assume that a fair proportion of these are in fact cases of this same pancreatic œdema? For if the surgeon is not alive to the possibility of pancreatic œdema, and if his incision is made in the lower half of the abdomen, or indeed even in the upper half, it is almost inevitable that he will fail to discover the pancreatic swelling, the more so in that fat necroses are rarely present, and the pancreatic enlargement may not be great.

But you may well ask what proof have we that such a series of events in a case of this sort actually occurs in the human. My present conviction that it can and does occur was established twenty-one years ago, upon the occasion of operating upon a patient for a severe epigastric attack of pain which I had diagnosed as being due to acute pancreatitis. I will read you his case report.

The patient, a man, twenty-six years of age, first entered the hospital in September, 1907, with an acute attack of abdominal pain, so severe that half a grain of morphia relieved him very little. The pain was generalized over the whole abdomen. He recovered shortly and nothing was done. The diagnosis on admission was appendicitis, but this was altered to pancreatitis before discharge. He was readmitted on November 28, 1908, a year later, having had meanwhile seven or eight similar attacks, in all of which pain was so excruciating that large doses of morphia had practically no effect. The last attack began on November 24, at 11 P.M., with sharp, shooting pain in the epigastrium, followed two hours later by a dull pain across the lower half of the abdomen. Vomiting followed. During the three days before admission, the pain remained very severe, and in spite of heavy doses of morphia he could not sleep. He was unable to remain still, and the position in which he found most relief was prone on his face. The abdomen was found to be rather scaphoid, moving freely with respiration, symmetrical, and on palpation soft; no mass could be felt, but there was great tenderness in the epigastrium, if anything more marked to the right of the median line, though extending also to the left. There was occasional vomiting of bile-stained fluid. The stomach was not dilated. The bowels had not moved. The leucocyte count was 11,600, and a differential count revealed nothing abnormal. His urine was normal. On examining him for skin anæsthesia, a Head zone was found on the trunk, extending in the form of a band about two inches wide about the level of the umbilicus, transversely from the median line anteriorly, across the left side of the abdomen, to the median line posteriorly. Examination of the urine by Doctor Bruère, for lipase, showed that the urine caused marked hydrolysis of .55 cubic centimetres of butyric ether, in twenty-three hours, demonstrating that lipase was present. Control sample, boiled for ten minutes, was without action on butyric ether. Otherwise there was nothing relevant in the general examination. A diagnosis was made of acute pancreatitis, and operation carried out on November 30. By this time the condition was rapidly subsiding. Upon opening the abdomen the following observations were made. The peritoneum showed no signs of inflammation; the liver appeared healthy; the gall-bladder was partly filled with bile, seemed quite normal, and did not contain stones. The common duct was palpated and nothing found in it. The stomach and duodenum appeared normal, but the pancreas was decidedly firmer and larger than normal, and the enlargement involved practically the whole organ. It was not, however, exposed for direct inspection. A thorough examination of the rest of the abdomen, including the kidneys, spleen, cæcum, appendix, transverse and descending colon, revealed nothing abnormal. There were, however, a few palpable glands at the root of the mesentery. No peritoneal adhesions could be found.

At that time I had not come to formulate the principle of prolonged bile drainage as a therapeutic measure for the condition of pancreatitis, so that I closed the abdomen without doing anything more. Within two days the pain had practically disappeared, and he made an uninterrupted recovery and was discharged, feeling quite well, on December 18. The urine was examined by Doctor Bruère on December 8, who reported that no lipase was present.

On January 11, 1909, the patient was readmitted. He had remained quite well until about midnight on January 9, when he was awakened by a very severe pain, which began in the abdomen but soon extended all over the body, especially in the back and in the arms. The pain was excruciating and shortly he vomited. In the morning he felt better and got up, but the pain recurred with renewed violence; morphine was administered, three-eighths grain, and he obtained partial relief. The pain continued through the night, with vomiting, and he was admitted to the hospital on the morning of the 11th Upon examination one found very marked tenderness in the epigastrium and also moderate tenderness over the whole abdomen. Upon careful thumb pressure there was found an area of extreme tenderness about two inches wide, midway between the umbilicus and the ensiform cartilage, extending from one inch to the right of the mid-line, to two and a half inches to the left. No mass could be felt. His pain was still severe, and continued so through that day and the following day. Morphia was given in doses of half a grain, five times in all, up to the evening of January 12, and he vomited several times. On the 13th he was better, although still suffering much pain in the back and shoulders. On the 15th and 16th he completed his recovery and was discharged apparently well. His temperature was practically normal throughout, save that on the 14th it went up to 101°, but came back to 99° on the following day. This corresponded with a fresh attack of moderate severity, which shortly disappeared after the exhibition of one-half grain of morphia. In the idea of adding an antiseptic to his bile, he was given urotropin, ten grains, three times a day, and was instructed to take it for three weeks, at which time he was to report. The urine on this occasion was not examined for lipase. The patient did not return for observation, and was lost sight of, but about a year later the medical officer of an insurance company sent in an inquiry, as the man was applying for insurance. It was then learned that he had, in the meantime, suffered one or more further attacks.

Here, then, we have an instance of a light attack of pancreatitis without coincident gall-stones or any other obvious cause, diagnosed clinically before operation, and apparently subsiding without treatment. Nothing was done at this operation on account of my ignorance of any promising mode of treatment; and the abdomen was simply closed. Although at the time I did not

expose the pancreas for direct inspection, I have no reason to doubt that a transitory lesion of the organ was the cause of his symptoms, and that that lesion was in the nature of an acute œdema and congestion, such as was later demonstrated in animal experiments. A year or two of experiment brought deeper knowledge, and, if he had returned, I should have drained his gall-bladder for one or two months; but he disappeared, and efforts to trace him were unsuccessful.

Since that time I have had, or at any rate taken, no second opportunity of operating on a comparable case. It is rare when a patient suffering from an acute attack of epigastric pain, which lasts no more than a few hours, is brought to the surgeon for operation. The comparatively early subsidence of the pain encourages the attending physician to wait, and the marked improvement, or even entire disappearance of symptoms on the following day, decides the surgeon against an operation which would then be only exploratory. On the other hand, the usual diagnosis under these circumstances is gall-stones, and inasmuch as it has for long been considered sound policy not to operate during an attack of gall-stone colic, a rule which is as strong in the mind of the surgeon as in that of the general practitioner, operation is not undertaken at the very moment when a secondary or even independent pancreatic œdema might be found, but only later, during the interval, when all pancreatic swelling has disappeared; or, on the other hand, during a prolonged acute attack when the pancreas is found to be the site of a grave and advanced pancreatitis. In other words, the surgeon usually misses exactly that stage at which a light grade of pancreatitis, with œdema, would, or might, be seen. Nevertheless, when one comes to analyze carefully the case histories of patients who are operated on finally for gall-stones, or for severe pancreatitis, or for both, one very frequently discovers an account of one or of many previous attacks, passing off within a few hours or a couple of days. While it is natural to ascribe such previous attacks to gall-stones, it often happens that no gall-stones can be found, and it becomes obvious that such previous attacks could be hardly anything else than mild attacks of pancreatitis, consisting presumably in this very condition of pancreatic œdema with congestion. I feel sure that the thoughtful surgeon has for long formulated such a conception in order to explain these previous mild attacks. But it is also true to say that the great majority of practicing physicians think of pancreatitis only as a most severe and dangerous disease, usually ending fatally. It is curious to notice how this attitude of the general practitioner coincides with that of the pathologist, and in the case of both because of insufficient experience. Every now and again it happens that a patient who has been operated on, let us say for disease of the gall passages, comes to autopsy after a few days or more, and the surgeon concerned, who has, as he thought, distinctly felt an enlarged pancreas, makes a point of asking the pathologist concerning the condition of the pancreas, and is amazed to hear the simple, yet positive answer, that there was nothing wrong with the pancreas. Upon expressing his surprise, the pathologist, with that superior air which characterizes those of his profession as being men

who deal with demonstrable facts, merely shrugs his shoulders and suggests that the surgeon's conception of an enlarged pancreas was at fault. For, says he, tolerantly, and with a faint tinge of amusement, the pancreas is susceptible of many variations in size within normal limits. The result has been that many surgeons have come to distrust their opinion in such cases, and will set down in their report the note of an enlarged pancreas only when the enlargement is so gross that nobody could be of any other opinion. Only here and there does one find a surgeon who, being called upon to recant and confess, is of such an independent spirit as to exclaim, like Galileo, *"Eppur si muove*—it *was* swollen, anyhow!" Now the truth of such a matter, of course, is that both are right, but that the œdema, which increased the size of the organ to such an extent that the surgeon could feel it as enlarged, had disappeared during the intervening few days to such an extent that the pathologist would consider it normal.

Although such a pancreatic œdema is not infrequently found as a complication of gall-stone disease, it can also occur quite independently. In a series of some thirty-five cases of chronic pancreatitis which I analyzed in 1913, I found that, in approximately 50 per cent., gall-stones were conspicuous by their absence, and that in a further considerable proportion stones were present only in the gall-bladder and not in the common duct. And, indeed, this fact has long been a difficulty to those who roughly think of pancreatitis as being always secondary to disease in the gall passages. It was in the attempt to explain this large proportion of cases of independent pancreatitis that I suggested, about 1911, that bile might be forced into the pancreatic duct through a spasm of the sphincter of Oddi. This is a hypothesis which it is extremely difficult to prove in the human, but which I have been able to prove in animal experiments, and I confess that I am a convinced adherent of the theory which ascribes the cause of the great majority of instances of acute pancreatitis to the entrance of bile into the pancreatic duct. In this place I need say no more about this mode of causation than that I have found it possible in animals, by direct injection of bile, both normal and infected, into the pancreatic duct, or by forcing bile through an artificially induced spasm of the sphincter of Oddi into the pancreatic duct, to produce all grades of acute pancreatic disease, from the lighter forms, which are here in question, up to the hyperacute forms ending fatally within half an hour from the beginning of the experiment. And concerning the lighter forms, I have observed again all stages from a very mild and transitory œdema, with little congestion, limited to a small area of the gland, up to massive œdema of the whole organ, with intense congestion, small extravasations of blood, and here and there small areas of necrosis of the parenchyma; but all stages of these lighter forms may alike end in recovery, more or less rapid, through subsidence of œdema, reabsorption of hæmorrhagic exudate, and conversion of the small necrotic areas into scar.

Now, is confirmation to be found in the literature? I cannot pretend to have covered the subject exhaustively in my reading, but I have found one

article at least. In the *Deutsche Zeitschrift fur Chirurgie*, for 1922, there appeared an article by Zœpffel, the title of which ran thus: "Acute pancreatic œdema as an early stage of acute pancreatic necrosis." Zœpffel points out that the fundamental lesion in acute pancreatitis is the necrosis of the gland tissue, and this is now generally accepted. Early or light cases of the disease are those in which necrosis and possibly hæmorrhage are not only definitely present, but are also in process of further development. Zœpffel here set up a new class upon the basis of an experience of four cases, in which he found a picture which undoubtedly belonged in the rubric of acute pancreatic necrosis, although lacking the basic lesion of necrosis. In each of these four patients he discovered no more than a glassy œdema, which completely infiltrated and enveloped the pancreas, and invaded also the small omentum and the transverse mesocolon. The gland tissue was moderately swollen and hardened, but looked otherwise normal, and in the microscopical sections, which he obtained by cutting out in two cases a small piece of the organ, he was able to demonstrate an entire absence of necrosis, as also of hæmorrhage. In two of these, fat necroses were also found. He goes on to argue that this condition of acute œdema represents the earliest stage of a proper, acute pancreatic necrosis, and, what is more, that the process would infallibly have gone on into a full-blown pancreatic necrosis had he not intervened early. "The discovery of this condition (he says) of acute pancreatic œdema, and above all its successful management, I owe entirely to the principle of immediate operation during the ordinary gall-stone attack." All four patients recovered and all four were operated on within the first twenty-four hours, and indeed three within the first twelve hours. He assumes that his early operation came in time to prevent further progression into the stage of fully developed and possibly widespread necrosis, and he, therefore, demands that operation should be undertaken as soon as there is any suspicion of acute pancreatitis. Suspicion should be aroused immediately whenever, in the course of assumed cholelithiasis, an attack appears in which the most severe pain is found in the middle and left side of the upper abdomen, together with great tenderness and rigidity in this region. In 115 operations undertaken during the acute stage of a gall-stone attack, he found eleven cases of acute coincident pancreatic necrosis, including his four cases of œdema.

The finding of this paper of Zœpffel's was a source of considerable pleasure, for I discovered here the confirmation of my long-held conviction, which up to that time was supported only by the experimental work and the experience of the one case. I take it, therefore, that this picture, both pathological and clinical, may be now accepted as a distinct disease entity. I am under the impression that it is not generally familiar to medical men, but I imagine that nobody will deny its importance. One may contest, as indeed I do contest, Zœpffel's assumption that this pancreatic œdema will go on, usually, into the extremely dangerous condition of widespread necrosis, without thereby diminishing the importance of his observation. A very large number of these œdemas would resolve spontaneously within a few days, if left alone. How

often have we not seen even more advanced lesions in the pancreas, discovered by chance during gall-bladder operations, recover spontaneously without any such intervention as drainage or tamponing the pancreas! Is this not all the more true of the lighter lesions of pure œdema! By the terms, therefore, of this argument, we are brought back to the conception of a passing pancreatic œdema, caused by the accidental reflux of fairly normal bile into the pancreatic duct, as explaining many of the transient though possibly severe attacks of epigastric pain, often spreading to the left side (though that is not necessary), which are variously diagnosed as indigestion, gastric upset from improper diet, adhesions, ulcer, cholecystitis, appendicitis, or even renal colic. I admit that the diagnosis in such cases must often remain quite uncertain, but I maintain that merely to have in mind the possibility of pancreatic œdema is useful. For it is rather characteristic of this form of pancreatic disturbance that it is apt to be recurrent. The surgeon will not by his training dismiss lightly any complaint of a recurring trouble in the abdomen, which is accompanied by pain, but the general practitioner, familiar as he is with so many pains that come to nothing, and driven by the pressure of practice, is perhaps more apt to do so. Such patients should be thoroughly and methodically examined. Gastric and duodenal ulcer can usually be excluded; likewise, appendicitis. The finding of disease in the bile passages does not exclude, indeed, may rather support, the idea of coincident attacks of mild pancreatitis. In any case let us finish once for all with such vague generalizations as those just mentioned.

But, one may ask, are there no means by which we can attain to greater certitude in the clinical recognition of these cases of pancreatic œdema, or mild pancreatitis? I think there are. Certain clinical signs and symptoms do point to the pancreas. First the situation and character of the pain. A pain which is chiefly felt in the epigastrium and radiates to the left and especially into the left side of the back, while the right side of the abdomen remains comparatively free; and a pain which is of extraordinary severity, is most probably a pancreatic pain. It is commonly believed that the pain of a gall-stone attack often radiates to the left side. That is true, although Katsch and also Westphal deny it. Nevertheless, gall-stone pain is chiefly felt on the right side and radiates to the right shoulder-blade, and only when excessive and at the onset, to the left; it is easy to make sure that its *chief* location is in the mid-epigastrium and to the right. Pain which *persists* in the left side usually indicates a pancreatitis. The location of tenderness is also a good guide, but it is important to use thumb pressure and to work in from all sides toward the pancreatic area, marking the point at which the patient first evinces pain. It is remarkable how often the resulting figure will correspond with the anatomical situation of the pancreas. In some cases one will find an abnormally superficial aortic pulsation, which is most important. In many acute cases, a zone of left-sided hyperæsthesia (Head) is found, and points strongly to pancreatitis. In a gall-stone attack the zone is not found on the left. It was typically present in my case.

Tests for pancreatic function are gaining more favor lately. Wohlgemuth's test for diastase in blood and urine has been employed in a large number of cases in Germany, and is much thought of. Before the war, working with Doctor Bruère, I found that Hewlett's test for lipase in the urine was positive in over half the cases. And of late years the finding of a raised blood sugar is more and more frequent. But it is important that all these tests should be applied early, within the first forty-eight hours; later than that they usually fall out negative. I feel sure that the early generalized swelling of the whole organ is often sufficient to interfere with both internal and external secretions, but the lapse of even two days allows of sufficient reabsorption of œdematous fluid to set free the pancreatic tissue and the excretory paths. Thus then, even in these light attacks of pancreatic œdema, it is possible for the alert clinician to make a very good guess at the true condition. Abnormally severe epigastric pain, radiating to the left; persistent epigastric tenderness on finger pressure, limited to the anatomical position of the pancreas; a Head zone of hyperæsthesia in the left flank at the level of the eighth to the tenth dorsal; a transient hyperglycæmia; a positive test for diastase or lipase in the blood or urine,—all point only in the one direction, the pancreas. And if within a few days all these signs disappear, that very disappearance, corresponding to reabsorption of the pancreatic exudate, is a further link in the diagnostic chain.

Treatment.—The undoubted fact that the condition just described does not often progress to the stage of massive pancreatic necrosis, that it rather tends to spontaneous subsidence, would seem to suggest an expectant plan of treatment, yet the equally well-established fact that any one of these attacks may end in a fatal massive necrosis constitutes a grave warning, and will often justify operation. The diagnosis being established, one should, in my opinion, open the abdomen. When the lesion is apparently due to disease in the bile passages this will itself be a sufficient reason for operation, and the course to be followed is obvious. One will remove stones and drain the bile. With regard to removal of the gall-bladder, so universally, even indiscriminately practiced of late years, my opinion is that in the presence of pancreatic swelling a cholecystectomy is not permissible. With increasing experience we are finding that pancreatitis occurs not infrequently after the gall-bladder, with its valuable safety valve function, has been removed. Von Bergmann estimates the incidence of recurring pain after cholecystectomy at 20 per cent. While this is due in some cases to the fact that a common-duct stone was overlooked at operation, we know that in many other cases this explanation is not applicable, and it is necessary to assume that some disturbance in the peristalsis of the common duct, conceivably a spasm of the sphincter of Oddi, is responsible. It is obvious that such an occurrence would tend to throw bile into the pancreatic duct, and produce a mild or severe attack of pancreatic swelling. Our only safeguard under such circumstances lies in a bile drainage, and if the gall-bladder has been removed the common duct has to be utilized. We must then perform an operation which is technically more difficult than a cholecystostomy, and not without danger. If bile drainage has to be maintained for a month or two, as in my opinion it should be maintained, in order to allow time for the pancreatic swelling to resolve, we are faced with the trouble and risk of leaving a tube in the common duct over a long period, with consequent danger of stricture and with, also, whatever danger may lie in the diversion of the total amount of bile to the exterior. Consequently, I do not remove the gall-bladder for cholelithiasis in the presence of pancreatitis, but use it rather for prolonged drainage, which in my experience has been the surest road to cure.

If, on the other hand, no stones are found in the common duct or gall-bladder, and we have to assume a dyskinesia of the motor apparatus of bile excretion, we are at least following the safest course in instituting bile drainage through the gall-bladder, for this provides a safety valve for any transient, increased pressure in the common duct, and thereby tends to prevent a forcing of bile into the pancreatic duct.

In conclusion, therefore, I would urge that operation, under the circumstances described, is advisable, and that it should consist, when the pancreas is found swollen, in a cholecystostomy with bile drainage maintained for a period of one to two months, according to the degree of the pancreatic swelling, giving sufficient time, that is, for resolution of the pancreatic exudate to take place thoroughly.

BIBLIOGRAPHY

Archibald, Edward: The Experimental Production of Pancreatitis in Animals as the Result of the Resistance of the Common Duct Sphincter. Surg., Gyn. and Obstet., vol. xxviii, p. 529, 1919; Further Data Concerning the Experimental Production of Pancreatitis. Annals of Surgery, October, 1921; Diseases of the Pancreas. Nelson's Loose-Leaf Medicine.

von Bergmann, G.: Internistisches Korreferat zur Chirurgie des Pankreas. Arch. f. Klin. Chir., vol. cxlviii, p. 388, 1927.

Katsch, G.: Die Diagnose der leichten Pankreatitis. Klin. Wocheschr., p. 289, February 12, 1925.

Schmieden, V., and Sebening, W.: Chirurgie des Pankreas. Arch. f. Klin. Chir., vol. cxlviii, p. 319, 1927.

Westphal, K.: Experimentelle Untersuchungen Ueber die nervöse Beeinflussung der Bewegungsvorgänge der Gallenwege. Zeitschr. f. Klin. Med., vol. xcvi, p. 52, 1923.

Zoepffel, H.: Das akute Pankreasödem—eine Vorstufe der akuten Pankreasnekrose. Deutsch. Zeitschr. f. Chir., vol. clxxv, pp. 301–312, 1922.

Dr. Damon B. Pfeiffer said that the interdependence of certain inflammatory lesions of the abdominal viscera has long been recognized, especially by the surgeon who sees the forces of pathology in motion. The exact sequence of events, the precise determination of the pathogenesis of these processes, is in many cases not fully settled. This is particularly true of the acute and chronic lesions of the pancreas. Doctor Archibald's long interest in this subject and his contributions to it lead us to receive his findings and opinions with great respect.

It is undoubtedly true that the majority of attacks of pancreatitis at the

present time go unrecognized and misinterpreted. In reviewing the histories of cases of acute pancreatitis, the speaker has been impressed, by the frequency of previous attacks, milder in character but similar in kind to the final and too often terminal one. The failure to recognize the nature of such preliminary attacks finds a ready explanation if not an excuse in the lack of truly characteristic symptoms and signs of pancreatitis, in the absence of definite laboratory or other confirmatory methods and in the frequent preponderating admixture of symptoms of involvement of the biliary tract. Probably the situation will remain unsatisfactory until definite confirmatory methods are devised or until we gain a better knowledge of the true origin and incidence of the disease. Certainly early operations as advocated by Zoepfel would help greatly in unravelling the skein but it seems doubtful whether surgeons can be convinced that early intervention should be practiced in the acute calculous or non-calculous infections of the gall-bladder. Unless the risk of acute pancreatitis is greater than experience seems to indicate, it would seem that the greater risk involved in precipitate operation upon acute biliary disease would more than counterbalance the advantages to the pancreas. Surely Zoepfel's experience in finding 10 per cent. of cases of severe pancreatic disease in a series of a little over a hundred gall-bladder cases is exceptional. However, even without such purposeful early operation, it has fallen to the lot of every active abdominal surgeon to operate upon cases of more or less acute cholecystitis or cholelithiasis and to find the pancreas involved in the process. Allowing for the difficulties and personal equations involved in assessing the differences in size, contour, and consistency which would indicate pancreatic involvement the testimony of many surgeons of large experience and undoubted competence indicates some degree of participation by the pancreas in a considerable percentage of cases even up to 20 or 30 per cent.

Some years ago Arnsperger abroad and Deaver and the speaker in this country advanced the idea that the lymphatics of the head of the pancreas which are known to be in such intimate relation to those of the gall-bladder, liver, and duodenum might be the connecting link. The idea does not lend itself readily to experimental proof or disproof because of our inability to construct conditions comparable to the clinical state of affairs. However, the clinical inferences were attractive and gained some degree of acceptance. Now Doctor Archibald brings us back to the older idea of retrojection of bile and duct-borne infection as the probable explanation of both the acute and the mild and presumably chronic inflammations. It is healthy to have this divergence of opinion, and it is illuminating to see this demonstration and hear his views so ably expounded.

Doctor Pfeiffer has felt for a long time that it is probably a mistake to try to explain too much on a single hypothesis; that the solution probably involves multiple factors. Certainly there can be no doubt of the harmful influence of retrojected, infected bile upon the pancreas. That this can and does occur when a stone of a certain size is impacted in a certain way

in the papilla of Vater of a certain type of anatomical construction, we know. That pancreatitis occurs without stone is also known. Archibald's experiments upon the cat, however, have shown that the obstruction to the outflow of bile by the sphincter of Oddi may permit the pressure of bile within the ducts to be raised to a point such that bile may be injected backward into the pancreas. This disposes of that objection to the duct theory. But instances of pancreatitis have been reported in which the pancreatic duct did not join the common bile duct but passed directly into the duodenum and at least one instance of acute hæmorrhagic pancreatitis has been reported in an accessory pancreas. Possibly retrojection of duodenal contents may account for the latter cases. There is no way of dodging the incorrigible duct advocate. Those who have seen the œdema and infiltration of the peripancreatic tissue in association with certain cases of cholecystic disease, together with obvious alterations of the pancreatic head, may be pardoned for feeling that infection by lymphatic channels and contiguity is at least a probable factor. Possibly even a rapprochement of the two views may be possible in postulating stasis of pancreatic secretion due to inflammatory involvement of its terminal ducts where they are in close relationship with the termination of the common bile duct and in fact I strongly suspect that such is the case.

In any event the blame is still cast upon disease of the biliary tract. The chief offender is known. The pancreas suffers the frequent fate of the innocent bystander, only we do not know whether the brick was thrown overhanded or underhanded. When we do know, it may help us in the therapy of a not too satisfactory condition. Hence, the great importance of this communication and the necessity for renewed interest and activity in the gathering of data that will help to clear up this debatable point. It is the speaker's opinion that the solution of so-called pancreatitis involves not a single method of pathogenesis but multiple factors as above mentioned and that the apportionment of their relative importance is yet to be made.

Dr. J. Edwin Sweet, of New York, said that he had had some evidence of Doctor Archibald's contention that it is possible to have something less than a fatal pancreatitis. Most of those who have worked with the pancreas were misled by the early workers on the pancreas, who were not surgeons or pathologists, but generally German coroners, whose experience would naturally make them feel that pancreatitis is a fatal disease.

A few years ago in connection with Doctor Krumbaar some experiments were tried with radium emanation tubes in the pancreas. The experimenters found that they could produce areas of typical hæmorrhage of the pancreas. If a sufficient amount of emanation were used, the result was fatal; with fewer tubes inserted into the pancreas the result was not fatal. Doctor Sweet has felt since then with Doctor Archibald that non-fatal pancreatitis, with areas of typical hæmorrhagic pancreatitis, is possible. The speaker asked by just what route Doctor Archibald pictures the passage of this bile from the inside of the duct to the lymphatics in the interacinar

space. It would seem that by way of the duct it should first attack the parenchyma, but in his pictures it looks as if it went into the connective tissue first.

Dr. A. P. C. Ashhurst remarked that he should like to know whether this acute œdema which Doctor Archibald describes is an inflammation of the ducts of the pancreas, or a cellulitis, or a lymphangitis. The slides he showed looked like cellulitis. Doctor Pfeiffer spoke of the lymphatics. It seems to me important to decide which it is.

Doctor Archibald closed the discussion of his paper by remarking that he had not intended the paper to be the basis of a discussion on the etiology of pancreatitis and for that reason he had tried to avoid contentious points, but almost inevitably, in any discussion one comes back to the old argument concerning the essential factors of etiology. He can hardly be blamed for being an adherent of the bile retrojection theory in the face of the results he has seen from the direct injection of the pancreatic duct with bile. The connection is so obvious; in animals at least, it is a definite cause and effect sequence, without any chance of mistake. Whether it occurs that way in the human in the majority of cases remains a problem.

Doctor Sweet asked how he explained the transfer of bile, or the bile effect, from the main pancreatic duct and intralobular passages to the stroma. He was speaking, of course, only of œdema. Œdema represents an inflammatory reaction, which invades all the tissues of any organ or any one part of that organ, because it occurs in the vascular tissue which permeates the organ. Irritation of the ducts produces the phenomena of inflammation of which œdema is one of the first and most prominent. It must occur in any or in every tissue, wherever the irritating substance comes into contact with the vascular radicles. The speaker finds no difficulty in believing that an irritant introduced into the duct system, without necessarily penetrating the duct wall, can bring about a condtiion of œdema in the stroma as a phenomenon of inflammation. More than that he cannot say.

Answering Doctor Ashhurst's question, Doctor Archibald said that he believes it is purely an œdema, inflammatory but not infective like an aseptic inflammation which one may get from the injection of croton oil, but stopping short at the first stage of inflammation which is, let us say, exudation. Whether the irritant gets in by any of the ducts in human cases, we cannot prove. But in animals when he introduced it by way of the ducts, he obtained the appearance shown on the slides. If he introduced infection from outside, say in the gall-bladder, and tried to get the lymphatics to carry it to the pancreas, he was not successful. As to the blood current as a path for the irritant, that is extremely difficult to prove.

SURGERY OF THE STOMACH

Dr. John M. T. Finney, of Baltimore, Md., read a paper entitled "A Brief Historical Sketch of the Development of Surgery of the Stomach with Special Reference to the Part Played by American Surgeons," as follows:

Historical studies, always of interest, are profitable in proportion to the open-mindedness of the student. Thus only may he really benefit by the lessons contained therein. The historical approach to the study of any subject is most helpful. To learn what others have thought and done, along this or kindred lines, is both helpful and illuminating, as well as saving of valuable time and effort in covering ground that may have been already explored. This fact is well illustrated in tracing the development of surgery of the stomach from the crudeness of the first gastrotomy, as performed by Oriental surgeons, to the finesse of the total resection of that organ as performed today in one of our modern clinics.

In casting about for a subject for my address this afternoon, it has seemed to me that we could, perhaps, spend the time as profitably in this way as in any other. Unfortunately, however, the field is so broad that, in the limited time at our disposal, we cannot attempt to do more than touch the high places. What we shall have to say must, of necessity, therefore, be sketchy in the extreme. In the preparation of this brief historical review, we have been both interested and gratified in tracing the important part played by American surgeons in the development of surgery of the stomach. As Americans, we may well be proud of the contributions made to this branch of surgery by our fellow countrymen.

Philadelphians will, I am sure, be quick to claim the credit due for the pioneer work done by the great surgeons, past and present, whose names have added lustre both to their fair city and to the medical profession.

References to surgical procedures upon the gastro-intestinal tract by early medical historians are meagre. Hippocrates, Aphorism No. 18, states, "a severe wound of the bladder, of the brain, of the heart, of the small intestine, of the stomach and of the liver is deadly." While this statement clearly shows that even at this early date, along with wounds of certain other viscera, wounds of the stomach were already differentiated and their seriousness recognized, yet we have no definite knowledge as to how they were treated. Galen, in commenting upon this Aphorism, makes the statement that "it is said that some wounds of the stomach have been observed to heal, though seldom indeed."

Celsus refers to the use of the suture in wounds of the large intestine, but does not mention its use in either the small intestine or stomach, probably simply an oversight. Fallopius recommends for use in suturing wounds of the stomach linen or silk thread, and the continuous suture. Ambroise Paré, among others, also refers in his writings to intestinal suture. It thus appears that suture of the hollow viscera, even at a very early date, was a recognized surgical procedure. From the absence of any direct evidence to the contrary, it is quite probable that the wounds of the stomach, for which suture was recommended, were of traumatic origin rather than those purposefully inflicted by the surgeon.

The earliest definite references to surgical operations upon the stomach that I have been able to find are contained in "LaGrande Chirurgie," by Guy

de Chauliac, written in 1363. He writes as if the operation of suture of the stomach were already a recognized procedure. The following quotation would seem to justify this assumption: "In a penetrating wound of the abdomen in which the internal parts are wounded and do not protrude, if the said wound suffices, or, if it does not suffice, it may be extended with a suitable instrument, to be described later, they, *i.e.* the wounded internal parts, may be discreetly drawn outside. And if they are in need of suture, and if it profits them, as in wounds of the fundus of the stomach and large bowels, they may be sutured with the glover's suture, and not with the heads of ants, as recommended by some experimenters." With reference to the latter interesting and somewhat novel method of suturing the stomach walls, Gurlt, quoting from Leclerc's translation of Albucassis's "Surgery," written about the beginning of the tenth century, has this to say: "Ants with large heads are used; the edges of the wound are united and the head of the ant applied with the mouth open, to the lips of the wound. As soon as the ant has closed its mouth by closing the mandibles, the head is cut off and remains permanently attached. Others are applied, according to the extent of the wound. The wound is then reduced and a suture is applied to it. Now these heads remain adherent to the intestine until it has healed without causing any inconvenience to the patient." He goes on further to say: "The intestines can also be sutured by means of small filaments which are detached from the intestines of animals, on which they are superimposed. They are threaded in the needle in the following fashion: one of these filaments is seized and is disengaged with care; it is knotted with the end of a linen thread, fine and twisted, with which a needle is armed and the intestine sewed up."

In this single paragraph, reference is made to the early, perhaps, the earliest, beginnings of three important technical procedures in surgery, namely, the heads of ants, a forerunner of metallic clips; absorbable animal tissue as a suture material, from which comes catgut, kangaroo tendon, facial strips, etc.; the silk or linen guide, so widely used, especially by the earlier gynecologists for the easier introduction of the larger sizes of catgut then in vogue.

The first reference to a definitely planned operation, other than the suture of an accidental wound, that I have been able to find is that reported by Gunther in his classical work on surgery. He quotes Crollius, who reports the case of a peasant, thirty-six years old, who practiced jugglery and was in the habit of concealing a horn-handled knife in his throat. In the course of such a manœuvre, the knife slipped down into his stomach and remained there for seven weeks. After plasters and other means of treatment had been employed (among them a magnet to the stomach region) the point of the knife began to cut its way through the abdominal wall. At his urgent request, Mathis made an incision and extracted the knife. The date of this operation was 1602. The knife was nine inches long, entirely rusted, and was said to have been preserved as a curiosity. The patient recovered.

Numerous references to this case, which appears to have been quite celebrated, are to be found in the literature.

Again, in 1743, in the Memoirs of the Royal Academy, is to be found the report of a woman who, wishing to induce vomiting, inserted the handle of a knife into her throat. The knife, about seven inches long, slipped from her grasp and entered the stomach. After three days, she began to feel pain. On the eleventh day, the surgeon made an incision in the left hypochondrium, where the point had pierced the abdominal wall, and removed it.

Baron Larrey, in his Memoirs, reports that while a student at Toulouse in 1780, he was present when Doctor Frizac removed a piece of knifeblade from the stomach of a man. The patient recovered.

Other similar cases are to be found scattered through the literature; in fact the early history of surgery of the stomach seems to be confined to the relation of cases of suture of accidental wounds or the removal of foreign bodies, principally knives. The surprising thing about it all is the large percentage of recoveries among the cases reported. Can it be true of ancient, as well as of modern surgery, that the successful cases seem, somehow, to find their way into the literature with greater facility than the unsuccessful ones?

Apparently, the first American operation upon the stomach, the suture of a stab-wound of that organ, is recorded by John Archer, Medical Repository, New York, 1812. This case is one of considerable interest, for several reasons: (1) It was reported by John Archer, of Harford County, Maryland, who was the first to receive a medical degree in this country. He was graduated from Princeton College with the degree of A.B. in 1760, and was a member of the first class to graduate in medicine from the Philadelphia Medical College, the forerunner of the University of Pennsylvania, in 1768.

In the year 1837, Egeberg, a Norwegian Army surgeon, in a lecture before the Medical Society of Christiania, first recommended, as a justifiable procedure, the establishment of a permanent fistulous opening in the stomach through the abdominal wall, to which operative procedure the name of "gastrostomy" was given nine years later. The idea of establishing a fistulous opening into the stomach was suggested to him while studying a case of carcinomatous constriction of the œsophagus which had resisted all the usual forms of treatment. In justification of his position, he quotes cases in which individuals had sustained traumatic fistulæ of the stomach for varying terms of years, without especial trouble. He referred particularly to the epoch-making case of Alexis St. Martin, studied by Beaumont and reported by him in 1826.

Egeberg (1837), in discussing the subject of treatment of inoperable stricture of the œsophagus, asks the significant question, "Can nothing be done except feeding by rectum for such a case?" He suggests œsophagotomy for strictures high up, and gastrotomy for strictures low down. In discussing this latter proposition, he enunciates the principle, just as true today as then,

namely, "that the permissibility or non-permissibility of an operation depends upon the degree of sound probability that the operation will bring the desired result." He calls attention to the fact that hitherto the operation had been done only in order to remove foreign bodies. He recommends preliminary suture of the parietal and visceral peritoneal surfaces, in order to form protecting adhesions and prevent extravasation. "I cannot see why," he adds, "the indications should not be just as great to open the intestinal canal to put nourishment in as it is to open it to take a foreign body out." His logic is as convincing as his judgment was sound. He concludes his thesis by saying, "It all goes to prove that the stomach is not a *noli me tangere.*"

In 1846, Sédillot reported to the French Academy of Sciences the results of some operative experiments that he had made upon dogs. For this procedure, he first suggested the name of *"gastrotomie fistuleuse."* He reported three dogs upon which he had performed this operation with complete success. In a later communication he reported more in detail upon the same subject, discussing the indications for and against the operation, and proposes the name "gastrostomy," which has since been generally accepted by the profession.

Again in 1849 the same author reported the first case of gastrostomy deliberately planned and performed upon a human being. This patient, unfortunately, died a short time after the operation. Nothing daunted, four years later, he again operated in a similar manner, with the same result. Nevertheless, he predicted that "gastrostomy," in properly selected cases, is destined to enter definitely into the domain of practical surgery, a prophecy long since abundantly verified.

Fenger, of Copenhagen, was the second surgeon to perform this operation in 1853, independently of Sédillot, and after extended experiments upon animals.

In view of the continued agitation by misguided and fanatical antivivisectionists, it is interesting, indeed impressive, to note the early important part played in the development of surgery of the stomach by animal experimentation. Again and again, in reading over the reports of the work of the pioneers in gastro-intestinal surgery, one finds records of preliminary operations upon animals, indicating that many of the advances were based upon scientific experimentation and not the result of mere haphazard chance. Zesas, in his monumental work, calls attention to the fact that this period of the early forties was quite fruitful in experimental research along these lines. He refers to gastrostomies performed upon animals by Blondlot, Bassow, Bardeleben and other surgeons.

In this country, Watson, of New York, in 1844, discussed the question of the practicability of gastrostomy. "Having now shown," says Watson, "that wounds of the stomach are far from being necessarily fatal, we may next proceed to show that openings, whether the result of injury or occurring spontaneously, may give rise to permanent fistulous communication between the stomach and external surface of the abdomen, and that such fistulæ

may exist for years without seriously interfering with digestion or impairing the general health." In the face of these facts, he unhesitatingly recommended gastrostomy with the view of prolonging life in cases of intractable constrictions of the œsophagus.

The first gastrostomy performed upon man by an American surgeon of which I can find record was by Maury, of Philadelphia, in 1869, (*American Journal of the Medical Sciences,* vol. lix, 1870). It was deliberately planned and undertaken for relief of stricture of the œsophagus, after consultation with the Elder Gross, Pepper, and Weir Mitchell. Notwithstanding the usual fatal result, Maury states emphatically, "so great is my conviction that the procedure is justifiable, and to be regarded as one of the established operations of surgery, that I would have no hesitation in resorting to it in any case of impending starvation from non-cancerous stricture of the œsophagus, provided malnutrition had not reached a stage which rendered the case hopeless, and, I may state, that Doctors Gross, Pepper and Weir Mitchell entertain similar views." Certainly high commendation for any surgical procedure! While, therefore, credit is due to Egeberg, for first suggesting, and to Sédillot, for first performing this particular procedure, they must share with Fenger, Watson and others the credit for having first tested it experimentally and having established it upon a firm scientific basis.

Due recognition should here be given to the epoch-making work of William Beaumont, an army surgeon, the pioneer American physiologist, and to the value of his experimental studies in digestion made in 1822 and first published in 1826, upon the celebrated case of Alexis St. Martin, the French Canadian, to which reference has already been made. Says Sir William Osler: "There had been several cases of artificial gastric fistula in man which had been made the subject of experimental studies, but the case of St. Martin stands out from all others on account of the ability and care with which the experiments were conducted." And he, in turn, quotes Combe, as follows: "The value of these experiments consists partly in the admirable opportunities for observation which Beaumont enjoyed, and partly in the candid and truth-seeking spirit in which his inquiries seem to have been conducted." This work of Beaumont has been the model for all of his followers, antedating, as it does, the epoch-making work of Pawlow, and reflects great credit upon American medicine. All honor to this pioneer American scientist!

In 1810, Merrem, of Giessen, in an interesting monograph, reported some experiments upon dogs, undertaken in order to determine whether or not extirpation of the pylorus was possible.

It would appear from Merrem's statements that his work in this direction had been stimulated by the report of the experience, to use his own words, of a "certain famous professor, highly respected and renowned among the medical profession in Philadelphia." Unfortunately, Merrem neglects to give the name of this renowned Philadelphia professor, and a diligent search of all available sources fails, so far, to reveal either his identity or the source

from which Merrem obtained his information. This is extremely unfortunate, as, apparently, his work on the resection of the pylorus in dogs, done in 1779, antedates by about a century any similar work of which record can be found. To this unknown Philadelphia professor must be given credit, therefore, as the pioneer in this line of work.

Merrem's observation upon the future of pylorectomy based upon his own experimental work, which is reported in full, is of sufficient interest to quote: "That the extirpation of the pylorus can be accomplished with happy results seems to be confirmed by these experiments; nevertheless, experience has shown that it is a very difficult operation."

Reviewing these experiments of Merrem many years later, Langenbeck comments as follows: "To me it is inconceivable that anyone could think of extirpating the pylorus in man, so that it is not necessary to give reasons why this operation can never succeed." He then gives six specific reasons why it cannot possibly succeed, and ends with this significant comment: "I look upon this operation as a quicker method of sending out of this world a man whom it is impossible to save." An instance, of which the history of medicine contains other notable examples, where a celebrated personage has failed to grasp the full significance of the signs of the times.

Billroth was a better prophet, although he had the advantage of a later date for his prophecy. In 1877, he reported the operation performed by him in June of that year, which he called by the name of "gastrorrhaphie." This operation was performed for the closure of a gastric fistula which had resisted all other attempts at healing. Briefly, the operation was the separation of the stomach from the parietal peritoneum, to which it was densely adherent; next, the turning in of the edges of the stomach wound, which were sutured with fine silk, after inverting the edges of the gastric fistula.

In discussing this case, Billroth makes this significant comment: "This rare case should serve as a model for similar cases, and for many additional procedures along the same lines. From this operation to the resection of a piece of carcinomatous stomach, there is only a bold step to be taken, just as Czerny lately took the step from œsophagotomy to resection of a carcinomatous piece of œsophagus." It is here the influence of the Billroth School first began to make itself felt in stomach surgery.

It is interesting to note that preliminary experimental work, with this end in view, had already been done in Billroth's clinic by his assistants, Gussenbauer and v. Winiwarter. Their work, published a year previously, refers especially to the possibility of the operative treatment of cancer of the stomach, and dealt primarily with resection of the pyloric portion. They give detailed accounts of their experimental operations upon seven dogs, only two of which survived the immediate effects of the operation. The chief cause of failure seems to have been sepsis. Their work, however, established the fact that such an operation was possible under favorable conditions, and with better asepsis. To quote their own words: "The experiments here reported prove sufficiently that partial resection of the stomach, in so far as its practicability is concerned, does not involve undue difficulties, and the failures are due more to the accompanying circumstances than to the wound as such. On the basis of the experiments herewith reported, we believe that we are justified in proposing to employ partial resection of the stomach in man for the removal of carcinoma of the stomach, which experience has shown is most frequently located at the pylorus." Brave words, these, and advanced for that period, breathing, as they do, the scientific imagination, tinctured with the enthusiasm of youth.

At the same time, 1876, Czerny and Kaiser were following a similar line of experimental work upon resection of portions of the stomach in dogs, and succeeded in resecting the entire stomach of a dog, which survived and flourished for five years, his digestion and nutrition seemingly in no way impaired. He was then killed and his stomach examined by Ludwig, the physiologist, who found that a small piece of stomach wall at the cardiac end had been left, which had become dilated, forming a spherical pouch, which was filled with food.

The first resection operation upon the stomach in man was performed in 1879, by no less a person than Péan, the great French surgeon, who did a pyloric resection in an advanced case of cancer of the pylorus. The patient, very weak and emaciated from a practically complete obstruction of some weeks' duration, survived for five days. Péan, in discussing the operation, emphasized the feasibility of pyloric resection as a justifiable procedure, expressing the opinion that such would eventually be found to be the case.

A year later, 1880, Rydigier, influenced, as he states, by the experimental work on animals of Gussenbauer and v. Winiwarter from Billroth's clinic, and that of Wehr, one of his own assistants, and by Péan's case just referred to, performed the second pyloric resection in man. Rydigier's operation did not differ materially from that of Péan, except that he used catgut throughout instead of silk, and he excised a triangular portion of the lesser curvature of the stomach, which defect was closed by an oblique line of sutures, thus lessening the lumen of the stomach to more nearly that of the duodenum. Péan had made a transverse resection of the stomach, and had inserted the duodenum into the lower angle of the stomach incision. This was done in accordance with Wehr's experimental work. The autopsy showed that, macroscopically, the cancer had been entirely removed, and, there were no signs of infection. It was supposed that the case had died of inanition. In discussing his operation, Rydigier comments as follows: "In reviewing this case, we believe that we are justified in saying that this operation (pyloric resection) certainly has a future. We must not be frightened off by the first failures. First of all, we shall have to discover the earlier stages of cancer of the pylorus, and, for this end, greater certainty in the diagnosis of the very first stages is greatly to be desired. But then there is still much to be done to build up a good and certain technic of operation." "We agree," he goes on to say, "entirely with Czerny, that no one should attempt this operation who has not previously acquired the necessary practice by experi-

ments on the cadaver and on living animals." Wise surgeons, were they not? Many of the principles enunciated by them are just as true today as then, and departure from them is sure to court disaster.

One year later, in 1881, Billroth reported the first successful case of pyloric resection, the third performed on man, also for cancer of the pylorus. In his comments upon the operation, Billroth further establishes his reputation as a true prophet, as well as a master surgeon. "To reassure those who are of the opinion that my present operation is a foolhardy experiment on man is beside the question. Resection of the stomach has been as completely worked up anatomically, physiologically and technically by my students and myself as any other new operation. Every surgeon, who has had experience in experiments on animals and similar operations on man, has reached the conviction that resection of the stomach must and will succeed. To establish the indications and contraindications, and to work out the technic for the widely different cases, must be our next concern, and the object of our further studies."

The name of "Billroth" is inseparably connected with resections of the stomach and pylorus. The two operations that bear his name, Billroth Methods No. 1 and No. 2, or some modifications of them, represent the two types of resection operation generally performed upon the stomach. With these two classical procedures, everyone is, of course, quite familiar, so description of them will be omitted. There are, however, certain difficulties inherent in both procedures that will be at once apparent to the experienced abdominal surgeon. Recognizing these technical difficulties, many modifications of this operation, of more or less merit, have, from time to time, been suggested.

The great name of Kocher is intimately associated with the operative development of this phase of gastric surgery, and the well-known operation devised by him, and which bears his name, has a definite place in surgery.

It would lead us too far afield to discuss the varied and multitudinous modifications of the operation of pylorectomy that have been, from time to time, reported. Suffice it to say that the various methods devised by and bearing the names of Kocher, Mikulicz, Kronlein, Reichel, Polya, Finsterer, v. Haberer, and a host of others, including the speaker, are all of them, in a sense, modifications of one or other of these two methods of Billroth.

To Randolph Winslow, of Baltimore, belongs the credit for having been the first American surgeon to attempt a pylorectomy. He resected the pylorus for a case of cancer of the stomach in 1884 (*American Journal of the Medical Sciences,* July, 1884). Unfortunately, the patient survived the operation but a few hours.

Pylorectomy antedated gastro-enterostomy by two years, but the latter, as it has been gradually developed, has largely superseded the former, until it has, perhaps, become the most popular operation upon the stomach.

The name "gastro-enterostomy" was suggested by Wölfler, at that time an

assistant in Billroth's clinic, for a procedure first employed in 1881, and reported by him in that year in the *Centralblatt für Chirurgie.*

The operation was performed on a patient suffering from advanced carcinoma of the pylorus. A loop of jejunum was attached to the anterior wall of the stomach. The result of the operation was quite satisfactory. The second case was operated upon by Billroth himself in the same way. This patient developed a persistent bilious vomiting, from which the patient died on the tenth day. The autopsy showed the interesting condition so well known in the earlier days of the operation under the terms of "spur formation," or "vicious circle."

To Ransohoff, of Cincinnati, belongs the credit of being the first American surgeon to perform this operation. His case, carcinoma of the pylorus, was reported in the *Medical News,* November, 1884, and, unfortunately, succumbed in a few hours.

Many modifications of the operation of gastro-enterostomy have been suggested from time to time since Wölfler's original publication, the most important of which, perhaps, is v. Hacker's retrogastric method reported in 1885. The credit for the idea of making the anastomosis on the posterior, instead of the anterior, wall of the stomach has generally been given to v. Hacker. Courvoisier, however, antedated v. Hacker's work by two years, having reported in 1883 a case that he had operated upon in that way. The patient died thirteen days later of a diffuse peritonitis. In discussing the operation, he calls attention to the advisability of identifying the loop of jejunum used for the anastomosis by first finding the duodenojejunal angle, thus avoiding the use of a haphazard loop, a very real and important advance. In anastomosing the loop of jejunum to the posterior wall of the stomach, he made his incision in the mesocolon parallel to the long axis of the colon, rather than parallel to the blood supply, as did v. Hacker later. His patient, too, unfortunately, died, a record that recurs with melancholy frequency among the pioneer cases of gastric surgery. He was the first to suture the edges of the rent in the mesocolon to the stomach wall, another distinct addition to the technic of the operation. In discussing the high mortality rate of this operation, he makes this pertinent comment: "This is easily understood, since inoperable carcinoma is generally the indication for the operation."

Because of the fact that it is such a comparatively simple procedure, gastrojejunostomy has been at times employed rather indiscriminately and without proper indications.

The operation of gastro-enterostomy, whether performed anteriorly by the original long loop, either with or without some form of supplementary entero-anastomosis, or by the posterior no-loop-gastro-enterostomy, presents certain obvious objections inherent to the method. These are well known to every surgeon of experience, and are responsible for approximately 20 per cent. of unsatisfactory results. A few clinics report a lower percentage of failures, but the average is about as stated.

In order to do away, as far as possible, with these objections, various methods of direct union of the stomach and duodenum have been suggested and practiced by different authors.

To Jaboulay belongs the credit for having, in 1892, first suggested the method of gastroduodenostomy, which he, two years later, performed. He made the anastomosis directly between the walls of the duodenum and the stomach, folding the duodenum over on the anterior wall of the stomach, using the pylorus as a hinge.

Shortly after, Kummel reported an almost identical procedure. Later Villard, in 1897, brought the duodenum and stomach together side by side, and anastomosed the duodenum to the greater curvature of the stomach in what he calls his "subpyloric gastroduodenostomy." In this method, he does not disturb the pylorus at all.

In his original article, Jaboulay directs attention to the prime necessity of mobilization of the duodenum in all operations that have to do with the utilization of this portion of the intestinal canal for anastomotic purposes. Kocher, later, again stressed this point, and my own experience in this particular field has abundantly confirmed his observations. I wish to reëmphasize this point, namely, that upon the surgeon's ability to mobilize satisfactorily the duodenum depends, in large measure, the success of all forms of gastroduodenostomy.

Following Jaboulay's lead, many variations of his operation, of more or less merit, have been suggested.

In discussing gastroduodenostomy (pyloroplasty) and its indications and contraindications, Kocher makes the following emphatic statement, which expresses our own conviction in the matter: "Unlike other surgeons who have performed gastroduodenostomy, we do not limit the operation to special cases. On the contrary, we regard it as the normal procedure over all the previous methods,"—certainly high praise from one of the greatest of surgeons.

We have come to this way of thinking because we have found that, after thorough mobilization of the duodenum, one can do almost anything that he wishes with it, excise ulcers situated on either side of the pylorus, in fact, do a virtual pylorectomy through the gastroduodenostomy incision, as first suggested by us many years ago.

Gastrectomy has, from the beginning, held a great deal of interest for American surgeons. The first to perform this formidable operation was Conner, of Cincinnati, in 1884, and, of the first dozen gastrectomies performed, six were by American surgeons. In discussing his case, which, unfortunately, died upon the table from shock, Conner says: "I had hoped to be able to get the cardia attached to some portion of the intestinal tract. I did not care much where, so that the fluids poured out into the upper part of the small intestine might flow down to meet the food and cause digestion in that part of the intestine where they came together." He further states that he considered the operation a perfectly feasible procedure.

The first successful total gastrectomy was reported by Schlatter, of Zurich,

in 1897. The second successful case was operated upon by Brigham, of San Francisco, in May, 1898.

In a recent monograph published jointly by the speaker and Rienhoff, sixty-seven cases of undoubted total gastrectomy were reported, with thirty-one recoveries; fifty-five cases of subtotal gastrectomy, with forty-one recoveries,—a truly remarkable showing!

In 1910, Payr, of Leipsic, recommended the so-called "sleeve resection," which, as the name indicates, involved the removal of a zone of tissue from the body of the stomach. This method achieved a considerable degree of popularity for a time, chiefly in Germany, but, owing to certain obvious objections, it never came into general use.

Experience has shown that in the "V"-shaped type of resection, the mechanical function of the stomach is more or less seriously interfered with, and emptying of its contents delayed. This, of course, constitutes a serious objection to its extended use.

With regard to the excision of ulcers, as first performed by Rydigier, 1881, other things being equal, it would appear to be advantageous to attack the ulcer directly and extirpate it completely, because there are certain possibilities for serious trouble inherent in an ulcer, namely, perforation; hæmorrhage; deformity from perigastric adhesions; narrowing of the lumen by cicatricial contraction and, lastly, in the malignant degeneration, which, in gastric ulcer is a real possibility. On the other hand, the resection of any considerable portion of the wall of the viscus must necessarily be attended by a certain amount of deformity and interference with function. These factors must all be taken into consideration in deciding for or against resection. It must be borne in mind, too, that even after complete resection of an ulcer, recurrence has been known to take place. Giving due weight to all these considerations, however, the manifest advantages occurring from excision of the ulcer would seem to warrant giving the operation serious consideration where practicable. Some operators make a practice of combining gastro-enterostomy with excision of the ulcer, but this would appear to be unnecessary, except where there is present definite obstruction of the pylorus. Our own practice has always been to excise the ulcer where possible, whether gastric or duodenal, through the gastroduodenal incision, recommended by us over twenty years ago, or to resect the pyloric portion of the stomach in case of gastric ulcer along the lesser curvature, followed by a gastroduodenostomy end-to-side, the so-called "Haberer-Finney Method," or by a gastrojejunostomy, after the method of Polya.

Of late, a tendency has been observed, especially in some of the Continental clinics, and in a few in this country, toward massive resection of the stomach in the treatment of duodenal and gastric ulcer. This is but an elaboration of Rodman's idea, enunciated many years ago, of the excision of the so-called "ulcer-bearing area." Unquestionably in certain cases of the indurated type of ulcer, where both the operating surgeon and the pathologist find difficulty in distinguishing it from cancer, wide excision is to be

recommended. In fact, when in doubt, it is probably the safer course, in all cases, to practice resection rather than any less radical method. But saner surgical judgment will, I think, not sanction the indiscriminate use of unnecessarily mutilating operations upon the stomach any more readily than elsewhere in the body. Such extensive resection operations, undoubtedly, have their place in surgery, but their use should be restricted for the present, at any rate, until we know a little more surely the ultimate effect of such extreme measures upon the physiology of digestion.

Time would fail us, nor is it the purpose of this paper, to discuss the many interesting problems in the etiology and pathology of ulcer and cancer of the stomach; or, in chemistry, physics, anatomy and physiology that are involved. Our aim has been rather to give a hasty and necessarily sketchy review of the history of the development of surgery of the stomach, in the hope of gaining a wider knowledge of, and a deeper insight into, the mental processes that controlled the pioneers in surgical thought and progress. Much creditable work has not been referred to, not because of lack of merit, but simply because of lack of time. Only those epoch-making contributions have been considered, which seem to have influenced more or less profoundly the historical development of the subject.

In this study, we have been interested in principles rather than methods. It has been a real pleasure to direct attention to some of the many excellent contributions that have been made by American surgeons, and in giving a somewhat tardy recognition to their pioneer work in this particular field.

It is of interest to note the order of sequence in which the various operative procedures on the stomach have been developed: (1) The emergency operations—suture of accidental wounds of the viscus; removal of dangerous foreign bodies that had been swallowed, *e.g.*, knives and other sharp-cutting objects. (2) The stage of deliberately planned operations, those of necessity, for the relief of obstructive symptoms resulting from cancerous growths or cicatricial contractions in the œsophagus or at the pylorus, or for the removal of these growths themselves. Then when more confidence had been gained from experimental study and wider knowledge of physiology and pathology, and with better surgical technic, gradually the field of surgical endeavor has been widened to include ulcer and all of the many sequelæ resulting therefrom. In other words, as in most other departments of surgery, the operations of necessity preceded the operations of choice, but once the principles thus laid down by the pioneer surgeons came to be established, further application and development along different lines were not long delayed.

As indicated in the opening sentence of this paper, many useful lessons may be learned from a study of surgical history. Among the more important, perhaps, are, first, in order that a given operation or method of surgical procedure should attain lasting success, it must be based upon correct anatomical, physiological and pathological principles. It must, in addition, conform to certain general laws of practicability and technic, that is, it should be possible of accomplishment with a fair degree of ease, by a surgeon of average

skill and ability. Finally, it should yield a high percentage of success, both as regards immediate mortality rate and ultimate functional recovery.

The pages of the history of surgery are covered with the records of operative procedures without number that, like Jonah's gourd, flourished vigorously for a time, but, when the pitiless rays of criticism and experience beat down upon them, like the gourd, they withered, because they were not deeply rooted in the fundamental principles underlying all good surgery. If he would not appear ridiculous, let him, therefore, who would benefit from the lessons of history, before linking his name to a given operative procedure, make sure that it conforms to the above requisites.

Furthermore, it should not be forgotten that all recoveries from surgical operations are not accompanied by complete restoration of function; far from it. It is a sad, and all too frequent, occurrence that a patient may recover from a surgical operation, and not only may be no better, but may even be worse than before. The war has taught us the valuable lesson that the term "recovery" should include function as well as life and that, other things being equal, a recovery from a surgical operation that does not carry with it restoration of function and the ability to enjoy life and earn a living, is hardly worthy of the name.

Applying these historical tests to the many and various surgical procedures that have been brought forward in the past comparatively few fruitful years of the development of gastric surgery, it will be readily seen why so many efforts in this direction were still-born, and why yet others failed to survive early infancy, leaving nothing but their memories behind. Changing the metaphor, they were sown in shallow ground physiologically, pathologically and surgically, and hence quickly withered and died. On the other hand, while there may be an occasional exception to this rule, it will be found that those methods that have stood the test of time and experience and that continue to yield the best functional results, with the lowest mortality rate, are those that most nearly conform to the fundamental principles of good surgery, which, in this presence, it is unnecessary to enumerate.

Let me repeat, in the last analysis, the acid test of every surgical procedure is the ultimate result in terms of restored physiological function and slight immediate risk to the life of the patient. The attainment of this goal should be the constant aim of the surgeon.

Every case that comes to the surgeon presents a problem which should be studied and decided, upon its own individual merits, and not by a process of generalization or by custom or habit, as is too often the case.

The surgeon's problem is twofold, diagnosis and treatment. The former may be established only after careful, perhaps prolonged, study of the case. The services of a competent internist may here prove most valuable. At times a positive diagnosis may not be possible without an exploratory incision, and, rarely, not even then. After the diagnosis has been made as nearly as may be, it becomes a matter for mature surgical judgment, not routine, nor habit, nor fashion, to decide what is the surgical procedure that is most likely to

give the best result in the particular case. Personally, the speaker has long since abandoned the pernicious habit of deciding beforehand what he will do in operating upon a given case, for each should be a law unto itself. In one case, one surgical procedure will be found to adapt itself best to the conditions present, while, in another case, another method will surely yield a better result, and the patient should always be given the benefit of the choice, and that method of operation which most nearly complies with the conditions found, other things being equal, should be given the preference. It is bad judgment and worse surgery to push the use of any operative method beyond its anatomical and physiological limitations. By so doing, the surgeon but courts disaster.

When these fundamental principles of surgery, abundantly established as they have been, both historically and by the combined experience of leading surgeons everywhere, come to be thoroughly understood and more generally observed, much of the present dissatisfaction with the end results of surgery of the stomach, upon the part of both patient and surgeon, will happily disappear.

Dr. J. Stewart Rodman said that since there is nothing to be added from the historical viewpoint it seemed that he might best use the time allotted in an attempt to briefly appraise some of these procedures from the standpoint of their ready usefulness in the clinic of an average worker in one of our larger centres.

The very fact that there is such a wide choice of procedure makes the problem somewhat difficult. It has seemed to the speaker that those of us who, even with several hospital appointments, have clinics of only moderate size will do well to limit the choice of operation to a comparatively few well-tried procedures and to leave to our larger clinics, with their vast array of cases, the broader field. This choice must of necessity, however, include a sufficiently broad field to cover the important necessities for management which arise for any surgeon who is qualified to handle gastric surgery.

In the first place, we are all called upon to handle the acute emergencies and should have a definite plan therefore of handling hæmorrhage, gastric or duodenal, or perforation of the stomach or duodenum. Hæmorrhage will often respond, in fact usually, to medical treatment, and it is essential to closely coöperate with the medical side in this matter as indeed in all others when undertaking the management of any gastric lesion. Usually rest in bed, morphia, restriction of diet and an ice-cap locally will suffice. If hæmorrhage is repeated the introduction into the stomach through a tube of hot water at 120° will sometimes check the bleeding. It is necessary, of course, that transfusion be done at times but this should be guardedly done as active bleeding may be thus started up. Lastly we will be called on, although infrequently, to directly check the bleeding by operative measures and then there is nothing to do but gastrotomy with direct ligature of the bleeding point. Whether or not gastro-enterostomy should be added

to this must be decided by two factors—first, one's ability to find the bleeding point, and second, the condition of the patient and the consequent margin of safety that one is working with in that particular case. Theoretically it is better to do a gastro-enterostomy if possible, especially if the bleeding area be at or near the pylorus.

In dealing with perforations either gastric or duodenal, unless the case be seen very early, say within the first six hours and there has been but small chance for soiling of the peritoneum, the least done in order to save the patient's life the better. Simple closure by purse string of the perforation reinforced by an omental tag, has been the speaker's choice in most cases. In a few cases where the perforation is duodenal and where the patient was seen early, he has been influenced by the teachings of Doctor Deaver who has had such a large experience in gastric surgery, and done a gastro-enterostomy as well. Undoubtedly there are times when ulcer symptoms will recur after the simple closure of a perforation, but one must assume this risk realizing that, in emergencies particularly, surgery must be life-saving first and ideal afterward.

When these emergencies do not exist and after the patient with gastric or duodenal ulcer has had more than a reasonable trial at cure by medical means, the judgment of a surgeon will often be taxed as to what operative procedure will best fit the given case. This problem is simplified somewhat in the case of duodenal ulcer. Doctor Rodman believes that surgery should not play a very large part in such cases. Most duodenal ulcers will heal under careful dietary restriction and other medical means. If symptoms persist in spite of such management a gastro-enterostomy either alone or, preferably, in combination with infolding of the ulcer will cure the majority. In handling gastric ulcers, however, the choice of procedure is much more difficult. Recent advances in pathological and physiological knowledge together with the wide choice of excellent technical procedures have made this so. There are, however, certain principles which one must adhere to. The first of these is excision of the ulcer if at all possible, whether one does this by direct excision with the knife or by Balfour's cautery method matters little. In addition to such local excision one should overcome the pylorospasm in these cases by doing gastro-enterostomy or pyloroplasty by either the Finney or Horsley technic.

As might be expected the speaker is a believer in the principle of pylorectomy for ulcer since his father believed so firmly in this principle and was the first to suggest it in 1900 in a paper read before the American Surgical Association. He believed this the logical thing to do because at that time most ulcers were thought to be in the pyloric zone, and the majority thought that the instance of the development of carcinoma from ulcer was high. We now know that the majority of gastric ulcers are situated along the lesser curvature and we believe that only a small number of gastric cancers have their origin in ulcer. While these reasons, therefore, cannot carry as much weight as then, the very fact that accumulated expe-

rience has shown that permanent cures are much more apt to follow pylorectomy than gastro-enterostomy is sufficient reason in itself for continuing this principle in preference. Also, there can be no reasonable doubt that while cancer does not develop on ulcer nearly so frequently as was formerly thought, malignant degeneration will occur at times. The work of that excellent pathologist, Doctor M. J. Stewart, of Moynihan's former clinic in Leeds, which shows that about 95 per cent. of ulcers develop into cancer and that some 17 per cent. of already developed cancers have their origin in ulcer fairly represents this matter. These figures also about express the average belief of many surgeons who do a considerable amount of gastric surgery. The reasons for preventing subsequent bleeding and perforation from the ulcer base by its complete removal are as sound today as when this principle was first proposed. Pylorectomy for ulcer is unquestionably a more serious operation than gastro-enterostomy and in the speaker's own experience is not as widely applicable as his father thought. In the presence of much imflammatory tissue he has found great difficulty in sufficiently mobilizing the pylorus to make a pylorectomy a reasonably safe procedure. In such cases a gastro-enterostomy will suffice as it is the general rule that when adhesions are too extensive to warrant pylorectomy they are also too extensive for a pyloroplasty. In these cases pylorectomy can follow at a later date, when often, after putting the pylorus at rest as has been done by the gastro-enterostomy, there will have resulted a sufficient quieting of perigastric inflammation to make the mobilization of the pylorus possible.

While a firm believer, therefore, in the principle of pylorectomy for ulcer, Doctor Rodman feels equally certain that the present-day enthusiasm on the part of some Continental surgeons and a few in this country for extensive gastric resections for gastroduodenal ulcer will quickly pass. One cannot help but feel that here the cure is worse than the disease and that this drastic procedure is not justified on pathological or physiological grounds.

In reëstablishing the continuity of the gastro-intestinal tract after pylorectomy or partial gastrectomy Polya's operation as modified by Balfour seems to be an improvement on the Billroth II. It is time conserving certainly, and where it is necessary to remove a fairly large part of the stomach gastro-enterostomy is made most difficult. The speaker must confess, however, to an entire satisfaction with the Billroth II technic in the average pylorectomy.

His experience with pyloroplasty has been so limited as to hardly warrant the expression of an opinion of its value. Certainly Doctor Finney has enormously improved on the original Heineke-Mikulicz technic and in his hands it has a definite field of application with excellent results. One of the many reasons, however, why all of us recognize in Doctor Finney the surgical master is that he possesses to an unusual degree that most admirable of traits, surgical judgment. Therefore, one feels sure that, in his hands, pyloroplasty is only done when it serves the particular case better than any other method.

Gastro-enterostomy either alone or in combination with local excision remains a useful operation. It is curative in duodenal ulcers and serves a useful purpose in those cases of carcinoma of the pylorus where radical removal is impossible and yet obstruction to the pylorus has developed. It is true that the serious matter of gastrojejunal ulcer will develop in the stoma at times but taking it by and large, gastro-enterostomy has been responsible for much relief from symptoms and many permanent cures.

Dr. John Shelton Horsley, of Richmond, Va., said that Doctor Finney's emphasis upon the necessity of following the results of a physiological as well as a pathological study of the stomach is important. The physiologic work of Cannon, Carlson, Luckhardt, Dragstedt, Kline and others has really formed a basis for our modern gastric surgery.

The physiology of the stomach may be divided into three general classes: First, the digestive function; second, the motor function; and third, the function of absorption. It seems necessary to keep these different functions in mind in order to reconstruct the stomach in such a manner that after the pathology has been removed or corrected its gastric physiology will be restored to normal as far as possible. There are several different operations on the stomach which may be indicated in different lesions. The surgical technic should be made to fit the pathology that is present, instead of attempting to stretch one surgical procedure in order to cover every lesion. When there is a small ulcer about the duodenum with but little surrounding infiltration and few if any adhesions, a pyloroplasty often gives excellent results. When the lesion of the duodenum is extensive and infiltrating, a gastro-enterostomy is usually the best procedure.

Gastro-enterostomy may be unphysiologic, but so is amputation of an extremity. There are very definite indications for both procedures. The tendency to excise a large portion of the stomach for a small duodenal ulcer appears to be a swing to a too radical procedure for the lesion that is being dealt with. It would seem wiser to do a less radical operation for a small lesion with a possibility of a recurrence in a few cases when a more radical procedure can be utilized, than to employ an extensive gastrectomy as a primary operation in all cases.

An absence of acidity following partial gastrectomy is not solely caused by the removal of a portion of the stomach. The pyloric portion of the stomach secretes alkaline material, and even if the acid secreting part is removed it does not include all of the acid-bearing gastric mucosa. Partial gastrectomy, or any operation which permits the free reflux of the highly alkaline duodenal contents into the stomach, causes a neutralization of the acid gastric juice. The chief element of alkalinity in the duodenal contents is the pancreatic juice. Any procedure, then, that will promote a free reflux of the duodenal contents into the stomach is likely to be followed by a reduction of acidity. This reduction, of course, is quite different from the achylia found in such diseases as pernicious anæmia or cancer, in which

the gastric glands themselves cease to secrete acid, probably due to some toxic influence.

DECOMPRESSION OF THE HEART

Dr. Evarts A. Graham, of St. Louis, Mo., read a paper with the above title as follows:

Decompression has become a recognized therapeutic principle in neurological surgery to relieve the brain of the serious destructive effects of pressure. Similarly the dramatic effects of decompression of the thorax have been noted repeatedly when air has been aspirated from a case of acute tension pneumothorax or when a large collection of fluid has been removed from a pleural cavity. The idea, however, of deliberately attempting to relieve the heart of embarrassing pressure has seldom been proposed, except as it has been applied to the removal of exudates within the pericardium which were causing the condition of so-called "heart tamponade."

The purpose of the present paper is to record two cases in which operations were performed for the deliberate purpose of decompressing the heart. Before giving the details of these cases, however, certain other aspects of the problem should be mentioned. First of all, there is but little information available on what the effects of pressure upon the heart are. This neglected field of study probably offers a rich harvest to those who will carry out properly controlled experiments. Dr. Duff Allen and I are now interested in this problem. So far as I have been able to find there is only a single observation in the literature in which experimental studies have been made of this question with satisfactory control. This was an observation made by Schmitt [1] during the course of some experimental work on partial heart block carried out in the Department of Physiology of the Washington University School of Medicine. He found that a complete block of the conduction of the contraction wave through an isolated strip of turtle heart muscle could be obtained merely by the pressure upon it of a thin strip of rubber dam. If such effects can be produced on a strip of normal muscle, it seems possible that serious effects may follow even less degrees of compression exerted on muscle which is already somewhat compromised by disease.

Normally the heart, enclosed in the pericardium, is partly surrounded by the lungs, which act as two air cushions. This fact might seem perhaps to indicate that nature had made provision against a serious compression of the heart at least from the sides. Moreover, the heart is ordinarily movable to a considerable extent and its mobility affords another possible means of protecting it against serious pressure. Although these protective mechanisms suffice under ordinary normal conditions, yet there seem to be cases in which the heart is subjected to a pressure which appears to be great enough to cause potential harm. These are the cases of children in whom there is a precordial bulging with widening of the intercostal spaces and sometimes apparently a

pushing forward of the ribs and costal cartilages on the left side. Under ordinary circumstances, in a child the bony thorax grows larger at about the same rate as the heart. However, in a child whose heart is greatly enlarged from rheumatic heart disease, it would seem that the thoracic cage may actually be too small. The heart, moreover, will continue to enlarge because of the demands of mere growth itself. Under such conditions as those described above it has seemed to me that perhaps some relief might be expected from an operation which would diminish the pressure exerted on the organ by the bony and cartilaginous wall of the thorax.

Brauer [2] in 1902 proposed to Peterson that the third, fourth and fifth left ribs should be removed in a case of chronic mediastinopericarditis in order to permit the heart to contract without the necessity of pulling on the rigid wall of the chest. The operation was carried out with conspicuous success by Peterson, and to it the name of cardiolysis was given by Brauer. The idea, strictly speaking, was not to accomplish decompression, but rather to permit the heart more freedom in action by allowing it to pull against soft yielding tissues instead of against a rigid bony wall. An exhaustive review of all the cases in the literature operated on in accordance with the principle of the Brauer cardiolysis has recently been made by Elsworth Smith and H. S. Liggett.[3] In 1907, however, Alexander Morison [4] of Edinburgh, in ignorance of Brauer's ideas, proposed "the principle of operative interference to relieve intrathoracic pressure when the mere bulk of the heart was the chief feature in the case." After hearing of the successful result in the first case of cardiolysis by Brauer and Peterson he concluded that perhaps the benefit derived from the operation was not entirely to be explained in accordance with the ideas of Brauer, but that perhaps also the factor of actual decompression was important. The following quotation is taken from his article:

"The question arises whether mere bulk is not a disadvantage in these circumstances, and whether, therefore, the justification does not arise for attempting to relieve pressure by the removal of a portion of the ribs and cartilages in the precordia, in obedience to the indications given by the precordial bulging of children, even when it may be assumed that pericardial tethering is absent."

Because of these ideas he persuaded Mr. E. C. Stabb, of Edinburgh, to carry out an operation similar to cardiolysis on a young man, nineteen years of age, whom he had been treating with only moderate success for six years previously for an aortic regurgitation with a greatly enlarged heart. This young man also had very severe precordial pain. The operation was well tolerated, and marked improvement occurred in the patient's condition, with almost a complete disappearance of the distressing pain. A subsequent report [5] a year later stated that the patient had continued to show improvement and was able to work steadily as a hat maker.

There are possibilities of two kinds of serious compressive effects when a heart is greatly enlarged. One type of these effects is on the heart itself.

As already indicated above we know very little about the consequences of pressure on the heart itself. The other type of effects is on other intrathoracic structures. We are much more familiar with the effects of compression on other structures than the heart. We know, for example, that the large veins can be rather easily compressed by intrathoracic tumors, by pneumothorax and by large collections of fluid. Still more recently we have learned through the important work of Alexander and Kountz,[6] of Washington University, that the supposed cardiac decompensation with its attending œdema of the extremities, the enlarged liver, etc., which sometimes accompanies conditions of extreme emphysema of the lungs, is not due to disease of the heart, but that rather it is due to the pressure exerted on the large veins by the greatly distended lungs. There are thus apparent many inviting problems for study in connection with the question of what may happen to a patient from a great enlargement of his heart.

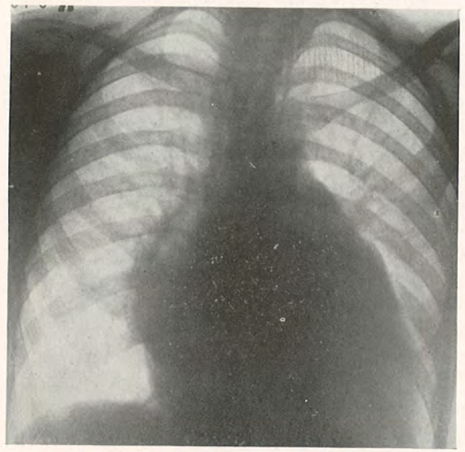

FIG. 1.—X-ray photograph of heart of Case No. 1.

In addition to the type of compression of the heart which arises from its too great enlargement in a restricted bony framework there is also another type in which the heart is squeezed by a pericardium which consists largely of scar tissue. As a result of inflammation the pericardial membrane sometimes becomes converted into scar tissue with dense fibrous adhesions between the parietal and visceral layers. When such a result occurs the action of the heart is inevitably embarrassed regardless of the question of size or of the state of the bony framework of the chest. At times this effect is even greater because the pericardium becomes actually calcified. For the relief of this condition Delorme, in 1895, proposed that in such cases some or all of the fibrous pericardium should be removed. This operation is often spoken of under the name of pericardial decortication. In 1924 he[7] reported and commented upon two patients that had been operated on by Hallopeau. Sometimes it is impossible to carry out the idea of Delorme because the parietal pericardium is so firmly attached to the heart that it cannot be stripped off. Not only is this true because of calcification which may be present but there are also, occasionally, strands of fibrous tissue which run right into the myocardium from the fibrosed visceral pericardium. Schmieden[8] has commented on these difficulties after an experience based on eight operations for decortication. He states that it is very important to remove the visceral layer, that is, the epicardium, in order to free the heart properly, and that it is very important to free the left ventricle before the right one. The Delorme operation is rational when it can be carried out and in certain cases the results have been most gratifying.

In this paper I am not discussing the question of a heart that is embarrassed by the contraction around it of a fibrous pericardium. I am discussing rather the question of a heart that may be embarrassed because it is so large that it cannot help being embarrassed by confinement within a bony chest wall. In the two cases reported here the pericardium was not thickened and in the second case it was intentionally opened to permit an inspection of the interior. No fibrous adhesions between the two layers of the pericardium were found, and both layers seemed on inspection to be practically normal. This case, therefore, did not seem to demand the principle of decortication.

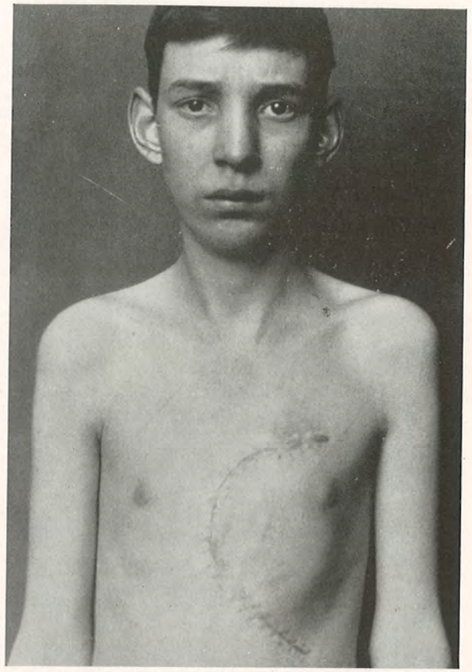

FIG. 2.—Case No. 1 two months after operation. The forward bulging of the heart is well seen in the photograph.

I have recently operated on two children for the purpose of accomplishing a decompression of the heart in accordance with the ideas expressed above.

The first patient, E. C., was a boy, fourteen years of age. Since the age of six he had spent most of his time in either the St. Louis Children's Hospital or at its convalescent farm because of frequent attacks of cardiac decompensation. In all he had been admitted to the Children's Hospital ten times in the past eight years. Sometime at about the age of five he had had, apparently, acute articular rheumatism. At the age of six his tonsils were removed and he had had many operations on his nasal sinuses. The patient stated that he stopped with the thirteenth operation on his nose. He has always since the beginning of his illness been very dyspnœic even on slight exertion. He has been much annoyed by a constant pounding in the precordium and his sleep

has been seriously interfered with because of palpitation of his heart. Because of having passed beyond the age limit of the Children's Hospital he was admitted to the Barnes Hospital August 27, 1928, with a return of symptoms of cardiac decompensation. Fibrillation which has been noted on numerous previous occasions was present at the time of this admission. There was a diffuse turbulent cardiac impulse extending about two inches outside the nipple. There was an apical systolic thrill and murmur. The rhythm and force of the beat were irregular. The rate was about 150 at the apex and about 120 at the wrist but it was difficult to count. The second pulmonic sound was accentuated. His blood pressure was 105/75. He was discharged on October 4 in compensation after digitalis therapy. He reëntered the hospital on October 9 because of a return of some symptoms of decompensation together with vomiting. At this time the only evidence of decompensation, however, was the presence of râles at the base of both lungs. The liver was not enlarged and the peripheral veins not dilated. The fluoroscopic examination showed that both cardiophrenic angles were clear with no evidence of adhesions. The heart shifted readily from right to left with change of position. There was no Broadbent sign. From these findings it was concluded that there was no evidence of a chronic mediastinopericarditis. The question, however, of decompression came up and was discussed extensively with various medical colleagues.

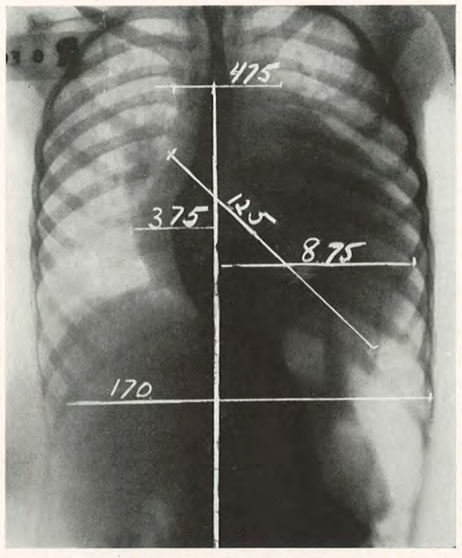

FIG. 3.—X-ray of chest of Case No. 2 immediately after the patient had swallowed barium. Not only is the greatly enlarged heart seen but the deviation of the œsophagus because of the pressure of the heart against it is also well shown. The numbers represent millimetres.

On November 5, with novocaine anæsthesia, the fourth and fifth ribs and costal cartilages, including the periosteum and perichondrium, were removed from the left border of the sternum to the anterior axillary line. The beating of the heart seemed much less restricted than before and the organ immediately bulged forward. The pericardium was not opened but seemed practically normal. The patient went through the operation in a very satisfactory manner, conversing and joking with various members of the operating team during the whole procedure. Immediately before the operation his blood pressure was 135/70. On the following morning it was 130/90; another reading thirty-six hours after the operation also gave the same value of 130/90. The most striking fact about the immediate result of the operation was the very marked subjective improvement. The patient stated immediately that the palpitation and the sense of pounding in the precordium had entirely disappeared. For that reason he was able to sleep much better than before. He was discharged from the hospital in the last week of December. His fibrillation was still present and was thought to be of a permanent nature. Although the subjective result is still excellent the patient has had another attack of decompensation which was thought by his physician to have been due to too much activity. At the present writing he is in Barnes Hospital again with œdema and other signs of cardiac decompensation in addition to some evidence of a pulmonary infarct. However, despite his decompensation he still states that his symptoms are much more easily endured than they were before the operation.

The second case, M. R., a colored girl, five years of age, was admitted to the Children's Hospital December 31, 1928. There had been two previous entries in April and June of 1928 because of cardiac decompensation following several attacks of rheumatic fever. She showed evidence of a mitral stenosis and aortic insufficiency and a myocarditis. There was a marked precordial bulge with a very evident heaving of the whole precordium. The heart extended eight and one-half centimetres to the left; the liver was enlarged. On June 15 and 17 the patient had two sudden attacks resembling acute shock in which the pulse became rapid and thready and respiration rapid and shallow. There was some suspicion that this child had a chronic mediastinopericarditis with fixation of the heart by adhesions. However, about the only evidence of this was that which was presented by an electrocardiographic study of the heart with the technic of Carter and Dieuaide.[9] There was no Broadbent sign and there was no systolic pull on the diaphragm noted fluoroscopically (Elsworth Smith sign). A swallow of barium showed a marked deviation of the œsophagus to the right. The measurements of the heart on a fluoroscopic tracing were as follows:

Widest diameter of the vessels	= 5.4	cm.
Med. Right	= 4.25	cm.
Med. Left	= 7.	cm.

On January 23 electrocardiograms showed arrhythmia and intraventricular block. There was also probably a nodal rhythm. There was thus a considerable amount of uncertainty as to whether or not this patient had merely an enlarged heart or an associated mediastinopericarditis. Compensation was restored and an operation was performed January 31, 1929, similar to the one which had been performed on the other patient. A semicircular incision was made beginning at the level of the second rib on the left side curving around the sternum and running backward to the anterior axillary line at the level of the eighth rib. The skin and subcutaneous tissues were turned back in a flap and subperiosteal resection of the fourth, fifth and sixth ribs and costal cartilages was made from the sternum to about the anterior axillary line. The periosteum and perichondrium were also carefully stripped off the pleura. This seemed an important part of the operation because if a permanent decompression is desired it is necessary to prevent regeneration of bone. The pleura was extremely thin and transparent but it was not opened at any place. The pericardium was seen plainly and the pulsation of the heart was regular. The pericardium was opened for inspection. Both layers seemed practically normal and there were no adhesions between them. Decortication, therefore, seemed unnecessary and was not performed. The pericardium was accordingly closed. There seemed to be no very pronounced change in the position of the heart after the removal of the ribs. The operation in this case was performed under anæsthesia with nitrous oxide because this child did not seem to be a good subject for local anæsthesia on account of her great fear of the operation. The operation was well tolerated and it did not disturb the patient appreciably. She was discharged from the hospital on February 19. The subjective improvement in this patient was as great as in the other patient. In addition a striking objective result was obtained. The venous pressure which had been found by Doctor Irvine-Jones to be eighteen centimetres of water just before the operation could not be measured at the time of discharge; in other words this seemed to be very definite evidence that pressure had been removed at least from the large venous trunks. The mother has been greatly pleased with the results of the operation, particularly with reference to the greater ability of the patient to sleep because of the absence of the complaint of too violent pounding in the precordium. The

mother also states that for the first time in more than a year the child is able to sleep without a pillow under her head. The nodal rhythm had also disappeared at the time of discharge.

Both of the two cases obtained marked subjective improvement from the operation. The second case, in addition, apparently obtained very definite objective improvement as shown by the disappearance of the raised venous pressure and of the nodal rhythm. In neither case were the ordinary indications for the Brauer operation of cardiolysis present, such as positive evidence of a tethering of the heart by adhesions. For this reason, therefore, the beneficial results seem to have been due entirely to the effect of a decompression. The return of a decompensation in the first case was of course disappointing, but too much cannot be expected as a result of the operation. For after all one cannot provide a new heart. Despite the recurrence of his broken compensation this fourteen-year-old boy has steadfastly claimed that he feels much better than before the operation and that he regards the operation as having been distinctly worth while. The second patient has remained entirely compensated since the operation, now about three months. During this time also she has been much more active at home than would have been considered advisable.

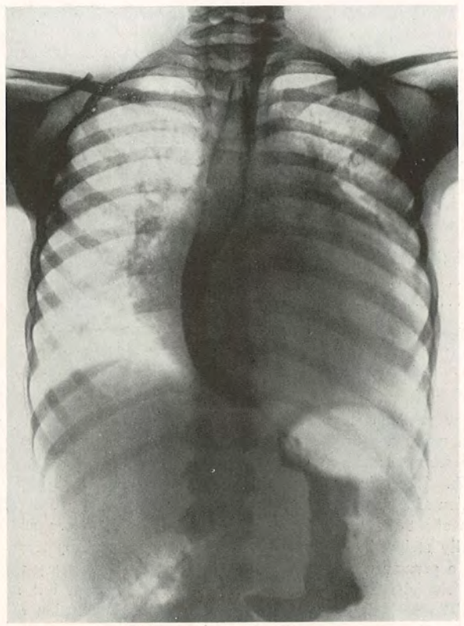

FIG. 4.—X-ray of chest about six weeks after operation and again after a swallow of barium. Although the œsophagus is still deviated to the right the amount of deviation is less than before operation. It would seem, therefore, as if the simple decompression relieved somewhat the pressure of the heart on the œsophagus.

In reporting these two cases in which a deliberate attempt was made to decompress a large heart it is fully realized that one must be cautious in the evaluation of the results, in fact that, perhaps, it would be unwise to draw any conclusions in the brief time which has elapsed since the operations except that certain striking immediate effects were produced. The operation itself seems to be associated with practically no danger. There would probably be at the most only a few cases in which the procedure would be justified. Those

apparently would be for the most part children who had a definite precordial bulging with a large heart. Perhaps when more is learned about the effects of pressure on the heart, other cases in which the indications mentioned above may not be present may be regarded as suitable for decompression; on the other hand, perhaps the operation will be found to be of no special value.

NOTE.—It is unfortunate that after the presentation of this paper both of these patients described above died. In the first case the fourteen-year-old boy, as noted in the article above, was readmitted to the hospital five months after the operation because of another attack of cardiac decompensation with evidence of a pulmonary infarct. Death occurred on the evening of April 23. The post-mortem examination performed immediately afterward showed extensive œdema of the lower extremities, the scrotum and the forearms. When the thoracic cavity was opened both pleural spaces were found obliterated in their lower portions by dense fibrous adhesions. There was also some evidence of a more recent pleurisy in process of becoming organized. Pocketed among these various adhesions were small fluid accumulations. The pericardial cavity was entirely obliterated by dense fibrous adhesions which bound the two pericardial surfaces very firmly together. The heart was tremendously enlarged and the chambers markedly dilated. The adherent pericardium was attached to the anterior thoracic wall and the apex of the heart was pointed in the region of the resected ribs. The mitral valve was greatly thickened and scarred and its leaflets shortened and contracted. The free margins were thick, tough and inelastic. The leaf on the right side of the valve was especially eroded and contracted until only a thin shelf of the original valve leaflet remained. The chordæ tendineæ were greatly thickened, somewhat shortened and were inserted immediately into the free margin of the valve. Distributed along the edge of this valve and extending for some distance down on the chordæ tendineæ were small raised wart-like vegetations characteristic of rheumatic verruccæ. The wall of the left auricle above the mitral valve was scarred and in some places calcium had been deposited in these accumulations of fibrous tissue. The tricuspid valve showed chronic changes but to a less degree than the mitral valve. However, on this valve were

FIG. 5.—Photograph of patient about two months after operation. The marked anterior bulging of the heart is noticed.

small verruccæ. The aortic valve showed no changes and seemed competent. The pulmonic valve also showed no change. In the myocardium were small, fine, grayish lines running along the muscle bundles, presumably deposits of connective tissue. The coronary vessels seemed normal, the lungs showed an extensive œdema. In the lower lobe and in the right upper lobe there was a large red infarct, in the right lower lobe there was apparently an older lesion of some type which was gray instead of red. There were some old caseous and partly calcified tracheobronchial lymph nodes. The liver was enlarged, weighing 1460 grams. It showed passive congestion and œdema.

In view of the post-mortem findings in this case it is doubtful if any operation could have had much permanent benefit. It is possible, however, that the patient might have been more greatly improved if an extensive removal of the pericardium had been undertaken in order to accomplish a decortication of the heart.

The second patient, the girl five years of age, was readmitted to the Children's Hospital April 18, with signs of consolidation of the right lower lobe, fever of 103 and 104, pulse of 160. The heart sounds were the same as on previous admissions. No pleural or pericardial friction rub was heard. A diagnosis was made of right lower lobe pneumonia. There was no evidence of cardiac decompensation and the venous pressure which had been markedly elevated before the operation was not sufficiently elevated to permit measurement at the time of this last admission. The child was placed in an oxygen tent but no improvement resulted and she died on April 23. At the post-mortem examination a few fibrous adhesions were found between the parietal pericardium and the chest wall at the site of the operation. The heart was much enlarged and the apex extended below the base of both lungs for a distance of three or four centimetres. On opening the pericardial sac the pericardium was seen to be smooth and glistening with no adhesions between the two surfaces. There was present the usual amount of pericardial fluid. The heart weighed 220 grams; its measurements were as follows:

Mitral valve	8.0 cm.	in circumference
Tricuspid valve	9.0 cm.	in circumference
Aortic valve	4.0 cm.	in circumference
Thickness of left ventricle	1.2 cm.	
Thickness of right ventricle	0.5 cm.	

Over the left cardiac surface there were a number of irregular fibrinous plaques. The myocardium was of a uniform red color, the musculature appeared normal. The mitral valve was markedly thickened at its margin by fibrous tissue. The papillary muscles of the mitral valve were much hypertrophied and the chordæ tendineæ were shorter than normal. The aortic valve appeared normal as did also the pulmonary valve. The margin of the tricuspid valves was moderately thickened, no fresh lesions of endocarditis could be found. The coronary arteries were patent and the aorta seemed normal. Both lungs showed large areas of consolidation. The pleural surfaces over these areas were covered with a thin fibrinous exudate. Purulent exudate was squeezed from the bronchi. There was no evidence of cardiac decompensation in any of the organs examined.

In this case the principal lesion at the time of operation seemed to be a very large heart with an old disease of the mitral valve. Very marked immediate benefit apparently resulted from the simple procedure of decompression. This benefit apparently was maintained and the death seemed to be an accidental one from an acute infection of the lungs which had no bearing on the cardiac condition so far as could be judged by the post-mortem examination. In spite of the death of this patient three months after the operation there seems to me to be a sufficiently beneficial result as to justify the performance of the operation in this sort of a case.

REFERENCES

[1] Schmitt, F. O.: Conduction in Depressed Cardiac Muscle and its Relation to the Theory of Partial Heart Block. Amer. Jour. Physiol., vol. lxxxv, p. 334, 1928.

[2] Brauer, L.: Die Kardiolysis und ihr Indicationen. Arch. f. klin. Chir., vol. lxxi, p. 258, 1903.

[3] Smith, Elsworth S., and Liggett, H. S.: Cardiolysis for Chronic Mediastinopericarditis. Proc. Interstate Postgraduate Assembly of North America, p. 489, 1928.

[4] Morison, A.: On Thoracostomy in Heart Disease. Lancet, vol. ii, p. 7, July 4, 1908.

[5] Morison, A.: Further Report on a Case of Thoracostomy for Heart Disease, Lancet, 1909, (Nov. 20), vol. ii, p. 1494.

[6] Not yet published.

[7] Delorme, E.: Symphyse cardiaque et cardiolyse (1895-1924). Bull. de L'Academie de Med., vol. xci, p. 663, 1924.

[8] Schmieden, V.: Arch. f. klin. Chir., 1925, vol. cxxxviii, p. 552; also "The Technique of Cardiolysis," Surg. Gyn. & Obstet., 1926, vol. xliii, p. 89.

[9] Carter, E. P., and Dieuaide, F. R.: On Certain Variations in the Form of the Human Electrocardiogram. Bull. J. H. H., vol. xxxii, p. 219, 1921.

Dr. George P. Muller said that he had had no personal experience and in the time he had to look up the subject, he could find nothing which suggested decompression of the heart within the limits laid down in the paper of Doctor Graham. The writer had excluded the Brauer operation for adhesions within the pericardial sac, indicating that in that disease the liability results from the drawing of the adhesions upon the surrounding structures and that by removng the anterior chest wall, one releases the pull. Three years ago in reading and abstracting a paper by Dr. John H. Musser, he noted that of 1700 autopsies 4 per cent. died either directly or contributarily from pericarditis with adhesions. He wondered whether there are not more indications for the Brauer operation. In the American literature there are but few cases reported. Shipley's paper on suppurative pericarditis showed that nearly 10 per cent. had symptoms referable to the adhesions, and mediastinopericarditis after rheumatism is not uncommon. This paper represents something, perhaps only an item, but something in the development of thoracic surgery. Unless one has kept in touch with the literature of thoracic surgery, one can have no idea how it has developed, and, leaving the tribute to the last, the speaker stated that Doctor Graham has been the chief leader.

Dr. Edward Archibald said that he remembered very well reviewing the first article of Brauer, in 1903, for a local medical journal and of being intensely interested in it. He has been talking to medical men on occasion for years, and asking them if they did not think that certain of their heart cases should have a cardiolysis. He never found a medical man, until the last year or so, who was willing to look at the question at all from a possible surgical point of view. However, lately in his clinic he has had a young man who has acquired a certain authority and whose mind is open and with him. The speaker has seen two patients in the last year concerning whom they deliberated whether an operaion should be undertaken. In one case they decided they might do it, but their intention was frustrated by an attack of such serious decompensation complicated by infection, that it became

impossible to operate and the patient died not long afterward. In the other they were afraid to operate because of the fact that they did not have the Brauer picture of adhesive pericarditis and mediastinitis. Doctor Archibald was pleased to hear Doctor Graham tell of his two cases, the second one of which was so encouraging, and to learn that the presence of the original picture had not been found necessary for the success of surgical interference.

From his experience in thoracoplasty, particularly in pulmonary tuberculosis, he has learned to respect the heart with the coincidence of a fibrotic lung; it is not safe to uncover it too much. In serious fibrotic cases with great contraction on the left side, the heart may be pulled up so far laterally and posteriorly that a portion of it may be exposed by posterior rib removal, whereby a certain risk is run, in the sense that the heart's action is made more rapid. It is difficult to say whether this result is due to the loss of the support which the heart gradually acquires in its new position from fibrotic contraction; and doubtless there are other factors which enter in, as for instance the tuberculosis. But the speaker has not been able to escape the impression that the uncovering of the heart does contribute to a relative heart failure; he is not able to reconcile these observations, if true, with the good effect obtained by cardiolysis in a condition which is also contractile, indeed he must confess that, in spite of a good deal of reading, he does not yet see his way at all clear in the matter of the indications for cardiolysis. He feels nevertheless, that Doctor Graham's contribution is a valuable addition to the subject, and hopes for the opportunity to study his cases more carefully.

Dr. Evarts A. Graham wished to emphasize one or two things: first of all, that he does not claim any originality for the idea of decompression of the heart. Alexander Morrison, of Edinburgh, in 1907, had in view the same idea which Doctor Graham expressed in this paper.

Regarding Doctor Archibald's remarks; if the speaker understood him correctly, he thinks that after thoracoplasty in cases of unilateral tuberculosis cardiac failure occurs because the heart has been freed from its fibrotic surroundings or rib support. Doctor Graham thinks this is a matter of interpretation and is inclined to disagree with him in his interpretation. In Alexander's survey of the literature on thoracoplasty, of 1100 cases nearly all of the deaths occurring within the first week or so after operation were due to pulmonary œdema. It appears that the most common cause of operative death in thoracoplasty is compression, whether of the big veins or of the heart he does not know, but it is compression of a sort we should not get. The fibrous capsule might act as a protection against pressure just as against depression; in the speaker's opinion both effects after thoracoplasty are due to too much pressure and not to the relief of pressure.

He was greatly impressed by what Doctor Muller had to say, namely, there must be literally hundreds of cases even of chronic pericarditis suffering from cardiac decompensation which could be greatly relieved by this simple form of cardiolysis. This speaker had the opportunity to operate on one

such patient, a man who had been totally incapacitated for several months, and who since operation has not missed a single day of work, working ten hours a day; it has been four and one-half years since operation. Answering Doctor Gibbon's question as to the operation described by Doctor Summers, the original operation as first described by Brauer, was for opening the pericardium and separating adhesions; he now advocates merely removal of the ribs and chest wall in order to permit the heart to pull on yielding structures and not on non-yielding ones. Doctor Summers' operation was of the latter type. Dr. Elsworth Smith, of St. Louis, has recently reviewed the entire literature on cardiolysis and he has found seventy-two cases in the literature of the entire world in which cases of chronic pericarditis had been operated on by this method.

Another point probably not made clear is the one which Doctor Archibald mentioned; many cases which could have been benefited by this procedure have been refused the operation because they did not present the clinical picture and were thought therefore not to be amenable to this simple performance of cardiolysis. From the speaker's experience with these two cases, he does not think we need to find a very definite clinical syndrome of chronic adhesive pericarditis in order to give relief by this operation.

BOOKS WRITTEN OR EDITED BY THE CHARTER MEMBERS OF THE PHILADELPHIA ACADEMY OF SURGERY

Agnew, David Hayes: Practical Anatomy. Phila., Lippincott, 1856.

Principles and Practice of Surgery. 3 vols., Phila., Lippincott, 1878–1883. (2nd Edition, 1889.)

Allis, Oscar H.: An Inquiry into the difficulties Encountered in the Reduction of Dislocations of the Hip. (Samuel D. Gross prize essay.) Phila., Dornan, 1896.

Ashhurst, John, Jr.: Injuries of the Spine, with an Analysis of Nearly Four Hundred Cases. Phila., Lippincott, 1867.

Editor: Erichsen's Science and Art of Surgery. Phila., Lea, 1869.

Principles and Practice of Surgery. Phila., Lea, 1871. (6th Edition, 1893.)

De la laparotomie; ou section abdominale comme moyen de traitement de l'intussusception. Paris, Asselin, 1875.

Editor: Transactions of the College of Physicians of Philadelphia, Vols. I to V, 1875–1881.

Editor: Transactions of the International Medical Congress. Phila., 1876.

Editor: International Encyclopædia of Surgery. 7 vols., New York, Wood, 1881–1895.

Editor: Encyclopédie Internationale de Chirurgie. 7 vols., Paris, Baillière, 1883-1888.

Editor: Lippincott's Medical Dictionary. Phila., Lippincott, 1897.

BRINTON, JOHN HILL: *Editor:* Erichsen's Science and Art of Surgery. Phila., Blanchard, 1854.
Personal Memoirs. New York, Neale, 1914.
GROSS, SAMUEL DAVID: Manual of General Anatomy. From the French of A. L. Bayle and H. Hollard, by S. D. Gross. Phila., Grigg, 1828.
Manual of Practical Obstetrics. From the French of Julius Hatin, by S. D. Gross. Phila., Grigg, 1828.
Treatise on the Nature, Cause, and Treatment of Contagious Typhus. From the German of J. V. von Hildenbrand, by S. D. Gross. New York, Bliss, 1829.
Tavernier's Elements of Operative Surgery. Phila., Grigg, 1829.
Elements of Pathological Anatomy. 2 vols., Boston, March, 1829. (3rd Edition, 1857.)
Anatomy, Physiology, and Diseases of the Bones and Joints. Phila., Grigg, 1830.
Experimental and Critical Inquiry into the Nature and Treatment of Wounds of the Intestines. Louisville, Prentice and Weissinger, 1843.
Elements of Surgery by Robert Liston. Fourth American from the last London edition, with copious notes and additions by S. D. Gross. Phila., Barrington, 1846.
Practical Treatise on the Diseases and Injuries of the Urinary Bladder, the Prostate Gland, and the Urethra. Phila., Blanchard, 1851. (3rd Edition, 1876.)
Report on Kentucky Surgery. Louisville, Ky., 1853.
Results of Surgical Operations in Malignant Diseases. Phila., Collins, 1853.
Discourse on the Life, Character, and Services of Daniel Drake. Louisville, Ky., *Louisville Journal,* 1853.
Practical Treatise on Foreign Bodies in the Air Passages. Phila., Blanchard, 1854.
System of Surgery. 2 vols. Phila., Blanchard, 1859. (6th Edition, 1882.)
Manual of Military Surgery. Phila., Lippincott, 1861. (2nd Edition, 1867.)
Hand-book der heelkunde. 4 vols. Nieuwediep, de Buisonje, 1863–1866.
Elements of Surgery. Translated into Japanese. 2 vols. n.p., n.d.
Lives of Eminent American Physicians and Surgeons of the Nineteenth Century. Phila., Lindsay, 1861.
Memoir of Valentine Mott. Phila., Lindsay, 1868.
History of American Medical Literature, From 1776 to the Present Time. Phila., Collins, 1876.
Memorial Oration in Honor of Ephraim McDowell. Louisville, Ky., Morton and Company, 1879.
John Hunter and His Pupils. Phila., Blakiston, 1881.

Autobiography of Samuel D. Gross. 2 vols. Phila., Barrie, 1887.
Practical Treatise on Tumors of the Mammary Gland. New York, Appleton, 1880.
Practical Treatise on Impotence, Sterility, and Allied Disorders. Phila., Lea, 1881. (4th Edition, 1890.)
HEWSON, ADDINELL: Practical Treatise on the Diseases of the Eye. By Mackenzie. From fourth revised and enlarged London edition, with notes and additions by Addinell Hewson. Phila., Blanchard, 1855.
HUNT, WILLIAM: *Editor*: Dissector's Manual of Practical and Surgical Anatomy. Phila., Lea, 1856.
Surgery in the Pennsylvania Hospital. Phila., Lippincott, 1880.
KEEN, WILLIAM WILLIAMS: Gunshot Wounds and Other Injuries of Nerves (with Drs. S. Weir Mitchell and Geo. R. Morehouse). Phila., 1864.
Editor: Christopher Heath's Practical Anatomy. Phila., 1870.
Editor: Holden, L., and Shuter, J.: Landmarks, Medical and Surgical. Phila., 1881.
Editor: An American Textbook of Surgery. Phila., Saunders, 1892. (4th Edition, 1903.)
Surgical Complications and Sequels of Typhoid Fever. Phila., Saunders, 1898.
Editor: Surgery; Its Principles and Practice. 8 vols. Phila., Saunders, 1906–1921.
The same. Spanish edition, 6 vols. Barcelona, 1910–1916.
Medical Research and Human Welfare. Boston, 1917.
The Treatment of War Wounds. Phila., 1917. (2nd Edition, 1918.)
I Believe in God and in Evolution. Phila., Lippincott, 1922.
Selected Papers and Addresses. Phila., 1923.
Surgical Operations on President Cleveland in 1893. Phila., Jacobs, 1927. (2nd Edition, Lippincott, 1928.)
MEARS, J. EWING: Practical Surgery. Phila., Lindsay, 1878.
Problem of Race Betterment. Phila., Dornan, 1910.
Triumph of American Medicine in the Construction of the Panama Canal. Phila., Dornan, 1911.
Surgical Psychoses. Phila., Dornan, 1912.
MORTON, THOMAS G.: History of the Pennsylvania Hospital, 1751–1895. Phila., Times Printing House, 1895.
PACKARD, JOHN HOOKER: J. F. Malgaigne's Treatise on Fractures. Translated from the French by J. H. Packard. Phila., Lippincott, 1859.
Handbook of Operative Surgery. Phila., Lippincott, 1870.
Editor: T. Holmes' System of Surgery. First American from second English edition by J. H. Packard. 3 vols. Phila., Lea, 1881–1882.
ROBERTS, JOHN B.: Clinical, Pathological and Experimental Study of Fracture of the Lower End of the Radius, with Displacement of the Carpal Fragment Toward the Flexor or Anterior Surface of the Wrist. Phila., Blakiston, 1897.

Surgery of Deformities of the Face, Including Cleft Palate. New York, Wood, 1912.

Treatise on Fractures. Phila., Lippincott (cop. 1916).

War Surgery of the Face. New York, Wood, 1919.

WILLARD, DE FOREST: Surgery of Childhood; Including Orthopedic Surgery. Phila., Lippincott (cop. 1910).

No books written or edited by: Samuel Ashhurst, H. Lenox Hodge, R. J. Levis, W. H. Pancoast.

INDEX OF SUBJECTS

LIST OF CONTRIBUTORS

Alexander, Emory G.
Appel, Kenneth E.
Archibald, Edward
Ashhurst, Astley P. C.
Baldwin, James H.
Beer, Edwin
Beltran, Basil R.
Bolling, Richard
Bothe, Albert E.
Bothe, Frederick A.
Boykin, Irvine M.
Bransfield, John W.
Brill, Selling
Brown, Henry P.
Burden, Berne G.
Buzby, Benjamin F.
Cancelmo, James
Carnett, John B.
Carrington, George L.
Chambers, Francis S.
Clerf, Louis H.
Crawford, William H.
Crossan, Edward
Davis, Warren B.
Deaver, John B.
Dorrance, George M.
Douglass, John
Eliason, Eldridge L.
Ellison, Richard T.
Elmer, Walter G.
Erdmann, John
Fay, Temple
Ferguson, L. K.
Finney, John M. T.
Flick, John B.
Frazier, Charles H.
Geist, Donald C.
Gibbon, John H.
Gill, A. Bruce
Gilmour, William R.
Graham, Evarts A.
Grant, Francis C.
Greene, Lloyd B.
Gurd, Fraser B.
Hearn, William P.
Herman, J. Leon
Hewson, Addinell
Hoffman, Clarence
Ingleby, Helen
Ivy, Robert H.
Johnson, Alfred C.
Jonas, Leon
Jopson, John H.
Keene, Floyd E.
Kelly, James A.
Kingsley, D. W.
Klopp, Edward
Lanyon, Searle
Lee, Walter Estell
Lewis, Fielding O.
Lipshutz, Benjamin
Loeffler, Paul A.
Loux, Hiram R.
McCarthy, Patrick A.
McClennhan, William
McShane, James K.
Melching, Hilda
Muller, George P.
Neubauer, Bernard B.
Owen, Hubley R.
Pfeiffer, Damon B.
Randall, Alexander
Raydin, Isador S.
Righter, Harvey M.
Rodman, J. Stewart
Ryan, Thomas J.
Ryan, William J.
Rugh, J. Torrance
Seelaus, Henry K.
Shallow, Thomas A.
Smyth, Calvin M.
Speed, Kellogg
Speese, John
Storm, W. Harold
Swartley, William B.
Sweet, J. Edwin
Taylor, Alfred S.
Taylor, K. P. A.
Thomas, Benjamin A.
Thomas, T. Turner
Tucker, Gabriel
Wagoner, George W.
Walkling, Adolph
Weeder, S. Dana
Weimer, R. C.
Wells, Ralston
Whipple, Allen O.
Williamson, Ernest G.
Willard, DeForest P.