

# A Bibliography of Electron Microscopy

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THE first ten years of the development of electron microscopy being over, it seems worth while to look back and assemble the publications in this particular field. In every new field which is growing rapidly, there is very keen competition not only among different countries but often among laboratories located in the same country. As a consequence, it often happens that accounts of the development become decidedly one-sided, forgetting completely to mention what other groups or individuals accomplished in the same field.

This bibliography is an attempt to present the field as completely and impartially as possible. Due to wartime conditions, the desired completeness may not have been achieved and we invite, therefore, the users of this bibliography to notify us of any omissions. The bibliography contains only those papers which were published in scientific periodicals; semi-scientific and popular accounts have been omitted. Of papers dealing with general electron optics only those are included which have a direct bearing on electron microscopy.

The material is arranged in eight categories:

1. Books
2. Emission Microscopy
3. Transmission Type Microscope
4. Optics of the Transmission Type Electron Microscope
5. Image Defects
6. Electron Speeds Above 100 kv
7. Different Related Instruments
8. Applications of the Transmission Type Microscope

Within each group the arrangement is chronological and within each year alphabetical by author and title. Titles of articles which appeared in languages other than English have been translated. The abbreviations of the names of journals are those used in Science Abstracts, Chemical Abstracts, and Index Medicus.

The generous assistance of Professor L. Marton, of the Division of Electron Optics, Stanford University, is gratefully acknowledged.

May 31, 1943.

*Addendum:* Since the closing date of this bibliography a number of publications appeared in this country and quite a number of papers published abroad, principally in Germany, came to our knowledge. Our intention is to bring the bibliography up to date by publishing an addition some time later.

## I. BOOKS

- Brüche, E. and Scherzer, O. *Geometrische Elektronenoptik*. J. Springer, Berlin, 1934.
- Marton, L. *Le microscope électronique et ses applications; suivi de: Henriot, E., L'optique électronique des systèmes centrés*. Revue d'Optique, Paris, 1935.
- Starks, H. J. H. The electron microscope. *Reports on progress in physics*, 2, 283-291. Physical Society of London, 1935.
- Brüche, E. and Henneberg, W. *Geometrische Elektronenoptik. Ergebnisse der exakten Naturwissenschaften* 15, 365-421. J. Springer, Berlin, 1936.
- Busch, H. and Brüche, E. *Beiträge zur Elektronenoptik*. J. A. Barth, Leipzig, 1937.
- Klemperer, O. *Electron optics*. Cambridge University Press, Cambridge, 1939.
- Myers, L. M. *Electron optics*. Chapman and Hall, London, 1939.
- Ardenne, M. von. *Elektronen Übermikroskopie*. J. Springer, Berlin, 1940.
- AEG Forschungs-Institut. *Jahrbuch. Sonderheft: Übermikroskop*. J. Springer, Berlin, 1940.
- Klemperer, O. Electron microscopes of high magnification. *Reports on progress in physics* 7, 107-129. Physical Society of London, 1940.
- Borries, B. von and Ruska, E. Microscopy of high resolving power by means of fast electrons. *Ergebnisse der exakten Naturwissenschaften* 19, 237-322. J. Springer, Berlin, 1941.
- Brüche, E. and Recknagel, A. *Elektronengeräte, Prinzipien und Systematik*. J. Springer, Berlin, 1941.
- Anderson, T. F. The study of colloids with the electron microscope. In Kraemer, E. O., ed. *Advances in colloid science*, Vol. 1, pp. 353-390. Interscience, New York, 1942.

- Burton, E. F. and Kohl, W. H.** *The electron microscope.* Reinhold, New York, 1942.
- Marton, L.** The electron microscope in biology. *Annual review of biochemistry*, Vol. 12, pp. 587-614. Annual Reviews Inc., Stanford University.

## II. EMISSION MICROSCOPY

- Brüche, E. and Johannson, H.** Cinematography of oxide cathodes using the electron microscope. *Ann. d. Physik* 15, 145-166 (1932).
- Brüche, E. and Johannson, H.** New investigations of cathodes with the electron microscope. *Phys. Zeits.* 33, 898-899 (1932).
- Knoll, M., Houtermanns, F. G., and Schulze, E.** Emission distribution at glow cathodes with the magnetic microscope. *Zeits. f. Physik* 78, 340-362 (1932).
- Brüche, E. and Johannson, H.** Crystallographic investigations with the electron microscope. *Zeits. f. techn. Physik* 14, 487-488 (1933).
- Brüche, E.** Electron microscopical reproduction by means of photoelectric electrons. *Zeits. f. Physik* 86, 448-450 (1933).
- Johannson, H.** Electron optical immersion objective. *Ann. d. Physik* 18, 385-413 (1933).
- Knoll, M. and Lubzinsky, G.** Electron microscope pictures with secondary electrons. *Phys. Zeits.* 34, 671-674 (1933).
- Richter, E. F.** Electron microscope observations of the migration of emitting material on oxide cathodes. *Zeits. f. Physik* 86, 697-709 (1933).
- Ruska, E.** Formation of pictures of surfaces irradiated by electrons in the electron microscope. *Zeits. f. Physik* 83, 492-497 (1933).
- Benham, W. E.** Demonstration of low voltage electron microscope using electrostatic focusing. *I. E. E., J.* 75, 388-390 (1934).
- Calbick, C. J. and Davisson, C. J.** Electron microscope. *Phys. Rev.* 45, 764 (1934).
- Brüche, E.** The electron microscope and its application in particular to the study of thin layers on metals. *Kolloid Zeits.* 69, 389-394 (1934).
- Brüche, E. and Knecht, W.** Electron-optical observation of the transformation of iron at temperatures between 500° and 1000°C. *Zeits. f. techn. Physik* 15, 461-463 (1934).
- Brüche, E. and Knecht, W.** Note on attaining high resolution with the electron optical immersion objective. *Zeits. f. Physik* 92, 462-466 (1934).
- Johannson, H.** Immersion objective for electron microscopes. *Ann. d. Physik* 21, 274-284 (1934).
- Knecht, W.** Combined light and electron microscope. *Ann. d. Physik* 20, 161-182 (1934).
- Brüche, E.** The electron-optical image of structures and its interpretation in the emission ratio of barium nickel cathodes. *Zeits. f. Physik* 98, 77-107 (1935).
- Brüche, E. and Knecht, W.** Electron-optical observation of the  $\alpha$ - $\gamma$  transformation in iron. *Zeits. f. techn. Physik* 16, 95-98 (1935).
- Brüche, E. and Mahl, H.** On the emission image of thoriated tungsten and thoriated molybdenum. I. *Zeits. f. techn. Physik* 16, 623-627 (1935).
- Dosse, J. and Knoll, M.** Electron distribution at focus of x-ray tubes with electron microscope. *Arch. f. Elektrot.* 29, 729-730 (1935).
- Kemnitz, G., Knoll, M., and Walcher, W.** Electron concentration by concave hot cathode surfaces with the electron microscope. *Zeits. f. Physik* 96, 612-619 (1935).
- Mahl, H.** Electron-optical image formation with emitting wires. *Zeits. f. Physik* 98, 321-322 (1935).
- Schenk, D.** Distribution of emission over a crystalline heated cathode. *Ann. d. Physik* 23, 240-254 (1935).
- Behne, R.** Characteristics of the immersion objective for image formation with fast electrons. *Ann. d. Physik* 26, 372-384 (1936).
- Behne, R.** Contribution to the knowledge of the electron-optical immersion lens, II. *Zeits. f. Physik* 101, 521-526 (1936).
- Behne, R.** Photography of foils with the electron-optical immersion objective. *Ann. d. Physik* 26, 385-397 (1936).
- Brüche, E. and Mahl, H.** On the emission image of thoriated tungsten and thoriated molybdenum, II. *Zeits. f. techn. Physik* 17, 81-84 (1936).
- Brüche, E. and Mahl, H.** On the emission image of thoriated tungsten and thoriated molybdenum, III. *Zeits. f. techn. Physik* 17, 262-266 (1936).
- Heinze, W. and Wagener, S.** The processes in the activation of oxide cathodes. *Zeits. f. techn. Physik* 17, 645-653 (1936).
- Mahl, H.** Influence of oxygen on glow emission investigated by the electron microscope. *Zeits. f. techn. Physik* 17, 653-656 (1936).
- Burgers, W. G.** Direct observation of structural changes at high temperature with the electron microscope. *Zeits. f. Metallkunde* 29, 250-251 (1937).
- Burgers, W. G. and van Amstel, J. J. A. P.** Electron-optical observation of metal surfaces. Parts I and II. *Physica* 4, 5-22 (1937).
- McMillen, J. H. and Scott, G. H.** A magnetic electron microscope of simple design. *Rev. Sci. Instruments* 8, 288-290 (1937).
- Burgers, W. G. and van Amstel, J. J. A. P.** Electron-optical observation of the transition of  $\alpha$ - into  $\beta$ -zirconium. *Nature* 141, 330 (1938).
- Mahl, H.** Electron-optical examination of electronic and ionic emission of wires. *Zeits. f. Physik* 108, 771-776 (1938).
- Meschter, E.** An electron microscope for studying thermal and secondary electron emission. *Rev. Sci. Instruments* 9, 12-15 (1938).
- Scott, G. H. and Packer, D. M.** The localization of minerals in animal tissues by the electron microscope. *Science* 89, 227-228 (1938).
- Scott, G. H. and Packer, D. M.** The electron microscope as an analytical tool for the localization of minerals in biological tissues. *Anat. Rec.* 74, 17-30 (1939).

- Scott, G. H. and Packer, D. M.** An electron microscope study of magnesium and calcium in striated muscle. *Anal. Rec.* **74**, 31-46 (1939).
- Scott, G. H.** An electron microscope study of calcium and magnesium in smooth muscle. *Proc. Soc. Exp. Biol. and Med.* **45**, 30-31 (1940).
- Fox, G. W. and Bailey, F. M.** Measurement of cathode emission by use of the electron microscope. *Phys. Rev.* **59**, 174-178 (1941).
- ### III. TRANSMISSION TYPE MICROSCOPE
- Knoll, M. and Ruska, E.** The electron microscope, *Zeits. f. Physik* **78**, 318-339 (1932).
- Marton, L. and Nuyens, M.** Geometrical electron optics. *Wis-en Natuurkundig Tijdschrift* **6**, 159-170 (1933).
- Marton, L.** Electron microscopy of biological objects. I. *Bull. Acad. Roy. de Belg., Cl. des Sciences* **20**, 439-446 (1934).
- Ruska, E.** Advances in building and performance of the magnetic electron microscope. *Zeits. f. Physik* **87**, 580-602 (1934).
- Ruska, E.** Magnetic objective for the electron microscope. *Zeits. f. Physik* **89**, 90-128 (1934).
- Sommerfeld, A. and Scherzer, O.** Description of an electron microscope. *Munch. Med. Wochenschr.* **81**, 1859-1860 (1934).
- Knoll, M.** The electron microscope. *Zeits. f. Ärtzl. Fortbild.* **32**, 644-678 (1935).
- Marton, L.** Electron microscopy of biological objects. III. *Bull. Acad. Roy. de Belg., Cl. des Sciences* **21**, 606-617 (1935).
- Fritz, R.** The electron microscope. *Rev. Gen. des Sciences* **47**, 338-342 (1936).
- Martin, L. C., Whelpton, R. V., and Parnum, D. H.** A new electron microscope. *Journ. Sci. Instruments* **14**, 14-24 (1937).
- Borries, B. von and Ruska, E.** Development and present efficiency of the electron microscope. *Wiss. Veröffent. Siemens-Werken* **17**, 99-106 (1938).
- Nuttall, A. K.** An electron microscope for high magnifications. *Metro-Vickers Gaz.* **17**, 256-259 (1938).
- Ardenne, M. von.** An electrostatic high voltage lens of short focal distance. *Naturwiss.* **27**, 614-615 (1939).
- Ardenne, M. von.** Single crystal fluorescent screens for supermicroscopy. *Zeits. f. techn. Physik* **20**, 235-239 (1939).
- Borries, B. von and Ruska, E.** Development and efficiency of the Siemens ultramicroscope. *Z. f. wiss. Mikroskop.* **56**, 317-333 (1939).
- Borries, B. von and Ruska, E.** An electron supermicroscope for research institutes. *Naturwiss.* **27**, 577-582 (1939).
- Brüche, E. and Haagen, E.** A new simple supermicroscope and its application to bacteriology. *Naturwiss.* **27**, 809-811 (1939).
- Burton, E. F., Hillier, J., and Prebus, A.** A report on the development of the electron microscope at Toronto. *Phys. Rev.* **56**, 1171-1172 (1939).
- Mahl, H.** The electrostatic electron microscope. *Zeits. f. techn. Physik* **20**, 316-317 (1939).
- Martin, L. C.** The electron microscope. *J. Roy. Microscop. Soc.* **59**, 217-231 (1939).
- Martin, L. C., Parnum, D. H., and Speak, G. S.** Report on experimental work on the development of the electron microscope. *J. Roy. Microscop. Soc.* **59**, 203-216 (1939).
- Prebus, A. and Hillier, J.** Construction of a magnetic electron microscope of high resolving power. *Canad. J. of Research* **17**, 49-63 (1939).
- Ardenne, M. von.** Results of a new electron ultramicroscope. *Naturwiss.* **28**, 113-127 (1940).
- Ardenne, M. von.** Stereo-ultramicroscopy with the universal electron microscope. *Naturwiss.* **28**, 248-252 (1940).
- Ardenne, M. von.** A universal electron microscope for bright field, dark field and stereoscopic use. *Zeits. f. Physik* **115**, 339-368 (1940).
- Borries, B. von, and Ruska, E.** The effect of the potential difference on the super-microscopic image. *Zeits. f. Physik* **116**, 249-256 (1940).
- Kinder, E. and Pendzich, A.** A new magnetic lens of short focal length. *Jahrbuch AEG-Forsch., Sonderheft, Übermikroskop* **7**, 23-26 (1940).
- Kinder, E.** A new high-potential ultramicroscope. *Zeits. f. techn. Physik* **21**, 222-223 (1940).
- Mahl, H.** The electrostatic electron ultramicroscope. *Jahrbuch AEG-Forsch., Sonderheft, Übermikroskop* **7**, 43-56 (1940).
- Martin, L. C.** Ultraviolet and electron microscopy. *Nature* **146**, 288-292 (1940).
- Marton, L.** A new electron microscope. *Phys. Rev.* **58**, 57-60 (1940).
- O'Daniel, H. and Radczewski, O. E.** Electron microscopy and electron-diffraction study on the same specimen of highly dispersed minerals. *Naturwiss.* **28**, 628-630 (1940).
- Marton, L., Banca, M. C., and Bender, J. F.** A new electron microscope. *RCA Rev.* **5**, 232-243 (1940).
- Prebus, A.** Improved pole piece construction of the objective lens of a magnetic electron microscope. *Canad. J. of Research* **18**, 175-177 (1940).
- Ruska, E.** Electron diffraction patterns recorded in the supermicroscope. *Wiss. Veröffentl. Siemens-Werken, Werkstoff-Sonderheft* 372-379 (1940).
- Ruska, H.** Supermicroscopy. *Ned. T. Natuurk.* **7**, 179-191 (1940).
- Zworykin, V. K.** An electron microscope for the research laboratory. *Science* **92**, 51-53 (1940).
- Ardenne, M. von.** Electron ultramicroscopy with accessory probe for production of electron diffraction diagrams with very limited field of view. *Zeits. f. Physik* **117**, 515-523 (1941).
- Hillier, J. and Vance, A. W.** Recent developments in the electron microscope. *Proc. Inst. Radio Engrs.* **29**, 167-176 (1941).
- Hughes, A. L.** The magnetic electron lens. *Amer. J. Phys.* **9**, 204-207 (1941).
- Vance, A. W.** Stable power supplies for electron microscopes. *RCA Rev.* **5**, 293-300 (1941).

- Zworykin, V. K., Hillier, J., and Vance, A. W. An electron microscope for practical laboratory service. *Trans. Am. Inst. Elect. Engrs.* 60, 157-162 (1941).
- Ardenne, M. von, Schiebold, E., and Gunther, F. Fine beam electron diffraction in the universal electron microscope. *Zeits. f. Physik* 119, 352-365 (1942).
- Ardenne, M. von. Further development of the universal electron microscope. *Phys. Zeits.* 43, 11-15 (1942).
- Bachman, C. H. and Ramo, S. Simplified electron microscope. *Phys. Rev.* 62, 494 (1942).
- Hillier, J., Baker, R. F., and Zworykin, V. K. A diffraction adapter for the electron microscope. *J. of Applied Physics* 13, 571-577 (1942).
- Bachman, C. H. and Ramo, S. Electrostatic electron microscopy. I. *J. of Applied Physics* 14, 8-18 (1943).
- Bachman, C. H. and Ramo, S. Electrostatic electron microscopy. II. *J. of Applied Physics* 14, 69-76 (1943).
- Bachman, C. H. and Ramo, S. Electrostatic electron microscopy. III. *J. of Applied Physics* 14, 155-160 (1943).
- Bachman, C. H. Simplified electron microscopy. *Electronics* 16, 78-81; 195-200 (1943).
- Zworykin, V. K. Electron microscope: most recent research tool. *Electronics* 16, 146-147; 254 (1943).
- Ardenne, M. von. The image errors of the electron microscope caused by electron scattering in the object and their relation to each other. *Zeits. f. Physik* 11, 152-157 (1938).
- Ardenne, M. von. Limits of the resolving power of the electron microscope. *Zeits. f. Physik* 108, 308-338 (1938).
- Borries, B. von, and Ruska, E. Image formation in the supermicroscope. *Zeits. f. techn. Physik* 19, 402-407 (1938).
- Ardenne, M. von. Chromatic errors in the electron microscopes. *Zeits. f. Physik* 113, 257-259 (1939).
- Ardenne, M. von. Intensity and resolving power of the electron microscope. *Zeits. f. Physik* 112, 744-753 (1939).
- Borries, B. von, and Ruska, E. Properties of the supermicroscopical image formation. *Naturwiss.* 27, 281-287 (1939).
- Borries, B. von, and Ruska, E. The resolving power of the supermicroscope. *Zeits. f. techn. Physik* 20, 225-235 (1939).
- Hillier, J. Effects of chromatic error on the electron microscope. *Canad. J. of Research*, A17, 64-69 (1939).
- Ardenne, M. von. Determination of the resolving power of electron microscopes. *Phys. Zeits.* 42, 72-74 (1941).
- Ardenne, M. von. Testing of short focus electron lens. *Zeits. f. Physik* 117, 602-611 (1941).
- Hillier, J. A discussion of the fundamental limit of an electron microscope. *Phys. Rev.* 60, 743-745 (1941).
- Marton, L. and Schiff, L. I. Determination of object thickness in electron microscopy. *J. of Applied Physics* 12, 759-765 (1941).
- Ruska, E. Lenses for electron microscopes of high resolving power. *Archiv. f. Elektrotechn.* 36, 431-454 (1942).
- Schiff, L. I. Ultimate resolving power of the electron microscope. *Phys. Rev.* 61, 721-722 (1942).

#### IV. OPTICS OF THE TRANSMISSION TYPE ELECTRON MICROSCOPE

- Davissou, C. J. and Calbick, C. J. Electron lenses. *Phys. Rev.* 38, 585 (1931).
- Davissou, C. J. and Calbick, C. J. Electron lenses. *Phys. Rev.* 42, 580 (1932).
- Knoll, M. and Ruska, E. Contribution to geometrical electron optics. I. *Ann. d. Physik* [5] 12, 607-640 (1932).
- Knoll, M. and Ruska, E. Contribution to geometrical electron optics. II. *Ann. d. Physik* [5] 12, 641-661 (1932).
- Ruska, E. and Knoll, M. The magnetic concentration coil for fast electrons. I. *Zeits. f. techn. Physik* 12, 389-399 (1932).
- Ruska, E. and Knoll, M. The magnetic concentration coil for fast electrons. II. *Zeits. f. techn. Physik* 12, 448 (1932).
- Henneberg, W. The resolving power of the electron microscope for transparent objects. *Zeits. f. Instrumentenk.* 55, 300-305 (1935).
- Stabenov, G. Magnetic electron lens without image rotation. *Zeits. f. Physik* 96, 612-619 (1935).
- Boersch, H. On the primary and secondary image in the electron microscope. I. *Ann. d. Physik* 26, 631-644 (1936).
- Boersch, H. On the primary and secondary image in the electron microscope. II. *Ann. d. Physik* 27, 75-80 (1936).
- Marton, L. Some considerations concerning the resolving power in electron microscopy. *Physica* 3, 959-967 (1936).
- Busch, H. Calculation of the trajectory of cathode rays in electromagnetic fields of axial symmetry. *Ann. d. Physik* 81, 974-993 (1926).
- Busch, H. On the action of the concentration coil in Braun-tubes. *Arch. f. Elektrot.* 18, 583-594 (1927).
- Picht, J. Theory of geometrical optics for electrons. *Ann. d. Physik* 15, 926-964 (1932).
- Glaser, W. Geometrical optics of electron rays. *Zeits. f. Physik* 80, 451-464 (1933).
- Glaser, W. Geometrical electron optics of the axial symmetrical electromagnetic field. *Zeits. f. Physik* 81, 647-686 (1933).
- Glaser, W. Optical imagery by mechanical systems and the optics of nonhomogeneous isotropic media. *Ann. d. Physik* 18, 557-586 (1933).
- Glaser, W. Theory of the electron microscope. *Zeits. f. Physik* 83, 104-122 (1933).
- Johannson, H. and Scherzer, O. Electric electron condensing lens. *Zeits. f. Physik* 80, 183-192 (1933).
- Posener, L. Theory of the electron microscope. *Zeits. f. Physik* 80, 813-818 (1933).

#### V. IMAGE DEFECTS

- Scherzer, O.** Theory of electric electron condensing lenses. *Zeits. f. Physik* 80, 193–202 (1933).
- Diels, K. and Knoll, M.** Proof of the aberrations of an electron lens by point imagery. *Zeits. f. techn. Physik* 16, 621–623 (1935).
- Glaser, W.** Theory of image defects of an electron microscope. *Zeits. f. Physik* 97, 171–201 (1935).
- Wallauschek, R. and Bergmann, P.** Theory of electron microscope using purely magnetic fields. *Zeits. f. Physik* 94, 329–347 (1935).
- Scherzer, O.** On some defects of electron lenses. *Zeits. f. Physik* 101, 593–603 (1936).
- Scherzer, O.** The weak electric single lens of least spherical aberration. *Zeits. f. Physik* 101, 23–26 (1936).
- Diels, K. and Wendt, G.** Eight third-order aberrations of magnetic electron lenses. *Zeits. f. techn. Physik* 18, 65–69 (1937).
- Rebsch, R. and Schneider, W.** Spherical aberration of weak electron lenses. *Zeits. f. Physik* 107, 138–143 (1937).
- Rogowski, W.** Defects in electron images. *Arch. f. Elektrot.* 31, 555–593 (1937).
- Rebsch, R.** Theoretical resolving power of the electron microscope. *Ann. d. Physik* 31, 551–560 (1938).
- Scherzer, O.** The theoretically attainable resolving power of the electron microscope. *Zeits. f. Physik* 114, 427–434 (1939).
- Voit, H.** Third-order electron-optical aberrations. *Zeits. f. Instrumentenk.* 59, 71–82 (1939).
- Glaser, W.** Chromatic aberration in electron lenses. *Zeits. f. Physik* 116, 56–67 (1940).
- Glaser, W.** On a magnetic field free from spherical aberration. *Zeits. f. Physik* 116, 19–33 (1940).
- Rebsch, W. and Glaser, W.** Aperture error of electron lenses. *Zeits. f. Physik* 116, 729–735 (1940).
- Dosse, J.** Optical constants of strong electron lenses. *Zeits. f. Physik* 117, 722–753 (1941).
- Dosse, J.** Precise computation of unsymmetrical field form  $H = H_0/1 + (z/a)^2$ . *Zeits. f. Physik* 117, 316–321 (1941).
- Glaser, W.** Precise computation of magnetic lenses with the field form  $H = H_0/1 + (z/a)^2$ . *Zeits. f. Physik* 117, 285–315 (1941).
- Kompfner, R.** On a method of correcting the spherical error of electron lenses, especially those employed with electron microscopes. *Phil. Mag.* 32, 410–416 (1941).
- Recknagel, A.** Theory of electrical electron microscope which is self-illuminating. *Zeits. f. Physik* 177, 689–708 (1941).
- Plass, G. N.** Electrostatic electron lenses with a minimum of spherical aberration. *J. of Applied Physics* 13, 49–55 (1942).
- Ramberg, E. G.** Variation of the axial aberrations of electron lenses with lens strength. *J. of Applied Physics* 13, 582–594 (1942).

## VI. ELECTRON SPEEDS ABOVE 100 KV

- Marton, L.** The electron microscope in biology. *Acta Union Internat. Contre Cancer* 4, 221–238 (1939).
- Ardenne, M. von.** 200-kv universal electron microscope with an object screen. *Zeits. f. Physik* 117, 657–688 (1941).
- Müller, H. O. and Ruska, E.** A supermicroscope for 220-kv beam potential. *Kolloid Zeits.* 95, 21–25 (1941).
- Zworykin, V. K., Hillier, J., and Vance, A. W.** A preliminary report on the development of a 300-kv magnetic electron microscope. *J. of Applied Physics* 12, 738–742 (1941).

## VII. DIFFERENT RELATED INSTRUMENTS

- Johnson, R. P. and Shockley, W.** Investigation of thermionic filaments with a simple electron microscope. *Phys. Rev.* 48, 973 (1935).
- Wehnelt, A. and Schilling, W.** Electron microscope examination of the electron emission of cold metals. *Zeits. f. Physik* 98, 286–287 (1935).
- Johnson, R. P. and Shockley, W.** An electron microscope for filaments: emission and adsorption by tungsten single crystals. *Phys. Rev.* 49, 436–440 (1936).
- Muller, E. W.** Electron microscopical observations of field emitters. *Zeits. f. Physik* 106, 541–550 (1937).
- Ardenne, M. von.** The electron scanning microscope. *Zeits. f. techn. Physik* 19, 407–416 (1938).
- Ardenne, M. von.** Electron scanning microscope—theoretical fundamentals. *Zeits. f. Physik* 109, 553–573 (1938).
- Johnson, R. P.** Simple electron microscopes. *J. of Applied Physics* 9, 508–516 (1938).
- Boersch, H.** The electron shadow microscope. I. *Zeits. f. techn. Physik* 20, 346–350 (1939).
- Zworykin, V. K., Hillier, J., and Snyder, R. L.** A scanning electron microscope. *A. S. T. M. Bull.* 117, 15–23 (1942).

## VIII. APPLICATIONS OF THE TRANSMISSION TYPE MICROSCOPE

- Borries, B. von, and Ruska, E.** Images of films in transmission by means of the electron microscope. *Zeits. f. Physik* 83, 187–193 (1933).
- Marton, L.** The electron microscope; first attempts at its application to biology. *Ann. et Bull. de la Soc. Roy. des Sciences Med. et Nat. de Bruxelles* [5–6] 92, 106 (1934).
- Marton, L.** Electron microscopy of biological objects. *Phys. Rev.* 46, 527–528 (1934).
- Marton, L.** Electron microscopy of biological objects. *Nature* 133, 911 (1934).
- Borries, B. von, and Ruska, E.** Electron microscope and its uses. *V. D. I.* 79, 519–524 (1935).
- Driest, E. and Müller, H. O.** Electron micrographs of chitin substances. *Z. f. wiss. Mikroskop.* 52, 53–55 (1935).
- Marton, L.** The electron microscope and its applications. *Rev. d'Optique* 14, 129–145 (1935).

- Marton, L.** The electron microscope and its applications especially in biology. *2ème Congrès Nat. d. Sciences, Bruxelles* 2, 928-933, 1935.
- Marton, L.** Electron microscopy of biological objects. II. *Bull. Acad. Roy. de Belg., Cl. des Sciences* 21, 553-564 (1935).
- Sauepe, E.** Use of electron microscope and diffraction in biology and pathology. *Frankfurt. Z. f. Path.* 47, 485-516 (1935).
- Krause, F.** Electron-optical pictures of diatoms with the magnetic electron microscope. *Zeits. f. Physik* 102, 417-422 (1936).
- Marton, L.** The electron microscope. *Rev. Microbiol. Appl.* 3, 117-124 (1936).
- Marton, L.** Electron microscopy of biological objects. IV. *Bull. Acad. Roy. de Belg., Cl. des Sciences* 22, 1336-1344 (1936).
- Beischer, D. and Krause, F.** Electron microscope in colloid investigations. *Naturwiss.* 25, 825-829 (1937).
- Krause, F.** The electron microscope and its use in biology. *Naturwiss.* 25, 817-825 (1937).
- Luft, F.** Practical uses of electron optics. *Röntgenpraxis* 9, 384-394 (1937).
- Marton, L.** Electron microscopy of biological objects. V. *Bull. Acad. Roy. de Belg., Cl. des Sciences* 23, 672-678 (1937).
- Beischer, D.** Determination of size of crystals in metal and metal oxide smokes by means of Röntgen- and electron-diffraction diagrams and electron photomicrographs. *Zeits. Elektrochem.* 44, 375-385 (1938).
- Borries, B. von, Ruska, E., and Ruska, H.** Bacteria and virus as seen in the ultramicroscope, with introduction to technology of ultramicroscopy. *Klin. Wochenschr.* 17, 921-925 (1938).
- Borries, B. von, Ruska, E., and Ruska, H.** Photographs of bacteria with the supermicroscope. *Wiss. Veröffent. Siemens-Werke* 17, 107-111 (1938).
- Borries, B. von, Ruska, E., and Ruska, H.** Status of the supermicroscope. *V. D. I.* 82, 937-941 (1938).
- Eitel, W. H., Müller, H. O., and Radczewski, O. E.** Examination of clay minerals with the ultramicroscope. *Ber. Deut. Keram. Ges.* 20, 165-180 (1938).
- Krause, F.** Examination of viruses by the electron microscope. *Naturwiss.* 26, 122 (1938).
- Marton, L.** A note on the article: "Practical uses of electron optics," by Fritz Luft. *Röntgenpraxis* 10, 352-353 (1938).
- Beischer, D. and Krause, F.** The electron microscope in colloid chemistry. *Angew. Chem.* 51, 331-334 (1938).
- Ruchardt, E.** New developments in electron microscopy and their results. *Münch. Med. Wochenschr.* 85, 1832-1837 (1938).
- Ardenne, M. von.** Possibility of examining living substances with electron microscopes. *Zeits. f. techn. Physik* 20, 239-242 (1939).
- Frank, F. and Ruska, H.** Examination of the blue structure of bird feathers with the electron microscope. *Naturwiss.* 27, 229-230 (1939).
- Friess, H. and Müller, H. O.** Smokes and dusts in the electron microscope. *Gasmask* 11, 1-9 (1939).
- Kausche, G. A., Pfankuch, E., and Ruska, H.** Examination of plant viruses with the high power electron microscope. *Naturwiss.* 27, 292-299 (1939).
- Kausche, G. A. and Ruska, H.** The structure of the "crystalline aggregates" of tobacco mosaic virus proteins. *Biochem. Z.* 303, 221-230 (1939).
- Kausche, G. A. and Ruska, H.** Supermicroscopic investigation of the adsorption of metal colloids on proteins. *Kolloid Zeits.* 89, 21-26 (1939).
- Krause, F.** Use of the electron microscope in biology and medicine. *Arch. Exp. Zellforsch.* 22, 668-672 (1939).
- Marton, L.** On the sensitivity of photographic emulsions for electrons between 50 and 100 kv. *Phys. Rev.* 56, 290 (1939).
- Müller, H. O.** The supermicroscope in medicine. *Med. Klinik* 35, 1041-1043 (1939).
- Piekarski, G. and Ruska, H.** Supermicroscopic pictures of bacterial flagellae. *Klin. Wochenschr.* 18, 383-386 (1939).
- Piekarski, G. and Ruska, H.** Supermicroscopical investigations of bacteria with particular reference to the so-called nucleoids. *Arch. Mikrobiol.* 10, 302-321 (1939).
- Radczewski, O. E., Müller, H. O., and Eitel, W.** The hydration of tricalcium aluminate. *Naturwiss.* 27, 837-838 (1939).
- Radczewski, O. E., Müller, H. O., and Eitel, W.** Supermicroscopical investigation of the hydration of lime. *Zement* 28, 693-697 (1939).
- Radczewski, O. E., Müller, H. O., and Eitel, W.** The hydration of tricalcium silicate. *Naturwiss.* 27, 807 (1939).
- Ruska, H.** Supermicroscopic demonstration of organic structure. *Arch. Exp. Zellforsch.* 22, 673-680 (1939).
- Ruska, H., Borries, B. von, and Ruska, E.** The importance of the supermicroscope in virus research. *Arch. Ges. Virusforsch.* 1, 155 (1939).
- Wolpers, C. and Ruska, H.** Structural investigations of the clotting of blood. *Klin. Wochenschr.* 18, 1077-1111 (1939).
- Ardenne, M. von.** Analysis of the structure of highly and very highly illuminated silver bromide grains with the universal electron microscope. *Z. Angew. Photogr.* 2, 14-20 (1940).
- Ardenne, M. von, and Beischer, D.** Examination of the fine structure of high-molecular compounds with the universal electron microscope. I. The structure of  $\beta$ -polyoxymethylene crystals. *Zeits. f. phys. Chem., [B]* 45, 465-473 (1940).
- Ardenne, M. von, and Beischer, D.** Examination of the fine structure of high-molecular compounds with the universal electron microscope. II. The morphology of rubber and Buna. *Kautschuk* 16, 55-60 (1940).
- Ardenne, M. von, Endell, K., and Hoffmann, E.** Examination of finest fractions of bentonite and cement with the universal electron microscope. *Ber. Deut. Keram. Ges.* 21, 209-227 (1940).

- Ardenne, M. von.** Images of minute particles, especially of molecules, by means of the universal electron microscope. *Zeits. f. phys. Chem.* [A]187, 1-12 (1940).
- Ardenne, M. von, and Beischer, D.** Investigation of catalysts with the universal electron microscope. *Angew. Chem.* 53, 103-107 (1940).
- Ardenne, M. von, and Beischer, D.** Investigation of metal oxide smokes with the universal electron microscope. *Zeits. Elektrochem.* 46, 270-277 (1940).
- Ardenne, M. von.** Occurrence of black lines in electron microscope images of crystal lamellae. *Zeits. f. Physik* 116, 736-738 (1940).
- Ardenne, M. von.** Stage vibrator for electron microscopes. *Kolloid Zeits.* 93, 158-163 (1940).
- Borries, B. von, and Kausche, G. A.** Determination of the size and shape distribution of colloidal gold by means of the supermicroscope. *Kolloid Zeits.* 90, 132-141 (1940).
- Borries, B. von, and Ruttman, W.** Metallographic investigations of steel, cast iron, and brass by means of the supermicroscope. *Wiss. Veröffentlich. Siemens-Werken, Werkstoff-Sonderheft* 342-362 (1940).
- Borries, B. von.** Higher resolving power at the formation of images of surfaces by the supermicroscope. *Zeits. f. Physik* 116, 370-378 (1940).
- Burton, E. F., Hillier, J., and Prebus, A.** Contribution of the electron microscope to medicine. *Canad. M. A. Jour.* 42, 116-119 (1940).
- Columbian Carbon Company Research Laboratories.** The particle size and shape of colloidal carbon as revealed by the electron microscope. *Columbian Colloidal Carbons* 2, 5-53 (1940).
- Eitel, W. and Schusterius, C.** The determination of the efficient surfaces of clay particles with the supermicroscope. *Chem. Erde* 13, 322-335 (1940).
- Eitel, W. and Schusterius, C.** The interpretation of electron microscope pictures for the determination of clay grain distribution. *Naturwiss.* 28, 300-303 (1940).
- Eitel, W. and Radczewski, O. E.** The characteristics of the clay mineral montmorillonite as shown by the supermicroscope. *Naturwiss.* 28, 397-399 (1940).
- Eitel, W. and Gotthardt, E.** Stereophotographic measurement of the thickness of very small crystals by electron microscope observation. *Naturwiss.* 28, 367 (1940).
- Frühbrodt, E. and Ruska, H.** Research on the structure of bacteria, especially of bacterium membranes and capsules. *Arch. Mikrobiol.* 11, 137-154 (1940).
- Husemann, E. and Ruska, H.** Making glycogen molecules visible. *J. Prakt. Chem.* 156, 1-10 (1940).
- Husemann, E. and Ruska, H.** Making visible the molecules of *p*-iodobenzoyl-glycogen. *Naturwiss.* 28, 534 (1940).
- Jakob, A. and Mahl, H.** Application of the supermicroscope in bacteriology, especially for experiments with capsules. *Jahrbuch AEG-Forsch., Sonderheft, Übermikroskop* 7, 77-87 (1940).
- Jakob, A. and Mahl, H.** Structure of bacteria, in particular capsulation of anaerobiae by means of the electrostatic supermicroscope. *Arch. Exp. Zellforsch.* 24, 87-104 (1940).
- Kausche, G. A. and Ruska, H.** The identification of tobacco mosaic virus molecules in the chloroplast of virus-infected plants. *Naturwiss.* 28, 303 (1940).
- Kausche, G. A.** Investigations on the problem of biological characterization of phytopathogenic virus proteins. *Arch. Ges. Virusforsch.* 1, 362-372 (1940).
- Kausche, G. A.** The mechanism of the gold-sol reaction of the protein of tobacco mosaic and potato-X-virus. *Biol. Zentr.* 60, 179-199 (1940).
- Kausche, G. A. and Ruska, H.** The problem of the structure of the chloroplast. *Naturwiss.* 28, 303-304 (1940).
- Kausche, G. A.** Results and problems of experimental plant virus research. *Ber. Deut. Botan. Ges.* 58, 200-222 (1940).
- Koch, L. and Lehmann, A.** Supermicroscopical investigation of rolled aluminum surfaces. *Wiss. Veröffentlich. Siemens-Werken, Werkstoff-Sonderheft* 363-371 (1940).
- Lembke, A., Ruska, H., and Christophersen, J.** Comparative microscopical and supermicroscopical observations on the infective agent of tuberculosis. *Klin. Wochenschr.* 19, 217-220 (1940).
- Mahl, H.** Application of the supermicroscope in colloid chemistry and metallurgy. *Jahrbuch AEG-Forsch., Sonderheft, Übermikroskop* 7, 67-76 (1940).
- Mahl, H.** Determination of the orientation of single crystals of aluminum by means of the supermicroscope. *Metallwirtschaft* 19, 1082-1085 (1940).
- Mahl, H.** The electrostatic electron microscope and some applications in colloid chemistry. *Kolloid Zeits.* 91, 105-117 (1940).
- Mahl, H.** Metallurgical researches with the electrostatic ultramicroscope. *Zeits. f. techn. Physik* 21, 17-18 (1940).
- Mahl, H.** A plaster-cast method for supermicroscopical investigation of metal surfaces. *Metallwirtschaft* 19, 488-491 (1940).
- Meldau, R.** Fine dusts in the submicroscopic field. *V. D. I.* 84, 103-106 (1940).
- Middel, V., Reichmann, R., and Kausche, G. A.** Supermicroscopic investigation of the structure of bentonites. *Wiss. Veröffentlich. Siemens-Werken, Werkstoff-Sonderheft* 334-341 (1940).
- Pfankuch, E. and Kausche, G. A.** Ultramicroscopic examination of bacteriophages. *Naturwiss.* 28, 46 (1940).
- Radczewski, O. E., Müller, H. O., and Eitel, W.** Supermicroscopic investigation of the beginning of precipitation of calcium carbonate from aqueous solutions. *Zentr. Mineral. Geol.* 8-19 (1940).
- Ruska, H.** Making visible the bacteriophage lysis in the supermicroscope. *Naturwiss.* 28, 45-46 (1940).
- Ruska, E. and Müller, H. O.** Progress in reproduction of electron irradiated surfaces. *Zeits. f. Physik* 116, 366-369 (1940).
- Ruska, H.** The structure of cellulose fibers. *Kolloid Zeits.* 92, 276-285 (1940).
- Ruska, H. and Wolpers, C.** The structure of "liquor-fibrin." *Klin. Wochenschr.* 19, 695 (1940).

- Ruska, H. and Kretschmer, M.** Supermicroscopic investigation of the degradation of cellulose fibers. *Kolloid Zeits.* **92**, 163-166 (1940).
- Ruska, H. and Frühbrodt, E.** Supermicroscopy as a method of investigation. *Biologie* **9**, 69-75 (1940).
- Ruska, H.** Visibility of bacteriophage cultures in the ultramicroscope. *Naturwiss.* **28**, 45-46 (1940).
- Trurnit, H. and Friedrich-Freksa, H.** The electron-microscopical investigation of "tomato mosaic virus Dahlem 1940." *Biol. Zentr.* **60**, 546-556 (1940).
- Zahn, H.** Experiments on the supermicroscopy of wool. *Melliand Textilberichte* **21**, 505-508 (1940).
- Anderson, T. F. and Stanley, W. M.** A study of the reaction between the tobacco mosaic virus and its antiserum by means of the electron microscope. *J. Biol. Chem.* **139**, 339-344 (1941).
- Ardenne, M. von.** Electron microscopy of living tissue. *Naturwiss.* **29**, 521-523 (1941).
- Ardenne, M. von, and Friedrich-Freksa, H.** Germination of the spores of the bacillus vulgatus from photographs in the 200-kv universal electron microscope. *Naturwiss.* **29**, 523-528 (1941).
- Barnes, R. B. and Burton, C. J.** Metallic smokes as test objects in electron microscopy. *Ind. Eng. Chem., News Ed.* **19**, 965-967 (1941).
- Beischer, D.** Newer methods for investigating the structure of colloidal systems. *Kolloid Zeits.* **96**, 127-135 (1941).
- Borries, B. von, and Janzen, S.** Image of finely machined technical surfaces in the supermicroscope. *V. D. I.* **85**, 207-211 (1941).
- Hall, C. E. and Schoen, A. L.** Application of the electron microscope to the study of photographic phenomena. *J. Opt. Soc. Am.* **31**, 281-285 (1941).
- Hass, G. and Kehler, H.** Investigations on the electrolytically-produced and annealed layers of aluminum oxide by means of electron interferences and measurements in the supermicroscope. *Kolloid Zeits.* **97**, 27-35 (1941).
- Hass, G. and Kehler, H.** On a temperature resistant and durable carrier for electron interference and electron-microscope investigations. *Kolloid Zeits.* **95**, 26-29 (1941).
- Humbert, R. P. and Shaw, B.** Studies of clay particles with the electron microscope. *Soil Science* **52**, 481-487 (1941).
- Knoll, M.** Evidence for built-up layers of iron oxide with the electron microscope. *Phys. Zeits.* **42**, 120-122 (1941).
- Kregel, E. A. et al.** A technique for electron-microscopic examination of encapsulated bacteria. *Science* **94**, 592 (1941).
- Marton, L.** The electron microscope. *J. Bact.* **41**, 397-413 (1941).
- Marton, L., McBain, J. W., and Vold, R. D.** Electron microscope study of curd fibres of sodium laurate. *J. Am. Chem. Soc.* **63**, 1990-1993 (1941).
- Mehl, R. F.** The structure and rate of formation of pearlite. *Trans. Am. Soc. Metals* **29**, 813-862 (1941).
- Menke, W.** Investigations of the fine structure of protoplasm with the universal electron microscope. *Protoplasma* **35**, 115 (1941).
- Morton, H. E. and Anderson, T. F.** Electron-microscopic studies of biological reactions. I. Reduction of potassium tellurite by Coryne-bacterium diptheriae. *Proc. Soc. Exp. Biol. Med.* **46**, 272-276 (1941).
- Mudd, S. and Anderson, T. F.** Demonstration by the electron microscope of the combination of antibodies with flagellar and somatic antigens. *Journ. of Immunology* **42**, 251-266 (1941).
- Mudd, S., Polevitzky, K., Anderson, T. F., and Chambers, L. A.** Bacterial morphology as shown by the electron microscope. *J. Bact.* **42**, 251-264 (1941).
- Mudd, S. and Lackman, D. B.** Bacterial morphology as shown by the electron microscope. *J. Bact.* **41**, 415-420 (1941).
- Mudd, S.** The electron microscope. *Frank. Inst. J.* **231**, 496-498 (1941).
- Müller, F. H.** Fiber production, fiber characteristics, and molecular structure. *Phys. Zeits.* **42**, 123-129 (1941).
- Schmieder, F.** Electron microscopic investigation of the relation between covering quality and grain size of pigments. *Kolloid Zeits.* **95**, 29-33 (1941).
- Shaw, B. T. and Humbert, R. P.** Electron micrographs of clay minerals. *Soil Sci. Soc. Am. Proc.* **6**, 146-149 (1941).
- Stanley, W. M. and Anderson, T. F.** A study of purified viruses with the electron microscope. *J. Biol. Chem.* **139**, 325-338 (1941).
- Wallner, F. E. and Schiebold, E.** Contribution to the interpretation of supermicroscopical pictures of fibrous specimens. *Kolloid Zeits.* **97**, 36-37 (1941).
- Wesch, L.** Electron-optical properties of Lenard phosphors. *Ann. d. Physik* **40**, 249-294 (1941).
- Zwozykin, V. K. and Ramberg, E. G.** Surface studies with the electron microscope. *J. of Applied Physics* **12**, 692-695 (1941).
- Anderson, T. F. and Richards, A. G.** Electron microscope studies of some structural colors of insects. *J. of Applied Physics* **13**, 748-758 (1942).
- Ardenne, M. von.** Reaction-chamber supermicroscopy by means of the universal electron microscope. *Zeits. f. phys. Chemie, [B]* **52**, 61-71 (1942).
- Baker, R. F., Ramberg, E. G., and Hillier, J.** The photographic action of electrons in the range between 40 and 212 kilovolts. *J. of Applied Physics* **12**, 450-456 (1942).
- Barnes, R. B. and Burton, C. J.** The electron microscope and its uses. *A. S. T. M. Bull.* **116**, 34-41 (1942).
- Brown, O. J., Jr. and Smith, W. R.** Relation of paint properties to surface areas of carbon black. *Ind. and Eng. Chem. Ind. Ed.* **34**, 352-355 (1942).
- Burton, C. J., Barnes, R. B., and Rochow, T. G.** The electron microscope: calibration and use at low magnifications. *Ind. and Eng. Chem. Ind. Ed.* **34**, 1429-1436 (1942).



- Clark, G. L., Bernays, P. M., and Tordella, J. P.** Progress in lime investigation with x-rays and electron microscope. *Nat. Lime Assoc. Proc., 24th Annual Convention*, May 1942.
- Clark, G. L., Barnes, M. R., and Baylor, E. R.** A study of lampbrush chromosomes by the electron microscope. *Science* **95**, 250 (1942).
- Eisenhut, O. and Kuhn, E.** Light microscopic and electron microscopic investigations of native and artificial cellulose fibers. *Angew. Chem.* **55**, 198-206 (1942).
- Frampton, L. V.** The size and shape of the tobacco mosaic virus protein particle. *Science* **95**, 232-233 (1942).
- Green, R. H., Anderson, T. F., and Smadel, J. E.** Morphological structure of the virus of vaccinia. *J. Exp. Med.* **75**, 651-656 (1942).
- Hall, C. E., Jakus, M. A., and Schmitt, F. O.** Electron microscope observations of collagen. *J. Am. Chem. Soc.* **64**, 1234 (1942).
- Hamly, D. H. and Watson, J. H. L.** Electron and optical microscope interpretation of the wall of pleurosigma angulatum. *J. Opt. Soc. Am.* **32**, 433-442 (1942).
- Heidenreich, R. D.** Electron reflections in MgO crystals with the electron microscope. *Phys. Rev.* **62**, 291-292 (1942).
- Hillier, J. and Baker, R. F.** The observation of crystalline reflections in electron microscope images. *Phys. Rev.* **61**, 722-723 (1942).
- Luria, S. E. and Anderson, T. F.** The identification and characterization of bacteriophages with the electron microscope. *Proc. Natl. Acad. Sci.* **28**, 127-130 (1942).
- Marshall, C. E., Humbert, R. P., Shaw, B. T., and Caldwell, O. G.** Studies of clay particles with the electron microscope. II. The fractionation of beidellite, nontronite, magnesium bentonite, and attapulgite. *Soil Science* **54**, 149-157 (1942).
- Marton, L.** Applications of the electron microscope in colloid chemistry. *Jour. Phys. Chem.* **46**, 1023-1032 (1942).
- Marton, L. and McBain, J. W.** The electron microscope and its developments. *Chemical Products* **5**, 61-67 (1942).
- Morton, H. E. and Anderson, T. F.** Some morphologic features of the Nichols strain of treponema pallidum as revealed by the electron microscope. *Am. J. Syph. Gono. and Ven. Dis.* **26**, 565-573 (1942).
- Mudd, S., Polevitzky, K., Anderson, T. F., and Kast, C.** Bacterial morphology as shown by the electron microscope. III. Cell wall and protoplasm in a strain of fusobacterium. *J. Bact.* **44**, 361-366 (1942).
- Mudd, S., Polevitzky, K., and Anderson, T. F.** Bacterial morphology as shown by the electron microscope. IV. Structural differentiation within the bacterial protoplasm. *Arch. Path.* **34**, 199-207 (1942).
- Mudd, S. and Anderson, T. F.** Selective staining for electron microscopy: the effects of heavy metal salts on individual bacterial cell. *J. Exp. Med.* **76**, 103-108 (1942).
- Mueller, H. and Sakmann, B. W.** Electro-optical properties of colloids. *J. Opt. Soc. Am.* **32**, 309-317 (1942).
- Picard, R. G.** Studies on the structure of thin metallic films by means of the electron microscope. Dissertation, U. of Michigan, 1942. (Manuscript)
- Richards, A. G., Jr. and Anderson, T. F.** Electron micrographs of insect tracheae. *J. N. Y. Ento. Soc.* **50**, 147-167 (1942).
- Richards, A. G., Jr. and Anderson, T. F.** Electron microscope studies of insect cuticle with a discussion of the application of electron optics to this problem. *J. Morph.* **71**, 135-183 (1942).
- Richards, A. G., Jr. and Anderson, T. F.** Further electron microscope studies on arthropod tracheae. *J. N. Y. Ento. Soc.* **50**, 245-247 (1942).
- Richards, A. G., Jr., Anderson, T. F., and Hance, R. T.** A microtome sectioning technique for electron microscopy illustrated with sections of striated muscle. *Proc. Soc. Exp. Biol. and Med.* **51**, 148-152 (1942).
- Rosenblatt, M. B., Fullam, E. F., and Gessler, A. E.** Studies of mycobacteria with the electron microscope. *Amer. Rev. of Tuberculosis* **46**, 587-598 (1942).
- Schaefer, V. J.** New methods for preparing surface replicas for microscopic observation. *Phys. Rev.* **62**, 495-496 (1942).
- Schaefer, V. J. and Harker, D.** Surface replicas for use in the electron microscope. *J. of Applied Physics* **13**, 427-433 (1942).
- Schmitt, F. O., Hall, C. E., and Jakus, M. A.** Electron microscope investigations of the structure of collagen. *J. Cell. and Comp. Physiol.* **20**, 11-53 (1942).
- Scott, G. H. and Anderson, T. F.** A study of connective tissue with the electron microscope. *Anat. Rec.* **82**, 445 (1942).
- Sears, G. R. and Kregel, E. A.** Application of the electron microscope to the problems of the pulp, paper and paperboard industry. *Paper Trade Jour.* **114**, 43-49 (1942).
- Sharp, D. G., Taylor, A. R., Beard, D., and Beard, J. W.** Electron micrography of the western strain equine encephalomyelitis virus. *Proc. Soc. Exp. Biol. and Med.* **51**, 206-207 (1942).
- Sharp, D. G., Taylor, A. R., Beard, D., and Beard, J. W.** Study of the papilloma virus protein with the electron microscope. *Proc. Soc. Exp. Biol. and Med.* **50**, 205-207 (1942).
- Shaw, B. T.** The nature of colloidal clay as revealed by the electron microscope. *Jour. Phys. Chem.* **46**, 1032-1043 (1942).
- Stanley, W. M. and Anderson, T. F.** Electron micrographs of protein molecules. *J. Biol. Chem.* **146**, 25-30 (1942).
- Taylor, A. R., Sharp, D. G., Beard, D., and Beard, J. W.** Electron micrography of the eastern strain equine encephalomyelitis virus. *Proc. Soc. Exp. Biol. and Med.* **51**, 332-334 (1942).

- Umbreit, W. W. and Anderson, T. F.** A study of thiobacillus thiooxidans with the electron microscope. *J. Bact.* **44**, 317-320 (1942).
- Wergin, W.** What does electron microscopy reveal regarding the structure of cellulose fibers? *Kolloid Zeits.* **98**, 131-141 (1942).
- Wiegand, W. B. and Ladd, W. A.** Colloidal carbon as revealed by the electron microscope. *Rubber Age* **50**, 431-436 (1942).
- Wile, U. J., Picard, R. G., and Kearny, E. B.** The morphology of spirochaeta pallida in the electron microscope. *J. Am. Med. Assoc.* **119**, 880-881 (1942).
- Alexander, L. T., Faust, G. T., Hendricks, S. B., Isley, H., and McMurdie, H. F.** Relationships of the clay minerals halloysite and endellite. *Am. Miner.* **28**, 1-18 (1943).
- Barnes, R. B. and Burton, C. J.** The electron microscope and cellulose. *Ind. and Eng. Chem. Ind. Ed.* **35**, 120-125 (1943).
- Chambers, L. A. and Henle, W.** Studies on the nature of the virus of influenza: I. The dispersion of the virus of influenza A in tissue emulsions and in extra-embryonic fluids of the chick. *J. Exp. Med.* **77**, 251-264 (1943).
- Chambers, L. A., Henle, W., Lauffer, M. A., and Anderson, T. F.** Studies on the nature of the virus of influenza: II. The size of the infectious unit in influenza A. *J. Exp. Med.* **77**, 265-276 (1943).
- Heidenreich, R. D. and Peck, V. G.** Fine structure of metallic surfaces with the electron microscope. *J. of Applied Physics* **14**, 23-29 (1943).
- Mahl, H. and Stranski, J. N.** The behavior of aluminium in metallographic etching. *Naturwiss.* **31**, 12-17 (1943).
- Plotz, H., Smadel, J. E., Anderson, T. F., and Chambers, L. A.** Morphological structure of Rickettsiae. *J. Exp. Med.* **77**, 355-358 (1943).
- Richards, A. G., Jr., Steinbach, H. B., and Anderson, T. F.** Electron microscope studies of squid giant nerve axoplasm. *J. Cell. and Comp. Phys.* **21**, 129-137 (1943).
- Zworykin, V. K.** Electron microscope in chemistry. *Electronics* **16**, 190-196 (January, 1943).

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#### Calendar of Meetings

##### October

- 7-9 Optical Society of America, Pittsburgh, Pennsylvania
- 16 American Physical Society, New England Section, New London, Connecticut
- 18-23 American Welding Society, Chicago, Illinois
- 23 American Physical Society, Metropolitan Section, New York, New York
- 29-30 Society of Rheology, New York, New York

##### November

- 6 American Physical Society, New York State Section, Ithaca, New York

- 12-13 American Physical Society, Evanston, Illinois
- 15-16 American Institute of Chemical Engineers, Pittsburgh, Pennsylvania
- 26-27 Central Association of Science and Mathematics Teachers, Chicago, Illinois

##### January

- 13-15 American Physical Society, New York, New York
- 13-15 American Association of Physics Teachers, New York, New York