SIGNIFICANT EVENTS
ELECTRICAL AND ELECTROMAGNETIC METHODS

1830 R. W. Fox
The first attempt to utilize electrical methods dates back to 1830 when Robert W. Fox observed that electrical currents flowing in Cornish tin mines were due to self potentials.

1835 R. W. Fox
First discovery of a sulfide body by electrical methods was the Penzance mine of Cornwall.

1867 C. Mateucci
First attempt to understand telluric currents.

1882 C. Barus
Introduced the non-polarizing electrode for self-potential surveys.

1883-1891 F. H. Brown
First attempt to determine differences in earth resistivity associated with ore deposits.

1887 F. Neumann
Derived the equation for the potential due to two electrodes on the earth's surface.

1900 H. S. Osborne
Performed first equipotential survey, copper bearing lodes, Michigan.

1908 W. Van Bemmelen
Introduced the roots of the MT method.

1912 M. Schlumberger
Introduced the direct-current equipotential-line method.

1915 F. Wenner
Introduced the Wenner array for resistivity sounding.

1917 H. W. Conklin
Took out basic U. S. patents on the electromagnetic method.

1917 K. Schilowsky
Earliest description of a practical electromagnetic prospecting method.

1920 C. Schlumberger
First described the induced-polarization phenomenon.

1921 K. Sundberg
Introduced the two-frame electromagnetic method.

1921 C. Schlumberger, and M. Schlumberger
Beginning of practical exploration of layered structures using the Schlumberger array.

1925 K. Sundberg, H. Lundberg, and J. Eklund
First successful application of the Sundberg electromagnetic method.

1926 H. Hunkel
Published early electric log using single point array.

1926 V. A. Fok and V. P. Bursian
Earliest Soviet theoretical study of the electromagnetic method.

1928 C. Schlumberger and M. Schlumberger
First electrical measurements in a borehole in France.

1928 R. Ambronn
First text which treated electrical methods, specifically.

1928 A. A. Petrowsky
First studied the potential distribution at the surface of the earth due to a buried electrically polarized sphere.

1929 A. S. Eve, and D. A. Keys
Published early text on Canadian exploration geophysics

1929 {J. N. Hummel}
{E. Lancaster Jones}
Introduced the method of images for D. C. resistivity sounding of a layered earth.

1930 S. Stefanesco, C. Schlumberger, M. Schlumberger.
Developed methematical formulation for D. C. resistivity over a layered earth.

1930 G. F. Tagg
First computed apparent resistivity curves for Wenner array across a vertical fault.

1931 H. Lundberg, and T. Zuschlag
Computed potential-drop ratio curves over a vertical fault and a vertical dike.

1931 A.B. Broughton Edge, and T. H. Laby
First text on use in Australia of electrical methods. Described Beiler-Watson method of measuring ellipse of polarization in electromagnetic prospecting.

1931 C. Schlumberger
First U.S. patent issued for electrical well logging.

1932 A. Hedstrom

Developed Turam method of electromagnetic exploration.

1932 L. B. Slichter
First scale-model electromagnetic studies in U.S.A.

1933 K. Sundberg and H. Hedstrom,
Described a semi-quantitative method of interpretation of compensator electromagnetic data over a layered earth.

1933 L. W. Blau
Issued a U. S. patent for the Eltran transient electromagnetic method of studying a layered earth.

1933 {R. E. Langer}
{L. B. Slichter}
Independently were first to develop formulation of the inverse problem in resistivity sounding of a layered earth.

1933 J. A. Jakosky
Patented the magnetometric resistivity method.

1934 L. Stratham
First paper on electrical prospecting to appear in Geophysics

1936 S. Werner
Developed the Slingram method.

1937 A. P. Kraev
Early paper on transient electromagnetic theory.

1940 L. C. Pekeris
Produced a good practical inversion scheme for inversion of d. c. resistivity data.

1941 V. N. Dahknov
Studied the IP phenomema in well logs.

1947 R. Maillet,
Introduced the Dar Zarrouk parameters for interpreting Schlumberger resistivity sounding data.

1948 I. P. Skal'skaya
Solved the dipping-bed problem in electrical geophysical applications.

1949 H.G. Doll,
First described the principles of the induction log.

1949 E. D. Sunde
Formulated the eigenvalue problem of resistivity of an n-layered earth which included both inductive and conductive coupling.

1949 H. O. Seigel
Was the first to formulate the induced polarization method.

1950 L.M. Al'pin, M.N. Berdichevskii, G.A. Vendrintsev and A.M. Zagarmistr

Published extensive treatise on dipole sounding.

1950 G.V. Keller
Important contributions to our understanding of the dielectric properties of clays.

1950 A. H. Tichonov
A written description of the elementary theory of the MT method over horizontally-layered structures.

1950 W.O. Cartier, C.S. Davidson, H.A. Harvey, W.A. Robinson and G.H. McLaughlin
Developed the first airborne electromagnetic prospecting system for fixed-wing aircraft.

1951 H.G. Doll
Described the introduction of the first "focused" electric logs.

1951-60 J. R. Wait
Enunciated much of the initial thorough theory for the electromagnetic prospecting method in practical application.

1952 S.H. Ward
Showed that it was possible to determine, uniquely, the parameters of a conductive permeable sphere from electromagnetic measurements.

1952 S.H. Ward
Demonstrated a technique for measuring, inductively, the electrical conductivity of a diamond drill core.

1952 W. J. Yost
Presented the theory of electromagnetic reflections from horizontally layered media.

1952 S.H.Ward, H.A. Harvey, A. Stevens and G.H. McLaughlin.
Developed the first broad-band ground electromagnetic system.

1953 D. F. Bleil
A major contribution to early understanding of the induced polarization method.

1953 H.W. March
Developed the mathematics for the field of an oscillating magnetic dipole in the presence of a conducting sphere.

1953 L. Cagniard
The first formalistic presentation of MT theory.

1954 S.H. Ward and H.A. Harvey
Reported on the first deep drillhole electromagnetic prospecting system.

1954 K. L. Cook and R. G. Van Nostrand
A comprehensive, historical, practical, and theoretical review of the resistivity prospecting method (a very important historical

reference).

1954 W.O. Cartier, H.A. Harvey, W.A. Robinson, G.H. McLaughlin.
Developed the first helicopterborne electromagnetic prospecting system.

1954 J.R. Wait
Used the transmission line analogy to produce a compact form of the impedance of a layered earth to an incident plane wave.

1956 R. Clark,
Performed early work on borehole electrical methods in mining environments.

1957 P. Lasfargues,
Early French text on d.c. resistivity sounding.

1957 E.N. Kalenov,
Early Soviet text on interpretation of vertical electrical sounding curves.

1957 P. G. Hallof
Pioneering work on the dipole-dipole method of induced polarization surveying.

1957-65 L. L. Vanyan
Transient and harmonic electromagnetic fields in the near and far zones relative to a finite source.

1958 K. Vozoff,
Demonstrated practicality and limitations of inversion of resistivity data over layered earths.

1958 W.O. Cartier, H.A. Harvey, G.H. McLaughlin, W.A. Robinson, S.H. Ward,
Developed the ground and airborne AFMAG systems

1959 J.R. Wait,
Edited the first significant book on the induced polarization method.

1959 H.O Seigel,
Developed the mathematical basis for the induced polarization response of an inhomogeneous earth.

1959 D. J. Marshall and T. R. Madden
An early in-depth study of the phenomena of induced polorization.

1960 M. Sato and H.M. Mooney,
An outstanding contribution to the understanding of self-potentials in an ore environment.

1960 W. Kertz,
Computed the fields about a conducting cylinder in a transverse uniform alternating magnetic field.

1960 T. Cantwell
Recognized the tensor nature of the MT method.

1962 A.R. Barringer
Developed the INPUT airborne electromagnetic system.

1963 Compagnie Générale de Géophysique,
Publish an album of Schlumberger sounding curves for three-layered earths.

1963 B. Nourbehecht,
Studied irreversible thermodynamic effects in self-potential studies.

1965 D.S. Dar~~r~~e✓,
Introduced dielectric induction logging.

1965 A.A.R. Zohdy,
Used the auxiliary point method of electrical sounding interpretation and demonstrated its relationship to the Dar Zarrouk parameters.

1965 Y.B. Shaub
Initiated research on nonlinear induced polarization.

1965 W. Lowrie and G.F. West
Early scale model demonstration of phase rotation, in electromagnetic methods, brought about by conductive overburden.

1966 E. Orellana and H.M. Mooney,
Publish^ed an album of Wenner sounding curves for layered earths.

1966 G. Kunetz
Introduced convolution in the processing of electrical geophysical data.

1967 F.H. Millet,
Calculated the first table of effects, on an induced polarization survey, of electromagnetic coupling.

1967 F.C. Frischknecht,
Calculated tables for the coupling between dipole pairs over a two-layered earth.

1968 D. Koefoed, ed
Interpret~~ing~~ resistivity sounding curves in the kernel domain

1968 K. Vozoff and C.M. Swift, Jr.
Documented the fact that the North German electrical anomaly arose in shallow sediments, not in the deep crust or upper mantle.

1969 K. Dieter, N.R. Paterson, and F.S. Grant
First to use a surface integral equation method to obtain IP and

resistivity type curves for 3-D bodies.

1969 V.N. Strakhov, and G.N. Kerelina, 1969,
Introduced filter coefficients to transform Schlumberger sounding curves into kernel function curves.

1970 A. Dey and S.H. Ward,
Effected a numerical scheme for inductive sounding of a multi-layered earth with a horizontal magnetic dipole.

1970 B.D. Fuller and S.H. Ward,
Introduced the notion of a linear system description of the electrical properties of rocks.

1970 M.N. Nabighian,
computed the quasi-static transient response of a conducting permeable sphere in a dipolar field.

1970 G.F. Risk, W.J.P. MacDonald, and G.B. Dawson
Used the bipole-dipole method in geothermal exploration.

1970 J.R. Parry and S.H. Ward,
Introduced a surface - integral method for electromagnetic scattering from infinite conductive cylinders, of arbitrary cross-section, in a conductive earth.

1970 J. Ryu, H.F. Morrison, and S.H. Ward,
Computed the fields about a loop source, of alternating current, located above a layered earth.

1970 C.M. Swift, Jr.,
Produced theoretical magnetotelluric and Turam responses for 2-D structures via a transmission-surface algorithm.

1971 B.D. Fuller,
Demonstrated the effect of a conductive shell surrounding a conductive sphere.

1971 D.P. Ghosh,
Introduced calculation of resistivity curves by convolution using inverse filters.

1971 J.H. Coggon,
Used finite-element modeling for interpretation for 2-D resistivity and I.P. data.

1971 T.R. Madden,
Gave the first quantitative analysis of equivalence in geoelectric layered-earth problems.

1972 T.R. Madden,
Documented the transmission system and network analogies to electrical geophysical forward and inverse problems.

1972 D.C. Fraser

Initiated the development of the DIGHEM helicopter-borne electromagnetic system.

1973 G.D. Van Voorhis, P.H. Nelson, T.L. Drake,
Used Drake model of a polarizable earth to remove electromagnetic coupling from induced polarization and thus obtained distinctive IP spectra for porphyry copper deposits

1973 ~~D.D. Snyder and~~ R.M. Merkel,
Used a surface integral equation method for response of conductors with a buried electrode.

1973 D.W. Strangway, C.M. Swift, Jr., and R.C. Holmer,
First applied the audio-frequency magnetotelluric method to mineral exploration.

1973 G.H. McLaughlin, and W.M. Dolan
Developed the Crone PEM time-domain electromagnetic system

1973 J.R. Inman, J. Ryu, and S.H. Ward, 1973,
Introduced the use of Bachus and Gilbert generalized inversion to Schlumberger sounding.

1973 W.E. Glenn, J. Ryu, S.H. Ward, W.J. Peoples, and R.J. Phillips,
First use of generalized inversion of magnetic dipole data over a layered earth.

1974 T. Lee and R. Lewis,
Obtained the transient electromagnetic response of a large loop on a layered earth.

1974 H.O. Seigel,
Introduced the notion of magnetic induced electrical polarization.

1974 P. Annan
Devised a numerical method for determining the electromagnetic response of a thin plate via eigencurrents.

1975 B.R. Spies,
Described the dual loop configuration of the transient electromagnetic method.

1975 G.W. Hohmann,
Developed a 3-D integral equation algorithim for modeling induced polarization and electromagnetic data.

1975 K. Vozoff and D.L.B. Jupp,
Showed how to invert two electrical geophysical data sets simultaneously.

1975 A.A.R. Zohdy
Developed an automatic method of direct interpretation of Schulumberger data.

1976 J.J. Lajoie and G.F. West,
Formulated the problem of a thin conductive plate in a less conductive layered earth.

1976 F.M. Kamenetskii,
Produced an applications handbook for transient electromagnetic methods.

1976 G.H. McLaughlin
Developed the digital Newmont EMP system.

1977 J.J. Daniels,
Modeled 3-D resistivity and induced polarization data for buried electrodes, using a surface-integral equation method.

1978 W.H. Pelton,
Demonstrated that the Cole-Cole model was an adequate representation for all polarizable earths and that by using this model, mineral discrimination and coupling removal by induced polarization was realizable.

1978 R.F. Corwin and D.B. Hoover,
Demonstrated that very low noise levels can be obtained in self-potential surveys by care in preparing and placing electrodes.

1979 M.N. Nabighian,
Introduced the notion of the "smoke ring" behavior of electric currents induced in a homogeneous earth by a transient-excited loop source.

1979 W.L. Anderson,
Introduced the most widely used digital filter method of evaluating Hankel transforms.

1979 T.D. Gamble, W.M. Goubau, and J. Clarke.
Received recognition for introducing magnetotellurics with a remote reference.

1980 A.A.R. Zohdy,
Used Gauss - Laquer method to compute Schlumberger sounding curves over layered structures.

1980 S.C. Ting and G.W. Hohmann,
Developed an integral equation algorithm for modeling magnetotelluric data

1980 G.A. Sobolev and V.M. Denin
Proved ~~Processed~~ the feasibility of the piezoelectric method of geophysical prospecting.

1980 J.A. Stodt
Exploited the non-stationery nature of MT noises and signals to improve estimates of the MT transfer functions.

1982 J.A. Stodt
Developed the statistical models of MT signals with added random noise.

1982 D.Z. Oehler and B.K. Strömberg,
Demonstrated the viability of the induced-polarization method for the indirect detection of hydrocarbons.

1983 W.R. Siegel,
Demonstrated the applicability of coupling mechanisms which allowed prediction of self-potential and thermal anomalies from known distributions of heat sources.

1984 P.E. Wannamaker, G.W. Hohmann, and W.A. San Filipo,
Developed an MT integral equation algorithim for modeling 3-D bodies in a layered earth.

1984 M.N. Nabighian, G.L. Oppliger, R.N. Edwards, B. Lo, and S.S. Chessman,
Demonstrated the borehole magnetometric resistivity method.

1984 G.F. Lezama,
First reported the successful use of the "head-on" Schlumberger array in Iceland.

1984 A.V. Dyck and G.F. West,
Investigated the surface-to-borehole electromagnetic method.

1984 P.E. Wannamaker, G.W. Hohmann, and S.H. Ward,
Demonstrated that 1-D or 2-D TE modeling of MT data can produce grossly erroneous interpretations when the earth is 3-D.

1986 F.X. Bostick, Jr.,
Introduced the EMAP method of MT data acquisition and processing which, by virture of an array of E-field sensors, largely eliminates the "static effect" in MT data.

1986 G.A. Newman, G.W. Hohmann, and W.L. Anderson
Solved the problem of the transient electromagnetic response of a 3-D body in a layered earth.