

# STANFORD EXPLORATION PROJECT MEMBERSHIP SUMMARY

Sponsor	73-4	74-5	75-6	76-7	77-8	78-9	79-80	80-1	81-2	82-3	83-4
AGIP (Italy)	- <sup>1</sup>	-	-	-	-	+ <sup>2</sup>	+	+	+	+	+
Amoco	+	+	+	+	+	+	+	+	+	+	+
ARAMCO (Saudi Arabia)	-	-	-	-	-	-	-	+	+	+	+
Arco	+	+	+	+	+	+	+	+	+	+	+
British Petroleum	-	-	-	-	-	+	+	+	+	+	+
Canterra (Canada)	-	-	-	-	-	-	-	-	+	+	+
CGG (France)	-	-	-	-	+	+	+	+	+	+	+
Chevron	+	+	+	+	+	+	+	+	+	+	+
Cities Service	-	-	-	+	+	+	+	+	+	-	-
Conoco	+	+	+	+	+	+	+	+	+	+	+
Digicon	+	+	+	+	+	+	+	+	+	+	+
Digitech (Canada)	-	-	+	-	-	-	-	-	-	-	-
Dome (Canada)	-	-	-	-	-	-	-	-	-	-	+
Exxon	+	+	+	+	+	+	+	+	+	+	+
GECO (Norway)	-	-	-	-	+	+	+	+	+	+	+
General Crude	-	-	-	+	-	-	-	-	-	-	-
Geosource (Petty-Ray)	+	+	+	+	+	+	+	+	+	+	+
Getty Oil	-	-	-	-	+	+	+	+	+	+	+
GSI	+	+	+	+	+	+	+	+	+	+	+
Gulf	-	-	-	+	+	+	+	+	+	+	+
IBM	-	-	-	+	+	+	+	+	+	+	+
INA (Yugoslavia)	+	+	+	+	-	-	-	-	-	-	-
Japex Geoscience	-	-	-	-	-	-	+	+	+	+	+
Koninklijke Shell (Holland)	-	+	+	+	+	+	+	+	+	+	+
Marathon	-	-	-	+	+	+	+	+	-	-	+
Mobil	+	+	+	+	+	+	+	+	+	+	+
Norsk Hydro (Norway)	-	-	-	-	-	-	-	-	+	+	+
Occidental	-	-	+	+	+	+	+	+	+	+	+
Petrofina (Belgium)	-	+	-	-	-	-	-	-	-	-	-
Phillips Petroleum	-	-	-	-	+	+	+	+	+	+	+
Prakla-Seismos (W. Germany)	-	-	-	-	+	+	+	+	+	+	+
Preusag (Germany)	+	+	+	-	-	-	-	-	-	-	-
Santa Fe Minerals	-	-	-	-	-	-	-	-	-	-	+
Schlumberger	-	-	-	-	-	-	-	-	+	+	+
Seiscom-Delta	+	+	+	-	-	-	-	-	-	-	-
Seismograph Service	+	+	+	+	+	+	+	+	+	+	+
Shell	+	+	+	-	-	-	-	-	-	-	-
SNEA (P) (France)	+	+	+	+	+	+	+	+	+	+	-
Sun Exploration	+	+	+	+	+	+	+	+	+	+	+
Superior Oil	-	-	-	-	-	-	+	+	+	+	+
Teledyne	+	+	+	-	-	+	+	+	-	-	-
Texaco	+	+	+	+	+	+	+	+	+	+	+
TOTAL (France)	+	+	+	+	+	+	+	+	+	+	+
Union	+	+	+	+	+	+	+	+	+	+	+
USGS	+	+	+	+	+	+	+	+	+	+	+
United Geophysical	+	+	-	-	-	+	+	-	-	-	-
Veritas Seismic (Canada)	-	-	-	-	-	-	-	-	-	-	+
Western Geophysical	+	+	+	+	+	+	+	+	+	+	+

<sup>1</sup>Dash (-) represents a nonmember

<sup>2</sup>Plus (+) represents a current member.

## References

- Aki, K., and Richards, P.G., 1980, *Quantitative seismology, theory and methods*: vol. I and II, Freeman, San Francisco.
- Anstey, N.A., 1980, *Seismic exploration for sandstone reservoirs*, International Human Resources Development Corporation, Boston.
- Backus, M.M., 1959, Water reverberations — their nature and elimination: *Geophysics*, vol. 24, pp. 233-261.
- Backus, M.M., and Chen, R.L., 1975, Flat spot exploration: *Geophys. Prosp.*, vol. 23, pp. 533-577.
- Balch, A.H., Lee, M.W., Miller, J.J., and Taylor, R.T., 1982, The use of vertical seismic profiles in seismic investigations of the earth: *Geophysics*, vol. 47, pp. 906-918.
- Bally, A.W., 1983, Seismic expression of structural styles — A picture and work atlas: AAPG studies in geology #15 - vol. 1, 2, and 3, AAPG, P.O. Box 979, Tulsa, OK 74101
- Baysal, E., Kosloff, D.D., and Sherwood, J.W.C., 1983, Reverse time migration: *Geophysics*, vol. 48, pp. 1514-1524.
- Beresford-Smith, G., and Mason, I.M., 1980, A parametric approach to the compression of seismic signals by frequency transformation: *Geophys. Prosp.*, vol. 28, pp. 551-571
- Berkhout, A.J., 1979, Steep dip finite-difference migration: *Geophys. Prosp.*, vol. 27, pp. 196-213.
- Berkhout, A.J., and van Wulften Palthe, D.W., 1979, Migration in terms of spatial deconvolution: *Geophys. Prosp.*, vol. 27, pp. 261-291.
- Berkhout, A.J., 1980, *Seismic migration — Imaging of acoustic energy by wave field extrapolation*: Amsterdam/New York, Elsevier/North Holland Publishing Co.
- Berkhout, A.J., and van Wulften Palthe, D.W., 1980, Migration in the presence of noise: *Geophys. Prosp.*, vol. 28, pp. 372-383.
- Berkhout, A.J., 1981, Wave field extrapolation techniques in seismic migration, a tutorial: *Geophysics*, vol. 46, pp. 1638-1656.
- Berkhout, A.J., and De Jong, B.A., 1981, Recursive migration in three dimensions: *Geophys. Prosp.*, vol. 29, pp. 758-781.
- Berryhill, R.T., 1979, Wave equation datuming: *Geophysics*, vol. 44, pp. 1329-1344.
- Bleistein, N., and Cohen, J.K., 1979, Direct inversion procedure for Claerbout's equations: *Geophysics*, vol. 44, pp. 1034-1040.
- Bloxsom, H., 1979, *Migration and interpretation of deep crustal seismic reflection data*: Ph.D. thesis,<sup>†</sup> Stanford University, SEP-22.

<sup>†</sup> Ph.D. theses included in this bibliography are available from University Microfilms International, 300 N. Zeeb Road, Ann Arbor, MI 48106, USA.

## References

- Bolondi, G., Rocca, F., and Savelli, S., 1978, A frequency domain approach to two-dimensional migration: *Geophys. Prosp.*, vol. 26, pp. 750-772.
- Bolondi, G., Loinger, E., and Rocca, F., 1982, Offset continuation of seismic sections: *Geophys. Prosp.*, vol. 30, pp. 813-828.
- Brown, D.L., 1983, Applications of operator separation in reflection seismology: *Geophysics*, vol. 48, pp. 288-294.
- Buhl, P., Diebold, J.B., and Stoffa, P.L., 1982, Array length magnification through the use of multiple sources and receiving arrays: *Geophysics*, vol. 47, pp. 311-315.
- Burg, J.P., 1975, *Maximum entropy spectral analysis*: Ph.D. thesis, Stanford University, SEP-6.
- Cherry, J.T., and Waters, K.H., 1968, Shear-wave recording using continuous signal methods, Part I - Early development: *Geophysics*, vol. 33, pp. 229-239.
- Chun, J.H., and Jacewitz, C.A., 1981, Fundamentals of frequency domain migration: *Geophysics*, vol. 46, pp. 717-733.
- Claerbout, J.F., 1970, Coarse grid calculations of waves in inhomogeneous media with application to delineation of complicated seismic structure: *Geophysics*, vol. 35, pp. 407-418.
- Claerbout, J.F., 1971, Toward a unified theory of reflector mapping: *Geophysics*, vol. 36, pp. 467-481.
- Claerbout, J.F., and Johnson, A.G., 1971, Extrapolation of time-dependent waveforms along their path of propagation: *Geophysical Journal of the Royal Astronomical Society*, vol. 26, pp. 285-293.
- Claerbout, J.F., 1971, Numerical holography: *Acoustical Holography*, vol. 3, pp. 273-283.
- Claerbout, J.F., and Doherty, S.M., 1972, Downward continuation of moveout corrected seismograms: *Geophysics*, vol. 37, pp. 741-768.
- Claerbout, J.F., and Muir, F., 1973, Robust modeling with erratic data: *Geophysics*, vol. 38, pp. 826-844.
- Claerbout, J.F., 1976, *Fundamentals of geophysical data processing*: McGraw-Hill (sometimes referred to in the text of this book as FGDP).
- Clayton, R.W., and Engquist, B., 1980, Absorbing side boundary conditions for wave-equation migration: *Geophysics*, vol. 45, pp. 895-904.
- Clayton, R.W., 1981, *Wavefield inversion methods for refraction and reflection data*: Ph.D. thesis, Stanford University, SEP-27.
- Clayton, R.W., and McMechan, G.A., 1981, Inversion of refraction data by wave field continuation: *Geophysics*, vol. 46, pp. 860-868.
- Cohen, J.K., and Bleistein, N., 1979, Velocity inversion procedure for acoustic waves: *Geophysics*, vol. 44, pp. 1077-1087.
- Crank, J., and Nicolson, P., 1947, A Practical method for numerical evaluation of solutions of partial differential equations of the heat-conduction type: Proc. Cambridge Philos. Soc., vol. 43, p. 50.
- Dahm, C.G., and Graebner, R.J., 1982, Field development with three-dimensional seismic methods in the Gulf of Thailand - a case history: *Geophysics*, vol. 47, pp. 149-176.
- Deans, S.R., 1983, The Radon transform and some of its applications: John Wiley, pp. 204-217.
- Dent, B., 1983, Compensation of marine seismic data for the effects of highly variable water depth using ray-trace modeling — A case history: *Geophysics*, vol. 48, pp. 910-933.
- Diebold, J.D., and Stoffa, P.L., 1981, The travel time equation, tau-p mapping and inversion of common midpoint data: *Geophysics*, vol. 46, pp. 238-254.
- Diet, J.D., and Fourmann, J.M., 1979, Determination of the shape parameter W in Stolt's frequency domain migration: presented at 49th Annual International Society of Exploration Geophysicists Meeting, New Orleans.
- Doherty, S.M., and Claerbout, J.F., 1976, Structure independent seismic velocity estimation: *Geophysics*, vol. 41, pp. 850-881.
- Doherty, S.M., 1975, *Structure independent seismic velocity estimation*: Ph.D. thesis, Stanford University, SEP-4.
- Dohr, G.P., and Stiller, P.K., 1975, Migration velocity determination: Part II. Applications: *Geophysics*, vol. 40, pp. 6-16.

## References

- Embree, P., Burg, J.P., and Backus, M.M., 1963, Wide-band velocity filtering — the pie-slice process: *Geophysics*, vol. 28, pp. 948-974.
- Engquist, B., and Majda, A., 1979, Radiation boundary conditions for acoustic and elastic waves: *Communications on Pure and Applied Mathematics*, vol. 32, pp. 313-320.
- Erickson, E.L., Miller, D.E., and Waters, K.H., 1968, Shear-wave recording using continuous signal methods, Part II - Later experimentation: *Geophysics*, vol. 33, pp. 240-254.
- Estevez, R., 1977, *Wide-angle diffracted multiple reflections*: Ph.D. thesis, Stanford University, SEP-12.
- Estevez, R., and Claerbout, J.F., 1982, Wide-angle diffracted multiple reflections: *Geophysics*, vol. 47, pp. 1255-1272.
- Fenati, D. and Rocca, F. 1980, Seismic reciprocity field tests from the Italian Peninsula: presented at the workshop on Seismic Reciprocity, 50th Annual International SEG Meeting, Houston, also expected to appear in *Geophysics* during 1984.
- FGDP: see Claerbout, J.F., 1976.
- French, W.S., 1974, Two-dimensional and three-dimensional migration of model-experiment reflection profiles: *Geophysics*, vol. 39, pp. 265-277.
- French, W.S., 1975, Computer migration of oblique seismic reflection profiles: *Geophysics*, vol. 40, pp. 961-980.
- Gabitzsch, J.H., 1978, Wave number migration: Application to variable velocity: presented at the 48th Annual International SEG Meeting, San Francisco.
- Gal'perin, E.I., 1974, *Vertical Seismic Profiling*, translated by A.J. Hermont, Society of Exploration Geophysicists, Special Publication No. 12
- Gardner, G.H.F., French, W.S., and Matzuk, T., 1974, Elements of migration and velocity analysis: *Geophysics*, vol. 39, pp. 811-825.
- Garotta, R., and Baixas, F., 1979, Simulation directional acquisition as an aid to migration: presented at the 49th Annual International SEG Meeting, New Orleans.
- Gazdag, J., 1978, Wave equation migration with the phase shift method: *Geophysics*, vol. 43, pp. 1342-1351.
- Gazdag, J., 1980, Wave equation migration with the accurate space derivative method: *Geophys. Prosp.*, vol. 28, pp. 60-70.
- Gazdag, J., 1981, Modeling of the acoustic wave equation with transform methods: *Geophysics*, vol. 46, pp. 854-859.
- Gazdag, J., and Sguazzero, P., 1984, Migration of seismic data by phase shift plus interpolation: *Geophysics*, vol. 49, pp. 124-131.
- Gibson, B., Larner, K., and Levin, S., 1983, Efficient 3-D migration in two steps: *Geophys. Prosp.*, vol. 31, pp. 1-33.
- Godfrey, R.J., 1979, *A stochastic model for seismogram analysis*: Ph.D. thesis, Stanford University, SEP-17.
- Godfrey, R. and Rocca, F., 1981, Zero memory non-linear deconvolution: *Geophys. Prosp.*, vol. 29, pp. 189-228.
- Gonzalez-Serrano, A., 1982, *Wave equation velocity analysis*: Ph.D. thesis, Stanford University, SEP-31.
- Gonzalez-Serrano, A., and Claerbout, J.F., 1984, Wave equation velocity analysis: *Geophysics*, vol. 49, pp. 1431-1456
- Gray, W.C., 1979, *Variable norm deconvolution*: Ph.D. thesis, Stanford University, SEP-19.
- Hale, D. and Claerbout, J.F., 1983, Butterworth dip filters: *Geophysics*, vol. 48, pp. 1033-1038.
- Hale, I.D., 1983, *Dip-Moveout by Fourier Transform*: Ph.D. thesis, Stanford University, SEP-36.
- Hale, I.D., 1984, Dip-moveout by Fourier transform: *Geophysics*, vol. 49, pp. 741-757.
- Hatton, L., Larner, K., and Gibson, B., 1981, Migration of seismic data from inhomogeneous media: *Geophysics*, vol. 46, pp. 751-767.
- Herman, A.J., Anania, R.M., Chun, J.H., Jacewitz, C.A., and Pepper, R.E.F., 1982, A fast three-dimensional modeling technique and fundamentals of three-dimensional frequency-domain migration: *Geophysics*, vol. 47, pp. 1627-1644.

- Hilterman, F.J., 1970, Three-dimensional seismic modeling: *Geophysics*, vol. 35, p. 1020.
- Hood, P., 1978, Finite difference and wave number migration: *Geophys. Prosp.*, vol. 26, pp. 773-789.
- Hubral, P., 1977, Time migration - some ray theoretical aspects: *Geophys. Prosp.*, vol. 25, pp. 738-745.
- Hubral, P., 1980, Wavefront curvatures in three-dimensional laterally inhomogeneous media with curved interfaces: *Geophysics*, vol. 45, pp. 905-913.
- Jacobs, A., 1982, *The pre-stack migration of profiles*: Ph.D. thesis, Stanford University, SEP-34.
- Jakubowicz, H., and Levin, S., 1983, A simple exact method of 3-D migration: *Geophys. Prosp.*, vol. 31, pp. 34-56.
- Jain, S., and Wren, A.E., 1980, Migration before stack - Procedure and significance: *Geophysics*, vol. 45, pp. 204-212.
- Jones, W.B., and Thron, W.J., 1980, *Continued fractions: encyclopedia of mathematics and its applications*: American Mathematical Society, vol 11.
- Judson, D.R., Lin, J., Schultz, P.S., and Sherwood, J.W.C., 1980, Depth migration after stack: *Geophysics*, vol. 45, pp. 361-375.
- Kennett, B.L.N., 1983, *Seismic wave propagation in stratified media*: Cambridge University Press.
- Kjartansson, E., 1979a, *Attenuation of seismic waves in rocks and applications in energy exploration*: Ph.D. thesis, Stanford University, SEP-23.
- Kjartansson, E., 1979b, Constant  $Q$  - wave propagation and attenuation: *J. Geophys. Res.*, vol. 84, pp. 4737-4748.
- Kosloff, D.D., and Baysal, E., 1983, Migration with the full acoustic wave equation: *Geophysics*, vol. 48, pp. 677-687.
- Larner, K., Chambers, R., Yang, M., Lynn, W., and Wai, W., 1983, Coherent noise in marine seismic data: *Geophysics*, vol. 48, pp. 854-886.
- Larner, K.L., Hatton, L., Gibson, B.S., and Hsu, I.C., 1981, Depth migration of imaged time sections: *Geophysics*, vol. 46, pp. 734-750.
- Levin, F.K., 1971, Apparent velocity from dipping interface reflections: *Geophysics*, vol. 36, pp. 510-516.
- Levin, F.K., Bayhi, J.F., Dunkin, J.W., Lea, J.D., et al., 1976, Developments in exploration geophysics, 1969 -1974: *Geophysics*, vol. 43, pp. 23-48.
- Loewenthal, D., Lu, L., Roberson, R., and Sherwood, J., 1976, The wave equation applied to migration: *Geophys. Prosp.*, vol. 24, pp. 380-399.
- Lynn, W.S., 1979, *Velocity estimation in laterally varying media*: Ph.D. thesis, Stanford University, SEP-21.
- Lynn, W.S., and Claerbout, J.F., 1982, Velocity estimation in laterally varying media: *Geophysics*, vol. 47, pp. 884-897.
- Ma Zaitian, 1981, *Finite difference migration with higher order approximation*: technical report of the China National Oil and Gas Exploration and Development Co.
- Ma Zaitian, 1982, Steep dip finite difference migration: *Oil Geophysical Prospecting*, no. 1, pp. 6-15 (in Chinese).
- Madden, T.R., 1976, Random networks and mixing laws: *Geophysics*, vol. 41, pp. 1104-1125.
- May, B.T., and Covey, J.D., 1981, An inverse method for computing geologic structures from seismic reflections - zero-offset case: *Geophysics*, vol. 46, pp. 268-287.
- Morley, L., 1982, *Predictive techniques for marine multiple suppression*: Ph.D. thesis, Stanford University, SEP-29.
- Morley, L., and Claerbout, J.F., 1983, Predictive deconvolution in shot-receiver space: *Geophysics*, vol. 48, pp. 515-531.
- Muir F., and Claerbout, J.F., 1980, Impedance and wave extrapolation: presented at the 42nd Meeting of the European Association of Exploration Geophysicists, Istanbul.
- Ostrander, W.J., 1984, Plane wave reflection coefficients for gas sands at non-normal angles of incidence: *Geophysics*, vol. 49, pp. (?)

## References

- Ottolini, R., Sword, C., and Claerbout, J.F., 1984, On-line movies of reflection seismic data with description of a movie machine: *Geophysics*, vol. 49, pp. 195-200.
- Ottolini, R., and Claerbout, J.F., 1984, The migration of common midpoint slant stacks: *Geophysics*, vol. 49, pp. 237-249.
- Ottolini, R., 1982, *Migration of reflection seismic data in angle-midpoint coordinates*: Ph.D. thesis, Stanford University, SEP-33.
- Pan, P.H., 1983, Case history of the exploration of the Grand Isle 95 Field in the Gulf of Mexico: *Geophysics*, vol. 48, pp. 900-909.
- Pann, K., Eisner, E., and Shin, Y., 1979, A collocation formulation of wave equation migration: *Geophysics*, vol. 44, pp. 712-721.
- Phinney, R.A., Chowdhury, K.R., and Frazer, L.N., 1981, Transformation and analysis of record sections: *J. Geophys. Res.*, vol. 86, pp. 359-377.
- Radon, J., 1917, Über die Bestimmung von Funktionen durch ihre Integralwerte längs gewisser Mannigfaltigkeiten, *Berichte Sächsische Akademie der Wissenschaften*. Leipzig, Math. - Phys. Kl. 69, pp. 262-267. for English translation see Deans [1983].
- Rice, R.B., 1962, Inverse convolution filters: *Geophysics*, vol. 27, pp 4-18.
- Riley, D.C., 1974, *Wave equation synthesis and inversion of diffracted multiple seismic reflections*: Ph.D. thesis, Stanford University, SEP-3.
- Riley, D.C., and Claerbout, J.F., 1976, 2-D multiple reflections: *Geophysics*, vol. 41, pp. 592-620.
- Ristow, D., 1980, *Three-dimensional finite-difference migration*: Ph.D. thesis, University of Utrecht, The Netherlands.
- Robinson, E.A., 1983, *Migration of geophysical data*: International Human Resources Development Corporation, Boston.
- Robinson, J.C., and Robbins, T.R., 1978, Dip-domain migration of two-dimensional seismic profiles: *Geophysics*, vol. 43, pp. 77-93.
- Rosenbaum, J.H. and G.F. Boudreaux, 1981, Rapid convergence of some seismic processing algorithms: *Geophysics* vol. 46, pp. 1667-1672.
- Sangree, J.B., and Widmier, J.M., 1979, Interpretation of depositional facies from seismic data: *Geophysics*, vol. 44, pp. 131-160.
- Sattlegger, J.W., 1975, Migration velocity determination: Part I. Philosophy: *Geophysics*, vol. 40, pp. 1-5.
- Sattlegger, J.W., Stiller, P.K., Echterhoff, J.A., and Hentschke, M.K., 1980, Common offset plane migration (COPMIG): *Geophys. Prosp.*, vol. 28, pp. 859-871.
- Schneider, W.A., Larner, K.L., Burg, J.P., and Backus, M.M., 1964, A new data-processing technique for the elimination of ghost arrivals on reflection seismograms: *Geophysics*, vol. 39, pp. 783-805.
- Schneider, W.A., 1971, Developments in seismic data processing and analysis (1968-1970): *Geophysics*, vol. 36, pp. 1043-1073.
- Schneider, W.A., 1978, Integral formulation in two and three dimensions: *Geophysics*, vol. 43, pp. 49-76.
- Schultz, P. S., 1976, *Velocity estimation by wave front synthesis*: Ph.D. thesis, Stanford University, SEP-9.
- Schultz, P.S., and Claerbout, J.F., 1978, Velocity estimation and downward continuation by wavefront synthesis: *Geophysics*, vol. 43, pp. 691-714.
- Schultz, P.S., and Sherwood, J.W., 1980, Depth migration before stack: *Geophysics*, vol. 45, pp. 376-393.
- Schultz, P.S., 1982, A method for direct estimation of interval velocities: *Geophysics*, vol. 47, pp. 1657-1671.
- Sengbush, R.L., 1983, *Seismic exploration methods*: International Human Resources Development Corporation, Boston.
- Sheriff, R.E., 1980, *Seismic stratigraphy*: International Human Resources Development Corporation, Boston.
- Sherwood, J.W.C., Adams, H., Blum, C., Judson, D., Jin Lin, and Meadours B., 1976, Developments in filtering seismic data: presented at the 46th Annual International SEG Meeting, Houston.

## References

- Sherwood, J.W.C., Schultz, P.S., and Judson, J.R., 1976, *Some recent developments in migration before stack*: released by Digicon Inc.
- Slotnick, M.M., 1959, *Lessons in seismic computing*: Tulsa, Society of Exploration Geophysicists.
- Stolt, R., 1978, Migration by Fourier transform: *Geophysics*, vol. 43, pp. 23-48.
- Taner, M.T., and Koehler, F., 1969, Velocity spectra — digital computer derivation and applications of velocity functions: *Geophysics*, vol. 34, pp. 859-881.
- Taner, M.T., and Koehler, F. (undated), *Wave equation migration*: released by Seiscom Delta Inc., Houston.
- Taner, M.T., 1980, Long-period sea-floor multiples and their suppression: *Geophys. Prosp.*, vol. 28, pp. 30-48.
- Taner, M.T., and Koehler, F., 1981, Surface consistent corrections: *Geophysics*, vol. 46, pp. 17-22.
- Taner, M.T., and Coburn, K.W., 1980, *Surface consistent estimation of source and receiver response functions*: presented at the 50th Annual International SEG Meeting, Houston.
- Tatham, R.H., and Stoffa, P.L., 1976,  $V_p/V_s$  — A potential hydrocarbon indicator: *Geophysics*, vol. 41, pp. 837-849.
- Tatham, R.H., 1982,  $V_p/V_s$  and lithology: *Geophysics*, vol. 47, pp. 336-344.
- Thorson, J., 1984, *Velocity stack and slant stack inversion methods*: Ph.D. thesis, Stanford University, SEP-39.
- Treitel, S., Gutowski, P.R., and Wagner, D.E., 1982, Plane wave decompositions of seismograms: *Geophysics*, vol. 47, pp. 1375-1401.
- Trorey, A.W., 1970, A simple theory for seismic diffractions: *Geophysics*, vol. 35, pp. 762-784.
- Trorey, A.W., 1977, Diffractions for arbitrary source-receiver locations: *Geophysics*, vol. 42, pp. 1177-1182.
- Tufekcic, D., Claerbout, J.F. and Rasperic, Z., 1981, Spectral balancing in the time domain: *Geophysics*, vol. 46, pp. 1182-1188.
- Waters, K.H., 1981, *Reflection seismology, a tool for energy resource exploration* (second edition): Wiley, New York.
- Wiggins, R.A., Larner, K.L., and Wisecup, R.D., 1976, Residual statics analysis as a general linear inverse problem: *Geophysics*, vol. 41, pp. 922-938.
- Yilmaz, O., 1979, *Pre-stack partial migration*: Ph.D. thesis, Stanford University, SEP-18.
- Yilmaz, O., and Claerbout, J.F., 1980, Pre-stack partial migration: *Geophysics*, vol. 45, pp. 1753-1779.
- Yilmaz, O., and Cumro, D., 1983, Worldwide Assortment of Field Seismic Records, released by Western Geophysical Company of America, Houston.
- Ziolkowski, A., 1984, *Deconvolution* International Human Resources Development Corporation, Boston.
- Zoeppritz, K., 1919, Erdbebenwellen VIIIIB: Uber Reflexion und Durchgang seismischer Wellen durch Unstetigkeitsflächen: *Göttinger Nachr.*, vol. 1, pp. 66-84.

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