

The HYDRODYNAMICS Group

studies in mass and energy transport in the earth

JOHN D. BREDEHOEFT *PhD, NAE*

Contaminant Transport
Numerical Models of Groundwater Flow and Transport
Water Resources Development
Contaminant Clean-Up including Nuclear Waste Disposal

EDUCATION

1955 BSE **GEOLOGICAL ENGINEERING**, Princeton University (Cum Laude)
1957 MS **GEOLOGY**, University of Illinois
1962 Ph.D. **GEOLOGY**, University of Illinois (minor in Civil Engineering—Soil Mechanics);
Thesis: *The Hydrogeology of the Lower Humboldt River Basin, Nevada.*

EXPERIENCE

In 1995 John Bredehoeft established the consulting firm—The HydroDynamics Group. He devoted the previous 32 years to public service at the U.S. Geological Survey (USGS). His expertise is in water resources, especially groundwater; he has worked on many aspects of water related problems. During his years at the USGS, he held both scientific research and high-level management positions. In 1994, Bredehoeft retired as a senior research geologist from the Water Resources Division of the USGS.

While at the USGS Bredehoeft testified before Congress on such diverse topics as: the USGS study of the Potomac Estuary, National Policy on the geologic disposal of nuclear wastes, water in the western United States, the use of numerical models in management decisions. He was a member of the National Academy of Sciences/National Research Council (NAS/NRC) Committee on the Waste Isolation Pilot Plant (WIPP), and a member of the NAS/NRC Panel that reviewed groundwater concerns for the Yucca Mountain Nuclear Repository.

Bredehoeft was George Pinder's Ph.D. advisor at the University of Illinois in 1967-68. Together they 1) developed and published the first widely utilized numerical groundwater flow model (for which they received the Horton Award of the American Geophysical Union), and 2) the first widely used contaminant transport model (for which they received the Meinzer Award of the Geological Society of America). During his career in research Bredehoeft worked on a variety of other topics: 1) analytical methods for the field determination of aquifer parameters, 2) geophysical experiments for both the prediction and control of earthquakes. He spent two years at Resources for the Future (RFF) where he engaged in analytical studies of the economics of groundwater management. He engaged in experiments utilizing water wells as strain meters at Parkfield, CA, and in studies of the hydrodynamics of deep sedimentary basins. In recent years he has also worked on studies of contaminant movement and nuclear waste disposal.

In the tradition of the USGS, Bredehoeft held positions in both research and high-level management. For five years in the 1970s, he managed the USGS National Water Research Program. In the early 1980s, he was the Regional Hydrologist, Western Region, where he supervised the Survey's water activities in the eight western states—Alaska, Arizona, California, Hawaii, Idaho, Nevada, Oregon, and Washington.

Bredehoeft taught one year as a visiting professor at the University of Illinois; and was a consulting professor at Stanford for 8 years, and at the University of California—Santa Cruz, and San Francisco State University for several years. He served on numerous national advisory committees for the National Research Council, the National Science Foundation, and the Department of Energy.

He received numerous awards: member of the U.S. National Academy of Engineering; Editor of the scientific journal, *Ground Water* (1991-95); received both the Horton Medal of the American Geophysical Union (the highest award given to a hydrologist), the Penrose Medal of the Geological Society of America (the highest award given to a geologist), and made a life-member of the National Ground Water Association (their highest award).

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EXPERIENCE

- 1994 **Consultant/Principal**—The HYDRODYNAMICS Group, Sausalito, CA
- 1985-94 **Research Geologist**—U.S. Geological Survey (USGS), Menlo Park, CA (Supergrade)
- 1989-91 **Consulting Professor**—Applied Earth Sciences Department, Stanford University
- 1980-85 **Regional Hydrogeologist**—USGS, Region Manager (8 states west), Menlo Park, CA
- 1974-79 **Deputy Chief Hydrologist for Research**—USGS, Reston, VA
- 1968-70 **Resources for the Future**—USGS (cooperative studies), Washington DC
- 1967-68 **Visiting Associate Professor**—Geology Department, University of Illinois, IL
- 1962-67 **Research Geologist**—USGS, Water Resources Division, Arlington, Virginia
- 1961-62 **Groundwater Hydrologist**—Nevada Department of Conservation and Natural Resources and the Desert Research Institute, University of Nevada, Reno, NV
- 1957-59 **Exploration Geologist**—Humble Oil, Vernal, UT

BIBLIOGRAPHY

Bredehoeft is the author of more than 100 scientific papers in the referred scientific literature.

SCIENTIFIC COMMITTEES

- 1995-98 **Council International Exchange of Scholars (Fulbright Scholars)**—Advisory Board
- 1996-98 **Lawrence Livermore National Laboratory**—Advisory Committee for Environmental Programs
- 1992-96 **Association of Ground Water Scientists and Engineers**, National Ground Water Association Board of Directors
- 1992-95 **Editor**—*GROUND WATER*, Journal of the Association of Ground Water Scientists and Engineers, National Ground Water Association.
- 1984-94 **National Research Council**—Member, Committee on the Waste Isolation Pilot Plant (WIPP)
- 1990-93 **National Science Foundation**—Member, Advisory Committee for Earth Science
- 1990-92 **National Research Council**—Member, HYTEC Panel for the Yucca Mountain Nuclear Repository (Chair, Modeling Subcommittee)
- 1970-92 **numerous other Advisory Committees, including NAS/NRC, US-DOE, UNESCO, etc.**

SCIENTIFIC SOCIETIES

American Association of Petroleum Geologists
Geological Society of America
American Geophysical Union
Association of Ground Water Scientists and Engineers
Russian Academy of Natural Sciences
U.S. National Academy of Engineering

MEDALS and AWARDS

- 1969 **HORTON AWARD**—American Geophysical Union (G. F. Pinder & J.D. Bredehoeft)
- 1974 **INTERDISCIPLINARY AWARD**—U.S. Committee for Rock Mechanics (C.B. Raleigh, J. Healy, & J.D. Bredehoeft)
- 1975 **O.E. MEINZER AWARD**—Geological Society of America (J.D. Bredehoeft & G.F. Pinder)
- 1978 **MERITORIOUS SERVICE AWARD**—Department of Interior
- 1981 **DISTINGUISHED SERVICE AWARD**—Department of Interior
- 1984 **BOGGESS AWARD**—American Water Resources Association (E.G. Reichard & J.D. Bredehoeft)
- 1991 **FOREIGN ASSOCIATE, RUSSIAN ACADEMY OF NATURAL SCIENCES**
- 1991 **M. KING HUBBERT AWARD**—National Ground Water Association
- 1994 **MEMBER, U.S. NATIONAL ACADEMY OF ENGINEERING**
- 1997 **HORTON MEDAL**—American Geophysical Union
- 1997 **PENROSE MEDAL**—Geological Society of America
- 1997 **LIFE MEMBER**—National Ground Water Association
- 1999 **LANGBEIN DISTINGUISHED LECTURER**—American Geophysical Union
- 2001 **HALBOUTY DISTINGUISHED LECTURE in RESOURCES**—Geological Society of America
- 2003 **DISTINGUISHED SERVICE AWARD**—Hydrogeology Division, Geological Society of America
- 2004 **LIFETIME ACHIEVEMENT AWARD**—Ground Water Resources Association

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SIGNIFICANT PROJECTS--USGS:

- Flow & Contaminant Transport Models
- Economic Studies—Conjunction Ground and Surface Water Use
- Earthquake Control—Rangeley, Colorado
- Oil Shale—Hydrogeology of the Piceance Basin, Colorado
- Water Wells as Strain Meters
- Nuclear Waste—WIPP and Yucca Mountain
- Hydrodynamics of Deep Sedimentary Basins

MAJOR CONSULTING PROJECTS—1995-06:

CONTAMINANT STUDIES

- Clean-up, Guadalupe Oil Field, California (California WQCB)
- TCE/PCE Contaminant Spill, California (U.S. Department of Justice)
- TCE/PCE Contaminant Spill, Phoenix, Arizona (U.S. EPA)
- MTBE Contamination, California (major Oil Company)
- Hydrogeologic Impacts of Mining, Summitville, Colorado (Mining Co. PRP)

NUCLEAR WASTE

- Yucca Mountain nuclear Repository—Oversight for Inyo County, California
- Savannah River Site—Remediation of the F and H Area Disposal Ponds
- Waste Isolation Pilot Plant (WIPP) (New Mexico Attorney General)
- Exploratory Drilling Deep Carbonate Aquifer—Amargosa Desert, CA (Inyo County)
- Contamination at Los Alamos National Laboratory (New Mexico Attorney General)
- Decommission of West Valley Processing Facility, New York (New York ERDA)

WATER SUPPLY

- San Francisco Zoo (Zoo)
- Platte River Groundwater—Wyoming vs Nebraska (Wyoming Attorney General)
- Santa Ynez River Basin—Santa Barbara County, California
- Fall River Springs: Impact of Geothermal Development—California (land owners)
- Conjunctive use, San Pedro Riparian Area, Arizona/Mexico (CEC)
- Groundwater in Mexico (World Bank)
- South Denver Metropolitan Area—Douglas County, Colorado (local Water Districts)
- Cadiz groundwater Storage and Supply—California (Environmental Coalition)
- SE-Nevada Carbonate Aquifer (Nevada Power Co.)
- Walker Lake, Nevada (Environmental Coalition)
- Conjunctive use, Gallatin Valley, Montana (Trout Unlimited, Montana Fish and Game)
- Pine Cove, California (Environmental Coalition and Pine Cove Water District)

OTHER

- Conrad Landslide, British Columbia (CN Rail)
- Powder River Basin; Coal-Bed Methane FEIS, WY & MT (Environmental Coalition)
- Feasibility of Gas Storage—Georgia (Country)

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John D. Bredehoeft—Significant Papers

- BREDEHOEFT, J.D., BLYTH, C.R., WHITE, W.A., and MAXEY, G.B., 1963, *A possible mechanism for the concentration of brines in subsurface formations*: American Association Petroleum Geologists Bulletin, v. 47, p. 257-269.
- BREDEHOEFT, J.D., WHITE, W.A., and MAXEY, G.B., 1963, *A possible mechanism for the concentration of brines in subsurface formations: reply to a discussion by Gordon Rittenhouse*, American Association Petroleum Geologists Bulletin, v. 48, p. 236-238
- BREDEHOEFT, J.D., and FARVOLDEN, R.N., 1963, *Disposition of aquifers in intermontane basins in northern Nevada*: International Association Scientific Hydrologists, Publication no. 64, p. 197-212.
- BREDEHOEFT, J.D., 1963, *Hydrogeology of the Lower Humboldt River Basin, Nevada*: Desert Research Institute, University of Nevada, Technical Report no. 3, 50 p.
- BREDEHOEFT, J.D., 1964, *Variation of permeability in Tensleep Sandstone, interpreted from core analyses and geophysical logs*: U.S. Geological Survey Professional Paper 501-D, p. D166-D170.
- BREDEHOEFT, J.D., and PAPADOPULOS, S.S., 1965, *Rates of vertical ground-water movement estimated from the earth's thermal profile*: Water Resources Research, v. 1, p. 325-328.
- BREDEHOEFT, J.D., 1965, *The drill-stem test: The petroleum industry's deep-well pumping test*: Ground Water, v. 3, p. 31-36.
- COOPER, H.H., Jr., BREDEHOEFT, J.D., PAPADOPULOS, S.S., and BENNETT, R.R., 1965, *The response of well-aquifer systems to seismic waves*: Journal of Geophysical Research, v. 70, no. 16, p. 3915-3926.
- BREDEHOEFT, J.D., COOPER, H.H., Jr., PAPADOPULOS, S.S., and BENNETT, R.R., 1965, *Seismic fluctuations in an open artesian well*: U.S. Geological Survey Professional Paper 525-C, p. C51-C57.
- BREDEHOEFT, J.D., COOPER, H.H., and VORHIS, R.C., 1965, *Response of the well-reservoir system to a seismic disturbance*: American Petroleum Institute, Paper No. 826-36-C, 3 p.
- BREDEHOEFT, J.D., PAPADOPULOS, S.S., and STEWART, J.W., 1965, *Hydrologic effects of ground-water pumping in northwest Hillsborough County, Florida*: U.S. Geological Survey Open-File Report, 23 p.
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- COOPER, H.H., Jr., BREDEHOEFT, J.D., and PAPADOPULOS, S.S., 1967, *Response of a finite-diameter well to an instantaneous charge of water*: Water Resources Research, v. 3, p. 263-269.
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- BREDEHOEFT, J.D., and HANSHAW, B.B., 1968, *On the maintenance of anomalous fluid pressures: I. Thick sedimentary sequences*: Geological Society of America Bulletin, v. 79, p. 1097-1106.

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- PINDER, G.F., and BREDEHOEFT, J.D., 1968, *Application of the digital computer for aquifer evaluation*: Water Resources Research, v. 4, p. 1069-1093.
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- BREDEHOEFT, J.D., and YOUNG, R.A., 1970, *The temporal allocation of ground water: a simulation approach*: Water Resources Research, v. 6, p. 1-21.
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- BREDEHOEFT, J.D., and PINDER, G.F., 1973, *Mass transport in flowing ground water*: Water Resources Research, v. 9, p. 194-210.
- KONIKOW, L.F., and BREDEHOEFT, J.D., 1973, *Simulation of hydrologic and chemical-quality variations in an irrigated stream-aquifer system--A preliminary report*: Colorado Water Resources Circular No. 17, 43 p.

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- KONIKOW, L.F., and BREDEHOEFT, J.D., 1973, *A water-quality model to evaluate water-management practices in an irrigated stream-aquifer system*: Proceedings 15th Western Resources Conferences—Salinity in Water Resources, Merriman Publishing Company, Boulder, Colorado, p.36-59.
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- BREDEHOEFT, J.D., 1976, *Status of quantitative ground-water hydrology*: Proceedings, Advances in Ground Water Hydrology, 1976 Symposium American Water Resources Association, p. 1-14.
- BREDEHOEFT, J.D., 1976, COUNTS, H.B., ROBSON, S.G., and ROBERTSON, J.B., 1976, *Solute transport in ground-water systems*: Chapter 9, in Facets of Hydrology (J.D. Rodda, editor), John Wiley, p. 229-256.
- BREDEHOEFT, J.D., WOLFF, R.G., KEYS, W.S., and SHUTER, E., 1976, *Hydraulic fracturing as a tool to determine the state of tectonic stress in the Piceance Basin, Colorado*: Geological Society of America Bulletin, v. 87, p. 250-258.
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- BREDEHOEFT, J.D., 1979, *Impact of technology on hydrology*: National Research Council: Studies in Geophysics -Impact of technology on geophysics, p. 50-54.
- KEYS, W.S., WOLFF, R.G., BREDEHOEFT, J.D., SHUTER, E., and HEALY, J.H., 1979, *In-situ stress measurements near the San Andreas Fault in central California*: Journal of Geophysical Research, v. 84, no. B4, p.1583-1591.
- BREDEHOEFT, J.D., and PAPADOPULOS, S.S., 1980, *A method for determining the hydraulic properties of tight formations*: Water Resources Research, v. 16, p. 233-238.

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- BACHMAT, Y., BREDEHOEFT, J., ANDREWS, B., HOLTZ, D., and SEBASTIAN, S., 1980, *Ground-water management: The use of numerical models*: American Geophysical Union, Water Resources Monograph 5, 127 p.
- HSIEH, P.A., and BREDEHOEFT, J.D., 1981, *A reservoir analysis of the Denver earthquakes: A case of induced seismicity*: Journal of Geophysical Research, v. 86, no. B2, p. 903-920.
- BREDEHOEFT, J.D., and MAINI, T., 1981, *Strategy for radioactive waste disposal in crystalline rocks*: Science, v. 213, p. 293-296.
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- BREDEHOEFT, J.D., and COOLEY, R.L., 1983, *Comment on a note on the meaning of the storage coefficient by T.N. Narasimhan and B.Y. Kanehiro*: Water Resources Research, v. 19, p. 1632-1634.
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- JENSEN, M.E., and BREDEHOEFT, J.D., 1983, *New efficiencies in water use vital for nation: in Using our Natural Resources--1983 Yearbook of Agriculture*: U.S. Department of Agriculture, p. 18-27.

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