Stanford



Franklin M. ("Lynn") Orr, Jr.

Keleen and Carlton Beal Professor in Petroleum Engineering, Emeritus

Energy Science & Engineering

Bio

BIO

*Not accepting any PhD students or Postdocs.

Franklin M. ("Lynn") Orr, Jr. served as Under Secretary for Science and Energy at the US Department of Energy from December 2014 to January 2017. He was director of the Precourt Institute for Energy at Stanford from its establishment in 2009 to 2013. He served as director of the Global Climate and Energy Project at Stanford from 2002 to 2008. Orr was the Chester Naramore Dean of the School of Earth Sciences at Stanford University from 1994 to 2002. He has been a member of the Stanford faculty since 1985 and holds the Keleen and Carlton Beal Chair of Petroleum Engineering in the Department of Energy Science and Engineering. He was a Senior Fellow at the Woods Institute for the Environment and the Precourt Institute for Energy. His research activities focus on how complex fluid mixtures flow in the porous rocks in the Earth's crust, the design of gas injection processes for enhanced oil recovery, and CO2 storage in subsurface formations. Orr is a member of the National Academy of Engineering. He served as vice chair of the board of directors of the Monterey Bay Aquarium Research Institute until 2014 and rejoined that board in 2017. He chaired the Advisory Panel of the Packard Fellowships for Science and Engineering for the David and Lucile Packard Foundation until 2014, rejoining that panel in 2017, and was a foundation board member from 1999-2008. He chairs the ClimateWorks Foundation Board of Directors.

ACADEMIC APPOINTMENTS

- Emeritus Faculty, Acad Council, Energy Science & Engineering
- Affiliate, Stanford Woods Institute for the Environment

ADMINISTRATIVE APPOINTMENTS

- Professor Emeritus, Energy Resources Engineering, Stanford University, (2014- present)
- Under Secretary for Science and Energy, U.S. Department of Energy, (2014-2017)
- Senior Fellow, Precourt Institute for Energy, Stanford University, (2009-2014)
- Founding Director, Precourt Institute for Energy, Stanford University, (2009-2013)
- Senior Fellow, Woods Institute for the Environment, Stanford University, (2005-2014)
- Founding Director, Global Climate and Energy Project, Stanford University, (2002-2008)
- Professor (by Courtesy), Chemical Engineering, Stanford University, (1994-2011)
- Dean, School of Earth Sciences, Stanford University, (1994-2002)
- Chair, Department of Petroleum Engineering, Stanford University, (1991-1994)
- Professor of Petroleum Engineering, Stanford University, (1987- present)

- Associate Professor (Research) of Petroleum Engineering, Stanford University, (1985-1987)
- Head, Miscible Flooding and Gas Injection, New Mexico Petroleum Recovery Research Center, New Mexico Institute of Mining and Technology, (1978-1984)
- Research Engineer, Shell Development Company, Bellaire Research Center, (1976-1977)
- Assistant to the Director, Office of Federal Activities, U.S. Environmental Protection Agency, (1970-1972)

HONORS AND AWARDS

- Arthur M. Bueche Award, National Academy of Engineering (2024)
- Outstanding Achievement Award, University of Minnesota (2020)
- Honorary Membership, Society of Petroleum Engineers (2019)
- Robert S. Schechter Award and Lecture, University of Texas at Austin (2018)
- Aurel Stodola Medal and Lecture, Eidgenössische Technische Hochschule (ETH) Zürich (2017)
- Izatt Christensen Award and Lecture, Brigham Young University (2017)
- Secretary's Exceptional Service Award, US Department of Energy (2017)
- IOR Pioneer, Society of Petroleum Engineers (2006)
- Honorary Doctorate in Engineering, Heriot-Watt University, Edinburgh, Scotland (2005)
- Robert Earl McConnell Award, AIME (2001)
- Election, National Academy of Engineering (2000)
- Keleen and Carlton Beal Chair, School of Earth Sciences (1994)
- Earth Sciences Teaching Award, School of Earth Sciences (1994)
- Distinguished Achievement Award for Petroleum Engineering Faculty, Society of Petroleum Engineers (1993)
- Distinguished Lecturer, Society of Petroleum Engineers (1989-1990)

BOARDS, ADVISORY COMMITTEES, PROFESSIONAL ORGANIZATIONS

- Member, Advisory Board, Energy Futures Initiative (2017 - present)
- Member, Board of Directors, ClimateWorks Foundation (2017 - present)
- Member, Board of Directors, Monterey Bay Aquarium Research Institute (2017 - present)
- Member, Advisory Committee, Climateworks Foundation (2011 - 2014)
- Member, Division Committee for the Division of Earth and Life Sciences, National Research Council (2012 - 2014)
- Member, Technical Advisory Board, Center for Sustainable Energy at Notre Dame (2013 - 2014)
- Member, Advisory Committee, Center for Frontiers of Subsurface Energy Security, University of Texas, Austin (2011 - 2014)
- Committee Member, National Research Council on Subsurface Modeling, Monitory, and Remediation of Fractured Rocks (2013 - 2014)
- Director, Precourt Institute for Energy, Stanford University (2009 - 2013)
- Member, California's Energy Future Task Force (2009 - 2011)
- Member, NRC Committee on America's Energy Future (2007 - 2009)
- Member, Visting Committee, Department of Chemical Engineering, University of Southern California (2007 - 2007)
- Co-chair, Workshop on Basic Research Needs for the Geosciences, US Dept. of Energy (2007 - 2007)
- Member, Committee to Visit Earth and Planetary Sciences, Harvard University (2006 - 2006)
- Member, Advisory Board, Carbon Mitigation Initiative, Princeton University (2004 - present)
- Member, Faculty Leadership Committee, Stanford Institute for the Environment, Stanford University (2004 - 2005)
- Director, Global Climate and Energy Project, Stanford University (2002 - 2008)

- Chairman, Committee on Coal Waste Impoundments, National Research Council (2001 - 2001)
- Chair, Provost's Committee on Faculty Housing Policy, Stanford University (1999 - 2000)
- Member, Board of Directors, David and Lucile Packard Foundation (1998 - 2008)
- Chairman, Panel to Review Energy Resources Programs of the U.S. Geological Survey, National Research Council (1998 - 1999)
- Member, Board of Directors, American Geological Institute Foundation (1997 - 2002)
- Member, Search Committee for Director, Institute of International Studies, Stanford University (1997 - 1998)
- Member, Basic Energy Sciences Advisory Committee,, U.S. Department of Energy (1996 - 2000)
- Member, Provost's Committee on the Environment, Stanford University (1995 - 2004)
- Member, Commission on Technology in Teaching and Learning, Stanford University (1995 - 1999)
- Member, Stanford in Washington Program Committee, Stanford University (1994 - 2002)
- Dean, School of Earth Sciences, Stanford University (1994 - 2002)
- Member, Board of Directors, Monterey Bay Aquarium Research Institute (1987 - 2014)
- Freshman advisor, Stanford University (1986 - 2003)

PROFESSIONAL EDUCATION

- Ph.D, University of Minnesota , Chemical Engineering (1976)
- B.Sc., Stanford University , Chemical Engineering (1969)

PATENTS

- S.T. Ide, F.M. Orr, Jr, K.G. Siesser, W.B. Flint. "United States Patent 8,770,306 B2 Inert Gas Injection To Help Control Or Extinguish Coal Fires", Leland Stanford Junior University, Southern Ute Indian Tribe, Jul 8, 2014
- David S. Schechter, Dengen Zhou, Franklin M. Orr, Jr.. "United States Patent 5,314,017 Method of Assisting the Recovery of Petroleum in Vertically Fractured Formations Utilizing Carbon Dioxide Gas to Establish Gravity Drainage", Leland Stanford Junior University, May 24, 1994

LINKS

- Energy Science and Engineering: https://ese.stanford.edu/

Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS

Research

My students and I work to understand the physical mechanisms that control flow of multiphase, multicomponent fluids in the subsurface, using a combination of experiments and theory. The theory part includes numerical simulation of flow in heterogeneous porous rocks and coalbeds, often using streamline approaches, and it also involves solving by analytical methods the differential equations that describe the interactions of complex phase equilibrium and flow (porous rocks containing more than one flowing phase can sometimes act like a chromatograph, separating components as they flow). The experiments are used to test how well the models describe reality. Applications of this work range from enhanced oil and gas recovery to geologic storage of carbon dioxide (to reduce greenhouse gas emissions) to the transport of contaminants in aquifers.

Teaching

I teach a courses for graduate students on the mathematics of multiphase, multicomponent flow in porous media and on the thermodynamics of phase behavior. I also teach an undergraduate course on energy for freshmen.

Professional Activities

Member, National Research Council Committee on Subsurface Characterization, Modeling, Monitoring, and Remediation of Fractured Rocks, 2013-present, Member, Technical Advisory Committee, Center for Sustainable Energy at Notre Dame; Member, Division Committee for the Division of Earth and Life Sciences of the National Research Council, 2012-present; Member, Energy Technology Innovation System Working Group, President's Council of Advisers on Science and Technology, 2010; Member, California Energy Future study committee (2009-2010); Member, NRC Committee on America's Energy Future (2007-2009); co-chair, Workshop on Basic Research Needs for the Geosciences, U.S. Dept. of Energy (2007); IOR Pioneer, Society of Petroleum Engineers (2006); Honorary Doctorate in Engineering, Heriot-Watt University, Edinburgh, Scotland (2005); member, Advisory Board, Carbon Mitigation Initiative, Princeton University (2004-present); director, Global Climate & Energy Project, Stanford University; member, Faculty Leadership Committee, Stanford Institute for the Environment (2004-05); National Associate of the National Academies (2002); Robert Earl McConnell Award, AIME (2001); election to National Academy of Engineering (2000); member, Board of Directors, David and Lucile Packard Foundation (1999-2008); member, Provost's Committee on the Environment (1995-2004); member, Board of Directors, Monterey Bay Aquarium Research Institute (1987-present); Chair, Fellowships for Science and Engineering Advisory Panel, David and Lucile Packard Foundation (1990-present);

Teaching

COURSES

2023-24

- Theory of Gas Injection Processes for CO2 Sequestration and Enhanced Oil Recovery: ENERGY 225 (Win)

Publications

PUBLICATIONS

- **What will it take to get to net-zero emissions in California?** *ENERGY POLICY*
  Neutel, J., Berson, A., Saltzer, S., Brandt, A., Weyant, J., Orr Jr, F. M., Benson, S. M.
  2026; 208
- **Long-Term Redistribution of Residual Gas Due to Non-convective Transport in the Aqueous Phase** *TRANSPORT IN POROUS MEDIA*
  Li, Y., Orr, F. M., Benson, S. M.
  2021
- **Opportunities for large-scale CO2 disposal in coastal marine volcanic basins based on the geology of northeast Hawaii** *INTERNATIONAL JOURNAL OF GREENHOUSE GAS CONTROL*
  DePaolo, D. J., Thomas, D. M., Christensen, J. N., Zhang, S., Orr, F. M., Maher, K., Benson, S. M., Lautze, N., Xue, Z., Mito, S.
  2021; 110
- **Measurement and Modeling of Minimum Miscibility Pressure: A State-of-the-Art Review** *SPE RESERVOIR EVALUATION & ENGINEERING*
  Dindoruk, B., Johns, R., Orr, F. M.
  2021; 24 (2): 367-389
- **Carbon Capture, Utilization, and Storage: An Update** *SPE JOURNAL*
  Orr, F. M.
  2018; 23 (6): 2444–55
- **A Trillion Tons** *DAEDALUS*
  Harvey, H., Orr, F. M., Vondrich, C.
  2013; 142 (1): 8-25
- **Magnetometer measurements to characterize a subsurface coal fire** *INTERNATIONAL JOURNAL OF COAL GEOLOGY*
  Ide, T. S., Crook, N., Orr, F. M.
  2011; 87 (3-4): 190-196
- **Real-Time Tracking of CO2 Injected into a Subsurface Coal Fire through High-Frequency Measurements of the (CO2)-C-13 Signature** *ENVIRONMENTAL SCIENCE & TECHNOLOGY*
  Krevor, S. C., Ide, T., Benson, S. M., Orr, F. M.

2011; 45 (9): 4179-4186

- **Comparison of methods to estimate the rate of CO2 emissions and coal consumption from a coal fire near Durango, CO** *INTERNATIONAL JOURNAL OF COAL GEOLOGY*
  Ide, S. T., Orr, F. M.
  2011; 86 (1): 95-107
- **Experimental Confirmation of Analytical Composition Routes in Three-Phase Partially Miscible Flow** *2006 SPE/DOE Symposium on Improved Oil Recovery*
  LaForce, T., Cinar, Y., Johns, R. T., Orr, F. M.
  SOC PETROLEUM ENG.2010: 160–70
- **Fissure formation and subsurface subsidence in a coalbed fire** *INTERNATIONAL JOURNAL OF ROCK MECHANICS AND MINING SCIENCES*
  Ide, T. S., Pollard, D., Orr, F. M.
  2010; 47 (1): 81-93
- **Extinguishing a coalbed fire: CO2 Pilot Injection Design, Implementation, and Results** *32nd National Assoc. Abandoned Mine Lands Program Conf*
  Ide, S. T., Siesser, K. G., Flint, W. B., Orr, F. M.
  2010
- **Onshore Geologic Storage of CO2** *SCIENCE*
  Orr, F. M.
  2009; 325 (5948): 1656-1658
- **Four-Component Gas/Water/Oil Displacements in One Dimension: Part III, Development of Miscibility** *TRANSPORT IN POROUS MEDIA*
  LaForce, T., Orr, F. M.
  2009; 79 (2): 225-247
- **Analytical Solutions for Multicomponent, Two-Phase Flow in Porous Media with Double Contact Discontinuities** *TRANSPORT IN POROUS MEDIA*
  Seto, C. J., Orr, F. M.
  2009; 78 (2): 161-183
- **A Multicomponent, Two-Phase-Flow Model for CO2 Storage and Enhanced Coalbed-Methane Recovery** *2006 SPE Annual Technical Conference and Exhibition*
  Seto, C. J., Jessen, K., Orr, F. M.
  SOC PETROLEUM ENG.2009: 30–40
- **CO2 capture and storage: are we ready?** *ENERGY & ENVIRONMENTAL SCIENCE*
  Orr, F. M.
  2009; 2 (5): 449-458
- **On Interfacial-Tension Measurements To Estimate Minimum Miscibility Pressures** *SPE RESERVOIR EVALUATION & ENGINEERING*
  Jessen, K., Orr, F. M.
  2008; 11 (5): 933-939
- **Gravity currents with residual trapping** *JOURNAL OF FLUID MECHANICS*
  Hesse, M. A., Orr, F. M., Tchelepi, H. A.
  2008; 611: 35-60
- **A new model of trapping and relative permeability hysteresis for all wettability characteristics** *2005 SPE Annual Technical Conference and Exhibition*
  Spiteri, E. J., Juanes, R., Blunt, M. J., Orr, F. M.
  SOC PETROLEUM ENG.2008: 277–88
- **Geoscience research for our energy future** *PHYSICS TODAY*
  DePaolo, D. J., Orr, F. M.
  2008; 61 (8): 46-51
- **Carbon dioxide capture and storage** *MRS BULLETIN*

Benson, S. M., Orr, F. M.
2008; 33 (4): 303-305

- **Sustainability and energy conversions** *MRS BULLETIN*
  Benson, S. M., Orr, F. M.
  2008; 33 (4): 297-302
- **Four-component gas/water/oil displacements in one dimension: part II, example solutions** *TRANSPORT IN POROUS MEDIA*
  LaForce, T., Jessen, K., Orr, F. M.
  2008; 72 (1): 83-96
- **Four-component gas/water/oil displacements in one dimension: Part I. structure of the conservation law** *TRANSPORT IN POROUS MEDIA*
  LaForce, T., Jessen, K., Orr, F. M.
  2008; 71 (2): 199-216
- **Development of Gas/Oil Miscibility in Water and Gas Injection** *SPE Annual Technical Conference*
  LaForce, T., Orr, F. M.
  2008
- **Storage of CO2 in saline aquifers: Effects of gravity, viscous, and capillary forces on amount and timing of trapping** *INTERNATIONAL JOURNAL OF GREENHOUSE GAS CONTROL*
  Ide, S. T., Jessen, K., Orr, F. M.
  2007; 1 (4): 481-491
- **Compositional gravity drainage 2: experimental measurements using an analog system** *TRANSPORT IN POROUS MEDIA*
  DiCarlo, D. A., Jessen, K., Orr, F. M.
  2007; 69 (2): 159-174
- **Using analytical solutions in compositional streamline simulation of a field-scale CO2-injection project in a condensate reservoir** *2003 SPE Reservoir Simulation Symposium*
  Seto, C. J., Jessen, K., Orr, F. M.
  SOC PETROLEUM ENG.2007: 393–405
- **Compositional gravity drainage 1. Equilibrium solutions and controlling Bond numbers for a two-phase, three-component system** *TRANSPORT IN POROUS MEDIA*
  DiCarlo, D. A., Orr, F. M.
  2007; 69 (1): 13-32
- **An analysis of the vanishing interfacial tension technique for determination of minimum miscibility pressure** *FLUID PHASE EQUILIBRIA*
  Orr, F. M., Jessen, K.
  2007; 255 (2): 99-109
- **Effect of IFT variation and wettability on three-phase relative permeability** *2004 SPE Annual Technical Conference and Exhibition*
  Cinar, Y., Marquez, S., Orr, F. M.
  SOC PETROLEUM ENG.2007: 211–20
- **Gravity currents in horizontal porous layers: transition from early to late self-similarity** *JOURNAL OF FLUID MECHANICS*
  Hesse, M. A., Tchelepi, H. A., Cantwell, B. J., Orr, F. M.
  2007; 577: 363-383
- **Comments on 'A new mechanistic parachor model to predict dynamic interfacial tension and miscibility in multicomponent hydrocarbon systems' by S. Ayirala and D.N. Rao** *J. Colloid and Interface Sci.*
  Orr, F. M., Jessen, K.
  2007; 306: 1-2
- **Transition in the propagation regime of a gravity current in a horizontal porous layer** *J. Fluid Mech*
  Hesse, M. A., Tchelepi, H. A., Cantwell, B. J., Orr, F. M.
  2007; 577: 363-383
- **Response to 'Comments on "An analysis of the vanishing interfacial tension experiment for determination of minimum miscibility pressure"'** *Fluid Phase Equilibria*

Orr, F. M., Jessen, K.
2007; 259

- **Theory of Gas Injection Processes**
  Orr, F. M.
  Tie-Line Publications, Copenhagen, Denmark.2007
- **Impact of relative permeability hysteresis on geological CO2 storage** *WATER RESOURCES RESEARCH*
  Juanes, R., Spiteri, E. J., Orr, F. M., Blunt, M. J.
  2006; 42 (12)
- **An experimental and numerical investigation of crossflow effects in two-phase displacements** *2004 SPE Annual Technical Conference and Exhibition*
  Cinar, Y., Jessen, K., Berenblyum, R., Juanes, R., Orr, F. M.
  SOC PETROLEUM ENG.2006: 216–26
- **Onset of convection in a gravitationally unstable diffusive boundary layer in porous media** *JOURNAL OF FLUID MECHANICS*
  Riaz, A., Hesse, M., Tchelepi, H. A., Orr, F. M.
  2006; 548: 87-111
- **Analytical Solutions for Compositional Three-Phase Four-Component Displacements** *SPE Annual Technical Conference and Exhibition, San Antonio, Texas*
  LaForce, T., Jessen, K., Orr, F. M.
  2006
- **Analytical Solutions for Three-Phase, Four-Component Partially Miscible Flow** *SPE Annual Technical Conference*
  LaForce, T., Jessen, K., Orr, F. M.
  2006
- **Scaling Analysis of the Migration of CO2 in Saline Aquifers** *SPE Annual Technical Conference*
  Hesse, M., Tchelepi, H., Orr, Jr., F. M.
  2006
- **Analytical modeling of CO2 storage and enhanced coal bed methane recovery** *Proceedings of the 8th Intl. Conf. on Greenhouse Gas Control Technologies*
  Seto, C. J., Jessen, K., Orr, Jr., F. M.
  2006
- **Phase Diagrams** *Petroleum Engineering Handbook*
  Orr, F., Jessen, K.
  edited by Fanchi, J. R.
  Society of Petroleum Engineers.2006: 371–396
- **Time scales for migration and trapping of CO2 in saline aquifers** *Proc. 8th Intl. Conf. on Greenhouse Gas Control Technologies*
  Ide, S., Jessen, K., Orr, F. M.
  2006
- **Natural convection during aquifer CO2 storage** *Proc. 8th Intl. Conf. on Greenhouse Gas Control Technologies*
  Hesse, M. A., Tchelepi, H. A., Orr, Jr. , F. M.
  2006
- **Four-component gas/oil displacements in one dimension: Part II: Analytical solutions for constant equilibrium ratios** *TRANSPORT IN POROUS MEDIA*
  Wang, Y., Dindoruk, B., Johansen, T., Orr, F. M.
  2005; 61 (2): 177-192
- **Four-component gas/oil displacements in one dimension: Part I: Global triangular structure** *TRANSPORT IN POROUS MEDIA*
  Johansen, T., Wang, Y., Orr, F., Dindoruk, B.
  2005; 61 (1): 59-76
- **High-order upwind schemes for two-phase, multicomponent flow** *2003 SPE Reservoir Simulation Symposium*

Mallison, B. T., Gerritsen, M. G., Jessen, K., Orr, F. M.
SOC PETROLEUM ENG.2005: 297–311

- **Measurement of three-phase relative permeability with IFT variation** *2004 SPE/DOE Symposium on Improved Oil Recovery*
  Cinar, Y., Orr, F. M.
  SOC PETROLEUM ENG.2005: 33–43
- **Increasing CO2 storage in oil recovery** *ENERGY CONVERSION AND MANAGEMENT*
  Jessen, K., Kovscek, A. R., Orr, F. M.
  2005; 46 (2): 293-311
- **Relative Permeability Hysteresis: Trapping Models and Application to Geological CO2 Sequestration** *SPE Annual Technical Conference*
  Spiteri, E. J., Juanes, R., Blunt, M. R., Orr, F. M.
  2005
- **Analytical modeling of CO2 storage and enhanced coal bed methane recovery** *American Geophysical Union, Fall Meeting*
  Seto, C., Jessen, K., Orr, F. M.
  2005
- **Gas cycling and the development of miscibility in condensate reservoirs** *2003 SPE Annual Technical Conference and Exhibition*
  Jessen, C., Orr, F. M.
  SOC PETROLEUM ENG.2004: 334–41
- **Interplay of phase behavior and numerical dispersion in finite-difference compositional simulation** *2002 SPE/DOE Improved Oil Recovery Symposium*
  Jessen, K., Stenby, E. H., Orr, F. M.
  SOC PETROLEUM ENG.2004: 193–201
- **Storage of Carbon Dioxide in Geologic Formations** *Journal of Petroleum Technology*
  Orr, F. M.
  2004; 56: 90-97
- **Analytical Solution for Gas-Oil Displacement with Temperature Variation** *SPE/DOE Fourteenth Symposium on Improved Oil Recovery*
  Zhu, J., Jessen, K., Orr, F. M.
  2004
- **Gravity Segregation and Compositional Streamline Simulation** *SPE/DOE Fourteenth Symposium on Improved Oil Recovery*
  Jessen, K., Orr, F. M.
  2004
- **Analytical theory of coalbed methane recovery by gas injection** *2002 SPE/DOE Improved Oil Recovery Symposium*
  Zhu, J. C., Jessen, K., Kovscek, A. R., Orr, F. M.
  SOC PETROLEUM ENG.2003: 371–79
- **Black Oil Streamline Simulator with Capillary Effects** *SPE Annual Technical Conference*
  Berenblyum, R. A., Shapiro, A. A., Jessen, K., Stenby, E. H., Orr, F. M.
  2003
- **The GEO-SEQ Project: A status report** *6th International Conference on Greenhouse Gas Control Technologies*
  Myer, L. R., Benson, S. M., Byrer, C., Cole, D., Doughty, C. A., Gunter, W., Hoversten, G. M., Hovorka, S., Johnson, J. W., Knauss, K. G., Kovscek, A., Law, D., Lippmann, et al
  ELSEVIER SCIENCE BV.2003: 1625–1628
- **Compositional Streamline Simulation** *SPE Annual Technical Conference*
  Jessen, K., Orr, F. M.
  2002
- **Fast, approximate solutions for 1D multicomponent gas-injection problems** *1999 SPE Annual Technical Conference and Exhibition*
  Jessen, K., Wang, Y., Ermakov, P., Zhu, J. C., Orr, F. M.
  SOC PETROLEUM ENG.2001: 442–51

- **Terrestrial sequestration of CO2: An assessment of research needs** *ADVANCES IN GEOPHYSICS, VOL. 43*
  Wawersik, W. R., Orr, F. M., Rudnicki, J. W., Ortoleva, P. J., Dove, P., Richter, F., Harris, J., Warpinski, N. R., Logan, J. M., Wilson, J. L., Pyrak-Nolte, L., Wong, T. F.
  2001; 43: 97-177
- **Direct Experiments on the Ocean Disposal of CO2** *Annual Technical Conference*
  Brewer, P. G., Peltzer, E. T., Orr, Jr., F. M.
  2001
- **CO2: the burning issue** *CHEMISTRY & INDUSTRY*
  Brewer, P. G., Orr, F. M.
  2000: 567-571
- **Calculation of minimum miscibility pressure** *1998 SPE/DOE Symposium on Improved Oil Recovery*
  Wang, Y., Orr, F. M.
  ELSEVIER SCIENCE BV.2000: 151–64
- **Direct experiments on the ocean disposal of fossil fuel CO2** *SCIENCE*
  Brewer, P. G., Friederich, C., Peltzer, E. T., Orr, F. M.
  1999; 284 (5416): 943-945
- **Outcrop-Aided Characterization of a Faulted Hydrocarbon Reservoir: Arroyo Grande Oil Field, California, USA** *Faults and Subsurface Fluid Flow in the Shallow Crust*
  Antonellini, M., Aydin, A., Orr, F. M.
  American Geophysical Union.1999: 7–26
- **Experimental tests of the ocean sequestration of fossil fuel CO2** *Proceedings of the 2nd International Symposium CO2 in the Oceans*
  Brewer, P. G., Friederich, G., Peltzer, E. T., Orr, F. M.
  1999: 425–428
- **Gas hydrate formation in the deep sea: In situ experiments with controlled release of methane, natural gas, and carbon dioxide** *ENERGY & FUELS*
  Brewer, P. G., Orr, F. M., Friederich, G., Kvenvolden, K. A., Orange, D. L.
  1998; 12 (1): 183-188
- **Analysis of Rising Bubble Experiments for Determination of Minimum Miscibility Pressures** *Soc. Pet. Eng. J.*
  Zhou, D., Orr, F. M.
  1998; 13 (1)
- **Analytical calculation of minimum miscibility pressure** *AIChE 1997 Spring Meeting*
  Wang, Y., Orr, F. M.
  ELSEVIER SCIENCE BV.1997: 101–24
- **Deep-ocean field test of methane hydrate formation from a remotely operated vehicle** *GEOLOGY*
  Brewer, P. G., Orr, F. M., Friederich, G., Kvenvolden, K. A., Orange, D. L., McFarlane, J., Kirkwood, W.
  1997; 25 (5): 407-410
- **Hydrocarbon drainage along corners of noncircular capillaries** *JOURNAL OF COLLOID AND INTERFACE SCIENCE*
  Zhou, D. G., Blunt, M., Orr, F. M.
  1997; 187 (1): 11-21
- **High-Throughput TVD-Based Simulation of Tracer Flow** *Soc. Pet. Eng. J*
  Wattenbarger, R. C.
  1997; 2 (3): 254-267
- **Theory of Multicontact Miscible Displacement with Nitrogen** *Soc. Pet. Eng. J.*
  Dindoruk, B., Orr, F. M., Johns, R. T.
  1997; 2 (3): 268-279
- **Simulating flow in heterogeneous systems using streamtubes and streamlines** *SPE RESERVOIR ENGINEERING*

Thiele, M. R., Batycky, R. P., Orr, J.
1996; 11 (1): 5-12

- **Scale-up of Miscible Flood Processes for Heterogeneous Reservoirs** *Final Report, U.S. Dept. of Energy Grant No. DE-FG22-92BC14852*
  Orr, F. M.
  1996: 255
- **Analysis of the Buckley-Leverett Problem in the Presence of Nonuniform Initial Data** *11th Petroleum Congress of Turkey*
  Dindoruk, B., Orr, F. M.
  1996
- **Miscible Gas Displacement of Multicomponent Oils** *Soc. Pet. Eng. J.*
  Johns, R. T., Orr, F. M.
  1996; 1 (1): 39-50
- **Effect of Wettability on Three-Phase Distribution** *Proc. 4th Intl. Symp. on Evaluation of Reservoir Wettability and its Effect on Oil Recovery*
  Zhou, D., Blunt, M. J., Orr, F. M.
  1996
- **THEORY OF MULTICOMPONENT GAS OIL DISPLACEMENTS** *INDUSTRIAL & ENGINEERING CHEMISTRY RESEARCH*
  Orr, F. M., Dindoruk, B., Johns, R. T.
  1995; 34 (8): 2661-2669
- **THE EFFECTS OF GRAVITY AND VISCOUS FORCES ON RESIDUAL NONWETTING-PHASE SATURATION** *IN SITU*
  Zhou, D., Orr, F. M.
  1995; 19 (3): 249-273
- **MODELING FLOW IN HETEROGENEOUS MEDIA USING STREAMTUBES .1. MISCIBLE AND IMMISCIBLE DISPLACEMENTS** *IN SITU*
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PRESENTATIONS

- Intro to Energy at Stanford - Energy@Stanford & SLAC 2013 (9/9/2013)
- Energy Research and Teaching at Stanford - Energy@Stanford & SLAC 2011 (9/12/2013)