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William J. Kirkwood

PROFESSIONAL EXPERIENCE:

June 1991 to Present

MBARI

Moss Landing, CA.

Senior Research and Development Engineer (2009)

Associate Director of Engineering Research and Development (1998-2009)

Management of the institute's core engineering team - 22 engineers

Program Manager for Autonomous Underwater Vehicles (AUV):

- Dorado
- Atlantic Layer Tracking EXperiment
- Multibeam mapping system
- Operations Physical Oceanographic (CTD) system

Project Engineer for Deep Ocean Raman In Situ Spectrometer

Project Engineer for Free Ocean CO2 Experiment

Program Manager / Lead Mechanical Engineer for the Remotely Operated Vehicle (ROV) Tiburon

1986 to 1991

Lockheed Missiles and Space Company

Sunnyvale, CA.

Group Engineering Supervisor - Advanced Systems Division

Management of 34 engineers operating as a matrix group over many projects additional efforts as design engineer on

several projects (sampling of classified and non-classified projects)

- Ground Based Laser - active optics and pointing mirrors
- Starlab - active optics and pointing mirrors
- Managed Ball Corp. sub-system delivery of optical components
- Boost Surveillance and Tracking Satellite - Solar array design and tracking optic design
- Mine Surveillance System - Modification of the DRAPER autonomous underwater vehicle (AUV)
- Precision Underwater Navigation System - Surface vessel design, build and system integration

Additional efforts included towfish, pressure housings, laser communications systems, infra-red precision guidance

systems, test apparatus, and operation of a 1500 sq. ft. laboratory.

1984 to 1986

Leach Relay Corporation

Los Angeles, CA.

Engineering Supervisor of Research and Development

Management of 4 engineers developing, designing, and documenting for manufacture power components and electromechanical devices for military and avionics applications.

- Research and development of "Smart Relay" technology for the F-16 fighter
- Raytheon sonar division, 3000 volt power components for US Navy submarine active sonar systems.
- High power (400 VAC - 25 AMP) contactor for the Blackhawk helicopter

Additional efforts included component design for Lockheed L-1011 and Galaxy aircraft, Rockwell Space Shuttle, Hughes

Helicopter, McDonald-Douglas military and commercial aircraft including Tomahawk cruise missile, aircraft, Boeing aircraft and weapons systems, etc.

1982 to 1984

American Telecom Corporation

El Monte, CA.

Design Engineer

Engineering and design of telecommunications equipment and components. Circuit board development, integration of new chip technologies into telecommunications for office and household use.

1979 to 1982

Kaiser Steel Corporation

Pico Rivera, CA.

Design Engineer

Design and construction of automated assembly line systems using logic design, automated and progressive tool design for production of heavy gauge steel parts, particularly automotive and building applications.

1976 to 1979

Mattel Toys Incorporated

Hawthorne, CA.

Student Intern - Design Engineer

Full time summer employee and part-time during the school year designing first generation handheld electronic games, and mechanisms for international toys.

EDUCATION:

June 1979 University of California Los Angeles Westwood, CA.

Bachelor of Science in Mechanical Engineering
Specializing in Materials and Applications
Society of Automotive Engineers member working on hydrogen powered automobiles

June 2000 University of Phoenix Phoenix AZ.
Masters of Science in Computer Information Systems

PERSONAL:

Place of Birth: Toronto, Ontario, Canada June 1956
US Citizenship: Naturalized - June 1974

PROFESSIONAL ACTIVITIES:

Treasurer of IEEE Ocean Engineering Society (2014)
Advisory Board Member IEEE/Ocean Engineering Society (2012)
Senior Member IEEE (2009)
National Science Foundation, Ocean Observatory Initiative ORION Office, Engineering Committee (2006)
Institute of Marine Science Seminar: NURP 2003 Distinguished Lecturer Technology Challenges and Advances for Oceanographic Observatories. University of Alaska Fairbanks, Oct. 13th, 2003.
Santa Clara University: Appointed Adjunct Professor - Fall 2002
Created and taught IEEE AUV Technology and Application Basics Tutorial from 2001 to 2009
Created

EXPEDITIONS:

Casey Station, Antarctica, November 2013 thru February 2014 collaboration with the Australian Antarctic Division

Mariana Trench, Chamorro CORK Site IODP 1200C, R/V Natsuhima with ROV Hyper-Dolphin, Winter 2009

Barkley Canyon expedition and Neptune Canada, Venus cable route mapping - Dr. P. Brewer P.I. - R/V Western Flyer, ROV Tiburon, AUV Dorado – Mapping Summer 2006

Costa Rican Subduction Zone - R/V Atlantis and HOV Alvin dive to 4370 meters, Spring 2004

Gulf of California, Guymas Basin - R/V Western Flyer and ROV Tiburon, Spring 2003

Arctic / 86 North, Nansen Basin - USCG Ice Breaker Healy and AUV ALTEX, Fall 2001

Mariana Trench - R/V Thomas Thompson and ROV Jason Winter 1998

PATENTS AND PUBLICATIONS:

Peer Reviewed Publications:

Fries, D. and Kirkwood, W.J. (2015), Non-Acoustic Sensors (Part B, Chapter 8), “Springer Handbook of Ocean Engineering”, M.R. Dhanak and N.I. Xiros, Eds., Springer Publishing, ISBN:9978-3-319-16649-0

William J. Kirkwood, Peter M. Walz, Edward T. Peltzer, James P. Barry, Robert A. Herlien, Kent L. Headley, Chad Key, George I. Matsumoto, Thom Maughan, Thomas C. O'Reilly, Karen A. Salamy, Farley Shane, Peter G. Brewer (2014) “Design, Construction, Operation and Performance of a Deep-Sea Free Ocean CO2 Enrichment (FOCE) Experimental System.” Deep-Sea Research I 97: 1-9. doi:10.1016/j.dsr.2014.11.005.

W.J. Kirkwood and P.G. Brewer (2013) Deep Ocean In Situ Raman Spectroscopy (Ch. 20). In: "Subsea Optics and Imaging", J. Watson and A. Zielinski, Eds., Woodhead Publishing, ISBN: 978 0 85709 341 7 E-ISBN: 978 0 85709 352 3.

Kline, D.I., L. Teneva, K. Schneider, T. Miard, A. Chai, M. Marker, K. Headley, B. Opdyke, M. Nash, M. Valetich, J. Caves, B. Russell, S. Connell, W. Kirkwood, P. Brewer, E. Peltzer, J. Silverman, K. Caldeira, R. Dunbar, J. Koseff, S. Monismith, G. Mitchell, S. Dove, O. Hoegh-Guldberg (2012). “A short-term in situ CO2 enrichment experiment on Heron Island (GBR).” Scientific Reports 2: 413. doi: 10.1038/srep00413.

Zhang, X., W.J. Kirkwood, P.M. Walz, E.T. Peltzer, and P.G. Brewer (2012) “Advances in Deep-Ocean Raman Spectroscopy.” Applied Spectroscopy 66: 237-24

Zhang, X., Hester, K.C., Ussler, W., Walz, P.M., Peltzer, E.T., and Brewer, P.G. (2011) "In situ Raman-based measurements of high dissolved methane concentrations in hydrate-rich ocean sediments." *Geophys. Res. Lett.*, doi:10.1029/2011GL047141.

Kirkwood, W.J., E.T. Peltzer, P. Walz, K. Headley, B. Herlien, C.D. Kocy, T. Maughan, T. O'Reilly, K.A. Salamy, F. Shane, J. Scholfield, and P.G. Brewer (2011). Cabled instrument technologies for ocean acidification research— FOCE (free ocean CO₂ enrichment). Underwater Technology, 2011 IEEE Symposium on and 2011 Workshop on Scientific Use of Submarine Cables and Related Technologies, Tokyo, Japan.

Brewer, P.G., Ussler, W., Peltzer, E., Walz, P., Kirkwood W., and Hester, K.C. (2011) "Accurate in situ observation of deep-sea sediment dissolved methane profiles in hydrate bearing provinces." Proceedings of the 7th International Conference on Gas Hydrates (ICGH 2011), Edinburgh, Scotland, United Kingdom, July 17-21, 2011.

Zhang, X., P. Walz, W.J. Kirkwood, K.C. Hester, W. Ussler, E.T. Peltzer, and P.G. Brewer (2010) "Development and deployment of a deep-sea Raman probe for measurement of pore water geochemistry." *Deep-Sea Res.* 1, **57**, 297-306, doi:10.1016/j.dsr.2009.11.004.

Zhang, X. P. Walz, W.J. Kirkwood, K.C. Hester, W. Ussler, E.T. Peltzer, and P.G. Brewer (2009)" Development and deployment of deep a deep-sea Raman probe for measurement of pore water geochemistry." *Deep-Sea Res.* 1, doi:10.1016/j.dsr.2009.11.004.

Erin Beck, William Kirkwood, David Caress, Todd Berk, Paul Mahacek, Kevin Brashem, Jose Acain, Vivek Reddy, Dr. Christopher Kitts, John Skutnik, and Dr. Geoff Wheat "SeaWASP: A Small Waterplane Area Twin Hull Autonomous Platform for Shallow Water Mapping" Marine Technology Society Journal, Volume 43, Number 1, Student Papers 2009.

K. C. Hester, E. T. Peltzer, W. J. Kirkwood, and P. G. Brewer (2008) "Unanticipated consequences of ocean acidification: A noisier ocean at lower pH", *Geophysical Research Letters*, October 1, 2008, Vol. 35 #31.

W.J. Kirkwood (2007) "Development of the DORADO Mapping Vehicle for Multibeam, Subbottom, and Sidescan Science Missions", *Journal of Field Robotics*, Vol. 24, Issue 6, June 2007, Pgs 487 – 495.

Sheri N. White, William Kirkwood, Alana Sherman, Mark Brown, Richard Henthorn, Karen Salamy, Peter Walz, Edward T. Peltzer, and Peter G. Brewer (2005), "Development and Deployment of a Precision Underwater Positioning System for In Situ Laser Raman Spectroscopy in the Deep Ocean" *Deep Sea Research*, Vol 5, No. 1, Ms. Ref. No.: DSR1-D-05-00037R1

Sibenac, M., W. Kirkwood, T. Podder, and Hans Thomas (2004) "Autonomous Underwater Vehicles for Ocean research: Current Needs and State of the Art Technologies." *Marine Technology Society Journal: Innovations in Ocean Research Infrastructure to Advance High Priority Science*, Volume 38, Number 2, Summer 2004.

Bellingham, J. G., Streitlien, K., Overland, J., Rajan, S., Stein, P., Stannard, J., Kirkwood, W., and Yoerger, D., "An Arctic Basin Observational Capability using AUVs", *Oceanography*, vol. 13, (2000), p. 64.

Brewer, P.G., F.M. Orr, Jr., G. Friederich, K.A. Kvenvolden, D.L. Orange, J. McFarlane, and W. Kirkwood (1997) "Deep ocean field test of methane hydrate formation", *Geology*, v. 25, 407-410

Publications:

W. Kirkwood (2016) "Deep Sea Laser Raman - Past, Present and Future Developments for In Situ Chemical Analysis and Applications", *Ocean Technology Conference Asia – Kuala Lumpur*, 24 March 2016

W. Kirkwood (2016) "Automation for In Situ Multi-Stressor Biogeochemical Experiments", *Sea Tech Week – ACO (A Connected Ocean) 2016 – Brest, France*, 10 -14 October 2016

C. Waldman, W. Kirkwood, T. Kier, S. Meckel (2016) "Performance Data of a Pneumatic Variable Buoyancy Engine for a Newly Designed Underwater Glider", *Oceans 2016 Monterey, Monterey, CA.*, 21 Sep 2016.

C. Kitts, G. Wheat, W. Kirkwood, S. Bertram, D. Azevedo, G. Del Vecchio, B. Hopner (2016), “A Portable ASV Prototype for Shallow-Water Science Operations”, Oceans 2016 Monterey, Monterey, CA. 22 Sep 2016.

Kecy, C.D., E.T. Peltzer, P.M. Walz, K. Headley, R.A. Herlien, T. Maughan, G.I. Matsumoto, T.C. O' Reilly, K.A. Salamy, F. Shane, C. Lovera, J. Schofield, W. Kirkwood, J.P. Barry, and P.G. Brewer (2013). Open Source Instrumentation Nodes for the Greater Oceanographic Community. *Proceedings of the Marine Technology Society / Institute of Electrical and Electronics Engineers Oceans '13 Conference*, San Diego, CA, September 23-26. (130502-067).

Shane, F.F., K. Headley, P. Walz, C. Kecy, G.I. Matsumoto, R.A. Herlien, E.T. Peltzer, J. Scholfield, K. Salamy, T. Maughan, T.C. O'Reilly, C. Lovera, W.J. Kirkwood, J. Barry, and P.G. Brewer (2013). xFOCE: An Open Source, Multi-disciplinary Resource for in-Situ Ocean Acidification Research. *Proceedings of the Marine Technology Society / Institute of Electrical and Electronics Engineers Oceans '13 Conference*, San Diego, CA, September 23-26. (130502-070).

Peter Brewer, William Kirkwood and Jean-Pierre Gattuso, Progress in Controlled In Situ Ocean Acidification Experiments, *FOCE Systems: Present Status and Future Developments; Villefranche-sur-Mer, France, 10-12 December 2012*, *Eos Trans. AGU*, 94(16), 152, Published 16 APR 2013, doi:10.1002/2013EO160004.

Kecy, C.D., E.T. Peltzer, P.M. Walz, K. Headley, B. Herlien, W. Kirkwood, T. O' Reilly, K.A. Salamy, F. Shane, J. Scholfield and P.G. Brewer (2011). “Design and Development of the CO₂ Enriched Seawater Distribution System.” *Proceedings of Oceans '11 - MTS/IEEE Kona Conference*, Kona, Hawai'i. September 19-22, 2011.

Zhang, X., W.J. Kirkwood, K.C. Hester, P.M. Walz, W. Ussler, E.T. Peltzer, F. Shane and P.G. Brewer (2011). “In Situ Raman Probe for Quantitative Observation of Sediment Pore Waters in the Deep Ocean - Development and Applications.” *Proceedings of Oceans '11 - IEEE Santander Conference*, Santander, Spain. June 6-9, 2011.

Marker, M., D. Kline, W. Kirkwood, K. Headley, P. Brewer, E.T. Peltzer, T. Miard, A. Chai, M. James, K. Schneider, J. Silverman, K. Caldeira, S. Monosmith, B. Opdyke, R. Dunbar, R. White, S. Dove, and O. Hoegh-Guldberg (2010). “The Coral Proto Free Ocean Carbon Enrichment system (CP-FOCE): Engineering and Development”, *Proceedings of the Marine Technology Society/Institute of Electrical and Electronics Engineers Oceans Conference*, Sydney, Australia, June 6 – 10, 2010.

William Kirkwood (2009) “AUV Incidents and Outcomes” IEEE – MTS Oceans, Biloxi, Mississippi, Oct. 28, 2009.

William Kirkwood and Larissa Sano “Developing New Instrumentation for In Situ Experimentation Related to Ocean Acidification” *Current - The Journal of Marine Education*, Volume 25, Number 1, 2009.

William Kirkwood, Ed Peltzer, Jim Barry, and Peter Brewer “Recent Advances in FOCE Technology: Building a Better Sea Floor CO₂ Enrichment Experiment”, *The 11th Pacific Science Inter-Congress of the Pacific Science Association* Pete, Tahiti, 2 - 6 March 2009.

W. J. Kirkwood, B.H. Robison, M. Chaffey, E. Mellinger, D. Au, and S. Etchemendy “An Ocean REsearch Platform: ROV *Tiburón*”, *Journal of Ocean Technology*, Underwater intervention: Robots on Patrol, Volume 4 Number 1 (Jan-Feb_Mar, 2009) pgs. XX - XX

William Kirkwood, Ed Peltzer, Peter Walz, and Peter Brewer “Cabled Observatory Technology for Ocean Acidification Research”, *IEEE-Ocean Engineering Society Oceans 2009*, Bremen, Germany, May, 11 2009.

David W Caress, H.Thomas, D.Conlin, D.Thompson, R.McEwen, R.Henthorn, W. Kirkwood (2008) “MBARI Mapping AUV Performance Improvements”, *IEEE AUV 2008 Workshop*, Woods Hole, Mass., October 14, 2008.

James Bellingham, W. Kirkwood, and E. Cokelet (2008) “Oceanographic Observations in the Margin Ice Zone with the ALTEX AUV”, *IEEE AUV 2008 Workshop*, Woods Hole, Mass., October 13, 2008.

Erin E. Beck, P. Mahacek, T. Burk, J. Acain, V. Reddy, C. Kitts, J. Kutnik, G. Wheat, W. Kirkwood, and D. Caress (2008) "SeaWASP: A Small Waterplane Area Twin Hull Autonomous Platform for Shallow Water Mapping", IEEE AUV 2008 Workshop, Woods Hole, Mass., October 13, 2008.

P.M. Walz, W.J. Kirkwood, E.T. Peltzer, K.C. Hester, and P.G. Brewer (2008) "Creating Controlled CO₂ Perturbation Experiments on the Seafloor – Develop of FOCE Techniques", MTS/IEEE Oceans 2008, Kobe, Japan, April 10, 2008.

Chris Kitts, Geoff Wheat, and William Kirkwood, "Robotic System Applications for Fisheries Research" American Fisheries Society 137th Annual Meeting, San Francisco, California, September 5th, 2007.

W. J. Kirkwood, E. T. Peltzer, and P. G. Brewer "In Situ Ocean Acidification Environmental Observations: MBARI's Cabled Observatory Technology for Controlled Studies of Changing Ocean pH", Underwater Technology Conference, Tokyo, April 18 – 20, 2007.

W. J. Kirkwood and D. W. Caress "Comparison of MBARI Autonomous Underwater Mapping Results for ORION Monterey Accelerated Research System (MARS) and Neptune Canada", Underwater Technology Conference, Tokyo, April 17 – 20, 2007.

Kirkwood, W.J., Brewer, P.G. (2006) "Free Ocean CO₂ Enrichment System: Technology for Chemical and Biological Studies", Sub Sea Cables Conference, Dublin, Ireland, February 2006.

Alana Sherman, Rachel M. Dunk, Sheri N. White, William Kirkwood, Edward T. Peltzer, Peter Walz, Farley Shane, Richard Henthorn, Karen A. Salamy, Peter G. Brewer (2006) "Second Generation Laser Raman Spectrometer for the Deep Ocean", Ocean Sciences Meeting, Honolulu, Hawaii, February 20 -24, 2006.

W. J. Kirkwood, D. Caress, H.T. Thomas, R. McEwen, R. Henthorn (2006), "Results of MBARI's Integrated Multibeam, Sidescan and Subbottom AUV Operations for Oceanographic Science", Scientific Committee on Antarctic Research Conference 2006, Hobart, Tasmania, July 13, 2006.

Alana Sherman, Rachel Dunk, Edward Peltzer, Peter Brewer, Jim Scholfield, Cheri Everlove, William Kirkwood, Peter Walz (2006), "Lessons Learned While Optimizing Instrument Sensitivity in Deep Ocean Raman Spectroscopy", MTS - IEEE Oceans 2006, Boston, Mass., September 18 - 21, 2006.

Richard Henthorn, David Caress, Hans Thomas, William Kirkwood, Rob McEwen, Charles Paull, Rendy Keaten (2006), "High-Resolution Multibeam and Subbottom Surveys of Submarine Canyons and Gas Seeps Using the MBARI Mapping AUV", MTS - IEEE Oceans 2006, Boston, Mass., September 18 -21, 2006.

White, S.N., Brewer, P.G., Kirkwood, W.J. (2006) "Raman Instrumentation for Deep-Sea In-Situ Analyses" Sea Technology, February 2006, Volume 47, No. 2, Pgs 17 - 24.

W. Kirkwood, D.W. Caress, H. Thomas, R. McEwen, F. Shane, R. Henthorn, and P. McGill (2005) "Results from MBARI's Integrated Mapping System", MTS/IEEE Oceans 2005, Washington D.C., October 2005, MTS/IEEE #050217-03.

Kirkwood, W., D. Graves, M. Conway, D. Pargett, J. Scholfield, P. Walz, R. Dunk, E. Peltzer, J. Barry, and P. Brewer (2005) "Engineering Development of the Free Ocean CO₂ Enrichment (FOCE) Experiment" MTS/IEEE Oceans 2005, Washington D.C., October 2005, MTS/IEEE #050304-93.

S. N. White, Kirkwood, W., M. Brown, R. Henthorn, S. Jensen, K. A. Salamy, E. T. Peltzer, and P. G. Brewer (2004), "Laser Raman Spectroscopic Instrumentation for in situ Geochemical Analyses in the Deep Ocean." MTS/IEEE Oceans 2004, Kobe, Japan. MTS/IEEE #470

Kirkwood, W., D. Caress, H. Thomas, M. Sibenac, R. McEwen, F. Shane, R. Henthorn, and P. McGill (2004) "Mapping Payload Development for MBARI's Dorado Class AUVs." MTS/IEEE Oceans 2004, Kobe, Japan. MTS/IEEE #479

Podder, Tarun K., M. Sibenac, H. Thomas, W. Kirkwood, and J.G. Bellingham (2004) "Reliability Growth of Autonomous Underwater Vehicle - Dorado." MTS/IEEE Oceans 2004, Kobe, Japan. MTS/IEEE #563

Kirkwood, W., S. N. White, M. Brown, R. Henthorn, S. Jensen, K. A. Salamy, E. T. Peltzer, and P. G. Brewer (2003) "Precision Underwater Positioning for In Situ Laser Raman Spectrographic Applications." MTS/IEEE Oceans 2003, San Diego, California. MTS/IEEE #411.

Mark Sibenac, William Kirkwood, Rob McEwen, Farley Shane, Richard Henthorn, Drew Gashler, and Hans Thomas, "Modular AUV for Routine Deep Water Operations", Oceans Proceedings, November 2002, Boluxi, Miss.

William Kirkwood, Mark Sibenac, Rob McEwen, Farley Shane, Richard Henthorn, Drew Gashler, and Hans Thomas, "Field Results for an Arctic AUV Designed for Characterizing Circulation and Ice Thickness" American Geophysical Union Fall Meeting, December 2002

Kirkwood, W. (et al), "MBARI / MIT Ducted Propeller Control System Developed for Autonomous Underwater Vehicles", Underwater Intervention 2001 Conference Proceedings, Tampa Bay, Florida, January 2001.

Tervalon, N. & Kirkwood, W., "Ice Profiling Sonar for an AUV: An approach for obtaining SCICEX quality ice draft data", Oceanology International - Amercias Conference, AUV Sensor Workshop Proceedings, Miami, Florida, April 2001.

Caress, D. & Kirkwood, W., "High Resolution Mapping with AUVs: Payload Development issues in Support of Oceanographic Science", Oceanology International - Amercias Conference, AUV Sensor Workshop Proceedings, Miami, Florida, April 2001.

Kirkwood, W., Bellingham, J., Stannard, J., Stein, P., Overland, J., "Development of Dorado / ALTEX Vehicle and Subsystems", Society for Underwater Technology - AUV Masterclass Symposium Proceedings, Southampton Oceanographic Centre, Southampton, England, September 2001.

Kirkwood, W. (et al), "Development of a Long Endurance Autonomous Underwater Vehicle for Ocean Science Exploration", Ocean Conference Proceedings, Honolulu, Hawaii, November 2001.

Kirkwood, W.J. "Tiburon: Science and Technical Results from MBARI's New ROV Integrated to a SWATH Platform". IEEE/MTS Oceans Conference Proceedings, September 28 - October 1 1998, Nice, France. IEEE Press.

Kirkwood, W.J. "Tiburon: MBARI's 4000 Meter ROV for Science and Exploration", Unmanned Underwater Vehicle Conference, Southampton, England, 1998.

Kirkwood, W. J. & Steele, D.E. "Active Variable Buoyancy Control System for MBARI's ROV". IEEE/MTS Oceans 1994 Conference, Brest, France, Nov. 1994. IEEE Press.

Posters:

K. L. Headley, R.A. Herlien, C.D. Kacey, G.I. Matsumoto, T. Maughan, T. C. O'Reilly, E.T. Peltzer, K.A. Salamy, J. Scholfield, F. Shane, P.M. Walz, P.G. Brewer, W.J. Kirkwood, J.P. Barry "xFOCE: Technology for Studying Ocean Acidification Impacts", (2012, Sep) Poster session presented at Third Symposium on The Ocean in a High-CO2 World, Monterey, CA.

R. Henthorn; D. W. Caress; M. R. Chaffey; P. R. McGill; W. J. Kirkwood; W. C. Burgess (2009) "Development of a High-Resolution Shallow Seismic Refraction Tomography System at the Monterey Bay Aquarium Research Institute" AGU, San Francisco, Ca., Dec 2009, OS21A-1148.

P. M. Walz; X. Zhang; K. Hester; W. J. Kirkwood; W. Ussler; E. T. Peltzer; P. G. Brewer (2009) "Development of an In Situ Raman Probe for Pore Water Geochemistry" AGU, San Francisco, Ca., Dec 2009, OS43B-1403.

Hester, K C, Peltzer, E T, Kirkwood, W J and Brewer, P G (2008) " Changing noise levels in a high CO2/lower pH ocean", American Geophysical Union, San Francisco, California, December, 13, 2006, OS21A-1157.

P. Mahachek, Erin E. Beck, T. Burk, J. Acain, V. Reddy, C. Kitts, J. Kutnik, G. Wheat W. Kirkwood, and D. Caress (2008) "Development and Initial Testing of a SWATH Boat for Shallow-water Bathymetry", MTS/IEEE Oceans 2008, Quebec, Canada, September 17, 2008.

E T Peltzer, R Henthorn, K C Hester, W.J. Kirkwood, J Rosal, K A Salmay, J Scholfield, FF Shane, A D Sherman, P M Walz, and P.G. Brewer (2007) "Recent Advances in Deep-Sea in situ Geochemical Measurements by ROV Deployed Laser Raman Spectroscopy", American Geophysical Union, San Francisco, California, December, 14, 2007, OS51B-0474.

W. J. Kirkwood, E. T. Peltzer, and P. G. Brewer "In Situ Ocean Acidification Environmental Observations: MBARI's Cabled Observatory Technology for Controlled Studies of Changing Ocean pH", Underwater Technology Conference, Tokyo, April 18 – 20, 2007, No. 1030.

D.W. Caress, H.J. Thomas, W.J. Kirkwood, and P.G. Brewer (2006) "An Autonomous Multibeam, Sidescan, and Subbottom Survey of a Methane Hydrate Outcrop in Barkley Canyon, Offshore Vancouver Island", American Geophysical Union, San Francisco, California, December, 14, 2006, MR43A-1063.

P.G. Brewer, E.T. Peltzer, W.J. Kirkwood, R.M. Dunk, P. Walz, K. Hester and E.D. Sloan (2006) "Novel Observations on the Massive Barkley Canyon Hydrates", American Geophysical Union (invited), San Francisco, California, December, 13, 2006, MR31A-03.

Peter Walz, Peter G. Brewer, Edward T. Peltzer, Rachel M. Dunk, Dale Graves, Jim Scholfield, William Kirkwood (2006), "Free Ocean Carbon Dioxide Enrichment (FOCE): Control and Measurement of Ocean Seawater to Simulate a Low pH-High CO₂ Ocean", Ocean Sciences Meeting, Honolulu, Hawaii, February 20 -24, 2006.

R. McEwen, D.W. Caress, H.J. Thomas, R. Henthorn, W. Kirkwood (2006), "Performance of an Autonomous Underwater Vehicle while Mapping Smooth Ridge in Monterey Bay", Ocean Sciences Meeting, Honolulu, Hawaii, February 20 -24, 2006.

Sherman, A., Dunk, D.M., White, S.N., Kirkwood, W., Peltzer, E.T., Shane, F., Henthorn, R., Salmay, K.A., Brewer, P.G., (2006) "Development of a 2nd Generation Laser Raman Spectrometer for the Deep Ocean" ASLO / TOS / AGU Ocean Sciences Meeting, Honolulu, Hawaii, February 20-24, 2006, OS44B-04.

McEwen, R.S., Caress, D.W., Thomas, H.J., Henthorn, R., Kirkwood, W. (2006) "Performance of an Autonomous Underwater Vehicle while Mapping Smooth Ridge in Monterey Bay" ASLO / TOS / AGU Ocean Sciences Meeting, Honolulu, Hawaii, February 20-24, 2006, OS25N-18.

Walz, P.M., Brewer, P.G., Peltzer, E.T., Dunk, D.M., Graves, D., Scholfield, J., Kirkwood, W., (2006) "Free Ocean Carbon Dioxide Enrichment (FOCE): Control and Measurement of Ocean Seawater to Simulate a Low pH-High CO₂ Ocean" ASLO / TOS / AGU Ocean Sciences Meeting, Honolulu, Hawaii, February 20-24, 2006, OS15D-12.

Kirkwood, W. J., Caress, D. W., Thomas, H., McEwen, R., Henthorn, R., Sibenac, M., McGill, P., Hamilton, A., Shane, F., Thompson, D., Jensen, S., Salmay K., (2005) "MBARI Mapping AUV: A High-Resolution Deep-Ocean Seafloor Mapping Capability" AGU Fall Conference 2005 San Francisco, California. December 7, 2005 Fall Meet. OS43B-0562, 2005.

Caress, D. W., Paull, C., Thomas, H., McEwen, R., Henthorn, R., Kirkwood, W. J., Thompson, D., McGill, P., (2005) "High-Resolution Multibeam, Sidescan, and Subbottom Surveys in and Around Monterey Canyon Using the MBARI Mapping AUV" AGU Fall Conference 2005 San Francisco, California. December 7, 2005, Fall Meet OS33C-1490, 2005.

Caress, D. W., Kirkwood, W. J., Thomas, H., McEwen, R., Henthorn, R., McGill, P., Thompson, D., Sibenac, M., Jensen, S., Shane, F., Hamilton, A., (2005) "MBARI Mapping AUV: A High-Resolution Deep Ocean Seafloor Mapping Capability" AGU 2005 Joint Assembly, May 23-27, 2005, New Orleans, LA. #U24A-02.

Kirkwood, W. J., Caress, D. W., Thomas, H., McEwen, R., Henthorn, R., McGill, P., Thompson, D., Sibenac, M., Jensen, S., Shane, F., Hamilton, A., (2004) "Development of the MBARI Mapping AUV" AGU Fall Conference 2004, San Francisco, California. December 13 -17, 2004, Fall Meet. OS43B-0562, 2004.

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Patents:

Title Of Invention: Title: Wireless Power and Data Transfer Device for Harsh and Extreme Environments: Patent Number: 8,946,941 Issue Date of Patent: 02-03-2015

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Title Of Invention: Aquaculture Farm System and Method:
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Patent Number: 4,973,145 Issue Date of Patent: 11-27-1990