

Exhibit No. 1

DEVELOPMENT OF RADIO-TRANSMITTED VIDEO SIGNAL FOR
MONITORING WILDLIFE

Description of research project

We request an experimental radio service to determine whether radio transmissions of a video signal can be used for monitoring and recording the behaviors of wildlife. In particular, we propose to use a radio signal (426.250 MHz or 427.250 MHz) to transmit video approximately 1-2 miles to a receiving station. The camera and radio transmitter will initially be used to record Caspian terns, harbor seals, and possibly egrets and herons in the Elkhorn Slough National Estuarine Research Reserve. The remote station will include a video camera, transmitter (developed and constructed by Telonics, Inc.), battery, solar panel, and antenna. The camera and transmitter will be encased in a housing for protection. The radio signal will be continuous during daylight, but will be off during night (a light sensor will control power) because visibility will be minimal. The signal will be broadcast approximately 1-2 miles to the visitor center of the reserve, where a down converter will convert the radio signal into video for recording and viewing. This experimental setup will allow us to test whether such a system can be used for monitoring wildlife without disturbing them.

This setup will be used on a non-interfering basis. We can turn the system off if it causes any interference. We believe it will not interfere with other radio communications because the signal strength is minimal (30 dbm), the transmitter will be located in remote areas away from homes and people, and will only operate during daylight.

Necessities of communication facilities

Behavioral observations of many wildlife species are difficult and biased. Whenever an observer is close enough for observations they may cause changes in the behavior of the subject. A remote means of observing and recording wildlife may greatly increase our understanding of their biology. The communication system we would like to use in this experiment will offer a cost-effective means of testing whether this system can be effective in observing wildlife. We propose to use the system on two species that are of special concern in this area (Caspian Terns and Harbor seals). These animals cannot be observed successfully without the proposed system.

Inadequacy of existing communication facilities

Presently we can only observe wildlife from a great distance, making adequate observations nearly impossible. Other means of observing wildlife at a close range are prohibitive, either financially or technologically. The proposed system is the only economical, portable, and remote means of monitoring wildlife in the field.

VITA

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Born:

San Diego, California, 21 July 1951.

Education:

San Jose State University, San Jose, CA. 1969-1974. B.A.,
Biology/Marine Biology (minor: Chemistry).
Moss Landing Marine Laboratories, Moss Landing, CA/
San Jose State University. 1974-1977. M.S., Marine
Biology (Spring 1979).
Oregon State University, Corvallis, OR. 1982-1987. Ph.D.,
School of Oceanography (minors: Statistics, Wildlife
Ecology).

Title of Master's Thesis:

Aspects of the natural history of the blue shark, Prionace
glauca L., in Monterey Bay, California.

Title of Doctoral Dissertation:

Population dynamics, annual food consumption, movements, and
dive behaviors of harbor seals, Phoca vitulina richardsi,
in Oregon.

Primary Research Interests:

Ecology, morphology, and behavior of marine mammals, birds,
and fishes; VHF/satellite-telemetry; marine
mammal/fisheries interactions; vertebrate sampling
techniques and experimental design; age and growth;
population and trophic dynamics; marine mammal stranding
studies.

Positions:

Assistant Professor, Moss Landing Marine Laboratories, San
Jose State University. (Teaching graduate courses,
conducting research, and advising students).
January 1991 - present.
Instructor, Moss Landing Marine Laboratories, Moss
Landing, CA. (Courses taught: Marine Birds and Mammals,
Behavior of Animals, Statistics, Graduate Seminar,
Techniques in Marine Vertebrate Ecology, Sampling and
Experimental Design). August 1989 - January 1991.
Fisheries Biologist, National Marine Mammal Laboratory,
National Marine Fisheries Service, Seattle, WA.
(Population biology of northern fur seals on the Pribilof
Islands), Summer 1990.
Instructor, Oregon State University (taught section of
Marine Biology Course, Bi450-451), Summer 1982, 1990.

Graduate Faculty, Oregon State University, Department of Science, Math, and Computer Science Education (taught Marine Mammal Course for educators, SED 508j), Summers 1983 - 1990.

National Research Council Post-doctoral Fellowship, N.O.A.A., National Marine Mammal Laboratory, National Marine Fisheries Service (pinniped feeding ecology), January 1988 - August 1989.

Visiting Professor, University of Oregon, Oregon Institute of Marine Biology, (taught Marine Vertebrate Ecology and Techniques in Marine Biology), Summers 1985 & 1987.

Instructor, Linn-Benton Community College (taught Oceanography), January - March 1987.

Graduate Research Assistant, Oregon State University (marine mammal acoustic deterrence, feeding habits, and strandings, ichthyoplankton studies, and museum preparations), 1982 - 1986.

Research Consultant, Cetacean Research Associates (radio-tagging and tracking studies of gray whale movements off Monterey, CA), January 1985.

Research Assistant, Oregon State University (marine mammal population biology, tagging and tracking, feeding, and strandings), November 1977 - September 1982.

Instructor, Linn-Benton Community College (taught Life History of Marine Mammals) September 1978 - November 1980.

Graduate Assistant, Moss Landing Marine Laboratories (life history and predators of market squid) September 1975 - August 1977.

Teaching Assistant, Moss Landing Marine Laboratories (assisted in teaching Marine Ecology) September 1977 - November 1977.

Diving Technician, Moss Landing Marine Laboratories (Field sampling during benthic life history studies) February - November 1977.

Research Technician, Moss Landing Marine Laboratories (cruise leader in collections of marine fishes, birds, and mammals, February 1975 - November 1977.

Second Mate, R/V Oconostota, Moss Landing Marine Laboratories, September 1976 - November 1977.

Research Assistant, Moss Landing Marine Laboratories (Longshore transport of sediment) June - September 1972.

Ecological Consultant, Harvey and Stanley, Assoc. (environmental impact studies, statistical analysis, and field studies on survival of Spartina) March 1972 - September 1974.

Professional Organizations:

American Association for the Advancement of Science
American Cetacean Society
American Society of Mammalogists
American Statistical Association
California Marine Mammal Stranding Network
Ecological Society of America
International Marine Animal Trainers Association
Pacific Seabird Group
Sigma Xi
Sociedad Mexicana Para El Estudio de los Mamiferos Marinos
Society for Northwestern Vertebrate Biology
The Society for Marine Mammalogy (Treasurer)
Western Society of Naturalists
Woods Hole Oceanographic Institution

Publications:

- Harvey, J.T. 1979. Aspects of the natural history of the blue shark, Prionace glauca L. in Monterey Bay, California. M.A. Thesis, San Jose State University. 86pp.
- Morejohn, G.V., J.T. Harvey, and L.D. Krasnow. 1979. The importance of Loligo opalescens in the food web of marine vertebrates in Monterey Bay, California. Calif. Dept. Fish Game, Fish Bull. 169:67-98.
- Mate, B., J. Harvey, and R. Sanchez. 1982. Radio tagging gray whales in Baja California, Mexico. Proc. Sixth Int. Reun. Study Mar. Mammals Baja Calif. Penin. pp. 90-100.
- Mate, B.R., J.T. Harvey, L. Hobbs, and R. Maiefski. 1983. A new attachment device for radio-tagging large whales. J. Wildl. Manage. 47:868-872.
- Harvey, J., R. Brown, and B. Mate. 1983. Two sightings following release of rehabilitated harbor seals. Murrelet 64:18.
- Cailliet, G., L. Martin, J. Harvey, D. Kusher, and B. Welden. 1983. Preliminary studies on the age and growth of blue, Prionace glauca, common thresher, Alopias vulpinus, and shortfin mako, Isurus oxyrinchus, sharks from California waters. U.S. Dep. Comm., NOAA Tech. Rep. NMFS 8:179-188.
- Harvey, J. and B. Mate. 1984. Dive characteristics and movements of radio-tagged gray whales in San Ignacio Lagoon, Baja California Sur, Mexico. pp. 561-575, In: M.L. Jones, S. Leatherwood, and S. Swartz (eds.), The gray whale (Eschrichtius robustus). Academic Press, Inc. N.Y.
- Mate, B. and J. Harvey. 1984. Ocean movements of radio-tagged gray whales. pp. 577-589. In: M.L. Jones, S. Leatherwood, and S. Swartz (eds.), The gray whale (Eschrichtius robustus). Academic Press, Inc. N.Y.
- Sumich, J.L. and J.T. Harvey. 1986. Juvenile mortality in gray whales (Eschrichtius robustus). J. Mamm. 67:179-182.
- Rice, D.W., A.A. Wolman, B.R. Mate, and J.T. Harvey. 1986. A mass stranding of sperm whales in Oregon: Sex and age composition of the school. Mar. Mam Sci. 2:64-69.

- Harvey, J.T. and D.L. Stein. 1986. The state of scientific information relating to the biology and ecology of the Gorda Ridge study area, northeast Pacific Ocean: Nekton. Oregon Dept. Geol. Mineral Res. 131 pp.
- Harvey, J.T. 1987. Population dynamics, annual food consumption, movements, and dive behaviors of harbor seals, Phoca vitulina richardsi, in Oregon. Ph.D. Thesis, Oregon State University. 168 pp.
- Mate, B.R., R.B. Brown, C.F. Greenlaw, J.T. Harvey, and J. Temte. 1987. An acoustic harassment technique to reduce seal predation on salmon. pp. 23-36. In: Mate, B.R. and J.T. Harvey (eds.), Acoustical deterrents in marine mammal conflicts with fisheries. A workshop held February 17-18, 1986 at Newport, Oregon. Oregon State University, Publ. No. ORESU-T-87-001. 116 pp.
- Harvey, J.T., B.R. Mate, and R.B. Brown. 1987. The feasibility and effectiveness of using an acoustic barrier to restrict the movements of seals into Netarts Bay, Oregon. pp. 75-78, In: Mate, B.R. and J.T. Harvey (eds.), Acoustical deterrents in marine mammal conflicts with fisheries. A workshop held February 17-18, 1986 at Newport, Oregon. Oregon State University, Publ. No. ORESU-T-87-001. 116pp.
- Mate, B.R. and J.T. Harvey (eds.). 1987. Acoustical deterrents in marine mammal conflicts with fisheries. A workshop held February 17-18, 1986 at Newport, Oregon. Oregon State University, Publ. No. ORESU-T-87-001. 116 pp.
- Harvey, J.T. 1989. Food habits, seasonal abundance, size, and sex of blue sharks, Prionace glauca, in Monterey Bay, California. Calif. Fish Game 75:31-44.
- Harvey, J.T. 1989. Assessment of errors associated with harbour-seal faecal sampling. J. Zool. (Lond.). 219:101-111.
- Harvey, J.T., R.F. Brown, and B.R. Mate. 1990. Abundance and distribution of harbor seals (Phoca vitulina) in Oregon, 1975-1983. Northwest. Nat. 71:432-440.
- Harvey, J.T. 1991. Survival and behavior of previously captive harbor seals after release into the wild. Pp. 117-122, IN: Reynolds, J.E. III and D.K. Odell (eds.), Marine mammal strandings in the United States. Proceedings of the 2nd Marine Mammal Stranding Workshop, Miami, Florida, December 2-5, 1987. NOAA Tech. Rept. NMFS 98. 157 pp.
- Hodder, J., J.T. Harvey, M.R. Graybill, R.F. Brown, and B. Ebberts. 1992. An outbreak of probable leptospirosis in California sea lions along the Oregon coast during fall 1984. Northwest. Sci. 73:37-41.
- Jeffries, S.J., R.F. Brown, and J.T. Harvey. 1993. Methods of capturing, handling, and tagging harbor seals. Aquat. Mamm. 19.1:21-25.

- Starbird, C.H., A. Baldrige, and J.T. Harvey. 1993. Seasonal occurrence of leatherback sea turtles (Dermochelys coriacea) in the Monterey Bay region, with notes on other sea turtles, 1986-1991. Calif Fish Game. 79(2):54-62.
- Harvey, J.T. and G.A. Antonelis. 1994. Biases associated with nonlethal methods of determining the diet of northern elephant seals. Mar. Mamm. Sci. 10(2):178-187.
- Harvey, J.T. and M.E. Dahlheim. 1994. Cetaceans in oil. IN: Impacts of the Exxon Valdez oil spill on marine mammals, Loughlin, T.R. (ed.). Academic Press, Inc. Orlando, Florida.
- DiMolfetto-Landon, L., K.L. Erickson, M. Blanchard-Channell, S.J. Jeffries, J.T. Harvey, D.A. Jessup, D.A. Ferrick, and J.L. Stott. 1995. Blastogenesis and interleukin-2 receptor assays in the harbor seal, Phoca vitulina. J. Wildl. Dis.
- Harvey, J.T., R. Helm, and G.V. Morejohn. 1995. Food habits of harbor seals inhabiting Elkhorn Slough, California. Calif. Fish and Game 81(1):1-9.
- Harvey, J.T., T.R. Loughlin, M. Perez, and D. Oxman. in press. Otolith length/fish length relationships for 63 species of fishes of the northeastern Pacific. NOAA Tech. Rept.
- Lamont, M.M., J.T. Vida, J.T. Harvey, S.J. Jeffries, R.F. Brown, H.H. Huber, R.L. DeLong, and W.K. Thomas. in press. Genetic substructure of Pacific harbor seals (Phoca vitulina richardsi) off Washington, Oregon, and California. Mar. Mam. Sci.

Papers Submitted or in Preparation:

- Burd, M.A., J.T. Harvey, and G.A. Antonelis. Aerobic bacteria of northern fur seal (Callorhinus ursinus) pups of the Pribilof Islands (USA) and Medny Island (Russia). In review, J. Wildl. Dis.
- Harvey, J.T., R.F. Brown, and V. Estelle. Dive behavior and movements of radio-tagged harbor seals in Oregon. To be submitted to Mar. Mamm. Sci. in fall, 1995.
- Brown, R.F., S.J. Jeffries, and J.T. Harvey. Seasonal abundance and winter feeding ecology of harbor seals in the Columbia River. To be submitted to Fish. Bull. in fall, 1995.
- Dorfman, E. and J.T. Harvey. Feeding ecology of harbor porpoise in Monterey Bay. To be submitted to J. Mamm. in fall, 1995.
- Raum-Suryan, K.L. and J.T. Harvey. Distribution, abundance, and habitat use of harbor porpoise (Phocoena phocoena) off the northern San Juan Islands, Washington. To be submitted to Fishery Bulletin in Spring, 1996.
- Suryan, R.M. and J.T. Harvey. Movements and dive patterns of the harbor seal (Phoca vitulina richardsi) off the San Juan Islands, Washington. To be submitted to Marine Mammal Science in Spring, 1996.

Papers Presented:

- Pollutant effects on harbor seals (Phoca vitulina richardsi) along the Pacific coast. 1995. Co-authored with D.G. Moser and M.D. Stephensen.
- Western Society of Naturalists. 1994. "You can't count critters in a meeting, but would they come?" Co-authored with G. Cailliet and M. Foster.
- Monterey Bay Research Symposium. 1994. "Harbor seals: dining in the bay". Co-authored with D. Oxman.
- La Sociedad Mexicana para el estudio de los mamíferos marinos. 1993. "Radio-tagging gray whale calves in San Ignacio Lagoon, Baja California, Mexico".
- Pacific Seabird Group. 1993. "Abundance and distribution of seabirds in Monterey Bay, California". Co-authored with J. Mason.
- Tenth Biennial Conference on the Biology of Marine Mammals. 1993. "Pollutants and population dynamics of harbor seals in San Francisco Bay". Co-authored with A.D. Kopec.
- Tenth Biennial Conference on the Biology of Marine Mammals. 1993. "Movements, daily activity patterns, and food habits of harbor seals (Phoca vitulina richardsi) in San Francisco Bay, California, U.S.A. Co-authored with M.L. Torok.
- 1992 Sea Turtle Symposium. 1992. Movements and Behavior of Leatherback sea turtles (Dermochelys coriacea) in Monterey Bay, California". Co-authored with C. Starbird and A. Baldrige.
- Ninth Biennial Conference on the Biology of Marine Mammals. 1991. "Bacteria of northern fur seal (*Callorhinus ursinus*) pups on the Pribilof and Commander Islands". Co-authored with M.A. Burd and G.A. Antonelis, Jr.
- Monterey Bay Research Symposium. 1991. "Marine birds and mammals of Monterey Bay". Co-authored with A. Baldrige.
- Wildlife 2001 Conference. 1991. "Toxic pollutant residues and health of San Francisco Bay harbor seals: preliminary findings". Co-authored with D. Kopec, S.G. Allen, and L.E. Fancher.
- Western Society of Naturalists. 1990. "Assemblages of pelagic nekton (squid, fishes, birds, and mammals) and their trophic interactions in Monterey Bay". Co-authored with G.M. Cailliet.
- Eighth Biennial Conference on Biology of Marine Mammals. 1990. "Quantifying errors in pinniped food habit studies." Co-authored with G.A. Antonelis, Jr. and C.J. Casson.
- Society for Northwestern Vertebrate Biology. 1989. "Dive patterns and movements of radio-tagged harbor seals in Oregon."
- Sixth Western Groundfish Conference. 1989. "Natural mortality of fishes attributed to harbor seals in Oregon."
- Seventh Biennial Conference on Biology of Marine Mammals. 1987. "Errors associated with pinniped fecal sampling."

Second Conference on Marine Mammal Strandings. 1987.
 "Survival and behavior of captive harbor seals after release."
 Second Workshop on Pinniped Energetics. 1987. "Annual fish consumption and feeding energetics of harbor seals in Oregon."
 Sixth Biennial Conference on Biology of Marine Mammals. 1985. Co-authored with Jan Roletto. "The distribution and diagnosis of the 1984-85 Leptospirosis epizootic in California sea lions."
 Fourth Biennial Conference on the Biology of Marine Mammals. 1981. "Movements and dive characteristics of radio-tagged gray whales."
 Fifth Reunion Internacional Sobre Mamiferos Marinos de Baja California. 1980. "The Oregon sperm whale stranding."
 Western Society of Naturalists. 1978. "Aspects of the natural history of the blue shark, Prionace glauca L., in Monterey Bay, California."
 Odontocete Aging Conference. 1978. Co-authored with B. Mate. "Aging of marine mammals using acetate peels."
 Marine Mammal/Fisheries Interaction Workshop. 1977. "Trophic analysis of vertebrate predators in Monterey Bay, California."
 CalCOFI Conference. 1976. Symposium on the market squid, Loligo opalescens. "Comparative feeding habits of king and silver salmon with blue sharks in Monterey Bay, California."

Recent Seminars Presented:

"Marine mammals in Monterey Bay: ecology and conflicts". Moss Landing Marine Labs. Community Seminar Series. Moss Landing, CA. 19 January 1994.
 "Rescues and miscues of marine mammals". American Cetacean Society. 25 August 1994.
 "Should we rescue marine mammals?". Long Marine Lab, UCSC. 30 August 1994.
 "Dining in the bay, resting in the slough". Elkhorn Slough National Estuarine Research Reserve volunteers. 8 November 1994.
 "Methods of tagging and tracking marine mammals". Monterey Bay Environmental Monitoring Workshop, Sponsored by Monterey Bay Aquarium Research Institute, 28-29 February, 1992.
 "Movements and diving of harbor seals in Oregon." Oregon State University, 20 June 1990.
 "Diving behaviors of harbor seals: Things that go beep in the night." University of Oregon, 20 June 1990.
 "Recent methods of studying marine mammals." American Cetacean Society, 29 March 1990.
 "Effects of harbor seal feeding on nearshore fish populations." University of California, Santa Cruz, 24 January 1990.

Reports:

- Mate, B. and J. Harvey. 1981. An evaluation of three radio tags applied to gray whales and their utility in assessing whale movements and dive characteristics. Final Rep., U.S. Dept. Interior, Bur. Land Manage. 68pp.
- Mate, B. and J. Harvey. 1982. Feasibility of tracking whales using the Argos satellite system. Final Report, U.S. Dept. Interior, Alaska Env. Stud. Prog. 26pp.
- Lien, J., D. Jinhai, L. Baraff, J. Harvey, and K. Chu. 1982. Whale entrapments in inshore fishing gear during 1982; A preliminary report to Fisheries and Oceans Canada. N.I.C.O.S. Contr. 26, 36pp.
- Harvey, J.T. 1984. Abundance and activities of harbor seals along the central Oregon coast. Final Report to: Oregon Dept. Fish and Wildl., 506 SW Mill St., Portland, OR 97208. 17pp.
- Harvey, J.T. 1984. Effects of digestion on size and number of fish otoliths and squid beaks in fecal samples from the harbor seal, Phoca vitulina. Prelim. Report, Nat. Mar. Mamm. Lab., Nat. Mar. Fish. Serv., Seattle, WA. 12pp.
- Swartz, S.L. and J.T. Harvey. 1985. Preliminary report on the use of radio-tags to determine daytime and nighttime migration rates of gray whales (Eschrichtius robustus). Prepared for Nat. Mar. Fish. Serv., Seattle, WA. 44p.
- Harvey, J.T., H.W. Braham, and T.R. Loughlin. 1990. A conservation plan for northern fur seals, Callorhinus ursinus. Prepared for National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Washington, D.C. 49 pp.
- Harvey, J.T. and M.L. Torok. 1994. Movements, dive behaviors, and food habits of harbor seals (Phoca vitulina richardsi) in San Francisco Bay, California. Prepared for the California Department of Water Resources, Sacramento, CA. 89 pp.
- Harvey, J.T., J.W. Mason, R.M. Suryan, and P.E. Byrnes. 1994. Seabird and marine mammal surveys during disposal of dredged material at the ODMDS. Prepared for PRC Environmental Management, Inc., San Francisco, CA. 58 pp.
- Kopec, A.D., J.T. Harvey, and M.L. Torok. 1994. Toxic pollutants, health indices, and population dynamics of harbor seals in San Francisco Bay. Prepared for the San Francisco Estuary Project, Oakland, CA. 13 pp.
- Lamont, M. and J. Harvey. 1995. Genetic variation of Pacific harbor seals (Phoca vitulina richardsi) from the inner and outer coasts of Washington and Monterey Bay, California. Prepared for The Bay Foundation. 17 pp.
- Kopec, A.D. and J.T. Harvey. 1995. Toxic Pollutants, Health Indices, and Population Dynamics of Harbor Seals in San Francisco Bay, 1989-1992. Prepared for San Francisco Bay Estuary Project, EPA. 172 pp.

Grants or Awards:

- American Society of Mammalogists, Grants-in-Aid of research. 1983. Supported preliminary work on attaching radio-tags to the heads of pinnipeds, \$487.
- Oregon Department of Fish and Wildlife, nongame research. 1984. Supported the purchase of radio-telemetry gear for a study of harbor seals, \$3,121.
- National Marine Fisheries Service, National Marine Mammal Laboratory. 1984. Funded a study of the digestion of fish otoliths in harbor seals, (Contract No. 41 USC 252 C 3), \$1,250.
- National Marine Fisheries Service, National Marine Mammal Laboratory. 1985. Provided 10 radio-tags for a study of the association of harbor seal pups with their mothers, \$1,800.
- Humanitarian of the Year for central Oregon coast, Oregon Humane Society. 1985. Awarded for yearly efforts involved with stranded marine mammals.
- National Marine Fisheries Service, through the Cooperative Institute for Marine Resource Studies. 1985. Provided funds to investigate the size distribution of seals along the coast of Oregon, \$1,500.
- Oregon Coast Aquarium. 1985. Support for a study of the survival of harbor seals once released into the wild after years of captivity, \$2,000.
- Walter G. Jones Memorial Scholarship. 1986. Fisheries Development Award, Oregon State University, \$400.
- National Research Council Post-doctoral Fellowship, National Marine Mammal Laboratory, National Marine Fisheries Service, Seattle, WA. 1988. Feeding Ecology of pinnipeds, \$50,700.
- National Oceanic and Atmospheric Administration. Marine Fisheries Service. 1989. Certificate of Recognition for outstanding contributions serving the public trust.
- National Marine Fisheries Service, Southwest Fisheries Center. 1990. Monitoring cetacean mortalities in fisheries of Monterey Bay, \$6,000.
- Texas A&M University at Galveston. 1990. Underwater recordings of whales using trained sea lions, \$1,500.
- National Marine Fisheries Service, Southwest Fisheries Center. 1990. Post-mortem examinations of marine birds and mammals caught in gillnet fishery, \$4,000.
- San Francisco Estuary Project, Gaps in Knowledge Program. 1991. Toxic pollution in San Francisco Bay: implications for harbor seal health and reproduction, \$40,066. (Co-principle investigator with Dianne Kopec).
- National Geographic Society. 1991. Use of trained California sea lions for recording underwater behaviors of whales, \$15,500.
- Environmental Protection Agency, University Academic Research Involvement Program for the San Francisco Bay/Delta. 1991. Habitat use of harbor seals in San Francisco Bay, \$41,744.

National Marine Fisheries Service. 1991. Photoidentification of bottlenose dolphins in Monterey Bay, \$500.00.

Office of Naval Research. Effect of low frequency sound on seasonal foraging ecology and diving behavior of the New Zealand fur seal, \$30,000. (co-PI Rob Mattlin).

Office of Naval Research. 1992. Remote recovery of data acquisition systems on marine mammals, \$21,075.

San Jose State University Foundation. 1993. The JASON Project: Tagging gray whales in San Ignacio Lagoon, travel award, \$2,500.

San Jose State University Foundation Research Grant. 1993. Coupling of physical and biological processes in Monterey Bay, \$2,500.

Sea Grant Trainee. 1993. Genetic engineering of fast growing strains of abalone, \$6,240. (co-PI Dr. Dennis Powers).

United State Navy. 1993. Effects of dredge disposal on marine birds and mammals at the Navy disposal site. \$22,000.

Army Corp. of Engineers. 1993. Mitigation for effects of repair of the Monterey breakwater on marine birds and mammals. \$15,455.

The Bay Foundation. 1993. Genetic variation of Pacific harbor seals (*Phoca vitulina*) from the inner and outer coasts of Washington and Monterey Bay, California. \$3,385 (co-PI Meg Lamont).

United State Navy. 1993. Ship shock trials - seabird surveys off southern California. \$23,442.

Office of Naval Research. 1994. Development of a new delivery and attachment system for tagging large cetaceans. \$163,363.

Office of Naval Research. 1994. Effects of low frequency sound on harbor seals. \$115,807.

University of California Sea Grant. 1994. Genetic engineering of fast growing strains. \$13,104. (co-PI D. Powers, Hopkins Marine Station).

University of California, Santa Cruz. 1994. Shipboard surveys of marine mammals off Point Sur related to the ATOC experiment. \$24,439.

City of Monterey. 1994. Boat ramp repair and effects on sea otters. \$2,874.

San Jose State University. 1994. Prevalence of Morbillivirus among harbor seals (*Phoca vitulina*) in the North Pacific. \$7,500 (co-PI John Boothby).

Monterey Bay National Marine Sanctuary. 1995. Monitoring abundance and distribution of marine birds and mammals in Monterey Bay, California. \$5,149.

National Oceanic and Atmospheric Administration. 1995. Marine mammal studies in the central California National Marine Sanctuaries. \$75,000 (co-PIs Dan Costa, Don Croll, and Terrie Williams, UCSC).

Professional Skills and Experiences:

Aerial and shipboard surveys enumerating pinnipeds, cetaceans, and seabirds along the west coast of North America.

Radio-tagging and tracking of gray whales in Baja California and California, humpback whales in Newfoundland, fur seals in the Bering Sea, and harbor seals along the west coast of the U.S.

Twenty years of experience with Telonics, AVM, and Cedar Creek radio-telemetry instrumentation.

Capture, collection, tagging, and experimental ecology of pinnipeds along the west coast of North America.

Co-coordinator of Marine Mammal Stranding Network for central Oregon coast.

Marine bird and mammal necropsies and rehabilitation.

Techniques of acoustical harassment of pinnipeds.

Feeding ecology of marine vertebrates, including: identification of cephalopod beaks (attended squid beak workshop in England), and fish otoliths (using personal reference collections).

Educational and research museum preparations of vertebrate skeletons and skins (including preparation of minke whale, gray whale and Steller sea lion skeletons for public display, and bird skins for museum collections).

Professional photography (published in A Guide to marine mammals of greater Puget Sound, Marine mammals of the eastern North Pacific, Whales and friends Calendars, Northwest Geographer series, Whales dolphins, and porpoises of the Pacific).

Extensive use of mainframes (e.g. Cyber) and personal computers (e.g. TRS, IBM, and Leading Edge, and use of FORTRAN and BASIC).

Underwater sampling techniques using SCUBA.

Teaching Experience:

Faculty, San Jose State University, Moss Landing Marine Laboratories, Moss Landing, CA. Quantitative Marine Science (MS 104), Introduction to Marine Animal Behavior (MS 110), Marine Birds and Mammals (MS 112), Ecology of Marine Marine Birds and Mammals (MS 211), Marine Graduate Seminar (MS 285), Scientific Writing (MS 285), Experimental and Sampling Design (MS 204).

Graduate Faculty, Oregon State University, Department of Science, Math, and Computer Science Education. Marine Mammals for Educators (SEd 508). (Summer 1990).

Visiting Faculty, Oregon State University. Department of Fish and Wildlife. Marine Biology (section of Bi450-451). (Summer 1990).

Visiting Professor, University of Oregon, Oregon Institute of Marine Biology. Marine Vertebrate Ecology, BI 464 and Techniques in Marine Biology, BI 408. (Summer 1987).

Instructor, Linn-Benton Community College. Oceanography (Winter 1987).

Instructor, University of Oregon, Oregon Institute of Marine Biology. Bi 408 (Techniques in Marine Biology), team-taught (Summer 1986).

Instructor, Oregon State University. Marine mammal section of marine biology, OSU Bi 448/449. (1982-1989).

Instructor, Oregon State University. Natural history of marine mammals, OSU Sci. Ed. 508. Class for secondary and elementary school teachers, team-taught with R. Brown. (1985-1987).

Instructor, Linn-Benton Community College. Team-taught with R. Brown three classes on natural history of marine mammals (1978-1980).

Yearly lecturer for University of Idaho, responsible for lectures on marine mammals for Marine Biology class (1981 - 1987).

Lectured and prepared labs approximately twice a year for Oregon State University classes (e.g. Biological Oceanography and Marine Resource Management) (1979 - 1987).

Assistant teacher, marine ecology at Moss Landing Marine Labs (1977).

Lectured for over 60 formal and informal meetings of various organizations (e.g. Audubon, Sierra Club, school teachers, high school classes, rehabilitation centers, OSU marine extension, and Oregon nature study groups, Seattle Aquarium). (1979 - present).

Assistant naturalist on natural history cruise of Baja California, aboard the FV Executive (1984).

Assistant teacher, high school biology (1973).

Assistant teacher, elementary school math (1972).

Produced (with N. Dimeo-Ediger) "A Teacher's Guide to the Marine Mammals of the Pacific Northwest." Text and photographs for teachers of marine mammal biology.

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References:

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