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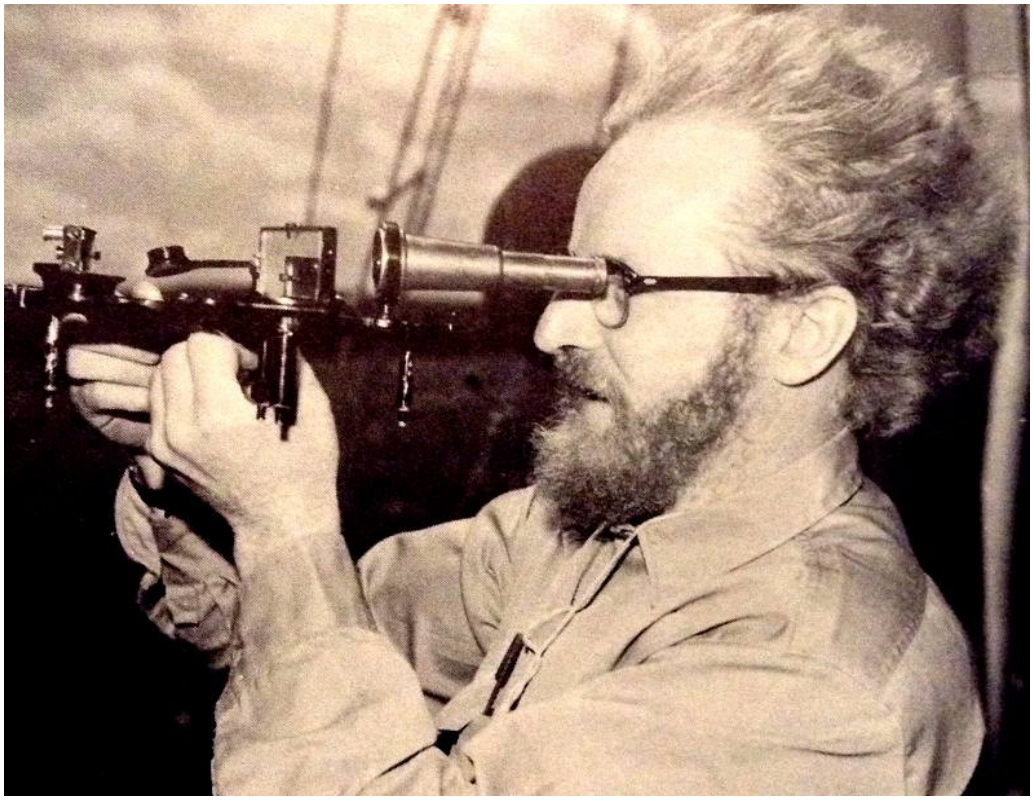
VOICEPIPE

Issue 85 September 2020

The Newsletter of the BIO-Oceans Association



Annual General Meeting
October 29th, 12:30 pm
Via Zoom
(see page 15)

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Beluga Award Recipient Dale Buckley

In the March edition of *Voicepipe,* we announced that Dale Buckley would be honoured with a special Beluga Award in recognition of his work at BIO, the spirit he exhibited carrying out that work, and his role in establishing both the Oceans Association and the Beluga Award. He was most pleased when informed of this recognition, and looked forward to accepting the award at our usual ceremony, what was to be the 20th anniversary of the Beluga Award. Because of the restrictions to combat Covid-19, our annual meeting and the award ceremony was postponed. Most unfortunately, Dale passed away in early April. We will reschedule the Beluga Award ceremony at an appropriate time and present the award to members of Dale's family.

As with any Beluga Award recipient, our practice is to publish an article giving our readers the background for our choice. In this case, no better summary of his life and career can be provided than Dale's obituary which we reprint here.
https://serenityfuneralhome.ca/tribute/details/8265/Dale-Buckley/obituary.html

Dale Eliot Buckley, age 83**,** passed away in the Dartmouth General Hospital on April 13, 2020 with his wife Betty and son Balon at his side. Dale was born in Wolfville, residing in Black River and Lumsden in his early years. His education started in a one room country school, advancing to city schools and then to Acadia

University where he earned his BSc degree. He went on to study for his MSc degree at the University of Western Ontario where he met his wife Betty, marrying soon after. He proceeded to USC in LA, and then on to the University of Alaska in Fairbanks to continue studies for his PhD.

He joined the Canadian Hydrographic Service in 1960, and then the Bedford Institute of Oceanography when it was built in 1962 as part of an interdisciplinary team of scientists and technicians. He became the first Head of the Marine Geology Subdivision when it was formed, as part of the Atlantic Geoscience Centre. He always felt he had the best job in the world and by the end of his 35-year career he had published over 225 scientific papers. He took part in many conferences around the world and participated in information-gathering on board scientific ocean vessels, Canadian and other. In 1982 he was a visiting scientist/lecturer at various cities in China, creating a text book which is still used today. In 1991 he served as a scientific advisor in Jakarta, Indonesia.

But his proudest achievement was the creation and sponsorship of the Beluga Award at BIO. This coveted award is presented yearly to a staff member who has contributed to the interdisciplinary cooperation and success of the Bedford Institute of Oceanography, be he/she a technician, dockworker, support staff or scientist. Potential recipients are nominated by their fellow workers who must document their worthiness and are voted on by committee.

Dale was an avid stamp collector from the time he was a young boy. He was an active Boy Scout achieving many badges via difficult challenges. Sports were always a part of his life, with hockey, handball, curling and golfing being his favourites. Amateur photography was a fun hobby. A showing of his photographs was well received and even resulted in a sale or two! He was mad about Bridge and welcomed an evening's competition at a moment's notice. While at Acadia he joined the Royal Canadian Air Force reserve which led to a posting to Canadian Joint Staff Headquarters in London, England. He loved the opportunity that gave him to see a bit more of the world. His interests were varied and he loved nothing more than discussing solutions to world problems over a cup of morning coffee.

Dale had a quirky sense of humour and he enjoyed intelligent comedy. Red Skeleton was his favourite comedian. Ever alert to opportunity he again managed to play a successful April Fool joke on his wife this year.

He is survived by his wife Betty (Galandzy); sons Balon (Ian Crowe) of Dartmouth NS, and Glen (Elizabeth) of Sackville NB; daughter Keera (Arne) Buchanan of Doha, Qatar; brother Ron (Carol) of Port William NS; as well as many nephews and nieces and their children.

Additionally, colleagues have provided their own tributes to Dale. Peter Wells recounts his reflections: "During my early career at BIO in the 1970s, I would sometimes meet Dale in the halls and over lunch, always finding him willing to chat about his research and inquire about mine, despite our different specialties. He exemplified the exciting research atmosphere that existed at BIO in its early years, so important to new and younger investigators.

Yet a highlight of memories of Dale was of our time spent together at the April 1978, *Amoco Cadiz* oil spill in Brittany, northern France. We were part of a six-member Canadian research team sent to assist the French scientists in monitoring the effects of the extensive spill and the various clean-up efforts deployed along the extensive and rugged coastline. A lot was learned from Dale about the interaction of oil and coastal sediments. We walked many beaches, monitoring the waves of emulsified crude oil coming ashore, being buried and unburied on sandy beaches and amongst the rocks through continuous wave action. Dale was a good natured field companion. He imparted a lot of knowledge about coastal sedimentology as we walked, dug, sampled and photographed many oiled and unoiled sites, often under unpleasant conditions due to the oil fumes.

A special highlight was at the trip's end. Back in the city of Brest where we were staying, we excited-

ly visited the main post office to acquire lots of recent French stamps. Both of us were avid philatelists, a shared life-long interest neither of us knew of before this trip.

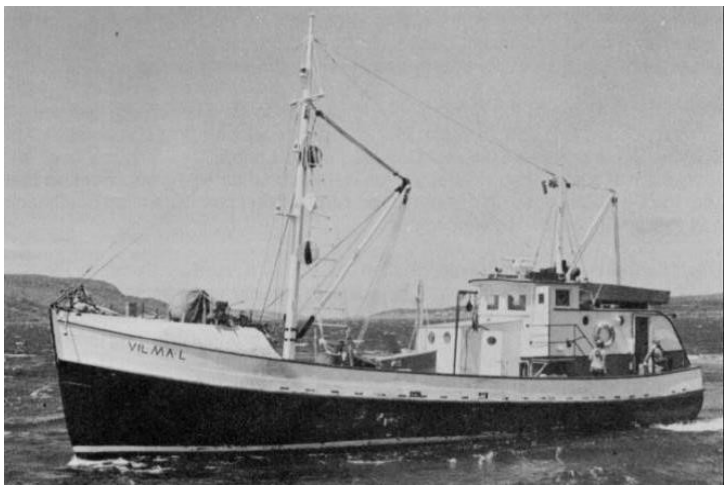
A better travel and field companion than Dale could not be wished for. My photos and notes from that overseas trip were lost in the 1979 BIO fire but memories of kind friends and exemplary scientists such as Dale never fade."

As a fitting, closing tribute to Dale, Lisa O'Neill gives us her heartfelt thoughts: "I arrived at BIO in the 1980s, a lowly two week temp typist. Assigned to work with the secretary to the Environmental Marine Geology group, I was eager, hard-working but very awkward. Dale was one of the first people I met at BIO. His kindness and support were always genuine and he encouraged me to become far more. His humour was always of great delight to me. Dale and I had years of back and forth practical jokes, always trying to outdo one another, and they became hilarious battles of creativity. I think, though, it was his generosity that was truly his trademark. I watched from the sidelines for a decade as he took students, colleagues, admin staff, mail room staff and cleaners under his wing and gave everyone a chance. His passing is truly a loss to the world, and the waves of effect he had on it will be felt forever."

Synergistic Science: The Canso Strait Project (Charles Schafer)

There were several Environmental Marine Geology (EMG) Research Scientists including myself that were, at first, somewhat skeptical about Dale Buckley's 1973 proposal for a comprehensive environmental analysis of Canso Strait based on using an integrated multidisciplinary approach. This initiative would recruit researchers from several EMG units with expertise in Quaternary studies (G.Vilks, F.Wagner, C. Schafer, and D. Walker), inorganic chemistry (D. Buckley, R. Cranston, G. Winters,), organic chemistry & sediment geotechnical properties (M. Rashid), and coastal geodynamics (E. Owens). At that time, those four units were supported by a strong cadre of first class field and laboratory technical assistants that reflected the rapid growth phase of BIO's early decades (e.g., K. Robertson, W. LeBlanc, M. Gorveatte, R. Fitzgerald, D. Clattenburg, and F. Cole). For some of us, the effort would involve placing other ongoing research on the back burner for about six months. However, after a closer preliminary evaluation of the target area, it became obvious that the project's proponents had selected the perfect field laboratory for surveying and testing a broad range of environmental issues that could be addressed using the various types of marine geology expertise that resided in the EMG Subdivision at that time. Thus, in the spring of 1973, the Subdivision's first multidisciplinary coastal research adventure began to take shape with its planners using a "swat-team" approach to identify specific tasks to document the environmental dynamics operating in the two apparently distinct environments in the north and south of the Canso Causeway. Field work employed the use of the *Vilma L*., a small inshore fishing vessel that was chartered for offshore operations.

Project goals included establishing the effects of the Causeway on the marine environment of the Strait particularly with respect to sediment texture and geochemical characteristics, and to distribution patterns of sediments and benthic communities in areas of the Strait located on either side of this man-made barrier. It also aimed to characterize the impacts of marine waste disposal practices emanating from various industries and municipalities situated on the south side of the barrier i.e., the towns of Port Hastings and Port Hawksbury, a gypsum loading terminal, the Nova Scotia Pulp mill, the Canadian General Electric heavy water plant, and the Gulf oil refinery and ocean terminal. The project would go on to document an impacted environmental setting that is now ripe for a follow-up study to ascertain changes brought about by new effluent treatment processes, new environmental protection legislation, changes to the area's industrial mix, and municipal (sustainable) growth over the past half century (e.g., the Port Hawksbury and Port Hastings waste water treatment plant that was commissioned in 2007).



The inshore fishing vessel *Vilma L* making its way north to the Canso Causeway Lock during the summer of 1973. Photo C.Schafer

Offshore areas of the Strait lying adjacent to the Cape Breton industrialized shoreline south of the barrier featured relatively greater percentages of clayey silt-sized particles that are normally restricted to deeper water environments. These nearshore subtidal sediments were shown to contain anomalous concentrations of trace metals and organic matter compared to those sampled in areas north of the Causeway and in Chedabucto Bay. Pulp mill-derived organic matter was observed to complex with copper and zinc more efficiently than with iron and manganese. Highest concentrations of organic matter were observed in the immediate vicinity of the Nova Scotia Forest Industries waste outfall where its organic matter-laden effluent caused a distinct decrease in both species diversity and abundance of the local community of benthic Foraminifera. Similar patterns were mapped for molluscs and ostracods. The latter group appeared to be the most sensitive biological pollution indicator as evidenced by the comparatively large area of its seafloor barren zone on the south side of the Causeway. Many of these patterns would have changed in later decades thanks to federal Pulp and Paper Mill Regulations that were enacted in 1971 and revised (improved) in 1992. The project went on to produce a considerable number of peer-reviewed journal publications in addition to several important in-house reports including D. Buckley's field report (BIO # 73-022), Geological Survey of Canada Paper 74-30, vol. 1 (co-authoured by Buckley, Owens, Schafer, Vilks, Wagner, Cranston, Rashid, and Walker) and a large report of geochemical data from the Strait of Canso and Chedabucto Bay (BIO Data Series BI-D-74.3) authored by Cranston, Fitzgerald and Winters. Collectively, they show that the Strait resembles a bisected fiord-like environment thanks to construction of the Causeway with major differences in benthic ecology, sedimentology and geochemistry between areas on the north and south sides of the barrier. Point-source industrial and municipal effluent discharges on the south side of the barrier were manifested by sedimentological, geochemical and biological anomalies that provided me with a treasure chest of baseline data for future marine pollution investigations in Chaleur Bay and the Saguenay Fiord.

The person mainly responsible for orchestrating this research effort was none other than Dale Buckley, whom I thought brought a measure of his Canadian military management experience to the project that was ultimately germane to convincing some of the potential key EMG players that a multidisciplinary approach would yield scientific benefits and a unique field experience for all participants. From my perspective, in those early exciting decades of well-supported BIO/DEMR operations, it worked out exactly as Dale had predicted – thank you for that, Dale Buckley! Nevertheless, in regard to the unique field experience part of it, I have a vivid recollection of the quality of meals that were arranged to be served to the EMG team in the cafeteria of the local high school where we were billeted. From time-to-time, they drove some of us to sneak out of the bunkhouse to local restaurants for gastronomical relief.

History of the BIO Photo Unit
(Kelly Bentham, Don Gordon)

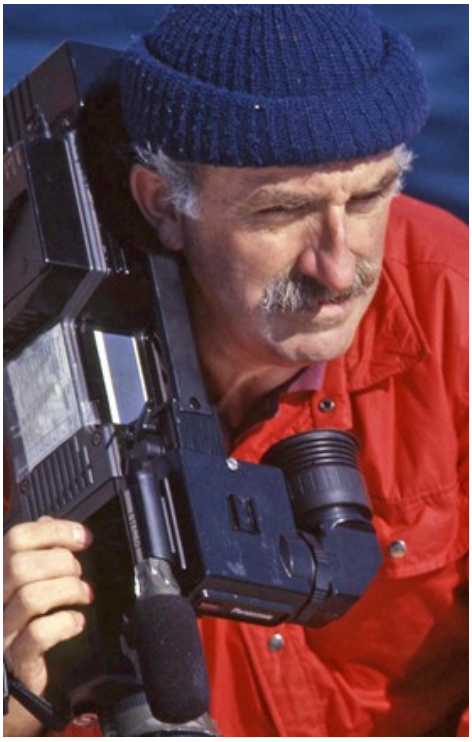
For over 55 years, the Bedford Institute of Oceanography (BIO) Photo Unit has played a critical role in the work of the Institute. This brief history provides an overview of how the Unit evolved over time, the people involved, the broad range of services provided and their involvement in developing new photographic instrumentation.

When BIO was founded in 1962, the need for a photographic unit in support of Institute activities was clearly recognized but it took several years before one was formally established. In 1965, an Illustrations, Drafting and Photography Unit was created under Hydrography and Norm Fenerty was appointed as a permanent photographer. Norm came to BIO from the Canadian Air Force where he had been part of the photo section on the HMS *Bonaventure*. He earlier served in World War II, stationed in England.

Norm Fenerty

The new photographic unit began operation as a service to the various components of BIO. Plans for the layout and initial equipment of the photo laboratory were prepared and a start made to acquire equipment.

Throughout this planning stage, limited photographic service was provided using the limited facilities available.



Robert Belanger

Roger Belanger joined the Unit in 1966. He too came from the Canadian Air Force where he had worked with Norm Fenerty on the HMS *Bonaventure.* Soon after arrival, he participated in a cruise to the Mid-Atlantic Ridge and was responsible for the underwater photography. The photographic lab continued to expand and photographic services to BIO groups increased steadily.

With time, the Unit developed facilities to meet specialized photographic problems of undersea investigations and marine surveys, in particular for the Canadian Hydrographic Service (CHS). This included acquiring a large process camera, purchased by CHS, for copying and rescaling hydrographic field sheets for navigation chart production. In order to observe what is happening during underwater photography and improve the techniques and instrumentation, Roger Belanger became a certified Scuba diver.

Photographic support for Institute programs continued to expand during the late 1960s. Personnel were involved with major field programs including Hudson 70, the first circumnavigation of the Americas, and Operation Oil, the Government of Canada response to the 1970 *Arrow* oil spill in Chedabucto Bay, NS. In addition to providing direct technical support to such projects, much valuable film footage was obtained for report and public relations use. Some of this footage was released to the Nova Scotia Information Service and was included in a science documentary entitled "Ologies and Isms" which won two international awards.

Heinz Wiele joined the Unit in 1970, increasing the number of photographers to three. Originally from Germany, he was trained in photography during a three-year apprenticeship with Photo Studio Berger in Hannover. Following this he worked two years as a camera assistant at DKP, a documentary film production company in Hannover, followed by another year as a camera assistant with Nordmark Film in Kiel. He immigrated to Canada in 1968 and worked for two years at Nova Photo in Corner Brook, NL, before moving to BIO.

Facilities were expanded further in 1970 to accommodate a cartographic camera and support facilities for producing field sheets, maps, charts and diagrams. The quality and quantity of chart and report reproductions showed a marked improvement. Hydrographic chart reproduction was now being done at BIO and the reproduction of field sheets became much more rapid than was previously possible in the Ottawa office.

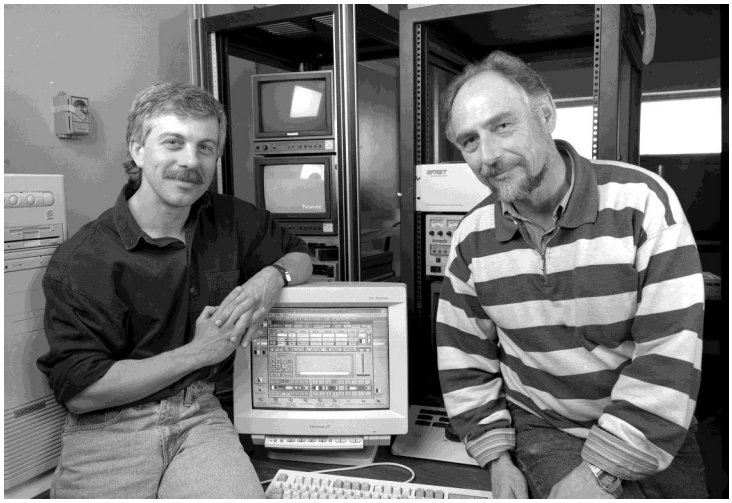
In the early 1970s, the primary role of the expanded Unit continued to be providing photographic service and support to the diverse scientific and technical operations of the Institute. About this time, Betty Gidney joined the Unit to provide clerical support. The majority of the work was performed on site but many assignments were for field work ranging from deep ocean-bottom projects on BIO research vessels to aerial operations employing Coast Guard helicopters. The practice of providing cameras and film to BIO staff for taking their own photographs during field operations was initiated. The work of the Unit continued to include cartographic reproductions, processing of all sizes of films, colour slide production, provision of studio facilities, audio-visual services and motion picture production.

Footage taken during the Arctic leg of Hudson 70 was used in a film on this epic voyage produced by Crawley Films of Ottawa and distributed through the National Film Board (NFB). The Unit also shot footage that was used in a film covering the activities of the Hydrography Division produced by NFB. In addition to supporting Institute research programs, the products of the Unit were also used in other ways such as public information, displays and publications.

The provision of photographic services to the various groups of BIO was normally a routine procedure but this responsibility was periodically broken up by working in the field or on special projects. During the 1970s, considerable effort was devoted to supporting various BIO field programs including included work in the Strait of Canso, Chedabucto Bay, the Gulf of St. Lawrence, the Magdalen Islands, Kouchibouguac, Bay of Chaleur, the Bay of Fundy, the Saint John River, Saglek and the Arctic. The new UMEL underwater camera system was used for the first time aboard CSS *Hudson* in 1974 to photograph the sea floor in Barrow Strait and Peel Sound. The results proved the system to be very satisfactory. A movie camera was mounted on a tethered balloon and used to study intertidal sediment transport in the Minas Basin. Langmuir cells in St. Georges Bay were studied by photographing, using a helicopter, the

distribution of computer cards spread on the sea surface. Another special project was photographing the CSS *Acadia* in considerable detail after she was retired from the BIO fleet in 1970. This historic vessel is now on display at the Maritime Museum of the Atlantic. The Unit also played an important role in the BIO response to the 1979 *Kurdistan* oil spill in the Cabot Strait.

In 1976, to facilitate and enhance BIO's publication effort, the Photo Unit became part of the newly created Publication Services Branch under Institute Facilities to facilitate and enhance BIO's publication effort. This new group, headed by Mike Latremouille, was composed of the scientific information resources previously affiliated with both the library and the central drafting and photographic services of the Institute. Its mandate was to help BIO scientists prepare clear, concise, and appropriate scientific reports, photographs, and illustrations as well as to develop and implement photographic systems and techniques in support of field and laboratory-based studies. Despite this change in organizational structure, the mandate of the Photo Unit itself was unchanged and Norm Fenerty continued as Head. The following year, Canada declared a 200-mile Exclusive Economic Zone that had a major impact on BIO programs, in particular expanding fisheries research.



Kelly Bentham and Heinz Wiele

Soon after this reorganization, the Unit began to contract out some activities to local firms to meet peak workloads and reduce the load of routine tasks. These activities included report distribution, printing and much of the routine darkroom production work such as slide duplication and colour processing.

With time the Unit began photographing major events at BIO such as important visitors, scientific conferences and workshops, the Huntsman and Beluga Awards and Open Houses. After the opening of the Murray Building in 1980, a major addition to the Institute, Photo Unit personnel looked after the audio-visual requirements of the new auditorium and assisted in setting up public displays in the lobbies and mini-theaters.

In 1982, Norm Fenerty received the William Gordon Memorial Award from the US Biological Photographic Association. When he retired in 1984, Roger Belanger took over as Head of the Unit. One day soon after, Roger was flying in a Coast Guard helicopter piloted by Chief Pilot Len Bentham and mentioned that the Unit was looking for a new photographer to replace Norm. Len replied that he had a son trained in photography who was looking for a job. Subsequently, Roger contacted Kelly Bentham who soon after was hired into a term position in January 1985. Kelly was a 1980 graduate of the three-year photographic program at Fanshawe College in London, Ontario, and had been working in studios, doing freelance photography and assisting with video productions. It did not take long for Kelly to demonstrate his worth to BIO but it was not until 1991 that he was appointed into a full-time position.

Another major reorganization took place at BIO in 1987 that included the introduction of sector management. When the dust settled, the Unit found itself in Engineering and Technical Services, headed by Don Dinn, within the newly created Management Services Branch. By this time there was less demand for the routine photographic services and, working in collaboration with BIO mechanical and electronic engineers, the Unit began to provide major technical support in the development and operation of new instrumentation for collecting imagery of the seabed. There was increasing emphasis by both BIO ecologists and geologists in seabed habitat studies. Imagery using both still and video cameras had become an essential tool for collecting data for several high priority projects. This led to the development of several unique tools including Videograb, Campod and Towcam. The Unit also played an essential role in the operation of this new equipment in BIO field programs dealing respectively with the impacts of fishing gear on seabed habitat and communities, the fate and effects of drilling wastes from offshore oil and gas platforms, deep water corals, the spatial relationships between seabed habitat and juvenile demersal fish and benthic habitat mapping. The information collected in these operations played a major role in the establishment of closed areas to protect sensitive seabed habitats on the continental shelf. These novel tools were on occasion copied by labs in other countries. The Unit frequently used the imagery from these studies to produce educational videos (some narrated) for use at conferences, workshops and in general displays. Videograb was used effectively by the Transportation Safety Board to recover debris from the Swiss Air Flight 111 in 1998.

Roger Belanger retired in 1991 after 25 years of service. He lived out in Grand Desert and thus had to get

up early to get to work on time. At his retirement gathering in the Auditorium, he took great pleasure in smashing his alarm clock with a hammer to the amusement of all in attendance. Kelly Bentham then took over as Senior Oceanographic Photo Technician. With the retirement of Roger, the Unit was reduced to two photographers, Kelly and Heinz.

During the mid 1990s, there was a gradual switch from film and analogue video to digital technology and this switch was completed by about 2000. Photographic operations were simplified as there was no longer a need for dark room facilities and images could be transferred easily over the Internet and edited on desktop computers.

In 2000, the Photo Unit was transferred to the Coast Guard and became part of Mechanical and Oceanographic Systems Development headed by George Steeves. In 2002, this unit was renamed the Systems Engineering Group. In 2003, Heinz retired after 32 years of service and the Unit was reduced to just one photographer.

In 2001, Roger Belanger was the winner of the first Beluga Award that was established by the BIO-Oceans Association to recognize employees who have exhibited unselfish dedication to teamwork and community spirit at BIO. Sadly, Roger passed away in 2008 but his Beluga Award is on display on the wall outside the BIO cafeteria. Norm Fenerty passed away in 2005 at the age of 80.

Kelly Bentham, Roger Belanger and Norm Fenerty

In 2004, the Systems Engineering Group was transferred from the Coast Guard back to Science and incorporated into the new Ocean Physics Section headed first by Michel Mitchell and later Tim Milligan. Today, the Photo Unit, composed of just Kelly, is part of the Ocean Engineering and Technology Section, headed by Kristian Curran, in the Ocean and Ecosystems Sciences Division.

Over the years, the Unit paid careful attention to archiving many of the images taken by their staff. These have been in high demand by BIO staff, government communications staff, other research institutes, authors, the general public and scientific media throughout the world. These images include both colour slides (approximately 24,000) and negatives (almost 9,000 jobs, each having from one to over 100 individual negatives). These extensive photographic archives document the rich history of BIO. They have recently been reorganized and inventories prepared, now available for anyone wishing to consult them on the BIO-OA website, under the Archives directory.

The early BIO directors were most wise to establish the Photo Unit soon after the Institute opened and to provide it the necessary resources to develop and thrive. It soon became a critical part of the Institute to the benefit of all government departments. Throughout its long history, the Unit has seen major changes in organization, resources, technology and responsibilities but has always strived to provide top-notch professional support to the entire BIO community. While now much smaller and limited by resources, BIO is most fortunate that the Unit, now located on the ground floor of the Strickland Building, continues to function.

The structure and function of the Photo Unit have evolved over the past 55 years and its products have played an essential role in raising the visibility of BIO and the importance of its programs. The many services provided by the Unit will continue to be required in the future by all components of BIO. While, with smart phones, everyone has a camera at their fingertips with the benefit of instant online images, there will always be demand for high quality, well-composed professional photography. There is fascinating work currently underway in the Ocean Engineering and Technology Section involving underwater imaging systems which includes the fiber optic advances in Campod, a new mid-water camera system, trawl cameras, year-long underwater time lapse systems and numerous other projects. With the advent of Remote Sensing, Gliders and Autonomous Underwater Vehicles, there will be a continuing demand for design and development of innovative underwater camera systems, both at BIO and through partnerships with other laboratories. Hopefully the resources can be found to maintain, and maybe even expand, the Photo Unit when Kelly retires.

Acknowledgements: The BIO annual reports (1962-2009) were absolutely critical in compiling this history. We thank Mike Sinclair, Jim Elliott, Bob Reiniger, George Steeves, Heinz Wiele, Tim Lambert and Kristian Curran for kindly reviewing drafts of this article and providing corrections and suggestions for improvement.

From the President

My congratulations go to Michael for another great issue of the *Voicepipe*. The story about Dale Buckley has particular meaning for me since it was Dale that made possible my first job experience at BIO as student for three summers starting in 1971. I too was one of the team that spent the summer in Port Hawkesbury. It is a credit to Dale's leadership that it was conceived and executed so effectively. Charlie in his thorough description of the project mentions "gastronomical relief". That summer in Port Hawkesbury resulted in my distaste for boiled carrots to this day.

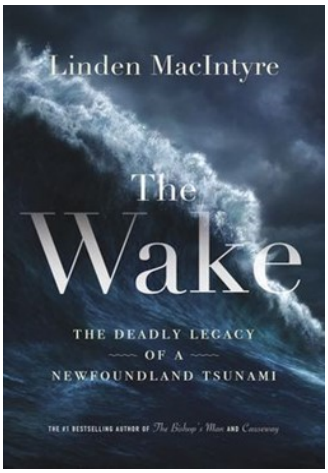
We had discussed at the Executive some events to mark the anniversary of the Hudson '70 expedition particularly the return of CSS *Hudson* to Halifax in October 1970. These events have been impacted by the pandemic. CCGS *Hudson* has now returned to BIO from its extensive life extending refit. The anniversary is still worth celebrating so we will bring our ideas back to the Executive when larger gatherings without social distancing are permitted. In the meantime, after reading Peter Wadham's contribution to the *Voicepipe,* you can view Don Gordon's presentation on the Hudson '70 on the BIO OA website (http://www.bio-oa.ca/index.php) and read Don's article in the next issue of the Proceedings of the Nova Scotian Institute of Science.

Don and Kelly's story on the history of the photo unit is very timely and appropriate. Roger Belanger was the first recipient of the Beluga Award. Kelly has been indispensable in assisting Don in his inventory of the photo collection, meeting with curatorial staff at the Maritime Museum of the Atlantic about our collection of CSS *Acadia* photos, developing the presentation and display of the Hudson '70 Power Point, and of course documenting our Beluga Award ceremonies.

Finally, you will have received by email a request to attend a virtual Annual General Meeting on Thursday October 29. Connection details are in this message. It is at this time that we report on the past year and elect the team that will plan and guide the Association into the future. To be of value to its members an organization needs effective and inspired leadership. I thank everyone on the Executive team who has been serving as officers, committee members and Directors and welcome any and all of them to return to their position. However it is important that leadership be shared and renewed. Therefore I ask you, dear reader, to step forward and volunteer to take a place at the Executive or Committee table. Please contact me at asherin@ncf.ca with your ideas about BIO-OA's future and your willingness to serve.

Book Review: The Wake: The Deadly Legacy of a Newfoundland Tsunami by Linden MacIntyre (Andy Sherin)

The Wake is a very fitting title for Linden MacIntyre's non-fiction recalling of life in the Burin Peninsula of Newfoundland during and after the 1929 tsunami. A wake is a disturbance left on the water by a passing ship. The tsunami left a devastating disturbance on the very rural society of the communities on the Burin Peninsula: Lamaline, Taylor's Bay, Lord's Cove, Lawn, St. Lawrence, and others. Fishing, the economic base of the communities, was destroyed, leaving families desperate for another way to make a living. A wake is also a term used for a celebration of the life of a loved one. MacIntyre tells of the deaths caused by the tsunami wave itself, "Thomas Fudge watched, aghast, as his own house lifted off and sailed away on the retreating tide. Inside his wife and three young daughters were screaming for help … There was another wave and his house was gone." Those who survived the waves were in bad shape as well, as one letter to the outside world stated "Everything we have is gone and we are ruined."



MacIntyre has four interludes in his story entitled "Conversations with the Dead." The fourth one tells, in part, of conversations with and letters from his father, who worked in the fluorspar mines. Near the end of his first letter his father commented "I have a lot of old friends, and there's a lot of them dead and gone." MacIntyre as his 17 year old self callously states "dead and gone was to be expected of people in their forties." His father in a second letter refers to radiation in the mines. The radiation came from radon sourced from the uranium in the granite host rocks of the fluorspar ore. Poor ventilation caused the lung cancers that resulted in many early deaths of the men working in these mines: Black Duck, The Director, Iron Springs, Blue Beach, Newfluor.

MacIntyre states the people of St. Lawrence had "been manipulated and exploited by outsiders since the area was first "discovered" by stranded English sailors in 1583. The ability to endure hardship without complaint was a mark of fortitude and a source of pride." Following the tragedy of the tsunami itself, the book

tells a story of exploitation by American mining investors, unresponsive governments in St. John's and London, poor and dangerous working conditions, and labour management struggles. Some brave men like Rennie Slaney, former mine manager and Al Turpin, union organizer, stood apart and worked for the improvement of conditions and compensation.

One significant departure from this story line is the rescue in 1942 by the villagers of Lawn and St. Lawrence of sailors from two United States Navy vessels, the USS *Pollux* and the USS *Truxtun* that grounded attempting to resupply the American military base at Argentia, Newfoundland, during the Second World War. One hundred and eighty six sailors survived "by the strength of their own stamina, an inexhaustible will to live and the heroic generosity of strangers." In belated recognition of the aid given to the US Navy sailors, the US government provided funds to build a hospital in St. Lawrence. The US Memorial Hospital was opened in 1954.

At its root, this story is a personal story, in part a story of self-discovery for MacIntyre. He was born near St. Lawrence, Newfoundland. Although the 1929 earthquake and resulting tsunami are well-known in the marine geological community and even by the public, in general the equally devastating history of fluorspar mining and the miners' deaths from silicosis and lung cancer from radiation is far less well known and is part of the author's family's past. The book is heavily foot noted and well indexed. While I had no previous knowledge of this distressing story, it was a fascinating read filled with well-developed and believable characters.

Where was Hudson 70 in July-August of 1970? (Peter Wadham)

When I think of "Hudson-70", the period of exactly 50 years ago, from July-August 1970, is especially nostalgic. As a young research assistant from England, I had enjoyed my time at BIO and during the first wonderful legs of "Hudson-70" in South America, Antarctica and the Pacific, but I hadn't yet seen the western half of Canada, and I suspected that this would be the most wonderful experience of all.

Our previous leg had taken us northward from Tahiti into the Gulf of Alaska, to complete a gravity line for the forthcoming Seasat satellite, and now, on 7 June, we turned east towards Vancouver. The run in to Vancouver took three days. On the third day land appeared to the east in the form of a distant skyline of hills covered in a blanket of dark green forest. It was the wild rainy west coast of Vancouver Island, and a deeply moving moment for the crew. Here was the first sight of their native land for seven months. Sparky connected the P.A. system to the local radio station, to reveal the clear voice of Anne Murray singing "The Snowbird". There was scarcely a dry eye in the ship.

During the afternoon we entered the Strait of Juan de Fuca, with the great snow-capped ranges of the Olympic Mountains in Washington State to the south of us. We skirted the southern tip of Vancouver Island and then edged in to the outer harbour of Victoria, where we dropped anchor for a couple of hours while some engine room spares were ferried out to us. The capital of British Columbia looked extremely inviting on this sparkling summer afternoon. "Just wait till you see it properly," enthused Pete Reynell, whose parents lived on the island. "It's like everything that England could have been but isn't." Peter was one of my close friends on the ship, the Third Mate and an Englishman about my age. Tragically he was killed in 1971 when a ship on which he was an officer was blown up by Viet Cong frogmen after calling at Da Nang.

As evening drew on we raised anchor and threaded our way through the wooded islands of the Strait of Georgia towards Vancouver. "Some day I'm going to buy land on one of those and settle down," said Pete, pointing out a large island with a conical hill at the centre. "By the way, make sure you're up early to see the entrance to Vancouver Harbour."

Early rising was difficult, because Pete and I spent a long boozy evening while he talked reverently of the relaxed 'west coast' feel of Vancouver Island. However, I managed to emerge into the pine-scented clarity of a perfect morning just in time to see an enormous suspension bridge floating above me. It ran between two high bluffs covered with apparently uninhabited forest. This was Lion's Gate Bridge, guarding the entrance to Vancouver. But where was the city? The wooded wilderness to the right of the bridge is in fact an urban park, Stanley Park, which hides the city from those who approach by sea. As we passed under the bridge an immense harbour opened up to my gaze. On the south side was a big cluster of skyscraper office blocks marking downtown Vancouver. And, miraculously, the docks for which we were heading lay at the foot of this thicket of towers, in the very centre of town.

Waiting on the dock were three figures; one I recognised immediately as George Pickard from UBC who had been chief scientist in the Chilean fjords, while the other two were Iver Duedall's wife and the Captain's wife. We tied up at 8:10 a.m. on June 12 and felt ourselves home again. For me the homely sensation was curiously strong. This is where I want to be, I thought.

Vancouver was a glorious city in that summer of 1970. It was still the era of 'flower power' and rock music, and the city glowed with light, colour and

warmth. I spent the first morning ashore wandering the downtown streets, mingling with the noisy, colourful crowds and marvelling at the street life. Long-haired freaks stood on street corners selling the *Georgia Straight* underground newspaper. 'Head' shops sold the approved paraphernalia for smoking marijuana, as well as the orthodox uniform of beads, Indian dresses, flowery shirts and smelly Afghan shoulder bags. Everything was so wonderfully innocent, and life seemed to hold infinite possibilities. After lunch a bus picked up the scientific staff from the ship and whisked us westward out through the suburbs to the wooded peninsula on which the University of British Columbia (UBC) is perched. Here we were treated to a reception at the Faculty Club at which all the old faces of the Chilean survey reappeared - George Pickard, Brian Bary waving his hook at me, Dave, Murray and the rest. Drink and reminiscences flowed freely.

Figure 1 - Vancouver Harbour, 1970 (author photo)

In the evening Roger and I (my cabinmate was Roger Smith, then a student at Queen's University, now a distinguished geophysicist) headed into the former skid row district of the city, called Gastown, which had been recently renovated as a trendy area of shops, bars and restaurants. The harmless drunks and derelicts had been tidied away out of sight. Next morning I went out to UBC by myself, talked to Brian Bary and George Pickard, and arranged to come and work for them for a while as a research assistant. *Hudson* was due to go over to Esquimalt (the naval dockyard suburb of Victoria) to be drydocked for repairs, a job that might take four weeks. My offer to go and work at UBC satisfied the BIO management that I would be gainfully employed during that time. It was decided that I would travel with *Hudson* over to Esquimalt then return with a UBC gang who were coming over by truck to unload some equipment from *Hudson*.

That evening *Hudson* returned UBC's hospitality by giving a cocktail party on board for them and for local dignitaries. Afterwards I escaped with Rog, Pete Reynell, and Pete's sister Vicky, who had come over from Victoria to meet him. We returned to Gastown where we sat in a smoky den, drank apple juice at exorbitant prices, and listened to a folk guitarist.

The next day was a Sunday, and an open house had been organised and heavily advertised in the Vancouver press. We were all conscripted to work positions along a tour route through the ship. My job was to demonstrate the computer. Two hours before the ship was open, a massive queue had gathered on the dock. Chaos ensued when they surged on board. Six thousand glossy brochures had been printed, which soon disappeared. More than ten thousand people tramped through the vessel. I bathed in the admiration of the visitors maidens, to whom I demonstrated the flashing lights whilst talking of the perils of Cape Horn. But we were soon off, for we were sailing that night for Esquimalt.

First light found us at the Esquimalt fuelling jetty. Esquimalt harbour is a large, peaceful expanse indented with rocky points and promontories, one of which bears a white weatherboarded lighthouse dating from the early days of settlement in the 1840s. The actual naval base, the main centre for Canada's Pacific fleet, takes up only a small part of the outer harbor. When it was founded, however, was a major British base. The fuelling jetty was deep in the neglected inner part of the harbour, where quiet waters lapped against rotting pilings.

Next morning the truck from UBC arrived with Murray Storm and Dave English. I helped them load up sampling gear from *Hudson's* hold, then we set off together northwards for the Vancouver ferry. The road led for 18 miles out of the city and into the pleasant rolling countryside of the Saanich Peninsula. At the northern tip of the peninsula we entered the Swartz Bay ferry terminal and ran the truck into one of the big BC Ferries which maintain the link with the mainland. The route is impressive because the vessel has to traverse a narrow passage between two islands, making an awkward right angle turn in the narrowest part of the channel, called Active Pass, where there are strong tidal currents. The turn is made more dangerous by the fishing and pleasure boats which hang around in the Pass, a good fishing area. Just a month later, one of these great ferries was cut in two by a Russian freighter attempting to enter the Pass, with the loss of four lives. After two hours we landed at Tsawwassen, a small village near the Canada-US border.

Back at UBC we unloaded, and I found that the university had arranged a room for me in a student residence. Next day I started work, and was set to helping Tom Osborn, a physical oceanographer, in the construc-

tion of a free-falling microstructure probe of his own design. It had been recently discovered that in the upper ocean the temperature and salinity often do not change steadily with increasing depth (as assumed from the results of Knudsen bottle casts) but rather in a series of steps. Each step is only a few metres deep, so the structure is a series of thin uniform layers of water and slightly different properties, like pages of a book. This structure is very delicate, and easily destroyed by wind-induced turbulence. Tom designed a probe which falls through the water, revolving as it goes, with a temperature sensor to map the microstructure. At some preset depth it drops a weight and rises again to the surface.

I worked happily away on this project, visiting the small UBC research ship *Vector* and being initiated into the mysteries of American football by my roommate in the residence. Then I accepted an invitation from Pete to come over to the Island and visit his family. They lived in Deep Cove, a small village on a beautiful fiord called Saanich Inlet near the Swartz Bay ferry terminal. The houses of the village were sunk in a dense forest of fir, spruce and cedar, surrounding a tiny cove where sailing boats rode at anchor. Pete's father, John, had owned a coastal shipping company in Borneo and had led an adventurous life. His stepmother, Tilly, was a beautiful Eurasian who had been a stewardess on Cathay Pacific Airways when they still flew flying boats. They were a happy and welcoming family. I talked away the hours with John, and went flying on a free lesson from the nearby Victoria Airport above the emerald mosaic of Gulf Islands. Next day we explored the islands properly in the family's old wooden boat. It was on that day that I decided that this was where I wanted to live. Amongst the Gulf Islands I was surrounded by the most beautiful scenery that I have ever encountered, outside of Chile, and even after a lifetime of further travels I have seen nothing to match it. I stayed on for Monday as well, as Pete and I hatched a holiday scheme. His friend had a Volkswagen minibus that he was willing to lend us; this would be a perfect opportunity to tour the Rocky Mountains and to try to get to Calgary for the annual Stampede. I returned to UBC on Tuesday, resumed my duties for a while, and obtained Tom's blessing for my disappearance.

By our return from our tour, it was now July 7th, and *Hudson* was due to sail on the 12th for her geophysical cruise to the Queen Charlotte Islands, off northern British Columbia. I drove back to UBC and met Tom Osborn. Far from being annoyed at my long absence, he promptly offered me a place as a graduate student at UBC. This was a serious offer and an attractive opportunity. I decided to stay on at UBC to think about it. Again I was put in a student residence, sharing a room with a student from Sarawak. Apart from a brief trip to Stanley Park Aquarium to see the performing killer whales, I stayed on the campus for three days, talking to scientists about possible research projects and receiving a formal offer from Bob Stewart, the department head.

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Figure 2 - Peter Wadham with his friend, Pete Reynell on their sidetrip to the Rockies. (author photo)

Still undecided, I caught the ferry over to the Island, where I was met by Pete and accommodated in his parents' house. A round of parties with family and friends followed, and I put off my decision until the end of the geophysical cruise, which now loomed bleakly before me. But I renewed my personal vow that, whatever life might bring, I would return one day to live on Vancouver Island.

After the wonderful experience of western Canada, the prospect of spending three weeks at sea on a marine geophysical cruise did not appeal. But there was nothing to be done about it, if I wanted to stay on the payroll of BIO. Besides, this would be a final chance to see if marine geophysics could be interesting enough for me to make it my career.

In many ways this leg, Phase VII of "Hudson-70", would involve some fascinating science. We were not going anywhere exotic, in fact we were operating in well-known waters, but we would be striving to put in place another piece of the jigsaw puzzle that is the pattern of plates over the Earth's crust. The Sixties had been an exciting decade for marine geophysics, in which the theory of seafloor spreading, or continental drift, had suddenly taken over as the new orthodoxy after being ridiculed and ignored since Alfred Wegener proposed it in 1912. Now everyone believed that the Earth's crust is made of plates which move at a speed of a few centimetres per year, and which spread apart from mid-ocean ridges where new crust is created. These new pieces of crust grind past each other or collide at faults where earthquakes and the upthrusting of fold mountains are palpable signs of the mighty forces at work. But the ac-

tual pattern of plates was not yet firmly established over the whole world, due to the shortage of scientists and ships to do the necessary survey work. Here off the west coast of Canada three plates meet (the American, Juan de Fuca and Pacific Plates) in what is known as a 'triple point', a zone of extreme complexity where the structures and motions involved cannot be easily determined theoretically, so that direct field measurements must be made.

These measurements would be of several kinds. Firstly, the normal gravity and magnetic survey lines would be run; for instance the pattern of magnetic lineations which is produced when the spreading crust solidifies reveals the direction of spreading. Secondly, seismic reflection profiling would be done with the ship under way, a form of glorified echo sounding using a powerful sound source (an air-gun) to produce echoes from internal layers of sediment and bedrock as well as from the seabed itself. The third technique would be seismic refraction shooting, in which one ship fires off an explosive charge while another records the arrival times of sound pulses that have passed down through the water, through various layers of rock and then up through the water to the surface again. This would tell us the actual thicknesses and compositions of the rock layers under the seabed. By shooting in different directions it would be possible to test for anisotropy, a property which some rocks have of transmitting sound with a different velocity in different directions, because of the stresses in the rock produced by seafloor spreading. Finally, a battery of supporting studies would be done, such as measuring heat flow through the seabed, taking cores, and dredging for bottom rocks.

We sailed early on the morning of July 12, initially for sea trials to test the newly repaired engines. I arrived at Esquimalt just in time to catch the ship. Ominously, a large diesel compressor had been bolted to the main deck immediately above my cabin. The compressor was to run the air-gun for the seismic reflection profiling. The air-gun is a 300 cubic inch cavity pumped full of compressed air which is released every 16 seconds; this gives the loud underwater belching noise needed to penetrate the upper layer of seafloor sediments. Where the sediments are thin it is possible to see bedrock beneath the sedimentary layers, and to trace this to the places where it outcrops as rock pinnacles. Since this type of profiling is carried out with the ship under way, the compressor was clearly going to operate continuously directly above my head. An indication of just how nasty it was going to be came when the system was run up for testing during the day. The results were frightening. The noise in the cabin was like that of a pneumatic drill, while the bulkheads and deckhead were visibly vibrating.

We ran up and down Juan de Fuca Strait during the morning, shuddering and shaking as full power was applied to all four engines. At 3 p.m. we put back to the pilot station at the mouth of Esquimalt Harbour where the Marine Superintendent and other officials were taken off by pilot boat. We had been pronounced seaworthy. Without further ado, or another night in port (for which I had been hoping), we put out to sea.

Charlie Maunsell was chief scientist for this leg, with Dave Ross in charge of the geophysical work, assisted by Charlotte Keen, Shiri Srivastava, Don Barrett, Keith Manchester and other BIO geophysicists. Dave gave me the 12-4 satellite watch, sharing with two students, Mike Purdy and Earl Davis. Earl was a graduate student at the University of Washington, while Mike had just completed his degree at Imperial College, London, and was about to go on to the Geophysics Department at Cambridge to do his doctoral research. Three of the normal faces were absent on leave: the Doctor; the Chief Engineer, who was replaced by a pleasant Scot called Gilmore; and the Captain, who was replaced by Fred Mauger, the Chief Mate.

Figure 3 - Preparing to set the transponder buoys. (author photo)

The first night watch passed quietly. We were still in the Juan de Fuca Strait, the coasts of which showed up clearly on the 24-mile range of the radar, with strong reflections off mountainsides inland. The watchkeeper on the geophysical console was Brian Taylor, a UBC student doing a summer job on board. This was his first time at sea, and although the sea was calm he was as sick as a dog. I felt very sorry for him. But when I went below at 4 a.m. I felt more sorry for myself. The air gun had begun operations, and the noise in my cabin from the compressor was deafening. It was impossible to remain within the cabin, let alone sleep, so I moved my mattress into the photographic darkroom behind the geochemistry laboratory, where I lay down amongst the bottles and chemical odours. Thus poisoned, I slept fitfully, thrashing around in my sleep and

smashing the darkroom safelight which I had modified to serve as a bedside lamp.

I awoke feeling ragged and sick. The day was calm, cold and sunny and we had a view of jagged snow-capped mountains in northwest Vancouver Island, 30 miles away; their rugged outline was quite different from the gentle summery countryside around Victoria. We ploughed steadily northwards, and by the morning of July 15 we were 50 miles south of the Queen Charlotte Islands, awaiting our rendezvous with the CNAV (Canadian Navy Auxiliary Vessel) *Endeavour*, which was to be our companion for the seismic refraction work. The technique calls for the two ships to begin close together. One ship then steams away from the other, dropping charges of gradually increasing size as the distance increases. The other ship remains stationary with a floating cable trailing behind, in which an array of hydrophones picks up the sounds of the explosion after transmission through the sedimentary layers.

Endeavour drew alongside early in the afternoon, a handsome white ship operated by the Defence Research Board in Esquimalt, with a high fo'c'sle and a helicopter hangar aft. We streamed our 400 ft long hydrophone cable, supported by red plastic floats. *Endeavour* sailed off, dropping her charges over the stern. In the quiet of our hove-to state, each charge sounded as a faint boom through the steel of our hull. She disappeared into the sea mist, and after a few hours we set off to join her for a fresh rendezvous and a second line. The work that she was doing was quite dangerous, for the largest charge that she dropped, at the greatest distance from us, contained 500 pounds of TNT, making it larger than the average depth charge. Today the whole technique has changed; instead of a floating hydrophone cable, the receiving ship places its sensors on the seabed, well away from wave noise, and the shooting ship can use charges as small as a quarter of a pound.

Figure 4 - Hudson at work in the Pacific. (author photo)

On our way northwards we had marked the second rendezvous spot by mooring a radar transponder buoy there. This buoy had a beacon activated by pulses from our own ship's radar, which would then transmit a signal back to *Hudson* allowing us to fix our position more exactly than by satnav alone. Unfortunately this beacon did not work and we finally found the buoy as a faint radar blip when we were almost on top of it. Off went *Endeavour* again, initially in the wrong direction, while we leaned over the stern and tried to snare the evil looking globular jellyfish which abounded in this area. So passed the second and then a third seismic line.

At the end of the set of lines we returned to the transponder buoy, which was a red and yellow polystyrene float some seven feet in diameter, hauled it out of the water and replaced it by a spare. The electronics in the ship still picked up nothing, so the fault clearly lay in our receiver rather than the buoy. We also met up with *Endeavour* again, picking up 25 pounds of salt from her and doing a deal whereby our awful movies were exchanged for her good ones.

Now came the important anisotropy experiment. Previous research had shown that the rocks in the Earth's mantle (the 1,500 mile thick layer underlying the crust) must themselves be flowing sluggishly, since they show a difference in properties in different directions. In particular the velocity of compressional P-waves (a type of sound wave) in the mantle varies with direction, with the highest velocity corresponding roughly to the direction of motion of the overlying crust. To measure these velocities in all directions, the shooting ship must steam a circle around the receiving ship, and this is what was done. We hove-to with our hydrophones out, while *Endeavour* steamed off for 50 miles and then ran a circle of that radius around us, letting off no fewer than 58 charges of up to 500 pounds in weight. When Charlotte Keen and Don Barrett analysed the results afterwards, they found that there is an anisotropy of about 8% in velocity, but the direction of maximum velocity is 107° whereas the direction of crustal spreading, inferred from the magnetic pattern, is 90°. The discrepancy suggests that perhaps the crust does not move with the upper part of the mantle, but in a somewhat different direction, like ice floes on the surface of the sea.

On July19, for a change, we tried a heat flow station. The idea here is to lower a probe into the seabed to measure the vertical flow of heat from the Earth's crust up into the ocean. In the interior of the Earth, the decay of radioactive isotopes produces the heat which keeps the earth's core molten and which drives convection currents in turn generating the earth's magnetism. The heat flows outwards from the liquid core into the surrounding mantle, believed to be a plastic solid which can be made to flow slowly. The sluggish convection

currents in the mantle produce horizontal motion at its surface which drags the overlying crust along with it - although not perfectly, as we had just discovered. We would expect the vertical heat flow through the crust to be greatest over places where the crust is thin, or over spreading centres, since these mark the lines of upward convection from the mantle.

The heat flow measurements were carried out by Clive Lister, an Englishman from the University of Washington. He used an instrument called a Bullard probe after its inventor, the famous Cambridge professor. The probe was a 7 foot long steel rod with a finned weight at its top end to drive it into the seabed. Along the rod at equal intervals were 27 thermistors (a type of transistor which measures temperature). The probe was driven into the bottom and left there for half an hour to reach equilibrium. Then the 27 temperatures were recorded, giving the temperature gradient in the sediment. This is not enough to determine the heat flow, because we need to know the thermal conductivity of the material in the sediment. This is measured by switching on heaters which warm the central thermistors by a known amount, then measuring the new temperatures of the outermost, unheated thermistors. From these measurements both the conductivity of the sediment and the vertical heat flow are obtained. A typical value is about 2 microcalories per square centimetre per second. On July 19 we found 2.7, but Clive went on to do several more heat flow measurements, including a series of seven stations ten days later over the Explorer Ridge, a spreading centre between the Juan de Fuca Plate and the Pacific Plate, at 50° 21'N, 130° 7' W, where new crust is being created. Here Clive was lucky enough to measure 16.8 microcalories, the greatest heat flow ever recorded from the ocean bed up until then. What he did not realise then was that this is a region with a high density of hydrothermal vents, narrow 'chimneys' only 1-2 metres across through which molten and even vaporous material is vented up to the seabed. Such vents were not discovered until the late 1970s, and it is likely that Clive's extremely high measurement was done only a few metres from an unsuspected vent.

On the first heat flow station we were overhauled by five Japanese whalecatchers, heading northwest at high speed for the whaling grounds in the Bering Sea where they were busy slaughtering the last of the bowhead and right whales. One day a huge school of over 100 porpoises surrounded the ship, and we saw the occasional right whale. Black-browed albatrosses were also common, and one evening a small black storm petrel came on board, flying into a floodlight. The poor creature spent the night vomiting, and although kept in a sink in the laboratory and fed with a pipette, he died within a day. At every station I noticed huge swarms of jellyfish, like small inflated plastic bags, so dense as to be herded together into bunches by the waves.

Two days later we finished the seismic refraction work, despite continuous problems with the old, patched hydrophone cable that we were using. *Endeavour* left us, heading for Port Hardy in northern Vancouver Island. We now began a long and tedious series of east-west survey lines, each line terminating near the sodden rainswept coast of the Queen Charlottes. The Canadian record for rainfall, over 250 inches per year, is held by a nearby mainland town called Ocean Falls. The only excitement was an attempt at bottom photography of a seamount at 52°10'N, 134°W, again by Clive Lister. We hove-to over the seamount, lowered the camera and moved slowly ahead. The instrument comprised a homemade steel frame contraption carrying the camera, which ran continuously for 15 minutes taking movie film at 5 frames per second, and a thallium iodide light source which emits in the 'green window' of the spectrum, a region where sea water is unusually transparent. The camera worked but the light source did not, so the seamount's appearance remained unknown to science. Later Clive got the camera to work on another seamount, showing ripple marks on the seabed which are evidence of strong bottom currents.

To make matters worse, the compressor above my head started to operate again as we began the seismic reflection profiling. Life was now truly a misery, and I sank rapidly towards being a physical and mental wreck. This period was for me the worst of the whole "Hudson-70" expedition. I remember one night coming off watch at 4 a.m. with Brian Taylor, cooking bacon and eggs in the pantry, and finding Bill Shaw the Chief Steward lying face down and totally comatose in the conference room. One of his boots had somehow found its way into the dining room. I felt a profound fellow feeling for him and his attempt to escape from the realities of life.

I tried to get out of my low state by exercising. I calculated that 160 circuits of the geochemistry laboratory or 48 circuits of the upper deck equaled one mile. The upper deck was inaccessible because of torrential rain, so I tried 80 circuits of the lab. I ended up very bored, very dizzy and rather bruised from knocking against desks and chairs. Another therapeutic project was a ship's newspaper, for which Pat Solowen (a secretary from BIO) was the editor and typist. I laboured manfully over a lengthy article of high literary quality about the British Club in Punta Arenas. Unfortunately the other contributions were not up to the same standard, and consisted mainly of doggerel, Newfie jokes, and anonymous squibs to let off steam, such as:

"All things bright and beautiful,
All creatures great and small;
All things wise and wonderful
Our Doctor shoots them all."

My hopes of deliverance were raised briefly by a total engine breakdown on July 25, when we lay-to helplessly for three hours. While the engineers scurried to and fro, I lay luxuriantly in my bunk, free at last of the compressor noise. A conference was held to discuss putting back into port, but it was decided to carry on. We ran more west-east lines, one of which brought us right into the entrance to Quatsino Inlet in northern Vancouver Island. The inlet was filled with small fishing vessels, with forests rising behind, but the intense rain made the scene utterly dispiriting.

But time passes, even at sea, and by August 4 it was all over. I was so exhausted when the compressor noise finally ceased that I slept right through our early morning arrival in Esquimalt and far into the afternoon. I don't know why I didn't ask for a cabin move, since the ship was not crowded. Somehow it was not possible.

What remained? Only one precious week in western Canada before the hard road to the Arctic. On the evening of our arrival there was a cocktail party and open house on board. One day Pete and I hired a catamaran and sailed out over the blue waters of the Strait of Georgia. It was a precious time, soon to be over. Fate was to bring me back to live and work in Victoria, but never with the carefree happiness of that first visit.

I made one more visit to UBC, and almost decided to go there for my PhD. At the same time I received a telex from the Scott Polar Research Institute in Cambridge. offering me a PhD place. After a year away, the Cambridge that I had been so happy to leave exerted a fatal, nostalgic pull. I decided to go to Scott Polar. With this decision made, one which I have many times regretted, I prepared to face the Northwest Passage.

August 13 was a gloriously sunny morning, the air filled as usual with the heady scent of deep pine forests. As I stood on the deck of the *Hudson* in Esquimalt Harbour and watched the familiar ritual of the lines being cast off, I should have been filled with eager anticipation. We were sailing to complete the first circumnavigation of the Americas, heading into the icy wastes of the Arctic to venture a Northwest Passage to the eastern sea. How romantic, but I felt an aching sense of sadness. I had fallen in love with the west coast of Canada. It was so tempting to stay, and to never leave this place.

My new companions made up a skeleton crew, on board to run basic survey operations as far as Herschel Island, where a large contingent would join to carry out a month-long geophysical survey of the Beaufort Sea. The senior scientist for this leg would be Bernie Pelletier, a sedimentologist from Bedford Institute. Familiar faces were Kegong Shih, Mike Purdy and Vernon Coady from the west coast survey, and Gus Vilks, a veteran from the Rio to Buenos Aires leg. There were two women, Frances Wagner,a palaeontologist and a geologist from the University of Calgary, Chris Havard. Pelletier explained we would be doing gravity, bathymetry and magnetic profiling, and occasionally stopping for oceanographic stations and cores. The Beaufort Sea survey would be the first ever there, of especial importance because of the possibility of finding offshore oil, and we would be joined for it by *Baffin*, which was sailing around from Halifax through the Panama Canal, and by the smaller *Parizeau*. Then would come the Northwest Passage if ice conditions were favourable.

Sailing time arrived too soon. We now had a helicopter on board for use in ice reconnaissance, and it was due to go up on a test flight as soon as we left the jetty. I claimed a seat on board in my role as Official BIO Photographer, so as the lines joining us to British Columbia were finally cast off, I was climbing into the front seat of the gleaming Bell Jet Ranger of Highland Helicopters. Strapping myself in and clutching the movie camera I glanced at the middle-aged pilot who was sitting smiling beside me. "Hello, I'm Wilfred," he said in a cultured English accent. "Is this your first time in a helicopter?"

As I nodded he took off quite suddenly, like an express lift. The harbour, the ship and my stomach were left far below us. Unlike an aeroplane, a helicopter seems to consist mainly of Perspex. The deep nose and side windows, a window in the roof and an alarming window that opened under my feet, all made it easy to see that this thing had no wings. Wilfred hurled the machine into steep banks and climbs over Victoria. The ship, steaming backwards out of her berth, was a tiny speck cleaving a white rent in the deep blue fabric of the sea. After I had recovered enough to do some filming, Wilfred brought us down to a smooth landing on the helicopter pad, which had been repainted with a bullseye target for the occasion. As we went below, Wilfred remarked casually,"I used to fly Spitfires during the War. They were more fun than helicopters." The next morning was bright and sunny, with the air still full of forest smells. We were now on a Great Circle course for Unimak Pass, the main shipping passage through the Aleutian Islands into the Bering Sea. Another chapter of "Hudson-70" was about to begin.

Annual General Meeting

The Annual General Meeting was postponed from its usual schedule of late May due to Covid-19 restrictions. We are now planning on holding the meeting on October 29th at 12:30 pm. As BIO is still closed except for limited access, we are looking for a venue. While there may be some provision for in person attendance, we will be providing access to the meeting through Zoom (or a similar platform). Details will follow by email to all members but please put this date in your calendars.

Editor's Keyboard:

We live in strange days. Putting a newsletter together during a pandemic should not be much different than during normal times but it is. Finding photographs without access to BIO can make things tricky. For Peter Wadham's article, we had to get Don Gordon to scan photos from Peter's book. Peter was in Italy, stuck in the pandemic and his photos were in England, so we did the best we could. We are still not able to send out hard copies of the newsletter, but we are getting them printed and will do that once we are allowed access to BIO and the mail office. I must add that Peter Wells provided much needed assistance with this edition - thanks Peter.

The pandemic also interfered with the OA's annual general meeting and the Beluga Award ceremony. As noted earlier, the annual meeting is now scheduled for Oct. 29 at 12:30 via Zoom. We will determine the date for the Beluga ceremony later.

We are always looking for stories. It would be interesting to hear how current employees are coping with the new reality of working remotely from BIO. What challenges are you facing? How do you cope with the lack of access to BIO? And, of course, we are open to any story from our members. Just contact me at oanewslettereditor@gmail.com and we can discuss what is needed.

ABOUT THE BIO-OCEANS ASSOCIATION

The Bedford Institute of Oceanography Oceans Association (BIO-OA) was established in 1998 to foster the continued fellowship of its members; to help preserve, in cooperation with the Institute's managers and staff, BIO's history and spirit; and to support efforts to increase public understanding of the oceans and ocean science. Membership is open to all those who share our objectives. Most current members are present or past employees of BIO or of the federal departments of Environment, Fisheries and Oceans, and Natural Resources (or their predecessors) located in the Halifax Regional Municipality. Membership is $10.00 per year, $40.00 for five years, or $150.00 for a lifetime membership.

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