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Editorial

An Overview of Dr. Keith Thompson's Contributions to Science Programs and High-Quality Training in Marine Prediction and Environmental Statistics

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Abstract: Dr. Keith Thompson was a highly influential scientist in marine prediction and environmental statistics in Canada and abroad. He was also exceptionally successful for providing high-quality mentorship to graduate students and early-career scientists. In this article, we provide an overview of Dr. Thompson's career contributions to marine science programs and training for graduate students and other highly qualified personnel.

Keywords: ocean modeling and prediction; data assimilation; dynamics; environmental statistics; mentorship

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1. Introduction

Dr. Keith Thompson was a professor at Dalhousie University (hereafter DAL) with a joint appointment in the Department of Oceanography and the Department of Mathematics and Statistics between 1988 and 2022, and he passed away on 11 July 2022. Dr. Thompson made major contributions in a wide range of research areas, including modeling and prediction of global, shelf, and coastal oceans, data assimilation, environmental statistics, and studies of atmospheric and ocean dynamics. He was a wonderful friend and colleague who played leadership roles in many national and international networks and projects. He is also remembered as an exceptional and inspiring teacher and mentor. This paper gives a broad overview of Dr. Thompson's career contributions and paves the way for more specific articles in this Special Issue tribute.

This paper is structured as follows: Section 2 presents examples of some of his most significant and impactful contributions to national and international research programs. His mentoring and training of highly qualified personnel are discussed in Section 3, which also contains comments from some of his former students and postdoctoral fellows. The summary and conclusion in Section 4 contains some comments from the Dalhousie University gathering in his memory. Appendix A outlines a list of key acronyms, and Appendix B summarizes his academic background and experience. Appendix C provides his other scientific publications not listed in the References section.

2. Leadership in Research Program Development

Benefiting from a strong academic background (Appendix B), Dr. Thompson very quickly demonstrated his research excellence after becoming an Associate Professor at DAL

in 1988. He was awarded the 1990 Canadian Meteorological and Oceanographic Society's (CMOS) President's Prize for his paper entitled "Sea Surface Temperature Variability in the Shelf-Slope Region of the Northwest Atlantic" ([1]; Figure 1).



Figure 1. The 1990 CMOS's President's Prize awarded to Dr. Keith Thompson for his paper entitled "Sea Surface Temperature Variability in the Shelf-Slope Region of the Northwest Atlantic.".

2.1. Significant Contributions to National and International Networks

Over the years, Dr. Thompson rapidly expanded his network and influence. He soon played very important roles in initiating and leading multi-agency and multi-year research programs.

2.1.1. The Ocean Production Enhancement Network

One such research program is the Ocean Production Enhancement Network (OPEN), which was one of fifteen networks of Centres of Excellence established in 1990 by Industry Science and Technology Canada ([2]). About 250 researchers from 8 Canadian universities and the Canadian Government's Department of Fisheries and Oceans (DFO) participated in 33 OPEN projects ([3]). The eight Canadian Universities included Memorial University of Newfoundland, Laval University, Dalhousie University, McGill University, the University of Quebec at Rimouski, the University of British Columbia, and Simon Fraser University. The OPEN also benefitted from the active participation of three of Canada's largest seafood companies: National Sea Products, Clearwater Fine Foods, and Fishery Products International. The main goal of the OPEN's research program was to investigate the physical and biological processes that control the survival, growth, reproduction, and distribution of fish and shellfish, primarily focusing on sea scallops and Atlantic cod, and use this knowledge in the interest of enhancing their production and improving the quality of management decisions related to their exploitation. Dr. Thompson was the leading principal investigator for innovative studies of larval tracking on the Scotian Shelf of Canada based on observations and numerical models (e.g., [4–12]).

2.1.2. The Atlantic Environmental Prediction Research Initiative

Dr. Thompson was also instrumental in fostering effective collaborations in environmental modeling and predictions among researchers of the Meteorological Service of Canada (MSC), Environment and Climate Change Canada (ECCC), and Canadian universities. For example, in February 1997, Dr. Thompson welcomed an MSC/ECCC delegation led by Dr. Hal Ritchie. Fruitful discussions ensued and led to the launch of the Atlantic Environmental Prediction Research Initiative (AEPRI) in autumn 1997, with the main objective of conducting collaborative research and developments for new and improved operational environmental prediction models and products, especially for ECCC's mandate to protect life and property regarding extreme weather events. Partners included Recherche en Prévision Numérique (see [13]), DAL, ECCC's MSC-Atlantic and Canadian Meteorological Centre (CMC), Institut Maurice-Lamontagne, Bedford Institute of Oceanography, McGill University, and Defence R&D Atlantic of the Department of National Defence (DND). This successfully established collaboration continued throughout his career and beyond, resulting in dozens of scientific publications and joint university–government innovation contributions to Canada's operational forecasts, many of which are referenced below.

The longest-lasting AEPRI collaboration revolves around the development of a storm surge prediction and water level alert system that predicts sea level changes caused by weather systems. It was based on the DAL coastal ocean model developed by Dr. Thompson's research team ([14]), driven by the ECCC regional forecasts of surface pressures and winds to alert flooding risks from a combination of high tides and large surges. On 21 January 2000, when the system was running in a real-time experimental mode, a powerful storm hit Atlantic Canada and caused significant flooding in Charlottetown on Prince Edward Island, with the maximum storm surge exceeding 1.2 m and the total sea level exceeding 4.1 m. The forecast model made a very successful prediction both in terms of water level heights and timing. This demonstration motivated a Climate Change Action Fund (CCAF) project entitled "Sea-level rise & climate change: coastal impacts and adaptation needs, Prince Edward Island" ([15]). This project included additional partners: the Geological Survey of Canada, the Canadian Hydrographic Service, Environment Canada Corporate Affairs, the Canadian Ice Service, the Centre for Geographic Sciences, the City of Charlottetown, and the Prince Edward Island Emergency Measures Organization. The main objective of this project was "Modeling Storm Surges and Flooding Risk at Charlottetown". The main result was that higher storm surges would be expected in response to increases in storminess anticipated under climate change (e.g., a 10% increase in wind is expected to give a 14% increase in surge amplitudes). The project team presented a press release in Charlottetown on 6 September 2001, and received a Government of Canada Award for Leadership in Advancing Science for Sustainable Development in Canada in 2002 (Figure 2).

This was followed by another CCAF-funded project for 2003–2006 entitled "Impacts of Sea-Level Rise on the Coastal Zone of Southeastern New Brunswick" ([16]). Its goal was to examine further impacts, including coastal infrastructure and ecosystems. This project included the simulation and analysis of trends in meteorological conditions and storm surges over 40 years, as well as sea ice impacts. The DAL and MSC teams had journal publications on the performance of the 21 January 2000 storm ([17]) and return periods of extreme sea levels based on the 40-year simulation ([18]). This research team received the 2006 CMOS Prize in Applied Oceanography "For the Development and Implementation of a New Operational Storm Surge Model at MSC-Atlantic" (Figure 3). Over the years, collaborations between ECCC and DAL continued to result in additional improvements to the flood forecasting system until his passing (e.g., [19–25]).



Figure 2. Dr. Keith Thompson's certificate for the Government of Canada Award for Leadership in Advancing Science for Sustainable Development in Canada in 2002.



Figure 3. The 2006 CMOS Prize in Applied Oceanography "For the development and Implementation of a new Operational storm surge model at MSC-Atlantic".

2.1.3. Collaborations with the Department of Fisheries and Oceans

Dr. Thompson was also very involved with the Department of Fisheries and Oceans (DFO). Throughout his career, Dr. Thompson developed productive collaborations with a number of DFO colleagues on an impressive breath of topics, including analyses of ocean variability, the development of ocean prediction models, and applied research to address ecosystem and fishery issues. He promoted several DFO scientists to be adjunct faculty members of DAL and arranged for some of them to maintain office rooms on the DAL campus. He co-authored many influential publications with DFO colleagues (e.g., [26–29]). Dr. Thompson and his students and associates frequently gave seminars in the DFO. He provided very valuable advice to DFO science programs, including serving on the DFO Science Advisory Council 2000–2005, acknowledged by an award from the DFO Science Sector (Figure 4).



Figure 4. The DFO plaque presented to Dr. Keith Thompson for serving on the DFO Science Advisory Council 2000–2005.

2.1.4. The Canadian Operational Network of Coupled Environmental PredicTion Systems

Dr. Thompson also played a very important role in the Canadian Operational Network of Coupled Environmental PredicTion Systems (CONCEPTS), which began as a collaboration between the DFO, ECCC, and DND. The main purpose of the CONCEPTS is to develop and implement computer models that support ocean–ice forecasting advancements ([30]). Dr. Thompson participated in a panel on "Strategy for the Development of an Operational Canadian Global Assimilation and Prediction Capability for the Coupled Atmosphere–Ocean–Ice System" together with Hal Ritchie (ECCC), Doug Bancroft (DFO), and Andy Cameron (DND). An international workshop was held at DAL on 26–27 August 2002 under the auspices of the Centre for Marine Environmental Prediction (CMEP). The goals of this workshop were to assess the benefits and costs of global marine environmental data assimilation and prediction for Canada, determine feasibility, and map out the most effective ways of proceeding. The main workshop recommendations were that Canada move ahead with the development and implementation of an operational global marine environmental data assimilation prediction program and that an interdepartmental advi-

sory panel (including members from the DFO, ECCC, DND, and universities) be formed to evaluate and present senior managers with options or a plan in this direction. The panel reviewed and endorsed the CMEP workshop report and recommendations, emphasized the importance of new long-term funding and permanent positions for this new activity, and recognized this as a good opportunity to contribute to the Global Ocean Data Assimilation Experiment (GODAE) program and benefit from international "common" activity. The panel fleshed out an implementation plan, and presentations were made to senior management seeking the commitment of operational resources as soon as possible. This initial planning work led to the establishment of the CONCEPTS, which has significantly advanced the development of operational ocean forecasting systems in Canada, with new progress continuing to be made today.

2.1.5. The Global Ocean–Atmosphere Prediction and Predictability (GOAPP) Network

To complement the R&D activities of the CONCEPTS, Dr. Thompson co-led with Dr. Ritchie to develop a proposal for the Canadian Foundation for Climate and Atmospheric Sciences (CFCAS) to fund the Global Ocean–Atmosphere Prediction and Predictability (GOAPP) Network.

The GOAPP received close to CAD 3 million from the CFCAS to fund 18 co-investigators, in-kind support of about CAD 975 k per year over 4 years from ECCC, DFO, and DND, and participation of 20 collaborators. The main objective of the GOAPP was to improve forecasts of the coupled atmosphere–ocean system on time scales of days to decades and space scales of tens of kilometers to global. Desired outcomes were better models and assimilation schemes and a deeper understanding of contributors and limits to predictability. Important achievements of the GOAPP include: (i) building expertise in critical areas of ocean modeling, coastal ocean data assimilation, seasonal forecasting, and land surface process modeling and validation; (ii) reconstructing 3D hydrodynamics in the North Atlantic and North Pacific Oceans; (iii) fostering interactions of government researchers with students and university faculty and improving connections among Canadian Government departments of ECCC, DFO, and DND; and (iv) developing pre-operational short-term ocean forecast systems and seasonal forecasts using the coupled models from ECCC's Canadian Centre for Climate Modelling and Analysis (CCCma). Some important research results were documented in [31–34].

2.1.6. Other Network Contributions

Dr. Thompson also played a vital role in establishing and participating in other important research networks, including the Canadian Ocean Tracking Network (OTN Canada, oceantrackingnetwork.org) and the Marine Environmental Observation, Prediction and Response Network (MEOPAR, meopar.ca). OTN Canada is an integrative research program that makes use of OTN Global technologies and infrastructure to understand changing marine ecosystems across Canada and contribute to global observation of coastal and ocean ecosystems. Dr. Thompson was one of the principal investigators in oceanography and marine prediction and served as a member of the Science Advisory Committee. The MEOPAR was established in 2012 with headquarters at DAL, with funding from the Government of Canada's Network of Centres of Excellence. The MEOPAR brought together outstanding Canadian researchers in the natural and social sciences dedicated to addressing critical issues related to human activity in the marine environment and the impact of marine hazards on human activities. Dr. Thompson made major contributions to the preparation of the MEOPAR proposal that led to the funding of Cycle I (2012–2017), with over 50 researchers from 11 Canadian universities and 4 federal departments to collaborate on 7 innovative research projects. He was a key investigator, particularly for Cycle I, and served on the Research Management Committee. Particularly noteworthy articles by his team during this period are [35–38].

Dr. Thompson also played a key role in establishing a Research Chair in Modeling and Prediction of Marine Environmental Extremes in the Department of Oceanography

at DAL. Dr. Jinyu Sheng was appointed to this position in 2011, initially funded by the Lloyd's Register Educational Trust, and then transformed into a regular faculty position. Dr. Sheng's research focuses on modeling and prediction of extreme events that occur in the ocean and atmosphere, makes extensive use of coupled atmosphere–ocean–ice models covering scales of variability from tens of kilometers to global, and uses advanced statistical methods in assessing the impact of climate change on the frequency of marine extremes.

2.2. Major Research Achievements

In addition to his leadership and participation in several national and international research programs mentioned above, Dr. Thompson also made significant achievements in many important research areas in the atmospheric and oceanic sciences. For example, he was the mastermind for the development and application of several very effective and efficient data assimilation methods for improving the performance of ocean circulation and biogeochemical models, including "incrementally" applying the adjoint of the linear model to improve the nonlinear model [26],the spectral nudging method [27,28,34,39–41], and an improved optimal interpolation method [42]. In collaboration with colleagues, Dr. Thomspon developed several new statistical approaches for examining oceanographic processes and extreme marine conditions based on observations and numerical model results [20,43–45]. He also made important scientific contributions to filling the knowledge gaps in the Madden–Julian Oscillation and regional ocean dynamics over the eastern Canadian seaboard [46]. Readers are referred to Appendix C for his other important research contributions.

3. Mentoring and Training Highly Qualified Personnel

Dr. Thompson was renowned for his excellent teaching at both the undergraduate and graduate levels. He is our role model for providing exceptional and supportive training to highly qualified personnel (HQP), including graduate students, postdoctoral fellows, and research assistants. His methodology for training graduate students was both comprehensive and detailed, with a strong emphasis on both theoretical and practical aspects, as reflected in both his teaching and research areas. Dr. Thompson generously shared his time and skills with so many people, mentoring both students and junior faculty members. He left an important teaching and training legacy in both oceanography and statistics at DAL, having for decades taught graduate courses (time series analysis and multivariate analysis) and been a dedicated, long-time instructor for the first-year Introductory Statistics. Dr. Thompson had a special talent for crafting clever examples to illustrate key concepts and for providing guidance to help students achieve their full potential.

Dr. Thompson also had a well-earned reputation for providing excellent mentorship for effective scientific communication. He offered unwavering support with patience and openness to graduate students so they could develop high-quality proposals and theses. He often spent significant time and efforts with graduate students and postdoctoral fellows, particularly those with English as their second language, for improving the text and figures in their presentation slides in order for them to present their research results effectively to audiences within and beyond the research community. Dr. Thompson also played a critical role in training students and postdoctoral fellows to become excellent and independent writers for peer-reviewed articles. He always provided highly valuable advice and suggestions to his trainees in developing an effective literature review, forming important scientific questions, and reaching major scientific findings. He also helped his trainees examine the observational data and model results for peer-reviewed publication using statistical and dynamic methods and improve scientific manuscripts for better readability.

Here, we share appreciations and admirations from some of Dr. Thompson's former students and postdoctoral fellows.

Dr. Natacha Bernier (a former doctoral student supervised by Dr. Thompson and now a senior scientist and senior manager at ECCC) wrote: "It has been a privilege to share Keith's passions for marine meteorology, applied statistics and scientific communication

for some 25 years. It is truly remarkable that he managed to train so many well-rounded scientists, each with their own unique abilities and expertise. I remember complimenting him for the success of some of his past students, he'd smile and say he was 'basking in our sunshine'. He was so gifted and yet so humble. The ease of his transition from being our supervisor to being a colleague was also remarkable. He relished our new ideas, especially if they initially raised more questions than answers. Even after all these years and his vast knowledge he was keen to look at data in all sorts of ways to further develop physical insight and intuition. Statistics could then be deployed as a powerful ally to shed light on the data at hand.

Transmitting his passion for stats to his student was important to him. He often found ways to convey new concepts rapidly and efficiently. Anna's example, below, with the lamppost is one of my favorites. I also remember him 'mimicking walking with his hand falling over his desk, a drunk man's walk, to introduce Markov chains'. Keith has motivated and encouraged us all to strive for excellency whilst instilling lasting trust and mutual respect amongst us, his scientific family. I will always miss our phone calls, going for coffee at Tim's or sharing a glass of Chardonnay at the Faculty club, always bouncing from each other randomly jumping across topics and ideas or witnessing his pride as he shared the recent success of one of us."

Dr. Michael Dowd (a former doctoral student supervised by Dr. Thompson and now a professor at DAL) wrote: "Keith was my mentor, colleague, and friend for the past 30 years. I did both my Masters and PhD under his supervision. It was exciting to be involved in his active research group, and in pioneering statistical data assimilation for operational oceanography. He instilled in me, and in all his other graduate students and post-docs, the goal of striving for research excellence. He also set an example of exemplary character for us all: being honest, fair, and working hard—but also not to take oneself too seriously. He was a valuable member of not only the Oceanography department at Dalhousie, but also the Statistics department. I taught courses with him in introductory Statistics, as well as at the graduate level. He was without exception a devoted and patient teacher, no matter what the level of the student. I have always tried to emulate his talent for coming up with clever, understandable and insightful examples to illustrate key concepts. I remain astonished at his legacy, and the many lives he has enriched."

Dr. Anna Katavouta (a former doctoral student supervised by Dr. Thompson and now a scientist at the National Oceanography Centre, United Kingdom) wrote: "*I was fortunate to be Keith's former PhD student and I am proud that I had the opportunity to study under him and that I met him. I consider Keith my academic father and mentor and I would not be the scientist or the person that I am today without him. Keith was a celebrated oceanographer and he is leaving behind a tremendous scientific legacy; but most importantly Keith was the most kind and generous person I have met. He went to great lengths to support all his students. He always found the time to help me with any of my academic endeavours but most importantly to support my mental health during my PhD. I have the fondest of memories with Keith, he had a great sense of humour and his laugh was infectious. I often remember how passionate he was about his music, and it was a great treat when I had the opportunity to see him playing his bass guitar. I keep thinking with both joy and sorrow of our conversations, and amongst Keith's many great pieces of advice one has made an impression as I found it brilliantly funny, and I quote: "Anna some people use statistics like a drunk man uses a lamp post, to get support rather than to illuminate". I am sure you all agree that Keith was many things but to summarize it in a few words to me Keith was a great human. He will be greatly missed but he will continue to be in my thoughts and heart*."

Dr. Youyu Lu (a former research associate supervised by Dr. Thompson and now a research scientist at Bedford Institute of Oceanography, the DFO) stated that "*Twenty-five years ago in 1997, Keith offered me a Research Associate position at DAL oceanography to work with him and the late Dr. Dan Wright. Since then Keith has influenced and helped me tremendously, as a mentor, collaborator and source of support. What I learned from Keith are the passion in science, effective work style, high standard, devotion to the community including colleagues and young researchers, and many more. In research, I have tried and will continue to apply Keith's approach of*

combining statistical and dynamic methods in analyzing observational and modelling data. Keith also told me how to do quality control in preparing presentations, papers, and research proposals. His sudden passing away created a huge hole in my heart and it will take many years for me to digest the consequence. I will forever miss Keith, his wisdom and warmness."

Dr. Christine Pequignet (a former Master's student at DAL and now a scientist at the Meteorological Office, United Kingdom) wrote: "I was studying in the Oceanography Department at Dalhousie between 1995 and 1999, and during that time, Keith was not only a dedicated and fascinating teacher, but although not my advisor, he went out of his way to help me with my research. His direction and encouragements were so important to me. About 10 years ago, I was fortunate to bump into him at a conference in Hawaii, and I was happy to tell him that part of the work he had helped me with at Dalhousie, had been used in another project at the University of Hawaii and published. He was so humble about his contribution, but I think he was glad to see that his trust in my work had not been misplaced. I am so grateful to have had the chance to learn and interact with Keith. His teaching of data analysis has followed me throughout my career, and I can't do any spectral analysis work without thinking about Keith. He was a wonderful man, scientist and educator, and the news of the passing of Keith has no doubt saddened all his former students and colleagues."

Dr. Christoph Renkl (a former doctoral student supervised by Dr. Thompson and now a postdoctoral investigator at Woods Hole Oceanographic Institution, United States) wrote: "*Keith Thompson was an outstanding scientist, inspiring advisor, and genuinely kind person who also had a great sense of humor. I am immensely grateful for his guidance, support, and encouragement throughout the years we worked together until his passing. I really appreciated his patience and openness to new ideas. He shared a sense of endless optimism that "this has to work" whenever we were puzzled with the ocean model that we worked with. Keith's scientific curiosity was contagious. The smallest wiggle in a time series or feature on a map would catch his attention often followed by a speculation that later turned out to be right. He paid great attention to detail without ever losing sight of the big picture. Keith always treated students as his colleagues—as much as he was happy to share his knowledge and experience, he was eager to learn from everyone around him. Although he would have never admitted it, Keith's role in shaping many scientific carriers, the Oceanography Department at Dalhousie University, and the oceanography community at large is unequivocal. He will be missed by everyone."*

Dr. Shiliang Shan (a former Doctoral Student at DAL and now a professor at the Royal Military College of Canada) wrote: "I am grateful for the invaluable advice and guidance Keith provided throughout my academic journey. His unwavering support and mentorship played a pivotal role in shaping my career development. From the early stage of my thesis to the challenges I faced as a postdoc and later as a young faculty member, Keith was always there, ready to listen, offer insightful perspectives, and encourage me to reach new heights. These fond memories of Keith's warm personality and his dedication to nurturing young minds will forever hold a special place in my heart. Although his physical presence is deeply missed, his teachings and the impact he had on countless students, myself included, will continue to inspire and guide us as we carry forward his legacy."

Dr. Jinyu Sheng (a former postdoctoral fellow supervised by Dr. Thompson and now a professor at DAL) wrote: "Keith was my supervisor and mentor, and later colleague and excellent friend for more than 30 years. I was his Post-Doctoral Fellow then and Research Associate supervised by Keith for development and applications of various types of shelf circulation models during OPEN. With great help from Keith, the Industrial Research Chair program in "Regional Ocean Modelling and Prediction" was established by the NSERC/MARTEC/MSC at Dalhousie in 1998. Professor Richard Greatbatch held the senior NSERC/MARTEC/MSC Research Chair, and I was recruited as the junior Research Chair in 1990. My team had strong collaborations with Keith in four main areas: development of prototype operational forecast systems, examination of prediction and predictability of dynamically downscaling shelf circulation for the eastern Canadian shelf, applications of

the spectral nudging method in the regional ocean circulation models, and high-quality training of HQP."

Dr. Liuqian Yu (a former doctoral student at DAL and now a professor at the Hong Kong University of Science and Technology) wrote: "*I was so lucky to have Keith on my PhD committee for five years and the referee of my postdoc and tenure-track position application. I got more interaction with Keith since he became my committee member. He is the best committee member one can ever expect, a wise man with unlimited patience, inspiration, and encouragement. He made suggestions in a fun way. I tended to write unnecessarily long sentences. He once marked in my manuscript, "oh Liuqian, I need to eat a burger to finish reading this long sentence". He cared for students deeply and readily offered help whenever he sensed the need. Once I was very stressed about a talk in an upcoming workshop because I felt I didn't have exciting results yet. He spotted me wandering in the hallway and said, "Liuqian, you're not as perky today". When I told him what I was worried about, he said with a comforting voice, "no worries at all. I think you can present a great story. If you're still concerned, I could drop by your office tomorrow. You show me what you're going to present, and I'll see what I can help". That was a Friday. I was so moved because I could never expect a professor to come to help on the weekend. I didn't bother him for help the next day because I already got what I lacked from his warm words*."

4. Summary and Conclusions

A fitting summary of Dr. Thompson's career can be taken from comments by his long-term colleague, Dalhousie Professor Emeritus John Cullen, at the gathering at DAL on 20 August 2022 in memory of Keith:

- "Keith was a tremendously good scientist and great friend who was selflessly generous with his knowledge, insights, and advice.
- He had a great sense of humor and always brought a smile into the room—whether a personal visit, a thesis committee meeting, or one of hundreds of meetings for proposal development, job searches, strategic planning, and the like.
- He was adept at avoiding confrontation. When someone proposed an idea that he thought was ill-informed or just plain wrong, he would say "it makes me nervous" rather than calling it out. This was compassionate and also brilliant, because by avoiding confrontational language he could get much more done.
- His students can tell you what a great mentor he was, but as a fellow faculty member, I can tell you how important he was as a thesis committee member, and he showed the students how to attain the highest scientific standards.
- He spent a tremendous amount of time and effort promoting world-class science at Dalhousie and beyond. This includes the development of marine observation and prediction at Dalhousie from ground zero in the 1990s to its world-class status today, and important contributions to the design of the global ocean observing system."

We conclude by noting that Dr. Thompson was awarded the CMOS J.P. Tully Medal for 2016 "for his profound and lasting contributions to the understanding of the oceanography of Canadian waters and his commitment to providing predictive tools for oceanic variables of societal concern" (Figure 5).



Figure 5. The CMOS J. P. Tully Medal for 2016 presented to Keith Thompson "for his profound and lasting contributions to the understanding of the oceanography of Canadian waters and his commitment to providing predictive tools for oceanic variables of societal concern".

Author Contributions: All authors contributed to the writing and editing of the manuscript. All authors have read and agreed to the published version of the manuscript.

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Conflicts of Interest: The authors declare no conflicts of interests.

Appendix A. List of Key Acronyms

Acronym	*Definition*
AEPRI	Atlantic Environmental Prediction Research Initiative
CCAF	Climate Change Action Fund
CCCma	Canadian Centre for Climate Modeling and Analysis
CCMEP	Canadian Centre for Meteorological and Environmental Prediction
CFCAS	Canadian Foundation for Climate and Atmospheric Sciences
CMC	Canadian Meteorological Centre
CMEP	Centre for Marine Environmental Prediction
CMOS	Canadian Meteorological and Oceanographic Society
CONCEPTS	Canadian Operational Network of Coupled Environmental PredicTion Systems
DFO	Department of Fisheries and Oceans
DND	Department of National Defence
ECCC	Environment and Climate Change Canada
GOAPP	Global Ocean–Atmosphere Prediction and Predictability
GODAE	Global Ocean Data Assimilation Experiment
HQP	Highly qualified personnel
IOS	Institute of Ocean Sciences (UK)
MEOPAR	Marine Environmental Observation Prediction and Response
MSC	Meteorological Service of Canada
OPEN	Ocean Production Enhancement Network
OTN	Ocean Tracking Network

Appendix B. Dr. Thompson's Academic Background and Experience

Appendix B.1. Academic Background

- 1973: Mathematics, University of Manchester
- 1974: Fluid Mechanics, University of Manchester
- 1979: Oceanography, University of Liverpool

Appendix B.2. Academic Experience

- 1975–1980: Research Scientist, IOS (UK) Proudman Laboratory
- 1981–1982: Research Associate, DAL Oceanography
- 1982–1983: Research Scientist, IOS (UK) Proudman Laboratory
- 1983–1988: Research Fellow, DAL Oceanography
- 1988–1989: Joint Appointment, DAL Oceanography and Statistics
- 1990–1999: Associate Professor, DAL Oceanography and Statistics
- 1999–2020: Professor, DAL Oceanography
- 2002–2016: Canada Research Chair, DAL Mathematics and Statistics
- 2021–2022: Emeritus Professor, DAL

Appendix C. Dr. Keith Thompson's Other Publications

1. Thompson, K.R. Regression models for monthly sea level. *Mar. Geodesy* **1979**, 2, 269–290.
2. Thompson, K.R. An analysis of British mean sea level. *Geophys. J. Royal Astrono. Soc.* **1980**, 63, 57–73.
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