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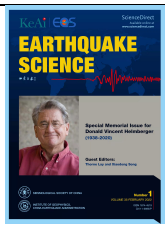

In Memoriam

Donald V. Helmberger, the master mentor: Testimonials from former international students

Xiaodong Song[1,✉], Sidao Ni[2], Ying Tan[3], Alex Song[4], Risheng Chu[5], Daoyuan Sun[6], Shengji Wei[7], Semechah Lui[8] and Voon Hui Lai[9]

[1] *Institute of Theoretical and Applied Geophysics*, *School of Earth and Space Sciences*, *Peking University*, *Beijing* 100871, *China* (*xiao.d.song@gmail.com*)
[2] *State Key Laboratory of Geodesy and Earth's Dynamics*, *Innovation Academy of Precision Measurement Science and Technology*, *Chinese Academy of Sciences*, *Wuhan* 430077, *China* (*sdni@whigg.ac.cn*)
[3] *Chevron Technical Center*, *Houston TX* 77002, *USA* (*ying.tan@chevron.com*)
[4] *Department of Earth Sciences*, *University College London*, *London WC1E 6BT*, *United Kingdom* (*alex.song@ucl.ac.uk*)
[5] *State Key Laboratory of Geodesy and Earth's Dynamics*, *Innovation Academy of Precision Measurement Science and Technology*, *Chinese Academy of Sciences*, *Wuhan* 430077, *China* (*chur@asch.whigg.ac.cn*)
[6] *Laboratory of Seismology and Physics of Earth's Interior*, *School of Earth and Space Sciences*, *University of Science and Technology of China*, *Hefei* 230026, *China* (*sdy2014@ustc.edu.cn*)
[7] *Asian School of the Environment/Earth Observatory of Singapore*, *Nanyang Technological University*, *Singapore* 639798, *Singapore* (*shjwei@gmail.com*)
[8] *Department of Earth Sciences*, *University of Toronto*, *Toronto*, *ON*, *M5S 3B1*, *Canada* (*semechah.lui@utoronto.ca*)
[9] *Research School of Earth Sciences*, *The Australian National University*, *ACT* 2601, *Australia* (*voonhui.lai@anu.edu.au*)

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Don trained many Ph.D. students over the ~5 decades of his career, at least 45 were advised or co-advised according to a Caltech account. A large number were international students including a high percentage of Chinese students. The contributors to this article graduated over a time span of 26 years, and we are now distributed in 6 countries across 14 time zones, yet we represent only a small fraction of his former students and postdocs.

Don had a natural talent for mentoring that attracted us deeply. Below are direct testimonies from us to that effect. It is easy to see common threads regarding his mentoring style. First, Don spent a lot of time with students. Second, he loved to look at data and to show students how to appreciate them. Third, he had a magical touch that is hard to describe. The following words come easily to our minds when thinking about him: insightful, inspirational, patient, humorous, magical, supportive, caring, and generous.

I

Don loved to look at data (seismograms). Digital stations were still sparse in the early 1990s. He would go down to the basement to find film chip records and bring

✉ **Corresponding author.** Contact any author at email provided.

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up a pile of paper-copy seismograms. He spent tons of time with students (in his office, or at football games and beer hours). Often there was a line of students waiting outside his office to talk to him or we would find “See me, Don” notes on our desks or computer screens. Thus, I was very happy to grab a chance to move into an office obliquely opposite to his so that I could see whether he was available without leaving my office. We would look over seismograms, codes, figures, and manuscripts in great details. He would hold up seismograms (synthetic and observed) and see how they match or mismatch. After some 30 years, these are the most vivid pictures that come up from my memory.

He had the magic of inspiration, out of his wisdom and humor, but also of modesty, kindness, and generosity.

II

Don was an inspirational mentor and a true seismologist with expertise for deciphering the secrets of earthquakes, interior of the Earth, as well as nuclear tests. His virtuosity in uncovering the above secrets is best demonstrated in his deep love of various seismic signals (wiggles, or seismic phases) in seismograms. I started my graduate study examining old seismograms on microfilms archived in the basement of the Seismo Lab, and Don taught me how to use the archaic instruments for reading the microfilms and how to understand and decipher the seismic phases in the seismograms. I would say, Don was much like the famous computer genius Alan Turing who cracked German secret codes during World War II. Don cracked the secret codes in seismograms and discovered many important features inside the Earth. Inspired by Don, I also become addicted to deciphering the seismic wiggles.

I much cherished "See me, Don" notes on my desk. Each note led to valuable opportunity for me to learn from Don and to share my progress with him.

III

Don was a fantastic advisor, the best one a student could wish for. He not only taught me how to solve the mysteries of the Earth from seismograms but also made sure I was having fun doing it. Don spent a lot of time working closely with his students. He closely monitored our well-being and academic progress and provided timely guidance. He set high standards for himself and his students. During my early days in graduate school, I felt some pressure from time to time, especially when Don put a yellow sticker with a sad face and a short message “can I see u?” on my computer after I had missed our regular catch-up sessions. Later, with hindsight, I started to appreciate his effort and to see the benefit of his approach. My officemate Chen Ji once joked that he was jealous about Don’s daily reminder and mother-hen approach for me. Don certainly knew who would need a little bit more help there. Besides seismology, Don also taught me wisdom of life, and corrected my English pronunciations of letters like “r” and “n”. I really liked his jokes; it just sometimes took me a while to figure them out. I enjoyed working with Don and really appreciate his patience and encouragement, especially when things did not go as expected. From time to time, I reminded myself what Don had taught me: "you need to get up and try again wherever you fall" or "some little birds, they never know how high they could fly, cause they never try"… We had stayed in touch since I graduated, and every time I called Don, I felt I was so welcome. It was always great to hear his excited and joyful voice. Don had been like a family member for me, and I know many of his students feel the same way. Don's fatherly care will live with us forever.

IV

I cherish every minute I had with Don. Perhaps some people just have that kind of charisma. Don was not loud and he almost always had a smile on his face, probably because another good idea came to his mind or perhaps he just finished another look at some seismograms. Normally, I sat next to Don in his office, we discussed a bit and next thing you know, he started looking at Mt Wilson, and soon after, we both were looking at Mt Wilson. For me, these short episodes of silence, sometimes they could be quite long, actually brought a peace of mind and clarity to me, and all of a sudden, we would come to a new understating about the story behind the seismograms. The idea may not work the next time, but the inspiration was always there, and Don seemed to have a magic touch to make people around him better. In a way, Don invited us to see the world through his lens. The inspiration comes each time when I see Mt. Wilson.

I consider myself incredibly lucky that I had seemingly a lot of time with Don during the 7 years I spent at the Seismo Lab since the summer of 2000. After a few long years and a move to the UK, we finally saw each other again in 2018 in Singapore. For some reason, seeing Don always brought a big smile to my face. I will always remember the humor and wisdom, the affection and the kindness from him.

V

I first met Don in November 2006 at the Earthscope/ USArray Imaging Science and CIG Seismology Workshop in Washington University in St. Louis. Prof. Lupei Zhu, my PhD advisor and Don's former student, invited him to stop by Saint Louis University for suggestions on our ongoing project. His profound knowledge of seismology, particularly waveform modeling, fascinated me, and I was determined to follow his path into the limitless universe of seismic wiggles.

In April 2008, I was lucky enough to join the Seismo Lab as Don's post-doc. Since then, we collaborated frequently and published 13 papers together, mostly on earthquake sources and upper mantle velocity structures from waveform modeling. Don was like a magician. He could turn many ordinary things into magic tools for seismic waveform modeling. I would show him observed and synthetic waveforms along different distance profiles for various azimuths. On each profile, he would draw many straight lines using a large ruler, marking arrivals of major seismic phases (apparent velocity of these phases can be inferred from the slopes of the lines). He also marked on a sticky note to tell different arrivals. Occasionally, he would copy a distance profile onto a transparency and align with other profiles to see the azimuthal variations. These seemingly small tricks enlightened me. I often use the same tricks in meeting with my students.

VI

Don was so humble and always proud of his students. Once, I asked him why he could train so many great students. He smiled and said, "Let them play in the sandpit freely and nicely". He was so good at identifying the distinct personalities of different students and treating them uniquely but equally. In any case, he was always supportive, caring, and believed everybody should be able to become the master to understand the wiggles.

I heard that there was always a line of students outside Don's office. I was lucky that I did not need to wait in line. From that point of view, I was not a very good student. Don always came to my office and put a note of "see me" on my computer screen. Sometimes, he would draw a smiling face instead. It was always a joyful and cherished moment to sit with Don in his office. Seeing Don plotting lines on the seismograms, waiting for him to reboot from a sudden stop, and enjoying the view of Mount Wilson and day dreaming with him has been the greatest memory.

Don's class of "Advanced Seismology" is notoriously hard. I know Don had prepared the lectures and class notes so seriously and brought piles of papers for everybody. He always went to the classroom before the class and wrote down equations on the blackboard. However, his class was just so difficult. However, every time I sat in that class, I learned something new.

"This is a wild goose chase", was sometimes the verdict after we studied some problems for several months and decided to "put it in a folder". However, such folders never stopped Don and us from studying more wiggles.

VII

Don had a unique charisma to attract students to work with him to get into his world of understanding the seismograms. When we identified phases in the seismogram, we sometimes bet on the solutions to verify our speculations and of course, I lost almost all the wagers. It is no question that strong curiosity had driven his life-long addiction to the seismograms. In one of the many conversations we had, he said that after I die, I will go to the bottom of the mantle and see what the hell is going on there. He also expressed several times in coffee hours and seminars that he is a dreamer in doing science. His genuine curiosity infected many of his students through countless meetings, which is one of the reasons that the Seismo Lab has a very high student ratio staying in academia after graduation. Don cared a lot about his students, not only for their work but also their life. He wanted his students to be happy in doing what they do, which he considered as the most important reason to eventually keep them in academia.

VIII

Don was one of the first professors I met at Caltech, and he gave me a warm welcome to the world of seismology. I am always inspired by his sharpness in extracting interesting waveform features and generating countless research ideas around them. One of Don's favorite things to do was to study seismograms on paper or transparency films. I am sure many of his students have had experience spending hours printing seismograms before their meetings with Don. Although tree lovers might not appreciate this, I would always look forward to spending fun afternoons sitting next to Don to go over the wiggles together. I would walk into his office with a few questions, and ended up walking out with way more!

As a mentor, Don showed tremendous support and care

through the ups and downs of my research career. Don was a man with few words, but his small gestures (a hidden thumbs-up during my qualifying exam) and unique sense of humor (telling me how much I should pay him for therapy time while I was getting ready for my defense) were the little magical things he did that kept me going. Don's office door was always open; the energy and time he dedicated to his students is something for which I will always be grateful. It has been a true blessing to have worked under Don's wings during my years at Caltech. I will miss him and the lessons he taught me in seismology and in life.

IX

Don is my greatest inspiration in my academic journey to become both an exceptional seismologist and an outstanding mentor. It is well known that Don had a very keen eye for seismograms and it seems almost magical to see how he identified anomalies from plain looking wiggles. However, as I have been able to meet many of his previous students over time, I am more amazed by Don's innate ability to cultivate each student, as we all have different personalities and background, to become the best scientist we can be. The journey of doing good science is difficult and peppered with failures, and Don was there with me, giving his time and knowledge with no holding back. He showed that there is always time to look at record sections, how to let go of wrong interpretations and start over, how not to be afraid to ask silly questions, and most importantly how to build confidence in our scientific capability. I will miss our afternoon discussions, where we poured over record sections and stared out the window at the mountains, thinking of models to explain the waveform anomaly, try them, and repeat again. "Praise from the praise-worthy is beyond all rewards." I will always be grateful for his patience in me as I am finding my footing in science; his trust in me by affirming my big or small achievements, whether it is finding an earthquake with good waveforms or winning grants; and last but not least, his confidence in me to pursue open questions about our Earth (even if it's without him).