



Dear Friends
and Family,

For a week, I've wondered how to start this holiday letter. "It was the best of times [for us], it was the worst of times [for our country]"? "May you live in interesting times [we do]"? Both pretty much sum up

the year. Bob and I have watched and read the news more than ever before, aghast at much of it – and not just in the political realm: this year's natural disasters, shootings and bombings have been and still are heart-rending. But we're grateful for our domestic life, which has been the best of times.

Our big news is, we now live within walking distance of three of our five grandchildren, instead of one. (The other two are either away at college or in the Marines – more on that in a minute.) Bob's daughter Jill moved to Oak Park in July, which is literally across the street from us. Her 11- and 13-year-old sons are here often, hanging out with Grandpa Bob. It's a joy to see them together and pure pleasure to be that close to more of the family.

Our oldest grandson, James, enlisted in the Marines and is now doing some important, heavy lifting (of 155mm=6.1 inch, 47 kg=103 lb. howitzer shells) at Twentynine Palms, California. Almost all the family went to his graduation in San Diego in April – a singular time of togetherness and a rare chance to see how the Marine Corps builds men and teaches them how to protect us. We are proud of him beyond words.

Our older granddaughter is in the home stretch to graduate from college, specializing in creating video games. Our younger granddaughter started college at age 17 this year, studying nursing. The two youngest men are thriving in their new school. We are proud of all of them and how they're growing up.

Bob has traveled more than ever. He'll probably list some of the places in his part of this letter. In short, he's accomplishing what he always wanted to do: make original contributions to science. It's a pleasure to revel in his excitement and satisfaction, even though I understand about half of what he's explaining to me.

I've gone on some of Bob's trips and also took some of my own, to Boise; to Cambridge, MA, for my 30th Harvard Kennedy School reunion; and to Hilo, Hawaii, to help our granddaughter set out on her college career. We celebrated Bob's 75th

birthday with his brother Ed, sister-in-law Barbara and daughter Sally in New York City. I joined him in Toronto, my first time there, and we visited Niagara Falls, also a first for me. (Hmm – 30th? 75th? Where did those big numbers come from?)

Although I gave up litigation work this year, my law practice is busier than ever and always interesting. Much of it is for an investor with a wide (and I do mean wide) array of investments that need tending. One project resulted in a bottle of designer vodka with my name engraved on it. Although I'm a dedicated Glenmorangie Scotch drinker, I'm most impressed with it.

The other interesting event for me this year didn't happen all at once – it just evolved. In January, I started working out with a new trainer, who I fondly call Brian the Terrible. I've had a long line of trainers who focused on fitness, but with respect for my middle- and older-aged body. Brian just focuses on producing sweat – dripping sweat, hair-soaking sweat – without mercy, without any exercise machines. For many months, I went because it was good for me, helped me sleep better, and gave me extra endorphins. (Brian is also cute and funny, which helps when one is sweating uncontrollably.) But not long ago, I realized – for the first time in my life – that I can master physical activity and even like it, that I felt proficient about my body. It's a long way from not being chosen for the kickball team or feeling eternally pudgy. I'm by no means svelte now, but I've gone down a dress size (not that I wear dresses) and I have real muscles and my upper arms barely jiggle.

To end with a quote from a Frank Sinatra song: “It's been a very good year.” We hope it's been a great year for you and your family, too. Now to Bob for his news.

From Bob:

A great year of beginnings: the Trowbridge family moved to Oak Park, 0.3 km = 0.2 mile from us and we have the joy of sharing much more of life with daughter Jill, and her children Henry and Alastair. Their sister Holly is in Nursing College in Hilo HI (with >150 inches = 381 cm of rain per year!) and brother James is protecting us in the US Marine Corps, in Twentynine Palms, CA so we do not see quite so much of them. [I use Marine Corps metric units, in deference to James.]

Close friend and collaborator Chun Liu has moved to the Illinois Institute of Technology (IIT) and appointed me Adjunct Professor of Applied Mathematics: a new beginning professionally, in addition to my emeritus status in Rush Physiology, and a deepening of an already well-developed friendship with our family.

Travel has continued, with visits to San Diego (for James' graduation) and New York to visit with daughter Sally and life partner Reid. A week in Lawrence, Kansas to work with Weishi Liu allowed us to visit the extraordinary sites of the Eisenhower presidential library, the LDS (i.e., Mormon) Church in Independence MO and eat some gluten free BBQ. A month in Toronto, thanks to Huaxiong Huang, brought Ardyth and me to Niagara Falls, smiling continuously for days at the wonder right

below our hotel window. The work with Huaxiong and his colleagues seems likely to produce three exciting new projects, two of which are quite different from anything else I have done.

Science continues to extend, and invigorate my life, as it has since 1950, when I discovered it, and started my engagement. Weishi Liu has shown how to write formulas for the remarkably nonlinear properties of ionic channels, which no one thought could possibly be understood that way. Xavier Oriols and Dave Ferry showed how conservation of current works inside atoms, as well as between stars, and I showed how to explain that in three slides, and three formulae.

Why does this matter? Because all our computers, digital technology, cell phones, and so on depend on the simplest version of conservation of current and little else. That law is true exactly from 0.0000000000001 amps of current to much more than 1000 amps of current, no matter what is producing the current flow, in a wire, in salt water, in your body, in air, or even in a vacuum (if you wonder how current can flow in a vacuum current, drop an email to bob.eisenberg@gmail.com). And that is why 1,000,000,000,000 components of our computers, some only 50 atoms long, can switch about 1,000,000,000 times a second, without significant mistakes. No one could design such systems by the exhausting and exhaustive trial and error methods that make molecular biology what it is today. It is only because physical models of semiconductors and mathematics work perfectly for electricity that our electronic technology is possible.

It is our dream is that we might extend this success to the worlds of chemistry and biology. We dream of learning how the wonderful structures celebrated in this year's Nobel Prize (to friend Richard Henderson among others) actually work. Goals like these are reaches, which must exceed our grasp, if they are to be of any use, I never forget!

I look forward to the coming year, as these new beginnings mature, while I am in Chicago and on trips scheduled to Hsinchu (Taiwan), Germany, Israel, Minneapolis, Toronto, and Suzhou (China), all before July 1, 2018.

I hope the New Year brings you all the joy and beginnings I have been blessed with in 2017.