

Remembering Dr. Al Bartlett

Physicist, professor, population activist, workhorse, and straight shooter

BY LEON KOLANKIEWICZ

As every reader of *The Social Contract* surely knows by now, Professor Emeritus of Physics Albert Allen Bartlett passed away on September 7, 2013, at the age of 90 at his home in Boulder, Colorado. Al Bartlett was no ordinary physics professor, but used the numerical skill this most mathematical of the sciences gave him, as well as his innate talent as a teacher, to exert an enormous presence on the world stage as an environmental educator — all with a single remarkable lecture that has now been seen by hundreds of thousands in person and millions via the Internet.

I first met Al and his wife Eleanor in 1994 at one of North America's truly idyllic getaways — the rustic Asilomar conference grounds on the iconic central California coast near Monterey, Carmel, and Big Sur. Al was then already 71 years old and retired since 1988, although that mere formality hadn't kept him from continuing to teach introductory physics to undergraduates at the University of Colorado-Boulder.

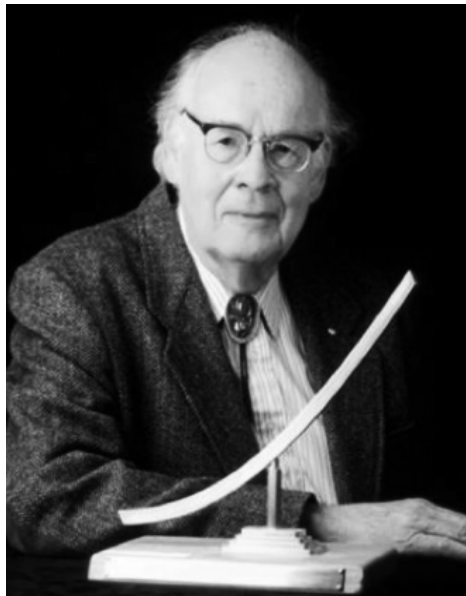
The occasion of our encounter was a board meeting of the population organization Carrying Capacity Network (CCN). Al served on this board back in the nineties. They had invited me up from Southern California to hear first-hand about my trouble-making within the Sierra Club on behalf of a rational national population policy that

recognized the need to limit immigration to achieve the crucial goal of U.S. population stabilization. It also turned out to be a job interview of sorts, for the following year I was offered a position by CCN and went to work for them in Washington, D.C.

Al and I hit it off from the get-go. Having lived in New Mexico, "The Land of Enchantment," I was indeed enchanted by his fine-looking bolo (shoestring) tie, which, as I discovered over the years, was a nearly omnipresent adornment: Al's simple homage to Western heritage and style. Al and Eleanor and I sat next to each other at dinner and Al and I swapped stories of youthful adventures, misadventures, and indiscretions. I was struck by his warmth and down-to-earth manner, and I loved the sound of his voice. For the next 19 years, we never fell out of touch.

For the first four of those years, we collaborated regularly on CCN projects. One of my very first efforts in 1996 was arranging for a presentation of Al's renowned lecture, "Arithmetic, Population, and Energy: Sustainability 101," in an elegant chamber of the U.S. Capitol. It was a sunny day, and I'll never forget the sight of the stately, shining Capitol dome looming above us.

That was the first of perhaps half a dozen times I saw Al's lecture in person. He had already presented it well over 1,000 times, on his way to an eventual 1,742 presentations before he died. This particular performance managed to attract several congressmen and a number of their staffers, some of whom were probably lured by the prospect of a free catered lunch as much as by the topic of exponential growth. But Al gave a command performance in any case. He made the daunting (for some) math look easy, and I think he convinced many that, indeed: "The greatest shortcoming of the human race is our inability to understand the exponential function." It was at this event that Bartlett



Physics professor Albert Allen Bartlett

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met Bartlett, as in Professor Al Bartlett meeting attendee and Congressman Roscoe Bartlett (R-MD), unrelated, who in 2005 established the Congressional Peak Oil Caucus with Representative Tom Udall (D-NM), son of Kennedy-Johnson era Interior Secretary Stewart Udall. Congressman Bartlett later invited Professor Bartlett to present testimony at a House hearing or two on energy and oil issues.

Before I even met him, Al had already lived 71 eventful years. As he told me that night over dinner at Asilomar, in the summer of 1994, before he ever became a scientist he had worked for a while as a dishwasher and cook aboard iron ore freighters on the Great Lakes. It was an experience that made a lifelong impression on him. He kept a framed photograph of an iron ore freighter on his office wall, and years later, in an on-camera interview for the 2008 documentary *Blind Spot*, Al said:

I dropped out of college for a while. And I worked on iron ore freighters...I used to think, 'would we ever run out?' And I can remember saying to myself, 'well, Al, you're just a dishwasher. There are smart people in Washington. If there's any danger of running out they will act rationally and warn us so we can reduce our consumption.' And I'm ashamed to admit how many years it was before I realized that my trust was misplaced.

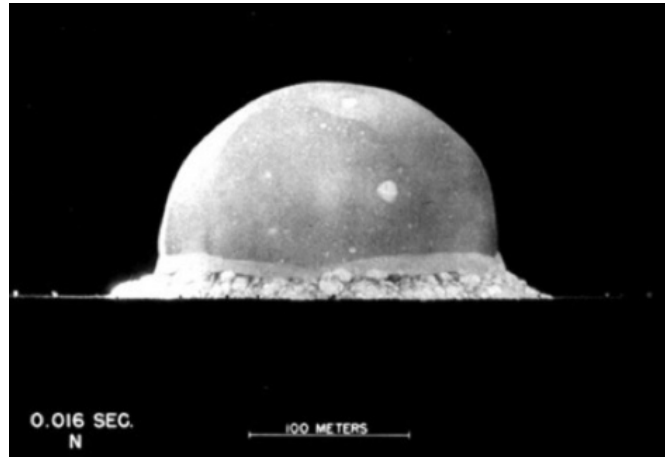
Al did return to school eventually, studying at Otterbein College and Colgate University as an undergraduate, and earning a B.A. in physics *summa cum laude* from Colgate in 1944. But a little thing called World War II intervened in his life, as it did in the lives of hundreds of millions. In July 1944, he was recruited by the top-secret Manhattan Project, the massive, multi-faceted, concealed effort to develop and deploy an atomic bomb before it was feared Nazi Germany would.

Al moved into a dorm room in Los Alamos, New Mexico. On one side was a Nobel Laureate, on the other two scientists who died from acute radiation exposure in separate incidents of uncontrolled chain reactions in 1945 and 1946, while conducting experiments



A young Al Bartlett

to determine the critical mass of plutonium (Pu). Al's job was to study the properties of the very Pu material to be used in the atomic bomb. He measured contamination by the Pu-240 isotope in the Pu-239 being produced by nuclear reactors at Hanford, Washington. After the July 16, 1945 Trinity Test of the plutonium bomb in an isolated, desolate swath of New Mexico desert known to Spanish *conquistadores* as "La Jornada del Muerto" (The Route of the Dead Man), Al and another technician were tasked with developing photographs of the first-ever atomic bomb detonation in the 4.6-billion year history of the Earth.



The Trinity explosion 16 milliseconds (16/1000 second) after detonation

Leaving Los Alamos behind, Al returned to college yet again, this time earning his Ph.D. in physics from Harvard in 1951, where he worked with Ken Bainbridge, a leader at Los Alamos for the engineering and testing of the atomic bomb. Al's dissertation research concerned the design and construction of a double focus beta-ray spectrometer.

Al joined the faculty of the University of Colorado's Department of Physics in September 1950 as an assistant professor, and there he served until his retirement in 1988. He was a Professor Emeritus there at the time of his death.

In a moving tribute written just after his passing, the Physics Department said:

Professor Bartlett had a profound impact on the Department of Physics, the University of Colorado, [and] the City of Boulder, and has had a transformative influence on science education and public policy.

The tribute continued:

Professor Bartlett was one of the most revered and successful teachers in CU's history. He taught introductory physics to generations of young scientists and engineers. He won the Distinguished Service Citation, Robert

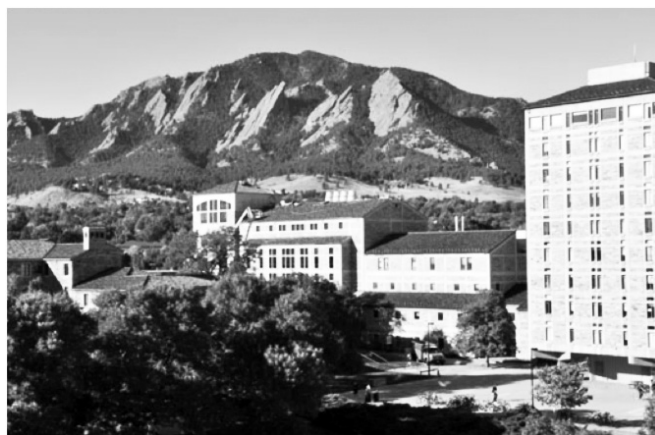
A. Millikan Award, and Melba Newell Phillips Award from the American Association of Physics Teachers, and served as the society's national president in 1978. Teaching and service awards from the University of Colorado include Boulder Faculty Assembly Excellence in Teaching Awards, the Robert L. Stearns Award, Thomas Jefferson Award, Centennial Medallion, President's University Service Award, University Heritage Center Award, and the Presidential Citation.

Al served on the Boulder Campus Planning Commission for 25 years, helping lead long-term campus planning for new buildings on the CU campus. He also chaired the faculty committee responsible for designing a new physical laboratories building, which is the current home of the Physics and Astrophysical and Planetary Sciences departments. Al and another professor were instrumental in the design of the innovative physics lecture halls, including rotating stages used to move lecture demonstrations into the lecture halls during 10-minute class-change periods.



In 1972, Al collaborated with Barbara Gamow, the widow of theoretical physicist and cosmologist George Gamow — an early advocate and developer of the Big Bang Theory — to establish an endowment at CU to permanently fund the George Gamow Memorial Lectures. Over the years, 24 Nobel Laureates have given this lecture, which has remained free and open to the public for more than four decades. As if this were not enough, Al co-authored a book on the history of the CU Physics Department, chronicling its evolution from a single professor to an abode of Nobel Laureates.

We have all heard of “thinking globally and acting locally.” Well, Al thought globally and acted not just locally, but on the regional, national, and global scales as well. His contributions to the University of Colorado and the CU campus community were matched by his contributions to his community, his nation, and the wider world.



University of Colorado at Boulder, at the base of the Rocky Mountains

Half a century ago, Al was one of the founding members of PLAN (People's League for Action Now) Boulder. This citizens group emerged from earlier advocacy he helped lead that restricted Boulder's sprawl onto the scenic Rocky Mountain foothills above town by establishing an elevation limit above which municipal water would not be supplied. In a very real sense, today's Boulder residents are indebted to Al's early leadership for the amenities they now enjoy — picturesque mountains and views of them, parks, bicycle paths, greenbelts, and open spaces.

But it is for his lecture, “Arithmetic, Population and Energy: Sustainability 101,” the same one I first saw in the U.S. Capitol building back in 1996, that Al garnered worldwide acclaim. In an effort that spanned more than 40 years, he gave the ever-evolving show in person to audiences ranging from students to corporate executives, scientists, politicians, and policy wonks. The lecture is based on his paper, “Forgotten Fundamentals of the Energy Crisis,” originally published in the *American Journal of Physics*. He spoke to groups in 49 states and several countries, reaching, as noted earlier, a combined audience that certainly numbered several hundred thousand. Via the Internet, his lecture has garnered nearly five million views on YouTube. This is an extraordinary number of viewers for serious educational content rather than pure entertainment, for a video in which numbers, graphs, and profound and provocative concepts are featured rather than low-brow, lowest common denominator sex, song, and dance.

Al starts his talk with his now-famous observation: “The greatest shortcoming of the human race is our inability to understand the exponential function.” But he reassures us that in fact one needn't be a math whiz or a rocket scientist to understand the treacherous, stunning implications of exponential growth. Using a combination of humor, wit, and great graphics, Al's lecture transports us to the exotic land of the exponential function, where a mere seven doublings of a quantity, growing at

a steady but seemingly unimpressive rate, lead to a product that is 128 times larger than the original amount, and ten doublings to a thousand-fold increase in the quantity. We are introduced (or reintroduced) to logarithms, the natural log (ln), the advantages of using semi-logarithmic plots, and the “rule of 70,” that is, if you divide the annual percentage rate of increase of the quantity in question into 70, you get the approximate doubling time.

Exponential growth is the same phenomenon as the compound interest that bankers and investors rhapsodize about. But unlike the notional dollars of stock markets, things in the real world, like the human population or oil consumption or greenhouse gas emissions or the production of iPods and iPads, cannot grow forever; nature imposes limits to growth. And this is anathema to those with the hubris to fantasize that there are no limits to what unfettered human ingenuity and technology and social justice can accomplish. Harkening all the way back to Malthus and his bitter nineteenth century critics such as Swift, Dickens, Marx, and Engels, and more contemporary economists, technological optimists, and libertarians, there is a fundamental philosophical divide between those who acknowledge limits, however reluctantly, and those who eschew them.

Using examples ranging from the prosaic to the profound, Al demonstrates how the numbers inexorably mount, slowly at first, but then treacherously faster and faster. “Just look at those numbers!” he exclaims in amazement. And he was genuinely amazed, even after 1,742 times. Others shared his amazement. Al’s lecture and his writings made lasting impressions on such innovative thinkers, iconoclasts, and public figures as William E. Rees, David Suzuki, Herman E. Daly, Richard Heinberg, James Howard Kunstler, and Chris Martenson.

Which country did Al think has the worst case of overpopulation? The United States hands down, due to our high and rapidly growing numbers, and our high per capita resource consumption. This is why he served on the board and volunteered on behalf of Carrying Capacity Network, which advocated U.S. population stabilization ASAP as well as the reduction in immigration numbers needed to attain this goal.

Al’s population advocacy was occasionally criticized or mocked from the arithmetically challenged and the ecologically ignorant on both the right and left, as well as from some religious fundamentalists. Indeed, he was once attacked for supposedly believing that human beings were no better than bacteria in a bottle, because of one of the exponential growth examples he used in his lecture! But Al’s unwavering commitment and honorable principles were also acknowledged by many others and the better informed. He was locally and internationally lauded with the Lifetime Achievement Award from the University of Colorado Environmental Center, the

M. King Hubbert Award for Excellence in Energy Education, the Pacesetter Award for Lifetime Achievement in the Boulder Community, the Gilbert F. White Award of PLAN Boulder County, and the Global Media Award for Excellence in Population Reporting.

The latter award, for the category Best Magazine Article in 2008, was presented to Al in Los Angeles by the Population Institute. He won for his article, “Why Have Scientists Succumbed to Political Correctness?” published in the *Teachers Clearinghouse for Science and Society Education Newsletter*, Vol. 27, No. 2. In that article, Al expressed his concern that even when scientists did recognize overpopulation, they were remiss in not recommending that it be addressed when considering solutions to the problems it caused.

Not all smart people become wiser as they age; some merely become sour or bitter. And many, tragically, succumb to the ravages of senility or Alzheimer’s. Fortunately for him, his family, and all of us, Al was one of those who remained sharp, as well as ever sweet and humble, even as he grew older and wiser. His aphorisms and observations reflected a rare blend of intelligence and wisdom. “To be successful with this experiment of human life on earth we have to understand the laws of nature as they are encountered in the study of the sciences and mathematics,” he said.

Then there was his population challenge:

Can you think of any problem in any area of human endeavor on any scale, from microscopic to global, whose long-term solution is in any demonstrable way aided, assisted, or advanced by further increases in population — locally, nationally, or globally?

I never heard anyone dare to take him up on it.

I got to see Al and Eleanor one last time on a trip through Boulder in about 2007. Al and I went out to buy a pizza and brought it back to their home, where the three of us supped together around their kitchen table. Unfortunately, it was not as light-hearted a dinner as the one 13 years earlier on the California coast. Eleanor was already very ill from her four-year struggle with ovarian cancer, which, along with a stroke, would ultimately claim her life in March 2008. In August of that year, Al wrote me:

...in June I was diagnosed as having a non-Hodgkin’s Lymphoma, so I am in the midst of a long series of chemotherapy treatments. The treatments have left me with greatly reduced strength, so I just can’t get as much done as I want to do. So far, the prognosis is good. I have cancelled lectures for most of the fall, but I hope to get back on the circuit by next year.

He was already 85 years old then, two decades above and beyond when most of us retire from work and active life, yet he intended to “get back on the circuit” as soon as he could! That is how dedicated Al Bartlett was to alerting and educating the citizens of America and the world of the danger posed by overpopulation. He was the living embodiment of indefatigability.

In that same email, Al talked excitedly about an upcoming family tradition, their annual camping trip in Colorado’s majestic Rocky Mountains:

In between treatments I am feeling pretty good, so in a week our daughters and I are planning to go on our annual summer camping trip. This consists of driving ... to a special campground on the Taylor River near Gunnison, setting up our big tents, and just staying put for a week, doing day trips as the spirits move us. We sleep on pads on the ground and cook on a Coleman propane stove. It will be the first year that we will be camping without my wife, so that part will be sad. Indeed, the day we drive to the campground will be our 62nd anniversary.

Again, one marvels at an 85-year old widower and cancer survivor reveling in getting to sleep on a pad on the ground rather than a cozier bed or sofa. It bespeaks an indomitable sense of adventure and engagement with life and nature, with all of their discomforts...and joys.

Al overcame his grief and his cancer to make it back onto the “circuit” to give a number of lectures more. About one special trip in 2011, he wrote me:

I’m still out lecturing, but not as much as I used to. Although I’m feeling fine, I’m quite weak from the treatments I’m taking for prostate cancer so I can’t travel alone. My daughters won’t let me travel unless I’m accompanied by an adult. My daughter Carol and I had a wonderful trip last month. We flew to Toronto and I spoke at a meeting of physics teachers at McMaster University in Hamilton, Ontario.

Then at 10PM on a rainy Saturday night we boarded VIA Canada’s Train No. 1 for Vancouver, B.C. What a ride! For three and a half days we went over an estimated 8 million railroad ties that took us through rocks and forests north of Lake Superior. Then we went through miles and miles of waterlogged farmland where the rivers were flooding and homes were sandbagged.

Then we got to the Canadian Rockies which are truly spectacular! The last morning of the three and a half day trip we were going down

the Fraser River into Vancouver. The canyon is incredibly scenic and the river was very high and the clouds were low. I spoke at the University of British Columbia and both David Suzuki and Bill Rees came down to hear me.

In that same 2011 email, Al provided me some helpful comments on an article I had just written for *Population Press* on the demographic clouds overshadowing the Arab Spring then just beginning:

Dear Leon,

Thanks for your article, “Demographic Trends Undermine Hope for a Better World Future” in the Spring 2011 *Population Press*.

On the first page you list Egypt’s population in 1960 as 27.8 million and in 2008 it’s 81.7 million. You have the observation that the population tripled in 48 years.

Make a guess as to the average annual rate of steady growth that gives this increase. It’s only 2.24 percent per year!

We need to hit the public over and over with the fact that trivial growth rates produce enormous consequence in modest periods of time.

Ever the educator and ever on-point!

In early 2012, an apologetic 88-year old Al took himself to task for (in his mind) no longer being as productive as yours truly:

Dear Leon,

I am nowhere nearly as prolific as you in writing articles on the perils of overpopulation. I finally got a new article out and I have reproduced it below. I hope that you will find this interesting.

This modesty was another of Al’s endearing traits that will stay with me till my own dying day.

“All things must pass,” sang ex-Beatle George Harrison way back in the seventies, even a brilliant, committed, long-lived physicist and educator whose legacy will long outlive him. Al’s appointment with eternity came earlier this year. Studying and understanding the fundamental forces of nature did not mean he could evade them, any more than any of us can.

In his matter-of-fact and outgoing way, Al shared his grim prognosis in an email distributed among his many friends:

July 16, 2013

On June 26 Jane, Lois, Scott, Nancy, and I started our annual two-week camping trip at the Rosy Lane Campground on the Taylor River near Gunnison. Scott and the girls set up the tents and we prepared for another wonderful camping vacation.

Our favorite recreation is walking around the paved campground drive. It's about a third of a mile. I would do it with a rollator walker and everyone else (including two little dogs) would walk.

About a week into the vacation I noticed one day that I was noticeably weaker than I had been the day before. Within a couple of days I could not do the loop. I bailed out early, came home and visited the Emergency Room of the hospital. They could find nothing wrong. We visited the oncologist and he outlined some frightening possibilities, including that my lymphoma might be returning. He ordered a group of diagnostic tests which are now underway. I had a PET scan yesterday and we are awaiting the results.

In the meantime, here at home under the loving care of Lois and Scott I am so weak that I can hardly shuffle from the bedroom to the bathroom and getting upstairs requires help.

That's where we are today.

Love, AL

July 19, 2013

Yesterday, July 18 we saw the oncologist. The news from the PET Scan is all bad! The lymphoma that we had treated in 2008 was back with a vengeance. It has spread through my abdomen and lymph nodes. There is nothing that can be done to treat it. So he gave me approximately 30 days, plus or minus.

We had a Hospice care person over today to make arrangements for Home Hospice care during the coming weeks. She remembered taking care of Eleanor in 2008.

So that's it.

My apologies for not personalizing this message so I am sending out this very impersonal greeting.

Love,

AL

With the help and permission of his daughters, I was able to talk by phone to Al one last time in his final

month of life. We said our goodbyes. In a fit of poor taste, or a lame attempt at levity, I ribbed him that the cancer cells now multiplying throughout his body exemplified the very phenomenon of exponential growth that he'd lectured about for nearly half a century. Good-natured Al just answered, "You know, you're right," where others might have taken umbrage at my impudence and insensitivity.

In his final days on this Earth, many were able to pay their respects to this great and humble man, in person, over the phone, and in written words. His loving daughters watched over him and managed the stream of visitors, friends, and admirers.

After his passing on September 7, eulogies and tributes galore appeared, most fittingly, and with many fine observations and memories. One of my favorite remarks was by Jan Lars Mueller in a post entitled "Albert A. Bartlett: Ode to a Gentle Giant" on the website of the Association for the Study of Peak Oil and Gas (ASPO)-USA, for which Al had served as an advisor. Mueller wrote:

For those that dare to concern themselves with the monumental issues that concerned Al, there is a risk of gloominess creeping into our outlook on life and humanity. Al is a beautiful reminder that need not be the case.

The note that Al wrote to us after he visited his doctor was filled with the peace and happiness of a man who had understood long ago what was important in life and had lived his own life accordingly. We should all be so blessed, and some of us were also blessed to know Al.

In honor to Al, inspired and informed by his life and his friendship, we re-commit ourselves to continuing and building on his legacy.

I could not have said it any better myself.

As part of that legacy, some 50 members of the University of Colorado community committed themselves to learning Al's lecture and giving it a certain number of times in the coming years.

I count myself among those who were blessed to know Al, and I will miss him greatly. He was my mentor and dear friend. He was one of a generation of giants who have now passed beyond, and in so doing have passed the torch to those of us who still care about the fate of humanity — and of our home the Earth. We will try to follow in their footsteps, but those are mighty big shoes to fill. ■