# Memories of Professor Charles Townes

"Charlie Townes had an enormous impact on physics and society in general. Our department and all of UC Berkeley benefited from his wisdom and vision for nearly half a century. His overwhelming dedication to science and personal commitment to remaining active in research was inspirational. Berkeley Physics has lost a true icon and our deepest sympathies go out to his wife Frances and the entire Townes family."

~Steve Boggs, Chair, Berkeley Physics

"The passing away of Professor Charles Townes today marks the end of an era. He was one of the most important experimental physicists of the last century, culminating in his winning the 1964 Novel Prize for the development of the maser and laser, and continuing until very recently here at the UC Berkeley Physics Department with his world leading research in experimental and molecular astrophysics. To those who knew him as colleagues or students, he was a role model, a wonderful mentor and a deeply admired person. He was a second father to me and I am proud to have had the privilege for more than three decades to have known and worked with him. His strength was his curiosity and his unshakeable optimism, based on his deep Christian spirituality. I would like to express my deep gratitude to him, and my condolences to his wife Frances, his four daughters and their families. He will be missed by the UC Physics community and beyond."

~Reinhard Genzel

"When I moved to Berkeley as a Full Professor in 1969, Charlie had settled in and started a large and active research group. He brought Reinhard Genzel to the department as a young post-doc, soon to become famous in his own right. He and his wife Frances invited us to some social event the day after we arrived. Some years later I became Director of the Space Sciences Laboratory and decided to expand its research in astrophysics. One of my first steps was to persuade Charlie to move his astrophysics research group into a recently added addition to SSL, where he built a movable optical telescope to measure the sizes of stars.

Jo Ann, Frances, Charlie and I have enjoyed a close friendship for nearly 20 years. In summers Charlie and I would spend a few days at our Camp in the Bohemian Club, interspersed with conversations during the hour and a half drive that ended in the redwoods with friends such as Bob Haas.

It has been an honor to know and admire Charlie, one of the greatest physicists of the century."

~Buford Price

"Charles Townes was the rarest of men, someone who revolutionized science and technology, but at the same time was kind and generous to others. At a time in life when many scientists are adding the final details to their accomplishments, he came to Berkeley, entered a new field--experimental astrophysics--and pushed it into new directions. I was very fortunate to have his support, both in the Physics Department and at the Space Sciences Lab. His wife, Frances, is an amazing person, and I express my deepest condolences to her on Charlie's passing."

~Christopher McKee

"Paul Goldsmith and I were members of the "Townes group" in the halcyon years [1969-1972 for me] during which infrared and microwave astronomy took off on the 5th floor of Birge Hall.  Upon hearing of Charlie's death, we wrote the following letter to the LA Times which published it on February 1. This is the way I will remember him."

~Michael Werner

 Charles Townes was a teacher first

**To the editor:** Thank you for your excellent [obituary](http://www.latimes.com/local/obituaries/la-me-charles-townes-20150128-story.html) of Charles Townes. As scientists who had the great fortune to work closely with Townes earlier in our careers, we benefited greatly from his tutelage and his

Townes was a teacher above all else. He kept track of a dozen or so research projects that were being spearheaded at any given time by students in his laboratory at UC Berkeley, and he frequently greeted one of us in the morning with a suggestion about a new angle or the interpretation of a puzzling result.

His roster of students includes one other Nobel Prize winner, numerous members of academies of science and many scientists who have gone on to leadership positions in academic, industrial and government institutions. He was never too busy to talk with us, and he provides a dramatic counterexample to the cliche of the inaccessible professor.

Townes' legacy includes the many students he mentored, and it will be perpetuated as we pass on what we learned from him to future generations.

Michael Werner, Pasadena

Paul Goldsmith, PasadenaWerner is project scientist for NASA's Spitzer Space Telescope; Goldsmith is chief technologist for astronomy, physics and space technology at the Jet Propulsion Laboratory.

"Charlie Townes was my colleague “down the hall” on the 5th floor of Birge Hall for almost 50 years. I would listen to him sing or whistle as he passed my office, and on those days when we talked, he was almost always upbeat and smiling. Until recent years, he walked the 5 flights of stairs with vigor while I rode the elevator. When I made the comparison about my being 20 years his junior, he again would just smile. I helped Charlie Kittel a bit when he recruited Charlie Townes to Berkeley in 1967, and Townes took us both to dinner at the Bohemian Club soon after he arrived. This was my first extended meeting with him. During dinner, he told us about his experiences related to advising U.S. Presidents and the Federal Government. The stories about how he participated in discussions about how to deal with terrorist’s demands after they planted a nuclear bomb in a U.S. city and the ease of making a nuclear device were chilling. I was comforted by the fact that our government consulted Charlie who I always regarded as amazingly level headed and brilliant. I should add that driving with Charlie at the wheel that evening was as frightening as his stories about nuclear weapons.

In 2005, we had a wonderful 90th birthday party for Charlie in Berkeley. I believe there were 19 Nobel Laureates there. We edited a book in his honor, and the range of subjects and level of the contributions were excellent.

Let me close with another time when Charlie “scared” me. I was on the committee for the “2008 International Conference on the Physics of Semiconductors” in Rio. I had offered to organize a Nobel session after my Brazilian colleagues said they don’t get many visits by Nobel Laureates. I invited Charlie and Frances, and they immediately said yes. I felt responsible for them, but never anticipated how independent they both were. When Charlie was paid his airfare in cash, he put the cash in his jacket pocket and refused my offers to put the money in a safe or keep it for him even after I repeatedly told him that Rio wasn’t safe. I watch that jacket every day he wore it and when he left it on a chair while he and Frances danced at the banquet. Despite my fears, nothing happened. Charlie said, “I told you not to worry.” The same was true on that trip when I tried to talk both of them into taking a nice city tour instead of a jeep excursion into the jungle. They refused. My wife Suzy and I went along to “watch over them”. We sat while Charlie stood during the bumpy jeep ride with a book in his hand as he bounced up and down while he identified the local birds.

Needless to say I will miss this wonderful man. Ironically, just as I finished having a laser procedure done on my eyes on January 27, I picked up my phone and got the email that Charlie had died. I began thinking about how much he has enriched my life and how far reaching his influence has been. My wife Suzy and I send condolences and offers of support to Frances and the rest of the Townes family."

~Marvin L. Cohen

"I was fortunate to join the Townes Group in early 1969 in Berkeley.  I had little to recommend myself, apart from being a graduate student in physics: virtually no experience in research or in the laboratory up to then. Like quite a few of us in his group, I had not taken any astronomy classes.  What skills or experience could I bring to the group? It didn't matter. Dr. Townes, as we always called him, made me feel welcome and within a few months asked me to join graduate student Jim Holtz and post-doc Dave Rank, who were attempting with him to open a new observing mode for astronomy: high-resolution mid-infrared spectroscopy.

Back then I had little idea of the bright future of infrared astronomical spectroscopy, which Dr. Townes saw so clearly. But even without that perception there was for me the excitement of learning this way of observing the universe, understanding how to make our spectrograph work and how to determine its performance, observing on what was then the second largest optical telescope in the world, and learning a bit of astronomy as we proceeded.  There also was the more sobering experience of obtaining an understanding of the signal-to-noise ratio, which was enhanced by the countless discussions we had with Dr. Townes about the significance, or lack thereof, of little “wiggles” in the spectra that we were obtaining.

Dr. Townes didn’t exert his authority over us or pressure us; he treated us as equals. When in Berkeley he was always available for meetings. In my subsequent relationships with scientists and non-scientists, and especially with students, I have always tried to emulate his approach.  And he was always open to suggestions, even radical ones.  A key moment in our project came when, after several unsuccessful attempts in 1969 to detect emission lines in planetary nebulae, Jim and Dave concluded that an infrared Fabry-Perot spectrometer, which we would have to build ourselves over a period of many months, would be superior to the Fourier transform spectrograph which Dr. Townes had, probably with considerable trouble, obtained on loan from a colleague in Colorado and which we had been using until then at the telescope.  Although it would have been easy for him to say “no,” after careful consideration he approved of this change of course, which turned out to be the right decision.

That change led to Jim’s successful PhD thesis, my thesis, and those of several grad students who followed us. The scientific results we obtained can each be achieved now in seconds or less, but at that time often took one or more all-night  marathons, in which Dr. Townes frequently joined us at the telescope on Mt. Hamilton. I recollect several occasions of dawn arriving and we bleary-eyed grad students feeling more than ready to shut down both our equipment and ourselves, when Dr. Townes would brightly “suggest” that we observe ammonia (his favorite molecule) in Jupiter. Of course a suggestion from him was not to be refused by any of us, and so we observed ammonia in Jupiter, often until 10 a.m. I did not and still do not understand how he managed to sleep so little and remain so alert.

Carole and I have treasured our warm friendship with Charlie and Frances, which continued and grew in the decades after I left Berkeley.  I am deeply grateful for the opportunity Dr. Townes gave me, for his constant generosity, for the environment he created for all of our group, and for his support and encouragement after I left Berkeley."

~Tom Geballe

"I had the privilege of working with Charlie on optical SETI, a field that he pioneered. Charlie was wonderful to work with: kind, generous, always enthusiastic, and full of interesting ideas. If Earthlings ever answer the question "Are We Alone?",  we'll have Charlie to thank.

An amazing 99 years."

~Dan Wertheimer

"I had the pleasure of a dinner with Charlie with a new Townes Fellows. His stories turned to the taxing chore of a seemingly endless number of panels upon which he served. One, however, the JASON's, included esteemed scientists that advised the U.S. government on all manner of national-level technology.  This panel was asked "Is it possible to send humans to the Moon?”. He succeed to advocate the positive case among his group and so the Apollo Program was undertaken. Charlie said this single accomplishment was one of which he was most proud."

~Jerry Edelstein

"I had the great privilege of doing my graduate work with Prof. Townes. It was the late '70s when long-wavelength astronomy was just becoming established and the Townes group was at the front in opening up new fields. The feeling of excitement and discovery of those days is unforgettable,  it was the scientific enterprise at its best. Prof. Townes was more than a scientific genius, he was an extraordinary person: calm and cheerful in every situation, always patient with the students, decent and fair to everyone. I think we are all better people for having known him."

~Sara Beck

"The Berkeley physics community has my heartfelt condolences for the loss of Charles Townes, a superb physicist, a warm human being, and a truly great professor - something that we all aspire to be, often with only partial success.  I was not a close colleague of Prof. Townes, but I interacted with him at numerous public events, and found him to be, simply put, a great guy. He understood very deeply that science was art, and he committed his life to helping people younger than himself find their voice and also to find the courage and means to make discovery happen.

I have one story to relate about Prof. Townes that I hope people at Berkeley will find particularly poignant.  I was a beginning undergraduate taking a big lecture quantum mechanics course, I think from Buford Price, although I would not swear by that.  The year must have been 1969. I was a kid from the Central Valley so provincial that I thought of San Francisco as the Big City. Prof. Townes, who was already a physics superstar by then, made a surprise guest appearance and proceeded to explain how a laser works so simply and so clearly that I was utterly dumbstruck.  How could somebody so famous, so brilliant and so busy make something so sophisticated this transparent and take the time to do it just for me?  I know.  This must be what a PHYSICIST is! I cannot remember whether this is the exact moment I switched out of engineering into physics, but it's burned into my brain as one of the reasons I was sure it was the right thing to do."

~Bob Laughlin

"One of our live's great privileges and blessings has been to have been acquainted with Charles and his family. We have learned and benefitted so much and all in a pleasant and enjoyable manner."

~God Bless, Thanks, Ron and Pat Shelton, SC

"I was the Townes' German au-pair from August 1959 to August '60, starting in New York. It was my first time in America and I spoke some English. Every morning, the family challenged me with a new word for my vocabulary. In the evening around the dinner table, I was expected to be able to spell the word and use it in a sentence. To compensate for my efforts, kindly Dr. Townes invited me to make conversation in German with him while eating breakfast, which I prepared.

Dr. Townes raised orchids in a lean-to greenhouse attached to his house. The goal that fall was to present his wife, his four daughters and me with an orchid corsage for Christmas Eve. I felt quite honored by this gift! In February 1960, the family moved to Washington, DC, where Dr. Townes served on the Science Advisory Committee under President Eisenhower. At one point during the move, I sat in the back of the station wagon to protect the already blooming orchids from falling over and getting damaged.

Very soon after settling in, my host took me to the Washington Monument. We rode up, but came down on foot. How many steps are there? Dr. T. was busy digging a fall-out shelter. Suddenly, Mrs. Townes burst out of the house shouting: "Charlie, Charlie, you have to catch a plane! You have to hurry! Here is your briefcase!" Charlie flew off, rumpled brown suit, dirty shoes and all. My hosts always insisted that I go to church with them.

This year with the Townes family was interesting, wonderful and truly life-changing."

~Gundel Bowen, Annapolis, MD

"When I graduated from Cal in 1977, Nobel laureate for Physics in 1964, Dr. Charles H. Townes spoke. He arrived on campus in 1967, and I took my first Physics course in Fall Quarter of 1969. He was still in his office in Birge Hall last year, for his 99th birthday party.

In an interview, Charlie Townes told us that his older brother went on to study Biology yet he found that to be, then, only a descriptive science and didn’t explain things. During his sophomore year at Furman University, he took his first course in Physics. He said he was drawn into this science, as Physics helps us understand things and how things worked. This was my discipline-discovery experience, too.

We were almost late for my graduation ceremony because I was thoughtless enough to move that week instead of celebrate with family and the friends I would be apart from the rest of my life. We hastened to LeConte Hall. The only seats left were added chairs in front of the lecture hall seats. My brother, Tom Klitgaard ’77 in Math and Economics, was looking for seats in the very back and I signaled to him to head to the seats I could see, in the very front.

I remember Professor Townes handing us our diplomas as he shook our hands, in congratulations. I still see the moment when my name was called and I needed only to rise and step a few feet forward. A gift to me to not be seen by the public or watched as I approached. It was just him and me in a moment I had worked for since my first physics experiments were sent to my home, in the fourth grade.

In around 1991, the California Monthly magazine had an article about Charlie Townes, on how he felt it was time to reunite science with knowledge of God. “Let there be Light,” I thought! The only Department Reunion ever held was in the Faculty Club in 2003. I introduced myself to him and reminded him of graduation ceremonies in 1977. I still see his smiling face, as life’s second evening together began.

When I listened to and read this, “In 1951, Townes was seated on a park bench in Washington, D. C. [waiting for a restaurant to open for breakfast], when he thought up the solution to the problem of how to create a beam of pure short-wavelength, high-frequency light,” I instantly though of Walt Disney. Walt sat on a park bench in LA’s Griffith Park in the early 1950s, watching his two daughters re-riding the merry-go-‘round, when he had the idea to make a park where parents and children could play together. Walt Disney’s bench is on display just as you come in to Disneyland. There is a bronze statue of Charlie Townes and his bench, in D. C.

Thanks be unto you and let Lux Aeterna shine upon thee, Charles Hard Townes. Amen."

~Kitty Klitgaard [Falconer] McCall '77

"I first met Professor Townes at a marina on St.Thomas USVI...where I had come to work after sinking the boat I was on in a hurricane. After some small talk, he was a bit amazed that a marina hand was well versed in laser physics and holography, which I practiced as an artist in NYC. Many fish dinners were shared on his Morgan(45?) and was blessed to listen to him recall his journey through his discoveries.

When in Berkeley, if he had some free time, we visited at a local cafe from time to time.

You are missed Charles...Rest in Peace...and thank you for your many gifts."

~Best, Bruce Polak

"My first meeting with Charles Townes was a textbook display of his generosity and support. I was curious how one professor had such a prominent role in inventing the laser, so I called him and he graciously granted me an office hours. I got ready and walked into his corner office in Birge Hall where we discussed a variety of things from the laser’s widespread use to his thoughts on religion. I was struck by his humility and willingness to speak with an undergraduate, especially when I did not have enough well-formed thoughts. However I knew the importance of the laser in our society and was deeply curious how one man did it.

A few weeks later I spotted Dr. Townes at the conclusion of the Oppenheimer lecture and asked him more questions. What are correct uses of laser analogies? What was the process of discovery? He replied with a request for a ride home—I learned his regular driver was missing and happily obliged. Before we could go, however, I had to answer questions from his colleague Ed Wishnow. Who am I? Will I drive Dr. Townes home safely? I understood Ed’s concerns and assured him I will get Dr. Townes home safely. When I learned Dr. Townes needed this help regularly, I volunteered to spend more time with him and out of a feeling of public duty—a man that has given the world so much ought to be helped by young ones.  As weeks turned into months, I learned the breadth of Dr. Townes’ accomplishments: inventor of the maser/laser, champion of the Apollo program, key government advisor, discovered polyatomic molecules in space, the black hole at the center of the Milky Way Galaxy, revolutionized interferometry and the Search for Extraterrestrial Intelligence (SETI). I was also struck by Dr. Townes’ humility, closeness to God and desire to help all life on Earth. He had an amazing way of combining science and religion to understand the special nature of life and humanity in the universe, and our role as thoughtful humans. This balanced and optimistic worldview can greatly affect the world.

Early on in this process I had been producing documentary interviews with climate experts and was familiar with film. I realized the importance of making the public aware of Dr. Townes’ work so I turned my focus to a feature-length documentary on him and his wife Frances. I gathered money and crew and began filming interviews with them. Over the years I have collected intimate and high-quality footage with the Townes in a variety of settings—their apartment, church, bird watching at the lake, and his UC Berkeley offices. With this enormous access comes responsibilities and I hope Unturned Stones is a fun film that promotes Dr. Townes’ legacy. It is titled Unturned Stones to represent his belief that the path of discovery is filled with stones waiting to be turned over. Unturned Stones will trace his path from a young boy in South Carolina wanting to understand the universe to his 73-year marriage, scientific career and why he thinks science and religion are converging to provide a fuller understanding of the nature and purpose of our universe.

At the peak of driving Dr. Townes to and from home and campus I was spending an average of an hour per day with him. I will always be grateful for this opportunity to learn science, religion, politics and personal behavior from one of the world’s finest minds, and I am also thankful to UC Berkeley for making such an education possible. In my opinion Dr. Townes is the type of figure that comes around once every few hundred years and his wide range of accomplishments and impeccable personal behavior are a model for others. He came into this world and made an enormous impact and it is great to see his memory cherished by so many. As for his film Unturned Stones, if funding lines up I will have it out this year."

~Taran Singh

"I am finishing my graduate program at UC Davis at Engineering Applied Science Department. For my dissertation work, I designed and built a Spatial Heterodyne Spectrometer (Khayyam) at Lick Observatory. In the process I spent 3.5 years (2010-2014) working and spending most of my time at Lick. My instrument, Khayyam, is located at the basement of the 3m Shane telescope called “the Laser Pool”. The very same location that Charles used to design and build his instruments with his group for decades… and here I was in the same location building my instruments after 30 years!

Here is how my story goes. In the middle of the cold winter of December 2010, I moved in my instrument from the UC Davis lab to the new location at the basement of the 3m Shane telescope inside the Laser Pool. We decided to use the mysterious milling table in the Laser Pool as an optical table and put the instrument on it. Parallel to building the instrument and the coupling optics to the 0.6 telescope, I slowly started to clean up the place, the tiles, the spider webs, the old black felts there. It was also a long time that no one had disturbed the tiny residences of the basement and I had to make it clear that they are not alone anymore!

I clearly remember the day that I heard Dr. Townes’ name. I was working on the alignment of the optical elements when Dr. Steve Vogt from UC Santa Cruz called me. With curiosity, he looked inside the basement. “So someone is using this place?” he said. He followed “the last time I saw someone using this place was about 30 years ago by Charlie Townes. I used to come here and see him working with his group.” And there it was. I asked more questions and learned Dr. Townes instruments were IR heterodyne Interferometers and he used that location for many years to develop his ideas and his instruments. He also put the milling table there and the entrance holes for the telescope light beams on the roof! At that point I was working (more like living) at the Pool for few weeks and I was using all of them without knowing the rich history of the place…

Based on the Observatory's logbooks, Dr. Townes last observed with his heterodyne spectrometer from May-Oct 1981. After that time, the location was used storage until I started using it at December 2010. All my time at Lick was spent with Dr. Townes. In every successful moment, happiness, frustrations, hopeful moments and hopeless tears I would remember Charles and tell myself “What would have Charles done if he was here?” … I must have asked that question from myself more than million times… I remember the night that I got the courage to send him a short email basically saying I’m working in your old lab! He replied to me the next day and we met for first time in person a week later in his lab with him, Frances, and Walt Fitelson. I told him “this is the first time we meet but not the first time I speak to you”. We maintained the friendship and I kept them updated about my work. He was in great favor of me working on instrumentation and doing everything with my hands and not only in computers. We had many discussions and I saw how his health changed in last year. Dr. Townes had an unforgettable and great role in my PhD process. We shared many similar memories from the same small location at Lick 3 decades apart! Last time I saw him was when I took the final version of my dissertation draft for him in end of November 2014. He kindly looked through it, gave me few comments and signed my cover page as a gift. It is my best graduation gift.

Unfortunately the news of Charles passing away was exactly the day that I was intended to write back to him to set a time to meet again. I am in the UNESCO International Year of Light 2015 Steering Committee, in Optics under 40 and Entrepreneurship sub-committee. I came back from the IYL2015 opening ceremony at UNESCO HQ, in Paris on January 25, 2015. I brought a gift for him and was so excited to tell him about the event. We were all excited about his 100th birthday and were planning for special events for it…  It’s truly with heavy heart feeling that I’m writing this story. Dr. Seuss has a quote that truly captures my feeling now and it goes as “don't be sad that it's over be happy that it happened”."

~Sona Hosseini

"I got to know Charlie well in 1998, when he generously invited me to Mt. Wilson to see and briefly work with him on his Infrared Spatial Interferometer that he used to measure the diameters of red giant stars thousands of light years from Earth.  Charlie was kind, thoughtful, intelligent, & wise beyond measure.  He had a way of looking at things that sought out the positive and practical, yet he did not hesitate to look to theory where it mattered.  He was a stable reservoir of genuine good.  A mighty oak has fallen."

~Bill Green

"Dr. Charles Townes gracefully accepted to be a committee member for my doctoral qualification exam, at UC Berkeley, in 2011. He provided for me the inspiration of a life lived to the fullest extent. After an aviation career, as I venture, at a later age, in the realm of teaching and research, a career step normally started in the early 30s, Dr. Townes's example, offers me the necessary strength and hope to proceed forward in what is for the most part, uncharted territory. Thank you, Professor Townes, for affecting and guiding so many lives by your life-example. Thank you, Frances, for the kind exchange (some of it in French), you, Marianne and myself shared on the occasion of your husband’s 99th birthday and also at a later physics department event."

~Eric Corsini

"The Passing of an Icon or, “Call me Charlie”.

In a way it was a fitting time for the death of Dr. Charles Townes the Nobel laureate who led the team that brought the Laser to life.

The announcement came two weeks before one of the largest trade shows in the world devoted to optics, electronics and lasers, namely, Photonics West. It was held at the San Francisco Convention Center, where Tom Lippens and I were manning the Epner Technology booth along with 1250 other exhibitors and some 27,000 visitors during the week of February 9th. Here is my point: I would venture that as many as 75% of  those 1250 exhibiting companies owed their very existence to the work of Dr. Charles Townes and his associates.

I first met Dr. Townes some thirty years ago at another Epner exhibit stand at CLEO, the big Laser meeting then held in Baltimore. I was discussing some arcane aspect of our Laser Gold coating and its application for NdYAG laser pump chambers to a young laser engineer named Gary Vaillancourt. Standing off to the side was a tall, elderly gentleman patiently waiting for me to finish my conversation with Gary

Not wanting to lose either potential customer, I signaled to the older man that I was aware that he was waiting.

Gary turned to see the target of my distraction, and then, spotting the gentleman’s name tag, created the most amazing moment I have ever experienced at a trade show. Dropping onto one knee in a genuflection of  honest awe, he reached up and started vigorously shaking Dr. Townes’ hand and exclaiming at the same time, “My God, Dr .Charles Townes….I cannot believe that I am meeting you at last” It was a scene out of a movie! Townes could not have been more gracious and gave his young acolyte a moment of attention that I’m sure Gary remembers to this day even more vividly that I do.

Our paths crossed again some years later at an SPIE Astronomy conference in Hawaii.He came to my table-top exhibit to discuss our gold for some mirrors for his lab at Berkley.  I of course greeted him as “Dr. Townes” and he smiled as we shook hands and said, “Call me Charlie.”

~David Epner

"My sincere condolences on the passing away of Prof. Charles Townes. He belongs to this category of scientists whose achievements and scientific work have contributed strongly to the progress of the Humankind. I am convinced that he was very happy to see that his invention, the laser, has had so many good uses. His passion for knowledge and exploration will be an inspiration to many."

~Miguel AF Sanjuan