

George Gamota's Biographical Sketch

I grew up in St. Paul, went to Cretin High School and attended the University of Minnesota with a goal of becoming an electrical engineer. However, soon after I started taking second year honor classes in physics and math, I changed my major to physics to a large degree because I was inspired by the developments in solid state physics and its potential impact on the future of electronics – vacuum tubes were out and transistors were in. To my amazement, EE was still all about vacuum tubes and no one was teaching or even knew much about solid state electronics. Sputnik and the race for the moon added to the technology euphoria, of the time. I had to choose between solid state physics (semiconductors) and space physics – it was not easy. In the end I chose solid state physics, in part because I found a professor who inspired me, a young assistant professor who offered me a part-time job in his laboratory. His name was Michael Sanders. He became my mentor and a life long friend. I also was inspired by Edwin Nye. He was a bit unconventional professor, but his teaching was excellent. I remember the time when he returned from Africa in the late 1950's on a mission to observe a total solar eclipse. He had many fascinating stories that he shared with us and several of my classmates went into astrophysics because of him.

I started working in a physics lab rather early and by my senior year I was working on a project that eventually led to my Masters thesis. I received my Bachelor's degree in 1961,

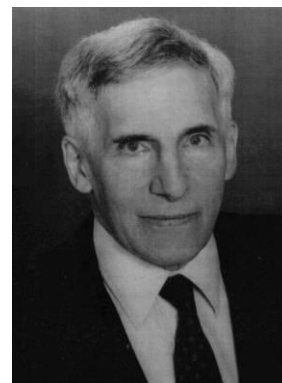


Figure 1 Michael Sanders



**Figure 2 Christina & George
Wedding Day August 5th 1961**

1961 was a big year for me in my love life. In addition to graduating, I married my Latin sweetheart – Christina. Christina (Dawydowycz) arrived from Argentina in 1959, and after a year of engagement we were married in August 1961. Christina was also born in Ukraine and we shared a common heritage.

Being poor and students, our honeymoon was modest and we started off by driving to the Black Hills, South Dakota with a credit card my father offered me to buy gas. However, despite it being summer and our best laid plans, we found the forests in Black Hills to be cold, rainy and rather miserable once we arrived., so we decided to drive further west, and west we continued until we reached the West Coast and sunny California.

Our first apartment was in Minneapolis, close to the university. As I remember, my days were full. In addition to taking a full load of courses, I also worked in the physics lab helping Dick Pontinen, who was the first of Mike Sanders' PhD. students. I am not sure how much help I was to Dick but I learned much about Si and semiconductors and most importantly how to work in a lab. Christina took a job to help pay our bills as an associate at Dayton's art department, and thus she started us to a life long appreciation and collection of art.

My MS thesis was to design and build a He³ cryostat to be able to study the behavior of materials at very low temperatures. The cryostat was build to potentially use it to study nuclear materials that might become useful for targets. I did the work together with Chester Hwang who was a post doc in the nuclear group but worked with Mike to learn low temperature techniques. Besides Dick, other students at Mike's lab were Arnie Dahm, Jim Levine, Dick's brother Ken and Jan Northby who joined us later. While in graduate school, I met new friends a number of whom

later on had an impact on my career: Vitalij Garber, Martin Fricke, Carlos Avery, and Rick Bernal. I also remember taking graduate thermodynamics courses together with Wolodymyr Minkowycz who was a PhD student in mechanical engineering. Minkowycz and I shared common heritage and spend time together at Ukrainian functions. My two years at Minnesota went fast and in 1963 after I received my MS. I was ready for the next set of challenges and changes in life. The most significant challenge ahead for both Christina and me was our imminent parenthood. Christina was expecting and was to give birth to our first son sometime in spring of 1964.



Figure 3 Christina & George moving to Ann Arbor

The second change in our life was to move to Ann Arbor Michigan, We were leaving Minnesota - our family, friends, and our home for Ann Arbor and the University of Michigan. We were part of a caravan leaving Minnesota since Mike Sanders accepted a position at the University of Michigan and offered me to join him. Jan Northby came as well although he continued to be officially a student at the University of Minnesota. Jim Levine and Dick Pontinen had completed their PhD requirements. Arnie was too far in his research to move and decided to stay at Minnesota although Mike still helped supervise his research.

It was the first of many moves in our lives. We might still be moving were it not for Christina to have said enough is enough and in 1986 we settled for good in Lexington Massachusetts. We moved to Ann Arbor towing our belongings and extra baggage in a U-Haul trailer. The trailer was full because not only did we tow our goods, but we carried some scientific equipment that Mike asked us to take with us. To make the journey as short as possible and avoid going through Chicago, we crossed Lake Michigan by a ferry.

Unlike Minnesota where we lived outside the university community, in Ann Arbor we were totally immersed in the city and lived within the confines of the university. Ann Arbor was a great college town that was, at that time and still is to this day, dominated by the university. On football Saturdays the town swelled by an extra 50,000 fans on top of 100,000 population.

My four years at the University went quickly. In March of 1963, I became a father; Christina gave birth to our oldest son, George Jr. The first year at Michigan, I took courses and worked as a research assistant together with Jan Northby in clearing space in the subbasement of Randal Laboratory which eventually became the Michigan Low Temperature Laboratory. On the other side of the subbasement there were already established labs under supervision of Gabby Weinrich, a new assistant professor Jens Zorn and Peter Franken who was sort of a godfather of the whole subbasement. Peter was a key person since he was able to obtain large block grants for the entire group. We became part of a fellowship known as the Resonance Group, and I believe Mike's subgroup

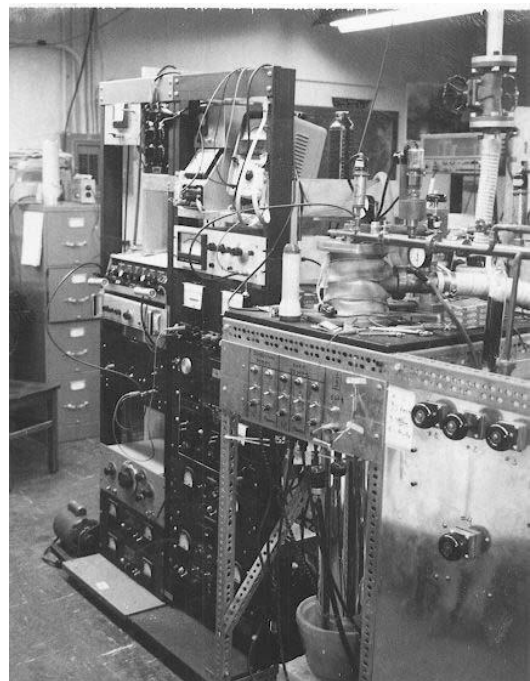


Figure 4 George's He3 Cryostat

became the largest at one time. The Resonance Group lost its leader when Peter took a job at DARPA, and then moved to Arizona to start an optical physics group. I started in earnest working on my PhD thesis problem, and on October 1965, our second son, Daniel was born.

In 1966, I finished my thesis, completed the written and oral exams and received my PhD. My thesis involved measuring directly the size of charged vortex rings in superfluid helium. Mike's group grew during those 4 years and we occupied 3 laboratories. The atmosphere during this time was really great. Besides Jan Northby, there was Richard Packard, Christie Zipfel, George Wu, Steve Whitmore, Stu Ryan, Burt Brody and several others. Arnie came from Minnesota to visit us several times and we all took turns in becoming part of a pit crew when Mike decided to buy a sports car and start racing.

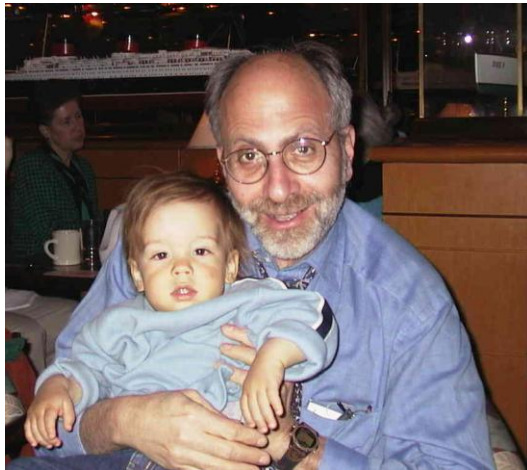


Figure 5 Burt Brody with grandson Alex Jr.

As I was getting my diploma, I was excited that Christina was also recognized for her support and patience, She received a PhT (pushing hubby through) degree; and it was well deserved since she did all the heavy lifting for our now family of four while I played with my "vortex rings".

I continued another year at the University of Michigan as a post doc, teaching as a lecturer and working with new graduate students. We were also getting ready for the arrival of our third son, and no small feat looking for a job. My first student that I supervised was Burt Brody, who turned out to be a real friend not only to me but also to my family as we struggled with health issues. Even today he is like an uncle to our boys, and now to the grandchildren.

Jobs for recently minted PhD's in physics were not plentiful during the mid 60's, but I was very fortunate to have had several options. We (the decision was not only mine but Christina had to approve) considered an offer from the University of Illinois, Urbana, staying at the University of Michigan, where I had an offer from its Flint campus, where I taught for a year. However, when I was offered a position at Bell Laboratories at Murray Hill, NJ, it became an easy decision. It was a once in a lifetime opportunity for a young physicist and I grabbed it.

During the summer of 1967 we moved to Summit NJ to start a new life on the East Coast starting with Bell Labs. Our third son, Alex was born in Summit on October 1967.

Our life in Summit had a challenging beginning. The work environment was outstanding but family health issues were troubling. Fortunately with excellent health resources we did all right.



Figure 6 From left: George Jr., Alex and Dan

Working at Bell Labs during the late 60's and early 70's was very exciting to me as a young scientist. Not only was I mingling with the pioneers in solid state physics but also Nobel laureates from all over the world. Several of my colleagues later received Nobel prizes in their own right. Others took on senior positions in industry, government and academia: presidents, chancellors or deans of University of California, Berkeley, Harvard, and Hong Kong University of Technology and University of Toronto to name a few.

Bell Labs was probably the most exciting scientific environment that existed in the 20th

century. Unfortunately for us as a nation, this cradle of scientific greatness started to crumble in late 70's and was destroyed in 1984 by a federal judge who broke up the Bell System. Lacking the resources provided by AT&T, Bell Labs continued to retract with the last insult being that its bones were sold to a French company, Alcatel, and it continues to flounder.

My research at Bell Labs eventually expanded to include superconductivity, although my most successful work continued to be in ions and vortices in superfluid helium. As I recall, I was given a starting budget of \$100,000, a laboratory, and an assistant and all I had to do is perform basic research in area of my own choosing and of course publish the work, and publish I did.

There was no written agreement for obtaining tenure but generally you were given two years to show success. Many that started with me did not quite make it but their experience at Bell provided them opportunities at universities or laboratories (government or industry). A few decided to move to applied areas and successfully migrated to Western Electric, an arm of the Bell System.



Figure 7 From left: president of Bell Labs, Ed McKay ; Governor Brendan Byrne; executive director Bruce Hannay; George; and foreground vice president Bill Baker.

Jersey. A new governor requested Bell Labs management to help him assess the capital needs of New Jersey, and I was given the responsibility of assessing natural resources of the state. I became part of the Governor's Task Force to write a comprehensive report for action. The report was then given to the governor who asked the legislature to provide funding and he implemented it. He was a popular governor who served 8 years in office.

Upon successfully completing my assignment, I returned to my research, but my appetite was growing to serve in positions that I could influence science at the state or national level. As I had done before, I discussed my interest with Bill Baker who became a mentor to me.

The next opportunity came when in 1974 President Nixon resigned and President Ford took office. The Viet Nam war was over but the after effects of the war were all still evident in the science community, especially

As I continued my research, around 3-4 years later, I became interested in science policy and science in politics. As an extracurricular activity I formed a scientific advisory committee to our local congressman, Matt Rinaldo. We looked at a number of problems he was interested in; an especially important one to his district was an effort to bring LNG up the Passaic River. The proposal was to allow very large tankers moving through heavily populated areas. Our report was used to block the proposal due to a potentially disastrous accident in heavily populated narrow passages.

At the recommendation of Vice President for Research, Bill Baker, in 1974 I took a sabbatical to work on an assignment at the state level of New



Figure 8 While at Bell Labs I took up a new hobby: skiing in Utah, something I gave up when in Washington

affected were those who were supported by the Department of Defense. Once considered as heroes for helping win World War II, many of these same scientists were now blacklisted on campuses. Contributing to this was the congressionally passed Mansfield Amendment which required that all research supported by the DoD be related to weapons development and acknowledged so in writing by the recipients of the funding. After much soul searching and with help and support of Bill Baker who was then the unofficial President's Science Advisor, I took a position at the Pentagon to try to remedy the problem. Thus ended my bench research career and a new chapter unfolded: science policy.

The experience of moving from a mostly academic environment at Bell Labs to the Pentagon was quite a jolt. First of all, was the realization that everybody working there held the rank of colonel or above. In fact colonels were a dime a dozen and most acted in secretarial positions. Being a civilian, I was given an equivalent of 2 ½ star General's rank. At 38, it felt good to think that I could tell a one or two star general what to do. My first experience at the Pentagon on the second day I arrived, I was given instructions to attend a meeting on lasers. I followed the order and showed up in the designated very crowded conference room. As I came in, people who were seated stood up, and I soon realized that I was to lead the discussion, and a seat was reserved for me at the head of the table. This turned out to be a typical experience while at the Defense Department. I got called many times to sit in or lead a discussion on topics I had little time to prepare. My physics training helped a lot. I also quickly understood that most activities were tied to a cyclical pattern – fiscal budget, and you either testified before Congress on ongoing programs, programs that you wanted funded, and plans for the future or you had to protect research funding from various offices who tried to trim your budget. Finally I found out that if you really wanted to change something, you had to work very hard, and do it on your time since 8-5 most days was taken with attending meetings, conferences, and appointments.

After 18 months, I was very frustrated and ready to go back to Bell Labs. My mission was to change the attitude of the Pentagon toward basic research and delete or modify the Mansfield Amendment. Unfortunately, all my attempts failed mainly because Secretary of Defense Donald Rumsfeld had too much on his plate to worry about basic research.

As I was planning my next career move back to Bell Labs, national politics brought in a new president and a new secretary of defense: President Jimmy Carter and Secretary of Defense Harold Brown. Suddenly in came Brown a former Cal Tech president and I found an ally so I decided to terminate my position at Bell labs and stayed in for another 4 years in government.



Figure 9 George receiving the Department of Defense Meritorious Service Award for his service as Director for Research. Award given by Acting Undersecretary of Defense George Millman. June 1981

Working with full support of Secretary Brown, Undersecretary Bill Perry, and Deputy Undersecretary Ruth Davis, I was able to literally change course on an aircraft carrier and allow the use of basic research to enter the vocabulary in the Pentagon. With support of Congress the Mansfield Amendment was modified and again academics could apply for research funding without worrying about being blacklisted by campus antiwar champions. To help me push through the changes, a new office for research was created and I became its first director. Having the clout of a new office and full support of senior managers in the Pentagon as well as the Office of White House Science Advisor, Frank Press, I was able to reverse the decline of research in the DoD,

and most significantly initiate new programs, such as: Ultra Small Electronics (it later morphed into Nanoelectronics), new laser designs such as the Free Electron laser, simplifying grant proposals and initiating block programs to universities. I remembered how productive it was back at the

University of Michigan with block grant programs managed by Peter Franken and I wanted to replicate it again. In fact Peter was at my doorstep with a proposal to create an Optics center in Arizona.

I started the block programs but left the full implementation to my successor. After 4 years, change again came to Washington and a new Administration. With the writing on the wall as all senior government managers felt, I left as Ronald Reagan took office.

Family life was a bit of a struggle during this period. We lived in Reston, Virginia, which was on good traffic days, an hour away from the Pentagon. I often left at 6am and came home after 7pm. My boys started out in public schools but had to switch to a private school for grades 7 and 8. My youngest son stayed in the public system because he qualified for a new special gifted program, a program that did not exist for the older boys. To help send the boys to schools, Christina started volunteering at a private school where they attended, and subsequently received a job offer to teach kindergarten, something she always wanted to do. Life in Washington was very exciting, especially for the boys. We all celebrated the bicentennial sitting on the Mall across from the Lincoln Memorial. We often went to Washington on weekends, visiting museums and the beautiful parks.

In 1980, with a new election cycle, change in party of power, and pressing need to worry about paying for college for my three sons after a few months with the Reagan administration, I decided to go back to Ann Arbor. I accepted the position of Director of the Institute of Science & Technology (IST), and a full professor of physics. Life in Ann Arbor had a difficult start, health issues again became domineering, on top of difficult budget crunch at the university, and an unnecessary very public contraction.

Academia proved to not be as fast paced or exciting as Washington. Having been in Washington and being a shaker and mover, it was harder to leave mentally, if not physically. Fortunately, I ran into many old buddies from graduate school, both from Minnesota and Michigan. The most important connection was with Marty Fricke, who was a VP at Science Applications, a new upstart high technology company. He hired me as a consultant, and working together we won a major contract to start what eventually became a major US Government program in benchmarking foreign science & technology. I also ran into another one of my graduate student buddies from Minnesota, Carlos Avery. Our effort started with benchmarking areas of science and technology, important to the Soviet Union, and then later Japan as it challenged the US in technology. Those programs expanded greatly over the years, and although I am no longer involved, many are still operating. One additional perk that came along with the consulting, Marty's office was in La Jolla California, and conveniently he invited me to "consult" for longer periods of time during the winter months. I remember how happy the whole family was to pack and leave in December the gray cold skies in Michigan to come to sunny California and enjoy the La Jolla beaches.

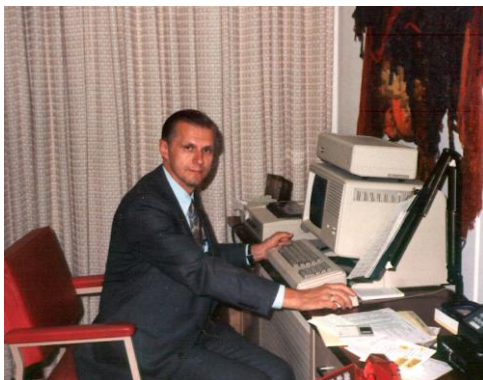


Figure 10 George at IST with Apple Lisa computer

After working at Bell Labs, and then Washington, Ann Arbor was not as stimulating as I had hoped, even with consulting in Washington. Academia was, shockingly, even more bureaucratic than the Pentagon. To get things done required endless hours of negotiations, and patience. The ongoing battles between the various schools were notorious and as a director of a self standing, self supported interdisciplinary institute, I was an easy target. Furthermore, the extremely liberal community held it against me (and the Institute) that I had previously worked in the Pentagon. Also, I had to deal with various threats and negative stories that ran in the local newspaper. Some were quite inflammatory. The most outrageous act that I was accused of was for setting a fire in the economics building. I was accused of starting it so that a weapons related institute could be built in its place in the center of the university. My family was affected as

well. My youngest son who was still in high school heard a teacher in class call me by name as someone who was bringing blood money to Ann Arbor. In 1986, when my last son graduated from the university, Christina and I left for the East Coast again. I was offered a position as president of Thermo Electron Technologies Corporation in Waltham, Massachusetts, and took it without much hesitation. We packed up and moved to Lexington where we still live today.

Lexington is a great little town. Its fame is forever integrated with the beginning of American independence and history, and both Christina and I are fervent volunteers and long term members of the Lexington Historical Society. Every April 18th, we get up at 4am to watch the “The Regulars” march into Lexington as a small band of Minutemen try to hold them off. Yes American history began right here, and I urge all to visit Lexington at least once.



Figure 11 The Redcoats firing on Patriots Day (April 18th) on Lexington Green



Figure 12 Visiting the US Embassy in Kyiv Ukraine. From left: embassy staffer, APS Executive director Judy Franz, Ambassador Bill Miller, George and APS international director Irving Lerch

American Physical Society’s emergency program, and provided them books, computers, and most importantly small grants to the young scientists to help them bridge the abrupt change in their surrounding.

Also, as part of a US delegation under the auspices of the Academy of Sciences, I helped convince the Ukrainian government to give up its nuclear weapons, and as a benefit helped set up the Science & Technology Center in Kyiv (Kyiv is the correct spelling of the capital of Ukraine, rather than Kiev).

Over the next 6 years I visited Ukraine many times, spending weeks at a time there in a rented apartment. One year, I

My next career change came when the Soviet Union fell apart. I left my industrial post, and started full time consulting, using my small high tech firm (Science & Technology Management Associates) as a base. T the request of the fledging Ukrainian Government, I was asked to assess Ukrainian strengths and weaknesses and provide them a report. The US Government paid for my work and I spend six weeks traveling throughout the country collecting information. In the process of my travels, I literally met hundreds of scientists who begged for help in making contacts with their Western counterparts. I offered my help but to actually fulfill the promise was more difficult. It was no easy task and I began by leading a delegation of physicists as part of the



Figure 13 Mayor of Slavutych making me an honorary citizen of Slavutych

remember we had Thanksgiving in Kyiv, including all the trimmings and even Maple leaves from Lexington that Christina brought with her.

My work in science evolved from building bridges between Ukrainian and American scientists at first; to later helping them start up small hi-tech companies by creating Technology Business Incubators. In 1998 during President Clinton's visit my work with the scientists from Chornobyl was cited as one of the benefits of American help. Many Ukrainian scientists and engineers lost their jobs due to the closing of the nuclear plant, and my small business incubator helped them start new lives. The mayor of Slavutysh (town where the people from Chornobyl moved to after the disaster) named me an Honorary Citizen for my work and saving their town.

My last large program that I managed in Ukraine was a two year program sponsored by the US State Department to help the deaf community. We provided them Western training and communication tools (computers, the Internet and distance learning modules). Much of that work is still ongoing. For my work in Ukraine I was honored by the Ukrainian National Academy of Sciences and made a foreign member of the Academy.



Figure 14 Visiting my ancestral village cemetery, near the city of my birth Lviv with my newly discovered 90 year cousin

In retrospective, I guess my mother's insistence that I learn and use Ukrainian proved critical to my success. I was glad that she was able to see her son visit his/our ancestral home after being away for nearly 50 years. I never believed that Ukraine would ever be free in my lifetime, and it was like a miracle that suddenly it happened.

One of the things that really excited me was that by going to Ukraine I was able to do some genealogical research on my family names. One of the real moving moments was in finding a distant relative who was able to fill in many of the blank pages. He was equivalent to my great grandfather. He was nearly 90 years old but had a very sharp memory. He took me to the family cemetery and we spend a lot of time discussing the fate of many Gamotas that I was not even aware of their existence. Many were executed under Stalin or sent to Siberia, others were killed by the Nazis. One cousin whose mother was Jewish died in the Warsaw Ghetto.

In parallel to my work in Ukraine, I continued my benchmarking of foreign science and technology for the US government agencies, including the National Science Foundation. One of the reports in 1996 was on nanotechnology and it was later used by President Clinton to start the National Initiative on Nanotechnology. My benchmarking work also brought me to Japan many times in the 90's. More recently in 2001, in 2006 and again in 2011 I was invited by the Japanese government to review their research programs. Similarly, in 2005, I spend 5 weeks in New Zealand also at the request of their government to review and assess their research programs. Much of this followed in parallel with my US efforts and occasional trips to Ukraine.

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Figure 15 A reception during one of my many visits to Japan

Going back in time a bit, in 1999, a seminal event occurred in the Gamota clan. Our first grandson was born. He lived in Washington DC, but since I was often on business in DC, it made it easy for Christina and me to visit him regularly. Grandma and grandpa were always there to "help". Later, my grandson and his family moved to London so we had to find excuses



Figure 16 Top left: Steve Whitmore UMN, John Magerlein, Jim Levine UMN, Stu Ryan, Jan Northby UMN, Gary Ihas, and Steve Forrest. Bottom left: Arnie Dahm UMN, George Gamota UMN, Mike Sanders UMN, Gabby Weinrich UMI, and Christie Zipfel.

to go to London. Fortunately, for us grandparents, the family moved back to the states, and currently lives in Lexington, just a few miles from us. Then in April of 2003, another grandson was born, quickly followed by a third grandson in July (from our son Dan and his wife). Finally in 2006, our last to date grandson was born. We are still waiting for a granddaughter!

In October 2007, I had the privilege of being invited to Mike Sanders' 80th Birthday celebration. Many of his Minnesota and Michigan students came. His students are now scattered throughout the US. Most are at universities, some in industry while a few have retired. Ten of the students are shown above. To help celebrate Mike's 80th Bill Zimmerman came from Minnesota. In the formal program each former student gave a short presentation on his career since leaving graduate school. Some were technical presentations, others were less serious.



Figure 17 After a short course in business development, I am signing certificates of completion for students in Pavlodar University, Kazakhstan.

Since 2006, I have continued to consult in the US as well as foreign countries, and help start ups. I also teach entrepreneurship in Ukraine, as well as in Central Asia as well as the Caucasus.

For example, in 2012 at the request of the State Department, I spent 10 days in Kazakhstan, visiting 3 major cities and 15 universities and research organizations. In each location I gave a talk on innovation and on how to bring research results to applications.

Last but most importantly, on August 5th 2011, Christina and I celebrated our 50th wedding anniversary with our whole Gamota clan, at a place we always enjoyed visiting: St. Thomas.



Figure 18 The Gamota Clan in St. Thomas, US Virgin Islands celebrating our 50th Anniversary