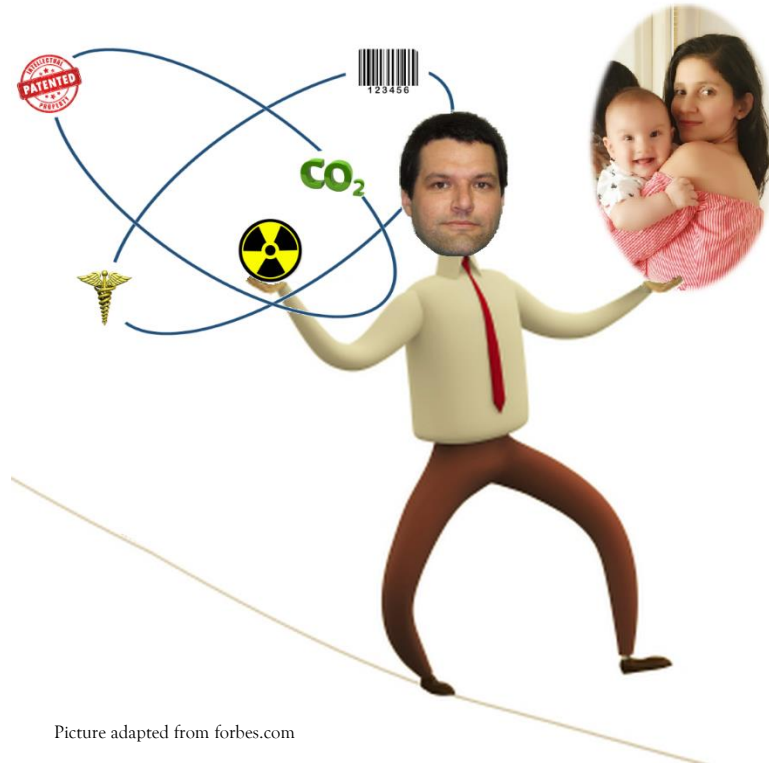


Balancing Family and Work – A Time of Renewal

Dr. Castaño's Report:



Picture adapted from forbes.com

I just came back from a break precipitated from the birth of my first son, Joseph. Joseph came at a rather convenient time, soon after my tenure, allowing me to take an extended family leave. As such, this year has been relatively light in achievements, since I was not researching, teaching or advising students in the Spring or Summer semesters. Nonetheless, there is a fair amount of news. First this year I obtained my first patent with Dr Lee: Method to Fabricate Portable Electron Source Based on Nitrogen Incorporated Ultra Nanocrystalline Diamond (N-UNCD), US Patent Number: 9,299,526. I also started the process of applying for a new patent on the production of radioactive gold nanoparticles that can be used for cancer treatment. We hope the next

couple of years will allow us to test retention of the nanoparticles in-vivo (mice). On the other hand, during this break, I finally found the time to start the exploration of a subject that is close to my heart. The reduction of CO₂ with nuclear energy. Nuclear energy is an excellent source of energy. Unfortunately, despite some progress with batteries (plug-in hybrids), electricity is still a poor transportation fuel. An elegant solution to the growing problem of climate change would be the recycling of CO₂. Dr Joseph Graham and I together with my newest graduate student, Lewis Rauschelbach will explore the field of radiation induced chemistry to see if we can find a viable path to reduce CO₂. Lewis is a GAANN Fellow and will explore this issue as part of his PhD. GAANN stands for Graduate Assistance in Areas of National Need.

On the other hand, I am conducting research with Dr Catherine Johnson on the development and testing of a nuclear bar code for the tracking of explosives. Dr Johnson's PhD student James Seaman is actively testing the idea and conducting irradiations in MSTR to test and refine the concept. On the personal level, there was a once in a lifetime event in my extended family. I made a family tree of my extended family. I have 16 uncles and aunts. One of my uncles left our family when he was 17 years old back in 1960, and we received reports he had been killed in 1980. I did some detective work and found him alive and well. He was living in a remote area of my country. It is not every day that you find a close family member that has been missing for 56 years ☺ He is back living with us. He is 73 years old now and brought his family with him. This has been a marvelous year in the personal and professional levels. Let's hope the streak continues. As usual, I like to recognize my colleagues and students that contribute to the continued success of the nuclear engineering department. We research, publish, and face life together. In particular, I would like to mention:

Prof. Henry Colorado: Dr. Colorado is a professor of Mechanical Engineering and Materials at the University of Antioquia (Colombia). Our cooperation extend many years on ceramic materials for structural and shielding applications that can resist fire and shock conditions possibly to be encountered in transportation accidents. We have also published a book chapter on the application of chemically bonded phosphate ceramics for nuclear waste applications.



Prof. Catherine Johnson: Dr. Johnson is a professor at the program of Mining Engineering of S&T. We are in the same department in different programs. Dr Johnson and I are collaborating on the development of a “nuclear bar code” which is basically microscopic addition of rare earths to sensitive materials (explosives, special material) such that even after catastrophic events or interdictions the material can be attributed.



James Seman: Is pursuing his PhD in explosives engineering and is conducting research with Dr Johnson and I. He is actively testing the concept of the nuclear bar code and is exploring the interference of the signals and the implementation of the concept.



Maria Camila Garcia: Maria Camila obtained her MS degree by making radioactive gold nanoparticles by gamma and neutron radiation. This technique has the advantage of producing well-characterized radioactive gold nanoparticles in a single step reducing the complexity and cost of producing specialty drugs for cancer treatment. Maria Camila has since moved to pursue her PhD degree with Dr. Schlegel. We are likely to continue our collaboration.



Raul Florez: Raul obtained his MS degree under Dr Alajo and my supervision by measuring the nuclear properties of specially prepared cementitious samples incorporated with special high Z materials (for gamma absorption) as well as high neutron cross section materials (for neutron capture). Raul is continuing pursuing his PhD degree with Dr Joseph Graham.



Lewis Rauschelbach: Lewis is my newest PhD student and my first GAANN Fellow. GAANN or Graduate Assistance in Areas of National Need is a program that assist graduate students with excellent academic records and plan to pursue the highest degree available in their course study at the institution in a field designated as an area of national need. We will explore the efficient recycling of CO₂ using nuclear energy.



Jenna Slocum: Jenna helped as an undergraduate with our research on radioactive nanoparticles and presented our work at the Undergraduate Research Day at the Capitol. She is currently Undergraduate Research Ambassador representing S&T in Jefferson City. She is interested in continuing the work with radioactive nanoparticles in-vivo systems (mice), and becoming an Academic Senator. I am looking forward to her continuing work in our group.

