Donald D. Clayton: a brief biography

In 2009 the author is 74 years old. He was born in 1935 into a farming community to parents who had been born on their family farms in southwestern Iowa. In the middle of the great depression his father left the family farm to start flying small aircraft and later moved his young family to Dallas, Texas to take better and steady work as an airline pilot with Braniff Airways. This leaving of the family farms of Adair County, Iowa produced an early sense of grief and loss in young Donald (then five years old). This sense of loss haunted him for decades.

The Clayton family was fortunate to purchase a new home on 1941 that lay on the outskirts of University Park and was accepted into the University Park school system despite not being a resident of the Park Cities. This soon to be legendary school system in the state of Texas provided for young Donald the excellent education and upward spirit that was exceptional in the history of his extended Iowa family. Graduation from Highland Park High School in January 1953 had exposed him to mathematics, physics and chemistry far beyond the typical experience of his farming relations. He then became the first of all of his relations to attend university, Southern Methodist University in Dallas. Showing exceptional gifts, he was invited to major in physics by the chairman of its department, who also created a laboratory teaching job that made that major financially possible. That Chairman and Professor later changed the author's entire life by suggesting that he attempt graduate school in physics at the famed California Institute of Technology. Before graduation the author married another 19-year-old from his high school, and in innocent naiveté they moved in 1956 to Pasadena CA and legendary Caltech. Doing so changed his life.

Clayton became fascinated with the new idea that the atoms of the chemical elements were assembled by nuclear reactions within dying stars, from which they were expelled. Thanks to good performance in the graduate course in nuclear physics, Clayton was accepted by the professor, William A. Fowler, as his graduate student. This suited Fowler's goal of making the nuclear physics lab into a center for study of the origin of the elements. This was the very year, 1957, of the publication by Fowler and coauthors of a famous review paper on nucleosynthesis, coauthored with Fred Hoyle who had created the stellar theory. Clayton's seminal works in that discipline while at Caltech involved first formulations of the change of abundances with time for three major processes of nucleosynthesis, as well as inventing a new nuclear clock for the age of the chemical elements. These won him fame and stature as a pioneer of this new scientific discipline. At the same time his first two sons were born in Pasadena, but his marriage severely declined, creating anxiety that would last for many years.

Following two postdoctoral research years at Caltech, Clayton moved to position of Assistant Professor in the new Department of Space Science at Rice University in Houston. That modern department was created to fit the mood of hosting the new Manned Spacecraft Center in Houston. At Rice University Clayton began a graduate course in the physical principles of the evolution of the stars and of the creation of the atoms of the elements in the stars. This became a famous textbook, published in 1968 and

still used today. With excellent research students and two new faculty hires, Clayton built the premier nucleosynthesis school in the United States, supplanting Caltech's initial leadership under Fowler. Responding to an invitation from Fred Hoyle and from Fowler, Clayton agreed in 1967 to become nucleosynthesis coordinator of Hoyle's newly formed Institute of Theoretical Astronomy in Cambridge UK. Clayton resided in Cambridge about 1/3 time for the next seven years. In the middle of that period, he introduced an exciting new astronomy of radioactivity in order to test nucleosynthesis by observing the gamma rays emitted by freshly created radioactivity in exploding stars. His leadership of that expectation led him to become a Co-Investigator on NASA's *Gamma Ray Observatory*, which did successfully detect radioactive nuclei two decades later. But at the peak of the Rice University program, his marriage ended in great stress and grief in 1969, as did Hoyle's institute when Hoyle suddenly resigned his professorship in 1972 owing to a dispute with Cambridge university electors. Clayton remarried rather suddenly in 1972 to a beautiful young German woman whom he met in Cambridge.

A seven-year period of "becoming German" followed in Heidelberg, where Clayton accepted an honorary position to develop his new theory of *stardust*. It predicted that solid grains that condense from hot vapor in dying stars could be recognized, if found, by their wildly unusual isotopic compositions for the chemical elements from which they condensed. His predictions laid the basis for another exciting new field of astronomy, revealing the physics of stars and of nucleosynthesis from isotopes within the stardust. So much controversial resistance to these ideas was exerted by prominent meteoriticists prior to the discovery of stardust within meteorites that Clayton's personality was altered by the scrimmage. Clayton resided half time for this seven-year period in Heidelberg, during which time his daughter was born. But this marriage too was unstable, and ended painfully and suddenly in 1980.

Clayton found a new approach to sexual love when he met Nancy McBride in Houston at Rice University. Their marriage brought a heretofore unknown peace and mutual care, creating the happiest personal phase of Clayton's life. The associated sense of a new start prompted them to also seek a new university position where Clayton could be of value and where life did not carry so much baggage. To that end he brought his *Gamma Ray Observatory* program to Clemson University, where they now live. Clayton centered the buildup of astrophysics there on that observatory and on stardust. Their son, Andrew, born in 1987, grew up in Seneca SC and in 2009 graduated from Clemson University. Clayton retired from active service, but still maintains a research office at Clemson University and meets with the astronomy research group that he constructed two decades ago.