Subatomic Transformers

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Just over a year ago, scientists with the NOvA experiment caught sight of their first neutrinos. Now they have evidence that these subatomic particles are oscillating—or transforming—from one "flavor" to another as they travel some 500 miles in less than three milliseconds. UT Professors Yuri Kamyshkov and Thomas Handler, along with Research Assistant Professor Athanasios Hatzikoutelis and Graduate Students Eric Flumerfelt and Philip Mason, are part of the 210-member NOvA team representing institutions from all over the world.

Based at Fermilab, the NOvA experiment seeks to demystify neutrinos, sometimes described as "ghostly" particles because though bountiful in the universe, they have no charge and interact weakly with matter. Neutrinos travel (even through our bodies) with negligible, if any, interference. First theorized in 1930, they eluded detection until they were experimentally discovered in 1956. The majority of neutrinos are thought to trace their origins to just after the Big Bang, though scores more are being generated all the time via the decay of radioactive elements. Yet their properties are still not clearly understood. Pinning down their mass and the hierarchy among neutrino "flavors"—electron, muon, or tau—opens more doors to how the universe works, as well as new and interesting physics at the subatomic level.

The UT Physics Department has a long tenure with neutrino studies. Physics faculty, for example, were part of the KamLAND collaboration that announced the first detection of anti-neutrinos in 2005. Then in the Double Chooz experiment they first measured one of the mixing parameters of the neutrino oscillations that now enables more fine effects of matter-antimatter asymmetry in neutrino sector to be measured by the next generation of neutrino experiments, including NOvA and the future DUNE experiment.

Read more about this latest discovery via **the official press release from Fermilab (http://www.fnal.gov/pub/presspass/press_releases/2015/NOvA-Neutrinos-Change-20150807.html)**. Also see **this recent article about NOvA and UT's involvement (http://tntoday.utk.edu/2015/06/24/utrelated-nova-neutrino-experiment-recognized-department-energy/)**.