DISTRIBUTION OF STELLAR ABUNDANCES

ABSTRACT

This study was conducted mostly to check the current models of stellar and galaxy formation; to see if our current theories and calculations on how the universe formed hold up. Stellar abundance data was taken from the Hypatia Catalog, and probability distributions for specific elements were constructed. Iron, Oxygen, Titanium, and Silicon were the primary focus. The probability distributions were compared with standardized distributions, using the Kolmogorov-Smirnov test. The test produces a D-statistic, which is the largest distance between the standardized distribution and the experimental one. It also produces a P-value, which measures how likely the two distributions could have been created from the same data population. The higher the P-value, the better the experimental distribution fits with the standardized one. We're primarily comparing to Gaussian, Cauchy, and Student's T distributions.

For my part in the study, I wrote a program in C# through the Microsoft Visual Studio program. From there I imported the data through text files, saved in local libraries, and ran it through the appropriate formulas. The Kolmogorov-Smirnov tests had to be imported through a third-party library, Meta-Numerics, developed by David Wright. Once all the data is compiled, it is exported to another text file, or presented on a graph in the program's display, which can also be exported as an image. I've displayed the data for Iron in the figure below.
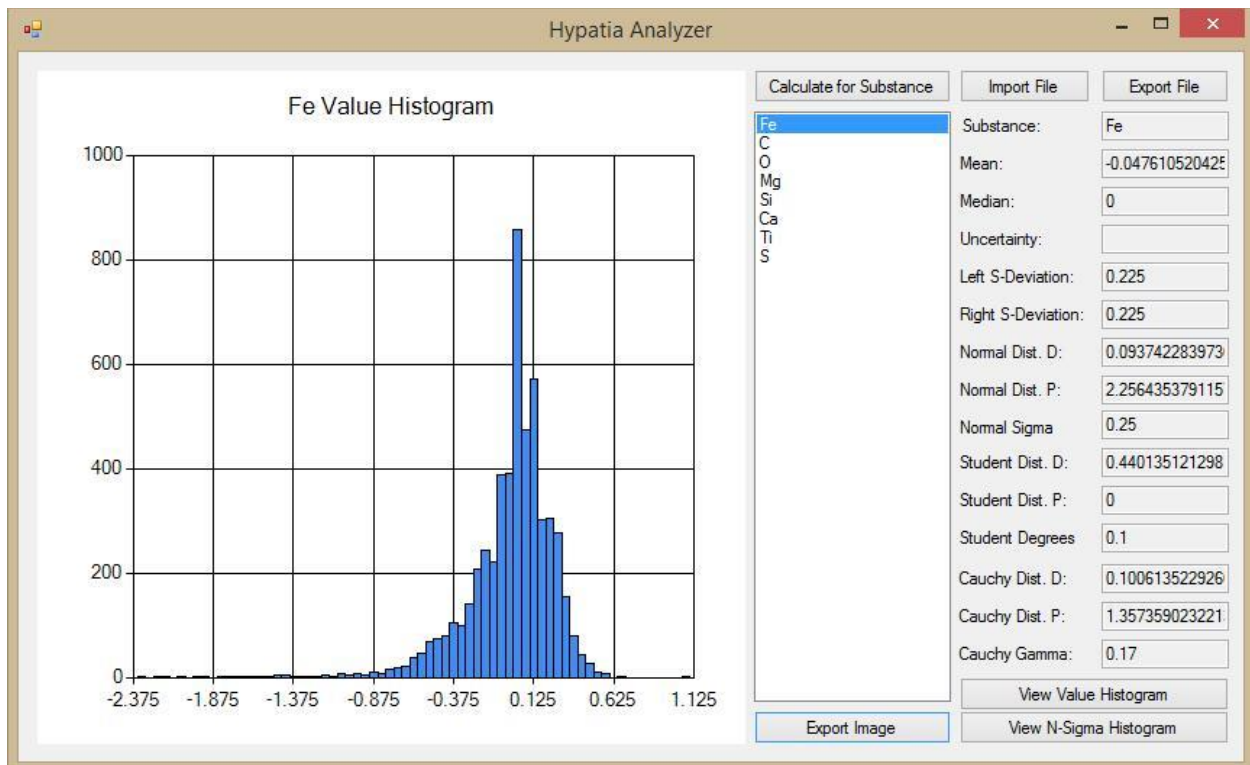
Fig 1: Iron Histogram