The Mathematical Tables Project March 15

The calculation of statistics for a cryptologic test is an activity that a good number of current NSA cryptanalysts take for granted. Today, many statistics are calculated on the fly by supercomputers. Prior to the proliferation of powerful computers, however, such tests often involved the use of mathematical or statistical tables found in handbooks. Creating such tables was an arduous process involving a great deal of care and time. As late as the 1930s and 1940s, the calculation of mathematical tables was a monumental undertaking that still had to be done by hand by a large team of individuals.

Such a project was initiated during the Depression by the Works Project Administration (WPA) in the winter of 1938 to put unemployed Americans to work. Known as the Mathematical Tables Project, it employed several hundred people as human "computers" who were supervised by a planning staff of nonrelief mathematical professionals. The mathematicians would break the calculations at hand into a series of simple mathematical equations involving only basic addition, subtraction, multiplication, and division. The resulting calculation plan was then passed to a group of human "computers" for computation and then to another group for error checking. Because this was a WPA project requiring the employment of as many people as possible, most of the calculations were done by hand with pencil and paper, in spite of the fact that desk calculators were fairly common by the late 1930s. In spite of the hand calculations (or maybe because of them), the tables produced were amazingly accurate, and few, if any, errors were ever found in the resulting mathematical publications.

Dr. Blanch

The technical director of the planning committee, Dr. Gertrude Blanch, a recent graduate of Cornell University, is largely credited for the success of the project. It was because of her meticulous organization that the mathematical tables produced were so accurate. Another important participant was Dr. Cornelius Laneczos, a Hungarian refugee from Nazism; in 1928 and 1929, Dr. Laneczos had been an assistant to Albert Einstein.

The Mathematical Tables Project tabulated many high math functions, including exponential functions, logarithms, and trigonometric functions. The results eventually were published by Columbia University Press in 28 volumes.

Due to the high quality of work performed by the "computers," the Mathematical Tables Project outlived the 1942 demise of the WPA, with some "computers" joining the Hydrographic Office of the Navy and others becoming part of the wartime Office for Scientific Research. Under these new organizations, the "computers" "produced many books and tables of elementary and higher mathematical functions." They also performed "numerous computational services for many government, scientific, and technical agencies including vital services for the military during the war years of 1942-1945." The computers' work included ballistic calculations for the Army, navigation charts for the Navy and some preliminary mathematical work for the Manhattan Project.

U.S. Army cryptanalysts undertook a similar project immediately after World War II. The work was described by the famous cryptanalyst Solomon Kullback in this way: "When the war ended, we still had a fairly large group of people, and the problem was now to convert from wartime tasks, the Japanese Army, to peacetime [and] reallocate the people. There were a number of tasks, which we did just to keep people going.... We took a special distribution, and we computed all of the values of that binomial formula. We were interested in it because of its potential use in cryptanalytic activities. We had the machines available because we hadn't converted yet to new jobs other that the Japanese Army, so we used this as a means of keeping people busy." Like the Mathematical Tables Project, the Army cryptanalysts' work also resulted in a published volume: a limited distribution statistical handbook issued by the Bureau of Standards.

To a modern analyst, either project seems tedious at best. Yet this work provided important support to the war effort and cryptanalytic work in the years that followed. In the end, it makes one appreciate the technology of today and very glad the days of hand-computing statistical tables are (hopefully) over.

SOURCES: Grieg, David Alan, "Gertrude Blanch of the Mathematical Tables Project," _IEEE Annals of the History of Computing_, Vol. 19, No. 4, 1997, 18-27.

"New York Mathematical Tables Project," _IEEE Annals of the History of Computing_, Vol. 11, No. 1, 1989, 52-53.

Oral History of Solomon Kullback, CCH Collection, August and September 1982.