The Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel

The mathematical algorithm used by the **NRMP** to place applicants into residency and fellowship training positions has gained international recognition.

In October 2012, Drs. Alvin E. Roth and Lloyd S. Shapley were awarded The Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel for their work in market design and game theory, fields that examine strategic decision making within complex, social institutions. In the early 1960s, Dr. Shapley and his colleague, Dr. David Gale, developed an algorithm that demonstrated how "deferred acceptance" of an offer for marriage could achieve stability and satisfaction of choice among mates. While lacking real-world application, the Gale-Shapley algorithm proved that the "stable marriage" principle of economics could be achieved consistently if individuals or entities were permitted to select alternative options after the most preferred option had been rejected.

In the early 1940s, the U.S. internship and residency selection process had become dysfunctional. The number of available internship positions had grown to exceed the available candidate pool, resulting in "exploding" offers to third-year medical students that allowed them only 24-48 hours to make training decisions so that hospitals would have some assurance that their positions would fill. The **NRMP** was established in the 1950s by medical students to address and correct the disorganized and chaotic methods that had evolved within the residency labor market. In 1984, Dr. Roth showed that the **NRMP** had achieved great success largely because the algorithm it utilized was a version of the Gale-Shapely algorithm.

In 1995, the **NRMP** matching algorithm was re-evaluated to address concerns that it favored residency programs over applicants. The existing algorithm had proposed matches based on the programs' rank order lists. Research conducted by Dr. Roth and Mr. Elliott Peranson revealed that in a very small number of cases, applicants would match to a higher-ranked program if the algorithm proposed matches based on the applicants' rank order lists. The **NRMP** modified the algorithm to make it applicant-proposing, and it continues to succeed today in pairing the preferences of applicants and program directors in a manner that produces a "best result" in filling available training positions.