

**ZMATH 2012f.01036**

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**Exploring properties of stable matchings: a quest for fairness leads to intriguing mathematical structures.**

Consortium, No. 100, 6-15 (2011).

Summary: The topic of matchings has both applied and pure aspects that continue to interest mathematicians. Hospitals and medical students are also keenly interested in the topic. The National Resident Match Program (NRMP) matches medical students and hospitals for their residencies, and in 1998 the NRMP changed the matching algorithm over an issue of fairness. In this problem, deciding what is fair involves working with large and complex mathematical structures. In 1962, David Gale and Lloyd Shapley initiated the formal study of stable matchings and some of the early questions in this field still motivate research today, as evidenced by a steady stream of publications. This article introduces some of the fundamental issues in a context that is accessible to high school students.

*Classification:* N60 K20 K30 M40

*Keywords:* matching problems; combinatorics; graph theory; operations research; optimization; optimal solutions; stable marriage problem; Gale-Shapley algorithm; measures of fairness; criterion of fairness; counting instances of stable-matching problems; matrices; discrete mathematics