1096-03-390 **Damir D Dzhafarov*** (damir@math.uconn.edu), Department of Mathematics, University of Connecticut. *New directions in reverse mathematics.*

Mathematics today benefits from having "firm foundations", i.e., a system of axioms sufficient to prove the theorems we care about. But given a particular theorem, can we specify precisely which axioms are needed to prove it? This is a natural question, and also an ancient one. Reverse mathematics provides a modern approach to this kind of question. A striking fact repeatedly demonstrated in this area is that the vast majority of mathematical propositions can be classified into just five main types, according to which set-existence axioms are needed to carry out their proofs. But more recently, a growing number of principles falling outside this classification have emerged, whose logical strength is more difficult to understand. These turn out to include many important mathematical results, such as various combinatorial problems related to Ramsey's theorem, and several equivalents of the axiom of choice. I will discuss some of these "irregular" principles, and some new approaches arising from trying to understand why their strength is so different from that of most other theorems. In particular, this investigation reveals new connections between different mathematical areas, and exposes the complex combinatorial and algorithmic structure of mathematics as a whole. (Received September 01, 2013)