We study fair division problems, where a set of resources needs to be allocated to a set of agents in some fair manner. The agents express preferences over the resources through valuation functions. The first part of the talk will give an overview of some solution concepts that are used in fair division, along with existing results (in particular, we will mainly discuss the notions of proportionality, envy-freeness, and maximin fair shares).

In the second part of the talk, we will focus on the problem of computing maximin share guarantees, a recently introduced fairness notion. Given a set of $n$ agents, the maximin share of a single agent is the best that he can guarantee to himself, if he partitions the goods into $n$ bundles and then let other agents choose a bundle before him (i.e., running generalization of the cut-and-choose protocol). The objective then is to find a partition, so that each player is guaranteed his maximin share. In the presence of indivisible goods, such allocations are not guaranteed to exist, hence, we resort to approximation algorithms. I will present a $2/3$-approximation algorithm, which runs in polynomial time for any number of agents and goods, improving upon previous results in the literature. We will also investigate some special cases where we can provide better guarantees.

Finally, I will conclude the talk with some more open problems on fair division with either divisible or indivisible items.

*Parts of this talk are based on joint work with Georgios Amanatidis, Afshin Nikzad, Amin Saberi.*

**Vangelis Markakis** received his bachelor’s degree in 2000 from NTUA, the National Technical University of Athens and then moved to Georgia Tech for graduate studies. He graduated from Georgia Tech in August 2005 with a PhD in Theoretical Computer Science. His advisor was Richard Lipton. After that he was a postdoc for one and a half year at the University of Toronto, and for another one and a half year at CWI, the national research center for Math and Computer Science in Amsterdam. Since February 2009, he has been a Lecturer at the Athens University of Economics and Business, in the department of Informatics.

**Research interests:** His interests lie in the areas of Analysis of Algorithms, Approximation Algorithms, Game Theory, Mechanism Design and Social Networks. A major part of his work in the last few years has focused on algorithmic questions that arise in the context of Game Theory and Economics, such as (i) computation of equilibria, and other solution concepts in cooperative and noncooperative games, and (ii) resource allocation and related optimization problems (e.g., allocations of indivisible goods in auctions or fair division contexts). In addition to algorithmic issues, he has also been interested in mechanism design aspects of auctions and voting procedures as well as in game theoretic treatments of coalition formation. Apart from algorithmic game theory, he is generally interested in algorithms, combinatorial optimization and discrete mathematics.