1077-11-2166 **Dimitris Koukoulopoulos*** (`koukoulo@crm.umontreal.ca`), Centre de recherche mathematics, Universite de Montreal, Montreal, Quebec H3C 3J7, Canada. *When is a multiplicative function small on average?*

Let f be a multiplicative function. The main problem we will be concerned with in this talk is understanding when f is small on average. Halász showed that, unless f 'pretends to be' n^{it} for some small t, this is true and gave quantitative estimates on the rate of decay of the partial sums of f. The estimate provided by Halász's theorem is in general tight but there are functions f for which it is far from the truth. A natural question that arises is to classify the functions f whose partial sums are significantly smaller than what one might predict by Halász's theorem. More precisely, if $\sum_{n\le x} f(n) \ll x(\log x)^{-A}$ for some big A, then what can we say about f? If f is real valued, we show that either $\sum_{p\le x}(1+f(p)) \ll x(\log x)^{-A/2+O(1)}$ or $\sum_{p\le x} f(p) \ll x(\log x)^{-A/2+O(1)}$, depending on whether the Dirichlet series corresponding to f vanishes at the point 1 or not. In other words, f looks very much like the Mobius function or its prime values are small on average. We also give an analogous result for the general case of a complex valued f. Finally, we show how these methods can be used to give a new proof of the prime number theorem in arithmetic progressions. (Received September 21, 2011)