

# Bulletin

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## FROM EXPONENTIAL COUNTING TO PAIR CORRELATIONS

BY JOUNI PARKKONEN & FRÉDÉRIC PAULIN

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ABSTRACT. — We prove an abstract result on the correlations of pairs of elements in an exponentially growing discrete subset  $\mathcal{E}$  of  $[0, +\infty[$  endowed with a weight function. Assume that there exist  $\alpha \in \mathbb{R}$ ,  $c, \delta > 0$  such that, as  $t \rightarrow +\infty$ , the weighted number  $\tilde{\omega}(t)$  of elements of  $\mathcal{E}$  that are not greater than  $t$  is equivalent to  $ct^\alpha e^{\delta t}$ . We prove that the distribution function of the differences of elements of  $\mathcal{E}$  is  $t \mapsto \frac{\delta}{2} e^{-|t|}$ , and that, under an error term assumption on  $\tilde{\omega}(t)$ , the pair correlation with a scaling with polynomial growth exhibits a Poissonian behaviour. We apply this result to answer a question of Pollicott and Sharp on the pair correlations of lengths of closed geodesics and common perpendiculars in negatively curved manifolds and metric graphs.

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