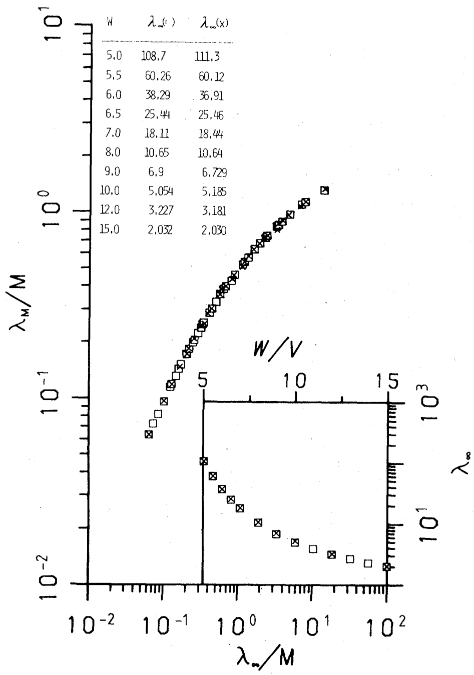
MacKinnon and Kramer Respond: In contrast to Haydock[1] we believe that our calculation allows us to conclude that there is only exponential localization in the two-dimensional (2D) Anderson model with diagonal disorder, at least down to disorder $W=2.0$.

The basis of this belief is the following two ideas, which are central to our calculations. In order to control the *purely statistical* errors the 2D Anderson model is reduced to a quasi-1D model. Then we know for sure that the localization length $\lambda(W,M)$ for any finite width (M) of the strip will be finite, for any value of disorder (W). Since we can calculate $\lambda(W,M)$ and its fluctuations we can use this to determine quantitatively an *error bar on this quantity* (1% in the actual work). Secondly, we have devised a procedure to test the hypothesis that the properties of the strip depend solely on the ratio $\lambda_\infty(W)/M$, where $\lambda_\infty(W)$ is a characteristic length which we later identify with the localization length in 2D. We expect this hypothesis to be valid for all values of this ratio, i.e., including $\lambda_\infty(W)/M \gg 1$, as long as both lengths are much larger than the lattice constant. The deviations from this scaling behavior for small M certainly depend on the boundary conditions. However, we do not believe that this applies to the underlying scaling curve itself, and, consequently, to the β function, which is calculated as its derivative. In order to test this belief we have performed calculations in 2D for different boundary conditions and have also studied the dependence of the calculated scaling curves on the width of the smallest systems used in the analysis. For $M_{\min} \leq 4$ we found clear deviations from scaling behavior, whereas for $M_{\min} > 4$ the points fall on a common curve independently of whether periodic or antiperiodic boundary conditions are used. Also the resulting values of λ_∞ appear to be identical to less than 4% where both have been calculated (Fig. 1). For free boundary conditions the deviations survive to larger M, presumably because of the existence of one-dimensional surface effects. Because of the exclusion of $M=4$ in our present calculation $\lambda_\infty(W)$ in Fig. 1 are about 10% larger than those shown previously.[2] This, however, does not affect our conclusions about localization because they are based on the existence and the analytical properties of the scaling function. On the other hand, our data for 3D, while being statistically just as accurate as the data for 2D, are still subject to systematic errors, due to system sizes which are too small. However, we feel that the conclusions are qualitatively correct.



W	λ_∞(□)	λ_∞(x)
5.0	108.7	111.3
5.5	60.26	60.12
6.0	38.29	36.91
6.5	25.44	25.46
7.0	18.11	18.44
8.0	10.65	10.64
9.0	6.9	6.729
10.0	5.054	5.185
12.0	3.227	3.181
15.0	2.032	2.030

FIG. 1. Scaling function λ_M/M for a strip of width M described by the 2D Anderson model with periodic (squares) and antiperiodic (crosses) boundary conditions. Disorder values W are indicated in the inset. M values taken into account are $M=8$, 16, 32. Inset table: some actual numbers for λ_∞.

It is important to note that our analysis is not subject to the restriction $\lambda_\infty < M$. Our newer data show, for example, that for $W=2$ in 2D the localization length is macroscopically large, namely $\lambda_\infty \approx 10^6$.[2]

The question why the statistics in the calculations by Licciardello and Thouless[3] turned out to dominate the results is indeed an intriguing one. Presumably it is related to the fact that the achieved system size was too small so that the statistical errors were too large for any reliable extrapolation.

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