Asymptotics Of The Heat Exchange

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Let K be a non-polar compact set in flat space, and suppose that K is at fixed temperature $u = 1$, while its complement K^c is at initial temperature $u(x;0) = 0$, $x \in K^c$. Suppose that u satisfies the heat equation on K^c. The heat content $E(K;t)$ is the total amount of heat in K^c at time t. Let K and L be disjoint, non-polar compact sets. We obtain the leading asymptotic behaviour of $E(K;t)+E(L;t)-E(K\cup L;t)$ as t goes to 0 under mild regularity conditions on K and on L. We discuss these results, and corresponding ones for the heat trace, in the light of some conjecture by Sir Michael Berry.