1099-40-106 **Stephen A. Fulling** and **Yunyun Yang*** (yyang18@math.lsu.edu). *Some subtleties in the relationships among heat kernel invariants, eigenvalue distributions, and quantum vacuum energy.*

Let $-H$ be the Laplacian on scalar functions in a compact region in $\mathbf{R^3}$ with smooth Dirichlet boundary; define the kernel traces $K(t) = \operatorname{Tr} e^{-tH}$ and $T(t) = \operatorname{Tr} e^{-t\sqrt{H}}$ and the eigenvalue counting function $N(\omega^2)$. Loosely speaking, the small-t asymptotics of K and T are in close correspondence with the averaged large-ω asymptotics of N, but some confusing subtleties exist. (1) Nonnegative integer powers of t in the expansion of K give rise to terms $\delta^{(n)}(\omega^2)$ in the *moment asymptotic expansion* of $dN/d(\omega^2)$ as a distribution. (2) The expansions of T and $dN/d\omega$ contain additional, nonlocal spectral invariants, related to Casimir energy in quantum field theory. (3) Because of an algebraic accident, the term of order t^{-1} in T vanishes; we clear up some confusion and controversy in the physics literature over the significance of this fact. (Received February 02, 2014)