

Exploring the boundary between consciousness and slumber

What was once seen as the neurological equivalent of annoying television static may have profound implications for how scientists study the brain.

Skeptics used to tell the neuroscientist [Bradley Voytek](#) that there was nothing worth studying in these noisy features of brain activity. But his own studies of changes in electrical noise as people age, as well as previous literature on statistical trends in irregular brain activity, convinced him that they were missing something. So he spent years working on a way to help scientists rethink their data.

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In collaboration with neuroscientists at UC San Diego and Berkeley, Voytek developed software that isolates regular oscillations — like alpha waves, which are studied heavily in both sleeping and waking subjects — hiding in the aperiodic parts of brain activity.

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One theory is that aperiodic signals somehow reflect the delicate balance between excitation and inhibition that the brain needs to keep itself healthy and active. Too much excitation may overload the brain, while too much inhibition may put it to sleep, Lendner said.

[Neuroscientist Robert] Knight thinks that explanation is on the right track. "I wouldn't want to say I'm positive it's an inhibition-excitation ratio change, but I think it's the most parsimonious explanation," he said.

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