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## **Analytical modeling enables explanation of paradoxical behaviors of electronic and optical materials and assemblies**

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**M**erits, attributes and challenges associated with the application of analytical modeling in electronics and photonics materials science are addressed, based mostly on the author's research during his tenure with Bell Labs, University-of-California, Portland State University, and small business innovative research (SBIR) ERS Co, USA. The emphasis is on practically important, yet often paradoxical, i.e., intuitively non-obvious, material behaviors. It is concluded that when material reliability is crucial, ability to effectively quantify it is imperative, and that analytical modeling is the most suitable, although never straightforward, technique to understand, explain and quantify material behaviors, especially in extreme, extraordinary and paradoxical situations.

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