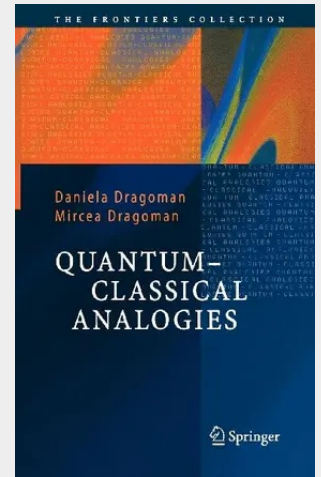


Quantum-Classical Analogies

It is unanimously accepted that the quantum and the classical descriptions of the physical reality are very different, although any quantum process is "mysteriously" transformed through measurement into an observable classical event. Beyond the conceptual differences, quantum and classical physics have a lot in common. And, more important, there are classical and quantum phenomena that are similar although they occur in completely different contexts. For example, the Schrödinger equation has the same mathematical form as the Helmholtz equation, there is an uncertainty relation in optics very similar to that in quantum mechanics, and so on; the list of examples is very long. Quantum-classical analogies have been used in recent years to study many quantum laws or phenomena at the macroscopic scale, to design and simulate mesoscopic devices at the macroscopic scale, to implement quantum computer algorithms with classical means, etc. On the other hand, the new forms of light – localized light, frozen light – seem to have more in common with solid state physics than with classical optics. So these analogies are a valuable tool in the quest to understand quantum phenomena and in the search for new (quantum or classical) applications, especially in the area of quantum devices and computing.

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