Realism is the belief that material bodies have properties independent of any observation, and that the results of any possible measurement depend on these properties. Locality is the belief that no influence may be transmitted faster than the speed of light in vacuum. Regardless of the time elapsed since the discovery that quantum mechanics violates some inequalities derived from the assumptions of local realism [J. S. Bell, Physics 1 (1964), 195–200], none of the dozens of experiments performed so far allows us to conclude that the principle of local realism should be abandoned in physics. All the experiments performed thus far admit local realistic models which exploit some “loopholes”, particularly the so-called detection loophole. A critical review is presented of most of these experiments, pointing out that the conclusion that local realism has been experimentally refuted is based on additional assumptions (beyond local realism itself), particularly the fair sampling assumption. The author maintains that local realism should not be rejected without powerful reasons and that “as more time elapses without a loophole-free violation of local realism, the greater should be our confidence in the validity of this principle”. Moreover, Santos suggests that it is possible to modify quantum mechanics without destroying its formalism and its impressive agreement with the experiments, in order to make it compatible with local realism. The price to pay would be replacing the unrestricted superposition principle, which implies a one-to-one correspondence between self-adjoint operators and observables, with the assumption that only some self-adjoint operators represent observables and only some density matrices represent physically realizable states.

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