A Few Remarks On AdS/CFT

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- Perturbative string theory – the oldest – miraculous-looking
- Nonperturbative dynamics – reached maturity in the mid-1990's
- AdS/CFT or gauge/gravity duality – just a few years later

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- The successes and also the beauty of perturbative string theory were always very strong indications of this.
- The ability to get an extremely rich and delicately consistent understanding of strong coupling behavior made the contrary hypothesis implausible. .
- Finally the clincher was the AdS/CFT correspondence, which gave a nonperturbative formulation of string theory in many situations ... though an enigmatic formulation that in many way still baffles us today.

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- The question of whether string theory exists beyond perturbation theory
- The question of whether it admits a background independent formulation
- Other matters we will come to in a moment.

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After 1997, though we still don't really understand QCD, we at least understand that many four-dimensional gauge theories are equivalent to string theories in the large N limit and this understanding has led to interesting new models of confinement and chiral symmetry breaking and increased our confidence in what we know.

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(However, I would not quite claim that QCD is an area where AdS/CFT made traditional arguments obsolete, mainly because there really weren't any physicists or pundits criticizing the idea that QCD might be equivalent to a string theory.)

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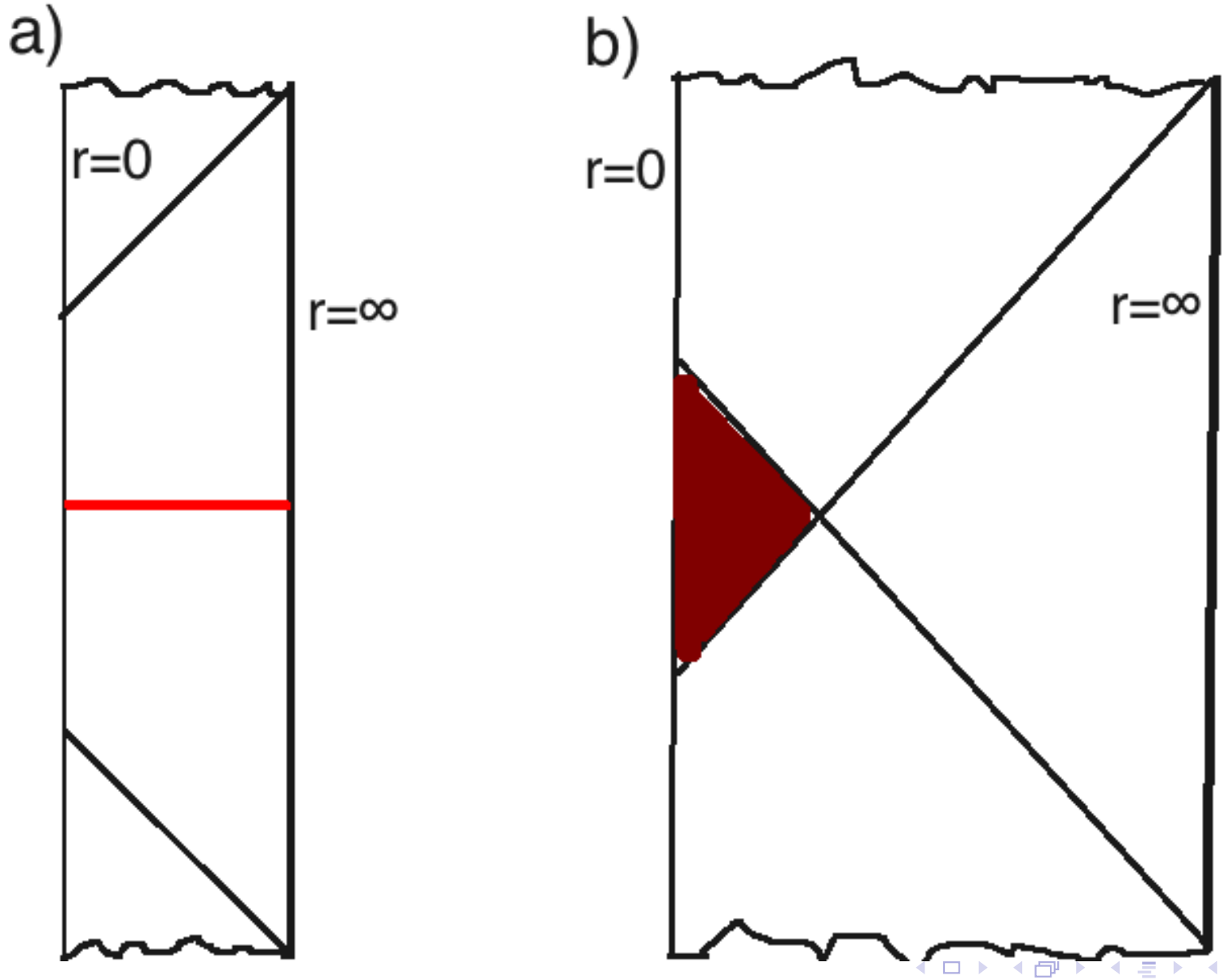

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I'd like to believe that such spacetimes correspond, roughly, to unstable saddle points of the large N theory (or maybe sometimes or more accurately, to saddle points of the large N effective theory that are not actually on the appropriate integration cycle). But I really don't know if that point of view is viable given the many examples in the literature that appear to raise this puzzle.