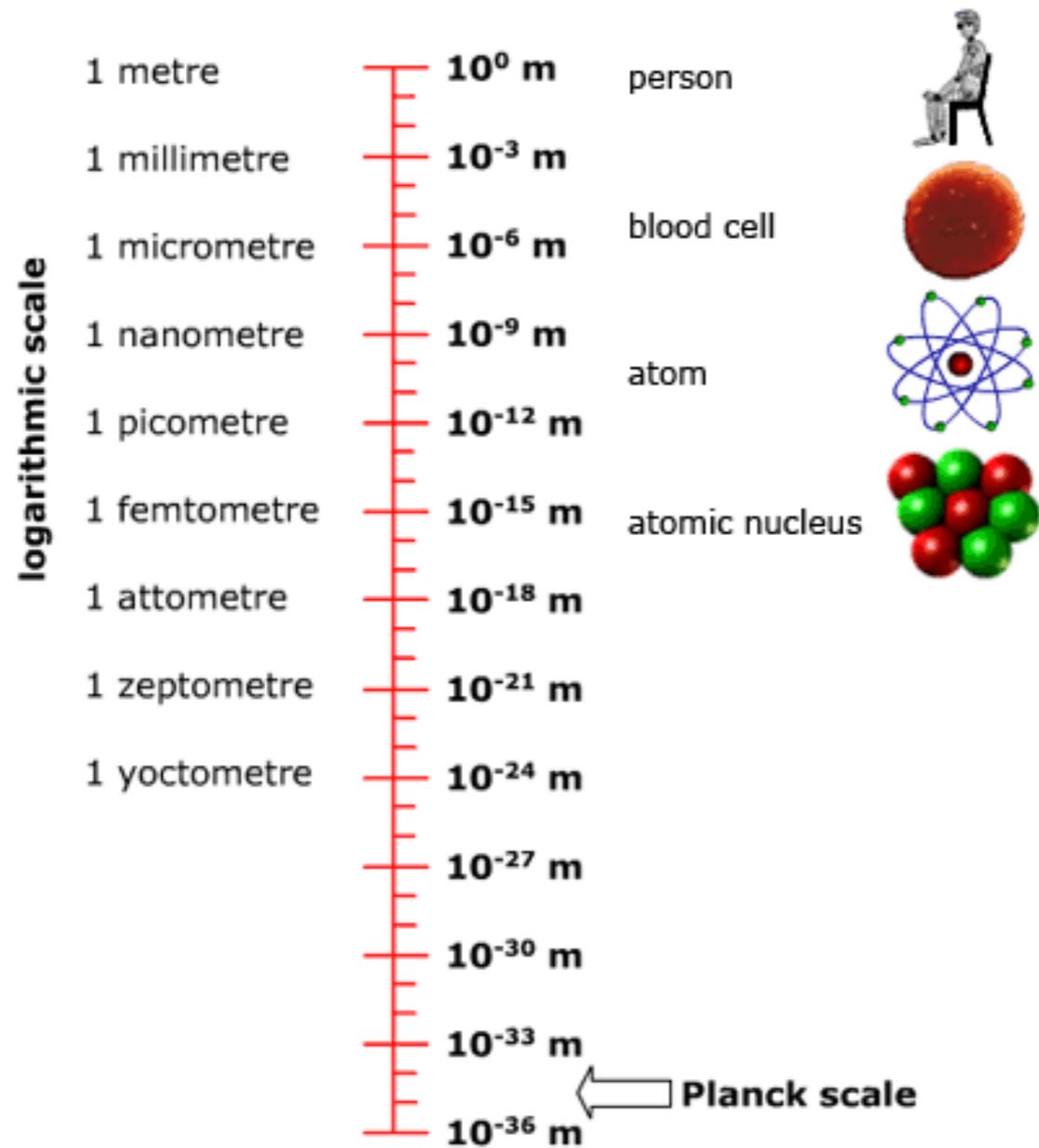


Is Lorentz symmetry relevant?

arXiv:1810.07971, accepted for publication in Phys. Lett. B

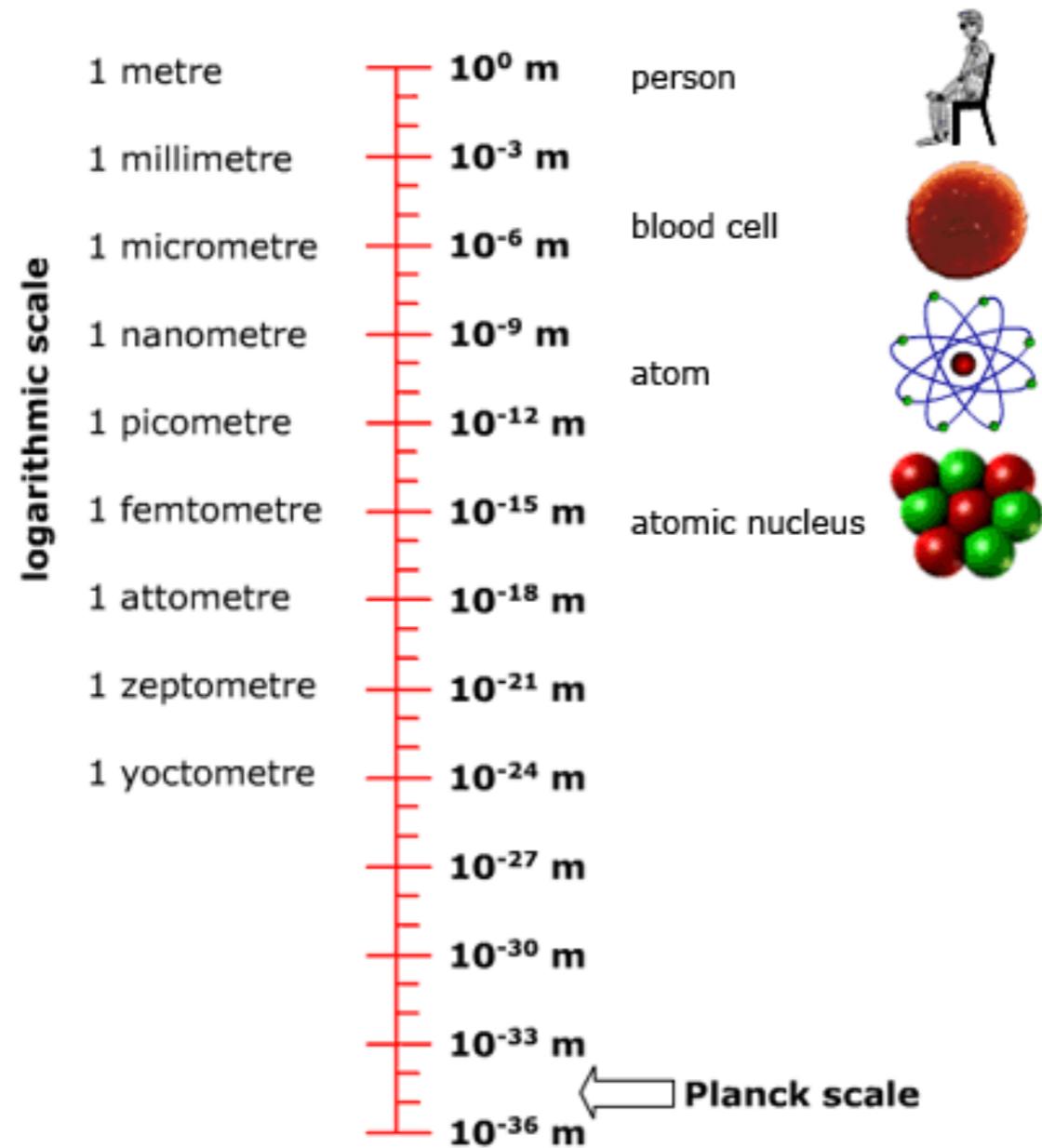
Benjamin Knorr

The scale of Quantum Gravity



www.phys.unsw.edu.au/einsteinlight

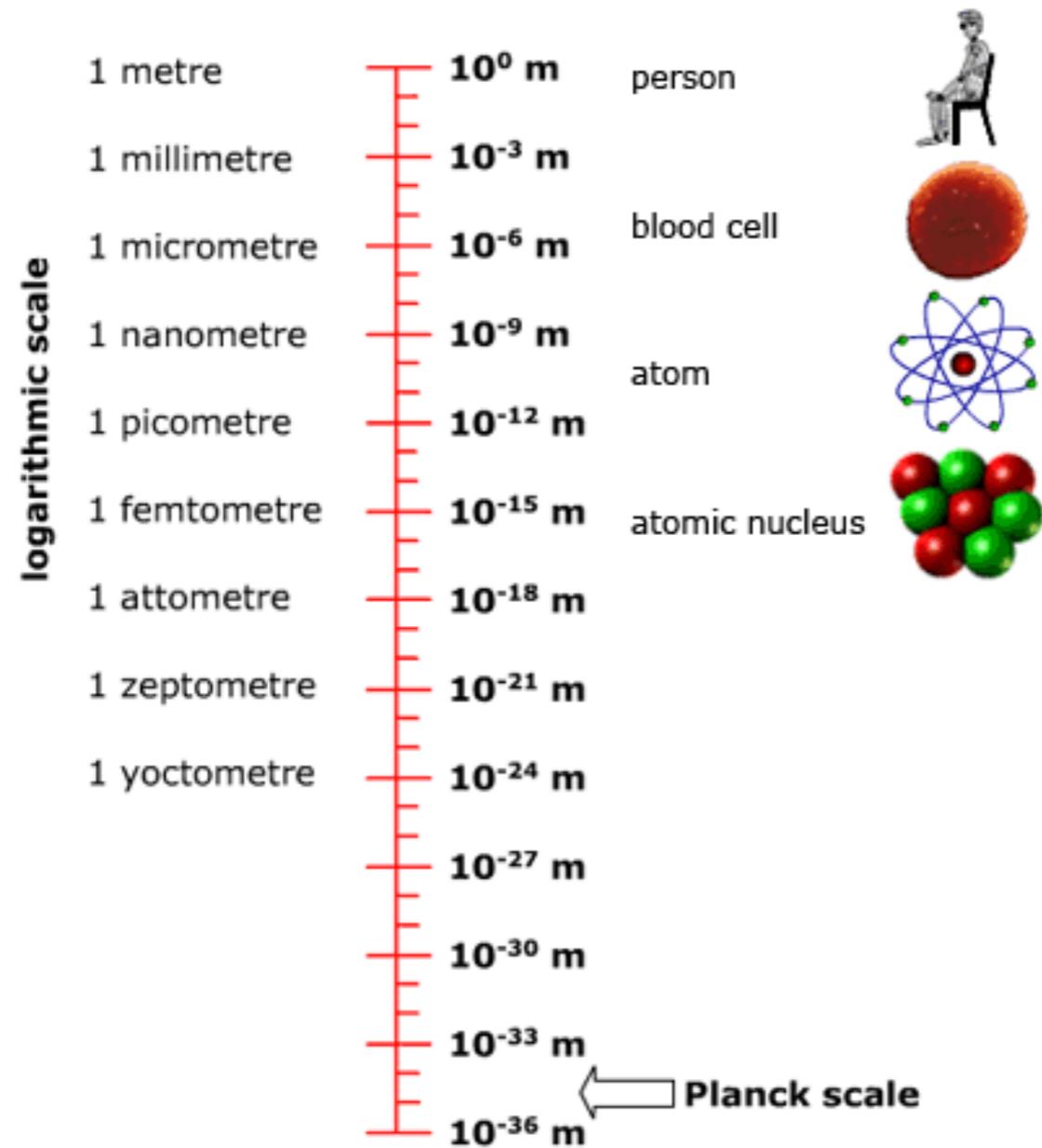
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← What's going on here?

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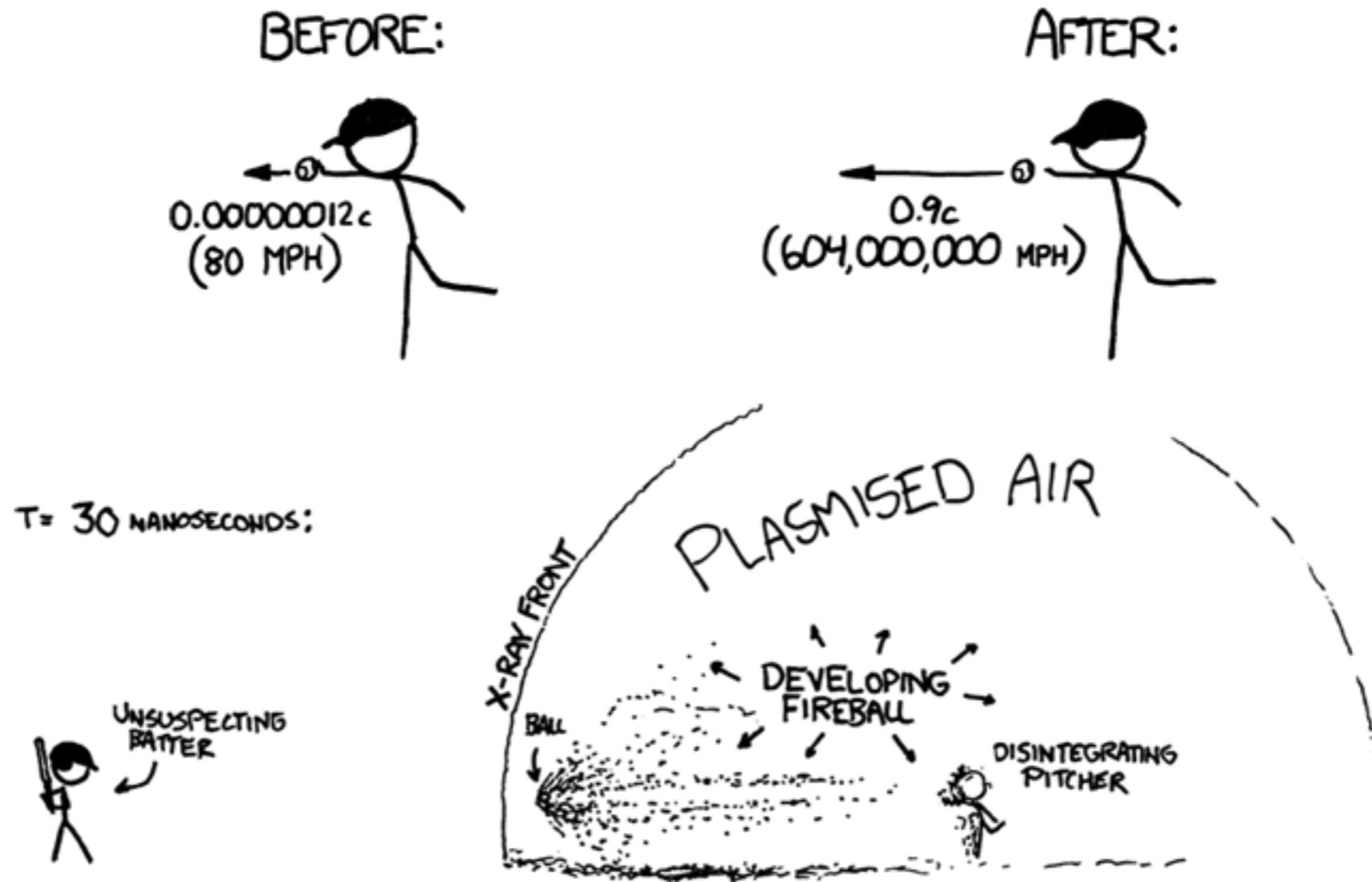
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Quantum Field Theory basics

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<https://what-if.xkcd.com/1/>

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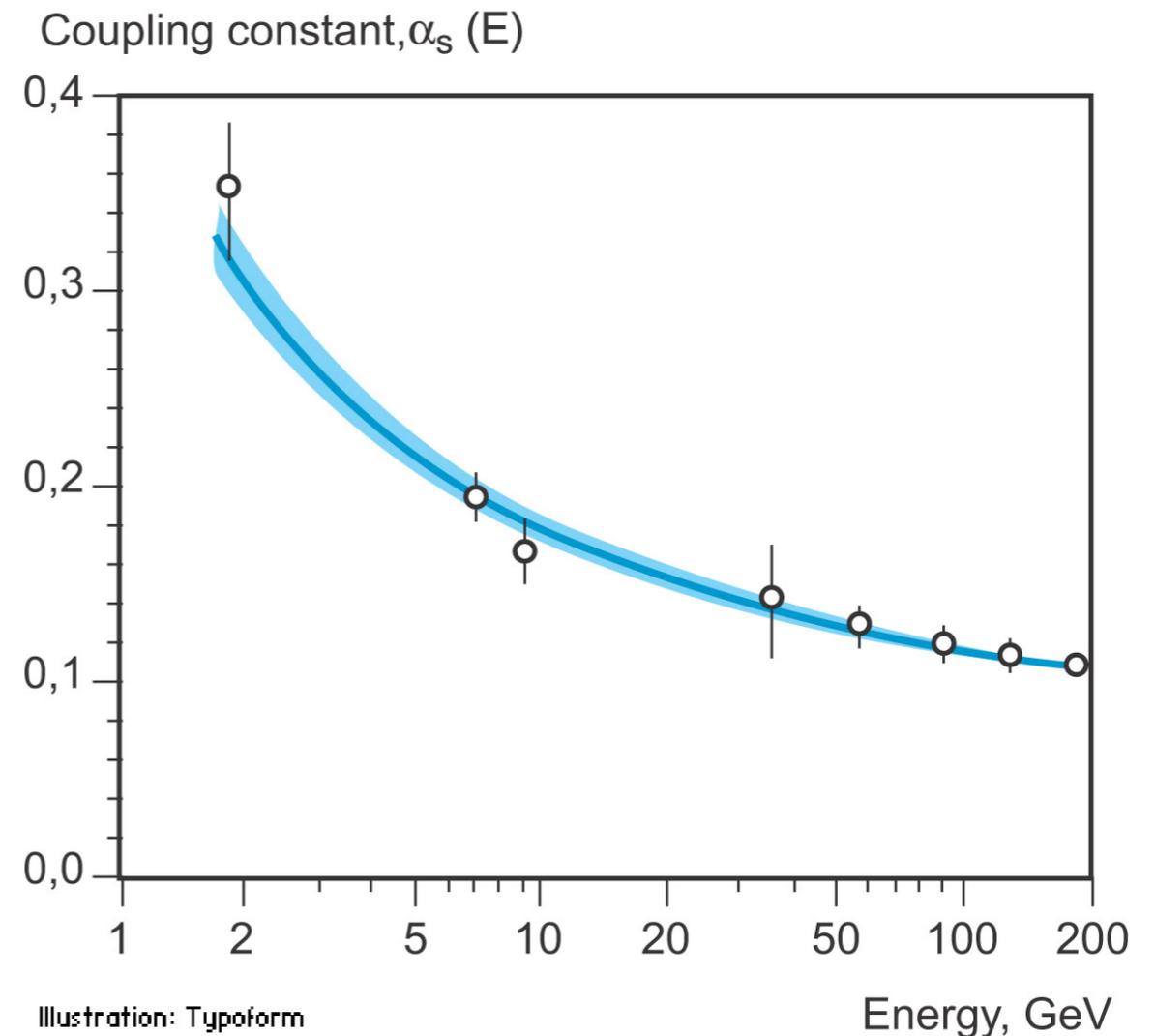
<https://what-if.xkcd.com/1/>

Quantum Field Theory basics

- many known QFTs show nice behaviour in their coupling constant: vanishes for large energies

QCD: the physics of quarks and gluons is asymptotically free

Nobel Prize 2004:
Gross, Politzer, Wilczek



<https://www.nobelprize.org/uploads/2018/06/phypub2highen.jpg>

Quantum Gravity: the odd one

- QFT resulting from General Relativity is not asymptotically free!
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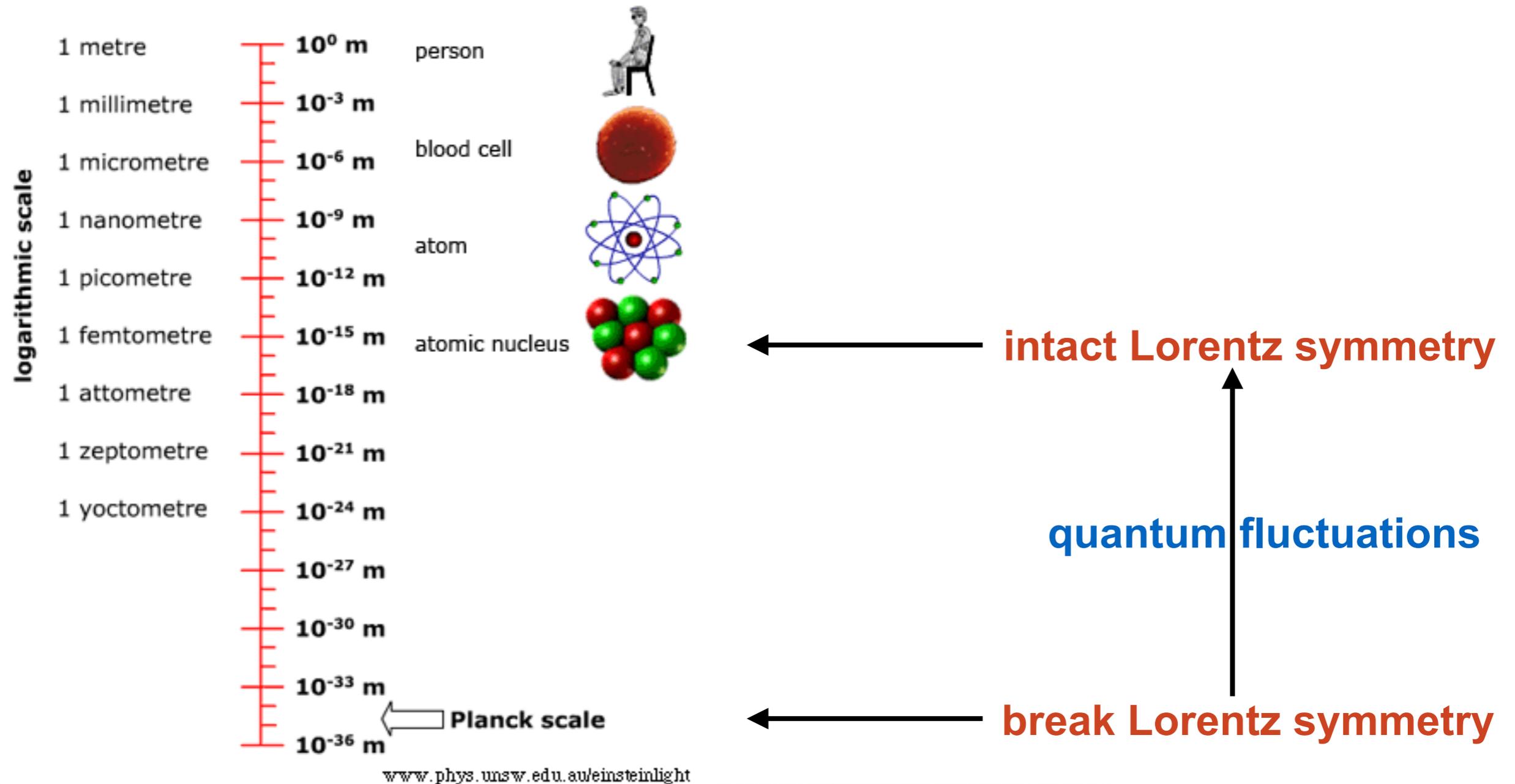
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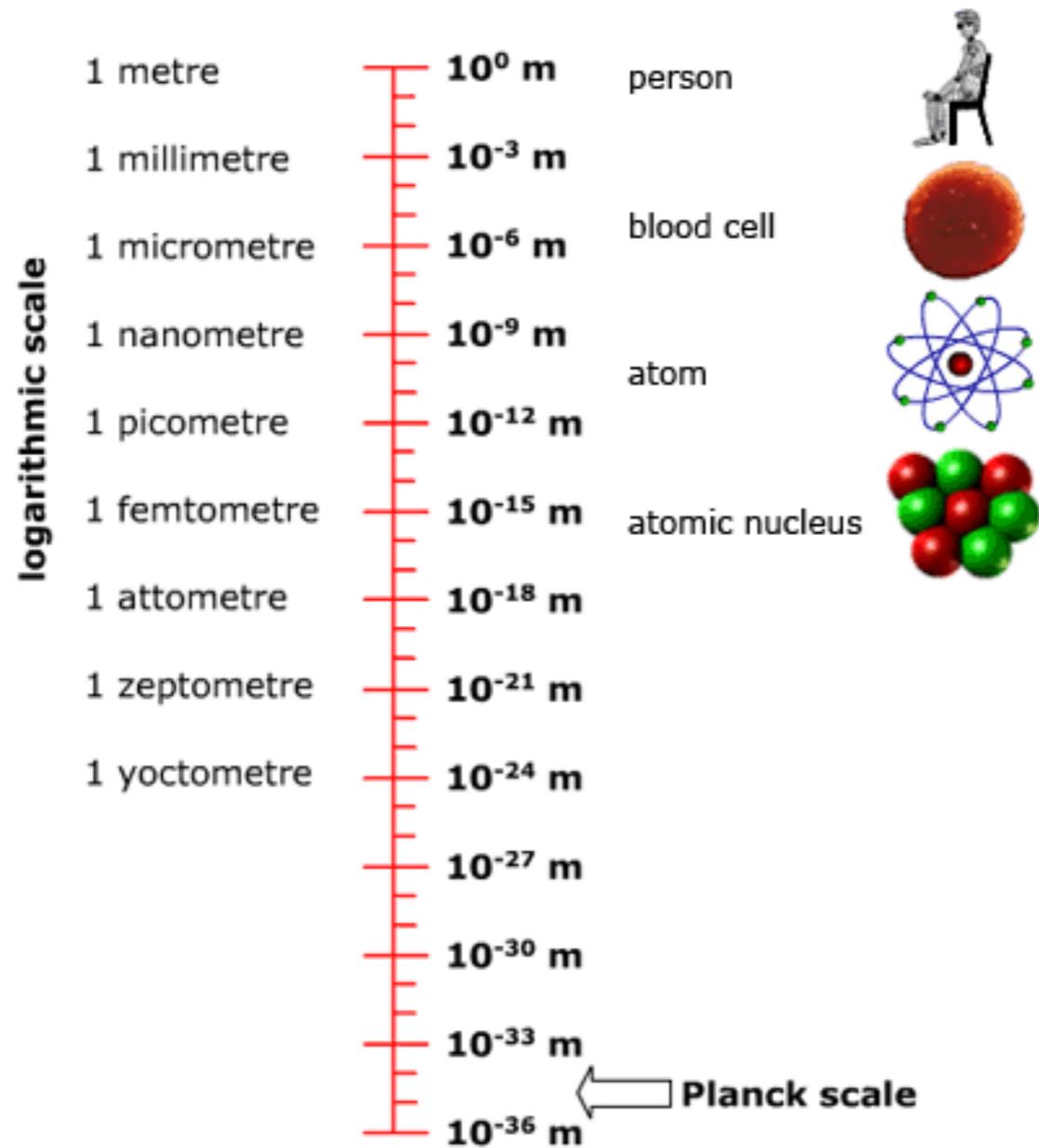
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- What to do?
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 - **re-investigate assumptions**

Quantum Gravity à la Hořava

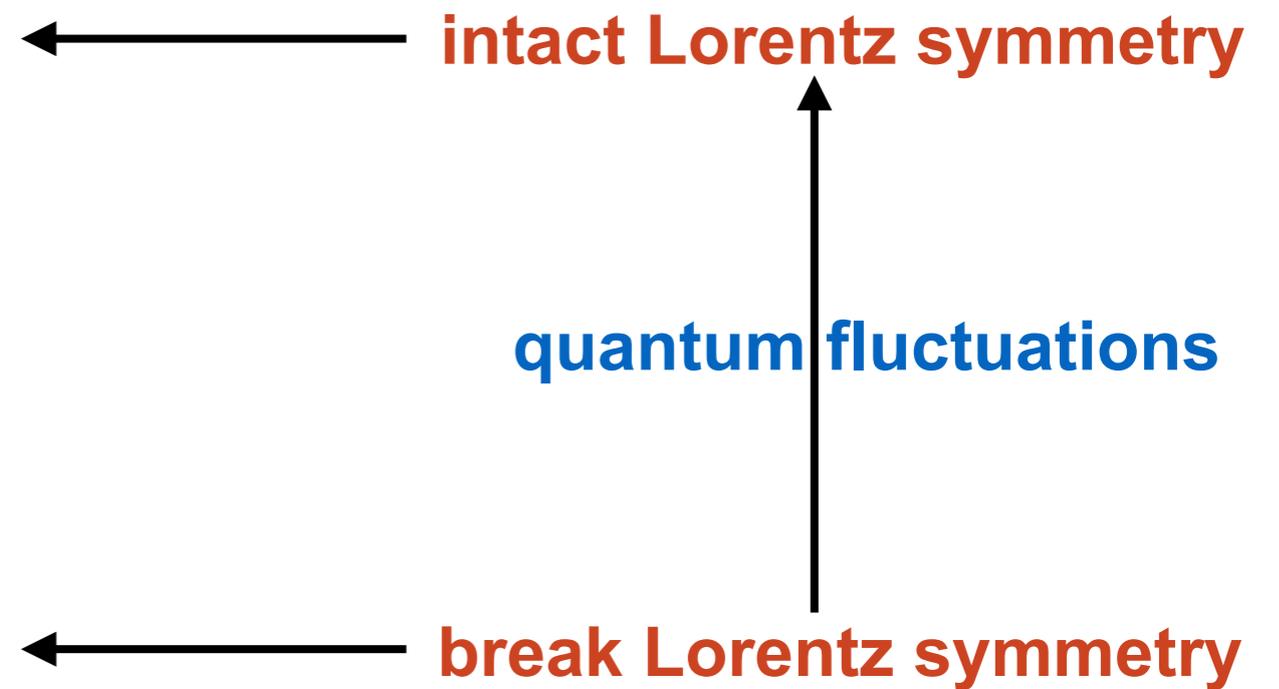


Quantum Gravity à la Hořava

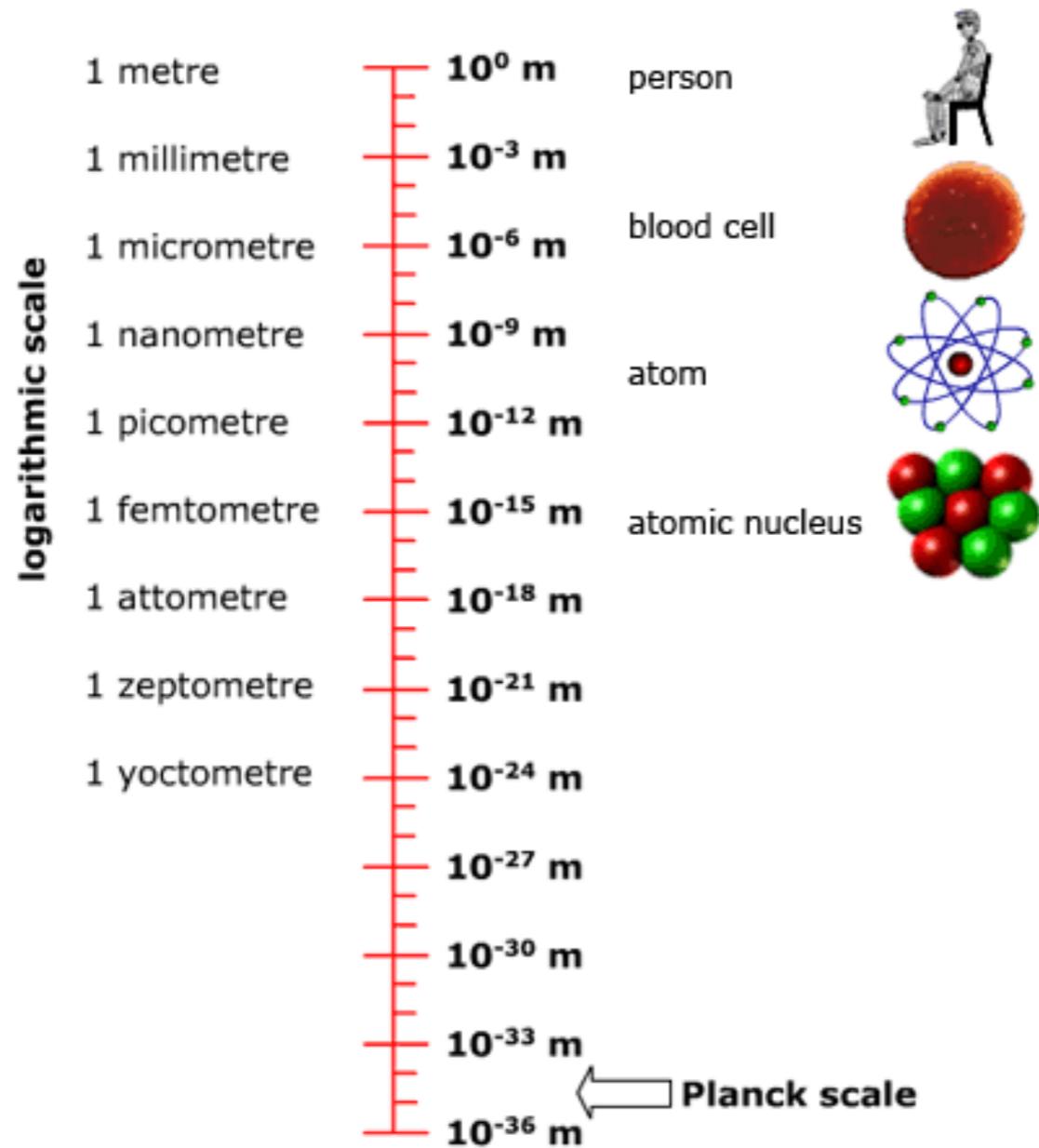


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Quantum Gravity with broken Lorentz symmetry can be asymptotically free!

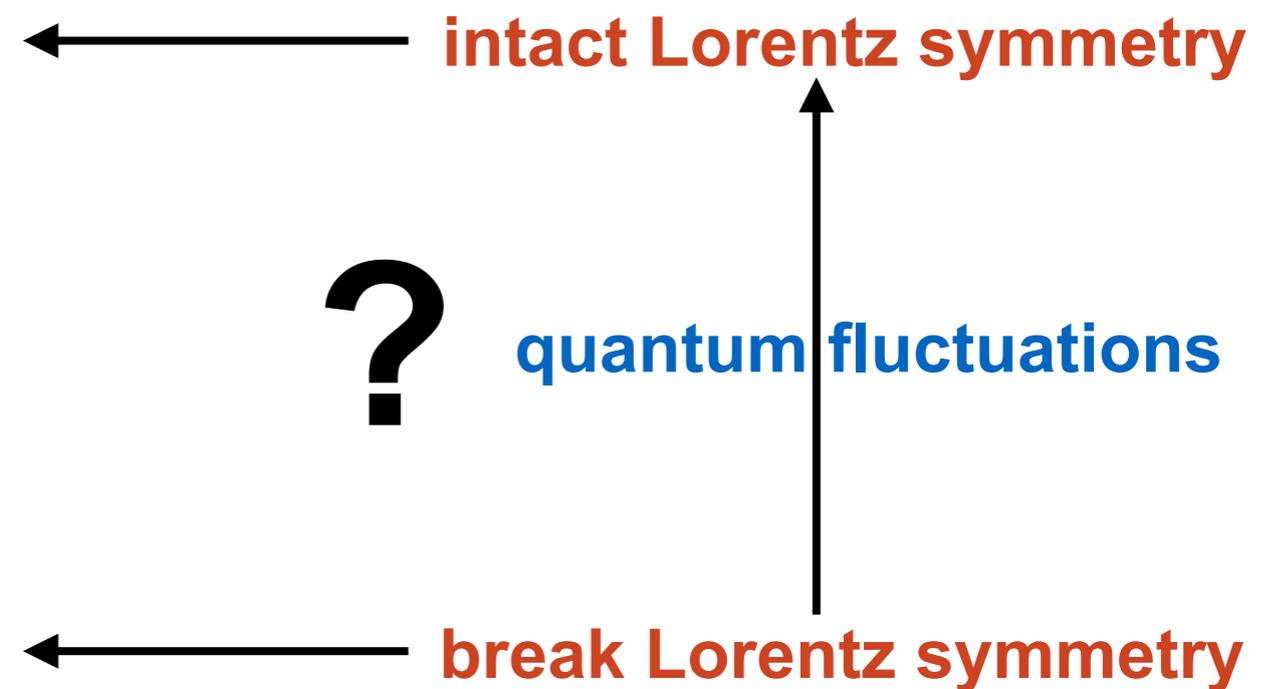


Quantum Gravity à la Hořava



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- shown: Lorentz symmetry breaking gets **worse**, not better, at larger scales...

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- study quantum gravity fluctuations once a tiny Lorentz symmetry breaking is introduced
- shown: Lorentz symmetry breaking gets **worse**, not better, at larger scales...
- ...but only slightly:

$$c_{\text{Lb}}(\ell = 1\text{m}) = \mathcal{O}(1) \times c_{\text{Lb}}(\ell = 10^{-35}\text{m})$$

- still a chance for this theory to work, but seems to be fine-tuned