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Quark mass variations of nuclear forces, BBN, and all that[1]

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In this talk, I discuss the modifications of the nuclear forces due to variations of the light quark masses and of the fine structure constant. This is based on the chiral nuclear effective field theory, that successfully describes a large body of data. The generation of the light elements in the Big Bang Nucleosynthesis provides important constraints on these modifications. In addition, I discuss the role of the anthropic principle in the triple-alpha process that underlies carbon and oxygen generation in hot stars. It appears that a fine-tuning of the quark masses and the fine structure constant within 2 to 3 per cent is required to make life on Earth viable.

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