I postulate next premise:

> An entity cannot "be" or exist unless it is able to fully manifest all of its properties.

This is based on common sense only. I cannot substantiate it by any observation to my knowledge.

It implies that an entity having at least one spatial property requires a minimal amount of space in order to be able to exist. This minimal space requirement is what I mean by the *minimal size* of an entity.

An entity having *mass* has at least two spatial properties: its *Schwarzschild radius* and its *Compton wavelength*. I will compare the *Compton wavelength* with a particle's diameter, so I'll also use the *Schwarzschild diameter*. The *volume* corresponding to the larger of those might be considered the entity's *size* and it would imply fundamental incompressibility to a smaller amount of space.

An electrically charged particle also has a *charge radius*. Then the electron's *minimal size* cannot be zero.

For particles like protons and neutrons, the *Schwarzschild diameter* is negligible with respect to the *Compton wavelength*, and according to quantum mechanics it would even be rather meaningless to consider smaller *distances* than the *Compton wavelength*. This might indicate that a particle's *size* could also be limited by it.

Proton:

mass:	1.672622	e-27	kg
radius:	0.8768	e-15	m
diameter:	1.7536	e-15	m
Compton wavelength:	1.321410	e-15	m
ratio:	1.3271		
density:	5.9239	e+17	kg/m^3
Compton density:	1.384480	e+18	kg/m^3

Neutron:

mass:	1.674929	e-27	kg
radius:	0.8	e-15	m
diameter:	1.6	e-15	m
Compton wavelength:	1.319590	e-15	m
ratio:	1.2		
density:	7.8	e+17	kg/m^3
Compton density:	1.392134	e+18	kg/m^3

Although I have serious doubts regarding electrons (leptons), the *Compton volume* might be the *minimal size* of protons and neutrons (hadrons). The latter would then - as particles by themselves - be fundamentally incompressible to below it. The *Compton density* would then be a upper limit.

Neutronium would then be incompressible to above the *density* of the individual neutrons. Only the inter-particle empty space might be squeezed to nought. Of course protonium cannot exist since protons heavily repel each other by means of the *Coulomb force*.

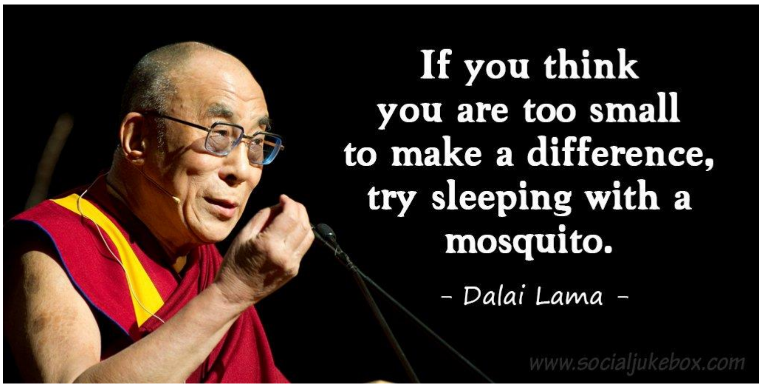
Free neutrons do exist, free quarks have not yet ever been observed. According to the *mass* of a single quark, its *Compton wavelength* would be far larger than the *diameter* of a nucleon. <u>Assuming</u> quarks are smaller than a nucleon (after all, a nucleon consists of three quarks), this would violate the fundamental limit given by the aforementioned *minimal size*. Might this be a reason why free quarks do not exist?

The proton, the electron, and the neutrinos are stable. The free neutron has a *lifetime* of 920 seconds, in a bound state (i.e. in an atomic nucleus) they might last forever, and the muon has 2.2 microseconds. All other particles have *lifetimes* from 52 nanoseconds or far less. This essentially makes nucleons and electrons the only relevant particles of which tangible matter consists.

The neutron is the smallest and densest hadron existing. Induction from this fact only would then yield that a greater *density* be impossible. To me it seems plausible that the *neutron Compton density* is a fundamental *density limit*. Bye bye standard big bang theory as far as the first second is concerned.

The *Schwarzschild radius* of a black hole exceeds its material *radius*. With this *density limit*, the minimal *diameter* of a black hole would be 21.5 km and its *mass* would be 3.64 suns. Bye bye mini black holes, let alone micro black holes.

http://henk-reints.nl/UQ/



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