

# September 2022 Problem of the Month

A sphere with radius  $r_0 = 10^{-18}$  meters fits inside a quark which is currently the smallest particle known. We circumscribe a cube around this tiny sphere. We then circumscribe a sphere around the cube and call its radius  $r_1$ . We then circumscribe a cube around the larger sphere with radius  $r_1$  and then circumscribe a sphere around this cube and call its radius  $r_2$ . We keep repeating the process of circumscribing a cube and then a sphere in that order. The radius of the  $n$ th sphere is defined as  $r_n$ . What is the smallest value of  $n$  where the radius of that sphere is larger than the radius of the observable universe of  $4.4 * 10^{26}$  meters? Please email solutions to Dr London at [slondon@luc.edu](mailto:slondon@luc.edu) in PDF form by 11:59pm on September 30.

