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Different numbers have different personalities, and 8 is one of my favorites. The number 8 plays a special role in mathematics due to the "octonions", an 8-dimensional number system where one can add, multiply, subtract and divide, but multiplication is noncommutative and nonassociative. The octonions were discovered by Hamilton's friend John Graves in 1843 after Hamilton told him about the "quaternions". While much neglected, they stand at the crossroads of many interesting branches of mathematics and physics. For example, superstring theory works in 10 dimensions because 10 = 8+2, where 8 is the dimension of the octonions. Also, the densest known packing of spheres in 8 dimensions occurs when the spheres are centered at certain "integer octonions", which form the root lattice of the exceptional Lie group E8. The octonions also explain the curious way in which topology in dimension n resembles topology in dimension n+8.
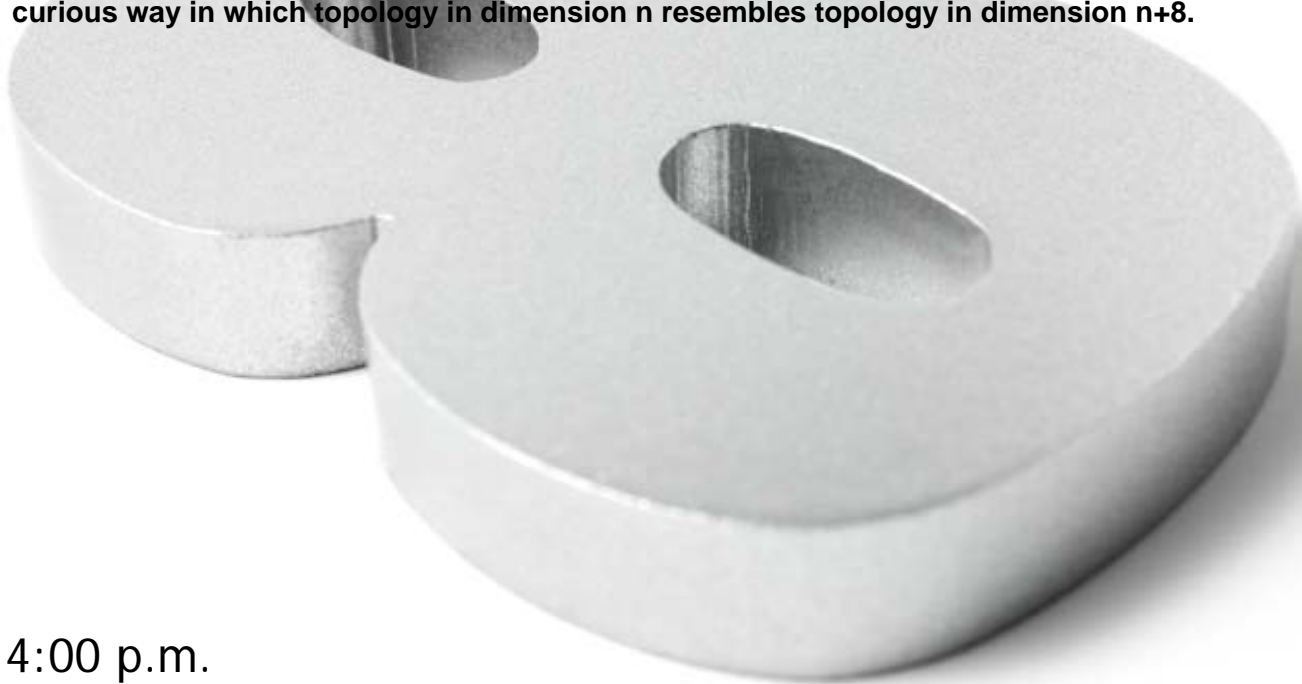
4:00 p.m.
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