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Unraveling the Mechanism of Nanotube Formation by Chiral Self-Assembly of Amphiphiles DGANIT DANINO, Technion - Israel Institute of Technology and the Russell Berrie Nanotechnology Institute — The self-assembly of *nanotubes* from chiral amphiphiles and peptides is still poorly understood. Here, we present the first complete path to nanotubes by chiral self-assembly studied with C_{12}-β_{12}, a tailored molecule designed to have unique hybrid architecture. Using direct-imaging cryo-transmission electron microscopy (cryo-TEM) we show the time-evolution from micelles to closed nanotubes, passing through several types of 1-dimensional (1-D) intermediates such as elongated fibrils, twisted ribbons, and coiled helical ribbons. Scattering and diffraction techniques confirm that the fundamental unit is a monolayer lamella, with the hydrophobic tails in the gel state and beta-sheet arrangement. The lamellae are held together by a combination of hydrophobic interactions, and 2 sets of hydrogen bonding networks. Our data exclusively indicate that twisted ribbons are the precursors for coiled ribbons, and we show this transition is directly linked to the ribbon width. Furthermore, quantitative analysis shows that neither the "growing width" model nor the "closing pitch" model accurately describe the process of nanotube formation, and *both* ribbon width and pitch grow with maturation, maintaining a linear growth in their ratio. We also show that chirality is a key requirement for nanotube formation. References: [1] Ziserman L et al., *J Am Chem Soc* **133(8)**, 2511-2517 (2011) [2] Ziserman L et al., *Phys Rev Lett* **106,** 238105 (2011)

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