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A Novel Class of Helical Nanostructures: Paradigms for their Design and Synthesis Using Imprint Lithography and Carbon Nanotubes
DAVID SMALLING, Undergraduate — This research focuses on the use of solenoid-like configurations which are both microscopic and macroscopic, to make energy conversions between electrical energy and other forms. Numerous conceptual models are to be evaluated for the construction of an environment in which a charged particle could be allowed travel along a helical path of extremely small pitch and comparatively large large radius. The two main types of solenoid designs discussed, are lithographically synthesized solenoids and coiled carbon nano tube solenoids. For future identification the family of structures described will be referred to as Zeta (ζ) Structures. In the case of a ζ solenoid, the objective would be to create a solenoid whose general structure is macroscopic but comprises a conductive trace which is on the nano-scale, In the case of such a solenoid the current flowing I and the magnetic flux B would be related approximately by $B \approx 1.256 \times 10^3 I$. Such a situation gives rise to a very fascinating relationship between B and I. This means that if a current of say 1 ampere was made to flow through the solenoid, a magnetic flux of 1250 Tesla would be generated. The defining characteristic of ζ structures is their overall macroscopic dimensions which comprise high level nano-scale repetition. This research discusses theoretical propositions for the development of a class sub micron structures defined by a unique helical foundation, to be used for the generation of magnetic fields.

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