

# B I - C O M A T H E M A T I C S C O L L O Q U I U M

**Herman Gluck**

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*“How Much Must You Bend a  
Rope to Tie a Knot?”*

**Monday, September 18, 2017**

Talk at 4:00 – Park 338

Tea at 3:30 – Park 339, Math/Physics Lounge

**Abstract:**

The curvature  $k$  of a smooth curve in 3-space is by definition non-negative, and its integral with respect to arc length is called the total curvature of the curve.

According to Fenchel's Theorem, the total curvature of any simple closed curve in Euclidean 3-space is at least  $2\pi$ , with equality if and only if it is a plane convex curve.

According to the Fary–Milnor Theorem, if the simple closed curve is knotted, then its total curvature is strictly greater than  $4\pi$ .

In this talk, I will say a few words about Fenchel's Theorem, indicate one proof of the Fary–Milnor Theorem, and then discuss generalizations about knots in 3-space, knotted surfaces in 4-space, and knotted  $n$ -manifolds in  $N$ -space.

At the end, I will state what I regard as the fundamental direction for further study.

**BRYN MAWR COLLEGE**