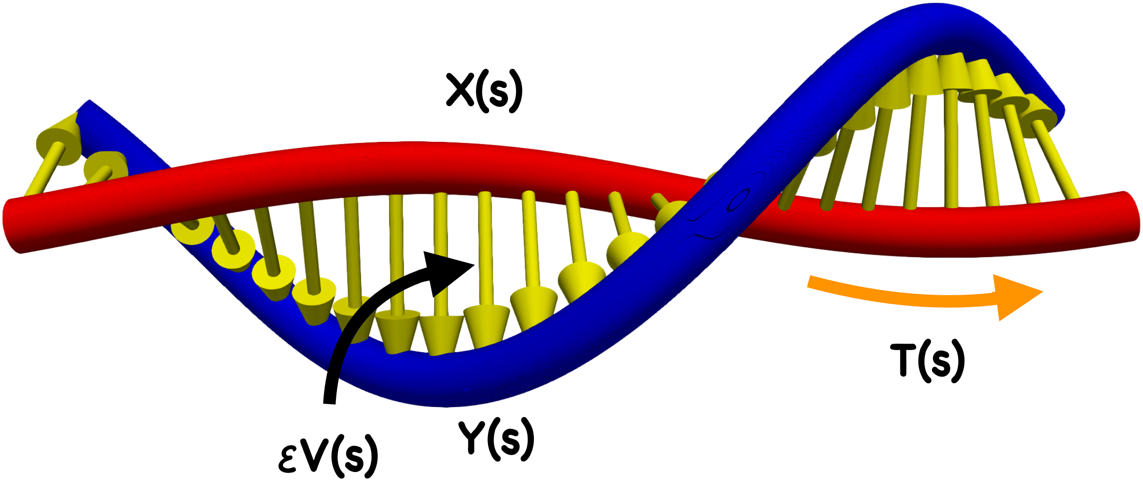
There are three geometrically distinct
ways of storing Helicity—or
winding vortex field-lines—in vortex tubes



X(s)
T(s)
εV(s)
Y(s)

# Twist

$$\mathcal{T} = \frac{1}{2\pi} \int \mathbf{T} \cdot \mathbf{V} \times \frac{\mathrm{d}V}{\mathrm{d}s} \mathrm{d}s$$

$$\mathcal{T} = \frac{1}{c}\int \frac{J_{\|}}{|\mathbf{B}|}\mathrm{d}s$$

# B

# Parallel Current Integral

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B

# Twist

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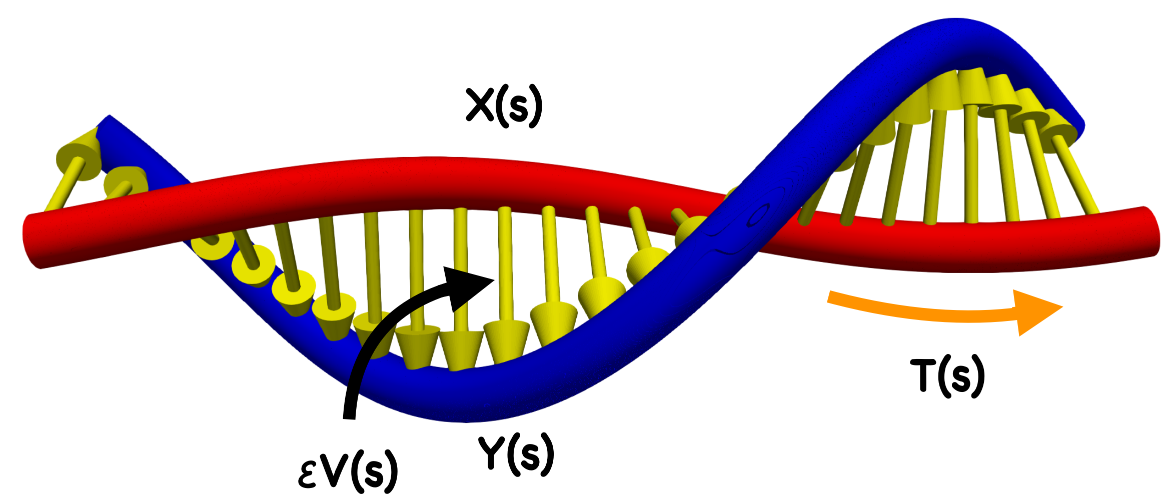
Parallel Current Integral

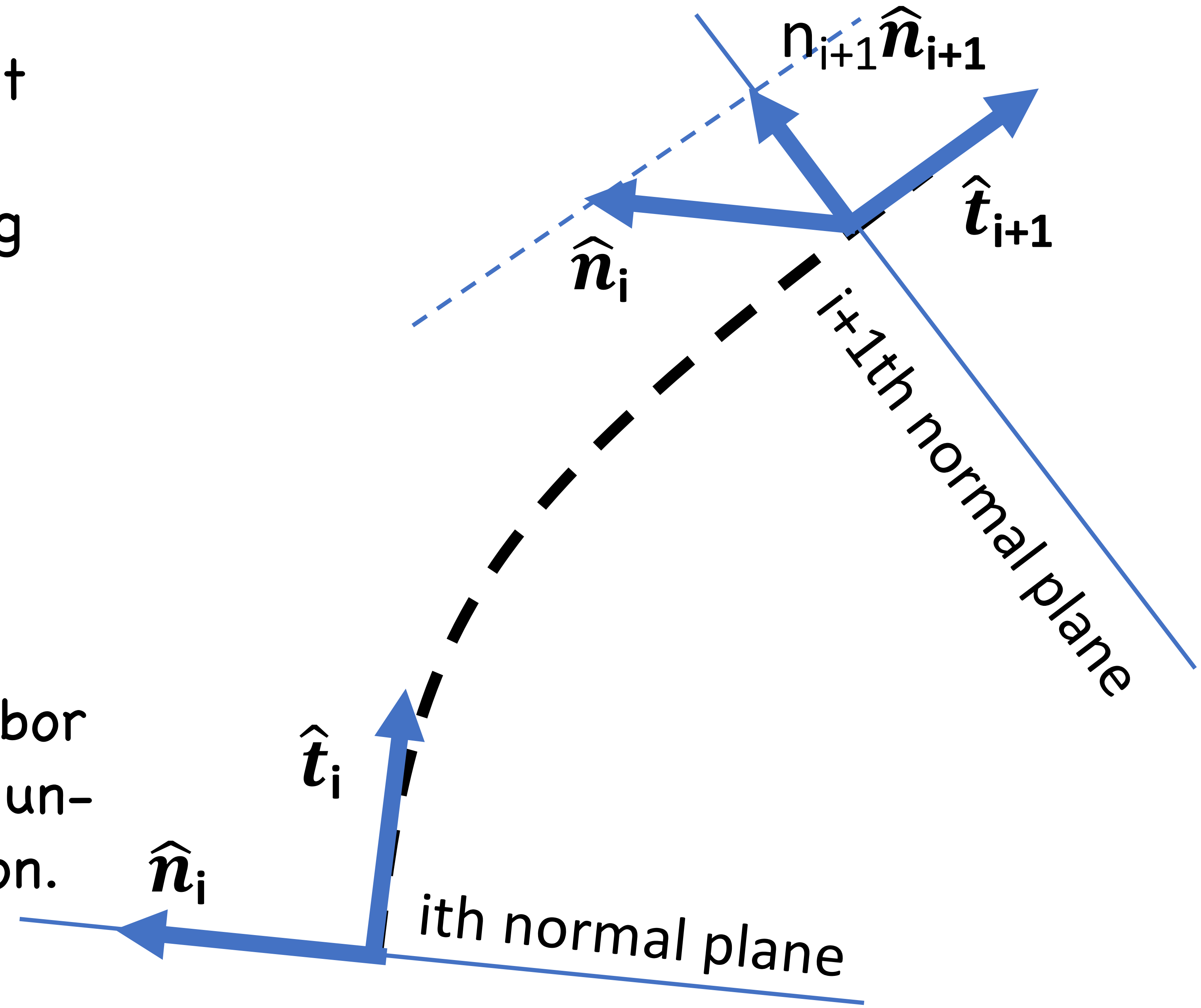
$$\mathcal{T} = \frac{1}{c}\int \frac{J_{||}}{|\mathbf{B}|}\mathrm{d}s$$




$$\mathcal{T} = \frac{1}{2\pi}\int \mathbf{T}\cdot\mathbf{V}\times\frac{\mathrm{d}V}{\mathrm{d}s}\mathrm{d}s$$

# New Twist

- First: define what is un-twist
  - using an un-spin co-moving frame.
    - $e_x$: $\mathbf{t} \cdot \partial \mathbf{n} / \partial s = 0$
    - $e_y$: $\mathbf{n}' = \mathbf{n} \times \mathbf{t}$
- The interaction of the neighbor field lines on the co-moving un-spin frame define the rotation.




Malanushenko & Longcope (2009)