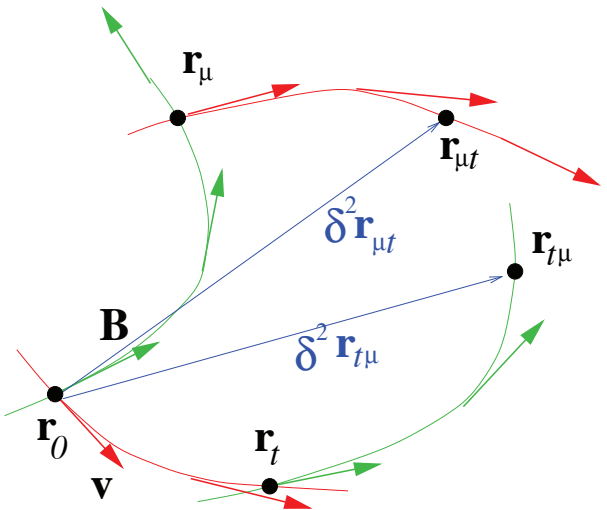
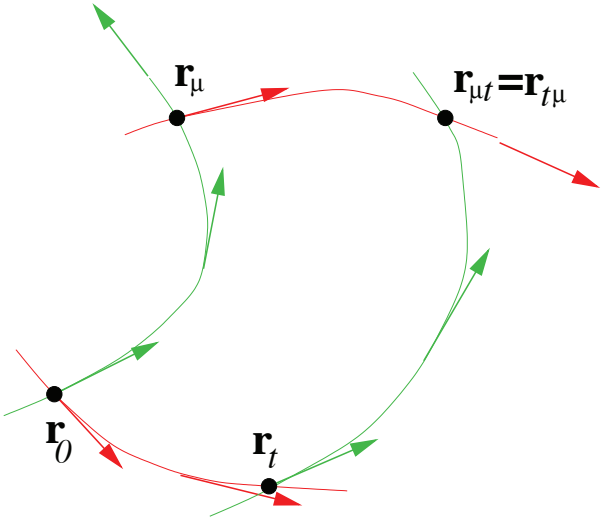
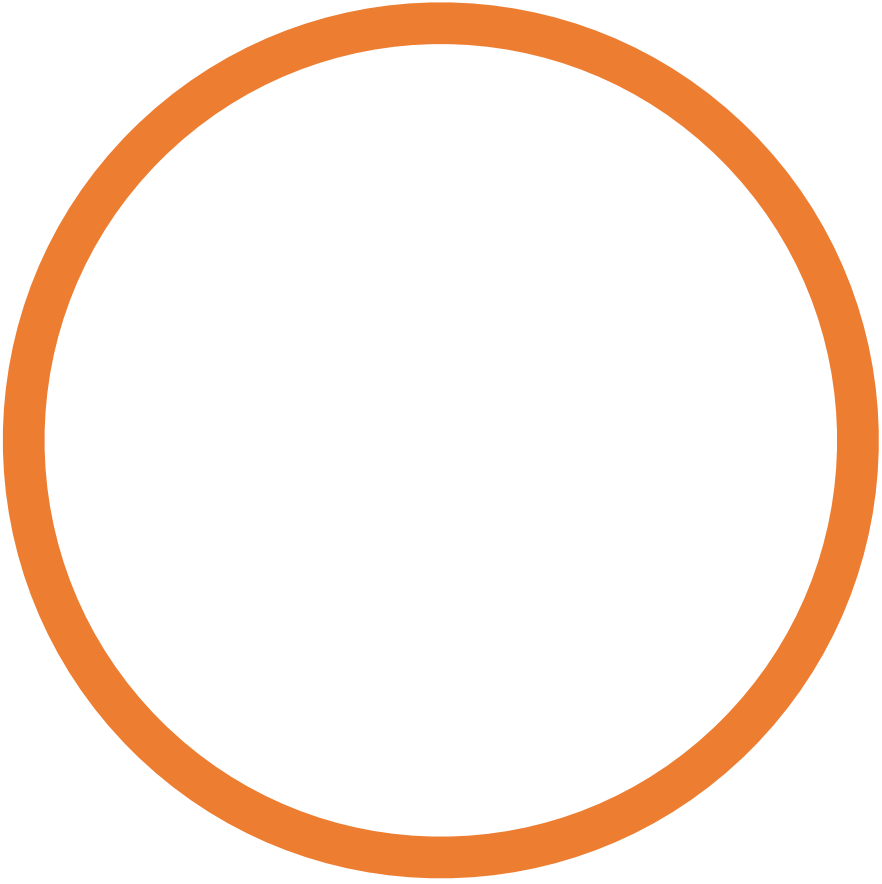
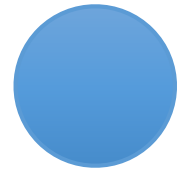

$\mathbf{r}_\mu$
$\mathbf{r}_{\mu t}$
$\delta^2\mathbf{r}_{\mu t}$
$\mathbf{r}_{t\mu}$
$\mathbf{B}$
$\delta^2\mathbf{r}_{t\mu}$
$\mathbf{r}_0$
$\mathbf{r}_t$
$\mathbf{v}$

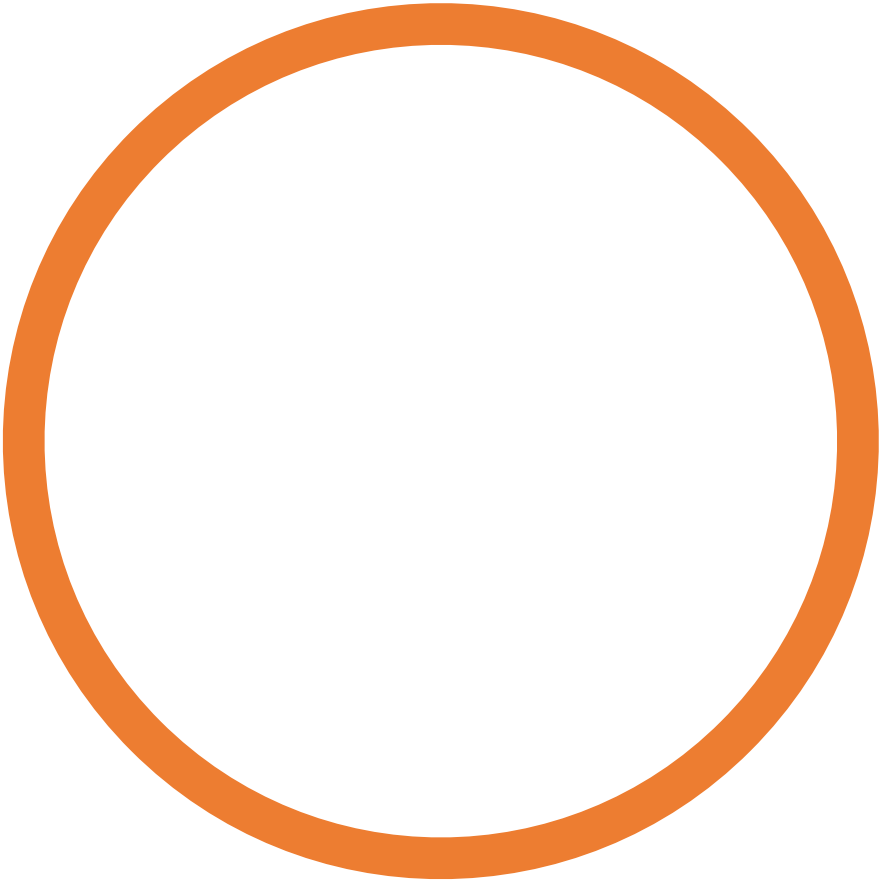

$\mathbf{r}_\mu$
$\mathbf{r}_{\mu t}=\mathbf{r}_{t\mu}$
$\mathbf{r}_0$
$\mathbf{r}_t$

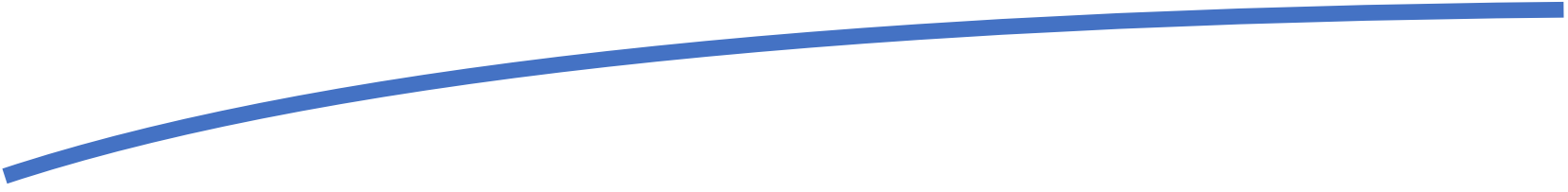
# Frozen field lines

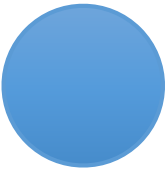
$$\phi \sim \int \mathcal{E}_{||} \mathrm{d}s$$

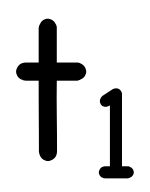


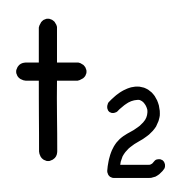






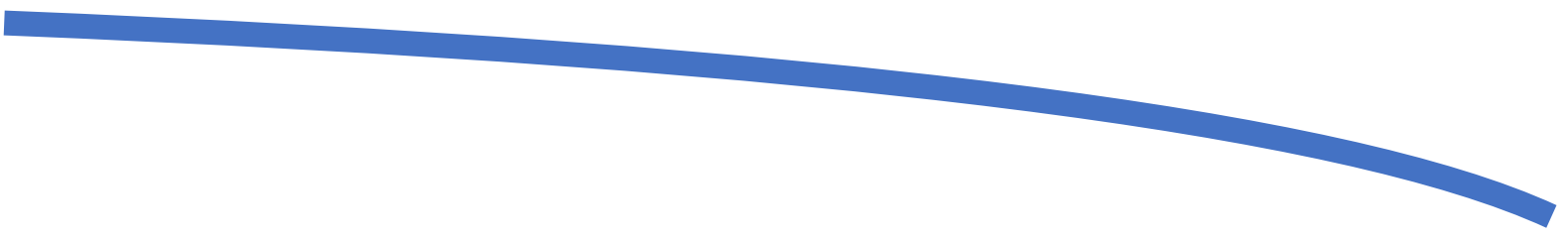


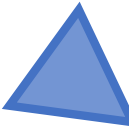




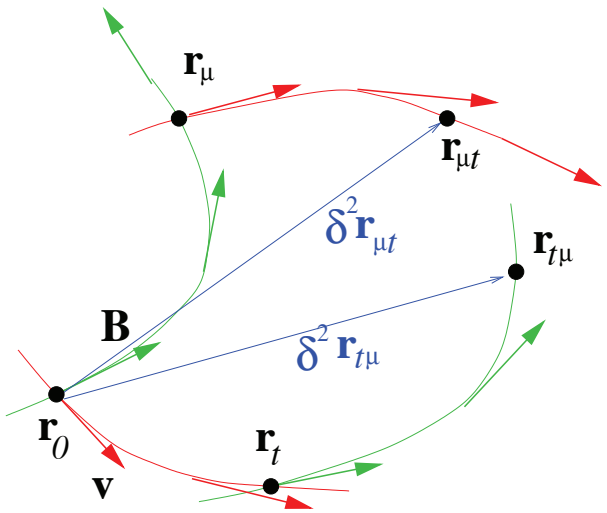
# Schindler & Hesse 1988

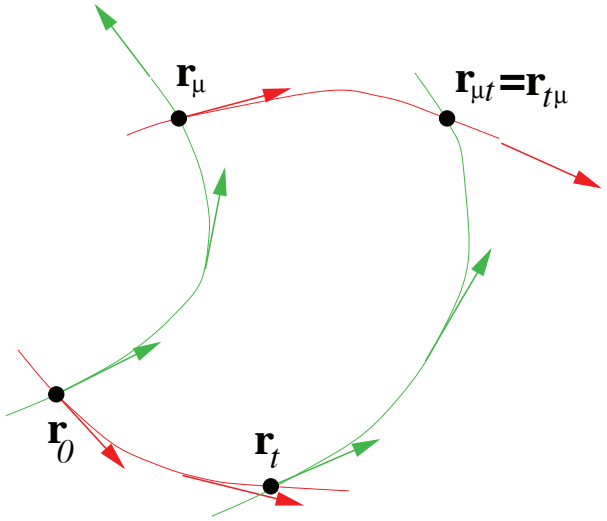
# Apparent Motion

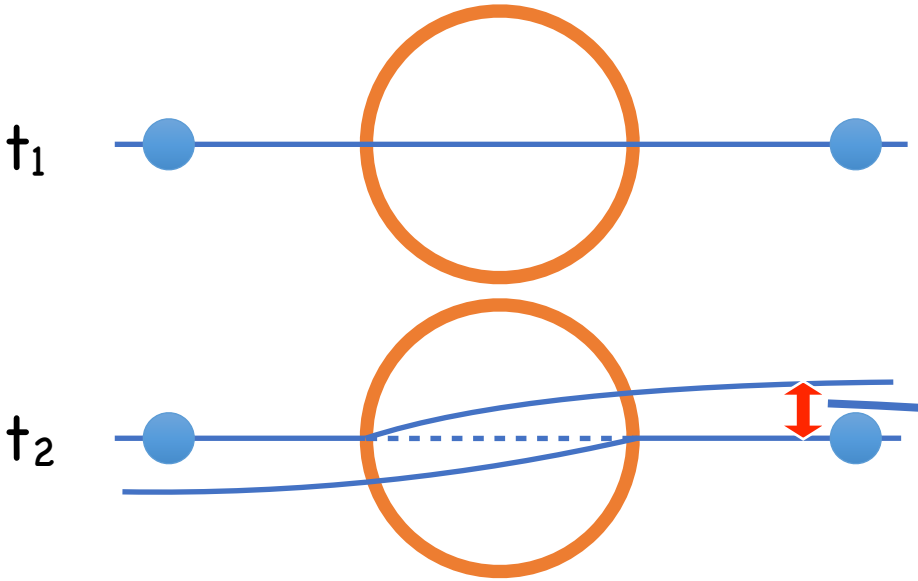




# Frozen field lines



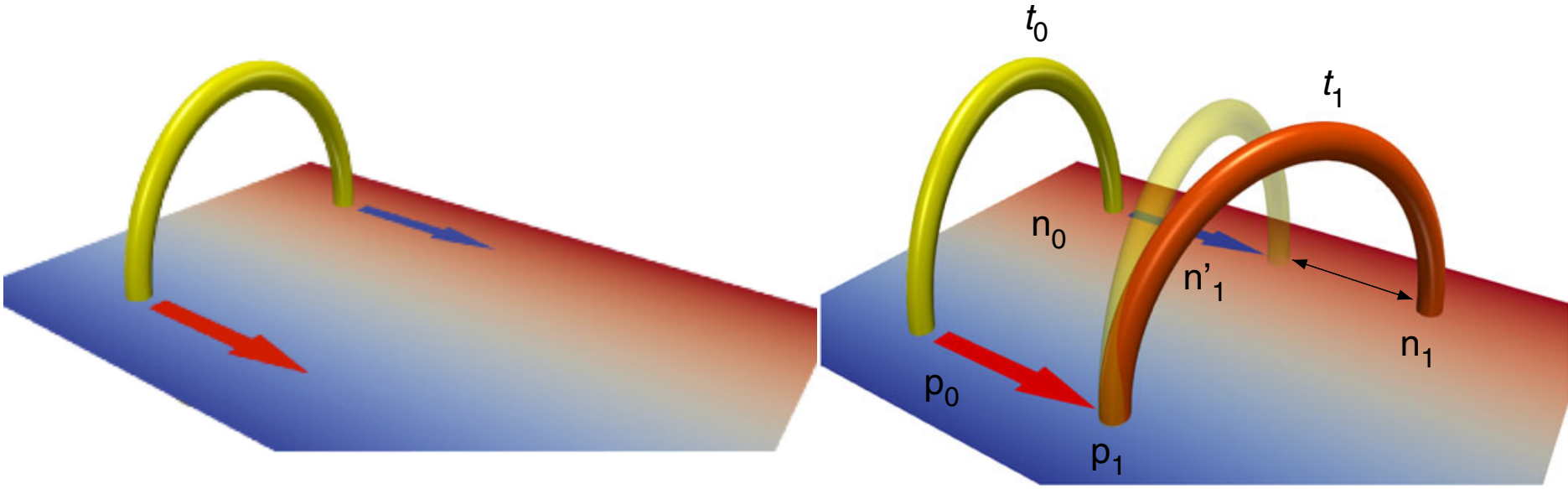




$$\dot{\phi} \sim \int \mathcal{E}_{\parallel} \mathrm{d}s$$

Apparent Motion

Schindler & Hesse 1988

# Measuring the non-ideal motion




$$\mathbf{x}_{n0} \xrightarrow{\mathbf{B}_0} \mathbf{x}_{p0} \xrightarrow{\mathbf{V}} \mathbf{x}_{p1} \xrightarrow{\mathbf{B}_1} \mathbf{x}_{n1}$$

$$V_s(\mathbf{x}_{n1}) = \lim_{\delta t \to \infty} \frac{|\mathbf{x}_{n1} - \mathbf{x}_{n'1}|}{\delta t}$$