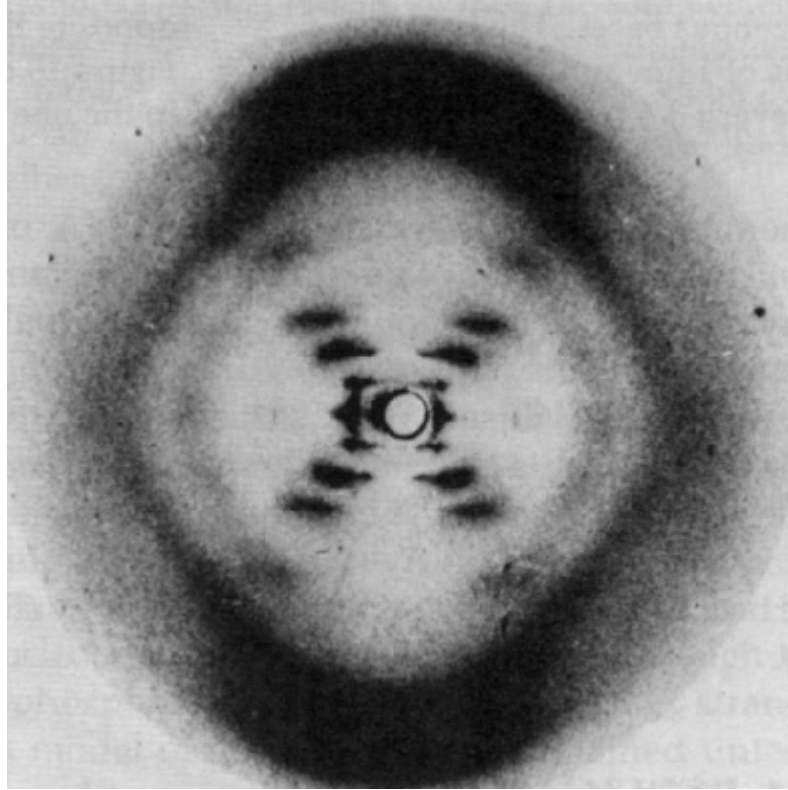


## Simulating the DNA Diffraction Pattern

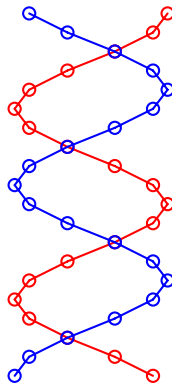


Sugar-phosphate groups per strand:  $A := 20$  Strand radius:  $R := 1$  Phase difference between strands:  $0.8 \cdot \pi$

First strand:  $m := 1..A$   $\Theta_m := \frac{4 \cdot \pi \cdot m}{A}$   $y_m := m$   $x_m := R \cdot \cos(\Theta_m)$

Second strand:  $m := 21..40$   $\Theta_m := \frac{4 \cdot \pi \cdot (m - A)}{A}$   $y_m := (m - A)$   $x_m := R \cdot \cos(\Theta_m + .8 \cdot \pi)$

$m := 1..20$   $n := 21..40$

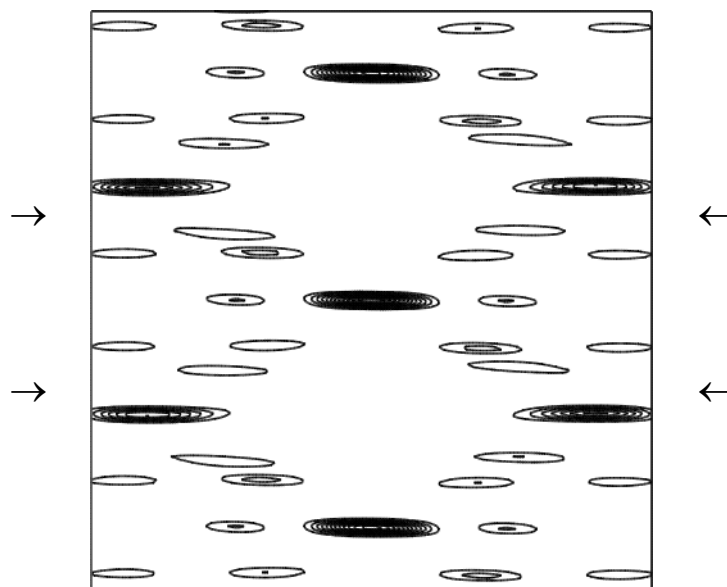


Coordinate space wave function:  $|\Psi\rangle = \frac{1}{\sqrt{N}} \sum_{i=1}^N |x_i, y_i\rangle$

Momentum space wave function:  $\Phi(p_x, p_y) := \frac{1}{2 \cdot \pi} \sum_{m=1}^{40} \exp(-i \cdot p_x \cdot x_m) \cdot \exp(-i \cdot p_y \cdot y_m)$

$\Delta := 8$      $N := 200$      $j := 0..N$      $p_{x_j} := -\Delta + \frac{2 \cdot \Delta \cdot j}{N}$      $k := 0..N$      $p_{y_k} := -\Delta + \frac{2 \cdot \Delta \cdot k}{N}$

DiffractionPattern $_{j,k} := \left( \left| \Phi(p_{x_j}, p_{y_k}) \right| \right)^2$



DiffractionPattern