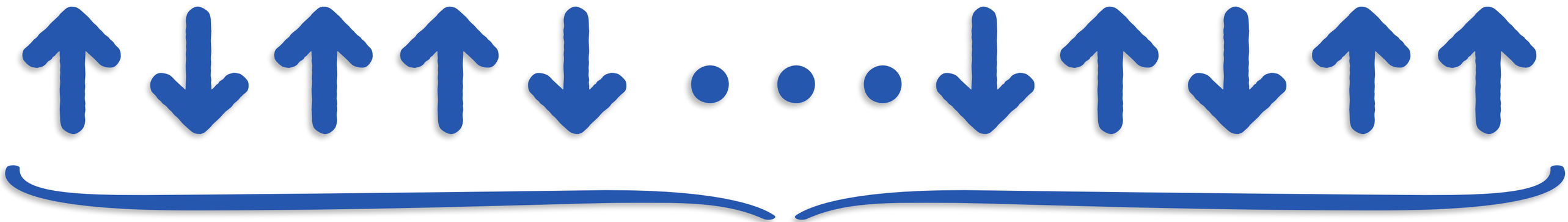
Jack Y. Araz

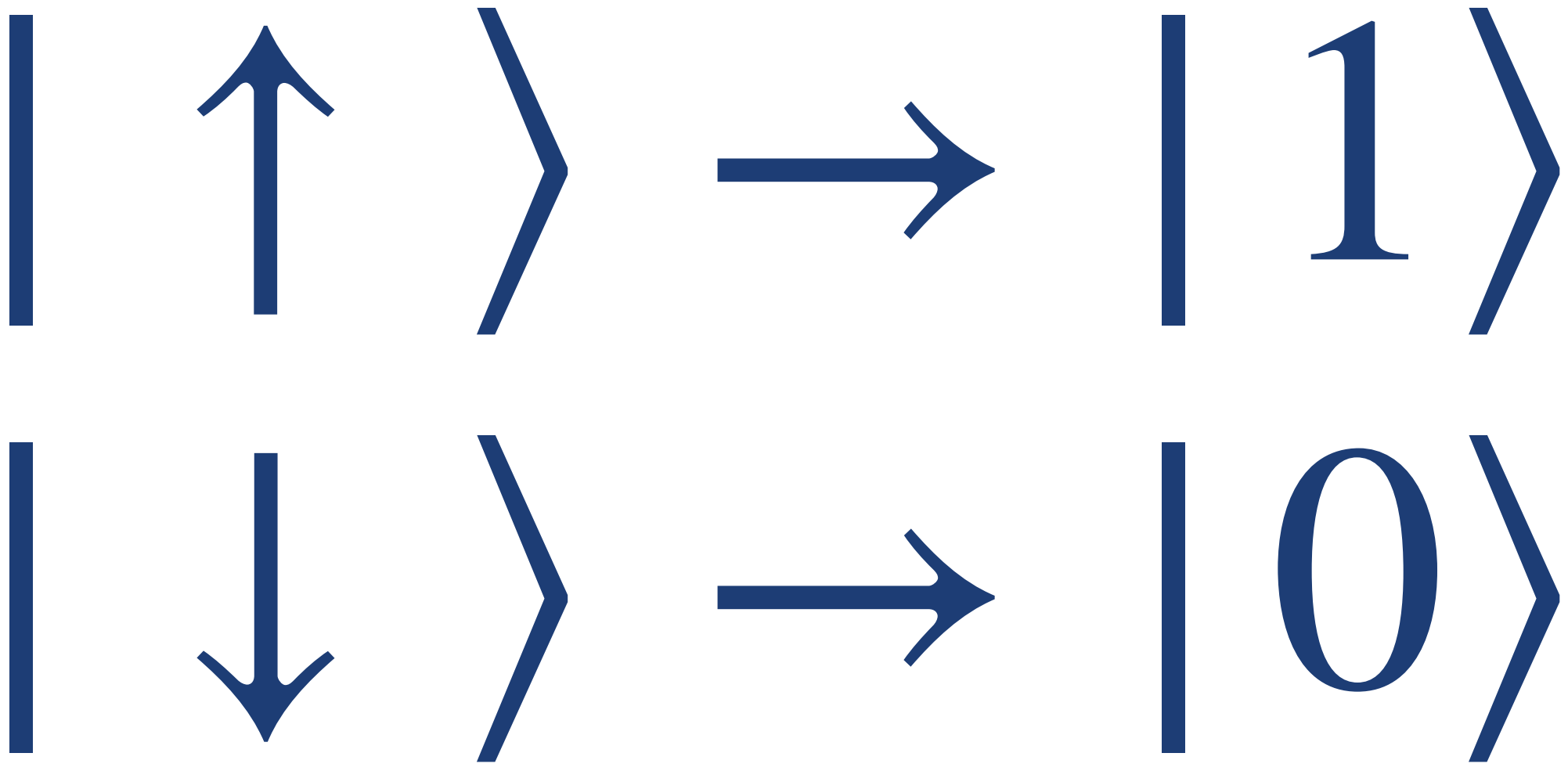
17


OLD DOMINION UNIVERSITY
1930

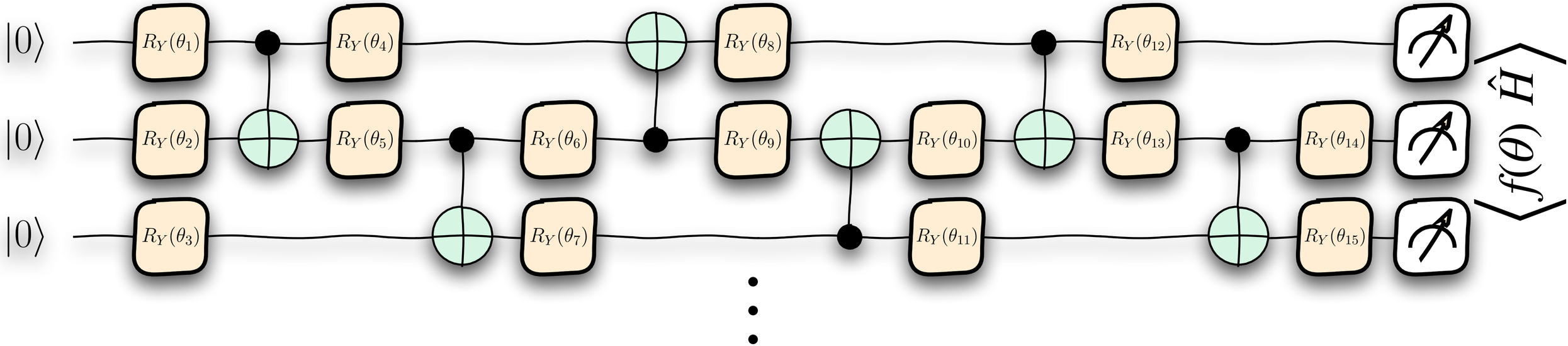

Jefferson Lab
EXPLORING THE NATURE OF MATTER



System of electrons with
spin up or down
What's it natural form?


|↑⟩ → |1⟩
|↓⟩ → |0⟩

We can only simulate systems with “short” range entanglement on a classical computer!

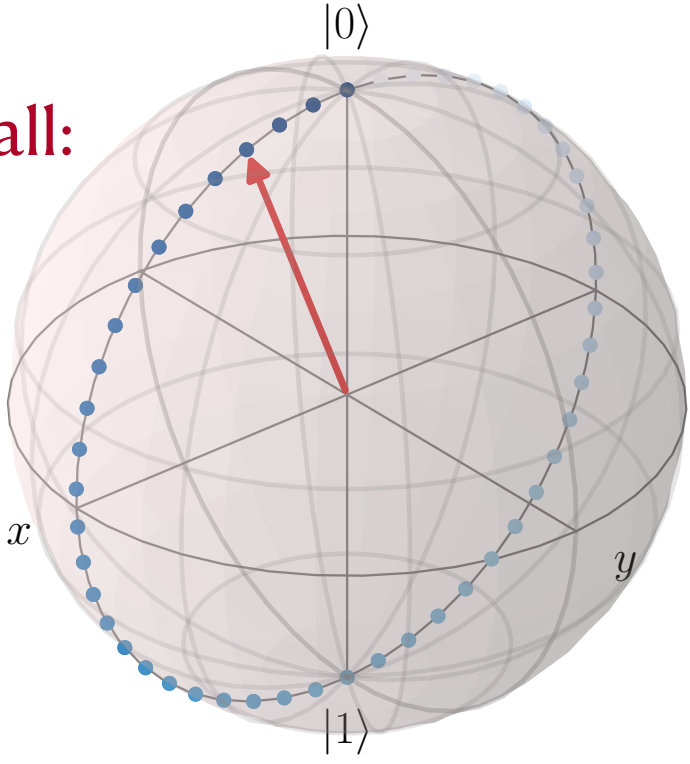

$|0\rangle$
$|0\rangle$
$|0\rangle$
$R_Y(\theta_1)$
$R_Y(\theta_2)$
$R_Y(\theta_3)$
$R_Y(\theta_4)$
$R_Y(\theta_5)$
$R_Y(\theta_6)$
$R_Y(\theta_7)$
$R_Y(\theta_8)$
$R_Y(\theta_9)$
$R_Y(\theta_{10})$
$R_Y(\theta_{11})$
$R_Y(\theta_{12})$
$R_Y(\theta_{13})$
$R_Y(\theta_{14})$
$R_Y(\theta_{15})$
$\langle f(\theta)\ \hat{H} \rangle$

$$\rightarrow \min_{\theta} \langle f(\theta)\hat{H} \rangle$$

The "Hamiltonian", $\hat{H}$, describes the dynamics of a quantum system

Update rotation angles

Recall:



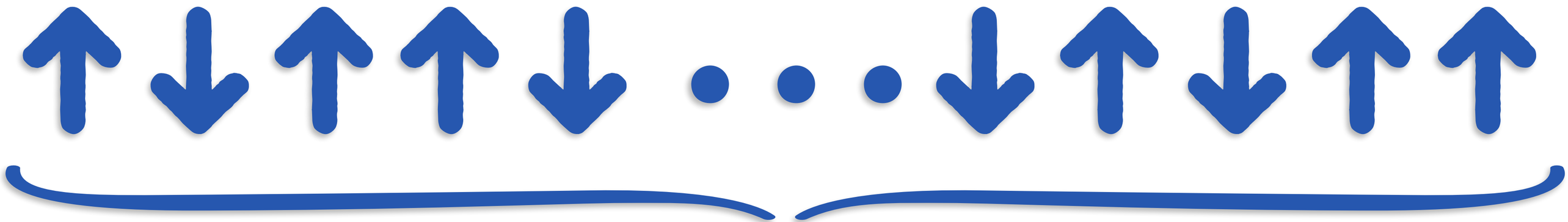
Update rotation

angles

Ground state:

$$|\,\mathrm{gs}\rangle \rightarrow \hat{H}\,|\,\mathrm{gs}\rangle = E_{\mathrm{gs}}\,|\,\mathrm{gs}\rangle$$

18



System of electrons with
spin up or down
What's it natural form?