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自旋（简介）

各个年龄段的人，都觉得陀螺和陀螺仪等快速旋转物体的行为很令人着迷，它们似乎可以抵抗重力。随着自转速度的增加，改变它们的转动方向将会变得很困难。自转物体被推动的过程中，在与推动方向相垂直的方向上会发生一种神奇的响应。孩子们对这样的现象乐此不疲，这些特性也对骑自行车的人有帮助。而对于工程师而言这些特性则非常有用，例如陀螺仪可以用来帮助飞机和航天器保持正确的航线。

地球也在自转。地球的自转使得昼夜交替，驱动着风和天气的变换循环往复，生生不息。

在量子世界中，自旋是基本粒子有别于宏观可见旋转的基本属性之一。电子自旋永不停止，这使电子变成了微小的、像地球一样的磁铁。电子自旋的方向可以用来存储信息。“ 1”和“ 0”这样两个信息可以用两个相反的自旋方向进行编码。传统的计算机使用大量大致排列整齐的电子，粗略地完成了这一工作。我们希望，最终能够将单个电子自旋用于计算机编码。如果能够轻松地操控电子自旋，我们将获得新的能力，即更快地处理信息，同时产生的热量更少。

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Art Topic: Spin

People of all ages find the behavior of rapidly rotating objects, such as tops and gyroscopes, fascinating. They can seem to defy gravity. As their spin increases, they get harder to re-orient, and they show strange “sideways” responses to being pushed. These effects are entertaining to children, helpful to bicyclists, and useful to engineers. Gyros help to keep airplanes and spacecraft on course.

The Earth’s spin gives us night and day, and those cycles drive wind and weather.

In the quantum world, spin is a basic property of elementary particles. Electrons never cease spinning. This makes electrons into tiny magnets, like the earth. We can store information in the direction of electron spins, with two opposite directions encoding “1” and “0”. Classical computers do this crudely, using many electrons that are roughly aligned. Eventually, we hope, computers will use individual electron spins. If we can learn to manipulate electron spins skillfully, we will gain new powers to process information much faster, while producing less heat.

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