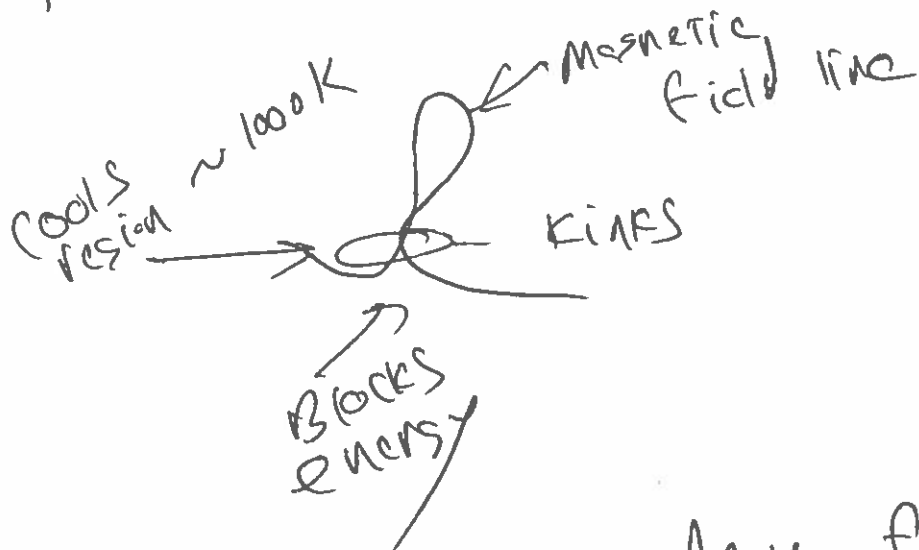


Geomagnetism

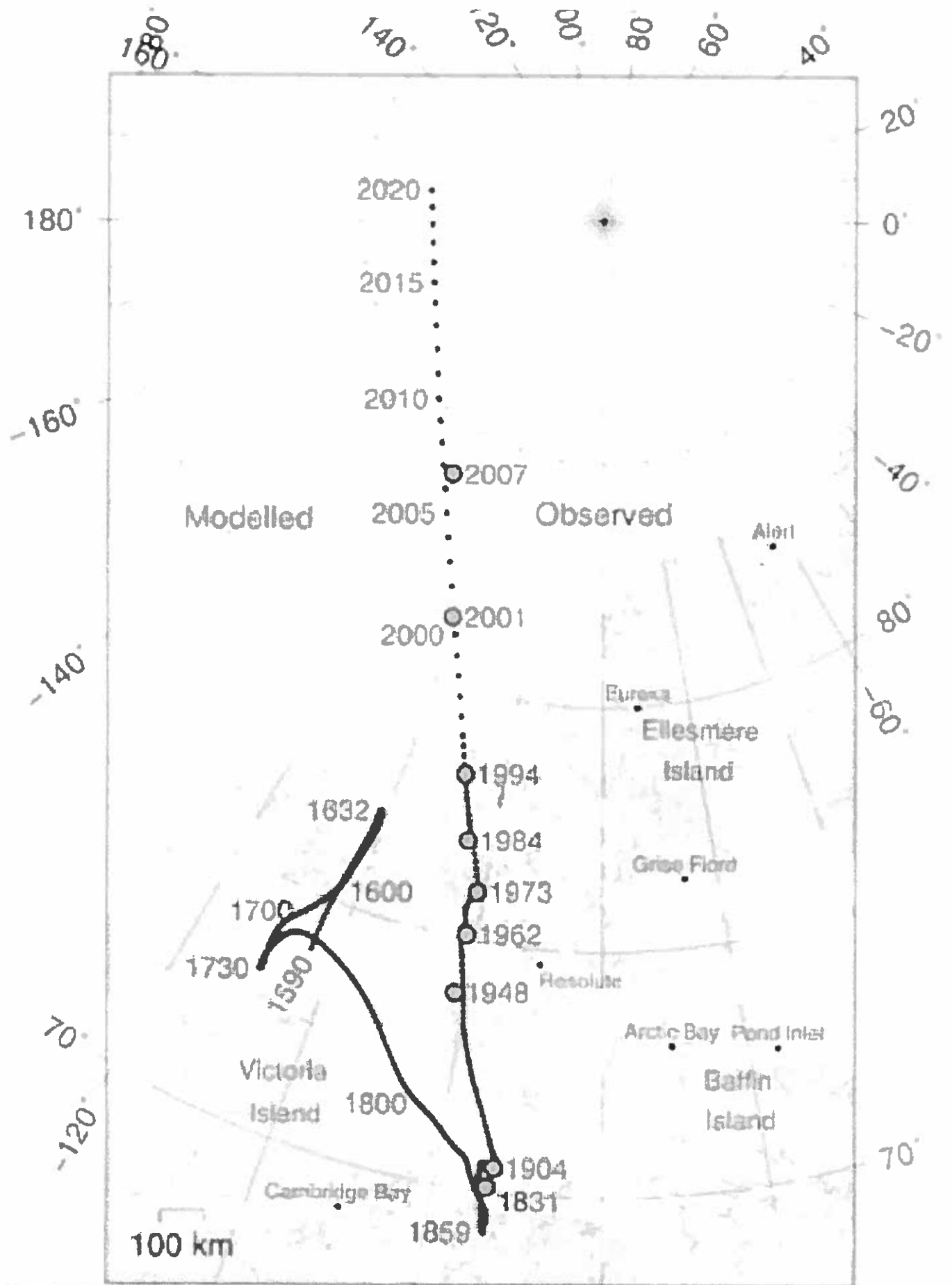
Earth due to its rotation about its own axis creates currents in its liquid outer Iron core

These currents create the Earth's magnetic field.

Currently the Earth's South magnetic pole (field lines enter South magnetic pole) is in Northern hemisphere and it moves!

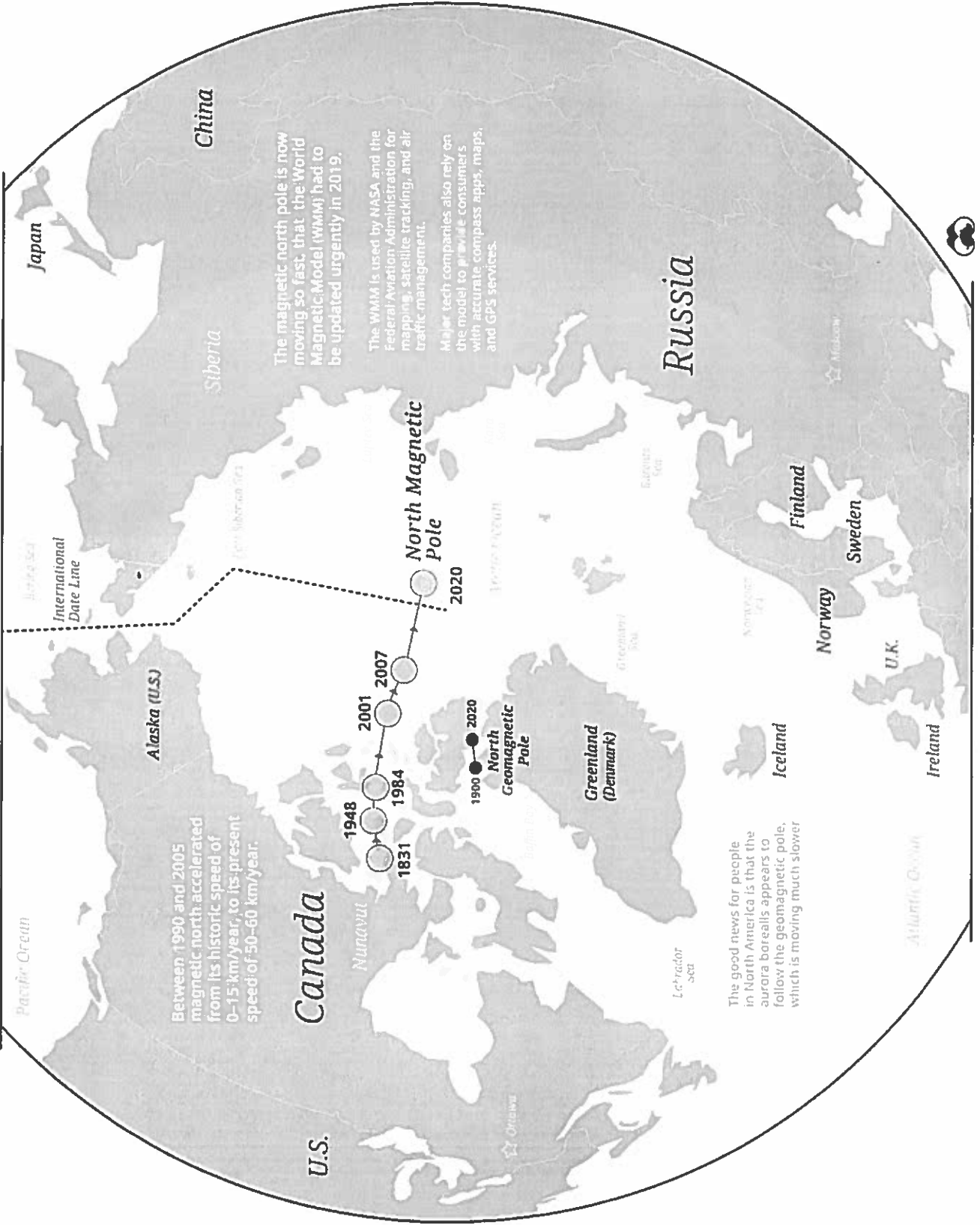


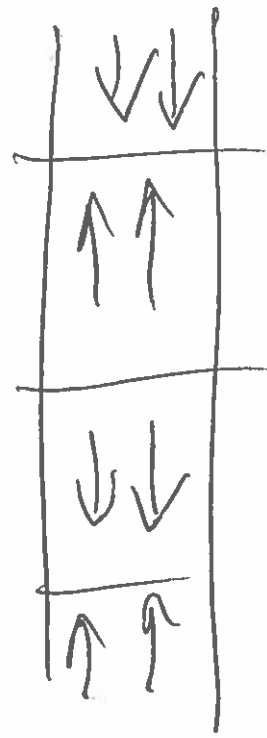
Experiment in Sydney Fish Bank





THE NORTH POLE IS MOVING TO RUSSIA





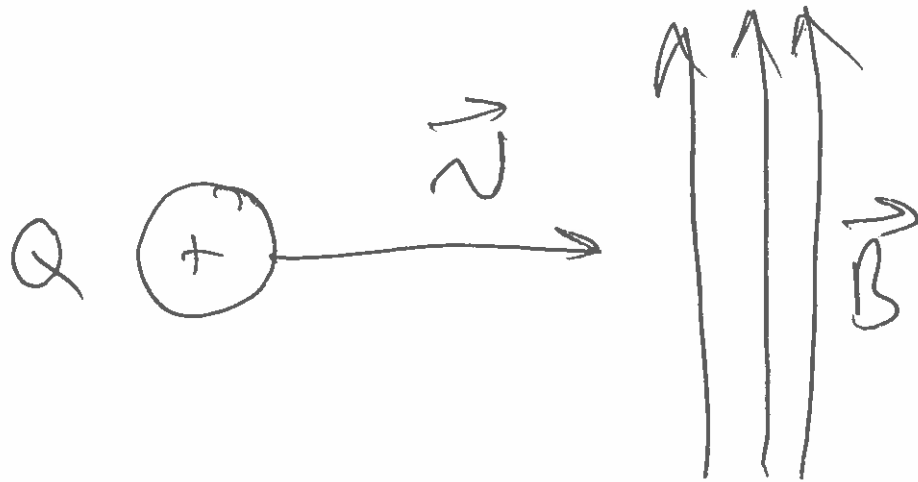
- Magnetic field

Sun reverses magnetic
polarity ~ every 11 years

Earth reverses on
order of few
hundred thousand
years.

Rock core
sample

Magnetic force created by a magnetic field acting on a charged particle.



$$\vec{F}_B = Q \vec{v} \times \vec{B}$$

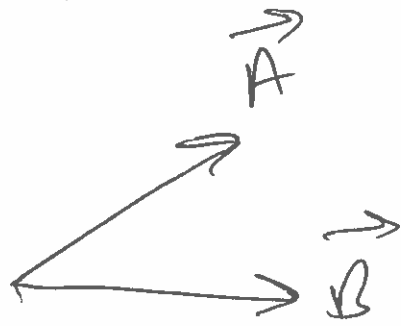
$$|\vec{F}_B| = Q |\vec{v}| |\vec{B}| \sin \theta_{vB}$$

Here $\theta_{vB} = 90^\circ$ $\sin 90^\circ = 1$

Use RT hand Rule to get

Direction \vec{F}_B points out of paper \odot

RT Hand Rule



$$\vec{C} = \vec{A} \times \vec{B}$$

Points \otimes into paper

MUST remember The result of a cross product must point perpendicular to the plane formed by the two vectors crossing.

$$\vec{D} = \vec{B} \times \vec{A} \quad \text{Points } \odot \text{ out of paper}$$

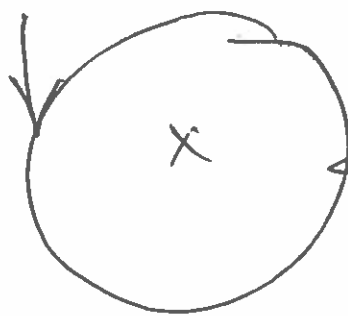


$$\vec{G} = \vec{E} \times \vec{F} \quad \text{Points?}$$

$$|\vec{G}| = |\vec{E}| |\vec{F}| \sin \theta_{EF} = |\vec{E}| |\vec{F}| \underbrace{\sin(180)}_{=0}$$

Cross product of parallel vectors = 0!

$F \Rightarrow$ Get rotation



$F \Rightarrow$ No rotation

Apply force to outside circle

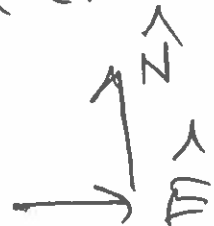
$$\vec{\tau} = \vec{r} \times \vec{F}$$

e^- moving 100 M/s \hat{E} $\vec{B} = 10 T \hat{N}$

$$\vec{F} = ?$$

$$\vec{F} = q \vec{v} \times \vec{B} = -(1.6 \times 10^{-19} C) (100 M/s \hat{E}) \times (10 T \hat{N})$$

$$|\vec{F}| = 1.6 \times 10^{-16} N \otimes$$



$\vec{v} \times \vec{N} \Rightarrow \odot$
but - sign reverses!