

# ON PARTICLE ACCELERATION BY LIGHTNING

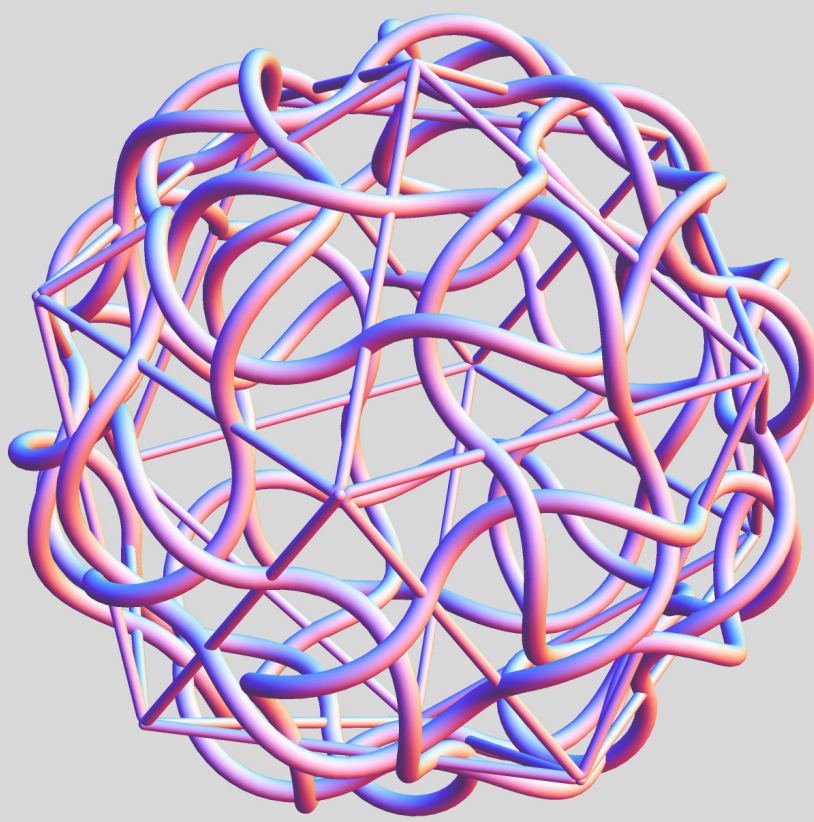


Photo series by **Oliver Francks**  
Bad Hindelang, Germany,  
13 August 2009  
Exposuretime 25 seconds

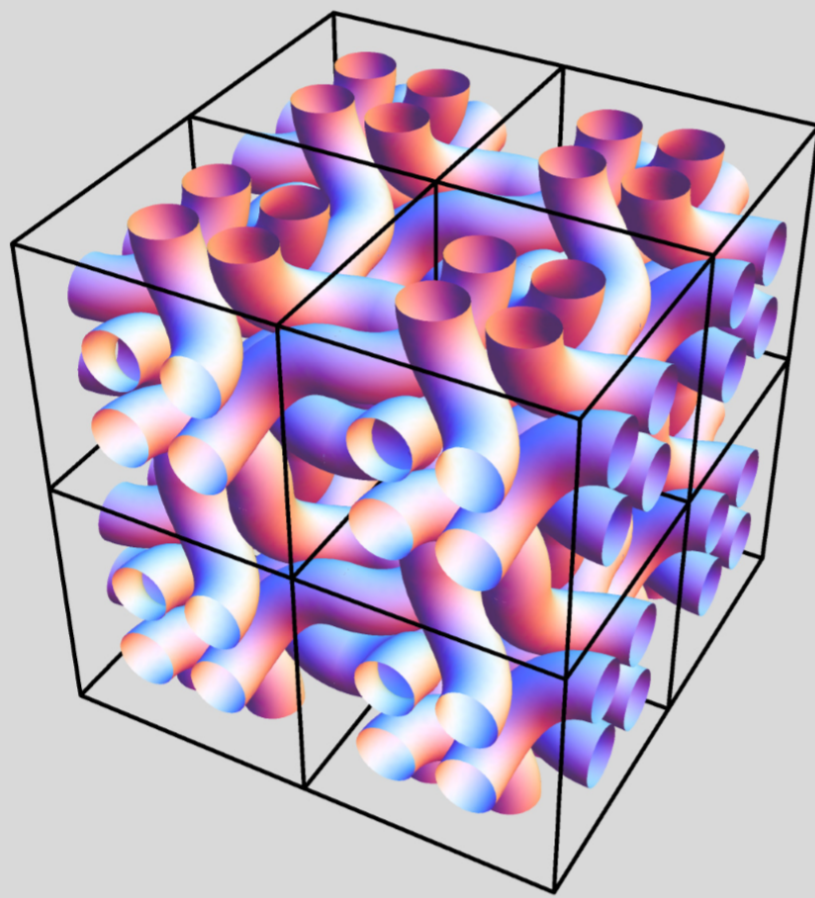
22:04:44

22:04:19

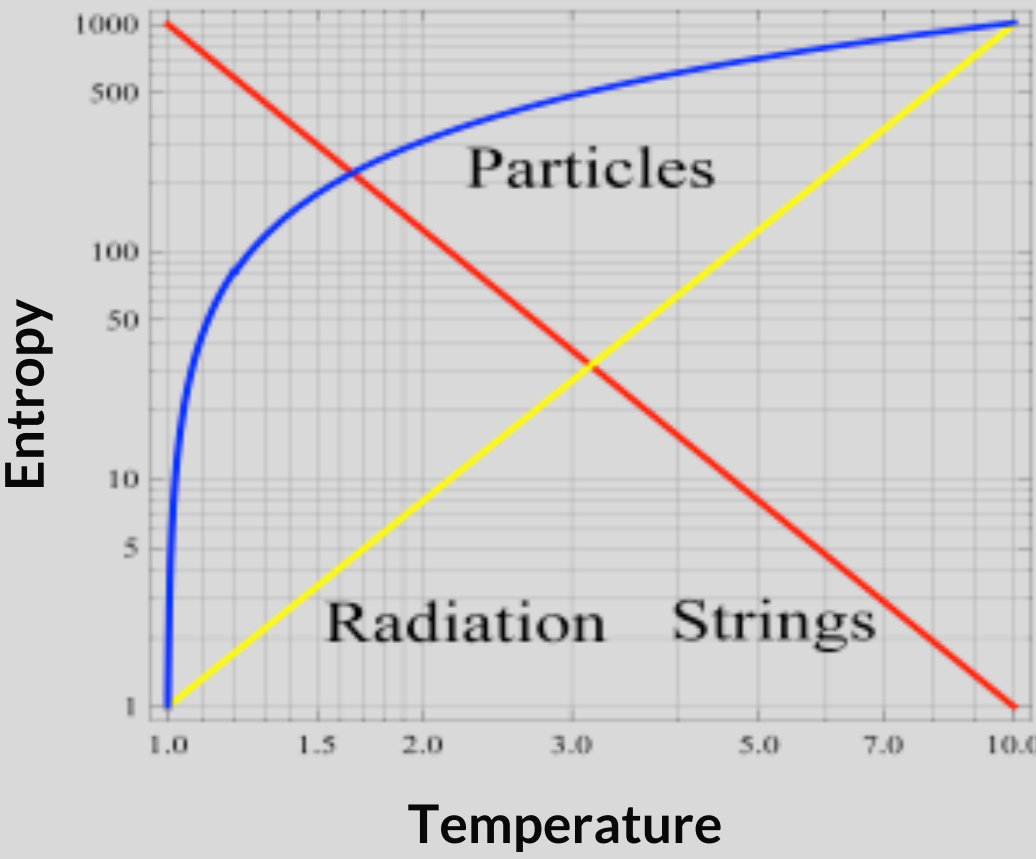
Fireball track



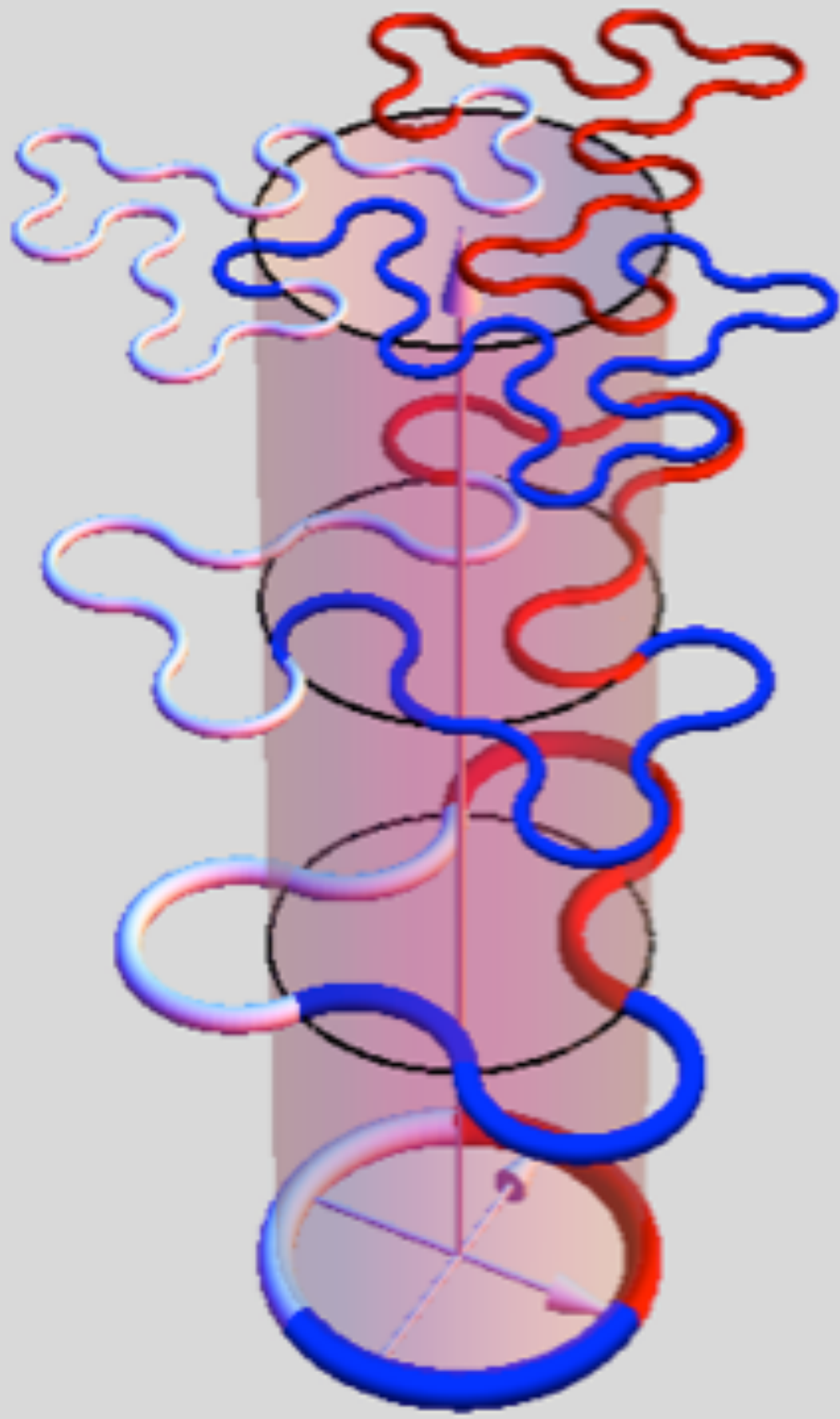
Regular ring link



Chiral cube grid

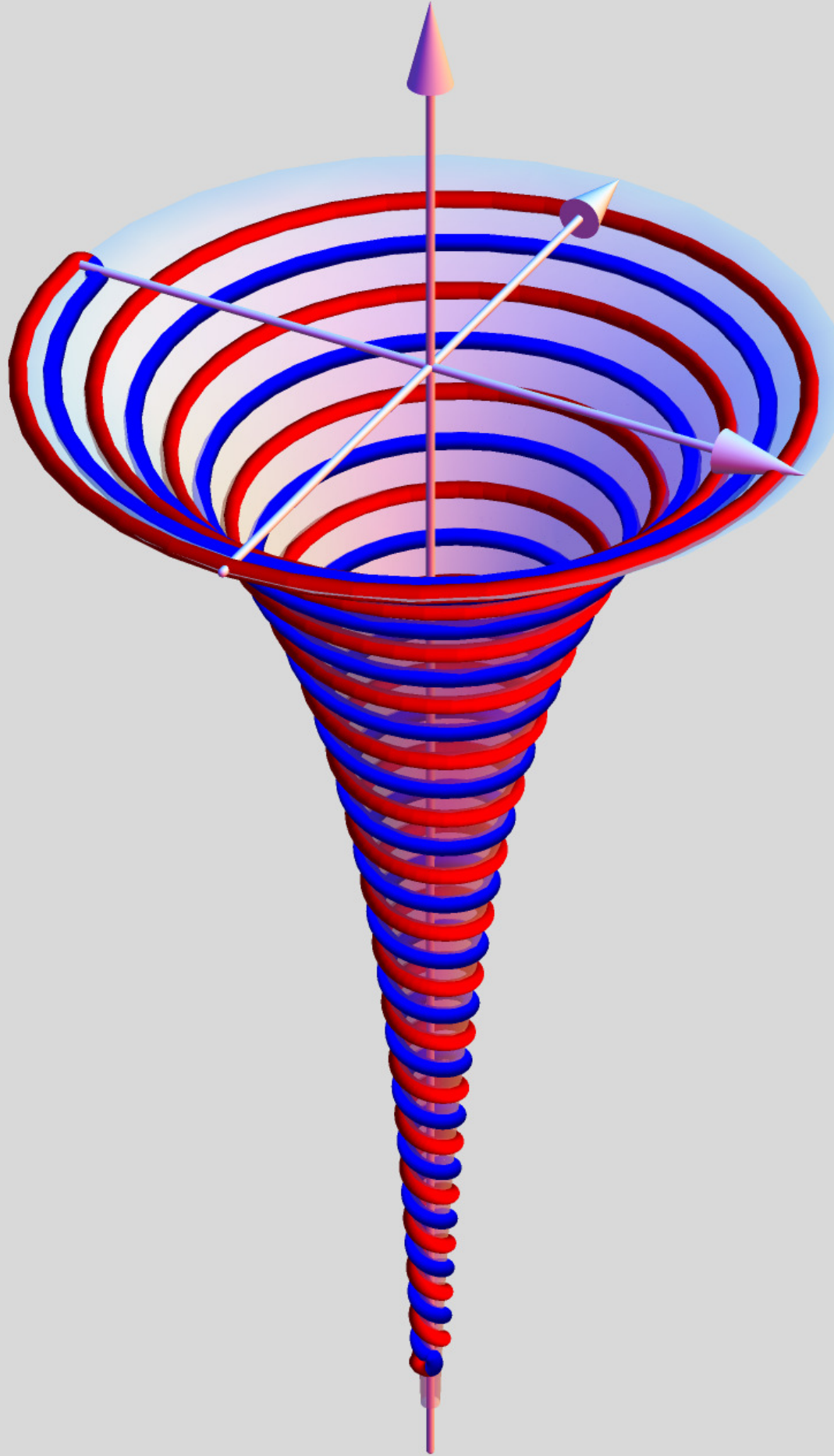


Particle energy follows loop  
length by plasma circulation  
in quantum liquid



**Peano process**  
scales chiral loop to infinite  
length on finite area

Lightning leader winds  
flux loop around  
pseudosphere channel



**Huygens tractrix**  
gives pseudosphere a  
finite area and volume

Kashiwazaki-Station Japan



**Radioactive flash**

Photonuclear  
reactions, positron  
emission, electron-  
positron annihilation

**DEUTERIUM FUSION**



**Convectron Natural  
Fusion N.V.**  
Rotterdam

**LET ENERGY INDEPENDENCE COME FROM GEOPHYSICS... IN EUROPE!**

**State law**

Entropy

$$\frac{V}{T^3}$$
$$VT^3$$
$$\log(VT^{3/2})$$

**Fundamental law**

System

Entropy

**Strings**  $U^{3/2}V^{1/2}$

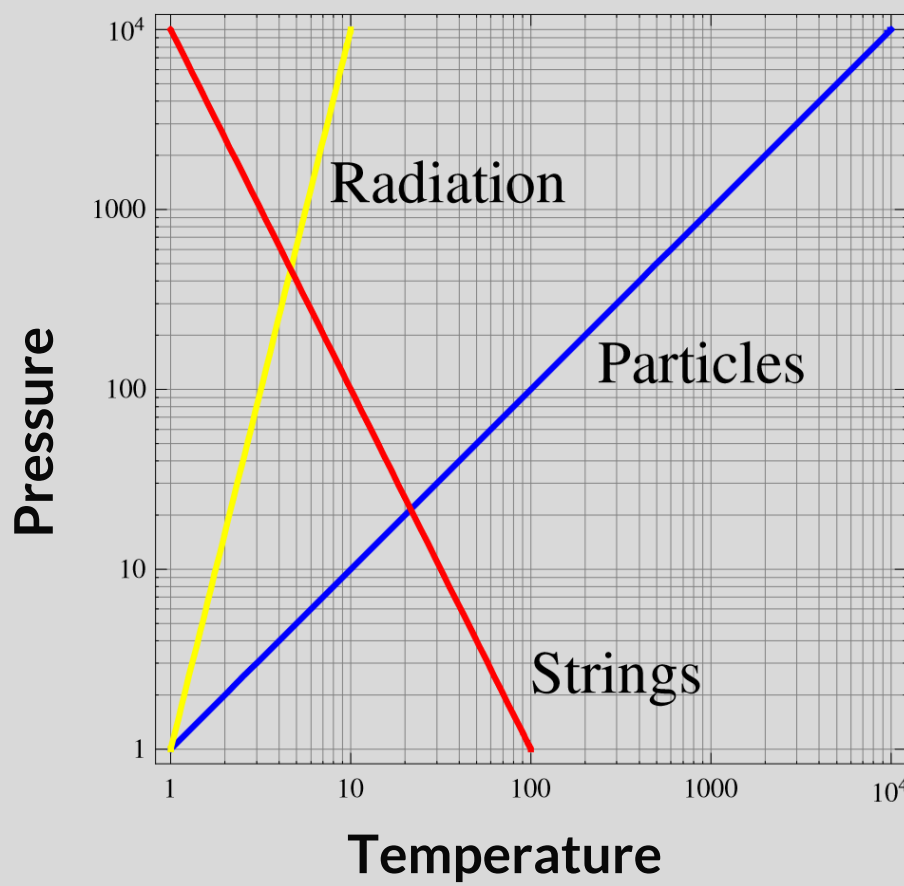
**Radiation**  $U^{3/4}V^{1/4}$

**Particles**  $\log(U^{3/2}V)$

**State law**

Pressure

$$-1/T^2$$
$$T^4$$
$$T/V$$



**EM field tensor  $F$**

$$\begin{bmatrix} 0 & -E_x & -E_y & -E_z \\ E_x & 0 & B_z & -B_y \\ E_y & -B_z & 0 & B_x \\ E_z & B_y & -B_x & 0 \end{bmatrix}$$

$$\text{Det}[F] = (\mathbf{E} \cdot \mathbf{B})^2$$

**Tensor invariants**

**Field energy**

$$2U = \mathbf{E}^2 + \mathbf{B}^2$$

$$\chi^2 = \mathbf{E} \cdot \mathbf{B}$$

**Field chirality**

**Force-free plasma**

**Current  $J$ ,  $B = \text{rot}A$**

$$J \parallel B$$

$$\chi^2 = A \cdot A$$

**Chiral superfluid**

**EM Potential tensor  $P$**

$$\begin{bmatrix} \Phi & -A_x & -A_y & -A_z \\ A_x & \Phi & A_z & -A_y \\ A_y & -A_z & \Phi & A_x \\ A_z & A_y & -A_x & \Phi \end{bmatrix}$$

$$\text{Det}[P] = (\Phi^2 + \chi^2)^2$$

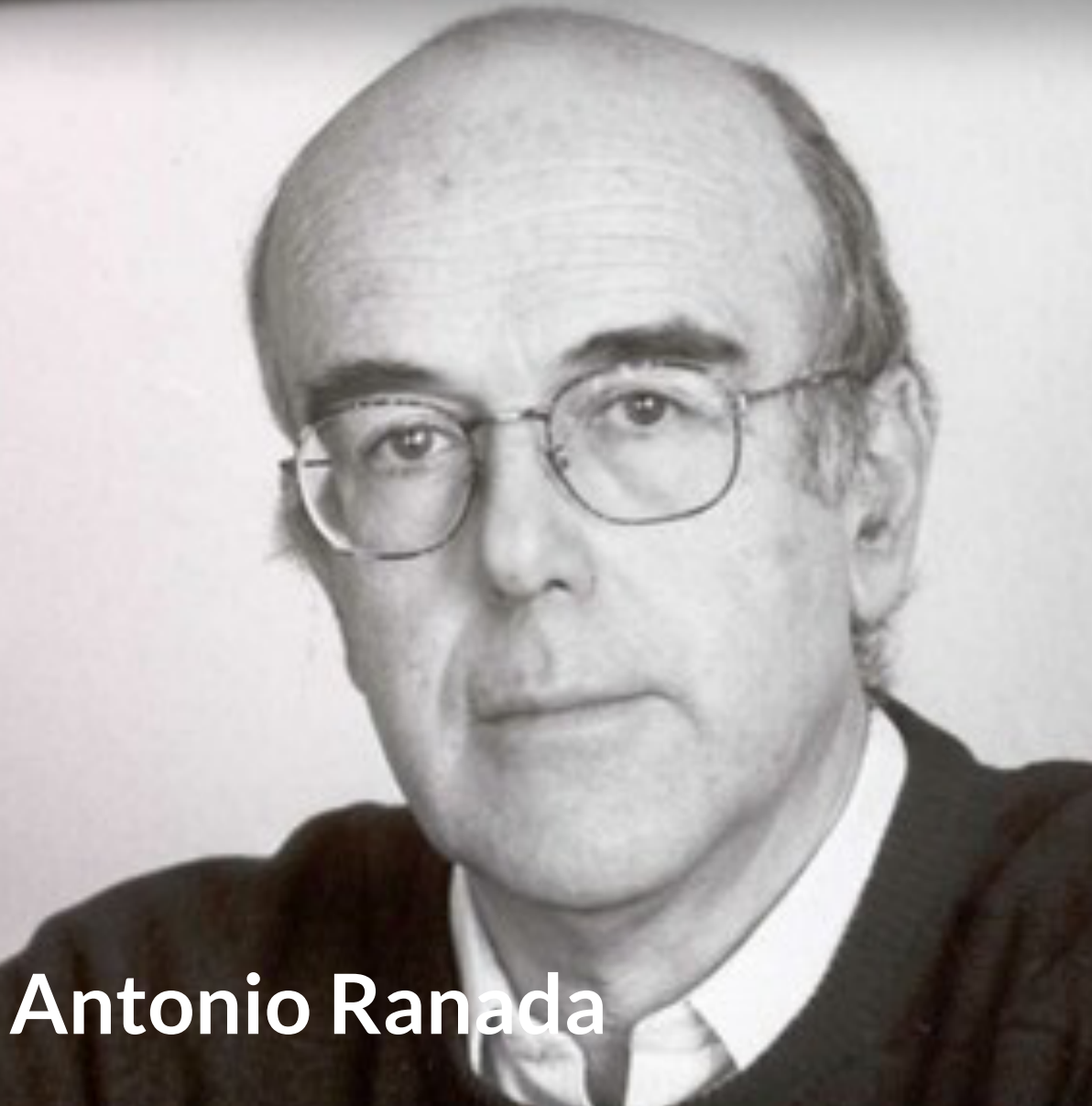
Wire-based grid  
mimics **plasma**  
**response to**  
microwave beam



Sir John Pendry

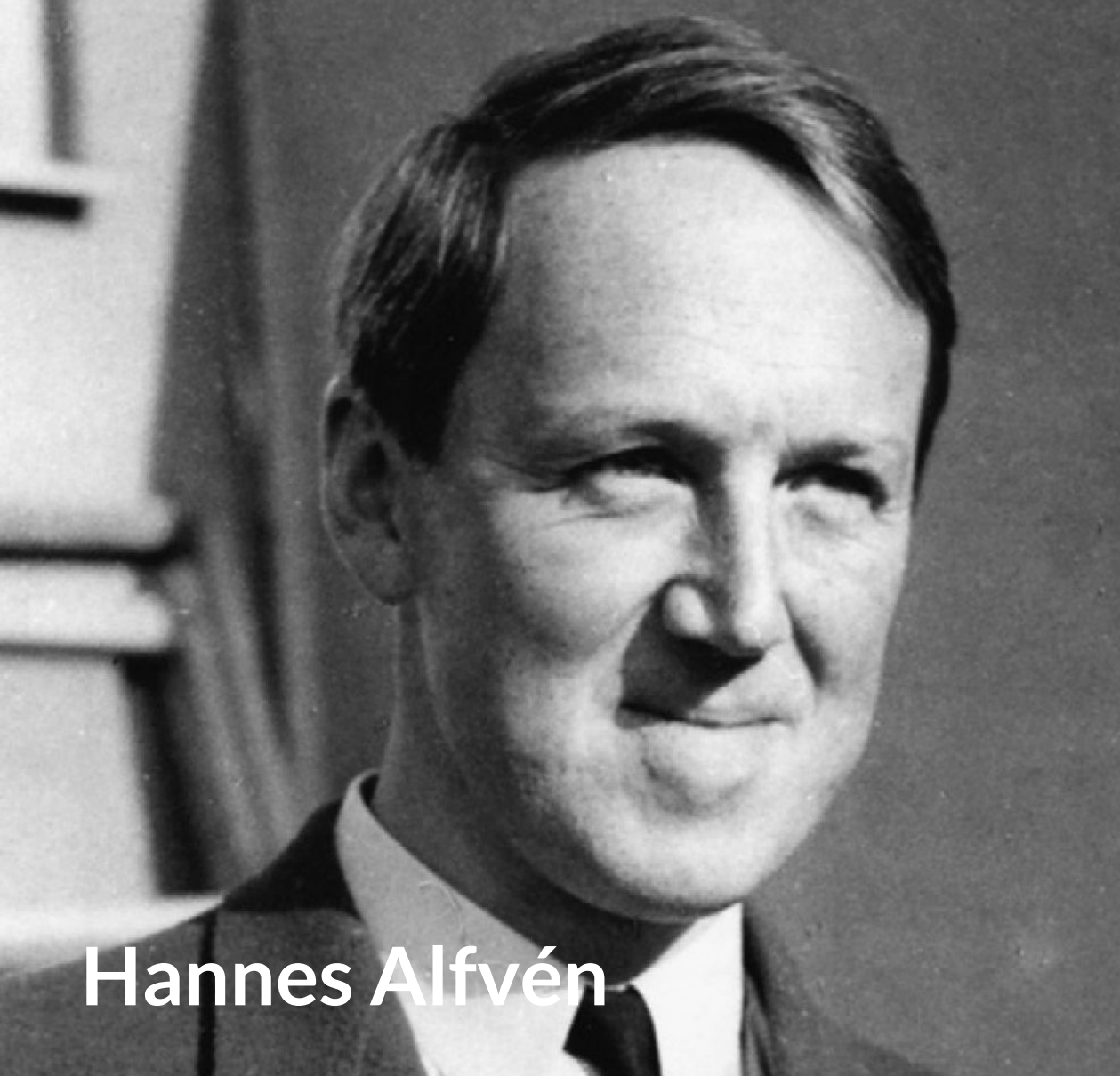
Entropy

$$S = k \log W$$



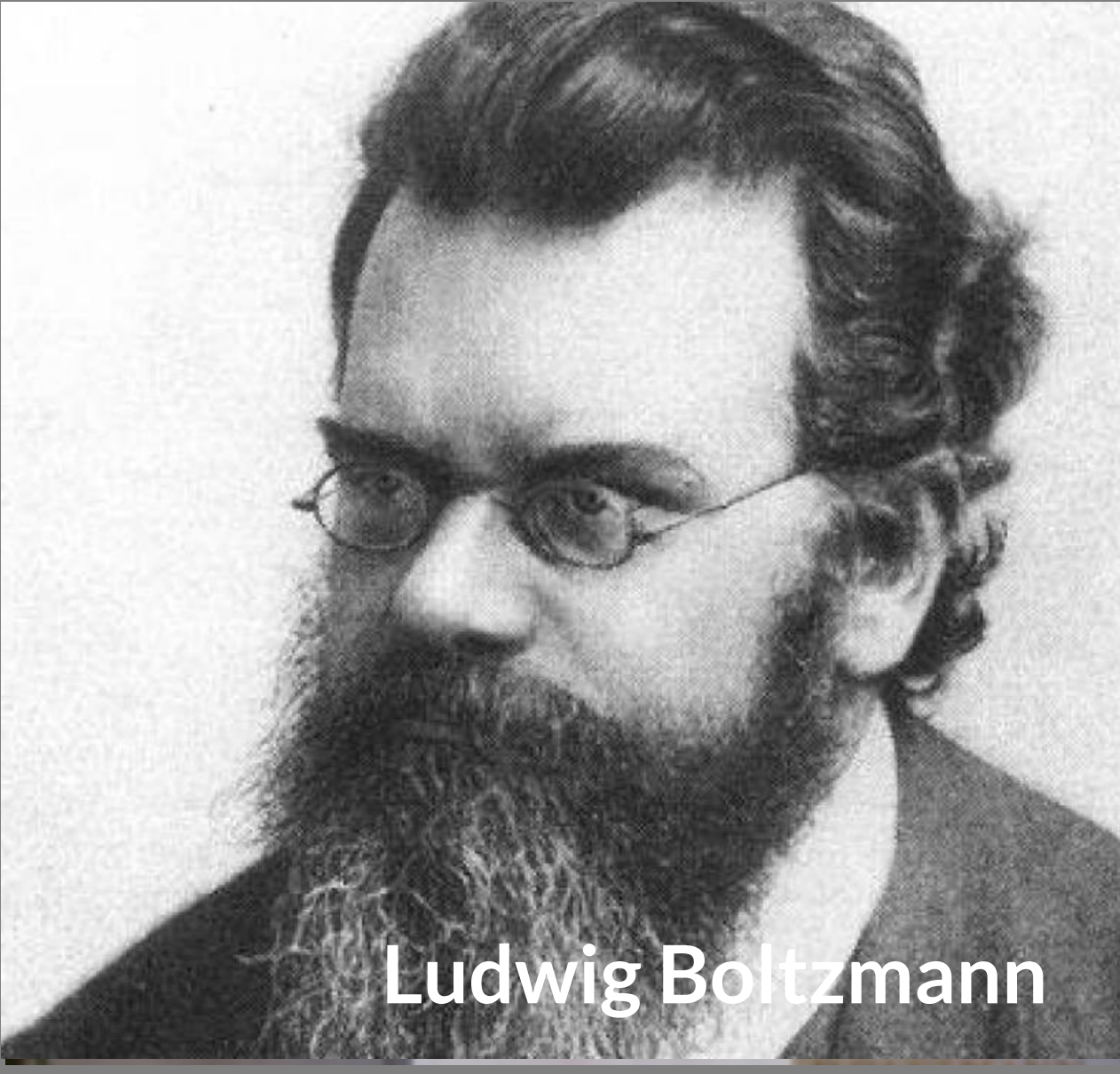
Antonio Ranada

**Thermonuclear**  
**plasma** twists flux  
tubes into loops,  
links and knots



Hannes Alfvén

Flux tubes exert  
elastic forces and  
**transmit magnetic**  
**plasma waves**



Ludwig Boltzmann

**Left-handed grids**  
reverse Snell's law,  
Doppler effect and  
Cherenkov cone



Victor Veselago