# Music Arrangement via Quantum Annealing

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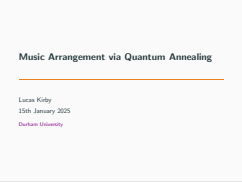
Durham University





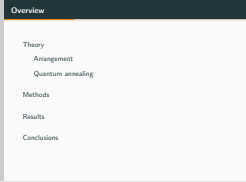


# Overview







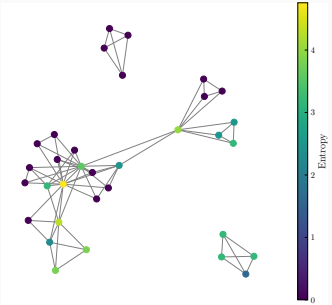


# What is flux?

# Theory

Theory

# Column layout

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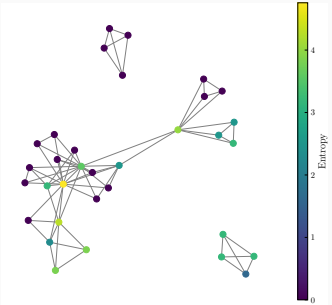
Column layout

# Column layout

- Net flux of liquid is zero




Source: Wikimedia Commons

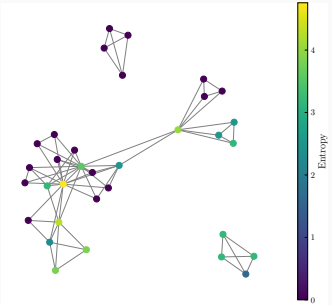




Column layout
• Net flux of liquid is zero

# Column layout

- Net flux of liquid is zero
- Sources provide net outwards flow

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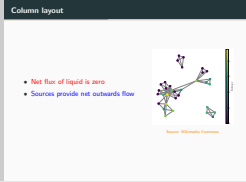
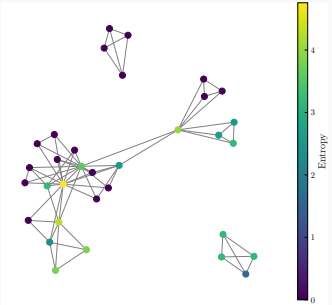


# Column layout

- Net flux of liquid is zero
- Sources provide net outwards flow
- Sinks provide net inwards flow

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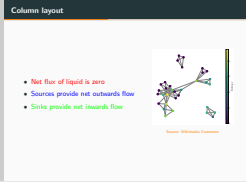

# Methods

Methods

# Results

Results

## Blocks

$$\oiint_A E \cdot dA = \frac{Q}{\varepsilon_0}$$





Blocks
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$$\oiint_A E \cdot dA = \frac{Q}{\varepsilon_0}$$

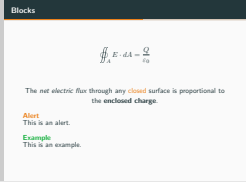
The *net electric flux* through any closed surface is proportional to the **enclosed charge**.

**Alert**
This is an alert.

**Example**
This is an example.







## Equation alignment

$$F = -\frac{GMm}{r^2}$$





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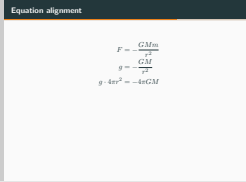
## Equation alignment

$$F = -\frac{GMm}{r^2}$$
$$g = -\frac{GM}{r^2}$$
$$g \cdot 4\pi r^2 = -4\pi GM$$





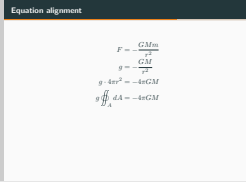


## Equation alignment

$$
\begin{aligned}
F &= -\frac{GMm}{r^2} \\
g &= -\frac{GM}{r^2} \\
g \cdot 4\pi r^2 &= -4\pi GM \\
g \oiint_A dA &= -4\pi GM
\end{aligned}
$$







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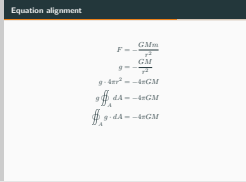

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The gravitational flux through any closed surface is proportional to the enclosed mass.





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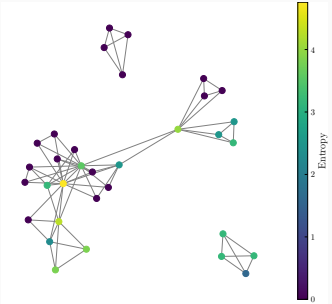
# Apperance sync

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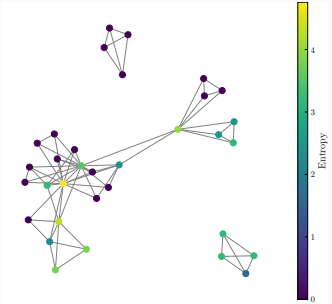
Apperance sync

# Apperance sync

- Volume rate of flow equal to divergence

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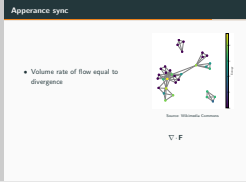
$$\nabla \cdot \mathbf{F}$$

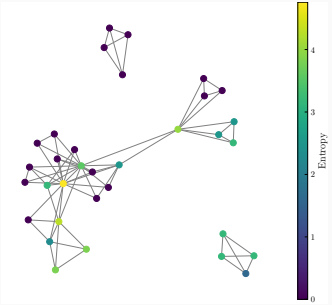






# Apperance sync

- Volume rate of flow equal to divergence
- Summed over entire volume

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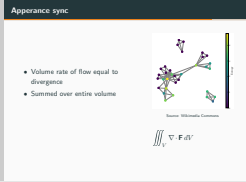
$$\iiint_V \nabla \cdot \mathbf{F}\, dV$$

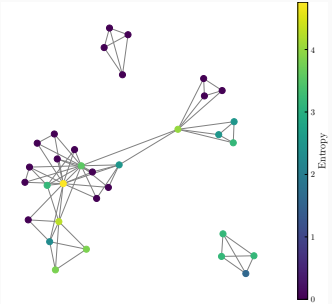






# Apperance sync

- Volume rate of flow equal to divergence
- Summed over entire volume
- Equal to net flow across the boundary




Source: Wikimedia Commons

$$\iiint_V \nabla \cdot \mathbf{F}\, dV = \oiint_A \mathbf{F} \cdot d\mathbf{A}$$



Apperance sync
• Volume rate of flow equal to divergence
• Summed over entire volume
• Equal to net flow across the boundary
Source: Wikimedia Commons
$\iiint_V \nabla \cdot \mathbf{F}\, dV = \oiint_A \mathbf{F} \cdot d\mathbf{A}$

# Conclusions

# Equation gather

$$\nabla \cdot \mathbf{E} = \frac{\rho}{\varepsilon_0}$$
$$\nabla \cdot \mathbf{B} = 0$$
$$\nabla \times \mathbf{E} = -\frac{\partial \mathbf{B}}{\partial t}$$
$$\nabla \times \mathbf{B} = \frac{1}{c^2}\frac{\partial \mathbf{E}}{\partial t} + \mu_0 I$$





Equation gather