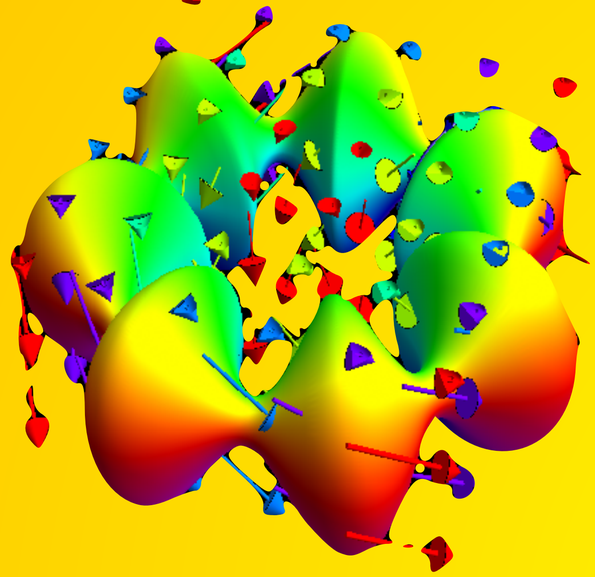

Lecture 34

Divergence Theorem

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1) The Theorem

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The Theorem

$$\iiint_E \operatorname{div}(\vec{F})\,dV = \iint_S \vec{F} \cdot d\vec{S}$$

Discussion

$$\iiint_E \operatorname{div}(\vec{F})\,dV = \iint_S \vec{F} \cdot d\vec{S}$$

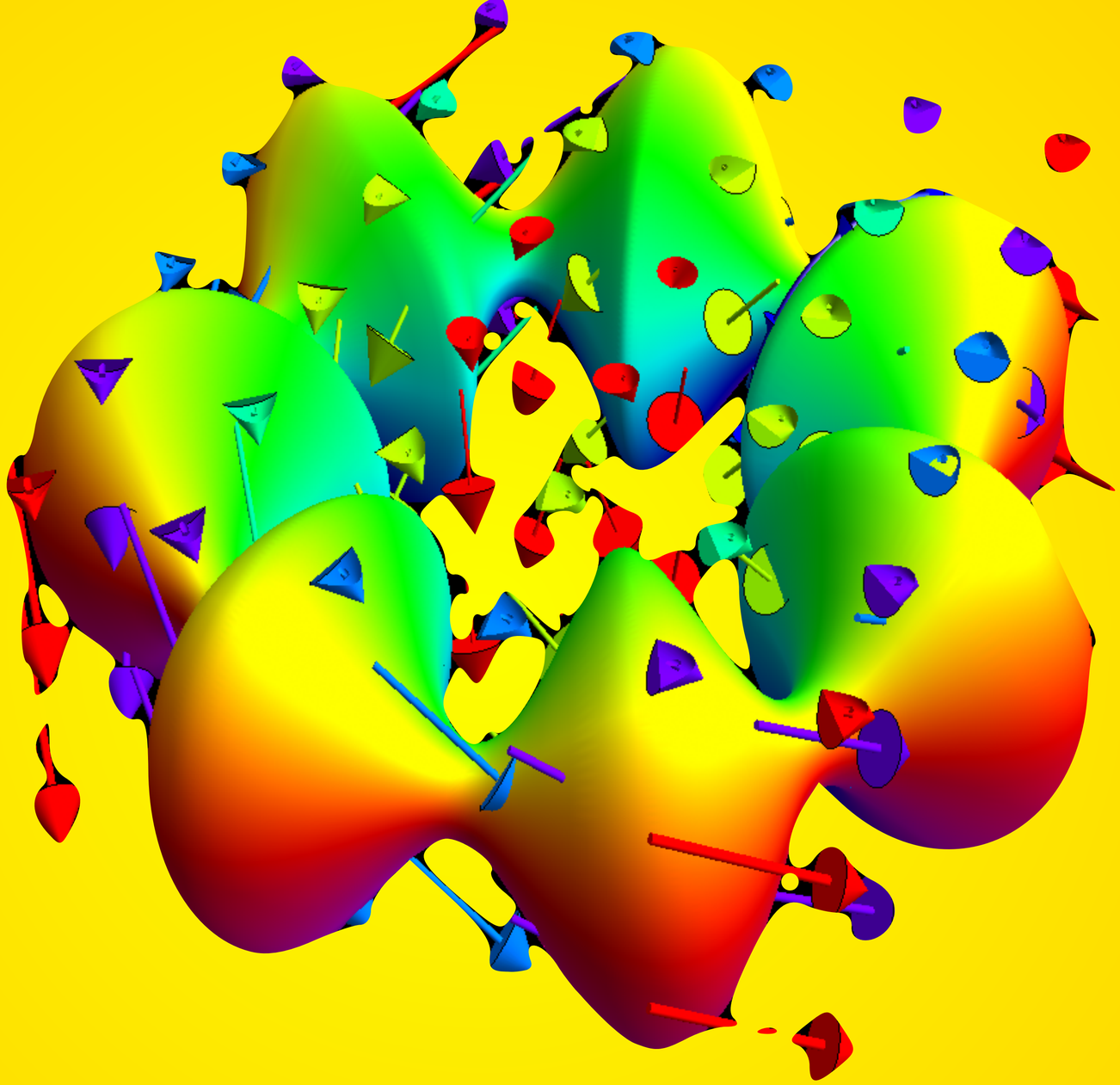
What happens if F is the curl of an other field?

What happens if F is a gradient field?

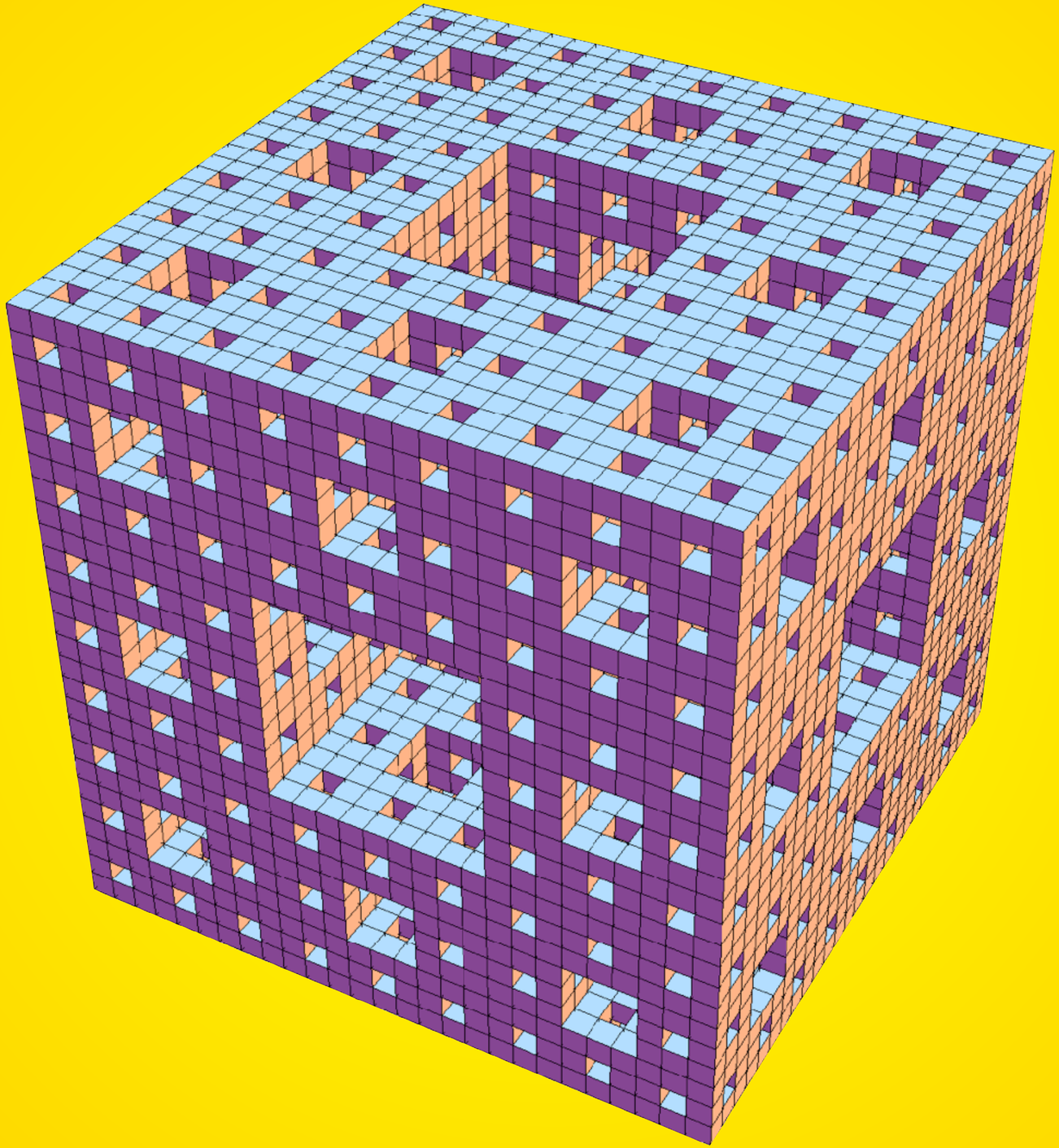
What happens if S is not closed?

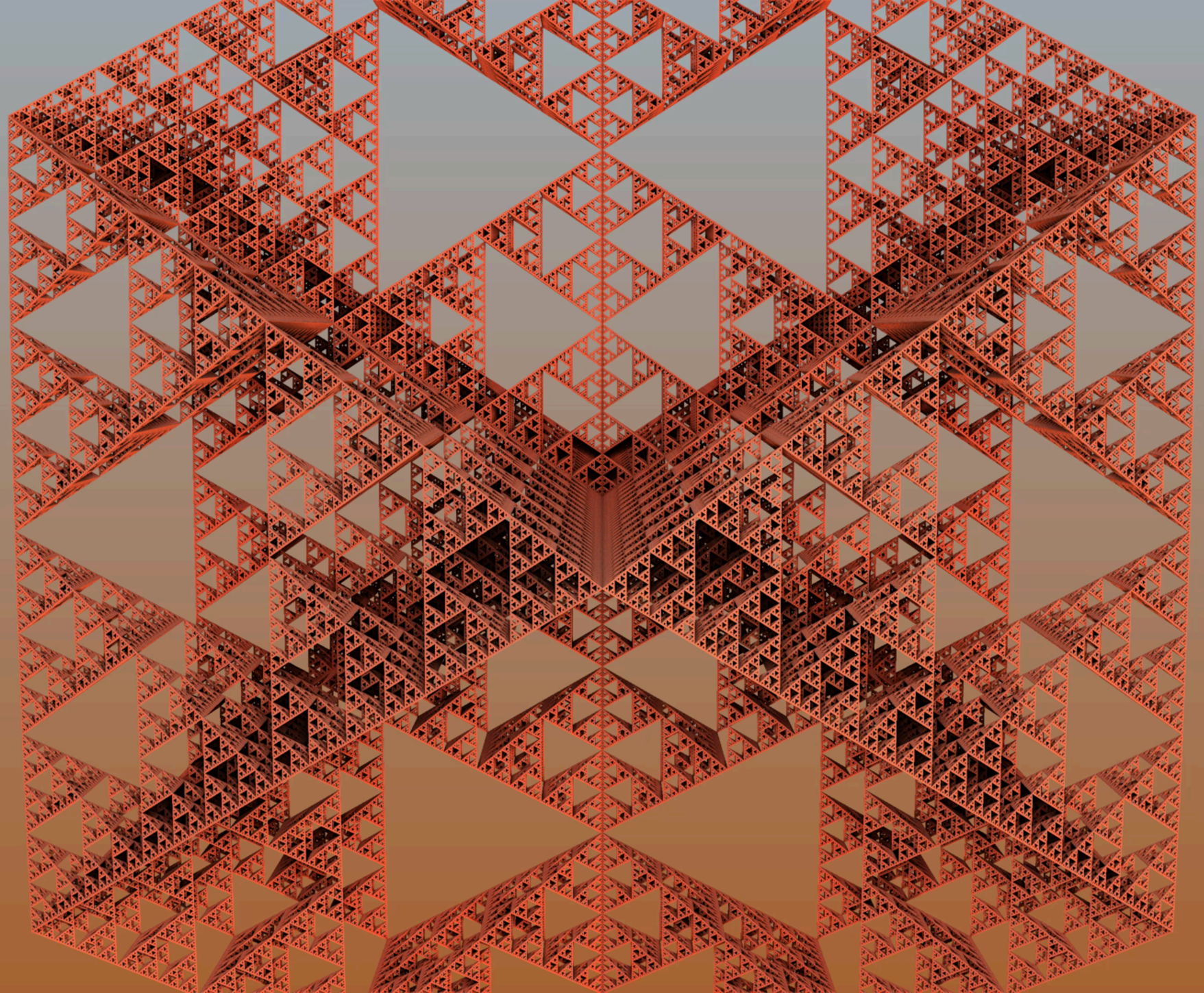
Can you use the theorem if F is not smooth everywhere, like $F(x,y,z) = \dfrac{\langle x,y,z\rangle}{r^{3/2}}$

Orientation



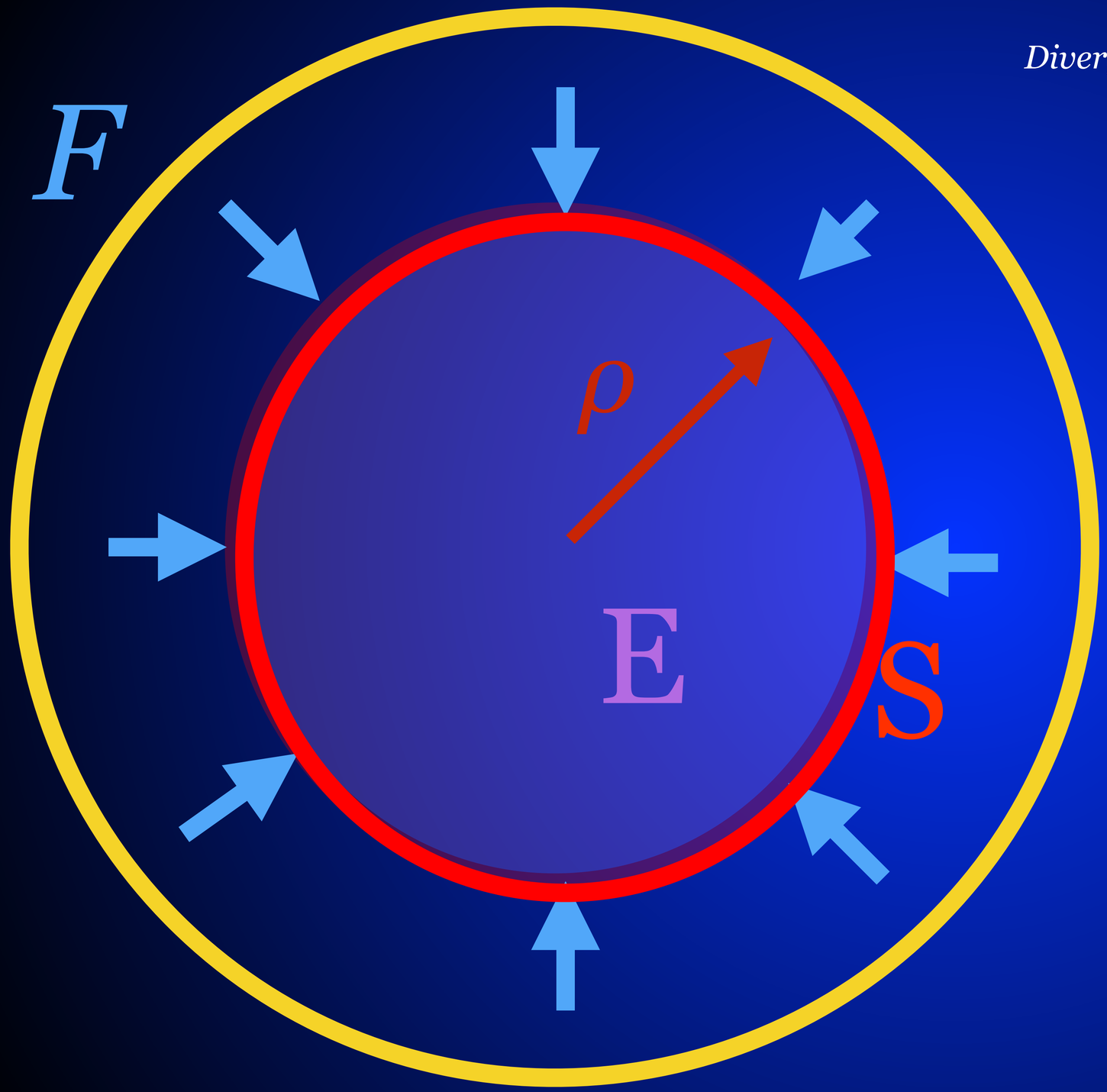
Examples





Gravity on the moon

WIKIPEDIA



Divergence theorem

$$\iint_S F dS = \iiint_E \operatorname{div}(F)\, dV$$

$$= \iiint_E 4\pi\, dV = \frac{(4\pi)^2 \rho^3}{3}$$

$$\iint_S F dS = 4\pi\rho^2 \,|\, F(\rho) \,|$$

The Core

History

In the movies

THE END