

PITF Summer 2004

**Exploring
Vectorfields Curl
and Divergence
using Flash**

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A close-up portrait of a man with short, dark hair and a light beard, looking directly at the camera with a slight smile. The background is black.

Presidential IT Fellow:
David Drew Mahfouda

a Visual and Environmental Studies
concentrator

Goal of the project:

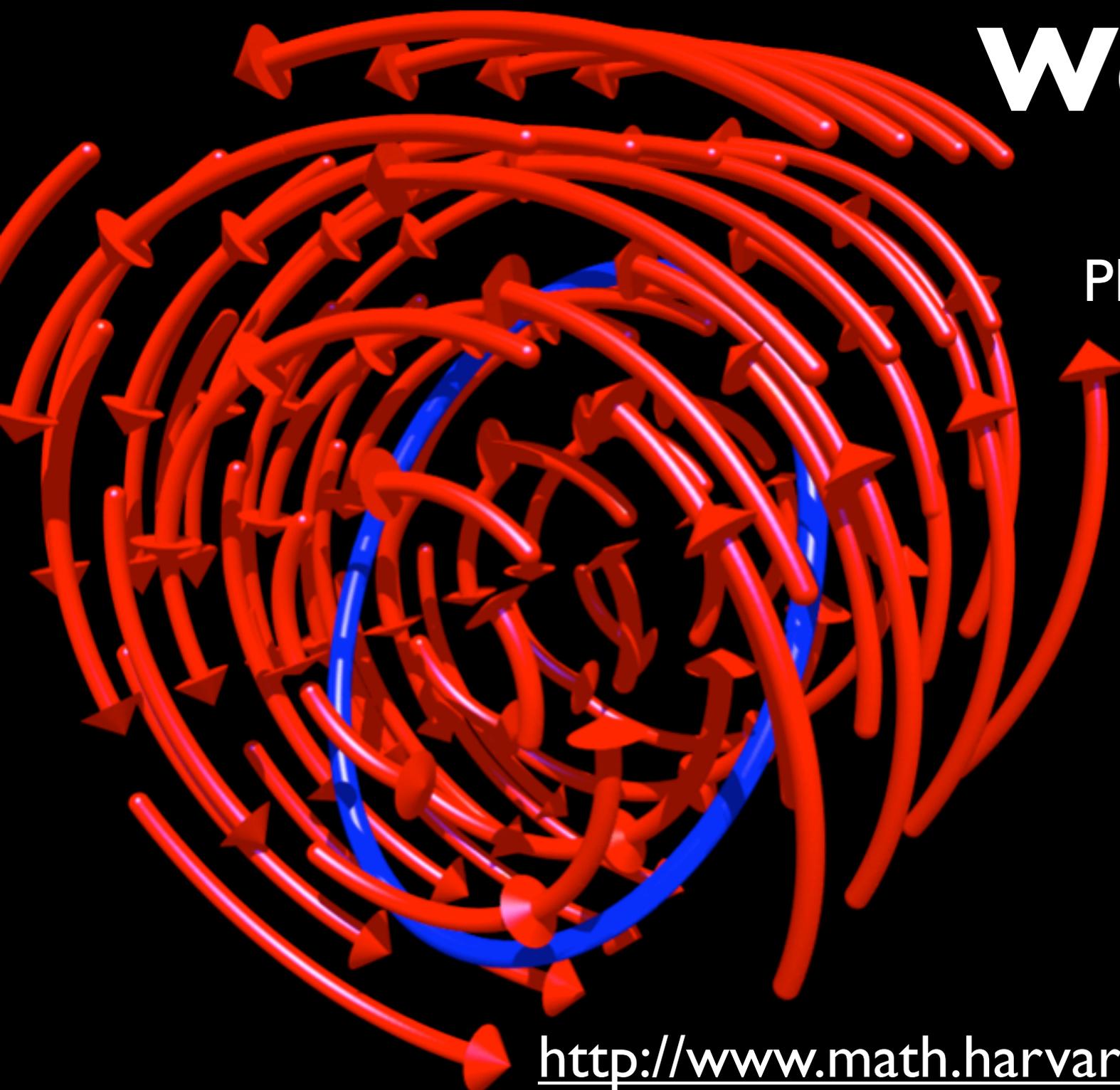
- Produce Flash Applications for Multivariable Calculus.
- Visualize Divergence and Curl with interactive tools.
- Explore advantages of Flash over Java

Website

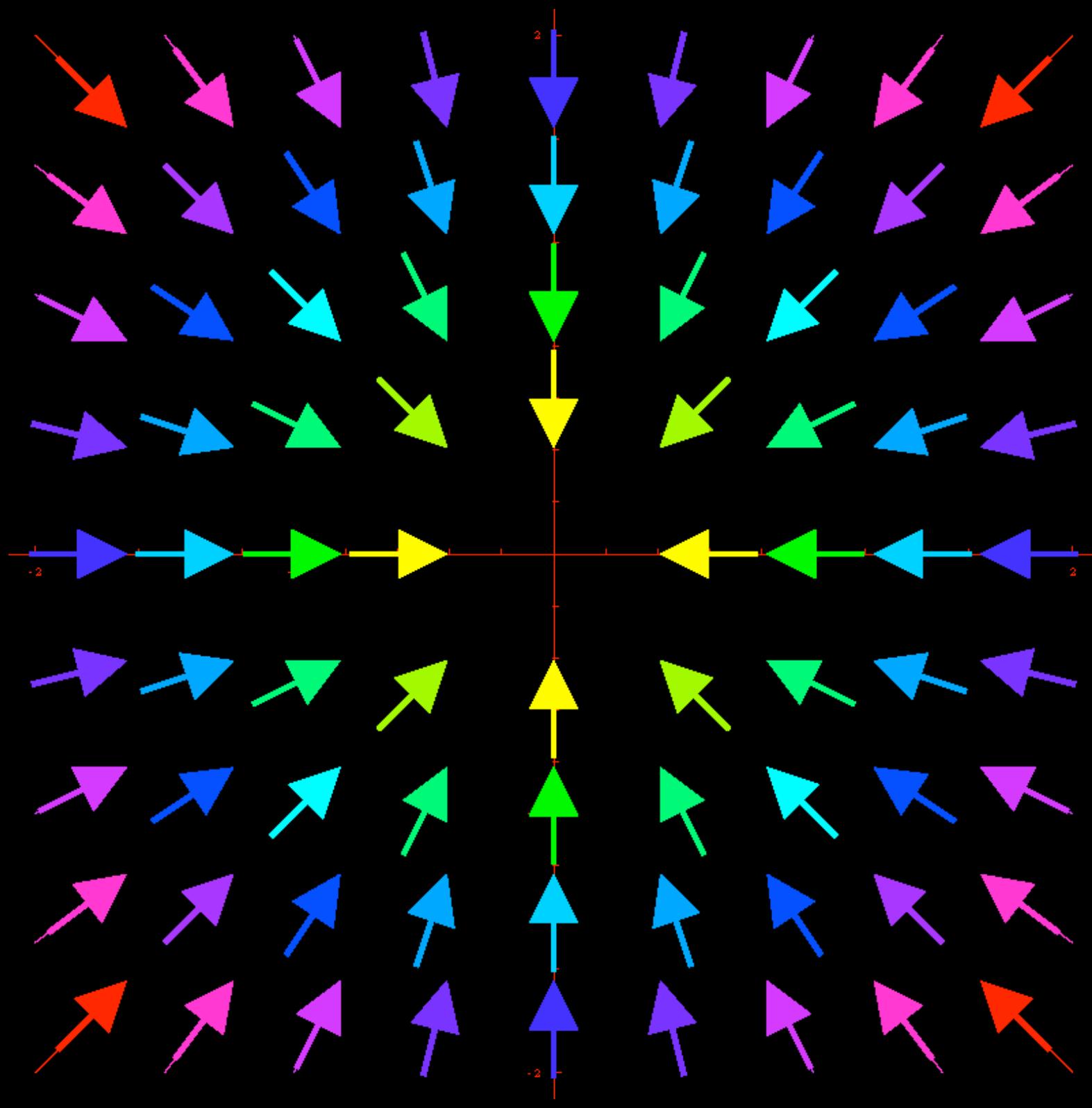
Google:
PITF VECTOR

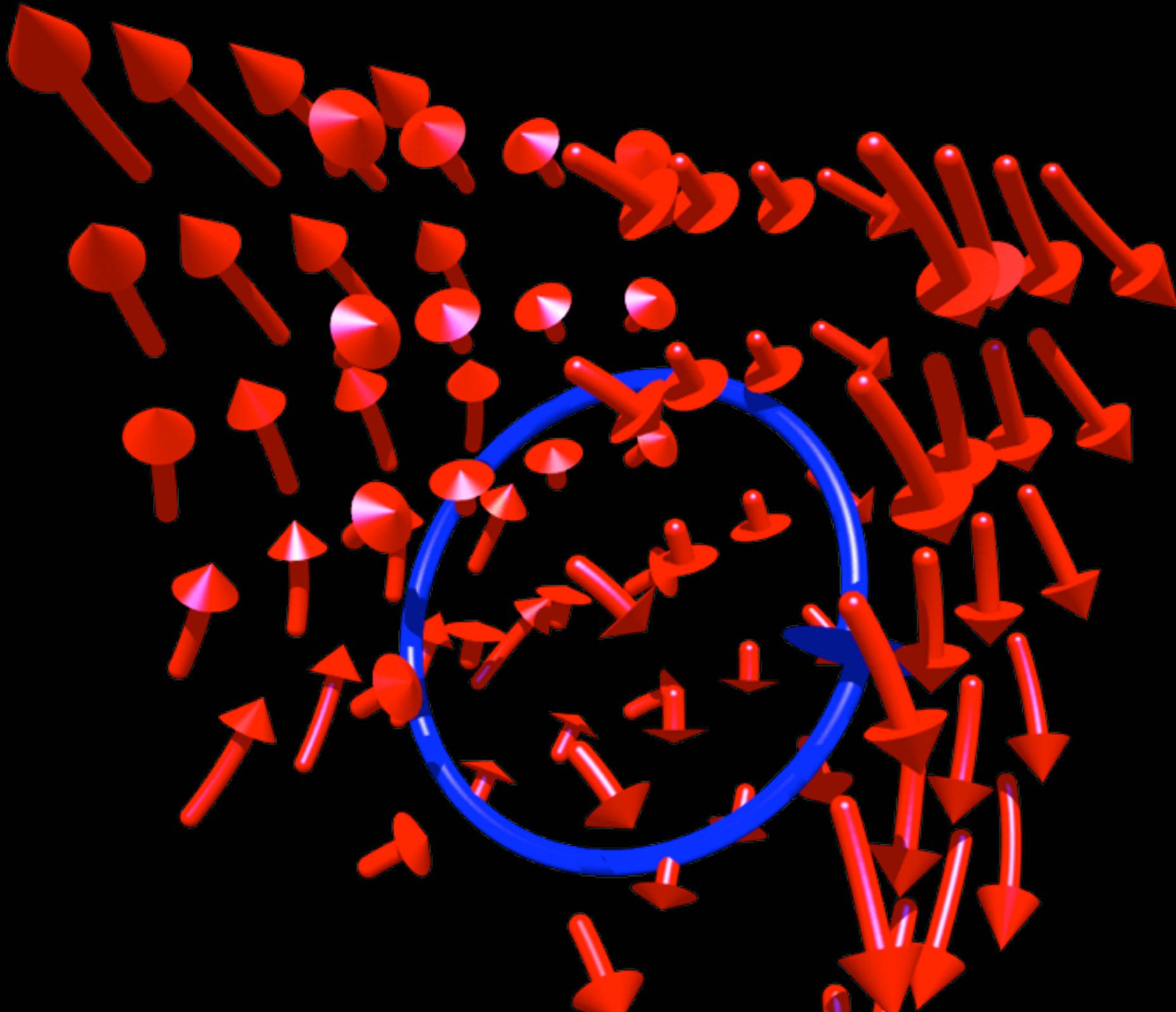
and feel
“lucky”

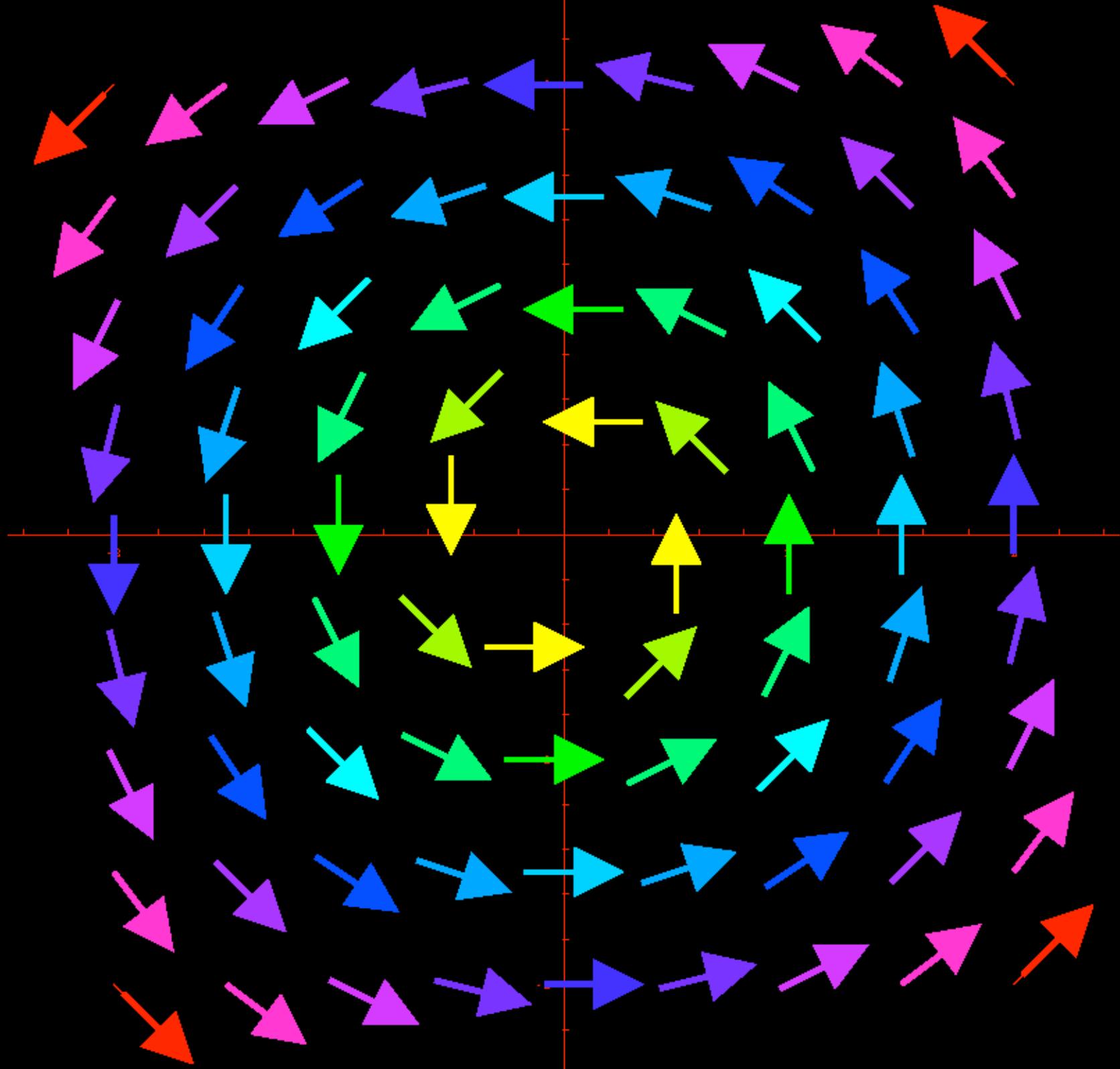
<http://www.math.harvard.edu/~knill/pitf>

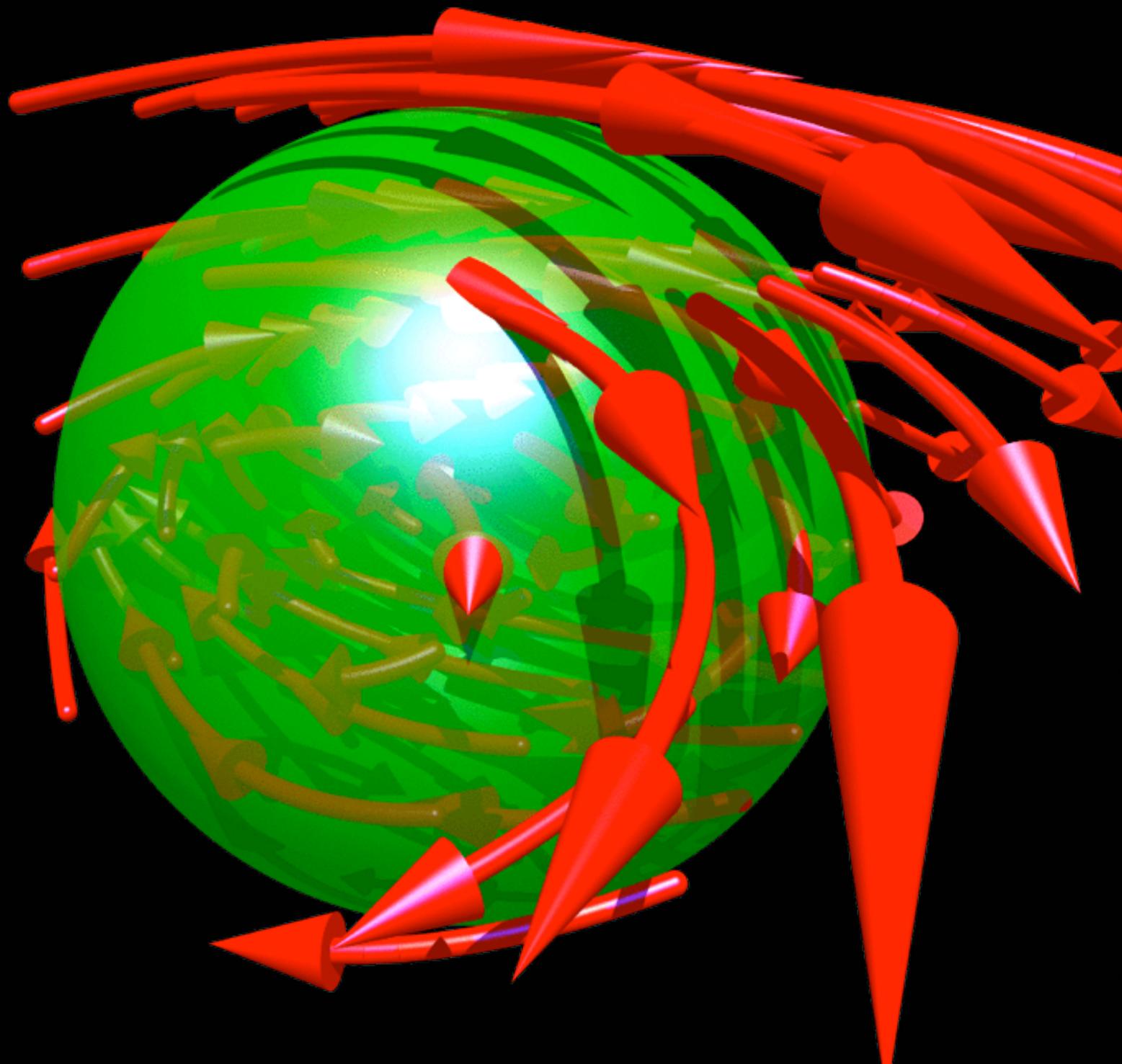


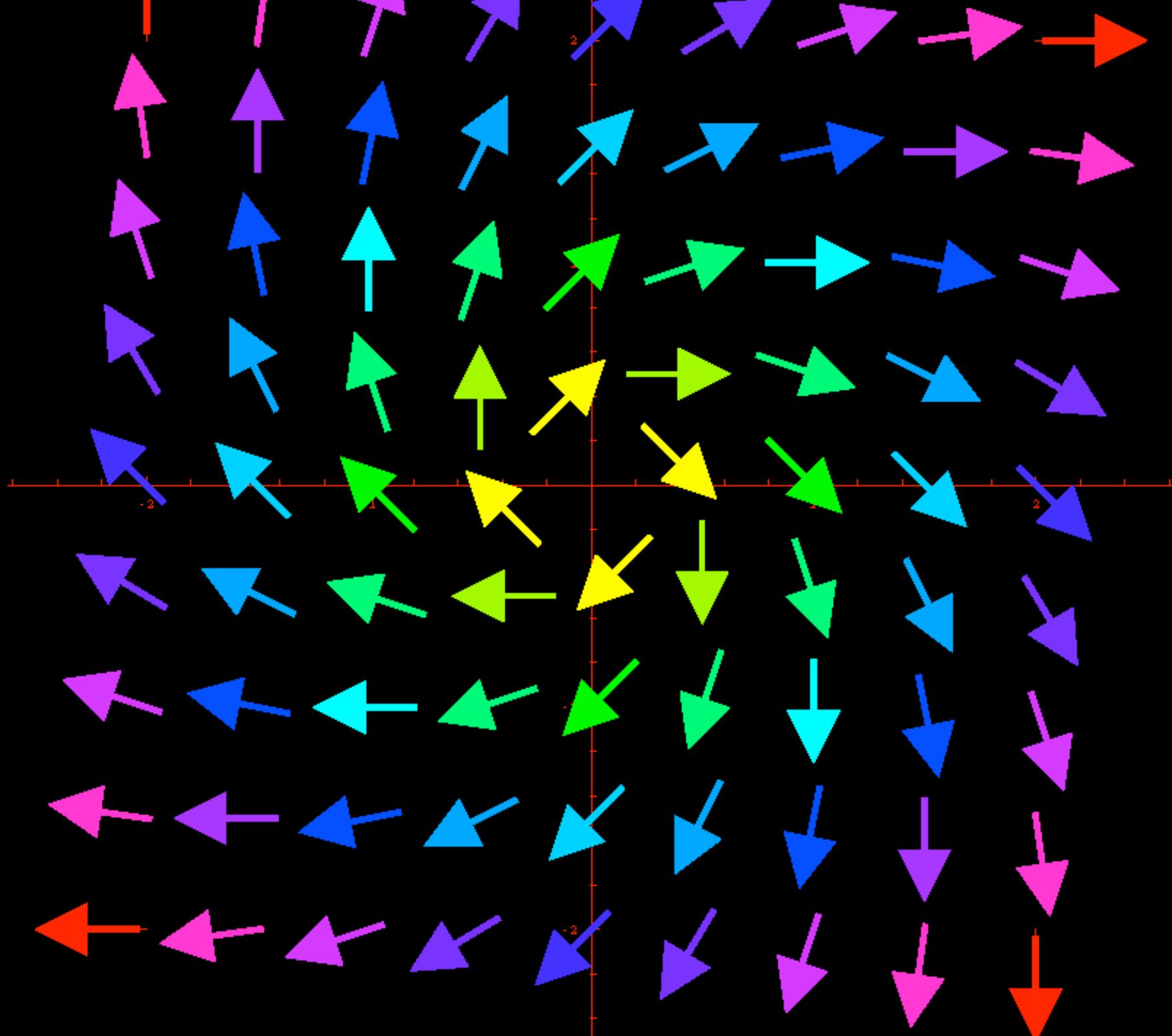
Vector fields









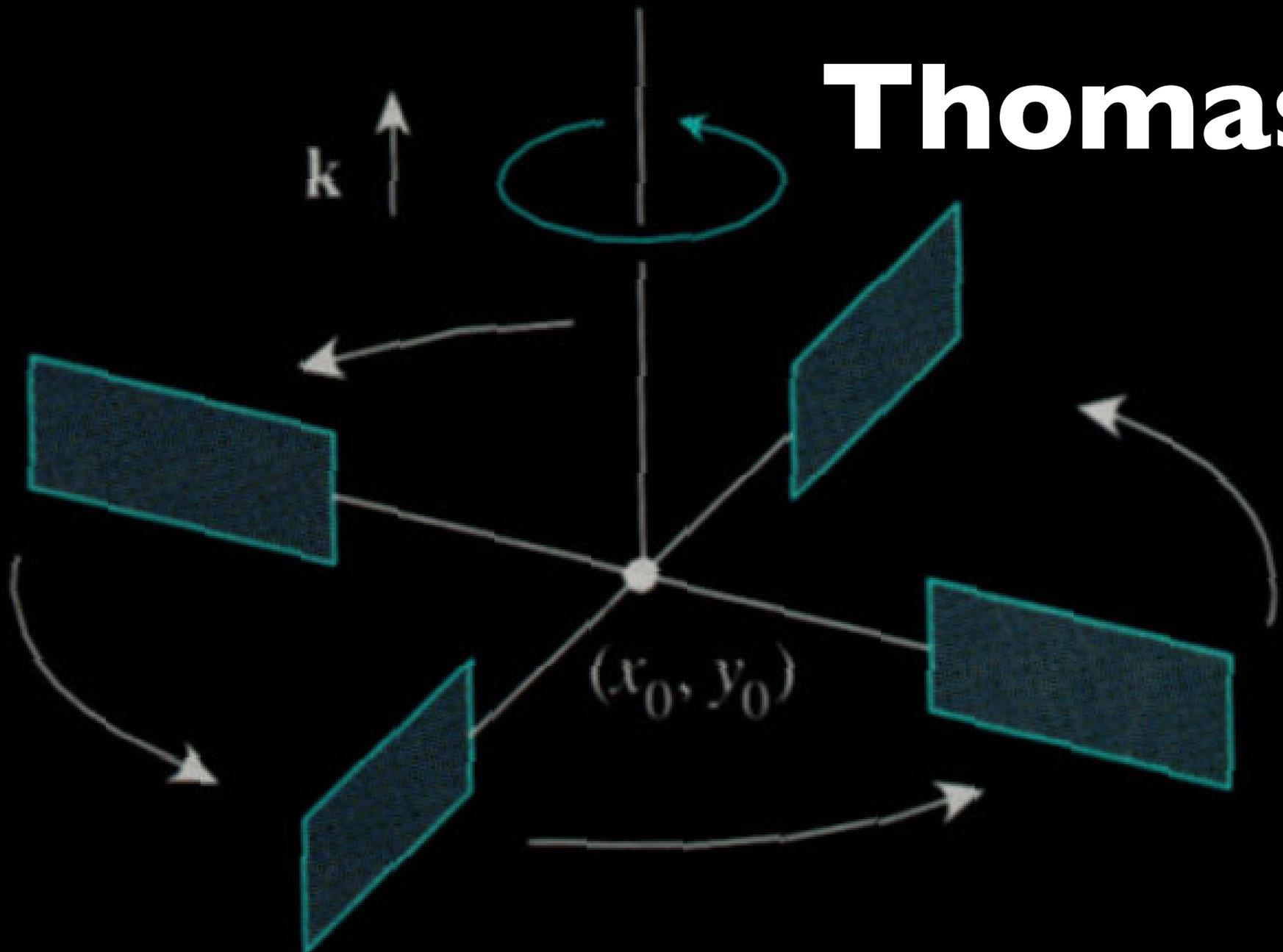






**How do textbooks
explain curl?**

Thomas

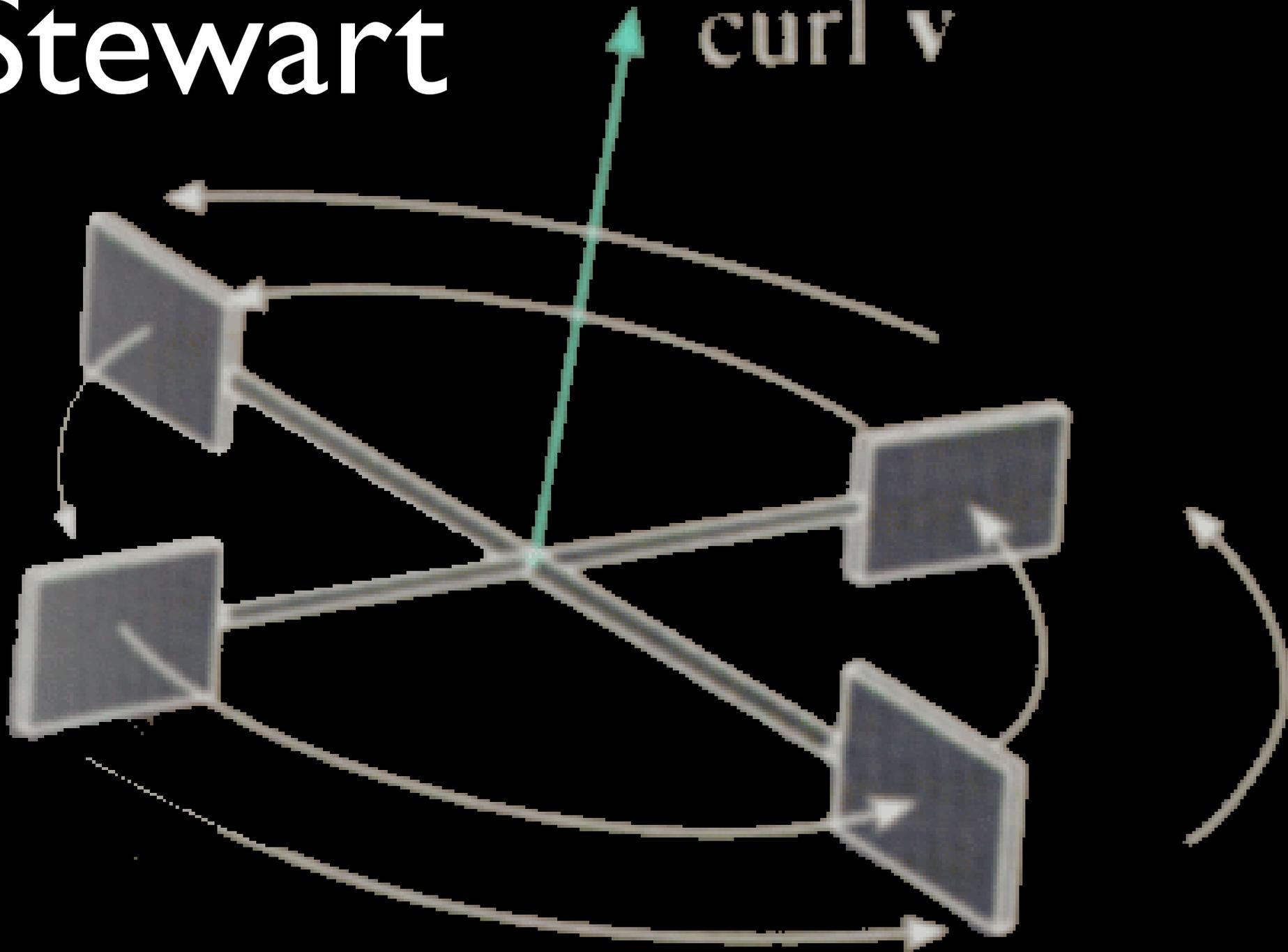


$$\text{Curl } \mathbf{F}(x_0, y_0) \cdot \mathbf{k} > 0$$

Counterclockwise circulation

Stewart

$\text{curl } \mathbf{v}$



Edwards-Penny

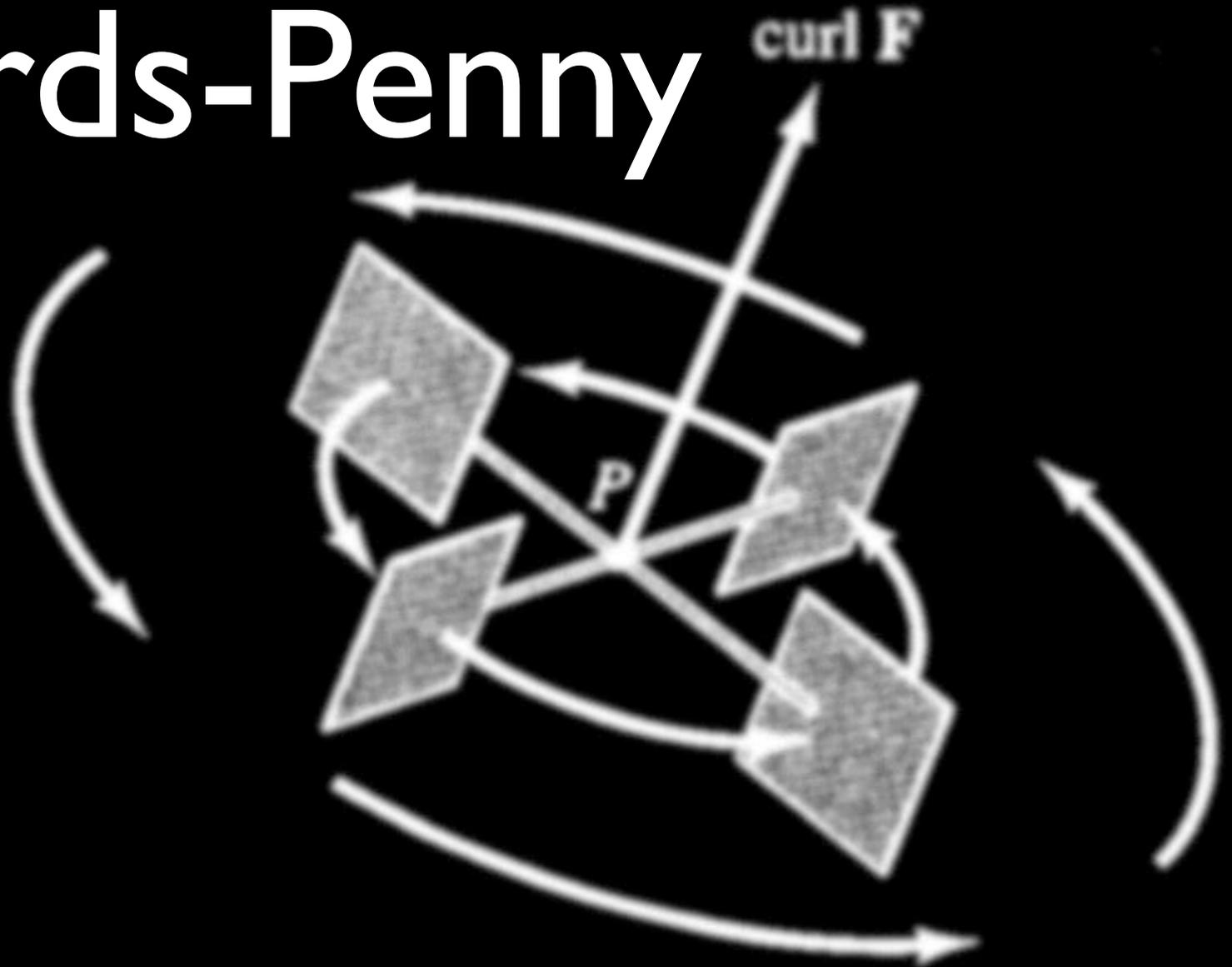


FIGURE 15.7.6 The paddle-wheel interpretation of $\text{curl } \mathbf{F}$.

Marsden Tromba

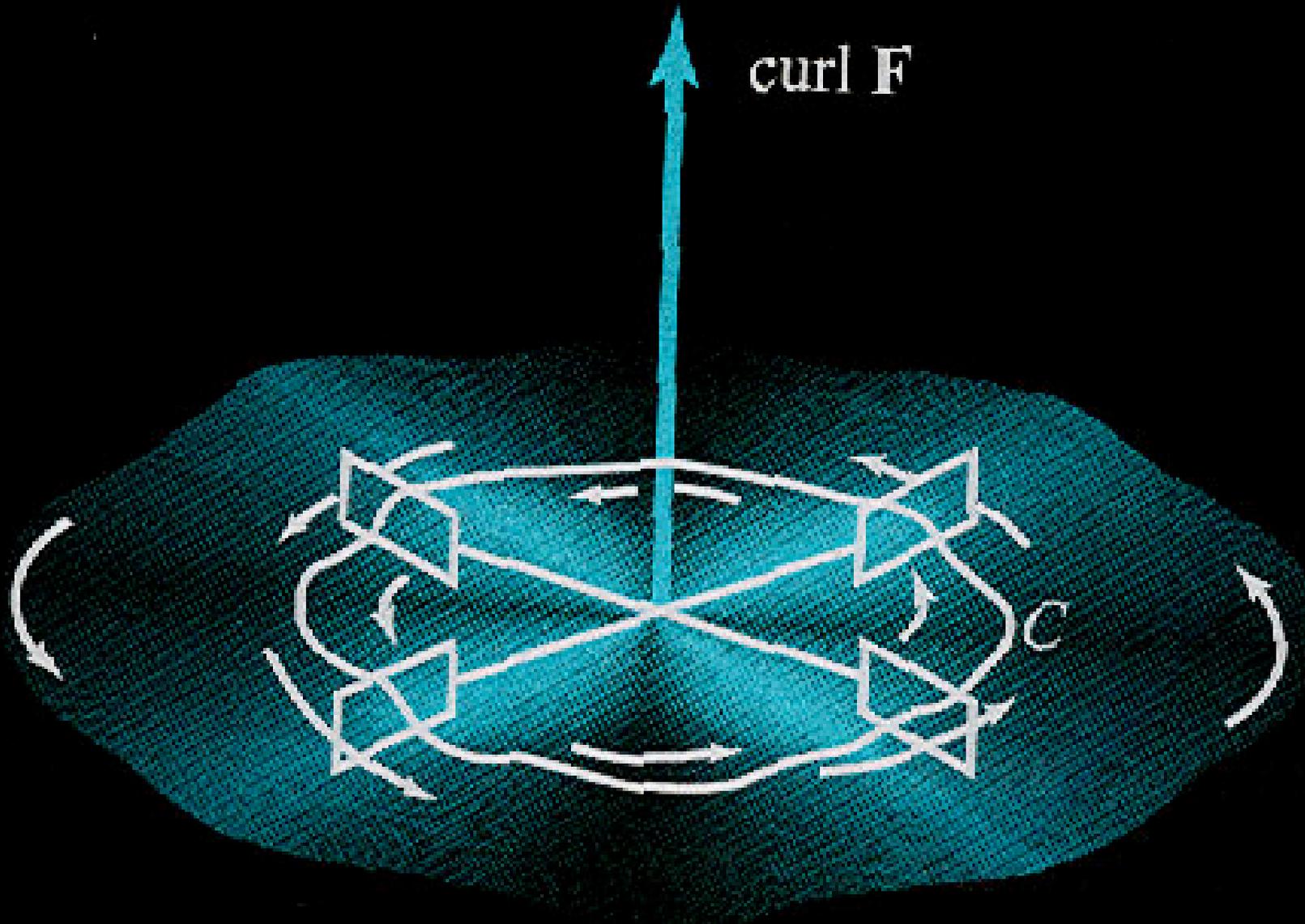
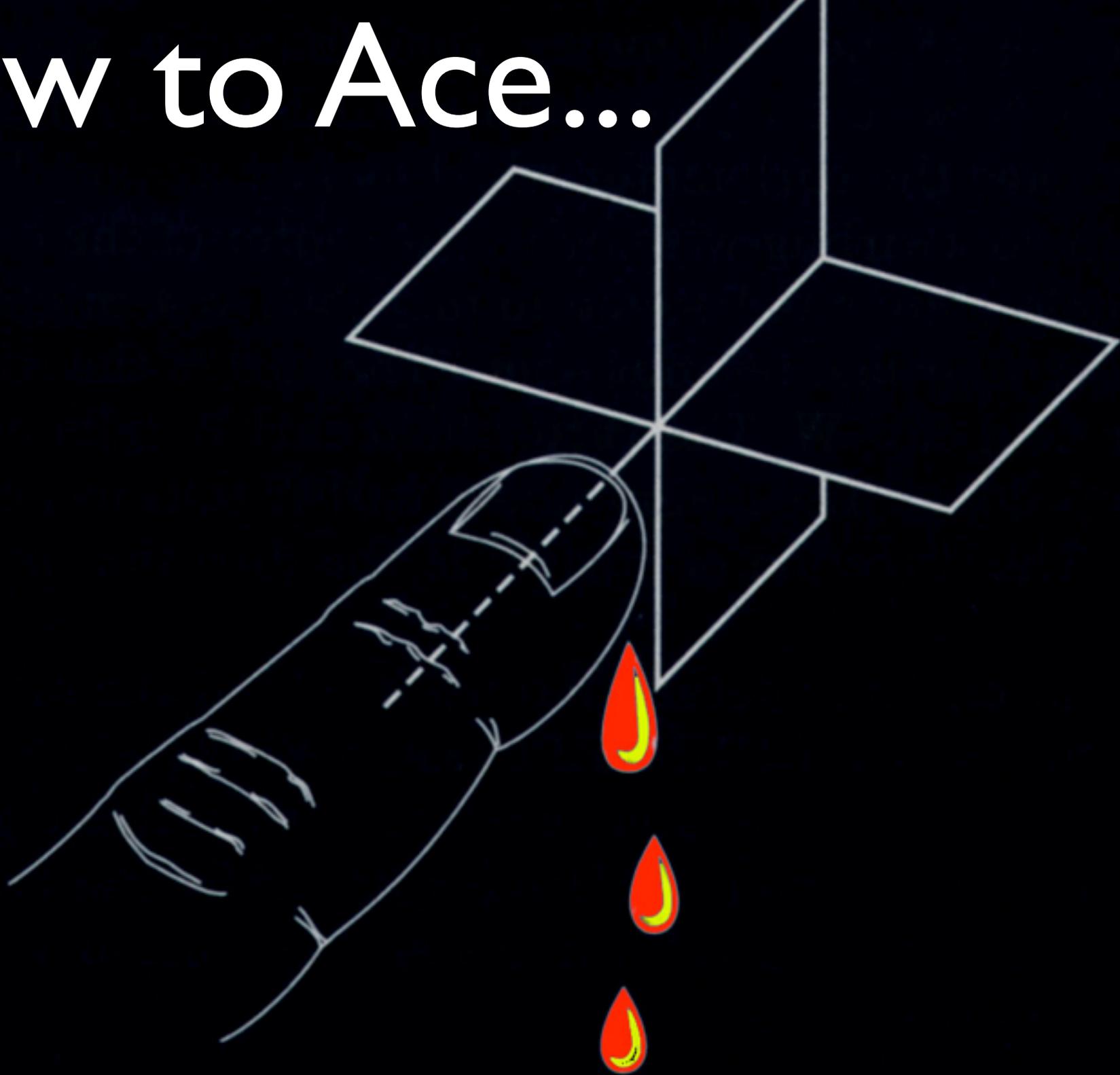


Figure
paddle
rotate a

How to Ace...



Fortunately

we have the



PITTF

IT

Math

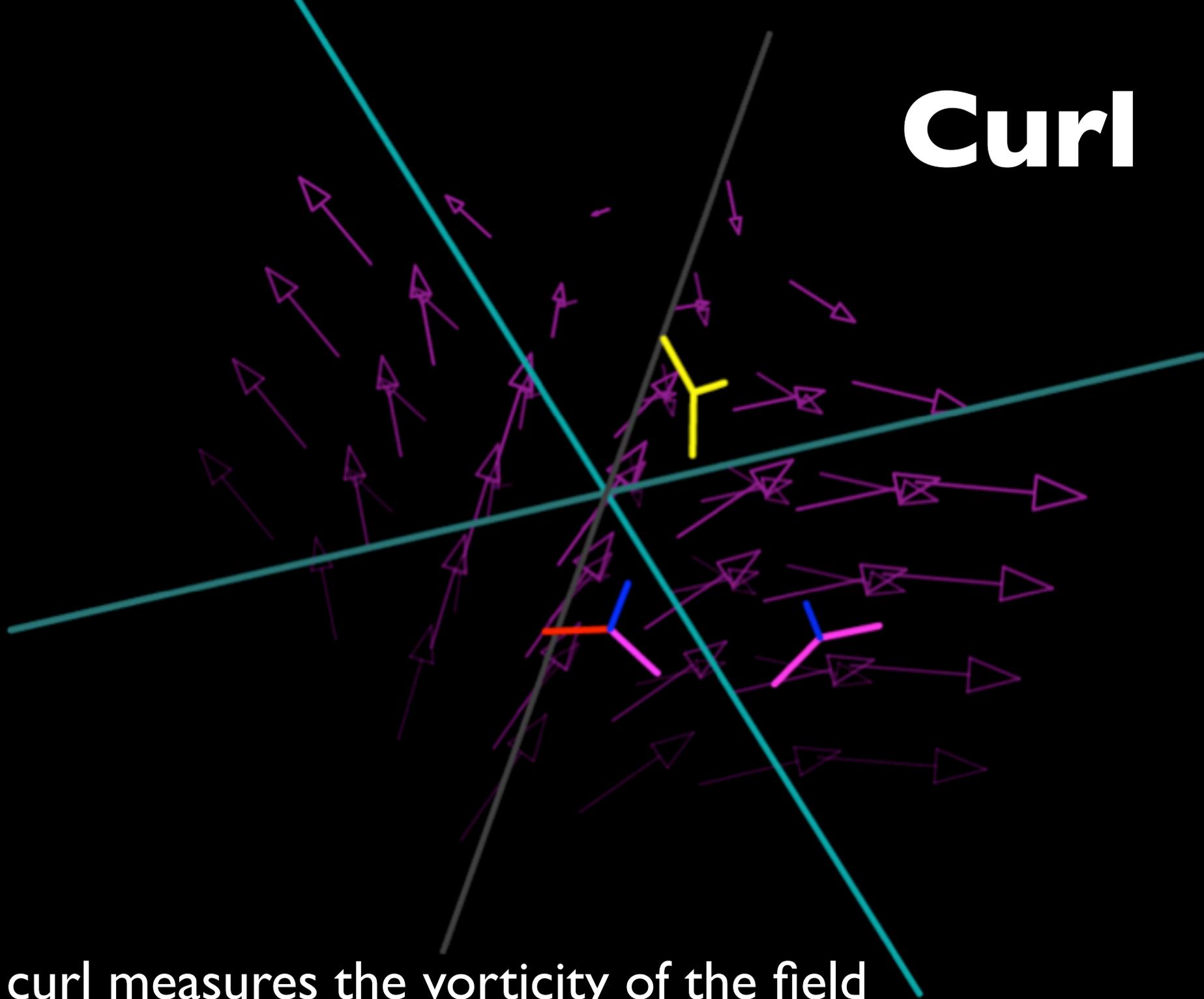
Pedagogy

Art

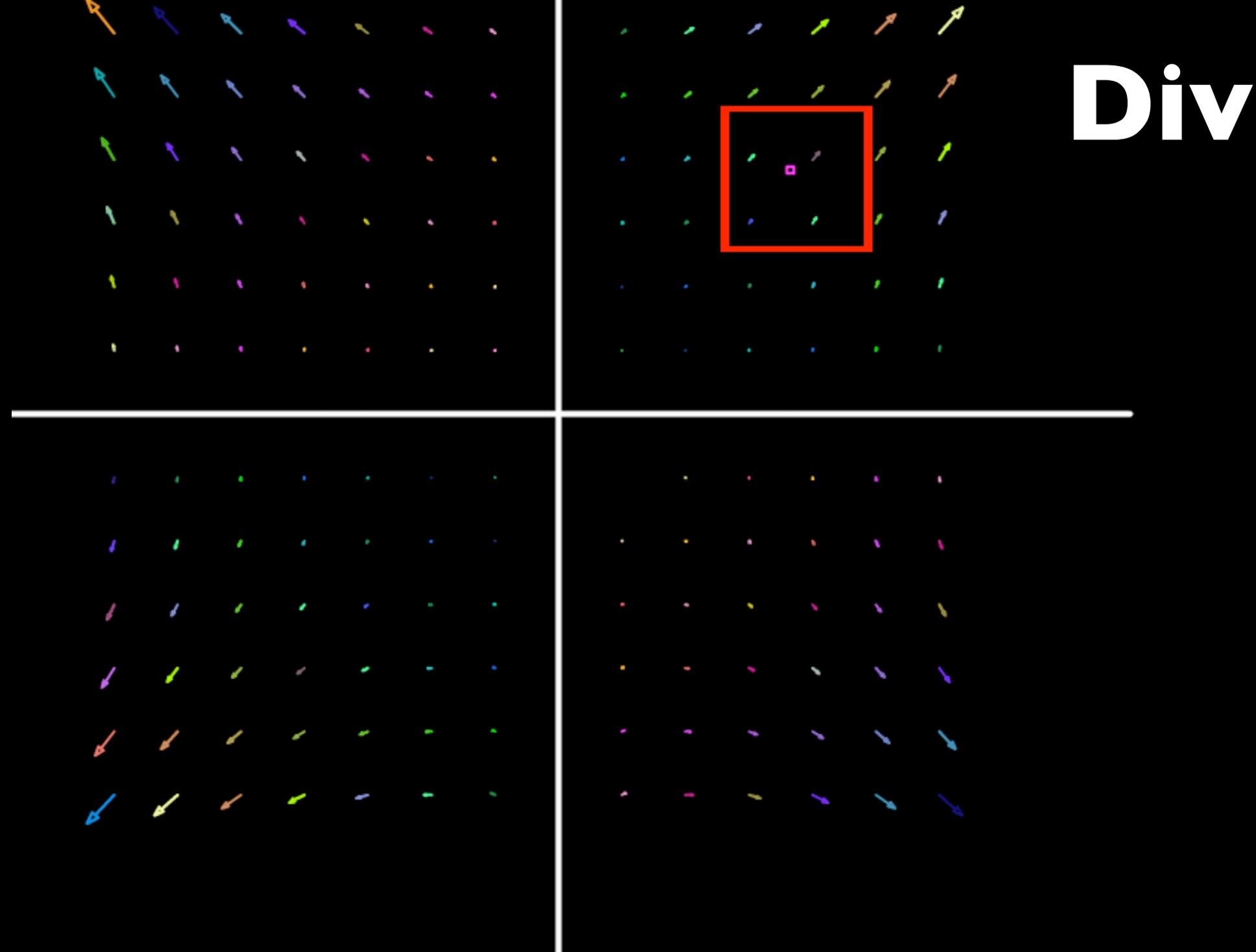
Management

**who can produce
interactive flash
Modules**

Curl

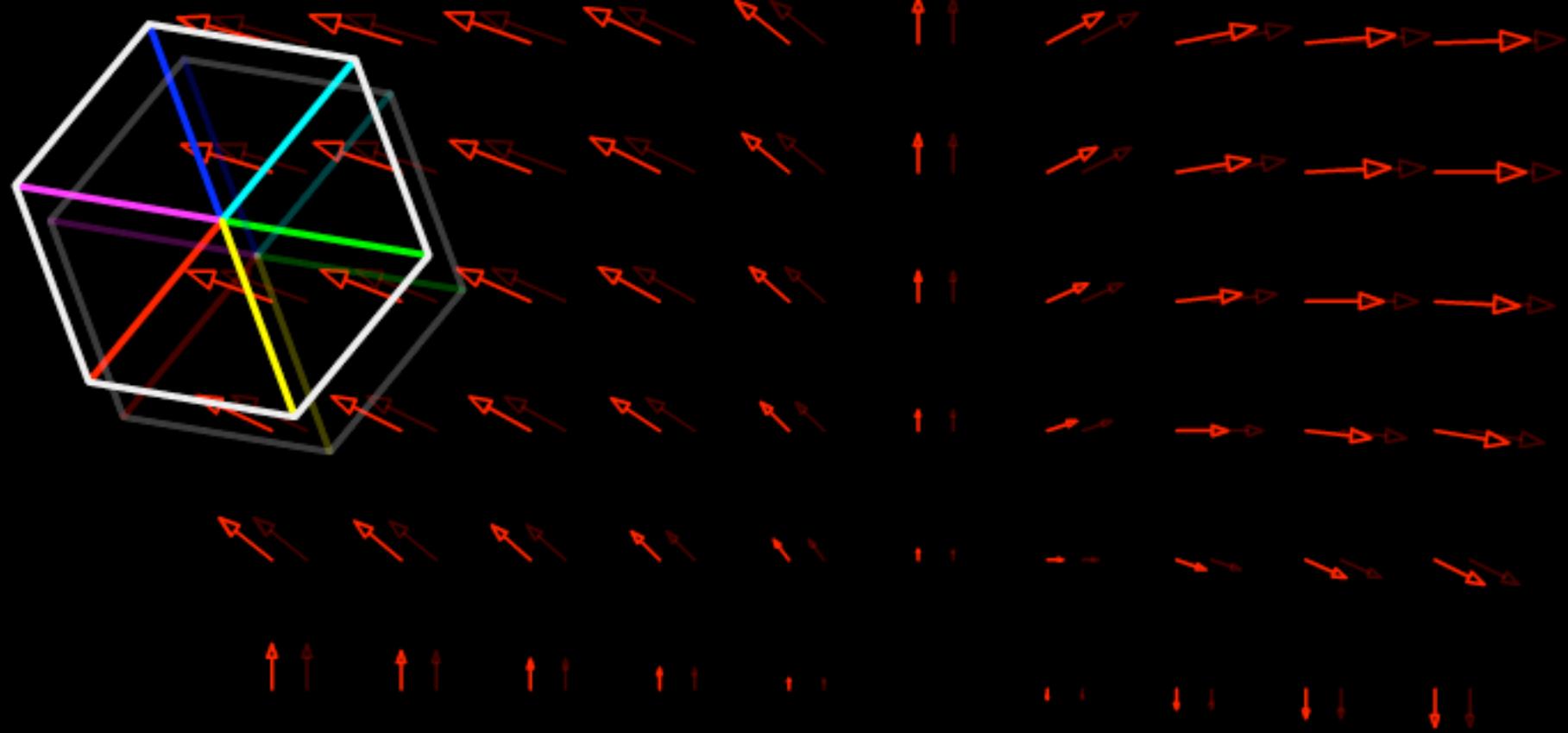


curl measures the vorticity of the field



Div

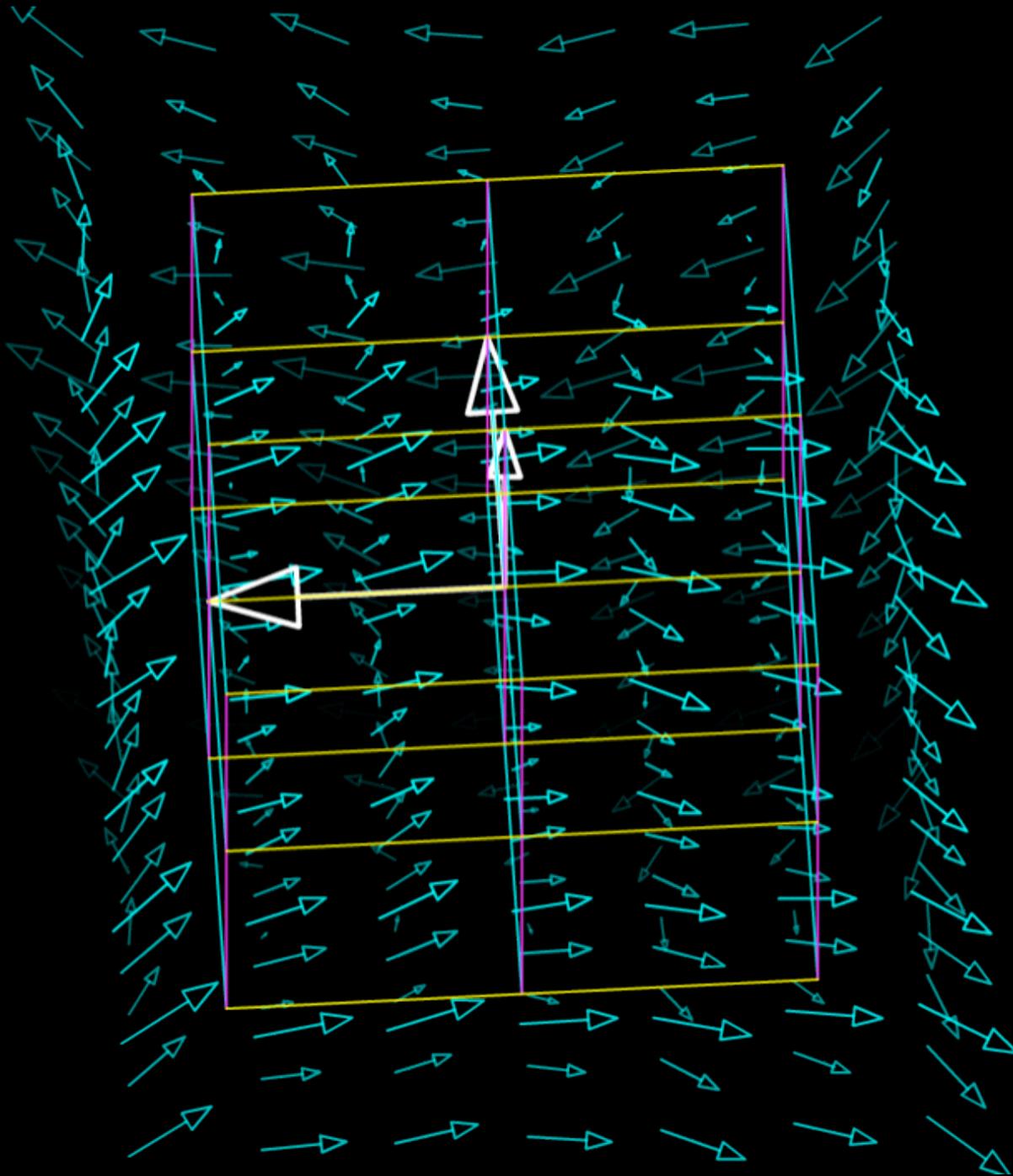
divergence measures the expansion of the field

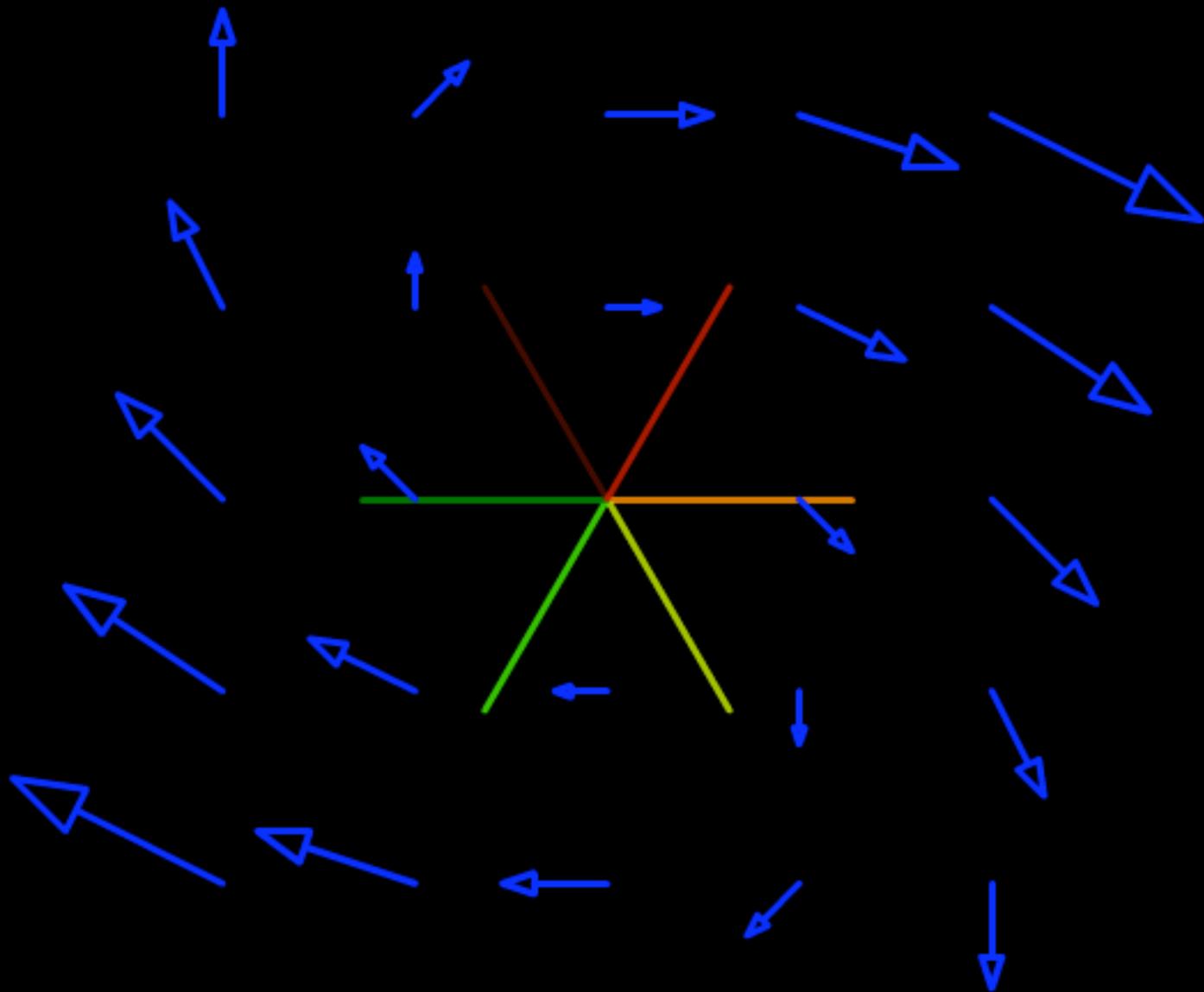


Curl curl measures the vorticity of the field

Div divergence measures the expansion of the field

3D Visualization





The project files

Benefits

- Explore Flash as an alternative to Java applets
- Deliver interactive features in course websites.
- Build actionscript building blocks for future projects

Comparison :

Flash -Java

Flash



Java

Sound and
multimedia work
well

Small plugin,
fast, abundant (98.3 %)

alpha channel
(main coolness factor)

Actionscript
accessible from binary

Long tradition in
education, usage 87.6

Development on all
operating systems

Not dependent on
fate of one vendor

Large additional
libraries available

Java and Flash demo

Conclusions

PITF-Faculty interaction

The student gained experience in delivering abstract mathematical content in a visual and interactive way. The challenges were to combine:

- technology
- pedagogy
- mathematics



programming

planning

together with ICG

Reminder: Google

“PITF VECTOR”

Download

GPL code



