Using Jupyter Notebooks in the classroom

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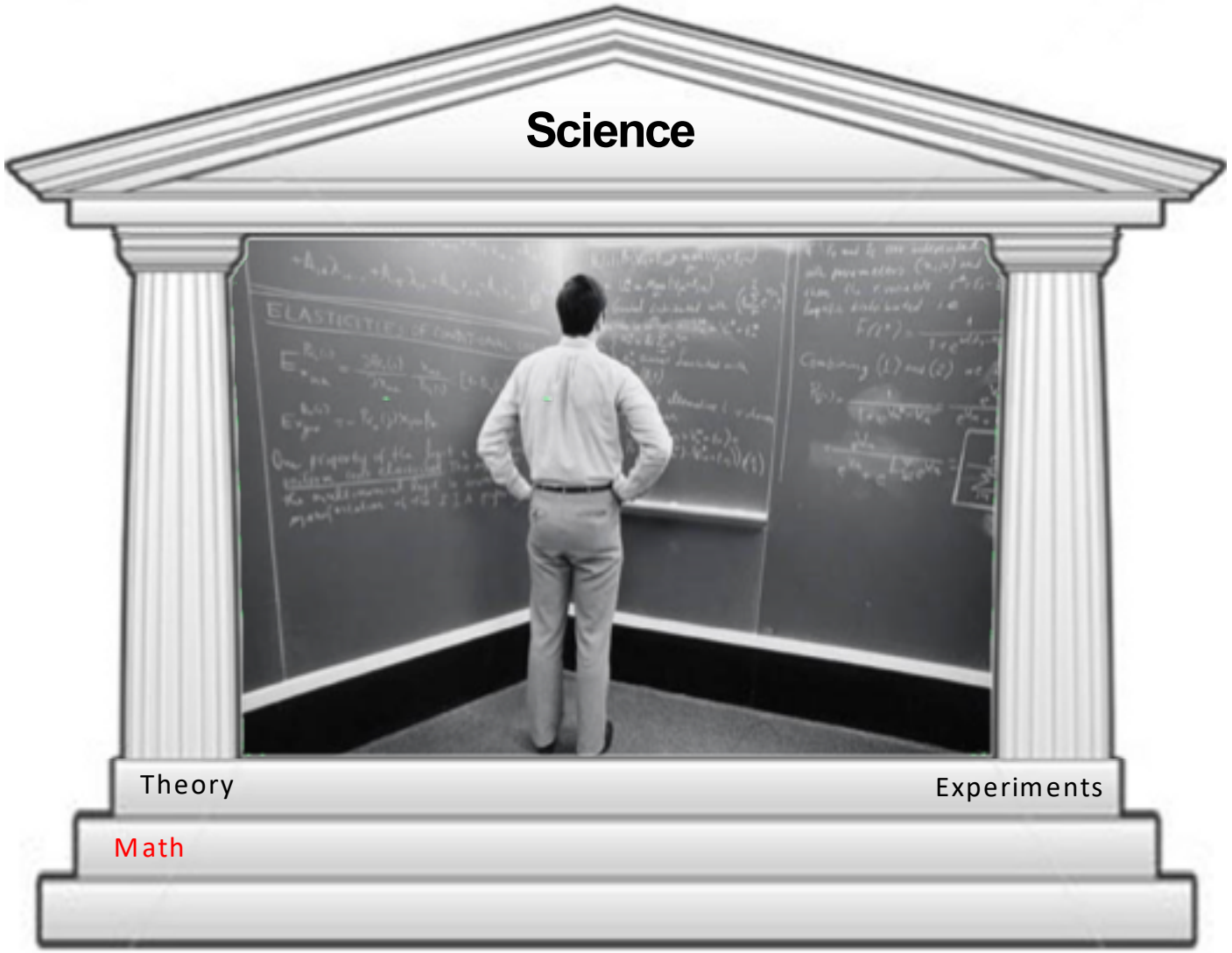
Agenda

- Introduction to CMSE
- Course Development in CMSE
- Why Jupyter
- Examples of Jupyter in the classroom
  - Pre-class notebook
  - In-Class notebook
  - Class homework


Science
Theory
Experiments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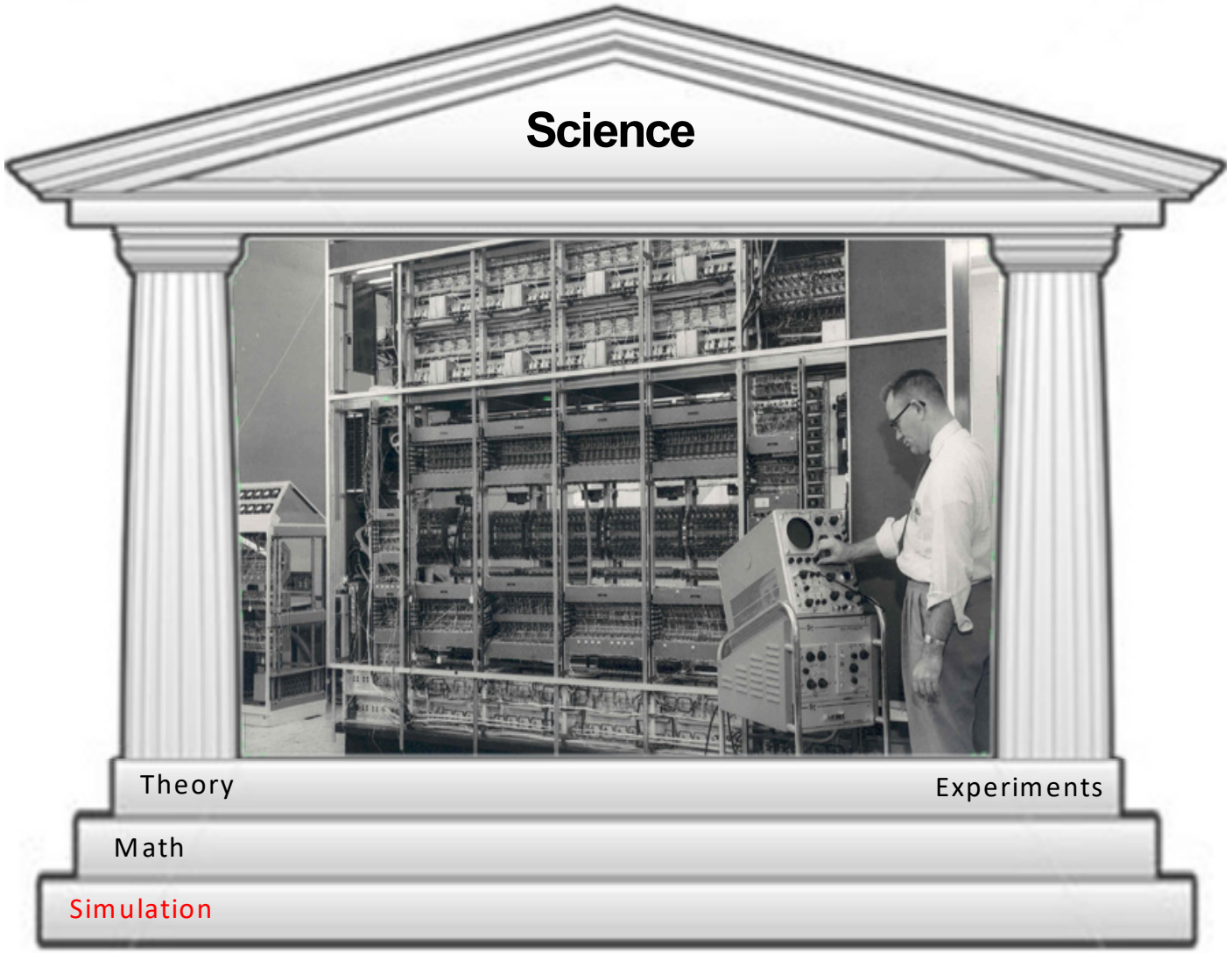
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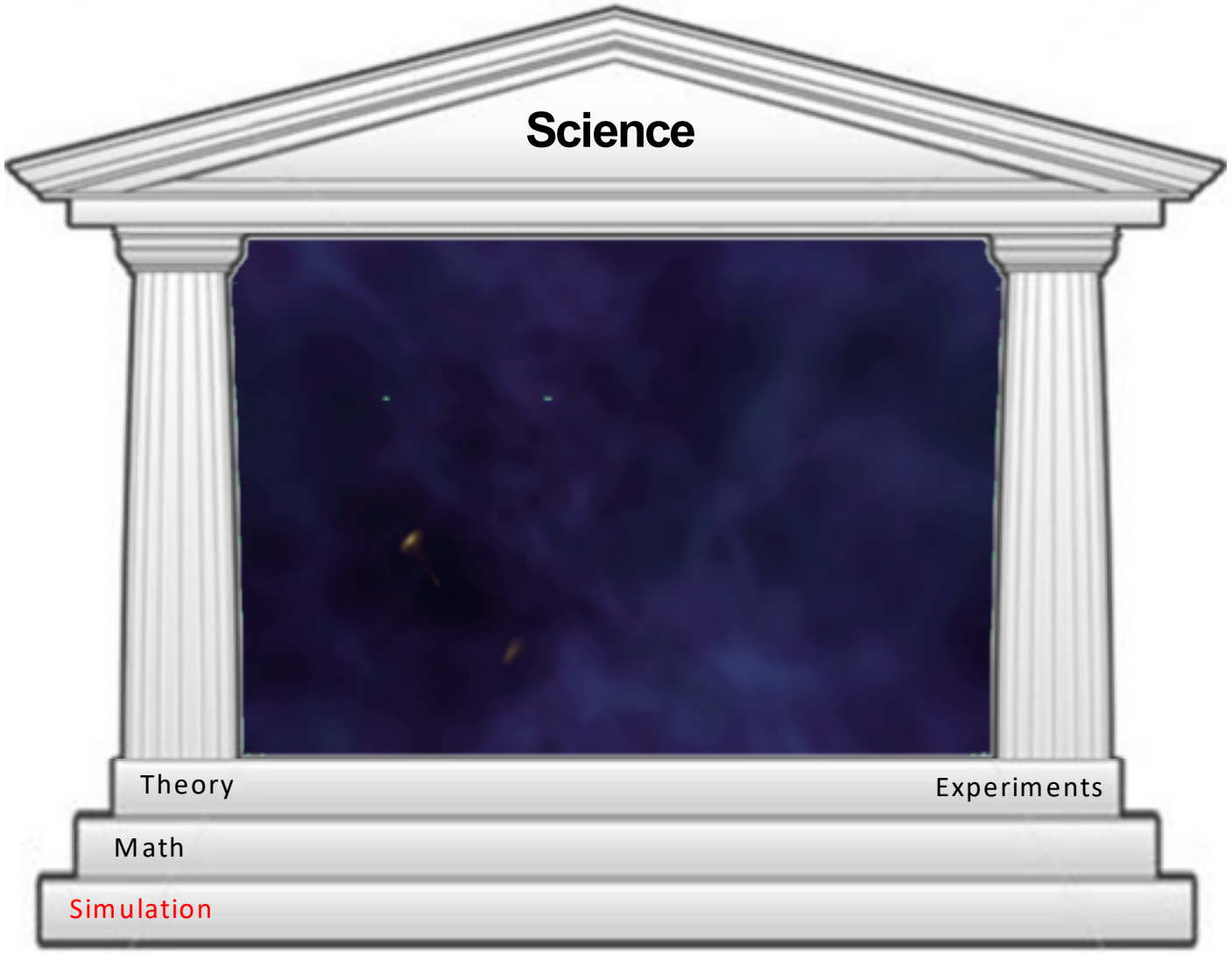
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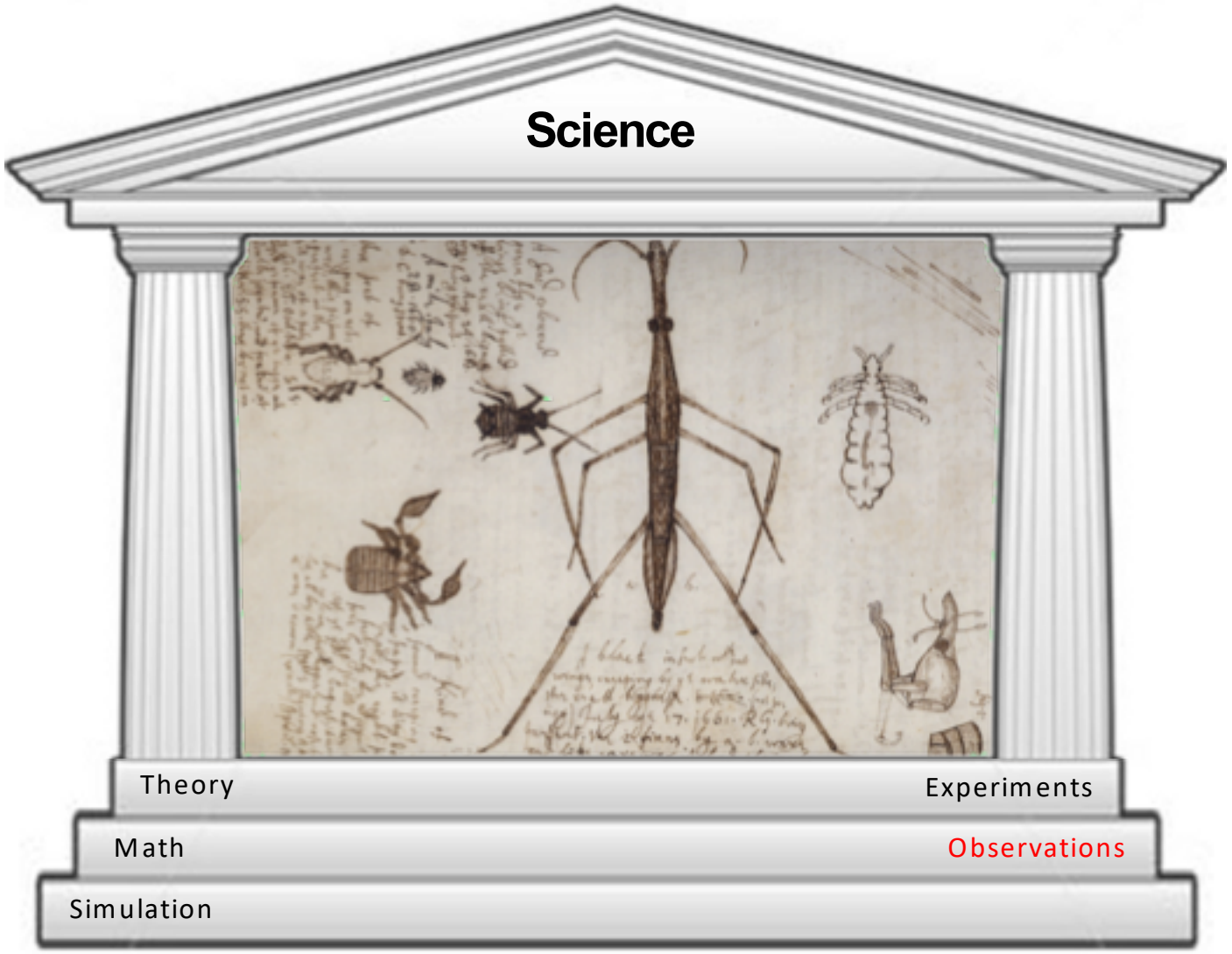
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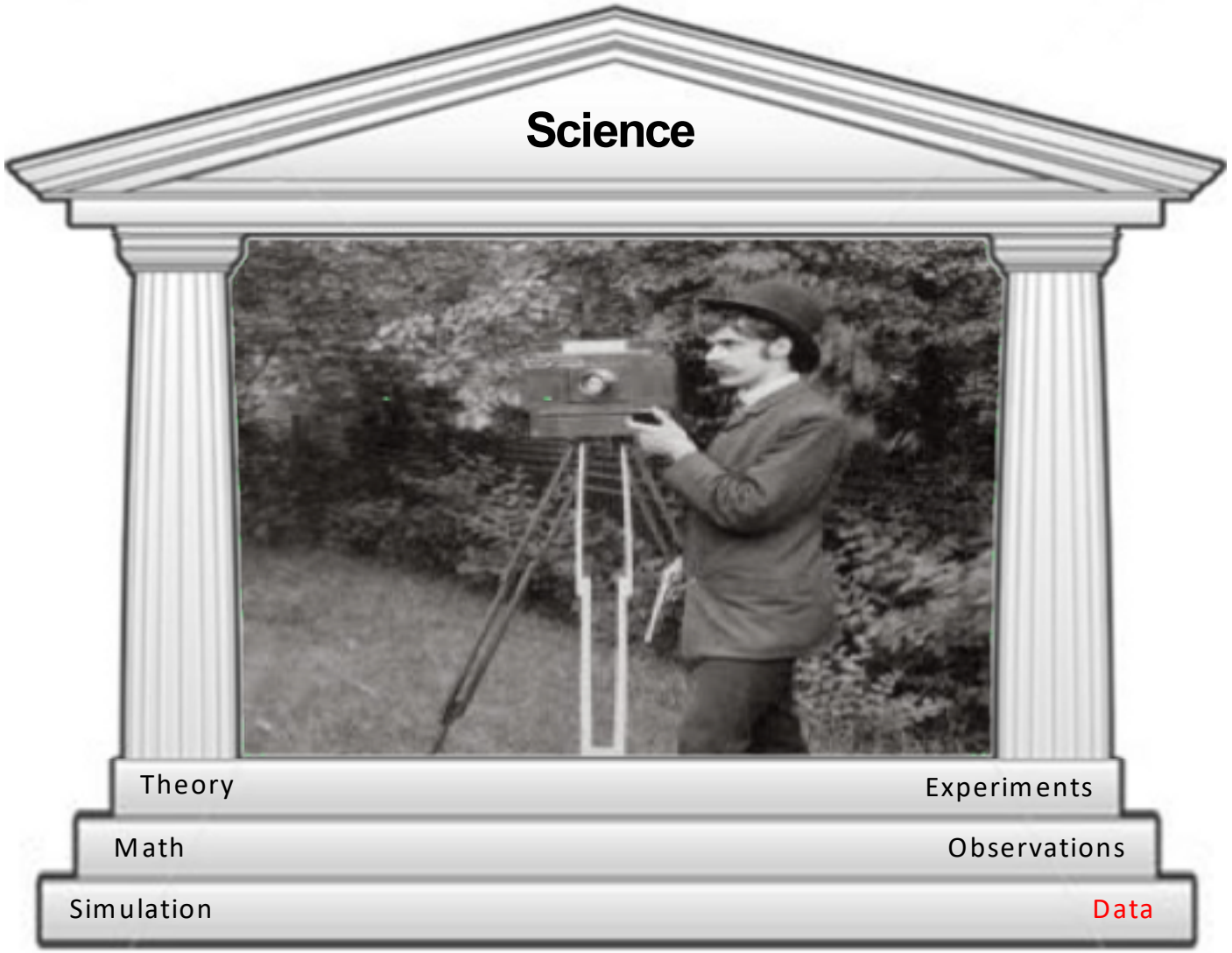
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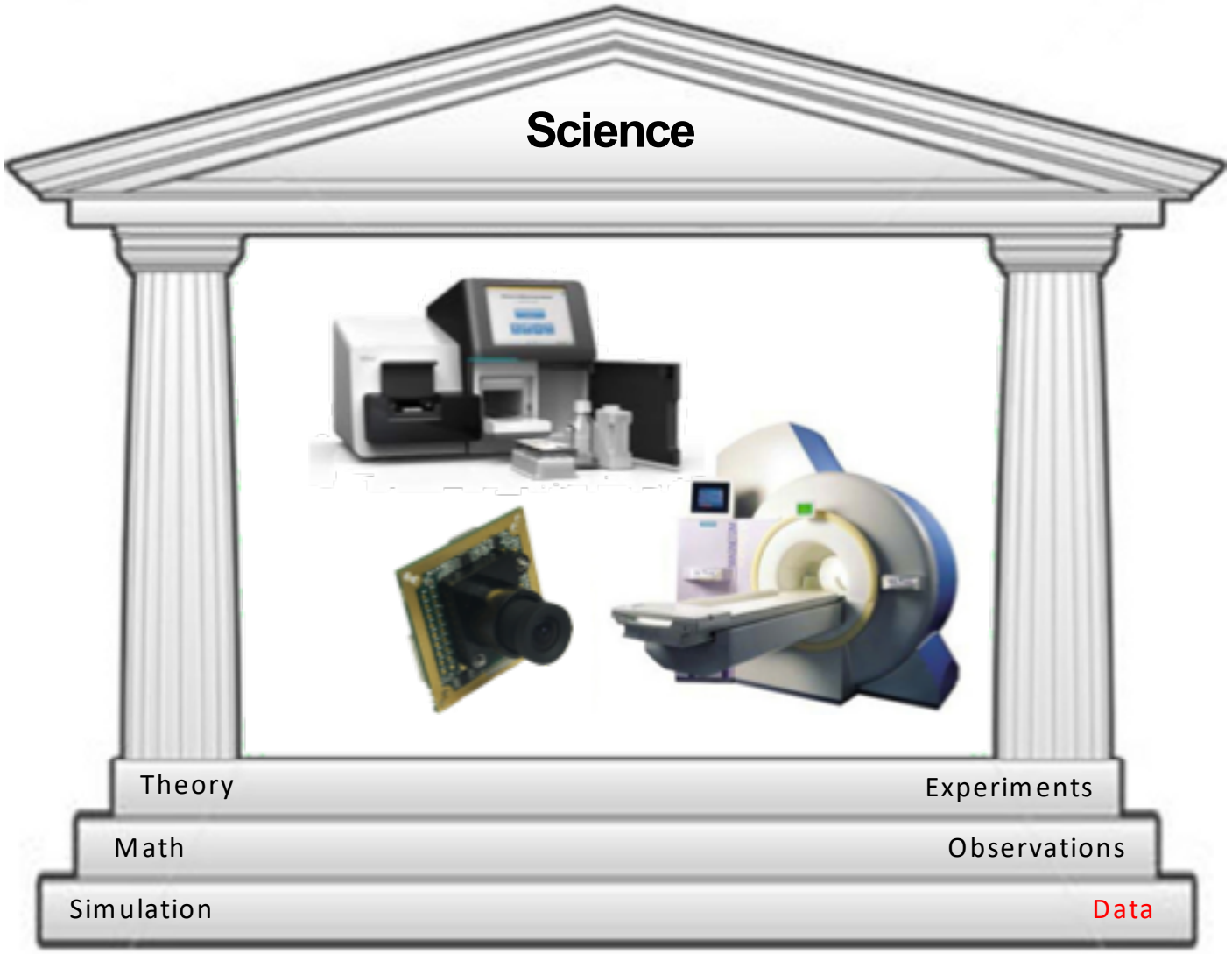
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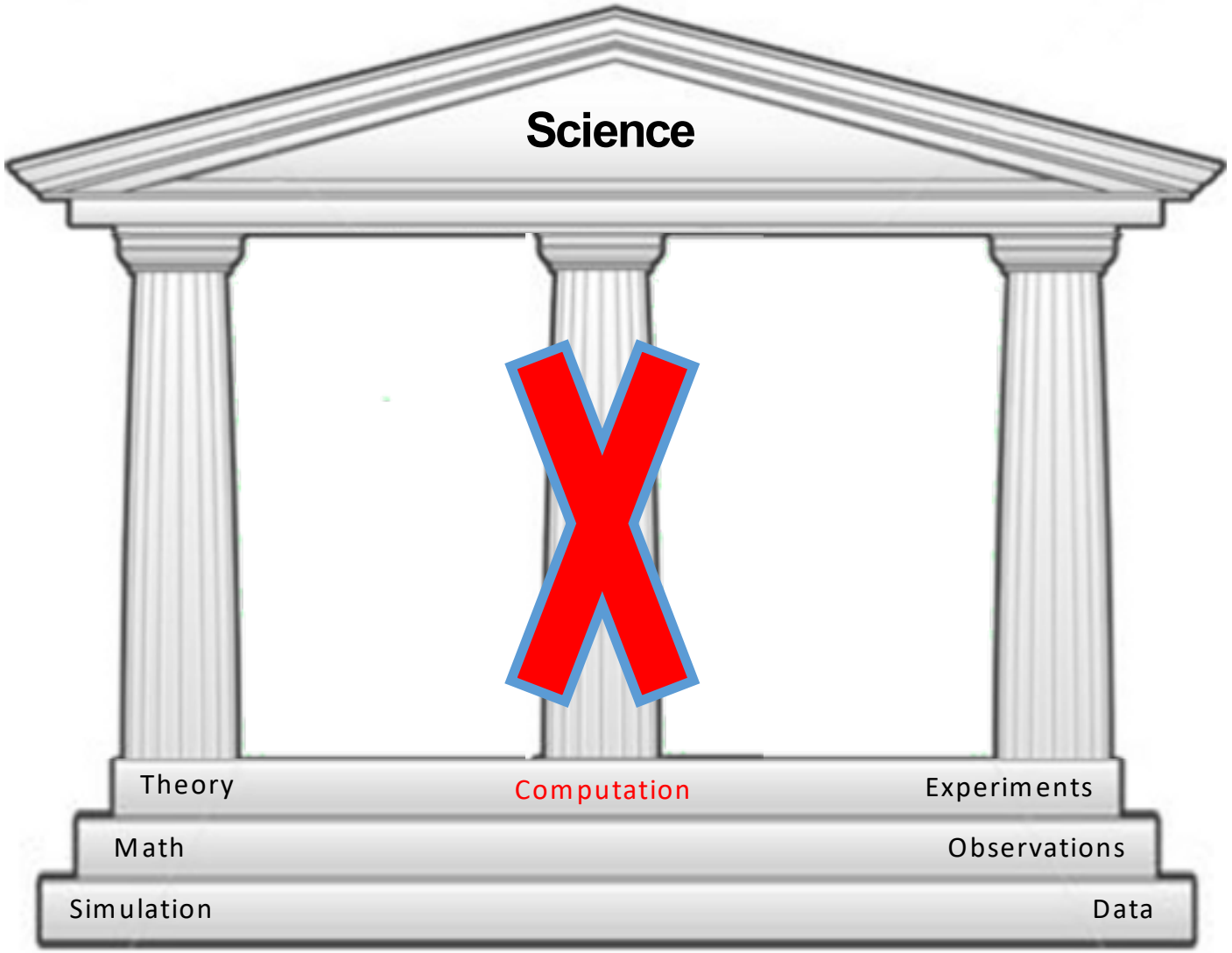
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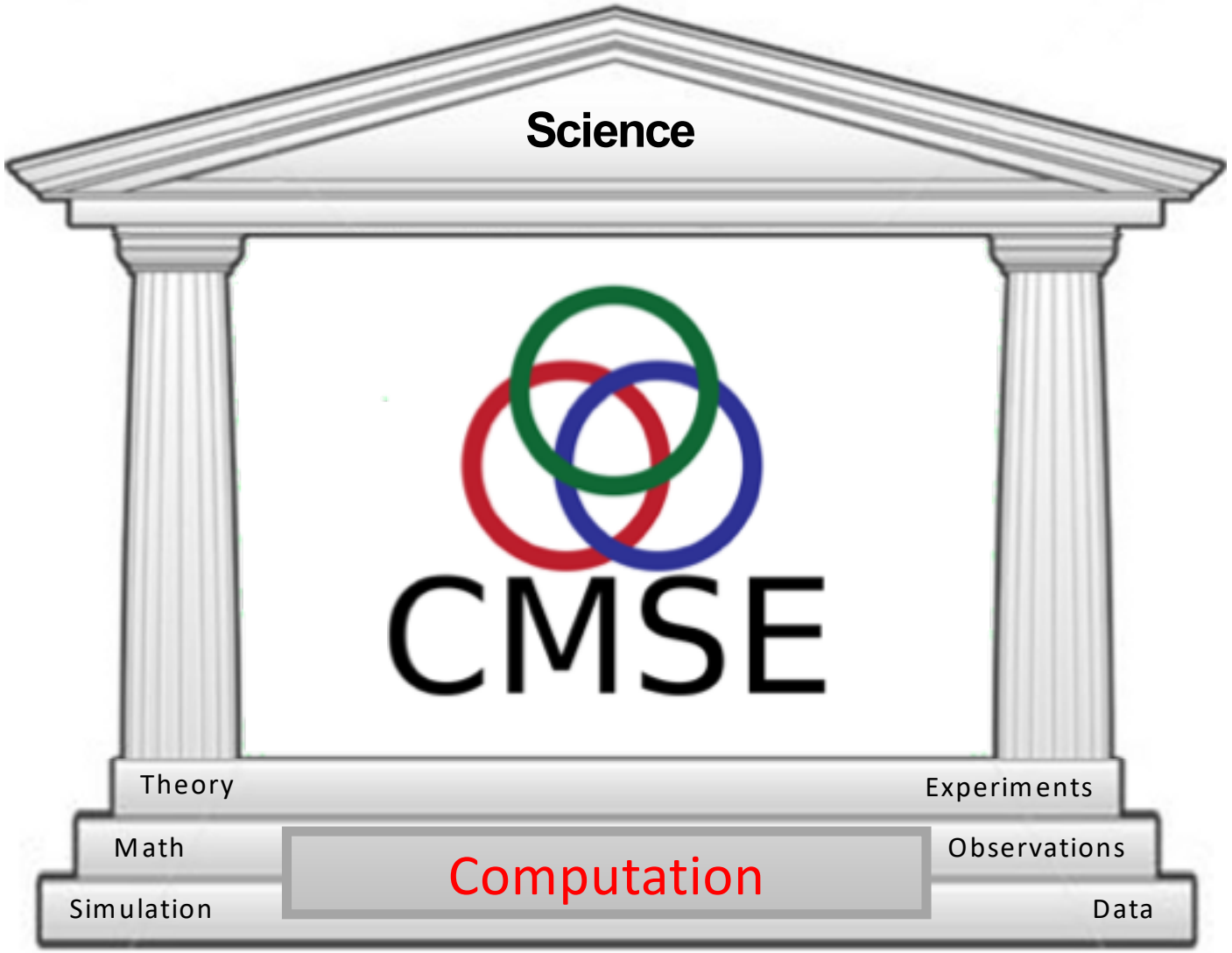
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Course Development in CMSE

- CMSE 201/202/801/802
- Computational Modeling and tools
- Flipped Classrooms
  - Lectures recorded as videos
  - Activities and projects done in class
- Problem Based Learning
  - Tools
  - Computing Concept
  - Scientific Concept
- Final Projects

Why Jupyter?

- Started out life as ipython notebooks
- Modified to include many programming languages
  - R
  - Python
  - Julia
  - BASH
  - Many others…
- Close to “Literate” programming
- I think of Jupyter notebooks as a communication tool more than an Integrated Development Environment (IDE)

Quick Example

Jupyter combines all of the following to make communication easier:

- Word Processing
- Images
- Videos
- Programming code
- Latex
- HTML
- Markdown
- Etc.

How do you use Jupyter?

- Install locally using conda:
  - https://www.continuum.io/downloads
- Jupyterhub – cloud based Jupyter server
  - http://jupyterhub.egr.msu.edu
- SageMath:
  - https://cloud.sagemath.com/

Downloading some examples:

1. Log into Jupyterhub
2. Hit the ”new” button and select terminal
3. Type the following commands:

```
git clone https://gitlab.msu.edu/colbrydi/CI-Forum2016.git
exit
```

4. Close the terminal window and go back to jupyterhub main menu.

Lets try some examples

- Typical Pre-class assignment
  - 03-Graph_Theory-pre-class-assignment
  - 07-OOP_pre_class_assignment
- Typical In-class assignment
  - 05_PCA-in_class_assignment
- Typical Homework assignment
  - HW2_Face_recognition

Some Notes

- To run a sell you can click SHIFT and then ENTER
- To get matplotlib graphs to work you need the following line at the beginning of your notebook

  ```
  %matplotlib inline
  ```

- Learn quick keys. Ex:
  - a – new cell (above)
  - b – new cell (below)
  - m – change to markup cell
  - c – change to code cell

Downloading more examples:

1. Log into Jupyterhub
2. Hit the ”new” button and select terminal
3. Type the following commands:

```
git clone https://gitlab.msu.edu/CMSE/Jupyter-Examples.git
exit
```

4. Close the terminal window and go back to jupyterhub main menu.
5. Explore the notebook files in the new Jupyter-Examples folder.

Conda Environments in jupyterhub

- Allows you to install your own plugins
- Includes support for pip and easy-install (sort of)
- Includes support for conda Installs

Questions?