Computational Science Moves to Interdisciplinary Research

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Dense Stellar Systems as a Laboratory for Fundamental Physics

We can study *elementary particles* through their interactions:

- bound states
- scattering experiments

Other extreme forms of matter: *black holes* and *neutron stars*

We can study these, too, through their interactions:

- bound states: double stars
- scattering experiments: collisions between stars

There is a natural laboratory: **dense stellar systems**

Dense Stellar Systems

- Interactions between individual stars important
  - Two-body relaxation time $<$ Age of the system
  - binary--single-star encounters; physical collisions
- Locations:
  - star-forming regions
  - old open star clusters
  - globular clusters
  - galactic nuclei

MODEST

MOdeling DEnse STellar systems

or

MODefying Existing STellar codes

http://www.manybody.org/modest.html


TRUCKS
UNLOADING
-6PM
FRI
nomad rugs
nomad
3N55

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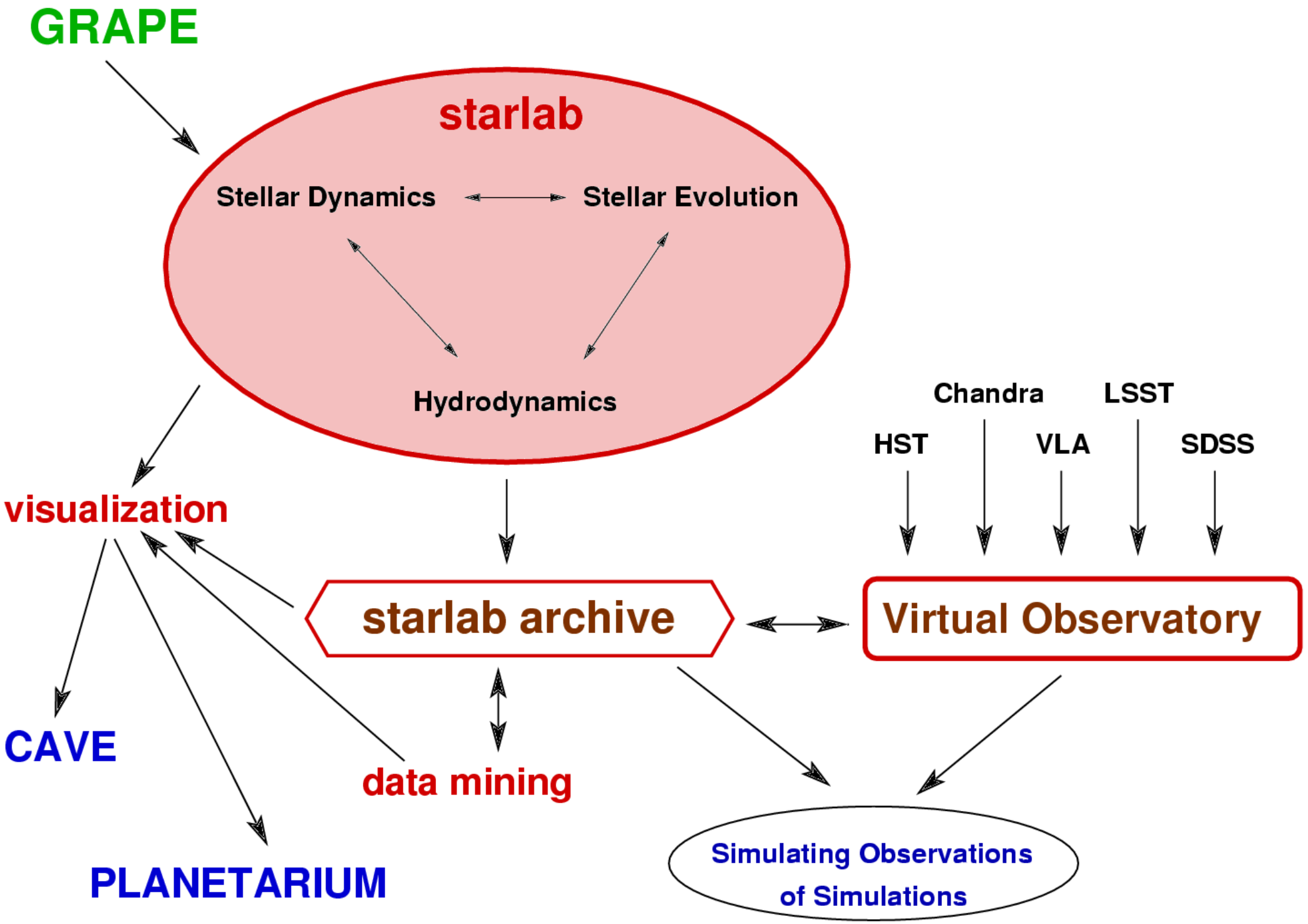
FREDERICK PHINEAS AND SANDRA PRIEST

ROSE CENTER FOR EARTH AND SPACE

Featuring the New Hayden Planetarium


GRAPE
starlab
Stellar Dynamics
Stellar Evolution
Hydrodynamics
visualization
Chandra
LSST
HST
VLA
SDSS
starlab archive
Virtual Observatory
CAVE
data mining
PLANETARIUM
Simulating Observations
of Simulations

A Brief History of Science

~ 2000 years ago:	Theory	--	Greek mathematics
~ 400 years ago:	Theory & Experiment	--	Modern Science
~ 50 years ago:	Theory, Experiment & Simulations	--	?

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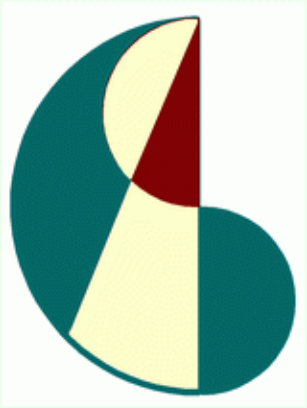
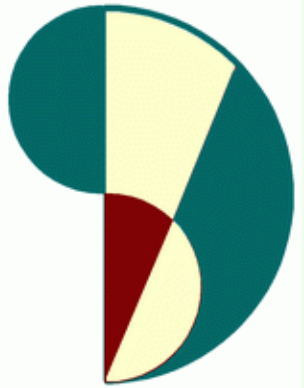
Science is the first “open source” project.

Experiments: a new lab culture had to be developed
-- make detailed lab notes, keep raw data
-- report failures as well as success

Simulations: a new `virtual lab' culture is now emerging
-- we don't yet have a good way to share code
-- we don't yet know how to share knowledge



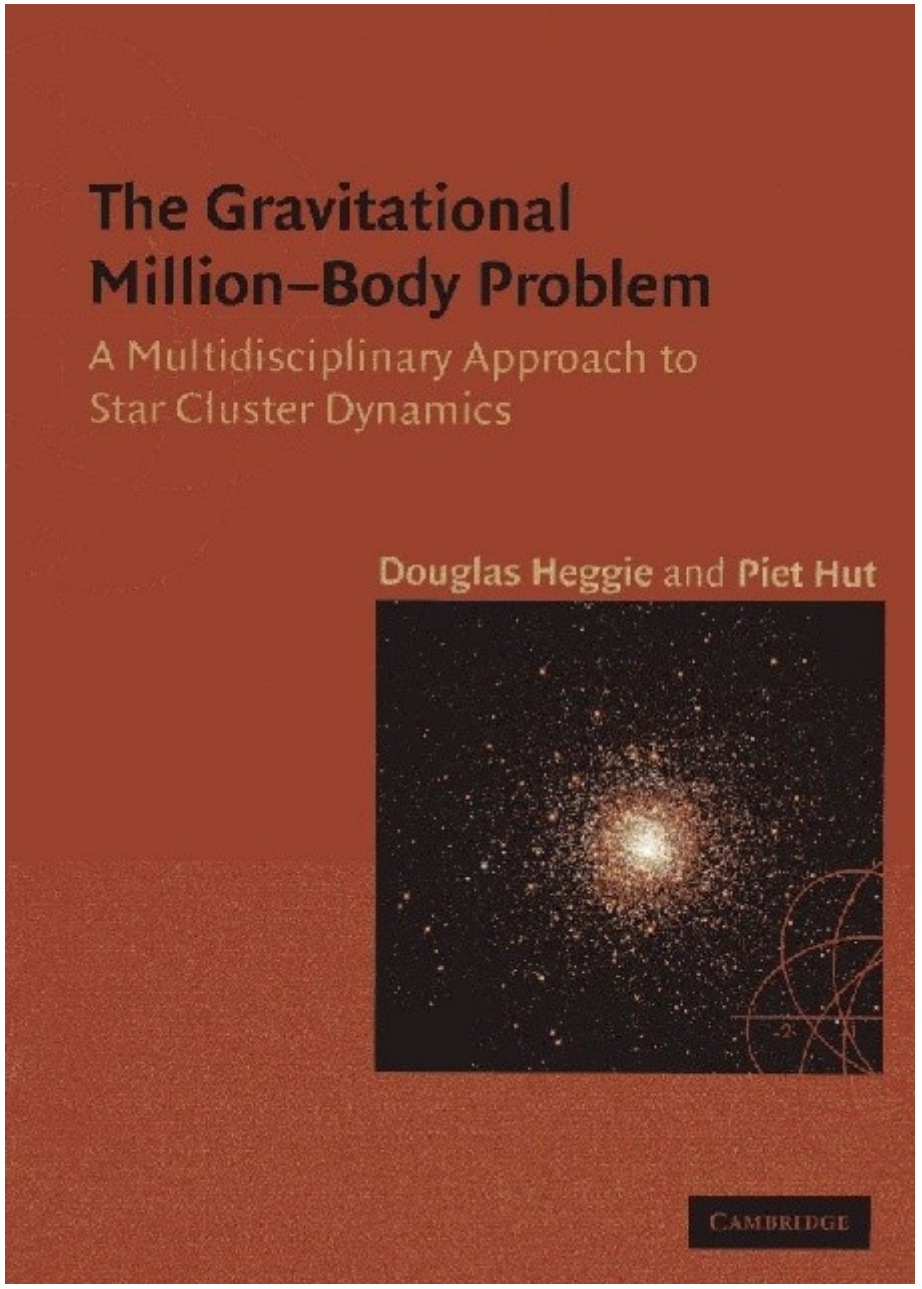
The Art of Computational Science



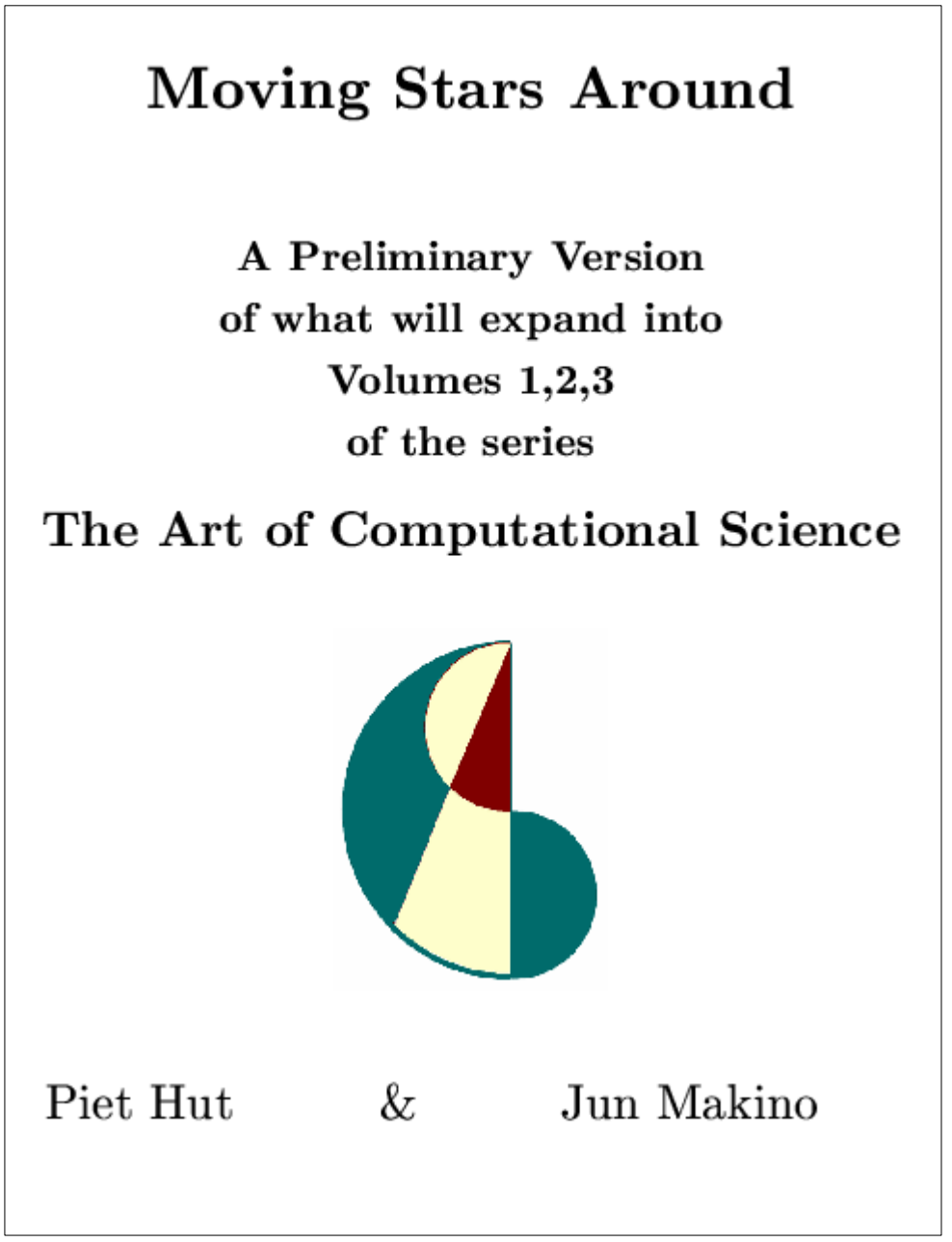
A series of books on how to build a computational lab

www.artcompsci.org

An open source project



4 Introductions: astrophysics
theoretical physics
computational physics
mathematics



3 themes: exploring N-body algorithms
writing N-body codes
performing N-body experiments

(www.artcompsci.org)