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Developing Community-Based Sustainability Models for Open Access Repositories: Business Planning Methodology for arXiv

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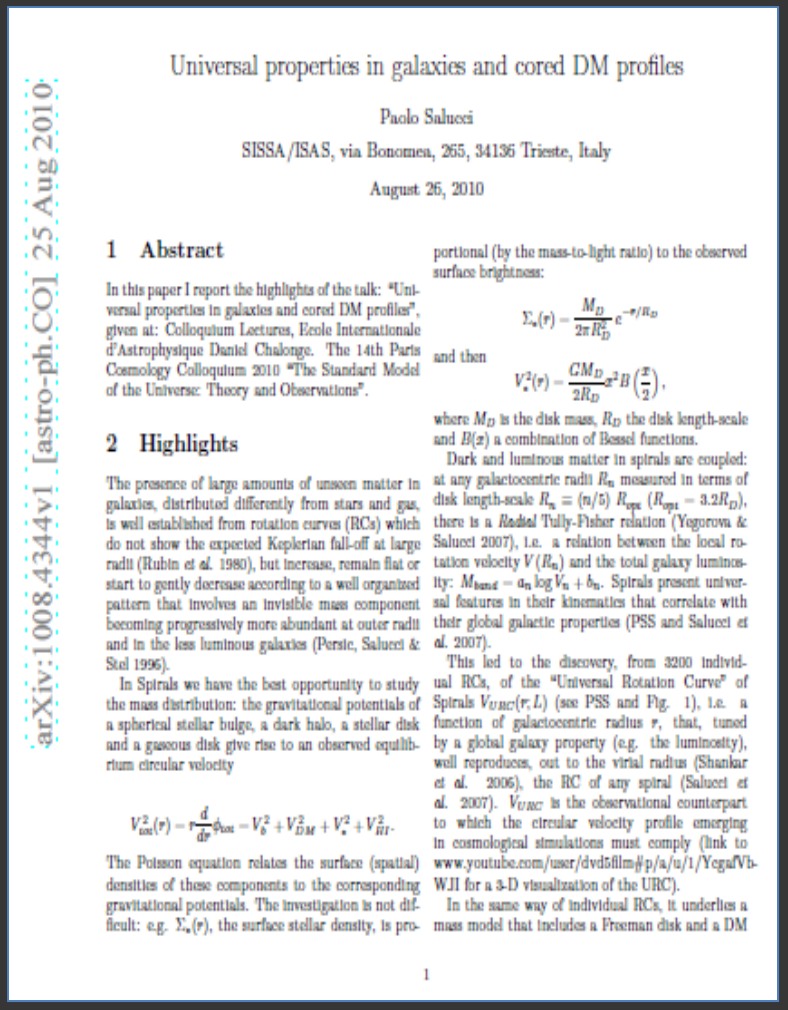
outline

- characterize arXiv.org
- explain the business planning process
- report on the current status of the sustainability initiative
- share reactions to our planning efforts
- expand on what sustainability entails
- describe future steps



Universal properties in galaxies and cored DM profiles

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1 Abstract

In this paper I report the highlights of the talk: "Universal properties in galaxies and cored DM profiles", given at: Colloquium Lectures, Ecole Internationale d'Astrophysique Daniel Chalonge. The 14th Paris Cosmology Colloquium 2010 "The Standard Model of the Universe: Theory and Observations".

2 Highlights

The presence of large amounts of unseen matter in galaxies, distributed differently from stars and gas, is well established from rotation curves (RCs) which do not show the expected Keplerian fall-off at large radii (Rubin et al. 1980), but increase, remain flat or start to gently decrease according to a well organized pattern that involves an invisible mass component becoming progressively more abundant at outer radii and in the less luminous galaxies (Persic, Salucci & Stel 1996).

In Spirals we have the best opportunity to study the mass distribution: the gravitational potentials of a spherical stellar bulge, a dark halo, a stellar disk and a gaseous disk give rise to an observed equilibrium circular velocity

$$V^2_{tot}(r) = r\frac{d}{dr}\phi_{tot} = V^2_b + V^2_{DM} + V^2_* + V^2_{HI}.$$

The Poisson equation relates the surface (spatial) densities of these components to the corresponding gravitational potentials. The investigation is not difficult: e.g. $\Sigma_*(r)$, the surface stellar density, is proportional (by the mass-to-light ratio) to the observed surface brightness:

$$\Sigma_*(r) = \frac{M_D}{2\pi R_D^2} e^{-r/R_D}$$

and then

$$V^2_*(r) = \frac{GM_D}{2R_D} x^2 B\left(\frac{x}{2}\right),$$

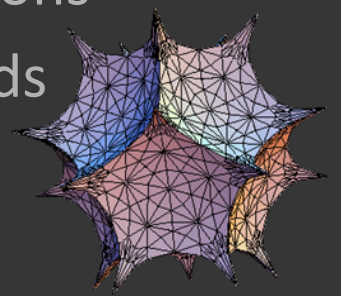
where M_D is the disk mass, R_D the disk length-scale and $B(x)$ a combination of Bessel functions.

Dark and luminous matter in spirals are coupled: at any galactocentric radii R_n measured in terms of disk length-scale $R_n = (n/5)\ R_{opt}$ ($R_{opt} = 3.2R_D$), there is a *Radial* Tully-Fisher relation (Yegorova & Salucci 2007), i.e. a relation between the local rotation velocity $V(R_n)$ and the total galaxy luminosity: $M_{band} = a_n \log V_n + b_n$. Spirals present universal features in their kinematics that correlate with their global galactic properties (PSS and Salucci et al. 2007).

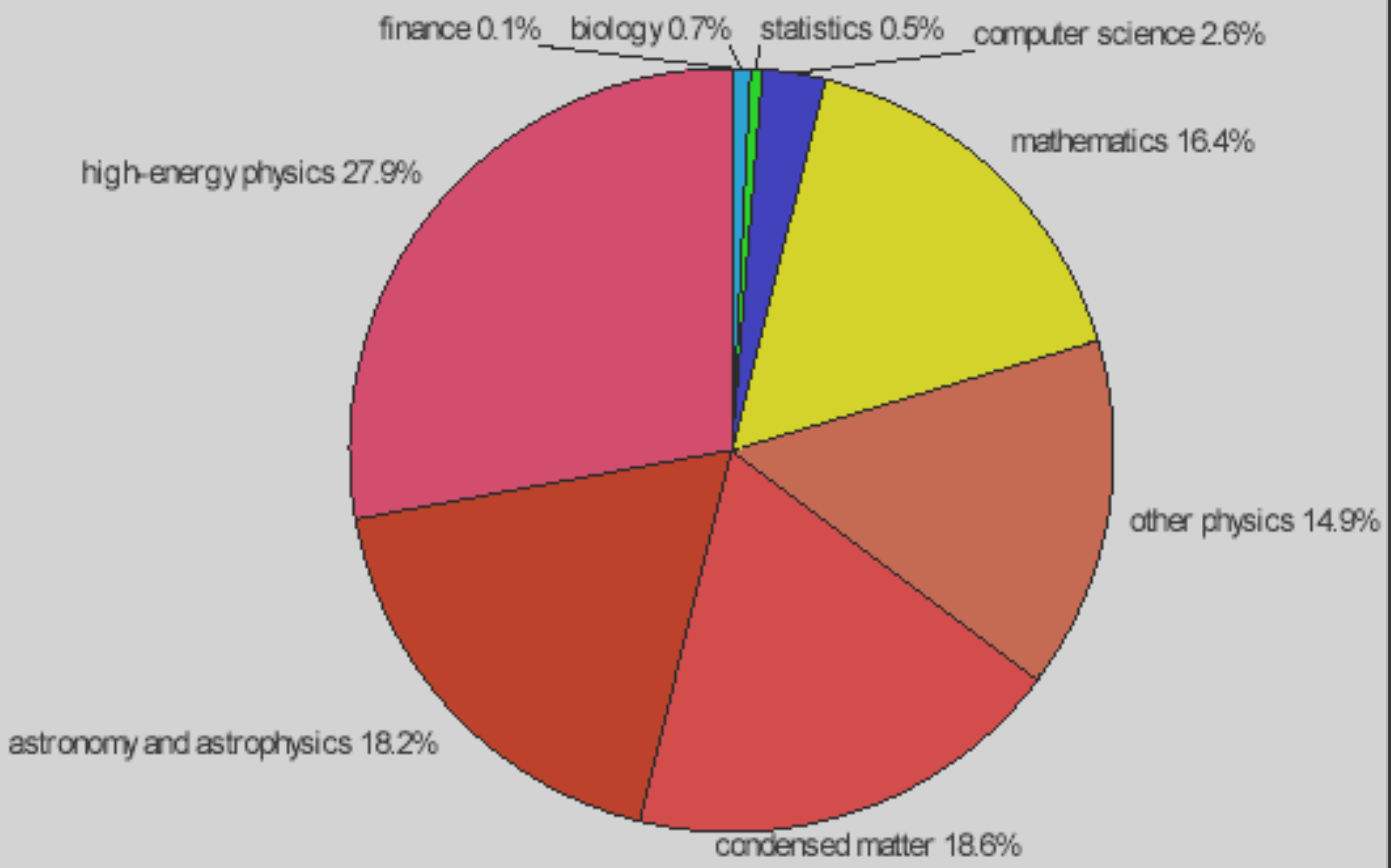
This led to the discovery, from 3200 individual RCs, of the "Universal Rotation Curve" of Spirals $V_{URC}(r, L)$ (see PSS and Fig. 1), i.e. a function of galactocentric radius r, that, tuned by a global galaxy property (e.g. the luminosity), well reproduces, out to the virial radius (Shankar et al. 2006), the RC of any spiral (Salucci et al. 2007). V_{URC} is the observational counterpart to which the circular velocity profile emerging in cosmological simulations must comply (link to www.youtube.com/user/dvdsfilm#p/a/u/1/YegafVbWJI for a 3-D visualization of the URC).

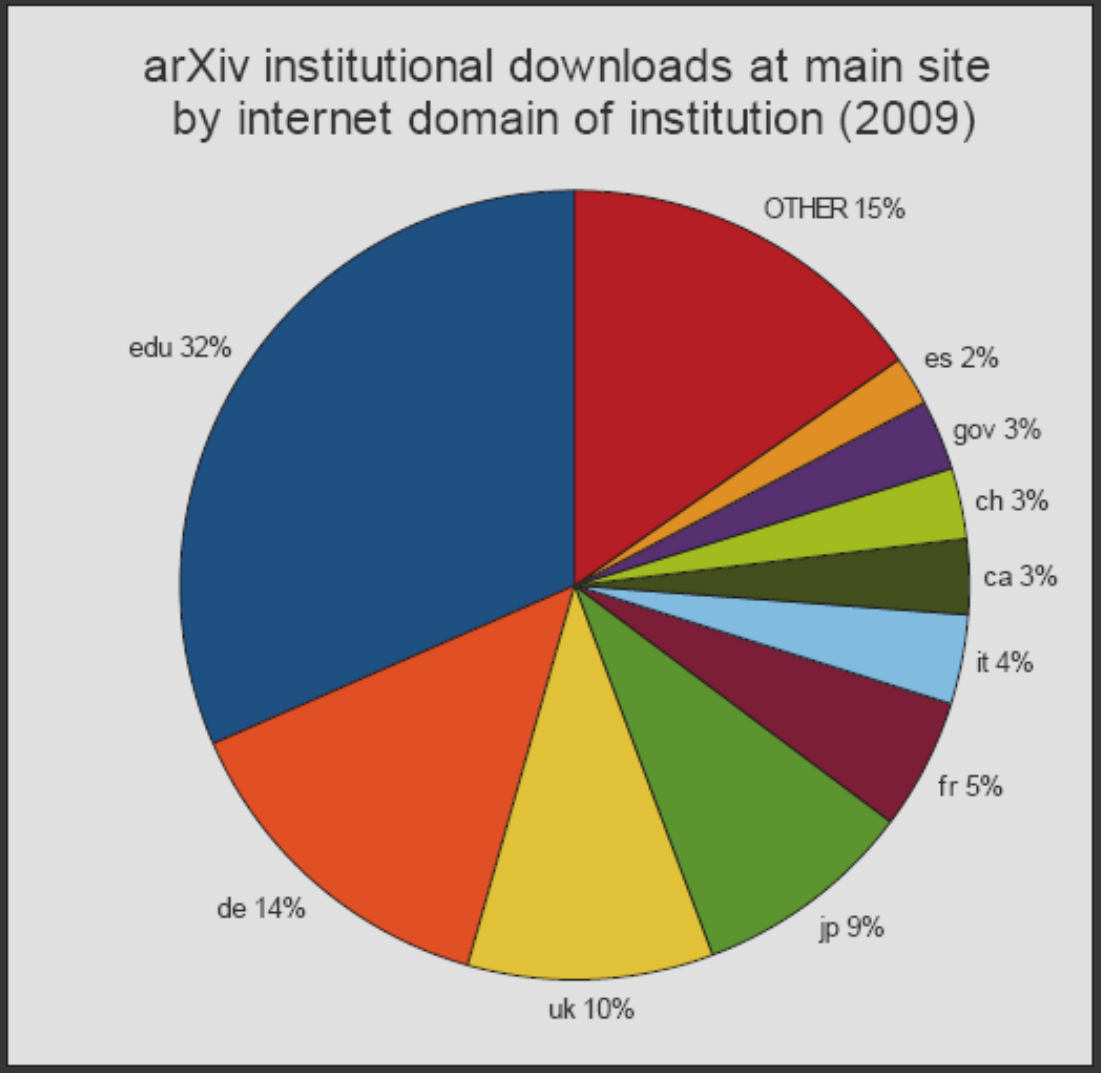
In the same way of individual RCs, it underlies a mass model that includes a Freeman disk and a DM

- established in 1991 by Paul Ginsparg as a pre-print archive
- has been hosted at Cornell since 2001
- includes 630,000 articles
- usage data from 2009:
  - 60,000 new submissions
  - 30,000,000 downloads



arXiv submissions by subject 1991-2009





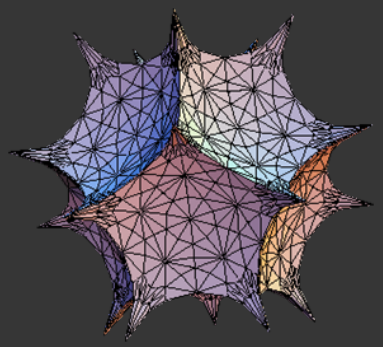
only 0.5 – 0.7% use from Cornell

2010 annual budget = $380K plus in-kind contributions

sustainability *is the ability to secure resources needed to protect and enhance the value of a service based on the needs of the user community*

- *cover operation costs through a combination of revenue sources and cost-management strategies*

- *enhance value based on the needs of the user community*

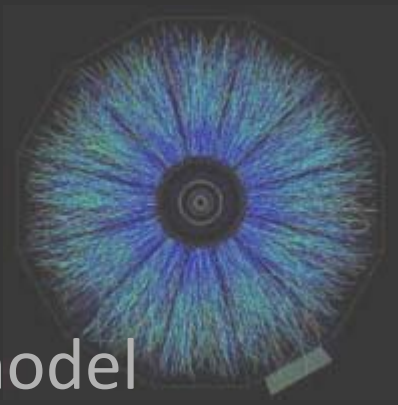


Source: *Sustainability and Revenue Models for Online Academic Resources. An Ithaka Report. 2008*

Sustainability Planning Process 2009-2010

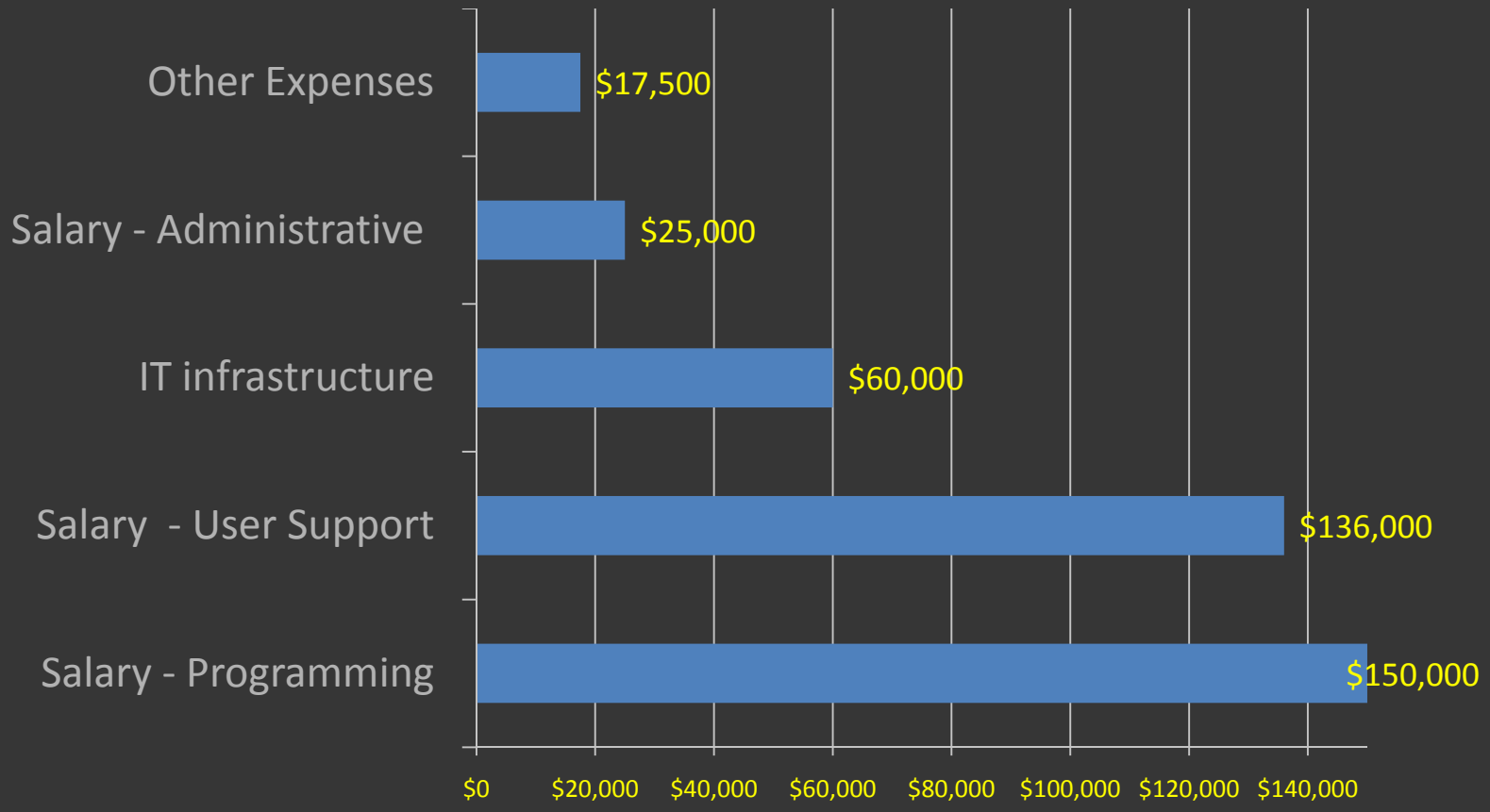
- Considered various income models for open access and explored the pros and cons of emerging practices
- Surveyed the key stakeholders' positions and opinions on the future of arXiv
- Expanded our understanding of operations, services, policies, technologies, practices associated with arXiv

Sustainability Planning
INTERIM MODEL



- Developed a 3-year collaborative support model requesting voluntary contributions from libraries and research institutes
  - Target the top 200 based on downloads from institutional domain names
  - Annual contribution tiers per institution:
    $4,000 $3,200 $2,300
  - Since January 2010, **secured $302,000 from 85 institutions**, representing 10 countries
    - in progress: MOU with TIB and HGF of Germany

CY 2010 Budget









- Annual budget = ~ $380,000 plus **in-kind contributions**
- Per unit costs:
  - $7 per submission
  - 1.4 cents per download

issues raised by libraries &research centers

- How will you address the free rider problem?
- Why not charge scholars per submission?
- What are the benefits for my institution?
- How will you structure a governance model?
- Are you opening a floodgate?
- What are the other potential sources of revenue?
- What is your long-term plan?
- When is arXiv going to replace the formal journals?

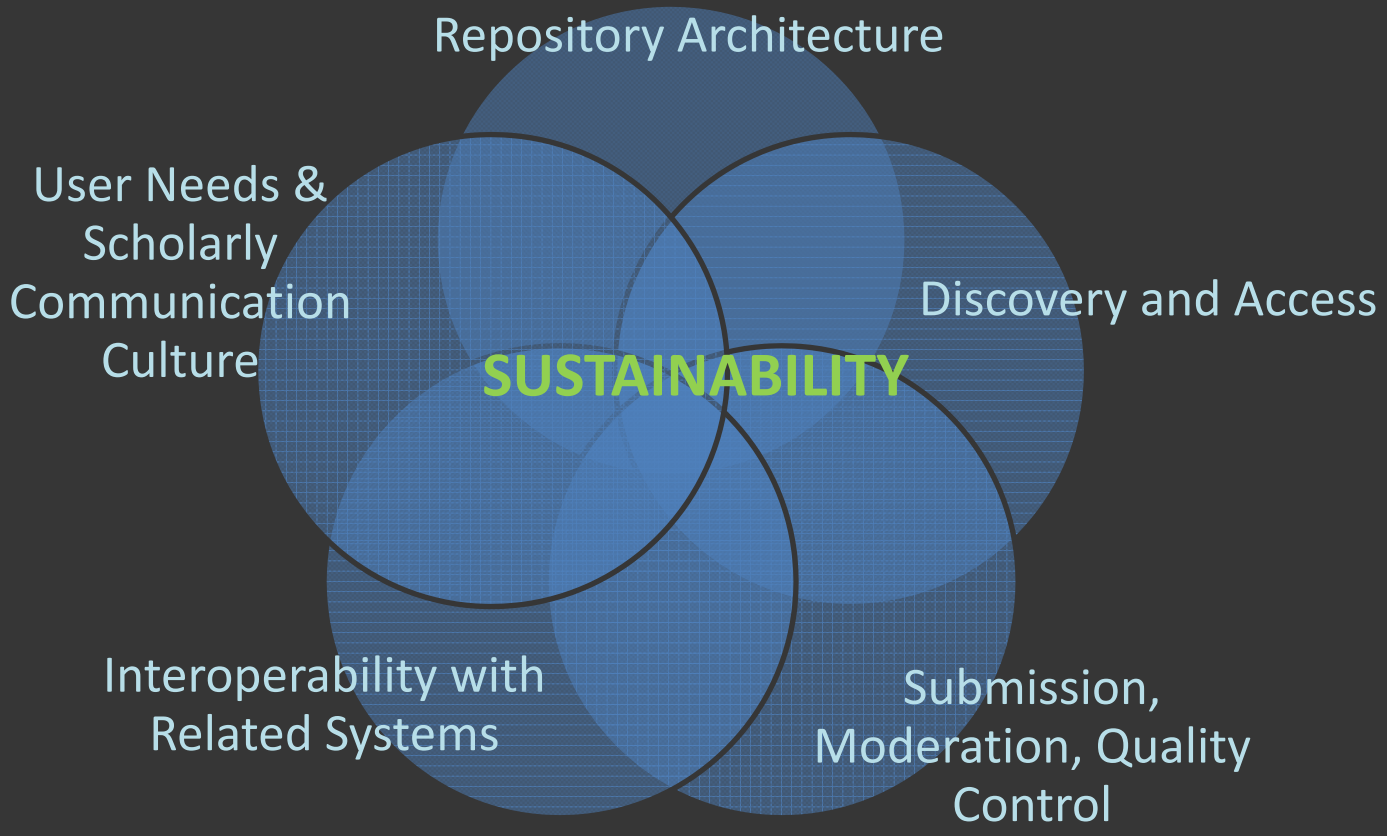
issues raised by users

- Will there be charge for using arXiv?
- Will contribution model be mandatory?
- Might this sustainability initiative harm the open access cause?
- Did you try other ways of raising money?
  - "surely agency X will support arXiv"
- What is your long-term plan?
- Isn't arXiv the most important thing Cornell University Library does?

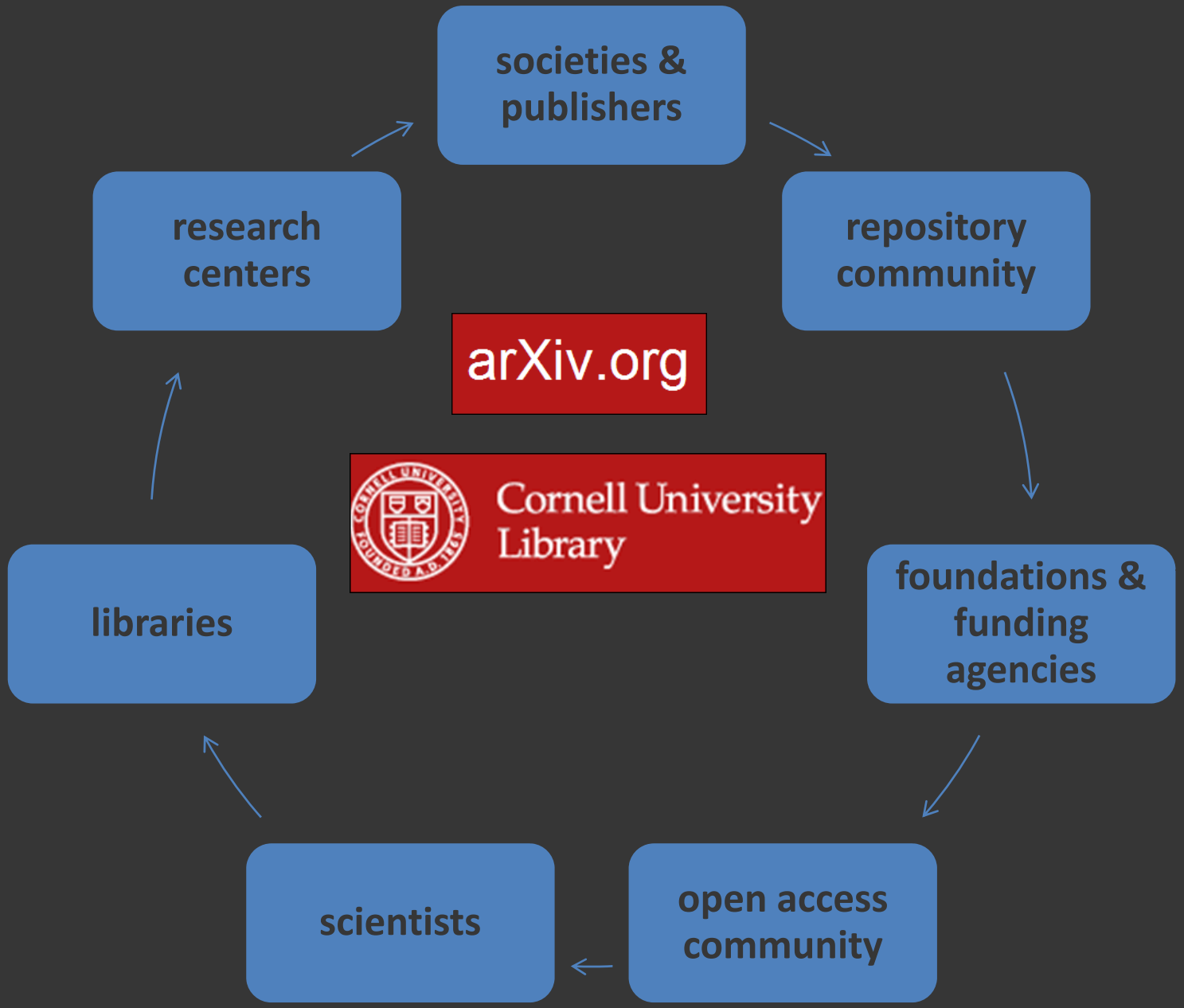
Looking Ahead

- Work with the international sustainability advisory group in long-term planning
- Hold discussions with a group of publishers and societies
- Identify funding sources from agencies and foundations
- Review arXiv architecture & services
- Consider a user study

as we address the sustainability of open access resources, we need to factor in a range of issues



…and factor in various stakeholders' perspectives



we gratefully acknowledge the support of the following institutions for calendar year 2010 (as of September 2010)

Tier 1 ($4,000 per year)

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ETH Zurich (Switzerland)
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Institute for Advanced Study
JISC Collections (UK Colleges and Universities)
Johns Hopkins University
Los Alamos National Laboratory Research Library
MIT Department of Physics and MIT Libraries
Nagoya University
New York University
Ohio State University
Penn State University
Princeton University
Purdue University
Rutgers University
Stanford University
Texas A&M University
The University of Tokyo
Tohoku University
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Hiroshima University
Indiana University
JISC Collections (UK Colleges and Universities)
Michigan State University
Northwestern University
Rice University
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The Institute of Mathematical Sciences
Tokyo Institute of Technology
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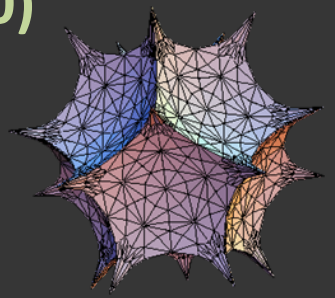
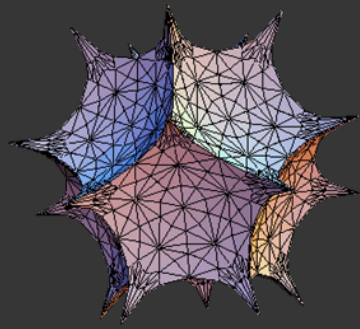
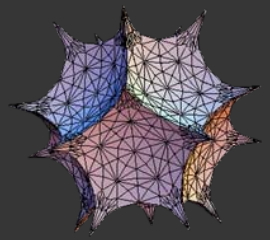
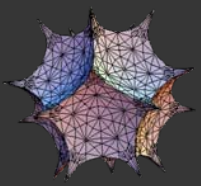

thank you!

more information available at:

http://arxiv.org/help/support