

A Technology Framework to Support Team Science

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Official Charge

- What technologies and infrastructure are needed to support Team Science?
 - Communication
 - Coordination
 - Information repositories
 - Computational infrastructure
- What factors should be considered in putting together this suite?

Agenda

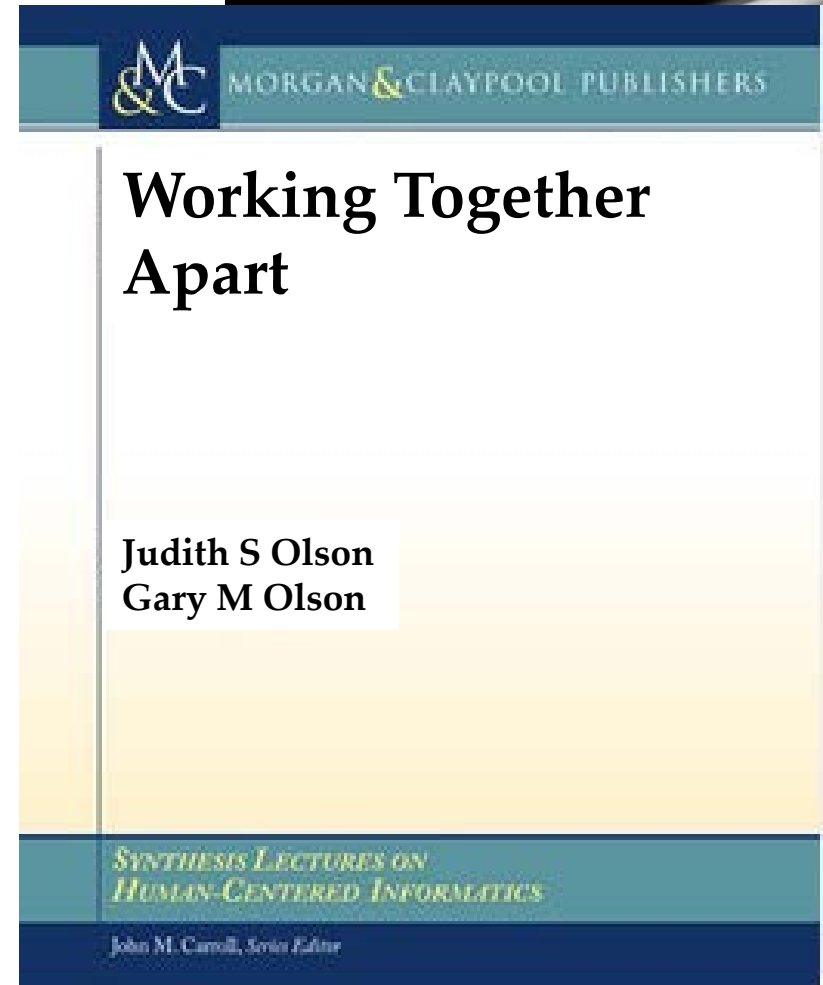
- Most science teams are distributed
 - In space
 - In time
- What's hard about working in a distributed team
- What technologies can help
 - Kinds of technologies
 - How they help what's hard
- How to decide what you need



Based on....

SCIENTIFIC COLLABORATION
ON THE INTERNET

- 20 years of **experience** studying distributed science teams
- **Literature** from business, sociology, informatics,



Many teams in science are distributed

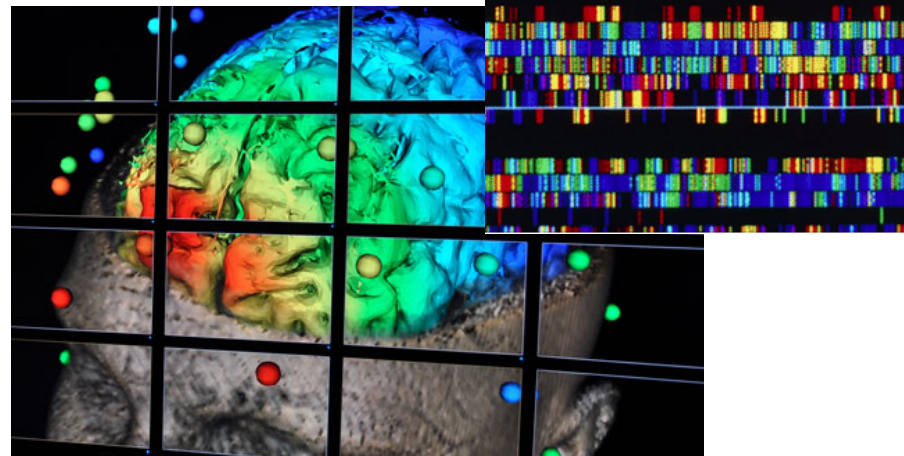
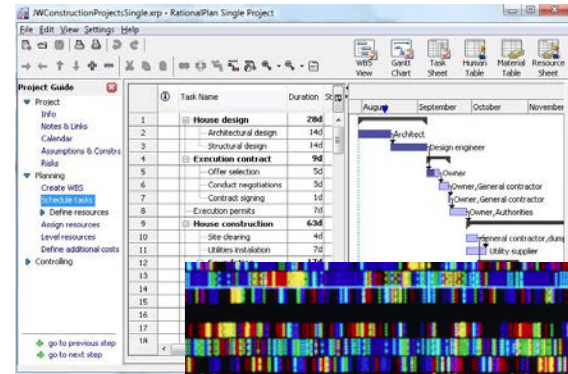
- Large science begets distance



- Distance presents challenges

Collocated teams require technology help

- Asynchronous work is distributed in time
 - Project management
 - Data repositories
 - Shared computational resources



Distance work

- More than 30 meters apart
 - Different floors of a building
 - Different buildings on campus



The Challenges of Distance

- Blind and invisible
 - Lose awareness
 - Time zone differences
 - Crossing institutions
 - Crossing cultural boundaries
 - Uneven distribution begets power differences
-
- Technologies can help
 - but they need appropriate social practices surrounding them

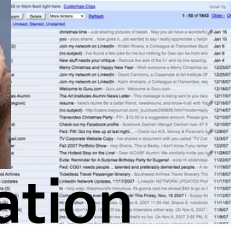
Kinds of technologies

Infra
structure

Synchronous or near



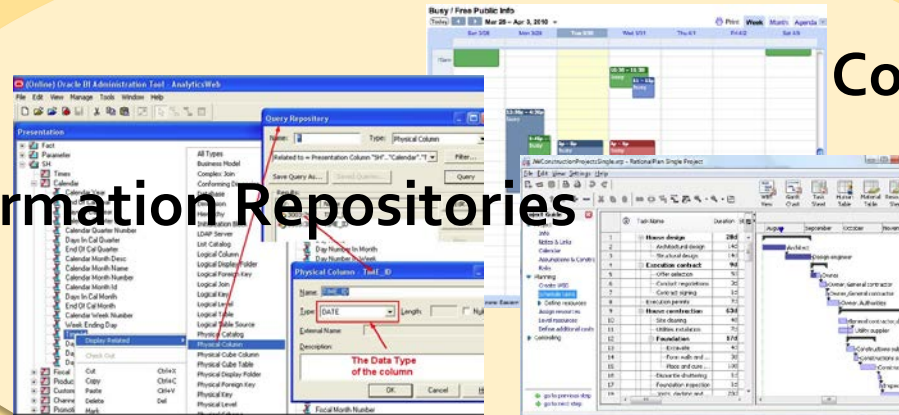
Coordination



Communication

Coordination

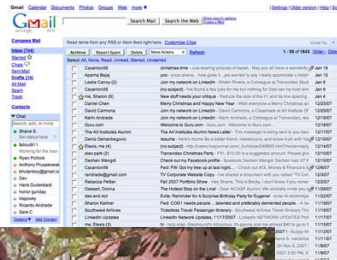
Information Repositories



Asynchronous

Communication

- Email



- Texting



- Audio conferencing

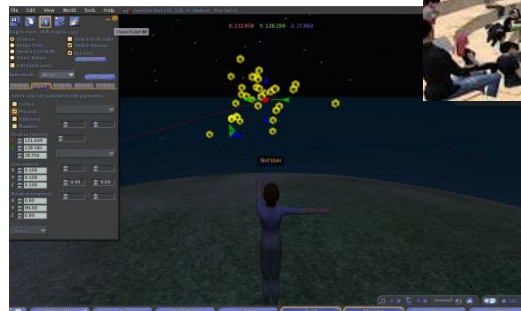
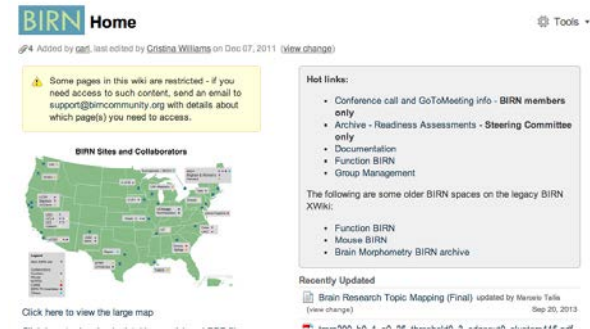
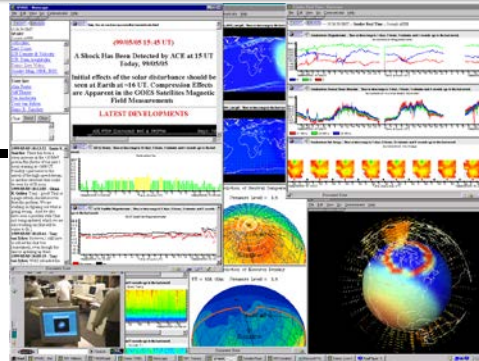


- Video conferencing



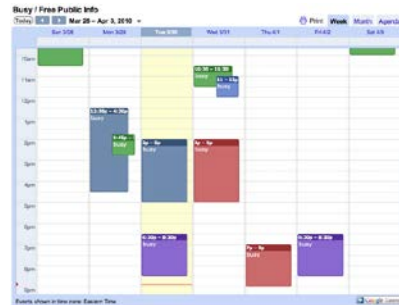
Communication

- Chat.....
- Forum
- Blog
- Wiki.....
- Virtual Worlds.....

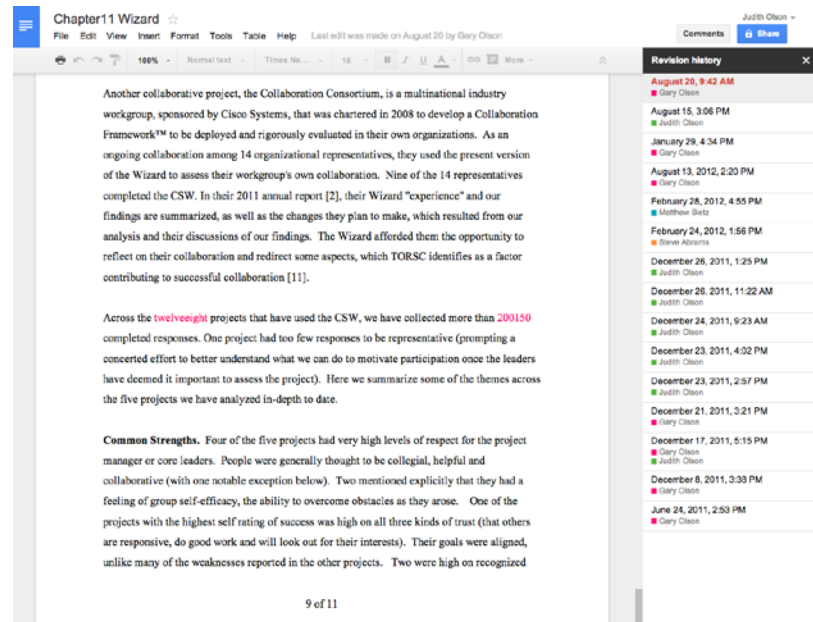
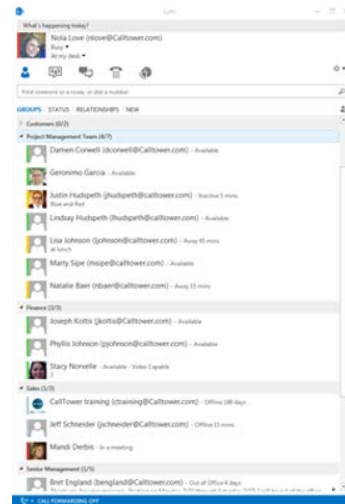


Coordination

■ Shared calendars



■ Awareness tools



Coordination

- Meeting support

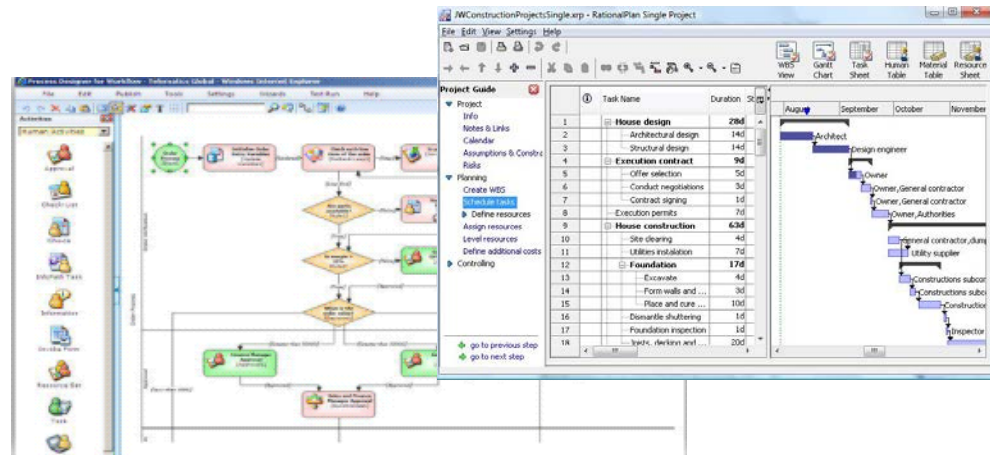


- Large visual displays



Coordination

- Workflow

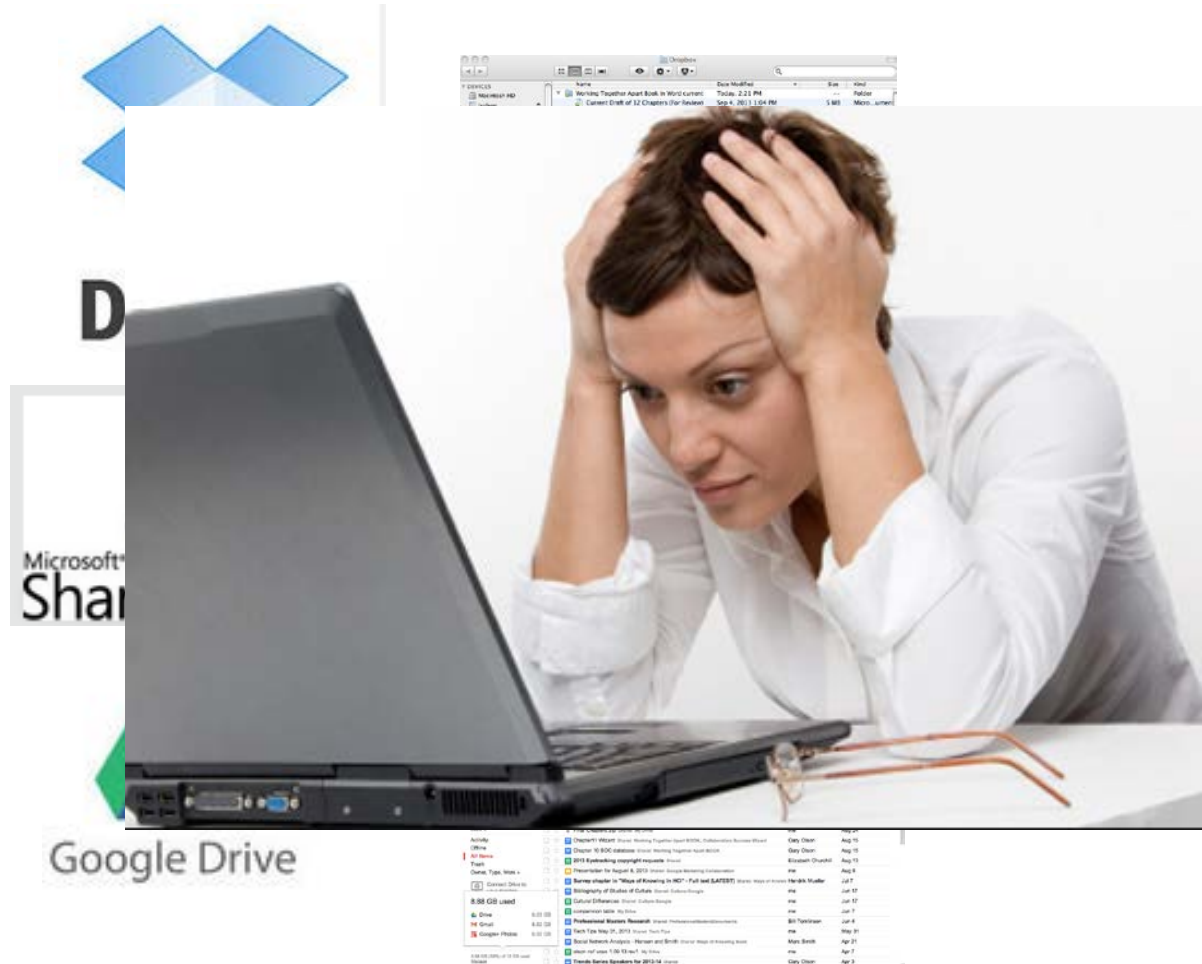


- Resource scheduling

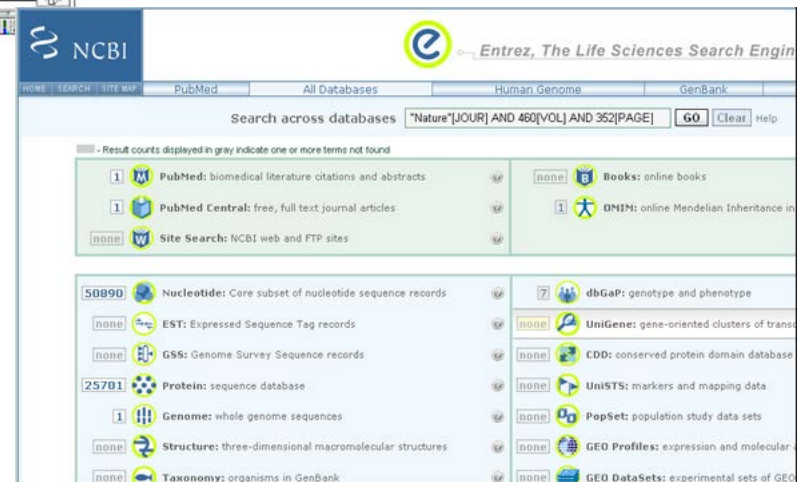
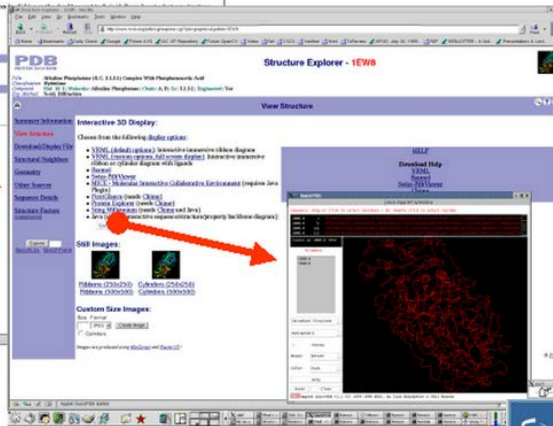
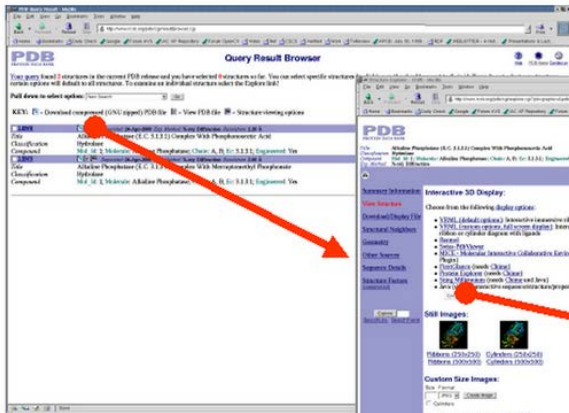


Information repositories

- Dropbox
- Sharepoint
- Google Drive



Information repositories

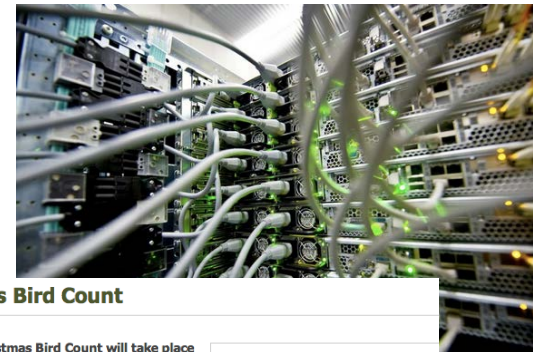


Computational Infrastructure

- System architecture
 - Private, secure machines
 - Massive data
 - ATLAS produces 23 petabytes per second
 - Standard office machines and servers
 - Cloud services
 - Each with their own behavioral consequences

Computational Infrastructure

- Computational resources
 - For high-end computational needs
 - NCAR develops these in-house
 - NSF supporting these projects
 - GRID
 - For ordinary computation
 - Office technology
- Human computation
 - Crowdsourcing
 - Gutenberg character recognition
 - Christmas bird count



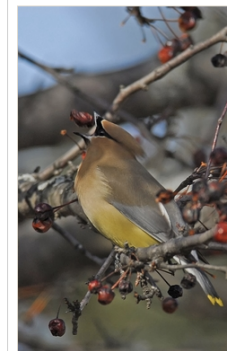
Christmas Bird Count

The 114th Christmas Bird Count will take place from December 14, 2013 through January 5, 2014.

Introducing American Birds: Your Citizen Science Newsletter. [Read the August 2013 edition.](#)

Sign up to receive American Birds online by going to the [Audubon Citizen Science portal](#) and entering your email address just to the right of "Want to keep up with Citizen Science?"

From December 14 through January 5 tens of thousands of volunteers throughout the Americas take part in an adventure that has become a family tradition among generations. Families and students, birders and scientists, armed with binoculars, bird guides and checklists go out on an annual mission - often before dawn. For over one hundred years, the desire to both make a difference and to experience the beauty of nature has driven dedicated people to leave the comfort of a warm house during the Holiday season.




Cedar Waxwing

Georgi Bain

What can technology do to alleviate the challenges of distance work?

- Being blind and invisible
 - Video conferencing
 - Awareness
 - Both in the moment and
 - Over longer terms
- Time zones
 - Shared calendars
 - Awareness of what others have been doing

What can technology do to alleviate the challenges of distance work?

- Cross institutions
 - Calendars
 - Protocols for IRBs, Intellectual property...
 - Cross country boundaries
 - Information sharing on holidays, customs
 - GlobeSmart
-  GLOBESMART®



Used by 140 major global organizations (including 30% of the Global Fortune 100 companies), **GlobeSmart** addresses one of the greatest causes of difficulty in global business interactions — the challenges of relating and communicating successfully with counterparts from other countries.

What can technology do to alleviate the challenges of distance work?

- *Uneven* distribution of people implying *uneven* power
 - Meeting dynamics to “hear” everyone
 - From the manager

How do we decide what's appropriate for us?

- It's complicated
 - Speed of response
 - Size of data
 - Security
 - Privacy
 - Accessibility
 - Richness of what needs to be transmitted
 - Ease of use
 - Context of use
 - Compatibility with other things used
 - COST

Conclusions

- Is this collaboratory using all the technology it should?
 - Communication
 - Coordination
 - Information repositories
 - Infrastructure
- Is it considering the range of possibilities?
- What are the obstacles?
 - Money
 - User training
- Choose wisely, reassess periodically

Thank you

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