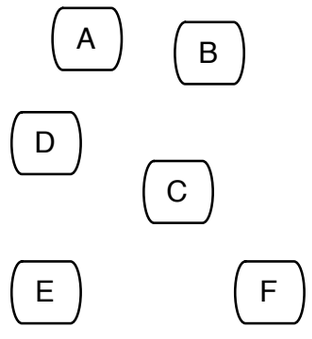
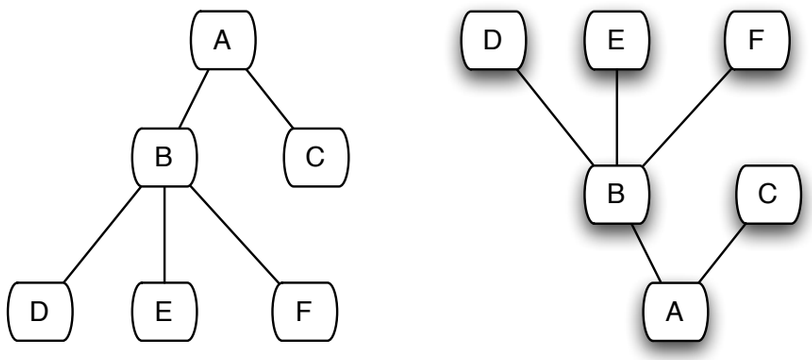
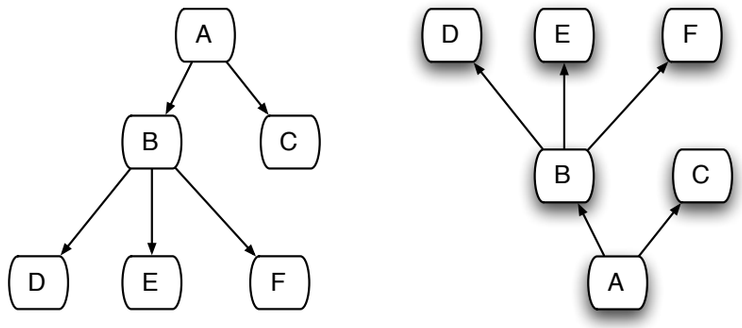
An Ethnomathematical Approach to Cultural Heritage Resource Description

- Is it possible to develop an Ethnomathematically informed perspective on Cultural Heritage **Resource** description?
  - **Resource** description in general and cataloging in particular involve the construction of descriptive structures – entities with attributes and relationships defined between those entities
  - These descriptive structures can be represented in ***graph*** form as combined ***sets*** {a b} of nodes and links/edges that represent (a) **Resources** and their attributes and (b) **Resource** relationships
  - Cultural Heritage **Resource** description graphs exhibit varying degrees of complexity in terms of node and link quantities and types
    - Graph-theoretical expressions of structure and complexity can be given meaning from a Cultural Heritage **Resource** description/ cataloging theory point of view

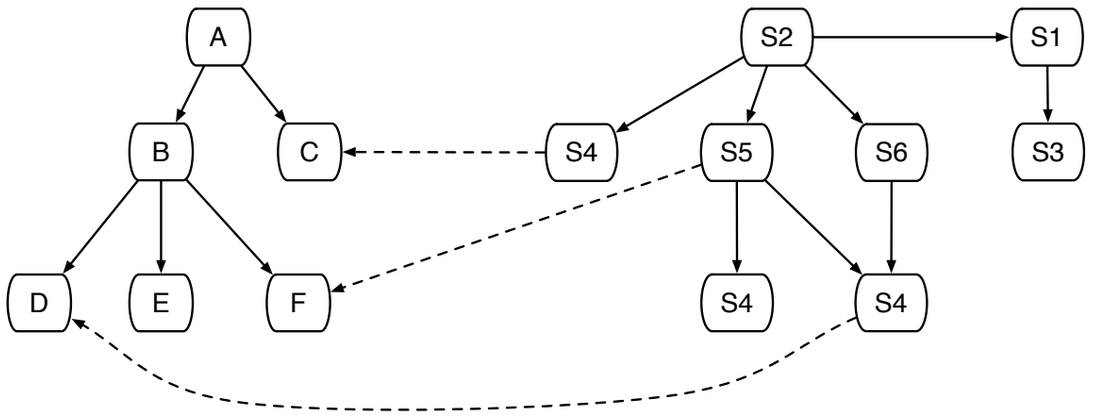
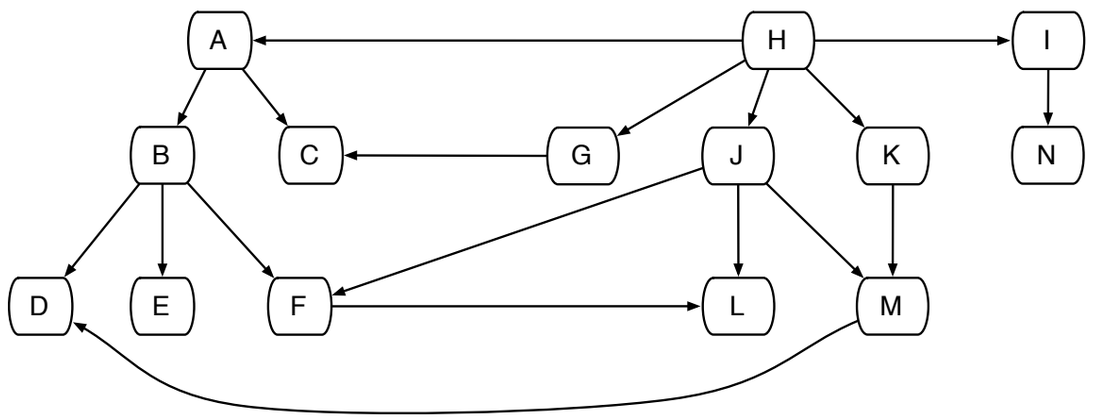
We All Speak Prose Here: Graph Structures In Resource Description And Access

- Define increasingly complex graph structures that could represent portions of different types of Cultural Heritage **Resource** descriptions
  - Graph structures will be used as part of more task-specific types of resource descriptions
- Discuss which graph structure combinations appear in different Cultural Heritage institutions and in the World Wide Web
- Discuss how **Resource** description structures interact with institutional missions and "self-concepts" (á la Abbott's *Flatland*)

We All Speak Prose Here: Graph Structures In Resource Description And Access

Graph Type	Graph Diagram	Comments
Empty/Edgeless		An edgeless graph consists of a set of nodes without links (relationships): {{A B C D E F}, {Ø}}. * Retrieval sets from Online Public Access Catalogs can be represented as edgeless graphs. They can be subjected to Boolean operations, and then ordered temporarily for display purposes.
Tree (AKA A Connected Acyclic Graph)		* Nontrivial trees have at least two end nodes. * The deletion of any tree link disconnects the tree. * There is only one travel path between any two nodes in a tree. * Trees are minimally - most economically - connected structures. * A forest is a graph whose components are trees Buckley & Lewinter (2003)
Directed Tree (Sequence & Hierarchy)		Hierarchies are represented by tree graphs whose arrowed links specify the direction of a relationship. * A ***sequence is*** a directed tree with no branches (*trivial tree)* * A polyhierarchy is a forest of hierarchies(?)

We All Speak Prose Here: Graph Structures In Resource Description And Access

Graph Type	Graph Diagram	Comments
k-Partite		The graph is separable into k non-overlapping sets, based on a specified relationship. This example illustrates a ***library*** graph separated into a bipartite graph by "subject_of" relationships (dashed links in diagram) that link Subject Heading Resource nodes ("S1") and Managed Named Resource nodes ("A").
Network		Multiple relationships (directional or nondirectional) can exist between nodes. One or more travel paths can exist between any two nodes. Networks can be richly connected Biologists now consider trees to be networks without *reticulations*

Structures & Institutions: It Begins With *Flatland*

- *Flatland* (1884) - Science fiction novella by Edwin Abbott Abbott
  - Social commentary on the British class system
    - Featured geometric characters who lived in lines, planes, volumes, hypervolumes, etc.
    - Spatial, social and self-imposed constraints on thought, "intuition," and action based on geometric characteristics
  - *Enlightenment* as the ability to engage in *dimensional thinking* independently of one's geometrical level

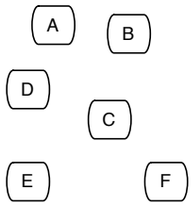
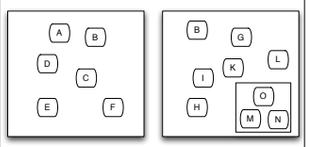
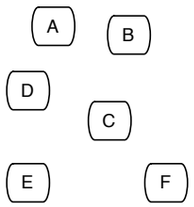
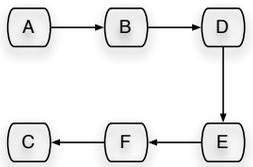
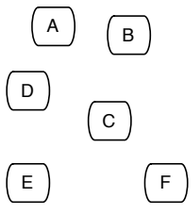
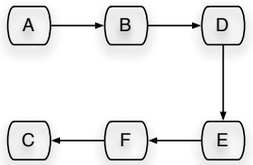
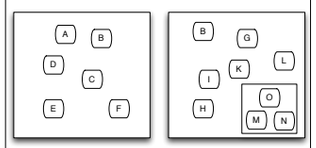
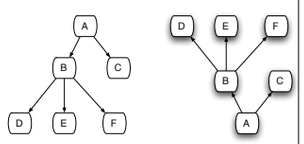
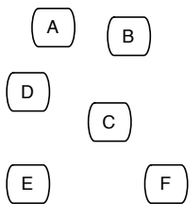
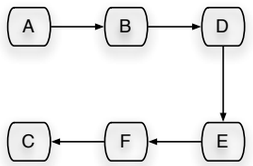
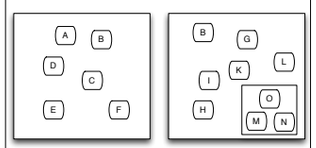
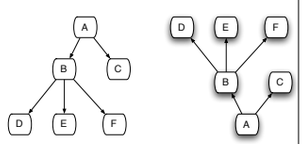
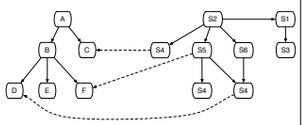
Binland, *Shelfland, Libraryland, & Webland:* Resource Description & Access Subcultures

- *Binland* - **Resources** aggregated by one or more Resource characteristics. Bins may be nested in other bins
- *Shelfland* - **Resources** ordered along a single **Resource** characterstic (organic growth ≈ time dimension)
- *Archiveland* - One or more hierarchically arranged *Binlands* and/or *Shelflands* managed by a responsible party. Established **Resource** collection, description, and preservation procedures exist

Binland, *Shelfland, Libraryland, & Webland:* Resource Description & Access Subcultures

- *Libraryland* - **Resources** organized into bins, simple & complex hierarchies, and de-facto networks following one or more "authoritative" set of cataloging rules. Structured or unstructured reference **Resources** are used to support access
- *Webland* - **Resources** organized into bins, simple and complex hierarchies, de-facto and explicit networks. Organization is variable because a *Webland* can contain one or more of all of the other lands

We All Speak Prose Here: Graph Structures In Support of Resource Description And Access

Bin	Edgeless, Subgraph			-	-		
Shelf	Edgeless, Sequential			-	-		
Archive	Edgeless, Sequential, Subgraph, Hierarchy/ Tree					-	
Library	Edgeless, Sequential, Subgraph, Hierarchy/ Tree," *k*-Partite						
Web	Edgeless, Sequential Subgraph, Hierarchy/ Tree," *k*-Partite, De-Facto & Explicit Network