Overview of the Semantic Web

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W3C Semantic Web

A Web of Information

- The current Web represents information using
  - natural language
  - graphics, multimedia, page layout
- Humans can process this easily
  - can deduce facts from partial information
  - can create mental associations
  - can deal with a variety of media
    - (see Web accessibility guidelines)

Example: airline reservation

- Your automatic airline reservation
  - knows about your preferences
  - builds up knowledge base using your past
  - can combine the local knowledge with remote services:
    - airline preferences
    - dietary requirements
    - calendaring
    - etc
- Interactions with other Web - or local - information
  - (M. Dertouzos: The Unfinished Revolution)

Example: data(base) integration

- Databases are very different in structure, in content
- Many applications require managing several databases
  - after company mergers
  - combination of administrative data for e-Government
  - biochemical, genetic, pharmaceutical research
  - etc.
- Most of these data are accessible from the Web - though not necessarily public yet

Example: “smart” portal

- Various types of “portals” are created (for a journal on-line, for a specific area of knowledge, for specific communities, etc)
- The portals may:
  - integrate many data sources
  - may have access to specialized domain knowledge
- Goal is to provide a better local access, search on the integrated data, reveal new relationships among the data

The structure of data integration

1. Map the various data onto an abstract data representation
   - make the data independent of its internal representation
2. Merge the resulting representations
3. Make queries on the whole
   - queries that could not have been done on the individual data sets

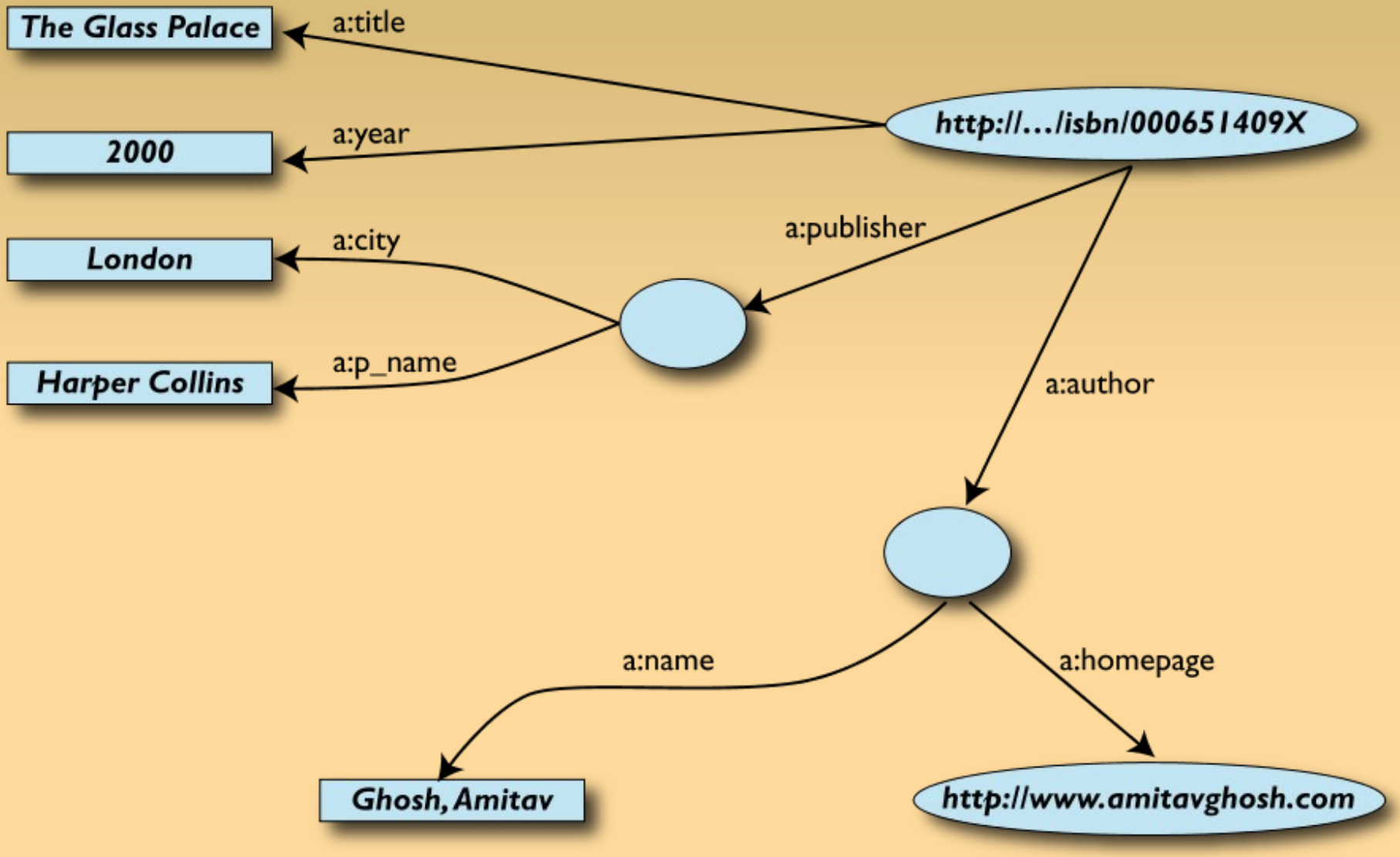
A *simplified* bookstore data (dataset "A")

ID	Author	Title	Publisher	Year
ISBN0-00-651409-X	id_xyz	The Glass Palace	id_qpr	2000

ID	Name	Home Page
id_xyz	Ghosh, Amitav	http://www.amitavghosh.com

ID	Publ. Name	City
id_qpr	Harper Collins	London

1st: expose your data as a set of *relations*



Some notes on exposing the data

- Relations form a graph
  - the nodes refer to the “real” data or contain some literal
  - how the graph is represented in machine is immaterial for now
- Data export does *not* necessarily mean physical conversion of the data
  - relations can be generated on-the-fly at query time
    - via SQL “bridges”
    - extracting from HTML pages
    - extracting data from Excel sheets
    - etc.
- One can export *part* of the data

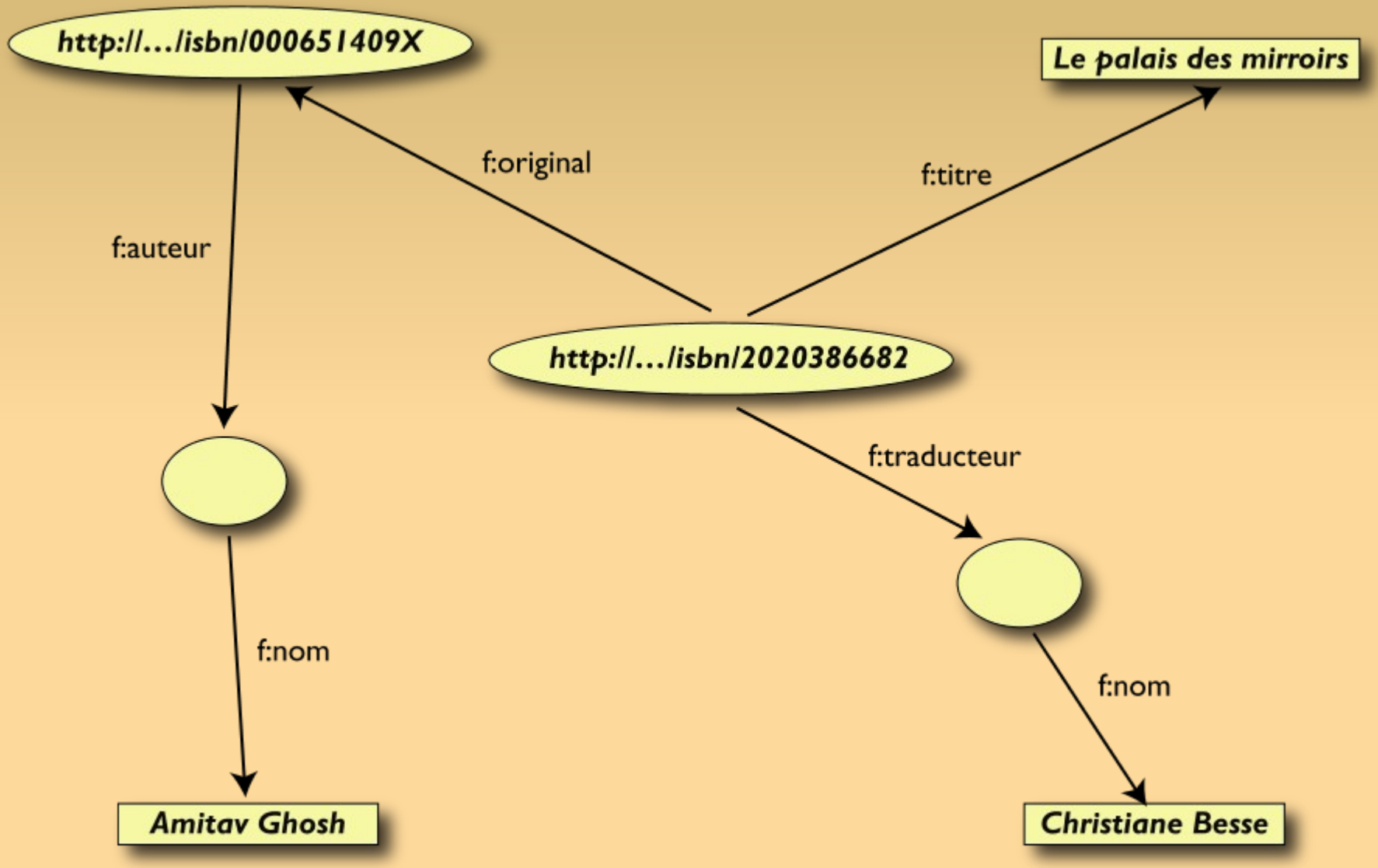
Another bookstore data (dataset “F”)

	A	B	D	E
1	**ID**	**Titre**	**Traducteur**	**Original**
2	ISBN0 2020386682	Le Palais des miroirs	A13	ISBN-0-00-651409-X
3				

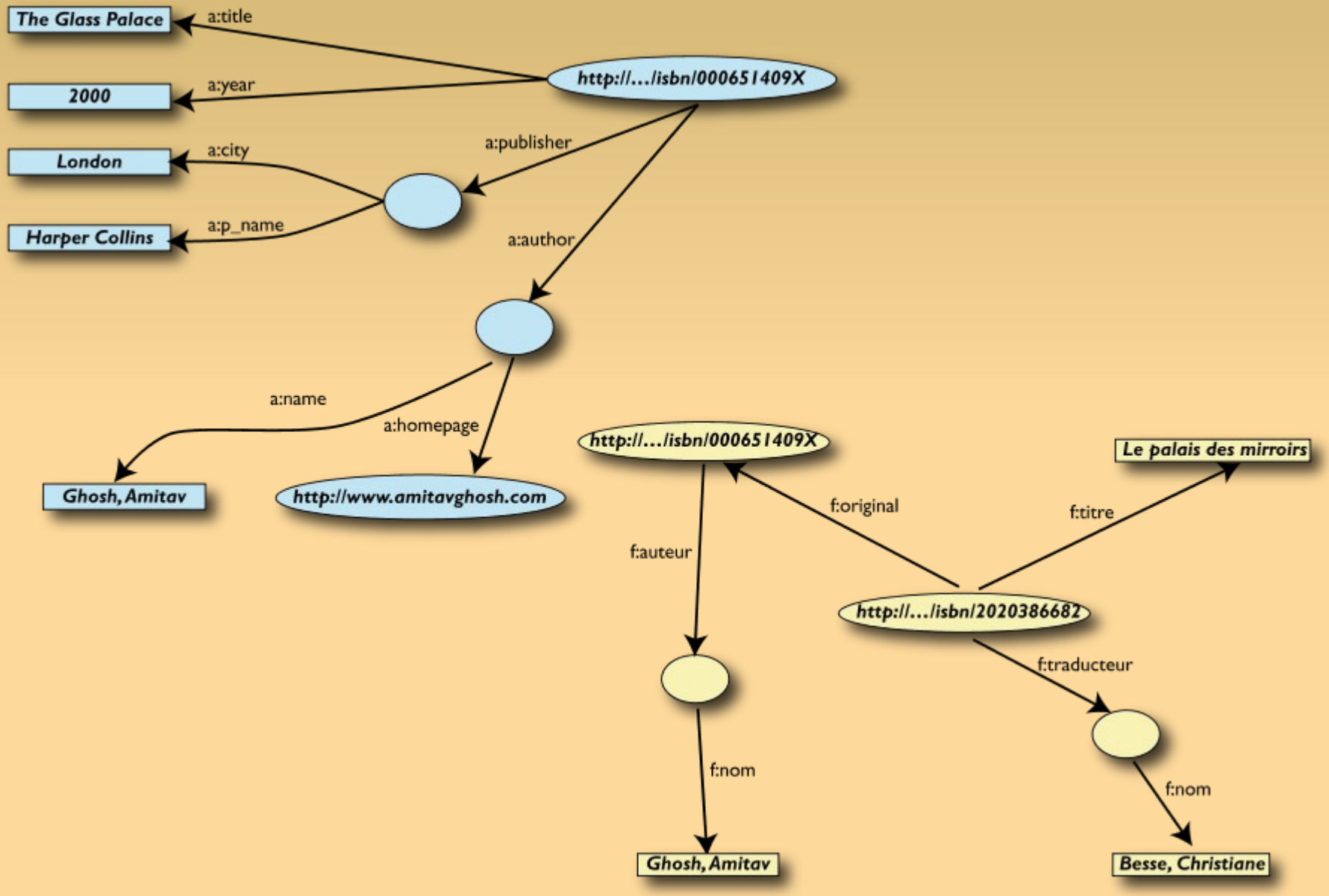
6	**ID**	**Auteur**
7	ISBN-0-00-651409-X	A12

11	**Nom**
12	Ghosh, Amitav
13	Besse, Christianne

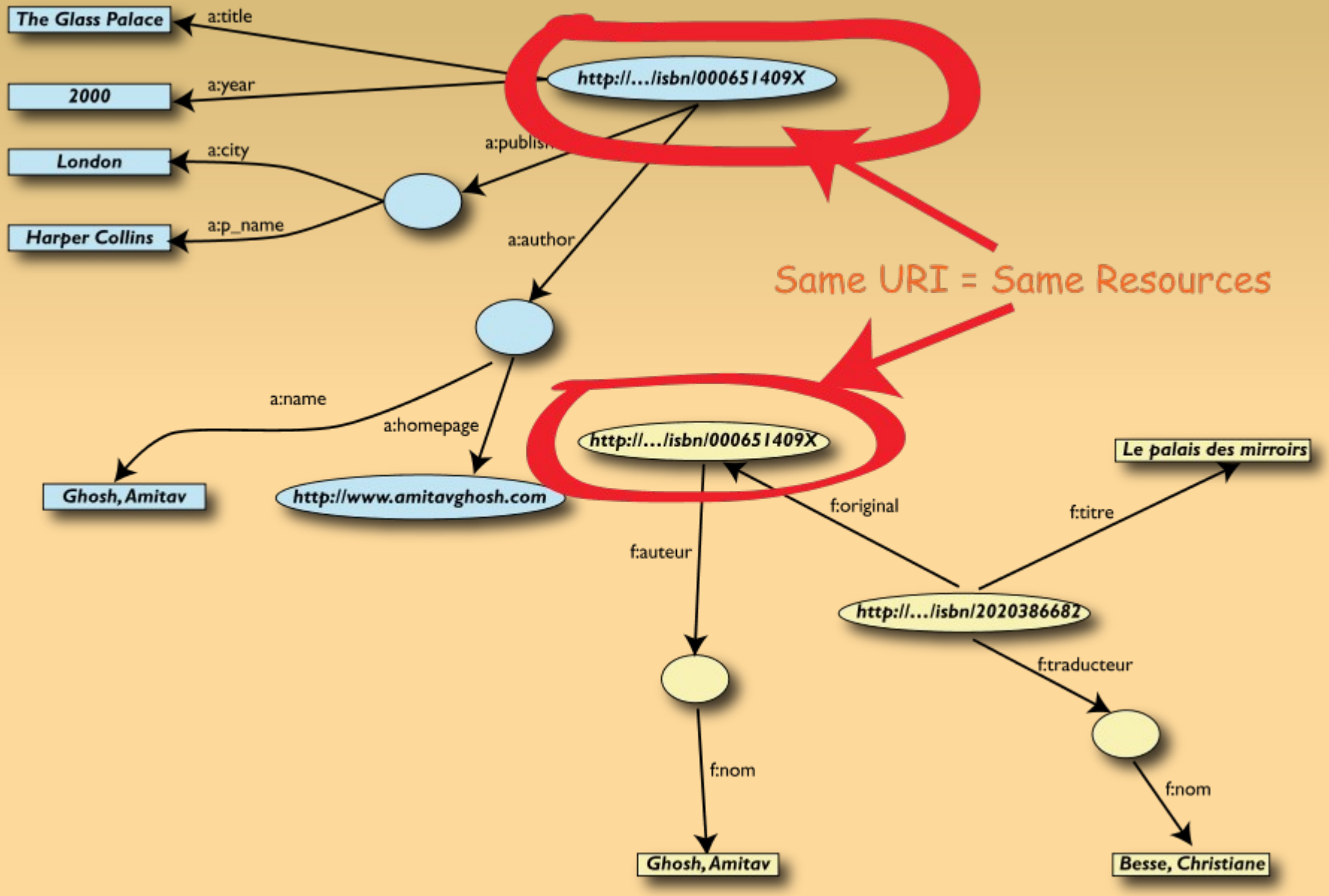
2nd: expose the second set of data



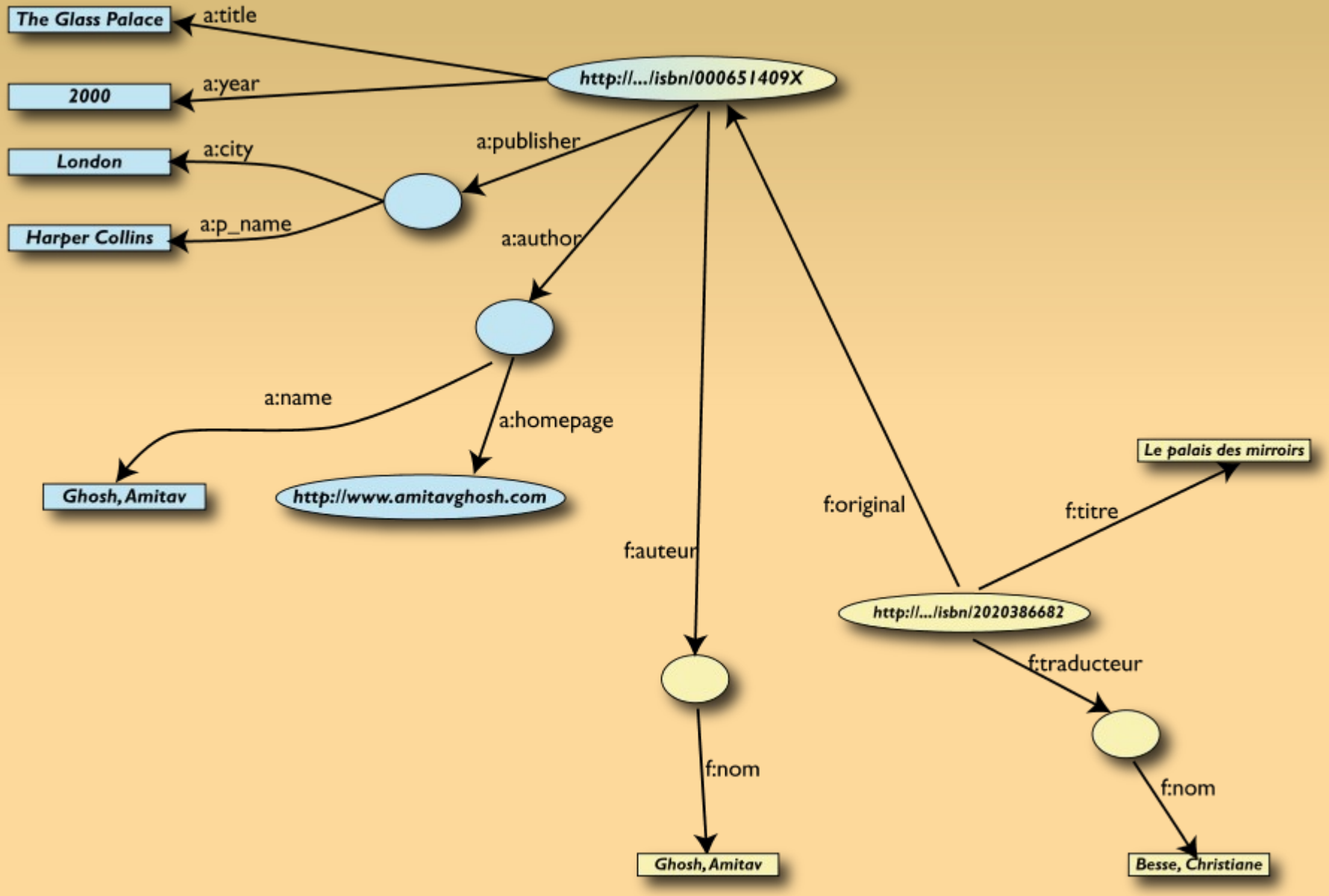
3rd: start merging these data



3rd: … Resource Identity

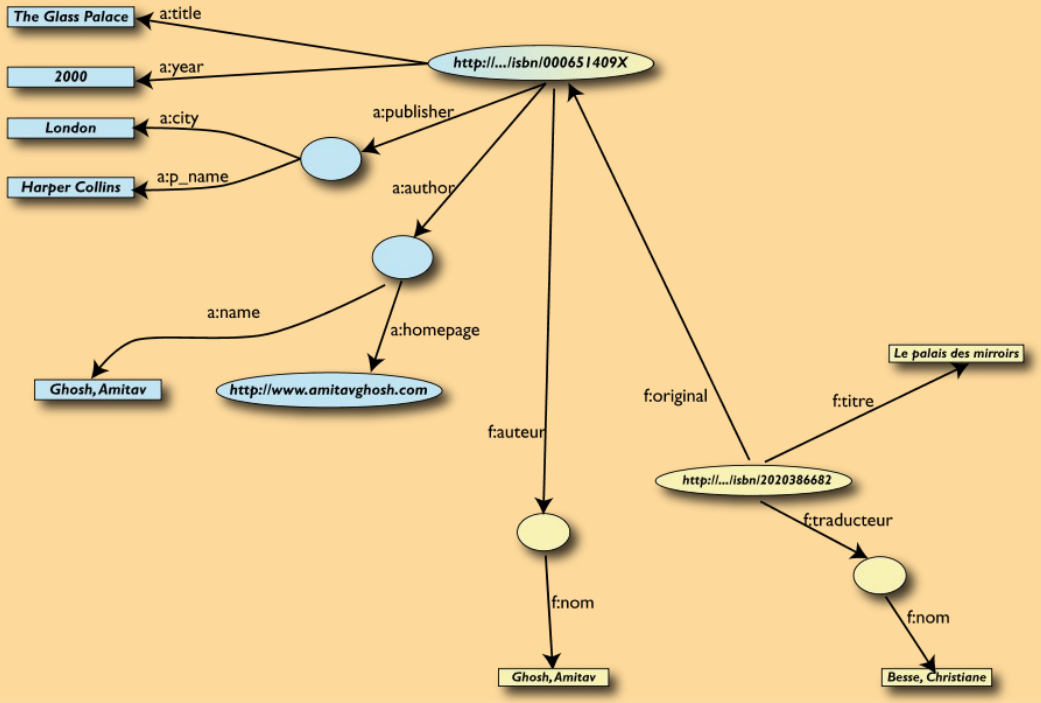


3rd: identical resources connect



Start making queries…

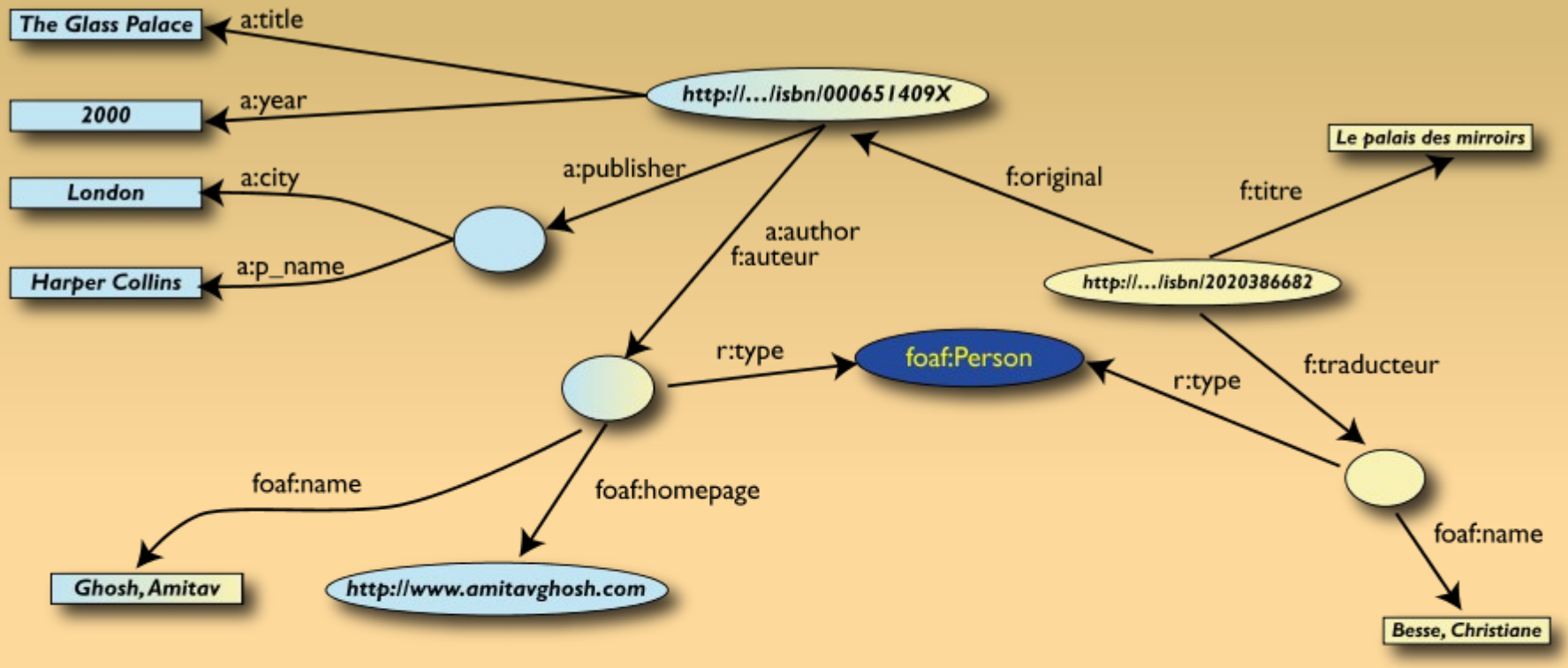
- User of data “F” can now ask queries like:
  - “give me the title of the original”
- This information is not in the dataset “F”…
- …but can be retrieved by merging with dataset “A”!

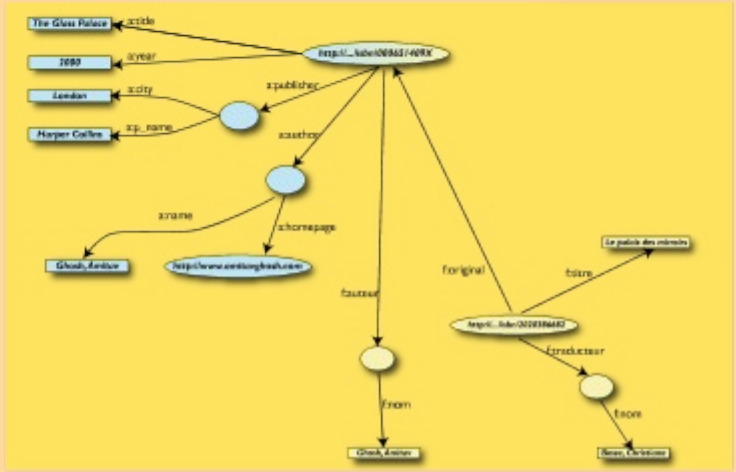


However, more can be achieved…

- **`a:author`** and **`f:auteur`** should be the same relation
- But an automatic merge does not know that
- Add some extra information to the merged data:
  - **`a:author`** same as **`f:auteur`**
  - both identify a “Person”
    - a term that a community may have already defined:
    - a “Person” is uniquely identified by his/her name and, (e.g.), Web homepage

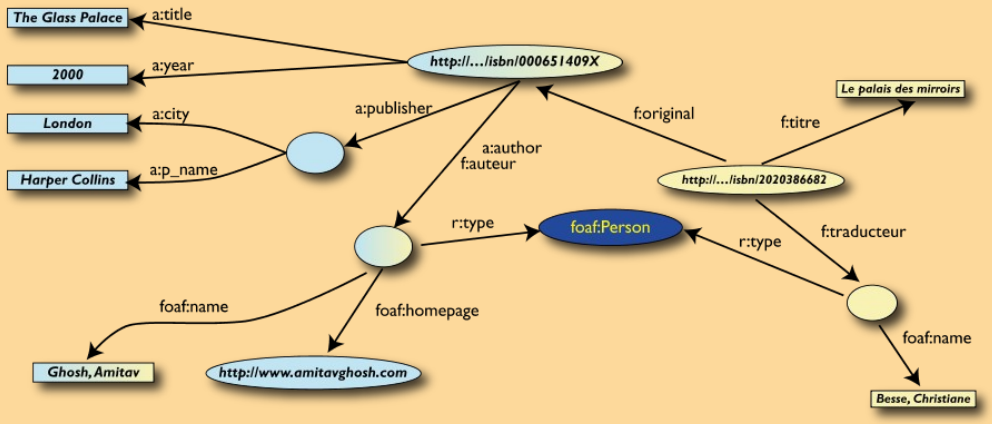
3rd revisited: use the extra knowledge



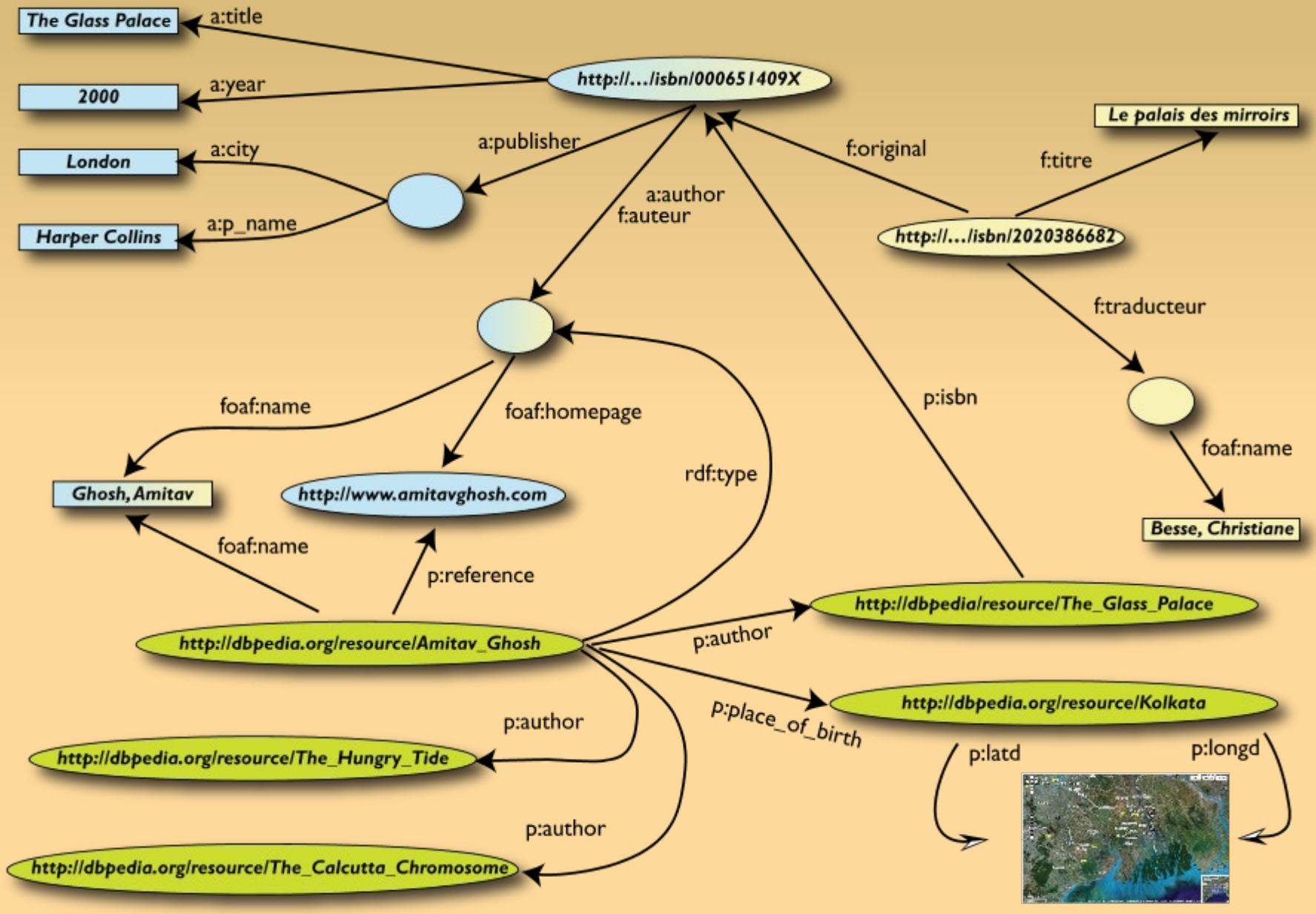


Permitting richer queries

- User of dataset “F” can now query:
  - “give me the home page of the original’s ‘auteur’”
- The information is not in datasets “F” or “A”…
- …but was made available by:
  - merging datasets “A” and datasets “F”
  - adding three extra statements as an extra “glue”



Merge with Wikipedia data



What did we accomplish?

- Combined different datasets that
  - are somewhere on the web
  - are of different formats (mysql, excel sheet, XHTML, etc)
  - have different names for relations
- We could combine the data because some URIs were identical (the ISBN in this case)
- We could add some additional information, using common terminologies that a community has produced
- Permitting new relations to be found and retrieved

Many Real Examples

- RPI Data-gov wiki

  http://data-gov.tw.rpi.edu/wiki/The_Data-gov_Wiki

- Contributed Case Studies and Use Cases

  http://www.w3.org/2001/sw/sweo/public/UseCases/

- Collection of more examples

- Semantic Web Challenge

Please make your raw data available

(internally)

Acknowledgements

- These slides are available on:

  http://www.w3.org/2010/Talks/0111-semweb-rrs

- Thanks to Ivan Herman,

  W3C Semantic Web Activity Lead

- And the Semantic Web community

  http://www.w3.org/2001/sw/

  http://www.w3.org/standards/semanticweb/

Future Work / Research

- Provenance
- Usage policy tagging
- Accountable Systems