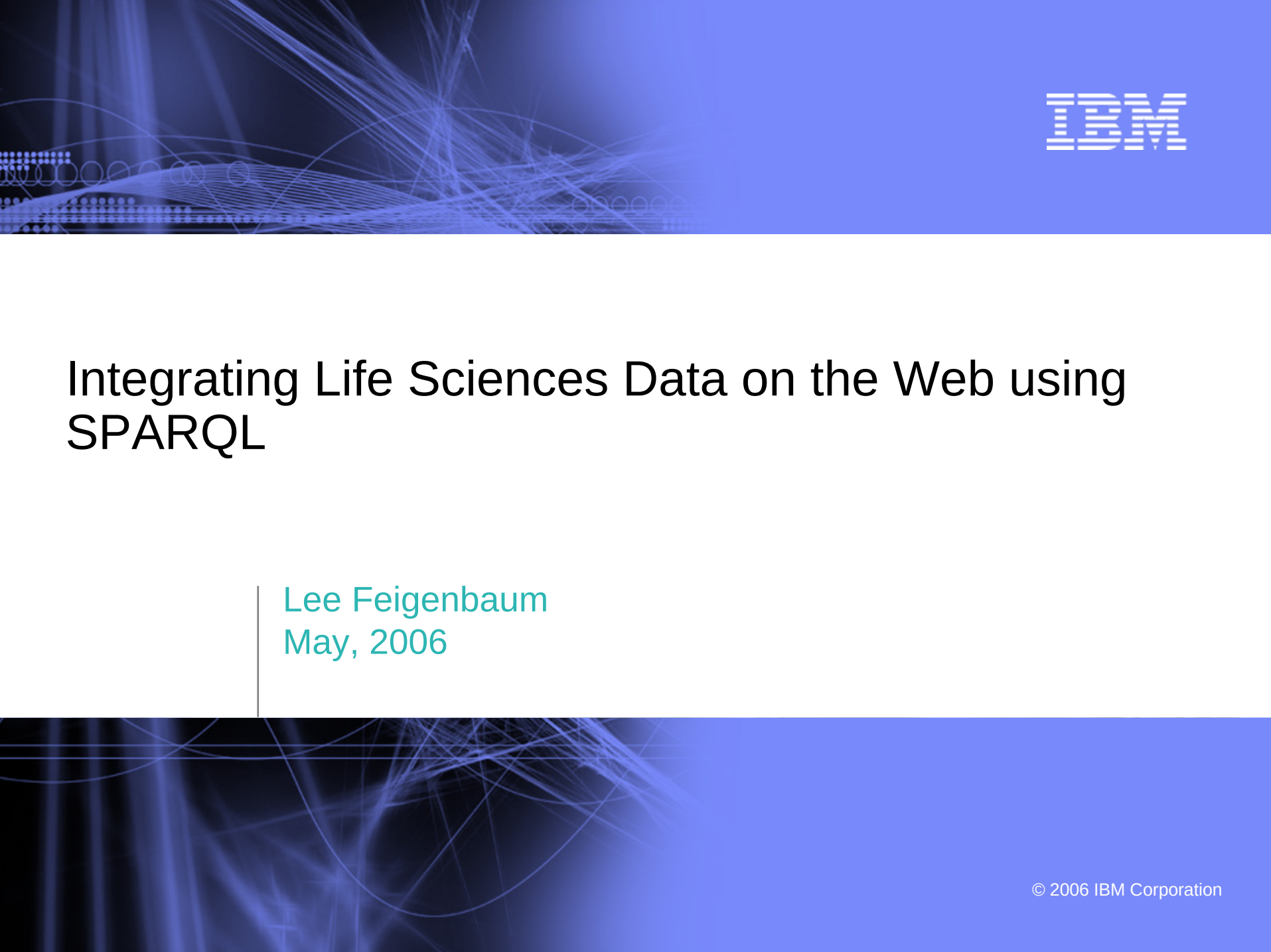

Integrating Life Sciences Data on the Web using SPARQL

Lee Feigenbaum
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SPARQL is…

- …a query language for selecting values from RDF graphs
- …a protocol for issuing queries via HTTP GET, HTTP POST, or SOAP
- …a W3C Candidate Recommendation
- …capable of returning results serialized as web-friendly JSON structures
- …perfect for mashing up disparate data sources representable as RDF

```
PREFIX foaf: <…foaf/0.1/>
PREFIX rdf: <…22-rdf-syntax-ns#>
SELECT ?name ?email
WHERE {
  ?person rdf:type foaf:Person .
  ?person foaf:name ?name .
  OPTIONAL {
    ?person foaf:mbox ?email .
  }
}
```

?name	?email
Lee Feigenbaum	feigenbl@us.ibm.com
Grandma Feigenbaum	*(unbound)*

The Scenario

- Provide a simple, one-stop answer to the question:

How can I discover proteins that are relevant to my work and locate antibodies that target those proteins?

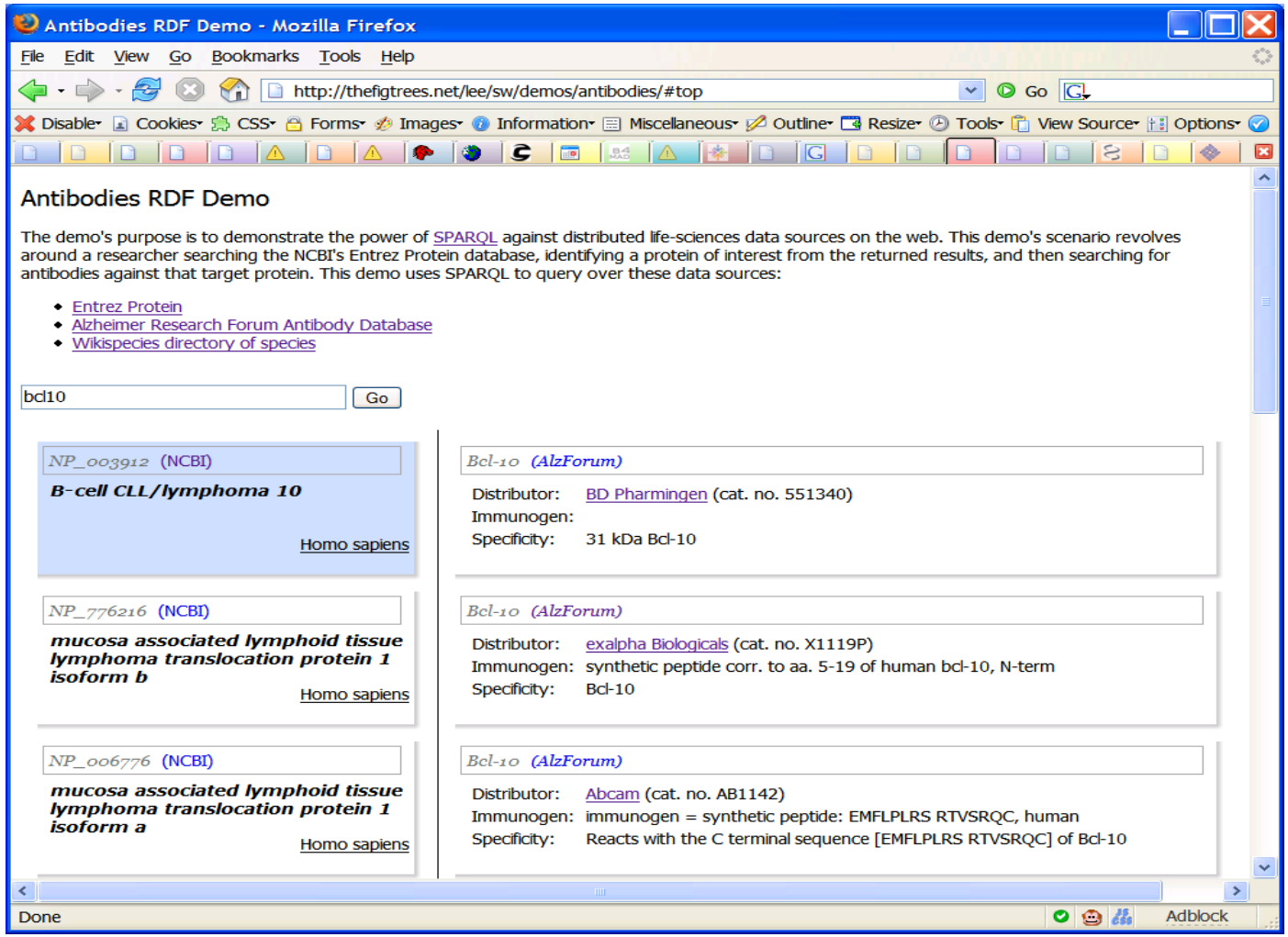
The Data Sources

- Entrez protein sequence and gene databases
  - National Center for Biotechnology Information (NCBI)
  - http://www.ncbi.nlm.nih.gov/
  - RDF ← LSID metadata
- Antibody directory
  - Alzheimer Research Forum (AlzForum)
  - http://alzforum.org/res/com/ant/default.asp
  - RDF ← HTML scraping
- Mapping data between genes and antibodies
  - Alan Ruttenberg, Millennium
  - RDF ← spreadsheet data
- Taxonomy information
  - Wikispecies, free species directory
  - http://www.wikispecies.org
  - RDF ← XSLT applied to XHTML

The Tools

- JavaScript SPARQL client library
  - Issue SPARQL SELECT queries and retrieve results as JavaScript objects
  - Supports all SPARQL endpoints returning JSON results (SPARQLer, Rasqal, XMLArmyKnife, …)
  - http://www.thefigtrees.net/lee/sw/sparql.js
- JSON
  - Lightweight serialization of data structures (e.g. SPARQL resultsets)
  - http://www.json.org
- Microtemplates
  - Automagically bind JavaScript-object data to DHTML fragments
  - http://www.microtemplates.org

The Demo



What We Learned

Take-away Lessons

- "*With a query language, a client can design their own interface.*"
  - Leigh Dodds
- SPARQL + JSON is a powerful Web 2.0 environment
- Even data sources not natively expressed in RDF can be mashed up with SPARQL
- Life sciences provides a rich domain of situational problems to approach with SPARQL-based mashups

Looking Ahead

- As we deal in larger and larger data sets, on-the-fly RDF creation becomes impractical, so:
  - "Smart" federation
  - Dedicated SPARQL endpoints
- Universal naming, merged graphs, and shared predicates only get us so far, so:
  - Custom relations
  - owl:sameAs
  - Human-guided curation

Next Steps

- More data sources!
  - Antibody distributors' databases (price, etc.)
  - Antibodies not related to neuroscience, and for other species
- Integration with NCBI website (e.g. GreaseMonkey script)
- Generate authoritative RDF data via GRDDL transformations or RDFa

Thanks!

- Questions?
- More information: `feigenbl@us.ibm.com`
- Demo online at http://thefigtrees.net/lee/sw/demos/antibodies/
- Thanks to:
  - Alan Ruttenberg, Millennium
  - June Kinoshita and Colin Knep, Alzheimer Research Forum
  - Elias Torres, Ben Szekely, and Alister Lewis-Bowen, IBM