

# Freebase: A Collaboratively Created Graph Database For Structuring Human Knowledge

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## ABSTRACT

Freebase is a practical, scalable tuple database used to structure general human knowledge. The data in Freebase is collaboratively created, structured, and maintained. Freebase currently contains more than 125,000,000 tuples, more than 4000 types, and more than 7000 properties. Public read/write access to Freebase is allowed through an HTTP-based graph-query API using the Metaweb Query Language (MQL) as a data query and manipulation language. MQL provides an easy-to-use object-oriented interface to the tuple data in Freebase and is designed to facilitate the creation of collaborative, Web-based data-oriented applications.

## Categories and Subject Descriptors

H.3.4 Systems and Software, Information Networks; E.1 Data Structures, Graphs and networks.

## General Terms

Design, Human Factors, Languages

## 1. INTRODUCTION

Freebase[3] is a database system designed to be a public repository of the world's knowledge. Its design is inspired by broadly used information communities such as The Semantic Web[2] and Wikipedia[1]. As such, it must support highly diverse and heterogeneous data simultaneously with high scalability.

Traditionally structured databases have been centrally controlled, with schemas created and modified only by a set of trusted administrators. Support for structural diversity is often difficult in such architectures. At the other end of the spectrum, popular wikis (e.g. Wikipedia) are semi-structured document repositories of great semantic heterogeneity, but with few tools providing structured query capabilities.

Freebase tries to merge the scalability of structured databases with the diversity of collaborative wikis into a practical, scalable, database of structured general human knowledge. The

design emphasizes practicality, and a substantial effort has been made to make Freebase immediately useful, especially to laymen beyond the research and technical communities.

The key components of Freebase are:

- **A scalable Tuple Store** that has built-in attribution and support for total “undo” through an integrated versioning mechanism. Together, these features facilitate large-scale collaborative data creation and maintenance.
- **An HTTP/JSON-Based API** where read and write queries and their results are formulated using the “Metaweb Query Language”[4] (MQL). MQL is an easy to use, object-oriented query language with a tree based result structure of objects. It includes dynamic schema support without the need for a DDL, path based node naming and idempotent transaction-less write support. Important MQL features include mixing structural data matching with approximate string matching of literals, cursors, and flat semantics of all data, which makes mixing of data and metadata easy.
- **A Lightweight, Collaborative Typing System.** Pervasive in the UI, API, and data itself is the Freebase typing system. It is a loose collection of structuring mechanisms and conventions, rather than a rigid systems of ontologies and representations. The type system has no intrinsic canonical view of data. Conflicting and contradictory types and properties may exist simultaneously in order to reflect users' differing opinions and understanding.
- **A Large, Diverse Data Set.** Freebase already has more than 100 million asserts about topics spread over 4000 types, including people, media, locations, and many others. This data is available through a Creative Commons license for almost any use.
- **A Philosophy of “Complete Normalization”.** Unlike in some databases, entities in Freebase are intended to be explicitly canonicalized. That is, there should be only one GUID in Freebase representing each real world entity, topic, or concept.

## 2. DEMONSTRATION OF FREEBASE

We will demonstrate how Freebase and MQL enable the accumulation of structured information in a manner that increases quality as well as quantity of data. The MQL

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Keyword search Freebase Search

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## Richard Feynman

Discuss "Richard Feynman" Hide Empty Fields

**Types:** Person (People), Author (Publishing), Physicist (Science), Deceased Person (People), Film writer (Film), Influence Node (mikelove's types), Person Or Being In Fiction (Fictional Universes), Book Subject (Publishing)

**Also known as:** Richard Phillips Feynman

**Gender:** Male

**Date of Birth:** May 11, 1918

**Place of Birth:** Far Rockaway, Queens

**Country Of Nationality:** United States

**Profession:** Physicist, Scientist

**Religion:** Atheism

**Parents:** double-click to add

**Children:** Michelle Louise Feynman, Carl Feynman

**Siblings:**

**Quotations**

Joan Feynman like sex: sure, it may give some results, but that's not why we do not create, I do not understand.

**Books Written**

What Do You Care What Other People Think?  
The Pleasure of Finding Things Out  
The Feynman Lectures on Physics  
Surely You're Joking, Mr. Feynman!

**Page History**  
Created by Metaweb Oct 22, 2006  
Last edited by robert Oct 29, 2007

**Web Link(s)**  
double-click to add

**Employment history**  
Cornell University  
California Institute of Technology  
Thinking Machines

**Education**  
Princeton University • 1942 • Ph.D.  
Massachusetts Institute of Technology • 1939 • Bachelor's degree

**Description**

Image 1 of 1

**Siblings**

Joan Fey  
Joan Feynman  
Richard Feynman (Richard Phillips)  
Ana Gasteyer  
Gervase of Tilbury  
Alec Baldwin (Alexander Rae)  
Ernest Thesiger  
Mean Girls  
Riverside Drive  
Portrait of Jennie  
Television Personalities (The Television)

Figure 1: This is the main Topic Display page in Freebase. The user is editing the “Richard Feynman” topic. Autosuggestion helps the user add the sibling property by linking to an existing object, rather than create an unnecessary duplicate.

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Domains & Types ▶ kurt's types ▶ Medicinal Plant ▶ Medicinal Plant schema

## Medicinal Plant

Type Key: medicinal\_plant (edit)

**Included types:** Topic (Common)

**Also known as:** add a synonym to this type to help others find it

**User Created Properties** Add a New Property

**Derived Drugs** (edit)

Property Key: derived\_medicines (edit)

**Expected Type**

Drug

**Property Description**

no description

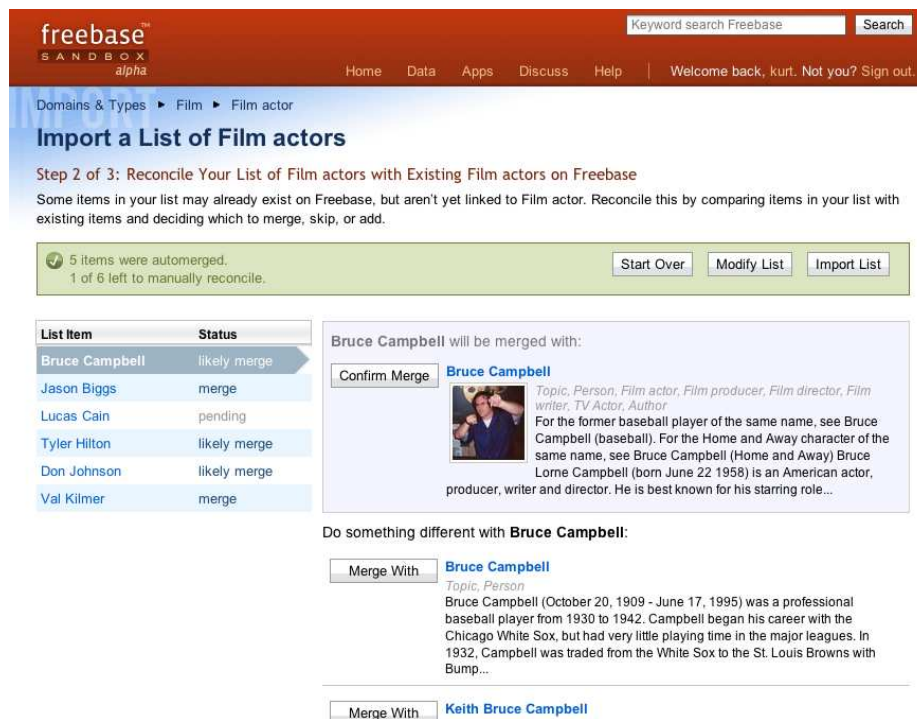
**Drug**

A drug is a chemical substance that has a physiological effect on an organism. Medicinal, herbal, and illegal drugs can be included in this type. ...

**Topics**

Opium poppy  
Eucalyptus  
Dandelion  
Basil  
Aloe vera  
Garlic  
Ginger  
Ginseng  
Absinth Wormwood

Figure 2: This is the Schema Editor used for schema creation and evolution. The user is editing the “Medicinal Plant” schema to add a “Derived Drug” property that expects an instance of “Drug” to be at the other end of the link when instances of this property are created.



**Figure 3:** The Mass Typer application lets the user submit a list of topic names that are semi-automatically reconciled during interaction with the user. The figure here shows this application as applied to an imported list of film actors.

language will be described through examples and demonstration on the live database. Several existing, practical walkthroughs and Web-based Freebase applications will be shown with the MQL they use, including:

- Data entry, shown by *Topic Display* (Figure #1)
- Schema creation and evolution, shown by *Schema Editor*: (Figure #2).
- Rapid Data Traversal
- Data evaluation and reconciliation, shown by *Mass Typer*: (Figure #3)
- Collaborative data analysis and repair
- MQL query creation and refinement

Freebase is intended to be a perpetually available public service on the Web. Readers interested in better understanding Freebase and MQL are encouraged to explore on their own at [www.freebase.com](http://www.freebase.com).

### 3. REFERENCES

- [1] "wikipedia (n.d.). wikipedia: The free encyclopedia. on the internet. <http://www.wikipedia.org>.
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