

CC7220-1

LA WEB DE DATOS

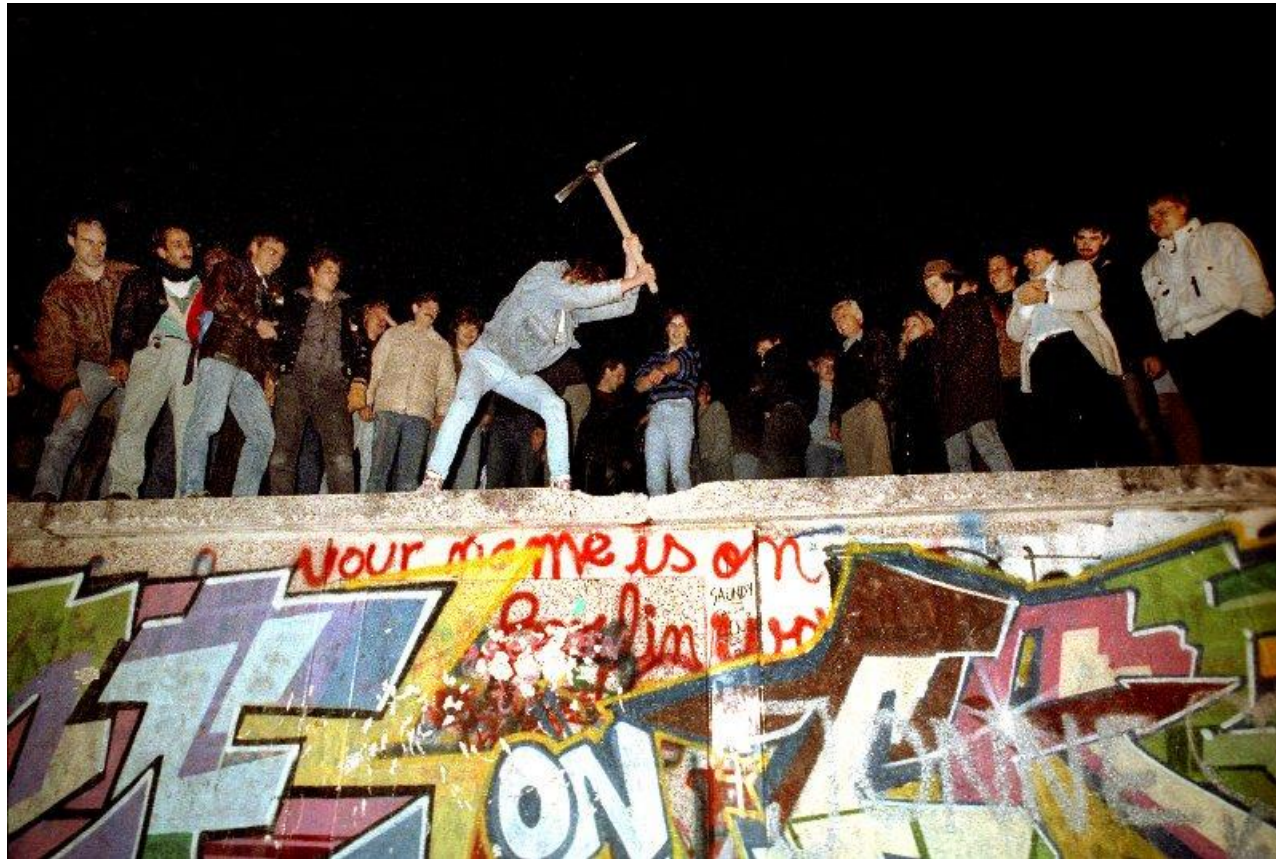
PRIMAVERA 2025

LECTURE 1: INTRODUCTION

Aidan Hogan
aidhog@gmail.com

THE WEB

THE WEB IS OVER 3 DECADES OLD



THE FUTURE OF THE WEB?



What will the Web be like in 3 decades time?



THE SEMANTIC WEB?

SEMANTIC WEB?



semantic web



Google Search

I'm Feeling Lucky

SEMANTIC WEB?



"The Semantic Web will bring structure to the meaningful content of Web pages, creating an environment where software agents roaming from page to page can readily carry out sophisticated tasks for users."

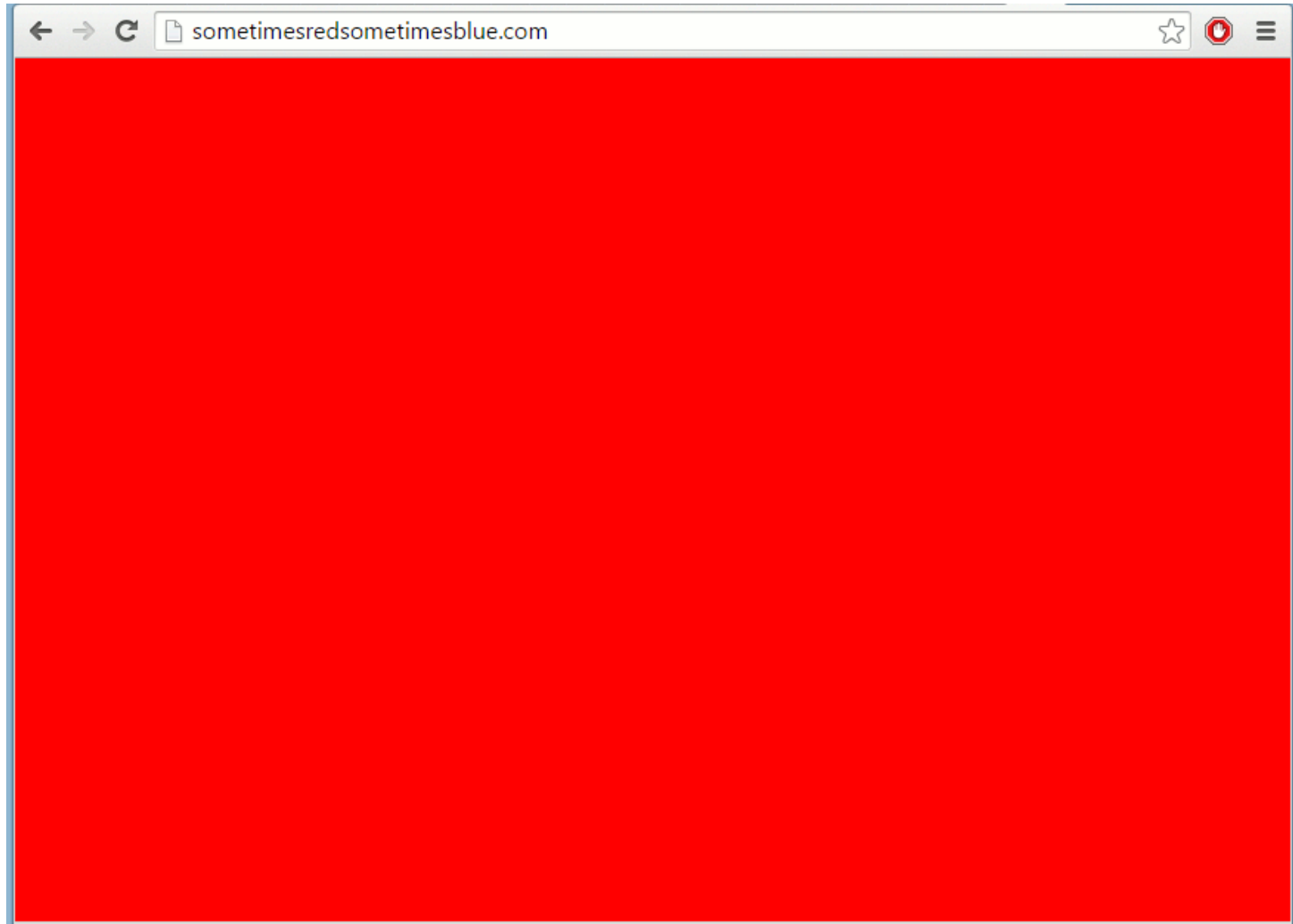
– Berners-Lee et al. (2001) "The Semantic Web"
Sci. American 283: 34-43.



Consider answering: "What is the Web?"

WHAT'S WRONG WITH THE
CURRENT WEB?

THE CURRENT WEB IS GREAT!



Google is also pretty great



movie what's in the box



Seven (stylized as SE7EN) is a 1995 American crime thriller **film** directed by David Fincher and written by Andrew Kevin Walker. It stars Brad Pitt, Morgan Freeman, Gwyneth Paltrow, John C. McGinley, R. Lee Ermey, and Kevin Spacey.



[Seven \(1995 film\) - Wikipedia](#)

[https://en.wikipedia.org/wiki/Seven_\(1995_film\)](https://en.wikipedia.org/wiki/Seven_(1995_film))



da da da dum symphony



[Web](#) [Videos](#) [News](#) [Shopping](#) [Images](#) [More](#) [Search tools](#)

About 107,000 results (0.36 seconds)



[Beethoven - Symphony No. 5 in C Minor \(1\) - YouTube](#)
www.youtube.com/watch?v=W2qW6fOtAMY



sometimes when i'm

sometimes when i'm **alone i use comic sans**
sometimes when i'm **alone i google myself**
sometimes when i'm **alone i cry**
sometimes when i'm **all alone**
sometimes when i'm **dreaming**
sometimes when i'm **sad i like to cut myself**
sometimes when i'm **dreaming lyrics**
sometimes when i'm **alone**
sometimes when i'm **driving on the road at night**
sometimes when i'm **alone i wonder**

Google Search

I'm Feeling Lucky

PROBLEM WITH THE CURRENT WEB: LITERATURE VETERANS

DOING A REPORT FOR UNIVERSITY ...



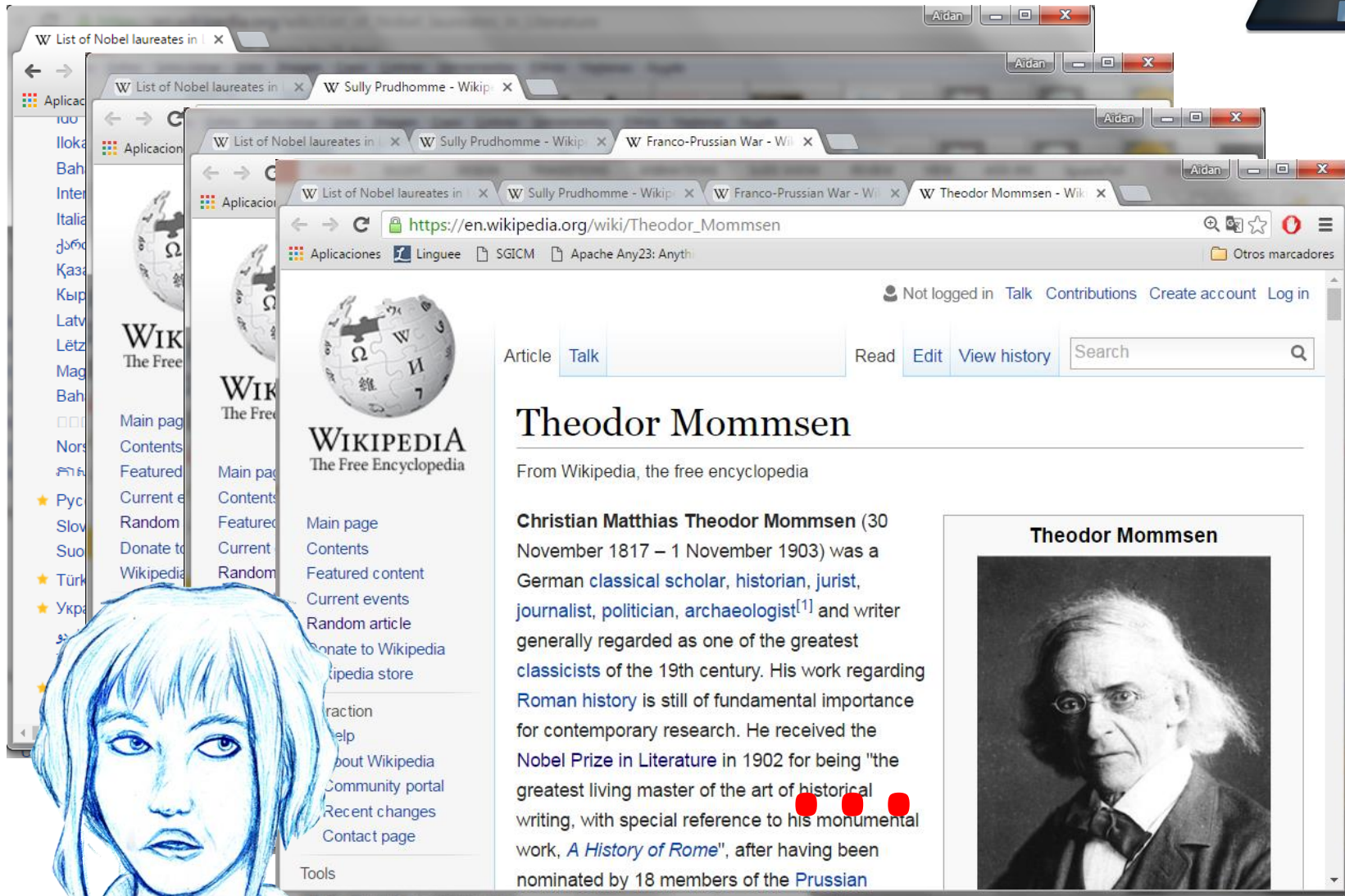
Wants to find all:

- Nobel Prize winners in Literature
- Who fought in at least one war
- The year they won the prize
- And the year the war(s) started



... how would you solve this?

LOTS OF WIKIPEDIA TABS ...



THE LAUREATE ALGORITHM (3 DECADES ON)



results := $\emptyset$

for all *nobel-lit-winner* in *wiki-list*

year-prize := year of *nobel-lit-winner*

wars := search “war”, “conflict”, “battle” in *nobel-lit-winner*

 for all *war* in *wars*

year-war := starting year of *war*

 add *nobel-lit-winner*, *year-prize*, *war*, *year-war* to *results*

 end

end

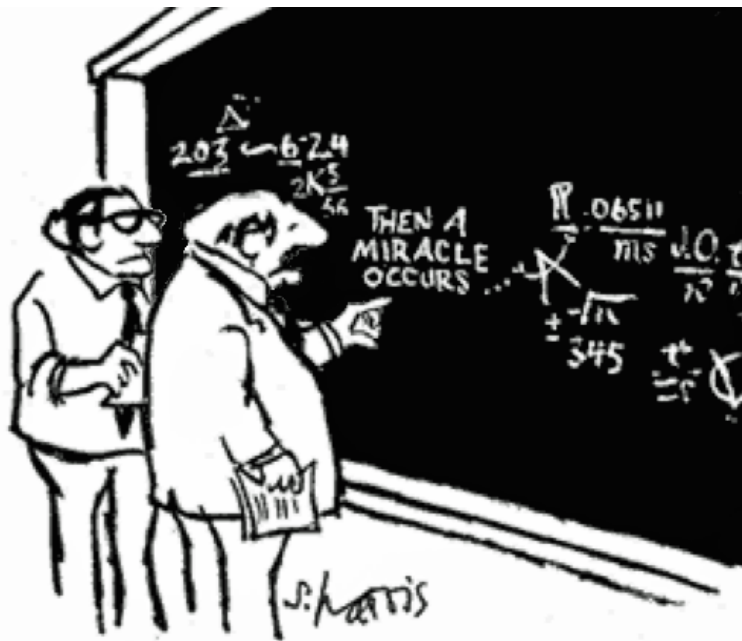
return *results*



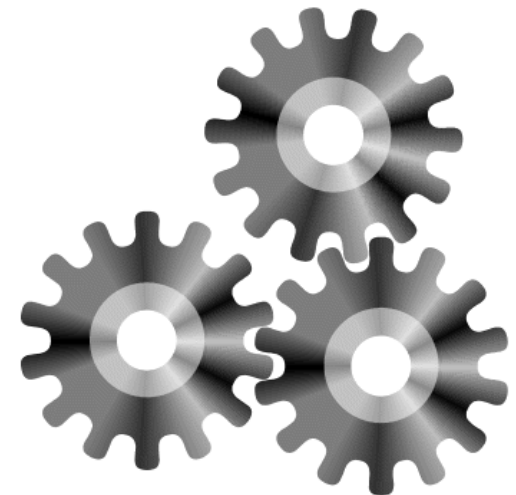
THE LAUREATE ALGORITHM (6 DECADES ON?)



```
nobel-lit-winner-and-wars := magical-sem-web-results()  
return nobel-lit-winner-and-wars
```



"I THINK YOU SHOULD BE MORE EXPLICIT HERE IN STEP TWO."



DOING A REPORT FOR UNIVERSITY ...



Wants to find all:

- Nobel Prize winners in Literature
- Who fought in at least one war
- The year they won the prize
- And the year the war(s) started



... why is this query hard on the current Web?

ASIDE: CHATGPT?



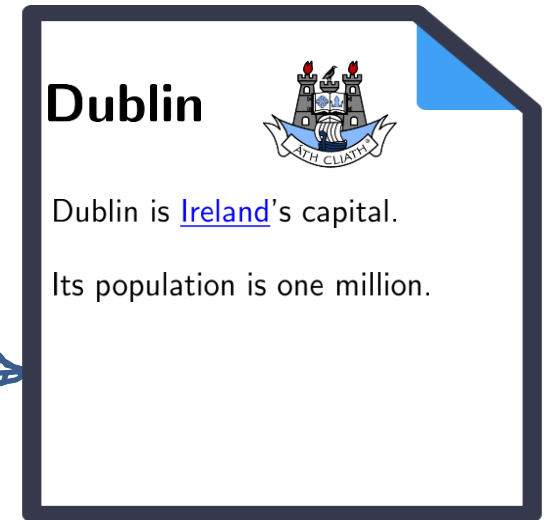
SO WHAT'S THE PROBLEM ...

THE CURRENT WEB IS DOCUMENT-CENTRIC

`http://ex.org/Ireland`



`http://ex.org/Dublin`



```
<html>
```

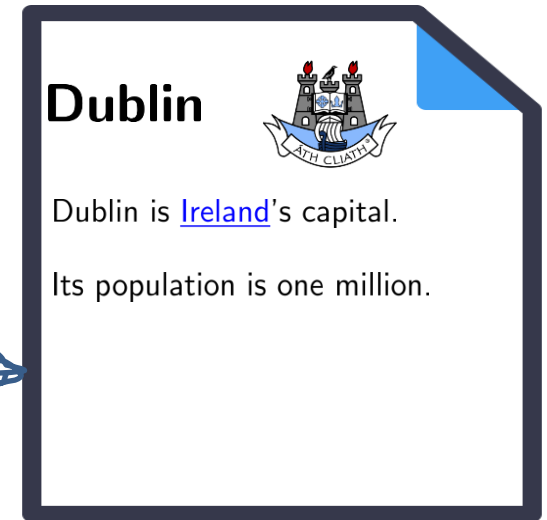
```
</html>
```


THE CURRENT WEB IS DOCUMENT-CENTRIC

<http://ex.org/Ireland>



<http://ex.org/Dublin>



```
<html>
  <body>
    <h1>Ireland</h1>
    <div class="flag"></div>
    <p>Ireland is a European country.</p>
    <p>Its capital is <a href="http://ex.org/Dublin">Dublin</a>.</p>
    ...
  </body>
</html>
```

(MOST OF IT) MAKES SENSE TO HUMANS

<http://ex.org/Ireland>

<http://ex.org/Dublin>

Ireland



Ireland is a European country.

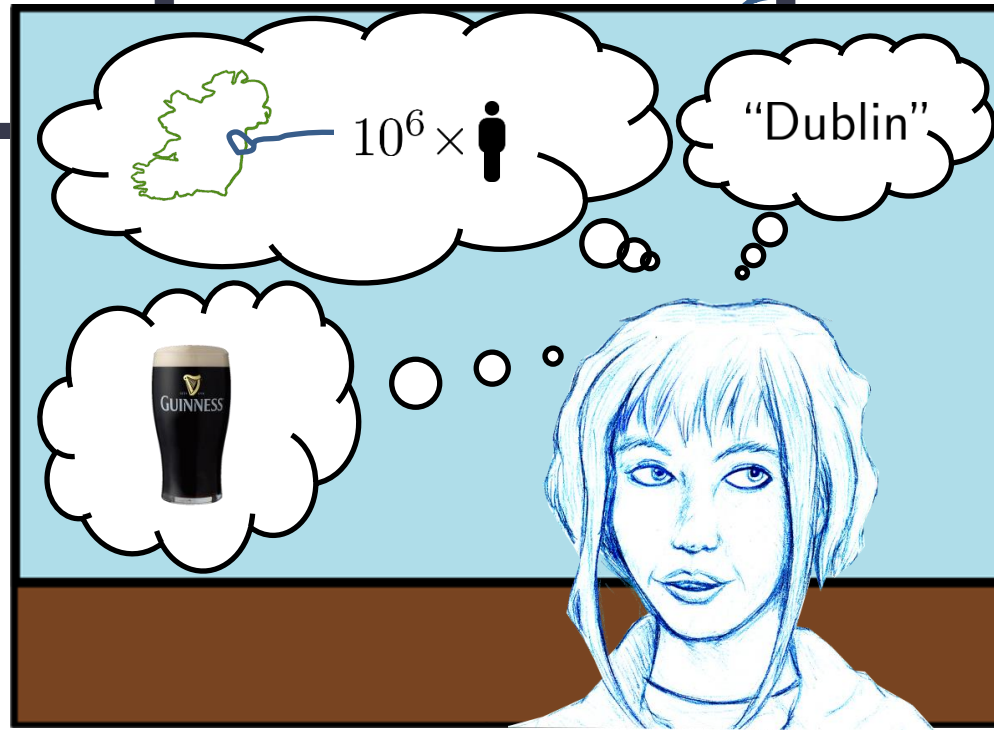
Its capital is [Dublin](#).

Dublin



Dublin is [Ireland](#)'s capital.

Its population is one million.



... ASSUMING THEY SPEAK THE LANGUAGE

<http://ex.org/Ireland>

<http://ex.cl/Dublín>

Ireland



Ireland is a European country.

Its capital is [Dublin](#).

Dublín



Dublín es la capital de [Irlanda](#).

Su población es un millón.



EVEN WORSE FOR MACHINES

`http://ex.org/Ireland`

`http://ex.cl/Dublín`

Ireland



Ireland is a European country.

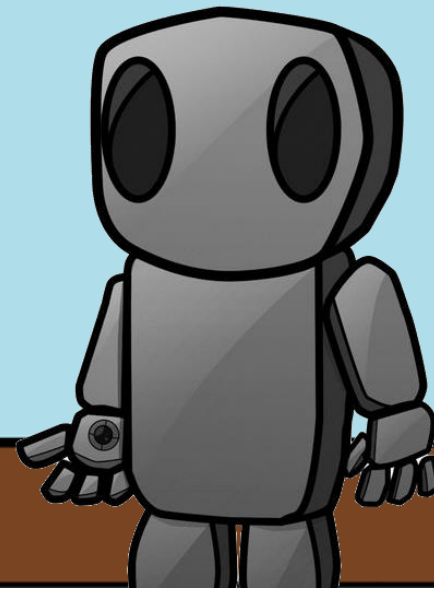
Its capital is [Dublin](#).

Dublín



Dublín es la capital de [Irlanda](#).

Su población es un millón.



YTYL NUGZY PUG MEBHOLYZ

<http://ex.org/0gyselw>

<http://ex.cl/Wdcsól>

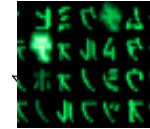
Ogyselw



Ogyselw oz e Ydguryel budlfgi.

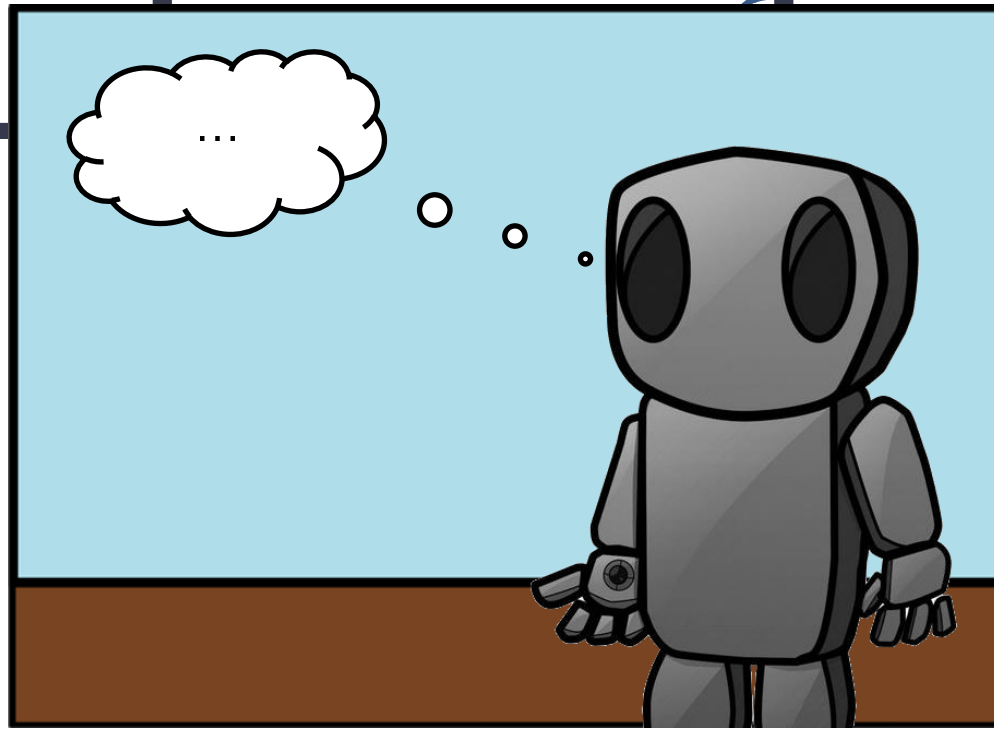
Ofz berofes oz [Wdcsol.](#)

Wdcsól



Wdcsól yz se berofes wy [Ogselwe.](#)

Zd rucseboúl yz dl mossúl.



SO WHAT'S THE PROBLEM ...

WHAT MACHINES CAN DO: FETCH DOCUMENTS

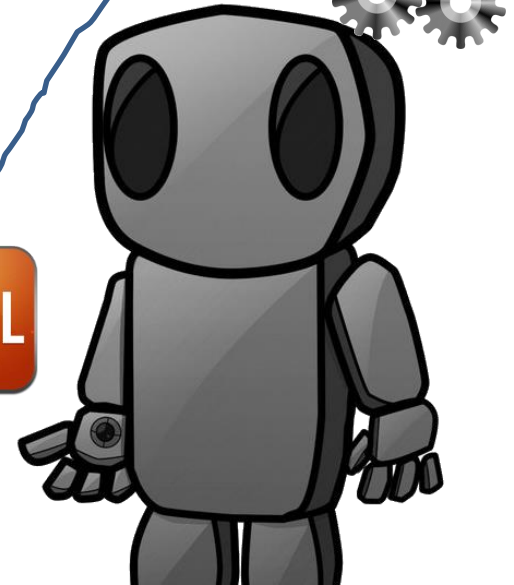


`http://ex.org/`



`http://`

HTML



WHAT MACHINES CAN DO: FIND DOCUMENTS

Ogyselw



Ogyselw oz e Ydguryel budlfgi.

Ofz berofes oz [Wdcsol.](#)



Google



Google Search

I'm Feeling Lucky

Ireland



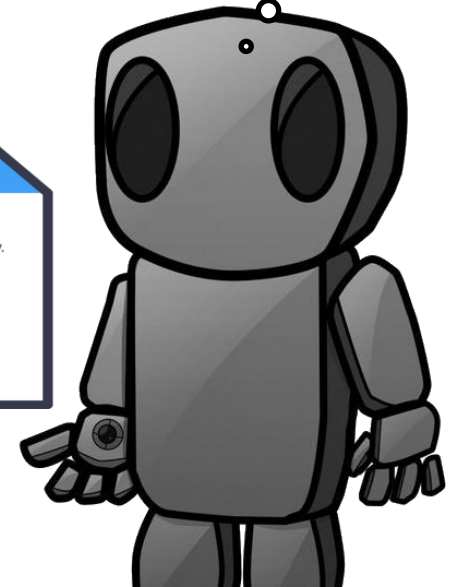
Ireland is a European country.

Its capital is [Dublin.](#)

ireland

ogyselw

ogyselw



WHAT MACHINES CANNOT DO: COMBINE SOURCES

<http://ex.org/0gyselw>

<http://ex.cl/Wdcsól>

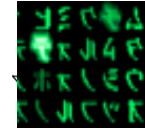
Ogyselw



Ogyselw oz e Ydguryel budlfgi.

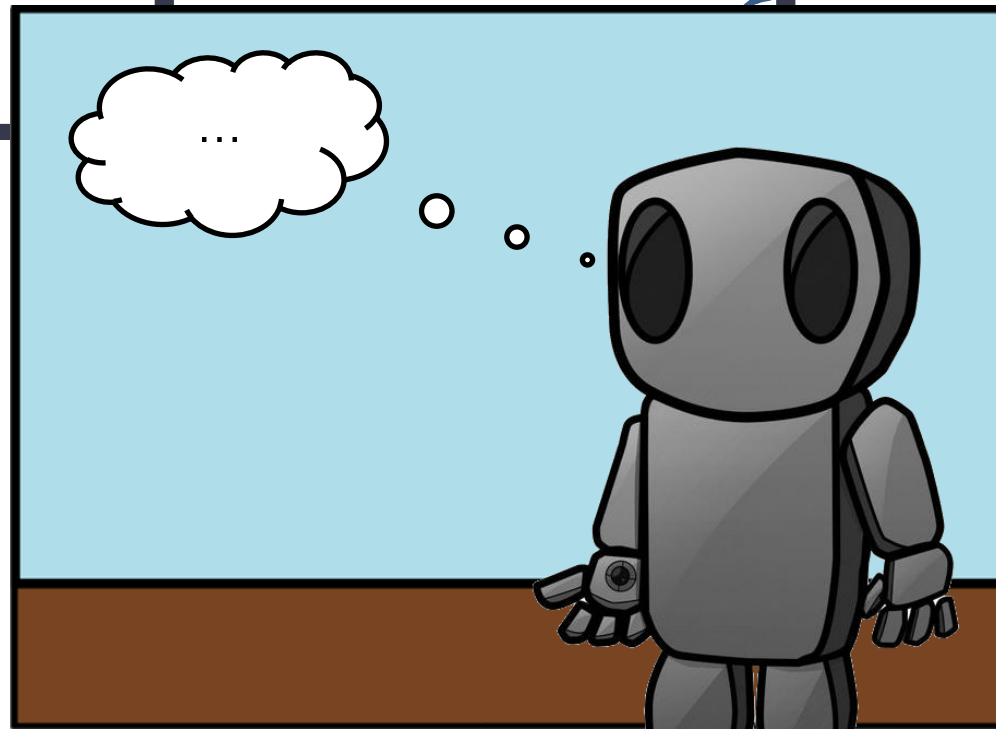
Ofz berofes oz [Wdcsol.](#)

Wdcsól



Wdcsól yz se berofes wy [Ogselwe.](#)

Zd rucseboúl yz dl mossúl.



TOWARDS A SEMANTIC WEB

MACHINES THAT “UNDERSTAND” THE WEB?

<http://ex.org/Ireland>

<http://ex.cl/Dublín>

Ireland



Ireland is a European country.

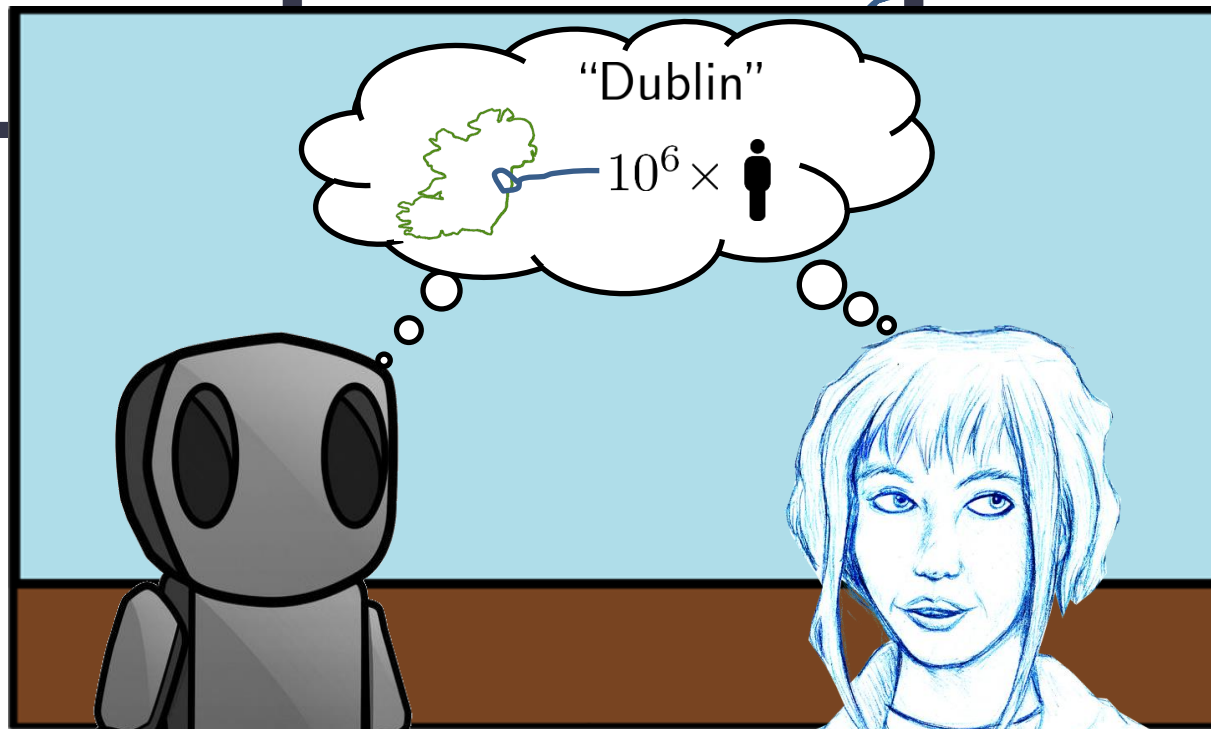
Its capital is [Dublin](#).

Dublín



Dublín es la capital de [Irlanda](#).

Su población es un millón.



EDSGER W. DIJKSTRA

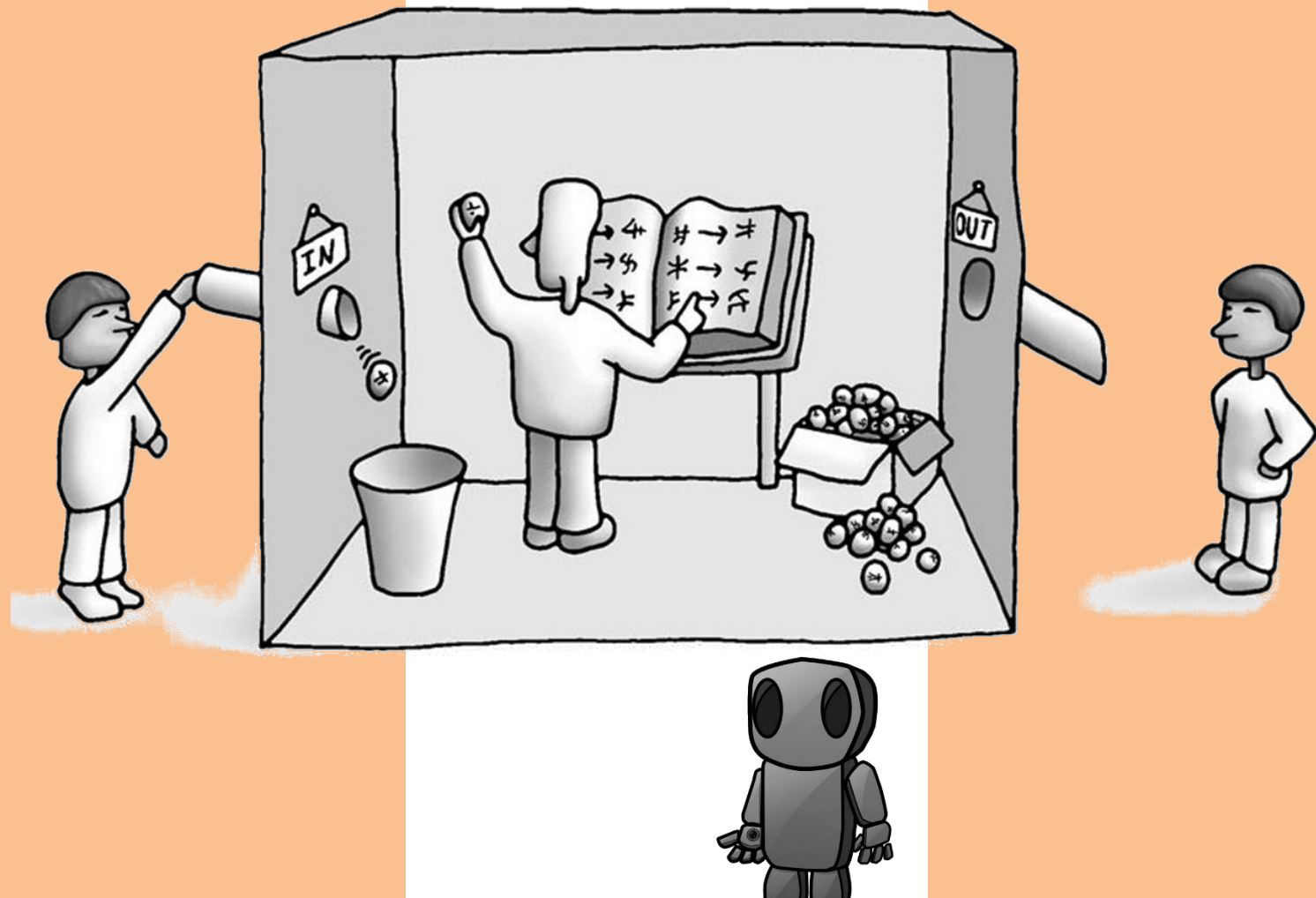


The question of whether computers
can think is like the question of
whether submarines can swim.

Edsger W. Dijkstra

quote fancy

SEARLE'S CHINESE ROOM ...



SEARLE'S CHINESE ROOM (NATURAL LANGUAGE)

<http://ex.org/Ogyselw>

Ogyselw

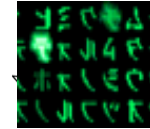


Ogyselw oz e Ydguryel budlfgi.

Ofz berofes oz [Wdcsol](#).

<http://ex.org/Wdcsol>

Wdcsol



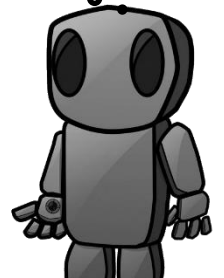
Wdcsol oz fhy berofes up [Ogyselw](#).

Ofz rurdsefoul oz uly mossoul.

INPUT: “Nhef oz fhy rurdsefoul up fhy berofes up Ogyselw?”

... what should the output be?

OUTPUT: “uly mossoul”



MULTIPLE NAMES, ONE THING ...

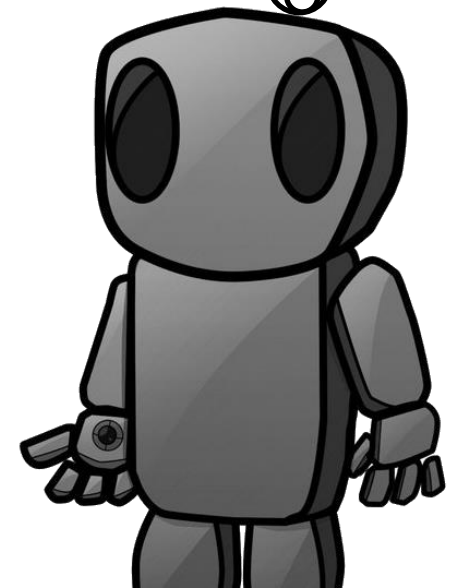


Ireland

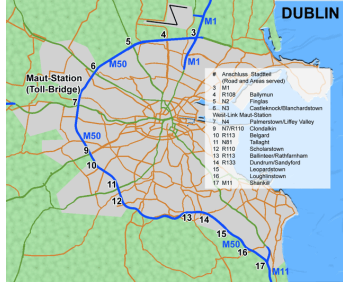
IE

Irlanda

Rep. of Ireland



ONE NAME, MULTIPLE THINGS ...



Dublín



MULTIPLE WAYS TO SAY THE SAME THING ...

Dublin's population is one million.

Dublin has a population of one million.

Dublin's population is 1,000,000.

Dublin has 1,000,000 inhabitants.

One million people live in Dublin.

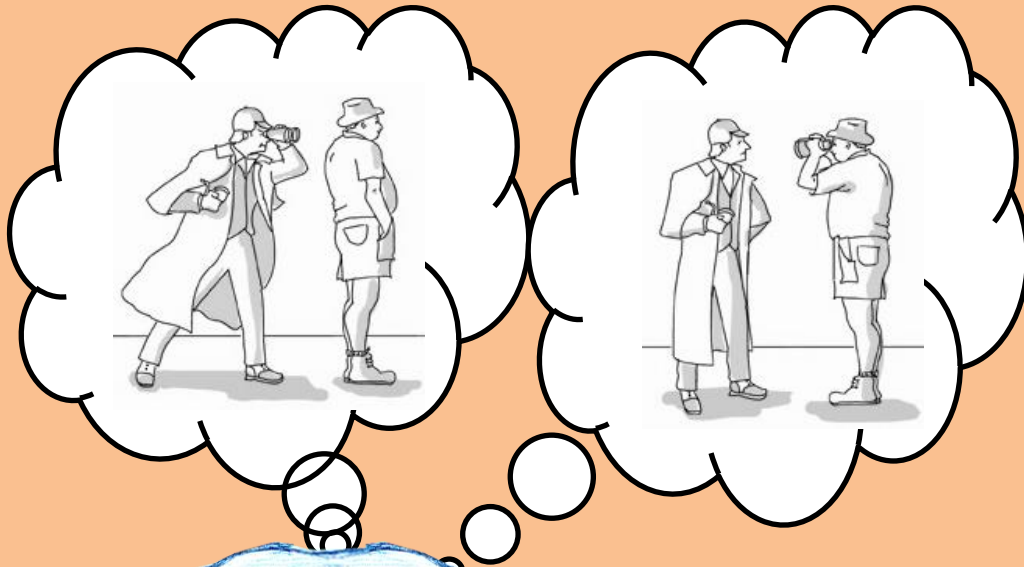
[Dublin] Its population is one million.

La población de Dublín es un millón.



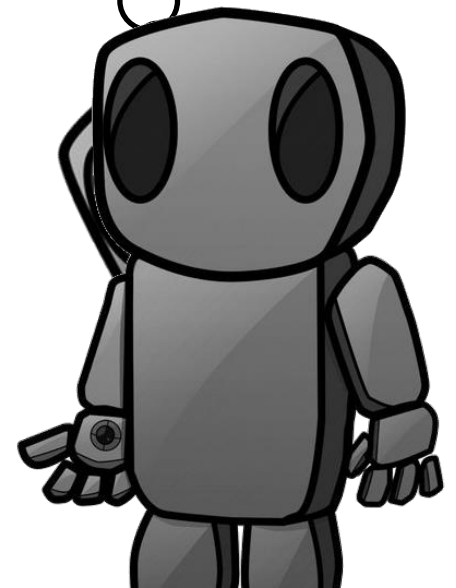
MULTIPLE MEANINGS FOR THE SAME SAYING ...

Sherlock saw the man using binoculars.

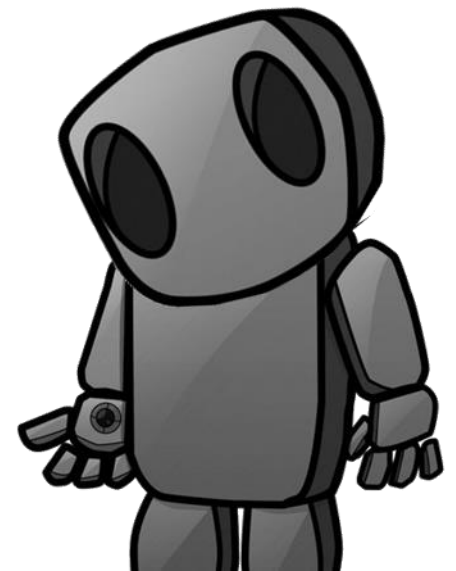


NOT SAYING WHAT IS MEANT ...

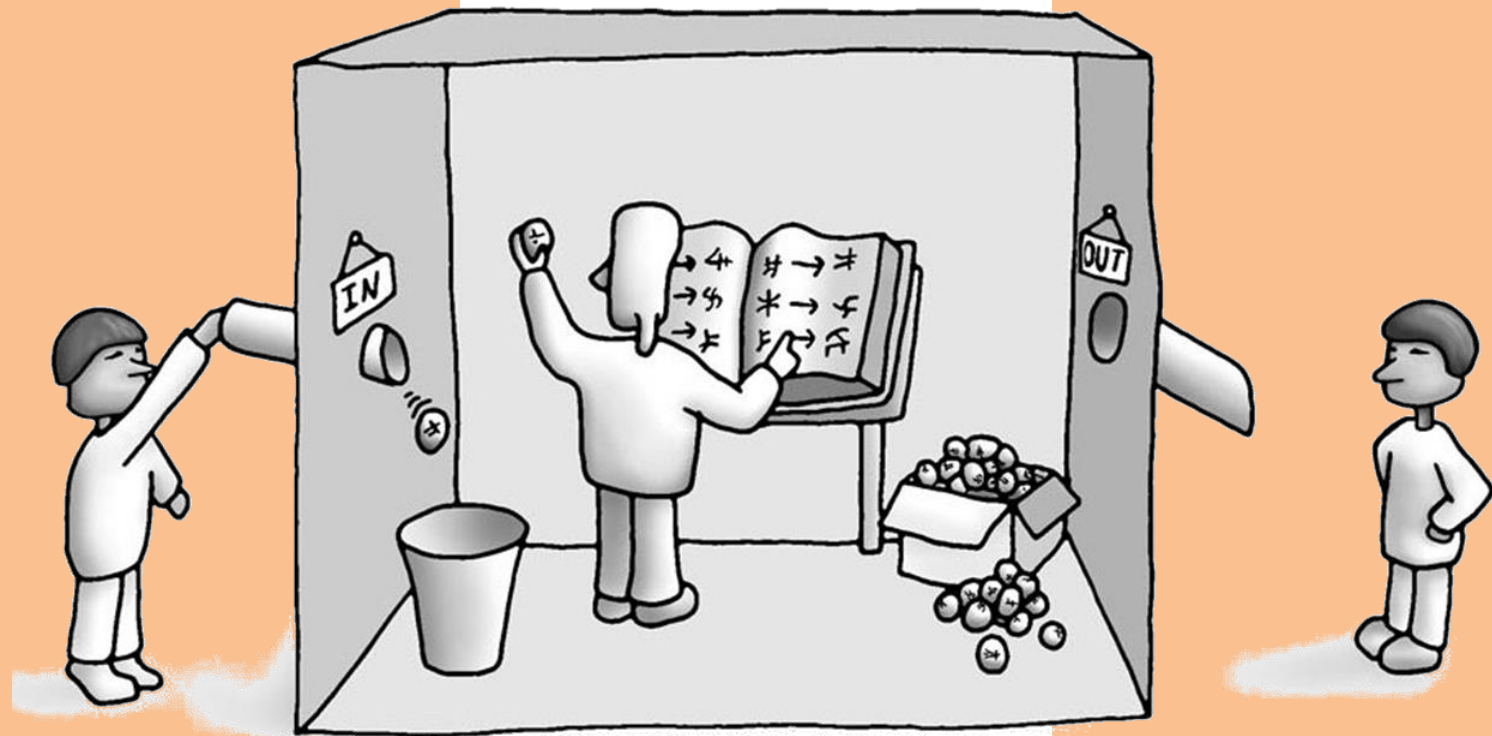
Fred está arriba la pelota.



THE SEMANTIC GAP



WHAT IF WE COULD “STRUCTURE” EVERYTHING ...



ONE SYMBOL, ONE MEANING ...



Ireland

IE

Irlanda

Rep. of Ireland

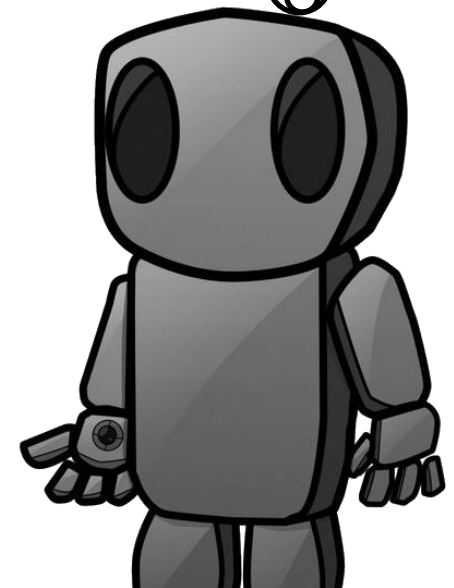


Р

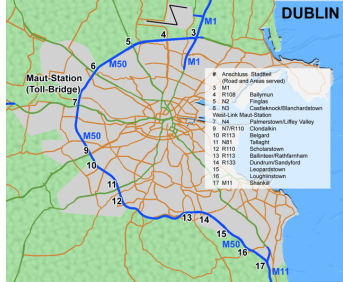
♂

☾

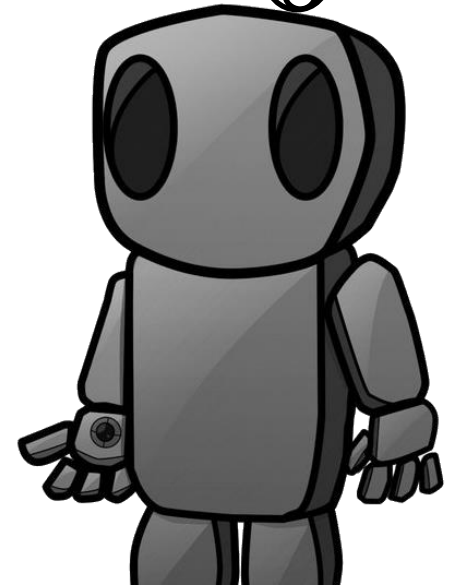
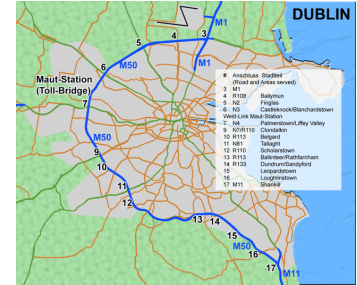
ћ



ONE SYMBOL, ONE MEANING ...



Dublín



ONE (SIMPLE) WAY TO SAY ONE THING ...

Dublin's population is one million.

Dublin has a population of one million.

Dublin's population is 1,000,000.

Dublin has 1,000,000 inhabitants.

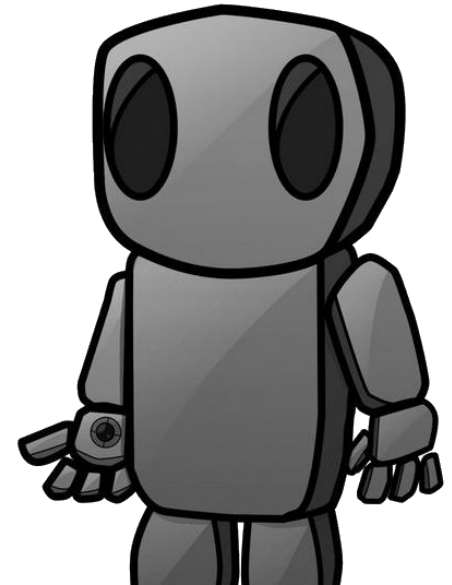
One million people live in Dublin.

[Dublin] Its population is one million.

La población de Dublín es un millón.

(Dublin,population,1000000)

($\Psi, \sigma, 1000000$)



SEARLE'S CHINESE ROOM (NATURAL LANGUAGE)

<http://ex.org/Ogyselw>

Ogyselw



Ogyselw oz e Ydguryel budlfgi.

Ofz berofes oz [Wdcsol](#).

<http://ex.org/Wdcsol>

Wdcsol



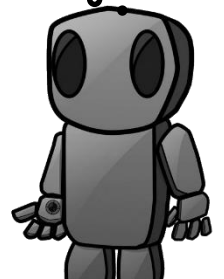
Wdcsol oz fhy berofes up [Ogyselw](#).

Ofz rurdsefoul oz uly mossoul.

INPUT: “Nhef oz fhy rurdsefoul up fhy berofes up Ogyselw?”

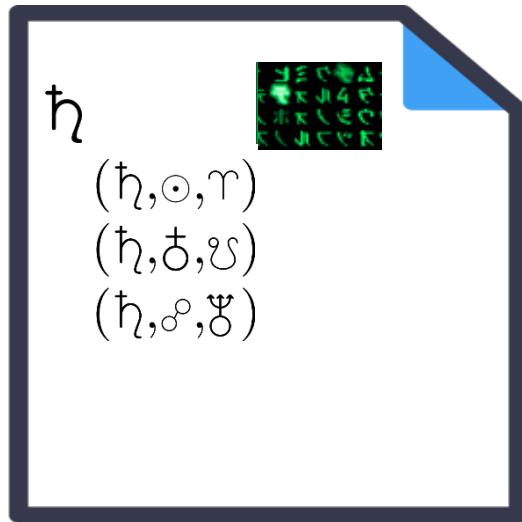
... what should the output be?

OUTPUT: “uly mossoul”

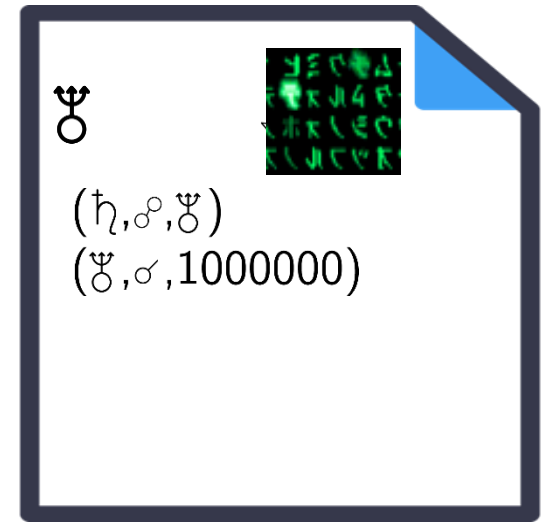


SEARLE'S CHINESE ROOM (SYMBOLIC)

<http://ex.org/h>



<http://ex.org/Ψ>



INPUT: “ $(\dot{h}, \rho, x), (x, \sigma, y)?$ ”

... what should the output be?

OUTPUT: $\{(x \mapsto \Psi, y \mapsto 1000000)\}$



SEARLE'S CHINESE ROOM (SYMBOLIC)

<http://ex.org/Ireland>

Ireland



(Ireland,partOf,Europe)
(Ireland,isA,Country)
(Ireland,capital,Dublin)

<http://ex.org/Dublin>

Dublin



(Ireland,capital,Dublin)
(Dublin,population,1000000)

INPUT: “(Ireland,capital, x), (x ,population, y)?”

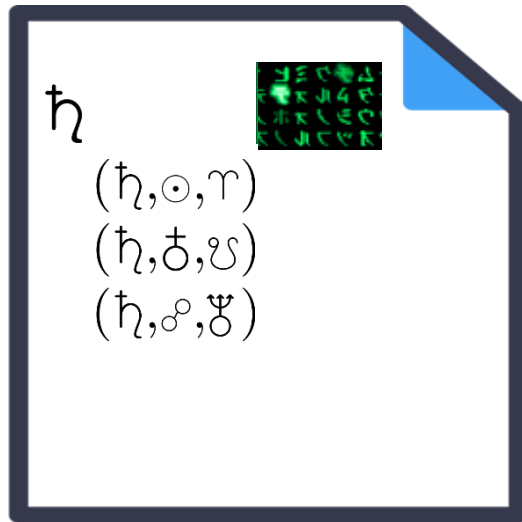
... what should the output be?

OUTPUT: $\{(x \mapsto \text{Dublin}, y \mapsto 1000000)\}$

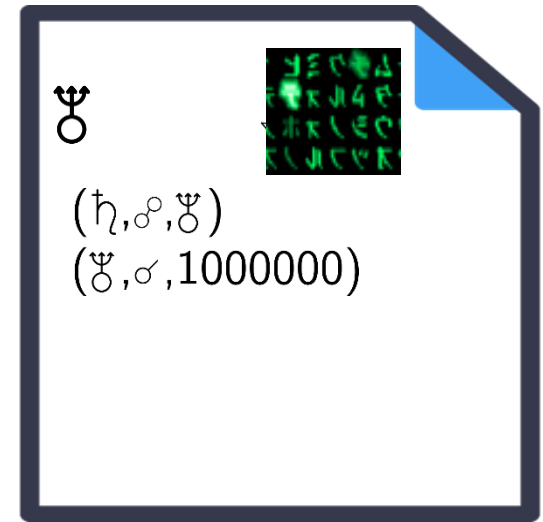


SEARLE'S CHINESE ROOM II

<http://ex.org/h>



<http://ex.org/Ψ>



INPUT: “($x, \odot, y$)?”

... what should the output be?

OUTPUT: $\{(x \mapsto h, y \mapsto \Upsilon)\}$

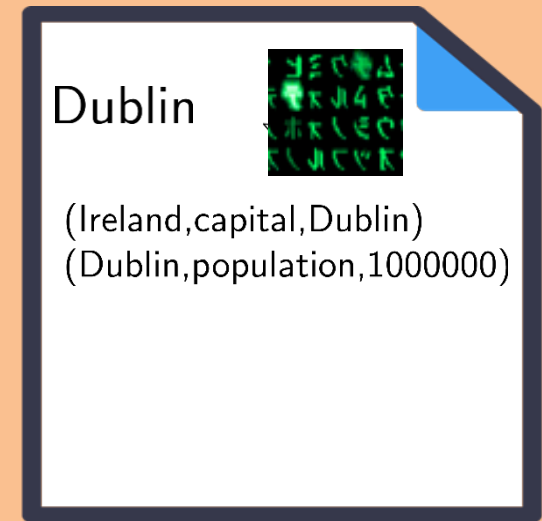


SEARLE'S CHINESE ROOM II

<http://ex.org/Ireland>



<http://ex.org/Dublin>



INPUT: “(x ,partOf, y)?”

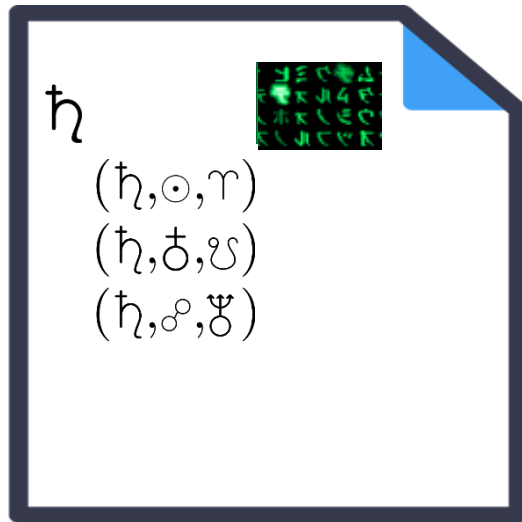
... what should the output be?

OUTPUT: $\{(\mathbf{x} \mapsto \text{Ireland}, \mathbf{y} \mapsto \text{Europe})\}$
 $(\mathbf{x} \mapsto \text{Dublin}, \mathbf{y} \mapsto \text{Ireland})?$

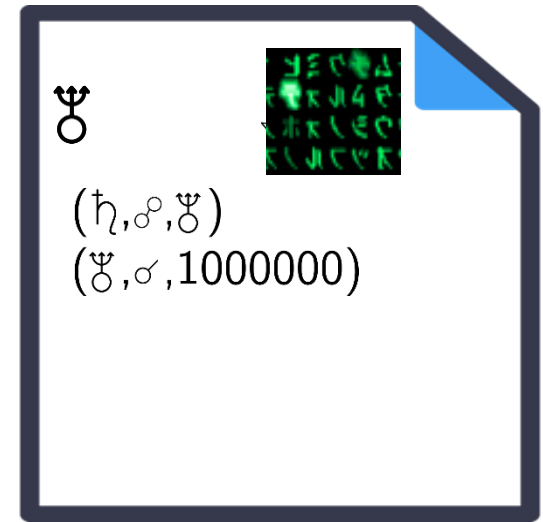


SEARLE'S CHINESE ROOM II

<http://ex.org/h>



<http://ex.org/Ψ>



RULE: “ $(b, \circ, a) \rightarrow (a, \odot, b)$ ”

INPUT: “ $(x, \odot, y)?$ ”

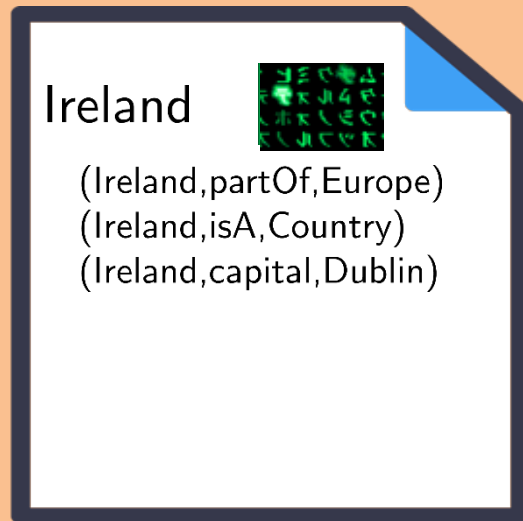
... what should the output be?

OUTPUT: $\{(x \mapsto h, y \mapsto \Upsilon), (x \mapsto \Psi, y \mapsto h)\}$

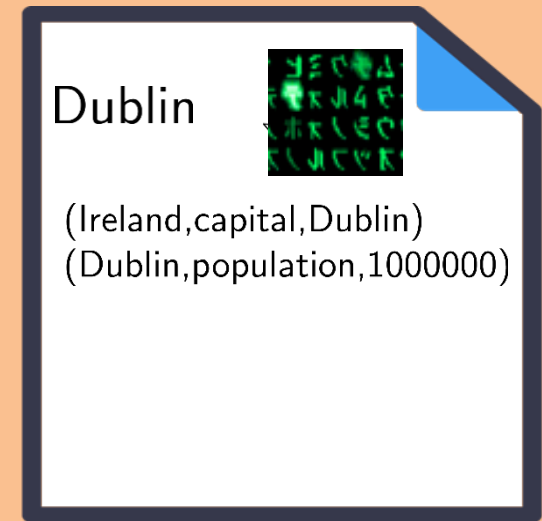


SEARLE'S CHINESE ROOM II

<http://ex.org/Ireland>



<http://ex.org/Dublin>



RULE: “(b ,capital, a) $\rightarrow$ (a ,partOf, b)”

INPUT: “(x ,partOf, y)?”

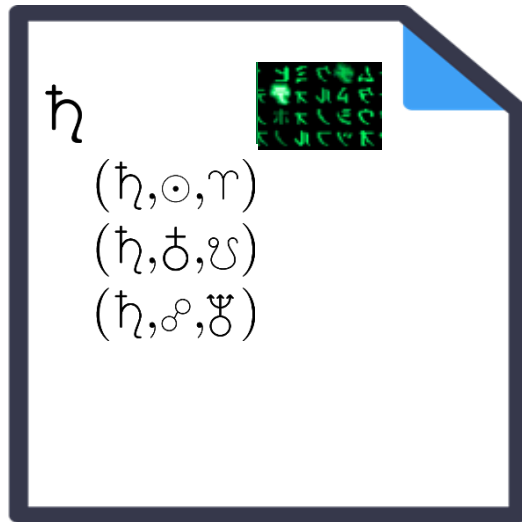
... what should the output be?

OUTPUT: $\{ (x \mapsto \text{Ireland}, y \mapsto \text{Europe}),$
 $(x \mapsto \text{Dublin}, y \mapsto \text{Ireland}) \}$
 $(x \mapsto \text{Dublin}, y \mapsto \text{Europe})?$

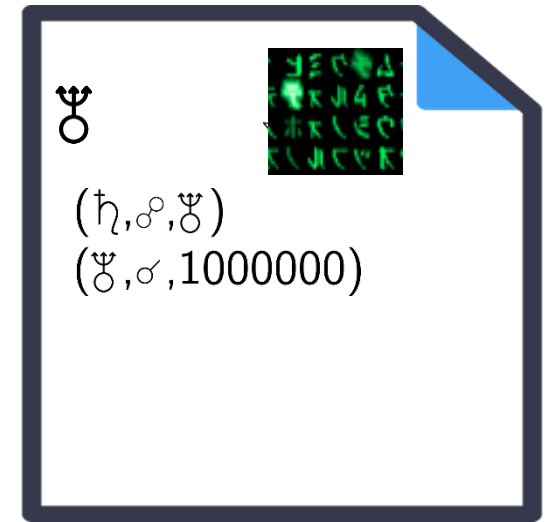


SEARLE'S CHINESE ROOM II

<http://ex.org/h>



<http://ex.org/ψ>

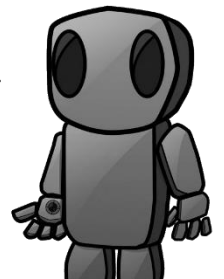


RULES: $“(b, \oslash, a) \rightarrow (a, \odot, b)”$
 $“(a, \odot, b), (b, \odot, c) \rightarrow (a, \odot, c)”$

INPUT: $“(x, \odot, y)”$

... what should the output be?

OUTPUT: $\{(x \mapsto h, y \mapsto \gamma), (x \mapsto \psi, y \mapsto h), (x \mapsto \psi, y \mapsto \gamma)\}$



SEARLE'S CHINESE ROOM II

<http://ex.org/Ireland>

Ireland



(Ireland,partOf,Europe)
(Ireland,isA,Country)
(Ireland,capital,Dublin)

<http://ex.org/Dublin>

Dublin



(Ireland,capital,Dublin)
(Dublin,population,1000000)

RULES:

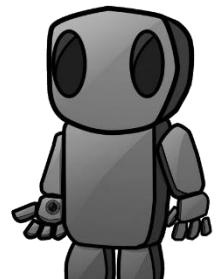
$“(b, \text{capital}, a) \rightarrow (a, \text{partOf}, b)”$

$“(a, \text{partOf}, b), (b, \text{partOf}, c) \rightarrow (a, \text{partOf}, c)”$

INPUT: $“(x, \text{partOf}, y)”$

... what should the output be?

OUTPUT: $\{(x \mapsto \text{Ireland}, y \mapsto \text{Europe}),$
 $(x \mapsto \text{Dublin}, y \mapsto \text{Ireland}),$
 $(x \mapsto \text{Dublin}, y \mapsto \text{Europe})\}$



SEMANTIC WEB: DATA, LOGIC, QUERY

DATA:

Ireland



(Ireland,partOf,Europe)
(Ireland,isA,Country)
(Ireland,capital,Dublin)

Dublin



(Ireland,capital,Dublin)
(Dublin,population,1000000)

LOGIC: $((b, \text{capital}, a) \rightarrow (a, \text{partOf}, b))$
 $((a, \text{partOf}, b), (b, \text{partOf}, c) \rightarrow (a, \text{partOf}, c))$

QUERY: $((x, \text{partOf}, y)?)$

OUTPUT: $\{(x \mapsto \text{Ireland}, y \mapsto \text{Europe}),$
 $(x \mapsto \text{Dublin}, y \mapsto \text{Ireland}),$
 $(x \mapsto \text{Dublin}, y \mapsto \text{Europe})\}$



THE SEMANTIC WEB NOW?

THE SEMANTIC WEB IS NOW ABOUT 25 YEARS OLD



... so where is it then?

HIDDEN WITHIN THE WEB ...



WIKIDATA: A WIKIPEDIA FOR DATA

WHAT IS WIKIDATA?



WIKIDATA

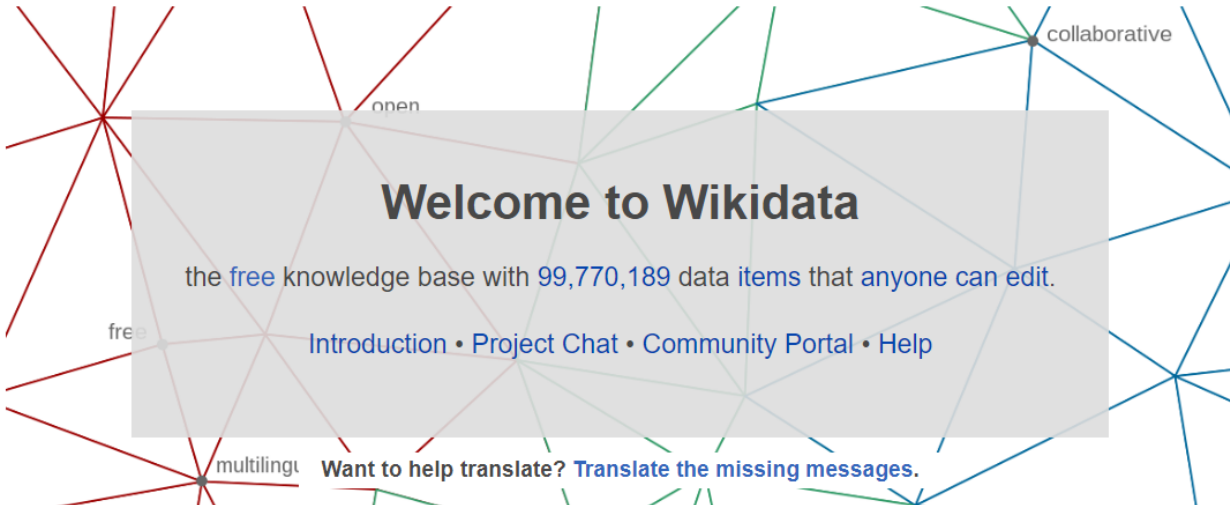
English Aidhog   Talk Preferences Beta Watchlist Contributions Log out

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Main page
Community portal
Project chat
Create a new Item
Recent changes
Random Item
Query Service
Nearby
Help
Donate

Lexicographical data
Create a new Lexeme
Recent changes
Random Lexeme

Tools
What links here
Related changes
Special pages
Permanent link
Page information
Wikidata item



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the **free** knowledge base with **99,770,189** data items that **anyone** can edit.

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Welcome!

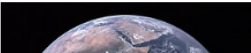
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WHY IS WIKIDATA?



WIKIDATA

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collaborative

open

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PROBLEM 1: DIFFERENT LANGUAGE VERSIONS

MANUALLY EDITED BY USERS

Alexis Sánchez



Sánchez with Chile in 2013

Personal information

Full name	Alexis Alejandro Sánchez Sánchez ^[1]		
Date of birth	19 December 1988 (age 26) ^{[1][2]}		
Place of birth	Tocopilla, Chile ^{[3][2]}		

National team[†]

2007	Chile U20	12	(2)
2006–	Chile	82	(26)

Alexis Sánchez



Datos personales

Nombre completo Alexis Alejandro Sánchez Sánchez

Carrera internacional

Selección	 Chile
Part. (goles)	82 (26)
Debut	2006

Alexis



Alexis Sánchez im Dezember 2011

Spielerinformationen

Voller Name Alexis Alejandro Sánchez Sánchez
Geburtstag 19. Dezember 1988
Geburtsort Tocopilla, Chile

Nationalmannschaft²

2007	Chile U-20	
2006–	Chile	76 (25)

PROBLEM 2: COMPLEX LISTS OF THINGS

MANUALLY EDITED BY USERS



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Search

Chile national football team

From Wikipedia, the free encyclopedia

Most capped players [\[edit \]](#)

As of September 1, 2016

*Players in **bold** are still active, at least at club level.*

Top goalscorers [\[edit \]](#)

As of September 1, 2016

*Players in **bold** are still active, at least at club level.*

#	Name	International Career	Caps	Goals	#	Name	International Career	Goals	Caps
1.	Claudio Bravo	2004 –	106	0	1.	Marcelo Salas	1994–2007	37	70
2.	Alexis Sánchez	2006 –	102	34	2.	Iván Zamorano	1987–2001	34	69
3.	Gary Medel	2007 –	96	7		Alexis Sánchez	2006 –	34	102
4.	Gonzalo Jara	2006 –	95	3		(list)			
						Eduardo			

ALEXIS SCORES A GOAL ...



Now an army of human editors has to manually update a bunch of articles: different languages, lists, ...

SOLUTION: WIKIDATA



WIKIDATA

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- Community portal
- Project chat
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- Recent changes
- Random Item
- Query Service
- Nearby
- Help
- Donate

Lexicographical data

- Create a new Lexeme
- Recent changes
- Random Lexeme

Tools

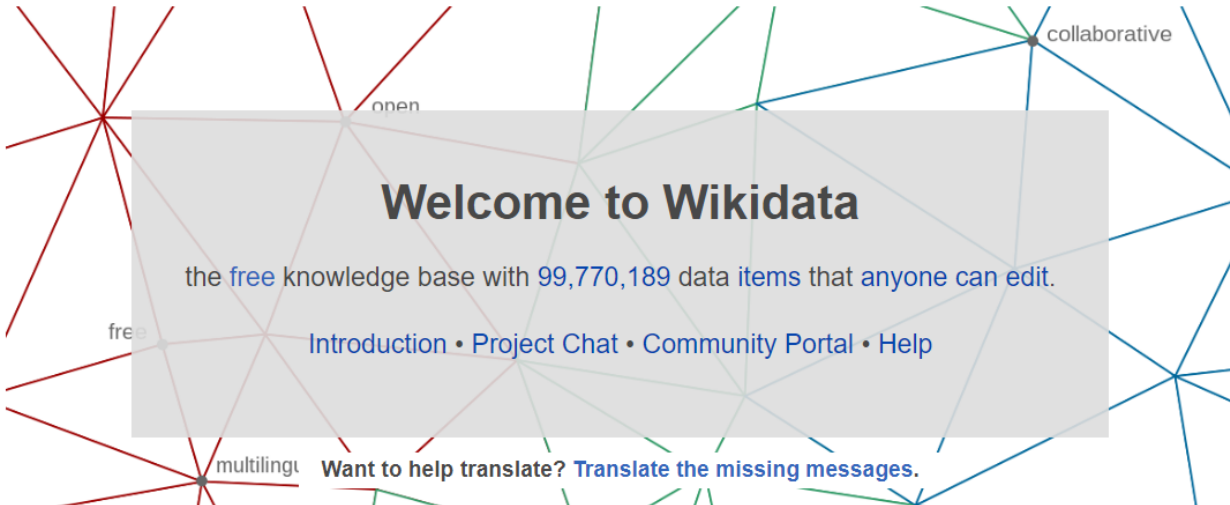
- What links here
- Related changes
- Special pages
- Permanent link
- Page information
- Wikidata item

English Aidhog   Talk Preferences Beta Watchlist Contributions Log out

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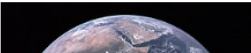
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Search



Alexis Alejandro Sánchez Sánchez (Q180553)

Chilean footballer

[edit](#)

Chiqui

[In more languages](#)

Statements

sex or gender

 male

[edit](#)

[1 reference](#)

[+ add](#)

member of sports team

 Cobreloa

[edit](#)

[1 reference](#)

 Udinese Calcio

[edit](#)

[1 reference](#)

 Arsenal F.C

[edit](#)

[1 reference](#)

 Club Atlético River Plate

[edit](#)



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- Portal de la comunidad
- Café
- Crear un elemento nuevo
- Elemento por título
- Cambios recientes
- Elemento aleatorio
- Cercanos
- Ayuda
- Donaciones

- Imprimir/exportar
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 - Versión para imprimir

- Herramientas
 - Lo que enlaza aquí
 - Cambios relacionados
 - Páginas especiales
 - Enlace permanente
 - Información de la página
 - Concept URI
 - Citar esta página

Elemento

Discusión

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Ver historial

☆

Buscar

Q

Alexis Sánchez (Q180553)

futbolista chileno ✎ editar

[Alexis Sánchez Sánchez](#) | [AS9](#) | [Alexis Alejandro Sánchez Sánchez](#) | [AS7](#) | [Alexis Alejandro Sánchez](#) | [Alexis Sánchez](#) | [Alexis Sanchez](#) | [Alexis Sanches](#)

► [En más idiomas](#)

Declaraciones

sexo	masculino ✎ editar
	► 1 referencia + añadir
miembro del equipo deportivo	Club de Deportes Cobreloa ✎ editar
	► 1 referencia
	Udinese Calcio ✎ editar
	► 1 referencia
	Arsenal Football Club ✎ editar
	► 1 referencia

Datenobjekt

Diskussion

Lesen

Versionsgeschichte



Suchen



Alexis Sánchez (Q180553)

chilenischer Fußballspieler

 bearbeiten

Alexis Alejandro Sánchez Sánchez | Alexis Sanchez | Alexis Alejandro Sanchez Sanchez

► In weiteren Sprachen

Aussagen

Geschlecht



männlich



bearbeiten

► 1 Fundstelle



hinzufügen

Mitglied von Sportmannschaft
oder -verein



CD Cobreloa



bearbeiten

► 1 Fundstelle



Udinese Calcio



bearbeiten

► 1 Fundstelle



FC Arsenal



bearbeiten

► 1 Fundstelle



CA River Plate



bearbeiten



- Заглавная страница
- Портал сообщества
- Форум
- Создание нового элемента
- Элементы по заголовку
- Свежие правки
- Случайный элемент
- Рядом
- Справка
- Пожертвования

- Печать/экспорт
 - Создать книгу
 - Скачать как PDF
 - Версия для печати

- Инструменты
 - Ссылки сюда
 - Связанные правки
 - Спецстраницы
 - Постоянная ссылка
 - Сведения о странице
 - URI концепта
 - Цитировать страницу

Санчес, Алексис (Q180553)

Описание не заполнено [редактировать](#)

Алексис Санчес

[▶ На других языках](#)

Утверждения

пол	мужской редактировать
	▶ 1 источник
+ добавить	

член спортивной команды	Кобрелоа редактировать
	▶ 1 источник
	Удинезе редактировать
	▶ 1 источник
	Арсенал редактировать
	▶ 1 источник
	Ривер Плейт редактировать

അലക്സിസ് സാഞ്ചസ് (Q18൦553)

വിവരണമൊന്നും നിർവചിച്ചിട്ടില്ല
അപരനാമങ്ങളൊന്നും കണ്ടെത്താനായില്ല.

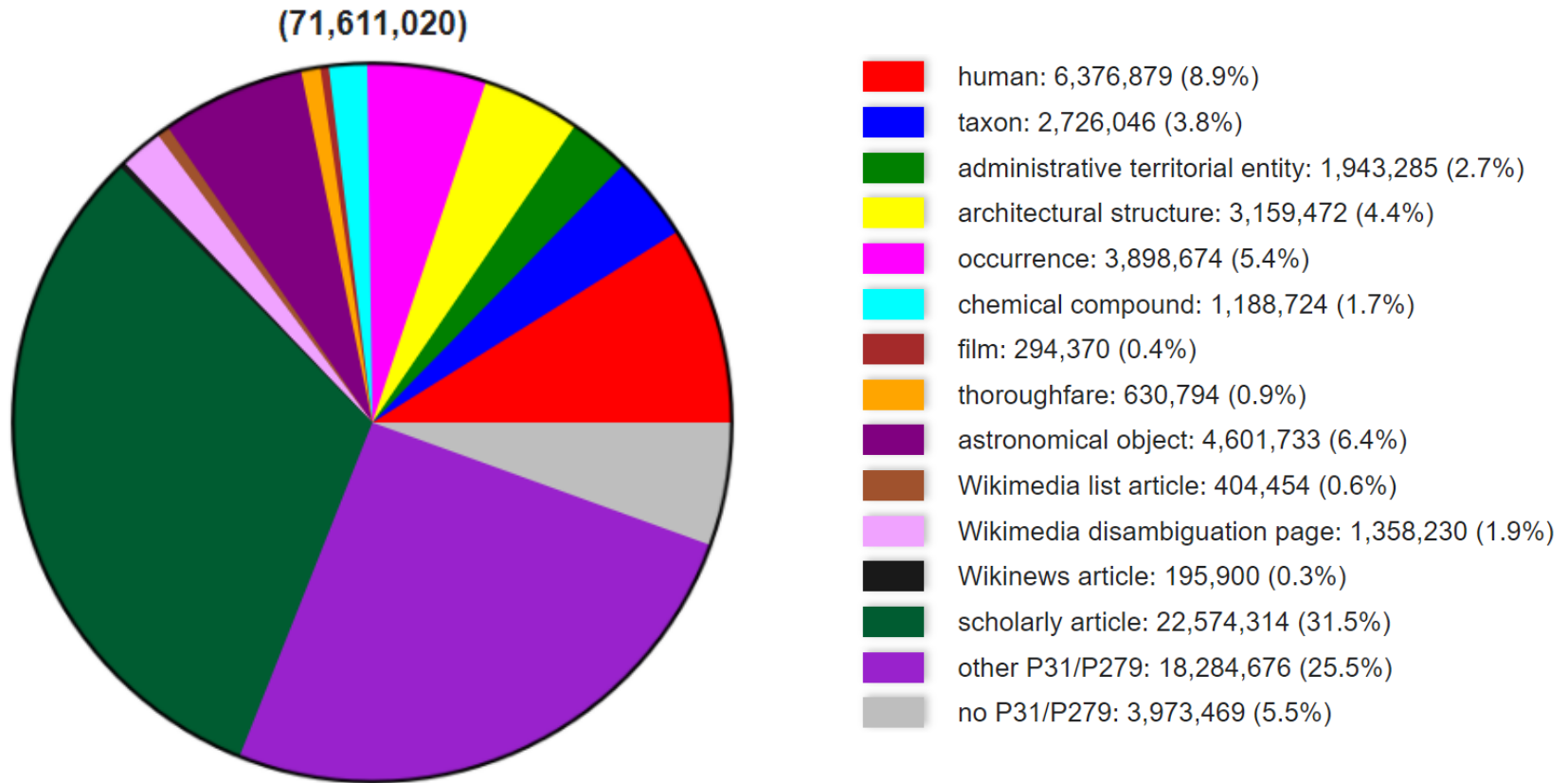
[✎ തിരുത്തുക](#)

► കൂടുതൽ ഭാഷകളിൽ

Statements

ലിംഗം	 പുരുഷൻ	✎ തിരുത്തുക
	► 1 സ്രോതസ്സ്	
+ ചേർക്കുക		
member of sports team <i>ഇംഗ്ലീഷ്</i>	 Cobreloa <i>ഇംഗ്ലീഷ്</i>	✎ തിരുത്തുക
	► 1 സ്രോതസ്സ്	
	 Udinese Calcio <i>ഇംഗ്ലീഷ്</i>	✎ തിരുത്തുക
	► 1 സ്രോതസ്സ്	
	 ആഴ്സണൽ എഫ്.സി.	✎ തിരുത്തുക
	► 1 സ്രോതസ്സ്	
	 Club Atlético River Plate <i>ഇംഗ്ലീഷ്</i>	✎ തിരുത്തുക

WHAT DOES WIKIDATA DESCRIBE?



- 22,986 active users

USE-CASE: INFO-BOXES



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The Free Encyclopedia

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Atacama Pathfinder Experiment

From Wikipedia, the free encyclopedia

The **Atacama Pathfinder Experiment** (**APEX**) is a [radio telescope](#) 5,100 meters above sea level, at the [Llano de Chajnantor Observatory](#) in the [Atacama desert](#) in northern [Chile](#), 50 km east of [San Pedro de Atacama](#) built and operated by 3 European research institutes. The main dish has a diameter of 12 m and consists of 264 aluminium panels with an average surface accuracy of 17 micrometres (*rms*). The telescope was officially inaugurated on September 25, 2005.

The APEX telescope is a modified [ALMA](#) (Atacama Large Millimeter Array) prototype antenna and is at the site of the ALMA observatory. APEX is designed to work at sub-millimetre wavelengths, in the 0.2 to 1.5 mm range — between infrared light and radio waves — and to find targets that ALMA will be able to study in greater detail. Submillimetre astronomy provides a window into the cold, dusty and distant Universe, but the faint signals from space are heavily absorbed by water vapour in the Earth's atmosphere. [Chajnantor](#) was chosen as the location for such a telescope because the region is one of the driest on the planet and is more than 750

Atacama Pathfinder Experiment



The APEX telescope

Observatory	Llano de Chajnantor Observatory
Location(s)	Atacama Desert, Chile
Coordinates	 23°00′21″S 67°45′33″W
Organization	Edit this at Wikidata Observatory Max Planck Institute for Radio Astronomy Onsala Space Observatory
Altitude	5,100 m (16,700 ft)
Wavelength	0.2, 1.5 mm (1.50, 0.20 THz)
First light	2004
Telescope style	Cassegrain reflector Cosmic microwave background experiment Radio telescope

USE-CASE: INFO-BOXES



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Atacama Pathfinder Experiment (Q753076) EX

radio telescope

[In more languages](#)

Statements

instance of	radio telescope edit 10
	▼ 0 references + add reference
Cassegrain reflector edit	▼ 0 references + add reference

Atacama Pathfinder Experiment



The APEX telescope

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First light	2004
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USE-CASE: QUALITY CHECKS

List of all person who do not have an age between 0 and 130. Update: 22:21, 10 September 2018 (UTC)

Item	Birth	Death	Age
Tuti Yusupova (Q1038827)	1880-07-01	2015-03-28	134
Karni Mata (Q1106783)	1387-10-02	1538-03-23	150
no label (Q11556831)	1185-01-01	1392-01-01	207
Minamoto no Chikayuki (Q11564306)	1185-01-01	1333-01-01	148
Bir Narayan Chaudhuri (Q11854281)	1857-00-00	1998-04-20	141
no label (Q12123094)	1091-00-00	1228-00-00	137
no label (Q12218744)	1819-00-00	1954-00-00	135
Maftai Pop (Q12734691)	1804-01-01	1952-03-15	148
Habib Miyan (Q1365575)	1868-05-20	2008-08-19	140
Egyō (Q1392070)	805-01-01	1185-01-01	380
Xu Xun (Q1428729)	239-01-01	374-01-01	135
Zaro Aga (Q148028)	1777-01-01	1934-06-29	157
Charles Étienne Guillaume Blandin de Chalain (Q15967550)	1740-06-07	1958-01-01	217
Javier Pereira (Q15999178)	1789-00-00	1958-00-00	169
Chen Jun (Q16077971)	881-00-00	1324-00-00	443
Jules Granier (Q16842647)	1770-01-01	1906-04-07	136
Genson (Q18115051)	1700-01-01	1950-01-01	250
Liutwin (Q18222784)	1200-01-01	1350-01-01	150
Salah (Q1827950)	-2068-00-00	-1635-00-00	433

USE-CASE: QUALITY CHECKS

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no label (Q11556831)	1185-01-01	1392-01-01	207
Minamoto no Chikayuki (Q11564306)	1185-01-01	1333-01-01	148
Julius Fessler (Q55677113)	1982-05-04	1937-10-27	-45
Max Hallbauer (Q55678777)	1851-12-04	1818-10-08	-34
Ernst Keiter (Q55679293)	1943-10-28	1907-10-30	-36
Franz Friedrich Theodor Steinhauer (Q55680095)	1849-12-25	1822-12-21	-28
Johann Joseph Schoder (Q55680781)	1918-12-07	1884-12-12	-34
Paul Kaspar Helbling (Q55681272)	2012-06-05	2011-06-20	-1
Gustaf Bolinger (Q55683866)	1988-12-19	1957-07-16	-32
Joseph Marcus Jaffé (Q55683961)	1867-03-11	1841-04-12	-26
Johann Baptist Hau (Q55683983)	1782-08-14	1758-12-26	-24
Wilhelm Klaubert (Q55684184)	1557-08-17	1526-10-03	-31
Dieterich Johann Krüger (Q55684826)	1742-06-23	1726-08-22	-16
Alfred Reichenbecher (Q55684894)	1884-01-26	1664-03-05	-220
Johann Ludwig Winckler (Q55901640)	1963-05-08	1767-08-08	-196
Johann Heremberck (Q55902890)	1811-01-01	1489-01-01	-322
Salah (Q1827950)	-2068-00-00	-1635-00-00	433

USE-CASE: QUERY SERVICE



Wikidata Query Service

<https://query.wikidata.org/#PREFIX%20wd%3A%20%3Chttp%3A%2F%2Fwww.wikidata.org%2Fentity%2F%3>

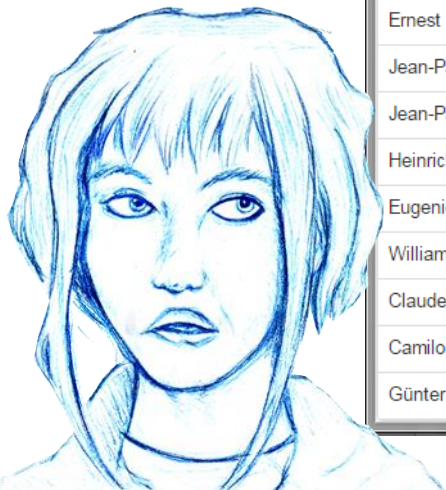
Aplicaciones Linguee SGICM Apache Any23: Anyth

```
16 ?war wdt:P580 ?warStart . # Get date the war started
17 BIND(YEAR(?warStart) as ?warYear) # Get year from date
18 ?laureate rdfs:label ?laureateName . # Get name of laureate
19 FILTER(lang(?warName)="en" # Filter for English
20 && lang(?laureateName)="en") # ... names only
21 } ORDER BY ?awardYear # Order by year
22
```

Press [CTRL-SPACE] to activate auto completion. Data updated a few seconds ago

Run Clear 12 Results in 1589 ms Display Download Link

laureateName	awardYear	warName	warYear
Carl Spitteler	1919	World War I	1914
Winston Churchill	1953	World War I	1914
Ernest Hemingway	1954	World War I	1914
Ernest Hemingway	1954	World War II	1939
Jean-Paul Sartre	1964	Algerian War	1954
Jean-Paul Sartre	1964	World War II	1939
Heinrich Böll	1972	World War II	1939
Eugenio Montale	1975	World War I	1914
William Golding	1983	World War II	1939
Claude Simon	1985	Spanish Civil War	1936
Camilo José Cela	1989	Spanish Civil War	1936
Günter Grass	1999	World War II	1939



USED IN APPLICATIONS LIKE SIRI ...

Siri Erroneously Told People Stan Lee Was Dead



Beth Elderkin

7/03/18 2:45pm • Filed to: STAN LEE ✓



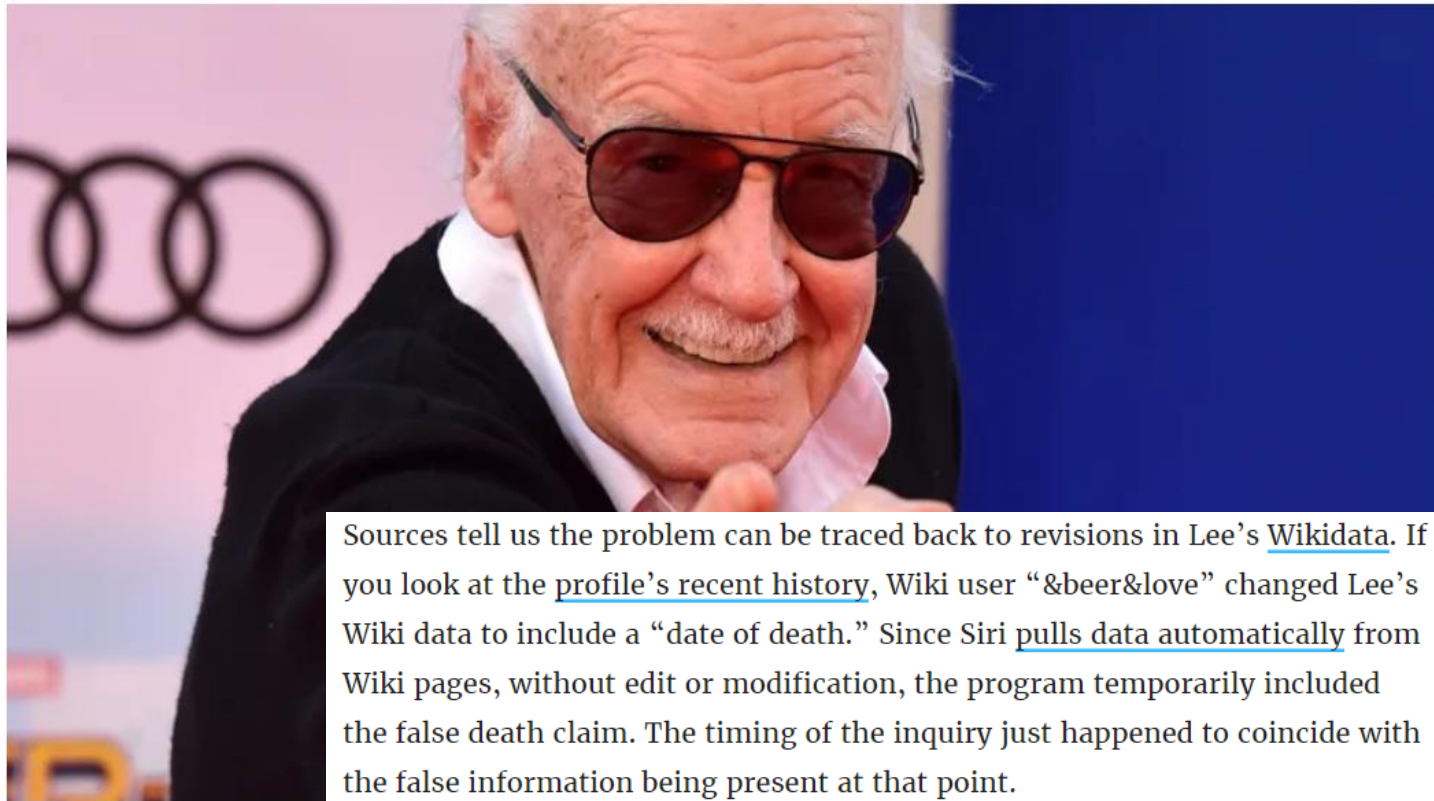
17.4K



45



5



Stan Lee at the premiere of *Spider-Man: Homecoming*.

Photo: Alberto E. Rodriguez (Getty Images)

GOOGLE'S KNOWLEDGE GRAPH

GOOGLE'S KNOWLEDGE PANEL

The screenshot shows a Google search for "sully prudhomme". The search results list several entries, including Wikipedia, Britannica, and NNDB. To the right, a Knowledge Panel for Sully Prudhomme is displayed, featuring a grid of portraits, his name, title "Poet", a brief biography, key dates (Born: March 16, 1839, Paris, France; Died: September 6, 1907, Châtenay-Malabry, France), books ("Les vaines tendresses"), awards ("Nobel Prize in Literature"), and a section for "People also search for" which includes portraits and names of other poets like Leconte de Lisle, Theodor Mommsen, Frédéric Mistral, Paul Verlaine, and Gabriel Fauré.

Sully Prudhomme - Wikipedia, the free encyclopedia
https://en.wikipedia.org/wiki/Sully_Prudhomme
René François Armand (Sully) Prudhomme was a French poet and essayist. He was the first ever winner of the Nobel Prize in Literature in 1901. Born in Paris ...
Early life · Writing · Nobel Prize · Death

Sully Prudhomme - Wikipedia, la enciclopedia libre
https://es.wikipedia.org/wiki/Sully_Prudhomme · Translate this page
René François Armand (Sully) Prudhomme también conocido como Sully Prudhomme (París, Francia, 16 de marzo de 1839 - Châtenay-Malabry, Francia, 6 de ...

Sully Prudhomme - Biographical - Nobelprize.org
www.nobelprize.org/nobel_prizes/literature/laureates/1901/prudhomme-bio.html
Rene Francois Armand Prudhomme (1839-1907) was the son of a French shopkeeper. ... Sully Prudhomme was a member of the «Conference La Bruyère», ...

Sully Prudhomme - Nobelprize.org
https://www.nobelprize.org/nobel_prizes/literature/laureates/1901/
The Nobel Prize in Literature 1901 was awarded to Sully Prudhomme "in special recognition of his poetic composition, which gives evidence of lofty idealism, ...

Sully Prudhomme | French poet | Britannica.com
<https://www.britannica.com/biography/Sully-Prudhomme>
Sully Prudhomme, pseudonym of René-François-Armand Prudhomme (born March 16, 1839, Paris—died Sept. 7, 1907, Châtenay, France) French poet who ...

Sully Prudhomme - NNDB.com
www.nndb.com/people/297/000098003/
It was at this moment that the small circle of which Leconte de Lisle was the center were preparing the Parnasse, to which Sully Prudhomme contributed several ...

Sully Prudhomme | Definition of Sully Prudhomme by Merriam-Webster

Sully Prudhomme
Poet

René François Armand Prudhomme was a French poet and essayist. He was the first ever winner of the Nobel Prize in Literature in 1901.
[Wikipedia](#)

Born: March 16, 1839, Paris, France
Died: September 6, 1907, Châtenay-Malabry, France
Books: [Les vaines tendresses](#)
Awards: [Nobel Prize in Literature](#)

People also search for [View 10+ more](#)

[Leconte de Lisle](#) [Theodor Mommsen](#) [Frédéric Mistral](#) [Paul Verlaine](#) [Gabriel Fauré](#)

USING SEMANTIC WEB KNOWLEDGE-BASES

From Freebase to Wikidata: The Great Migration

Thomas Pellissier Tanon^{*}
Google, San Francisco, USA
thomas@pellissier-tanon.fr

Denny Vrandečić
Google, San Francisco, USA
vrandecic@google.com

Sebastian Schaffert
Google, Zürich, Switzerland
schaffert@google.com

Thomas Steiner
Google, Hamburg, Germany
tomac@google.com

Lydia Pintscher
Wikimedia, Berlin, Germany
lydia@pintscher.de

ABSTRACT

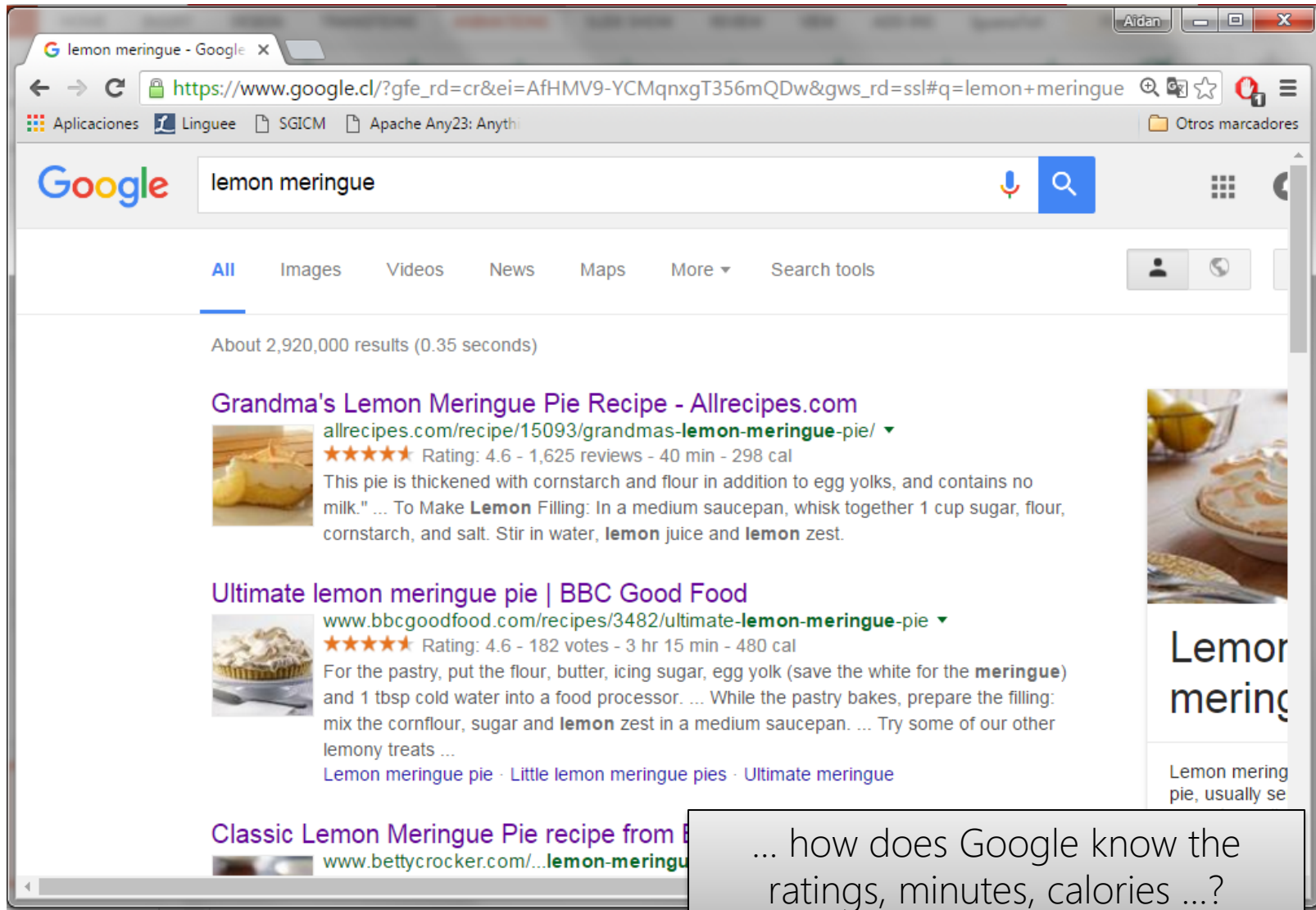
Collaborative knowledge bases that make their data freely available in a machine-readable form are central for the data strategy of many projects and organizations. The two major collaborative knowledge bases are Wikimedia's Wikidata and Google's Freebase. Due to the success of Wikidata, Google decided in 2014 to offer the content of Freebase to the Wikidata community. In this paper, we report on the ongoing transfer efforts and data mapping challenges, and provide an analysis of the effort so far. We describe the *Primary Sources Tool*, which aims to facilitate this and future data migrations. Throughout the migration, we have gained deep insights into both Wikidata and Freebase, and share and discuss detailed statistics on both knowledge bases.

One such collaborative knowledge base is Freebase, publicly launched by Metaweb in 2007 and acquired by Google in 2010. Another example is Wikidata, a collaborative knowledge base developed by Wikimedia Deutschland since 2012 and operated by the Wikimedia Foundation. Due to the success of Wikidata, Google announced in 2014 their intent to shut down Freebase and help the community with the transfer of Freebase content to Wikidata [10].

Moving data between two knowledge bases that do not share a similar design is usually a problematic task and requires the careful mapping between their structures. The migration from Freebase to Wikidata was no exception to this rule: we encountered a number of to-be-expected *structural* challenges. However, even more demanding was the *cultural* difference between the two involved communities.

GOOGLE'S RICH SNIPPETS

FANCY-LOOKING SEARCH RESULTS ...



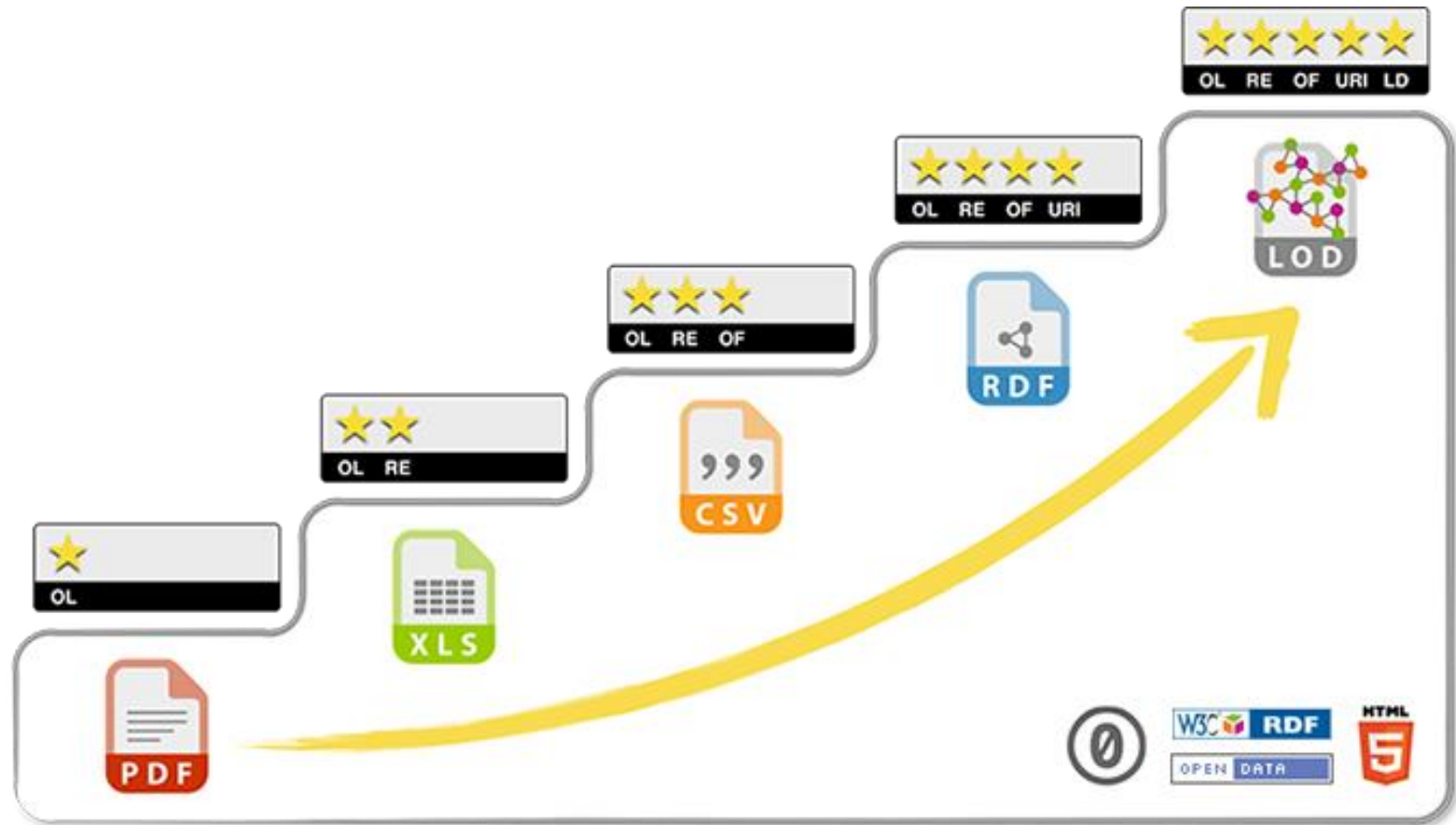
PUBLISHERS ADD STRUCTURED DATA!

```
<ul class="nutrition" itemprop="nutrition" itemscope
  itemtype="http://schema.org/NutritionInformation">
  <li>
    <span class="nutrition_label">kcal</span>
    <span class="nutrition_value" itemprop="calories">480</span>
    ...
  </li>
</ul>
```

- ✓ Publishers get more clicks on their results
- ✓ Google gets data to make fancy results

STANDARDS FOR OPEN DATA: LINKED OPEN DATA

HOW TO PUBLISH OPEN DATA?



5-Star Linking Open Data Scheme

The collage features a central network of blue nodes and lines connecting various logos and text elements. The logos include BBC, The New York Times, METAWEB, Google, NASA, Wikipedia, Sears, and Yahoo!. The text elements include "The Free Encyclopedia", "Computer Science Bibliography", "HM Government", and "As of September 2011". The background is a dense web of these logos and connecting lines, with a large blue node in the center.

ABOUT THE COURSE ...

TOPICS COVERED

- RDF (triple-based data model)
- RDFS/OWL (ontological languages)
- SPARQL (query language)
- Linked Data / Web of Data
- RDB2RDF (importing databases to Sem. Web.)
- Shapes (validating RDF data)

RESEARCH COURSE



STRUCTURE OF THE COURSE

- Each week:
 - Class on Monday (learn concepts)
 - Lab on Monday (see concepts in practice)
 - Auxiliar session on Friday (Q&A)
- Marking structure:

70%	labs
20%	project
10%	reading group

BIBLIOGRAPHY

Aidan Hogan

The Web of Data

This book concisely brings together the key standards and best practices relating to modelling, querying, validating and linking machine-readable data and semantics on the Web. Alongside practical examples and formal definitions, the book shows how these standards contribute to – and have been used thus far on – the “Web of Data”: a machine readable evolution of the Web marked by increased automation, enabling powerful Web applications capable of discovering, cross-referencing, and organising data from numerous websites in a matter of seconds.

The book is divided into nine chapters, the first of which highlights the fundamental shortcomings of the current Web that illustrate the need for increased machine readability. The next chapter outlines the core concepts of the “Web of Data”, discussing use-cases on the Web where they have already been deployed. “Resource Description Framework (RDF)” describes the graph-structured data model proposed by the Semantic Web community as a common data model for the Web. The chapter on “RDF Schema (RDFS) and Semantics” presents a lightweight ontology language used to define an initial semantics for RDF graphs. In turn, the chapter “Web Ontology Language (OWL)” elaborates on a much more expressive ontology language built upon RDFS. In “SPARQL Query Language” a language for querying and updating RDF graphs is described. “Shape Constraints and Expressions (SHACL/ShEx)” introduces two languages for describing the expected structure of – and expressing constraints over – RDF graphs for the purposes of validation. “Linked Data” discusses the principles and best practices by which interlinked (RDF) data can be published on the Web, and how they have been adopted. The final chapter highlights open problems and concludes with a general discussion on the future of the Web of Data.

The book is intended for students, researchers and advanced practitioners interested in learning more about the Web of Data, and about closely related topics such as the Semantic Web, Knowledge Graphs, Linked Data, Graph Databases, Ontologies, etc. Offering a range of accessible examples and exercises, it can be used as a textbook for students and other newcomers to the field. It can also serve as a reference handbook for researchers and developers, as it offers up-to-date details on key standards (RDF, RDFS, OWL, SPARQL, SHACL, ShEx, RDB2RDF, LDP), along with formal definitions and references to further literature. The associated website webofdatabook.org offers a wealth of complementary material, including solutions to the exercises, slides for classes, interactive examples, and a section for comments and questions.

Aidan Hogan



The Web of Data

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The Web of Data

OUTCOMES: LEARN ABOUT THE SEMANTIC WEB!

- An ongoing research topic here in the DCC
- Apply database, logic, AI, etc., to the Web
- Mix of theory and practical exercises
- The future of the Web?

QUESTIONS?

