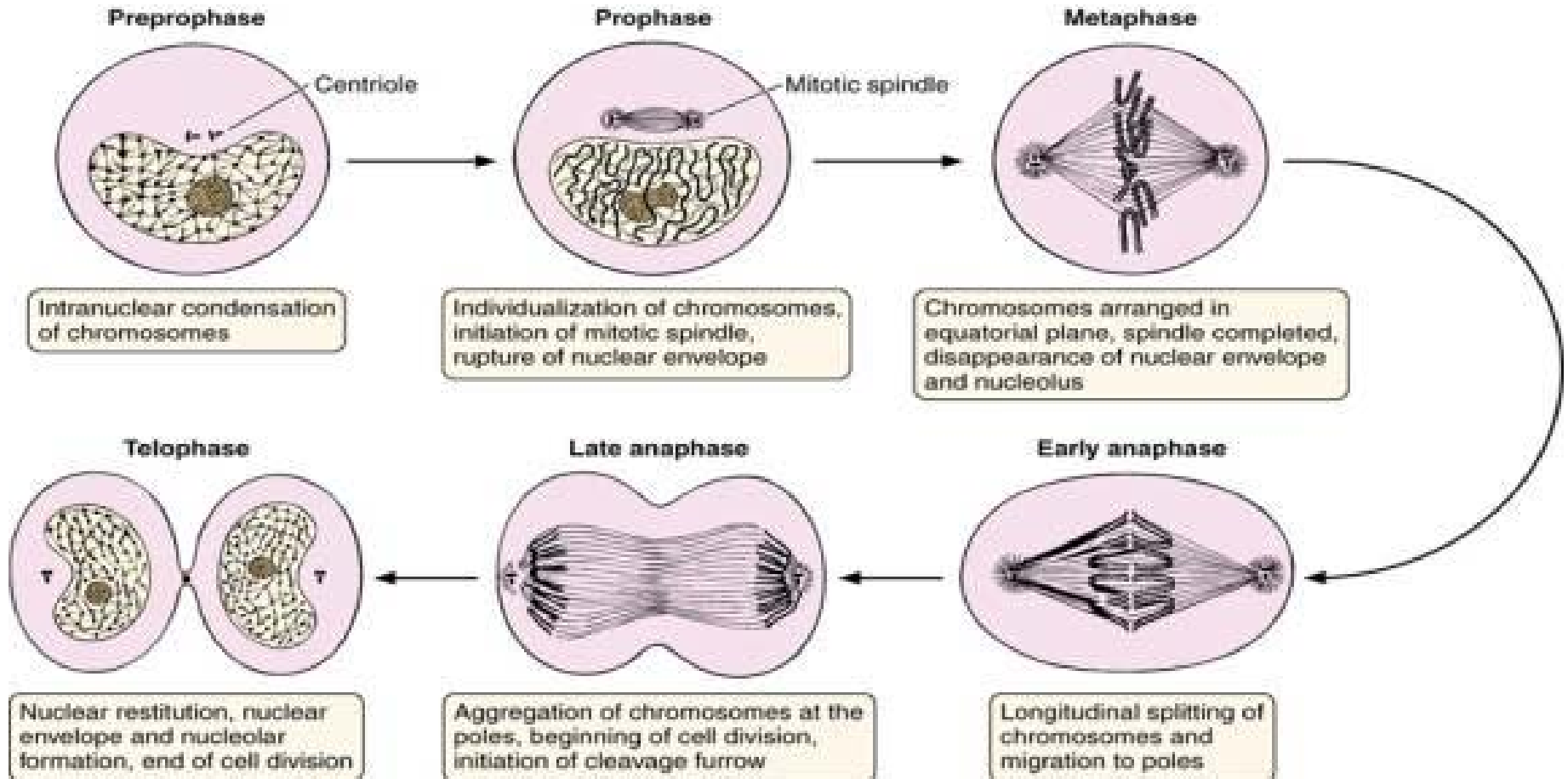


# Die Datenwelt von Morgen

Barry Smith

ZiF, October 25, 2016

# Old biology data



# New biology data

MKVSDRRKFEKANFDEFESALNNKNDLVHCPSITLFESIPTTEVRSF  
YEDEKSGLIKVVKFRTGAMDRKRSFEKVVISVMVGKNVKKFLTFV  
EDEPDFQGGPISKYLIPKKINLMVYTLFQVHTLKFNRKDYDTLSLF  
YLNRGYNELSFRVLERCHEIASARPNDSSSTMRTFTDFVSGAPIV  
RSLQKSTIRKYGYNLAPYMFLLLHVDELSIFSAYQASLPGEKKVDT  
ERLKRDLCPRKPIEIKYFSQICNDMMNKKDRLGDILHIILRACALNF  
GAGPRGGAGDEEDRSITNEEPIIPSVDEHGLKVCKLRSPNTPRRL  
RKTLDVAVKALLVSSCACTARDLDIFDDNNGVAMWKWIKILYHEVA  
QETTLKDSYRITLVPSSDGLSLLAFAGPQRNVYVDDTTRRIQLYTD  
YNKNGSSEPRLKTLTGLTSDYVFYFVTVLRQMQICALGNSYDAFN  
HDPWMDVVGFEFDPNQVTNRDISRIVLYSYMFLNTAKGCLVEYAT  
FRQYMREL PKNAPQKLN FREMRQGLIALGRHCVGSRFETDLYES  
ATSELMANHSVQTGRNIYGVD FSLT SVSGTTATLLQERASERWIQ  
WLGLESDYHCSFSSTRNAEDVDISRIVLYSYMFLNTAKGCLVEYA  
TFRQYMREL PKNAPQKLN FREMRQGLIALGRHCVGSRFETDLYE  
SATSELMANHSVQTGRNIYGVD FSLT SVSGTTATLLQERASERW<sup>4</sup>I

# How to do biology across the genome?

MKVSDRRKFEKANFDEFESALNNKNDLVHCPSITLFESIPTEVRSFYEDEKSGLIKVVKFRTGAMDRKRSFEKVVIS  
VMVGKNVKKFLTFVEDEPDFQGGPIISKYLIPKKINLMVYTLFQVHTLKFNRKDYDTLSLFYLNRYGYYNELSFRVLER  
CHEIASARPNDSSMRTFTDFVSGAPIVRSLQKSTIRKYGYNLAPYMFLLLHVDELSIFSAYQASLPGEKKVDTERL  
KRDLCPRKPIEIKYFSQICNDMMNKKDRLGDILHIILRACALNFGAGPRGGAGDEEDRSITNEEPIIPSVDEHGLKVC  
KLRSNTPRRLRKTLDVAVKALLVSSCACTARDLDIFDDNNGVAMWKWIKILYHEVAQETTLLKDSYRITLVPSSDGIS  
LLAFAGPQRNVYVDDTTRRIQLYTDYNKNGSSEPRLKTLTGGLTSDYVFYFVTVLRQMQICALGNSYDAFNHDPWM  
DVVGFEDPNQVTNRDISRIVLYSYMFLNTAKGCLVEYATFRQYMREL PKNAPQKLNFRMRQGLIALGRHCVGSR  
FETDLYESATSELMANHSVQTGRNIYGVD FSLTSVSGTTATLLQERASERWIQWLGLES DYHCSFSSTRNAEDVM  
KVSDRRKFEKANFDEFESALNNKNDLVHCPSITLFESIPTEVRSFYEDEKSGLIKVVKFRTGAMDRKRSFEKVVISV  
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EIASARPNDSSMRTFTDFVSGAPIVRSLQKSTIRKYGYNLAPYMFLLLHVDELSIFSAYQASLPGEKKVDTERLKR  
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VSDRRKFEKANFDEFESALNNKNDLVHCPSITLFESIPTEVRSFYEDEKSGLIKVVKFRTGAMDRKRSFEKVVISVM  
VGKNVKKFLTFVEDEPDFQGGPIISKYLIPKKINLMVYTLFQVHTLKFNRKDYDTLSLFYLNRYGYYNELSFRVLERCH<sub>5</sub>  
EIASARPNDSSMRTFTDFVSGAPIVRSLQKSTIRKYGYNLAPYMFLLLHVDELSIFSAYQASLPGEKKVDTERLKR

how to link the kinds of phenomena  
represented here



to data  
like  
these?

ALNNKNDLVHCPSTLFEVIPTEVRSFYEDEKSGLIKVVKFRTGAMDRK  
LTFVEDEPDFQGGPIPSKYLIPKKINLMVYTLFQVHTLKFNRKDYDTLSL  
RCHEIASARPNDSSMRTFTDFVSGAPIVRSLQKSTIRKYGYNLAPYMFLL  
SEKKVDTERLKRDLCPKPIEIKYFSQICNDMMNKKDRLGDILHIILRACALNF  
RSITNEEPIIPSVDEHGLKVCKLRSPNTPRRLRKTLDVAVKALLVSSCACTARDLD  
WIKILYHEVAQETTLKDSYRITLVPSSDGLSLLAFAGPQRNVYVDDTTRRIQLYTDY  
LDGLTSDYVFYFVTVLRQMICALGNSYDAFNHDPWMDVVGFEFDPNQVTNRDIS  
AKGCLVEYATFRQYMRELKPNAPQKLNFRMRQGLIALGRHCVGSRFETDLYESA  
QTGRNIYGVDSFSLTSVSGTTATLLQERASERWIQWLGLESDYHCSFSSTRNAEDVV  
AHQKISRVRTKRPREPKSTNDILVAGQKLFSSFEFRDLHQLRLCYEIYMADTPSVAVQA  
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DLASTNFTDRIA AWENIVECTFRTNNVKLGYLIVDEFHNFETEYRQSQFGGITNLDFAFEK  
STAPEAVADAALQRIGLTGLAKKSMDINELKRSEDLRGLSSYPTRMFNLIKEKSEVPLGHVHK  
ESQP EEALKLLLALFESEPE SKAIVVASTTNEVEELACSWRKYFRVWWIHGKLGAAEKVSRTKE  
DGSMLVIGTKLVTEGIDIKQLMMVIMLDNRLNIELIQGVGRLRDGGLCYLLSRKNSWAARNRKC  
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VGYLKYFSVKRREIYSQIQRNYAWYLAI TRRRETISVLDSTRGKQGSQVFRMSGRQIKELYFKVWSNL  
RESKTEVLQYFLNWDEKCCQEEWEAKDDTVVVEALEKGGVFQRLRSMTSAGLQGPQYVKLQFSRH  
HRQLRSRYELSLGMHLRDQIALGVTPSKVPHWTAFLSMLIGLFYNKTFRQKLEYLLEQISEVWLLPHW  
LDLANVEVLAADDTRVPLYMLMVAVHKELDSDDVPDGRFDILLCRDSSREVGELIGLFYNKTFRQKLE  
YLLEQISEVWLLPHWLDLANVEVLAADDTRVPLYMLMVAVHKELDSDDVPDGRFDILLCRDSSREV  
ELIGLFYNKTFRQKLEYLLEQISEVWLLPHWLDLANVEVLAADDTRVPLYMLMVAVHKELDSDDVPDGR

# Answer

Create an ontology: a controlled logically structured consensus classification of the types of entities in the relevant domain

scientists in the domain use the same ontology aggressively to tag their data

# tagging with common ontologies allows navigation between databases

## MouseEcotope

Tool	Statistical model	Correction for multiple comparisons	OO Visualization	Microarrays supported	Time to process 200 genes (s)
Orto-Express	$\chi^2$ , binomial, hypergeometric, Fisher's exact test	Sidak, Holm, Benjamini, FDR	Flat, Tree	572 commercial arrays (Affymetrix, SuperArray, Sigma-Genosys, Clontech, PeptideArrays, Qiagen, Thermo, NAI), can also upload a user-defined list	7, 8, 14, 28
GoMiner	Fisher's exact test	Reference enrichment	Tree, DAG	upload from user	77, 123, 229, 340
DAVID	None	None	Not available	Not applicable	15, 17, 27, 54
EASEonline	Fisher's exact test	Benjamini	Not available	27 arrays (Affymetrix only), can also upload a user-defined list	15, 19, 34, 74
GeneAge	Hypergeometric	Benjamini	Flat, or hierarchical structure	Upload from user	6, 6, 6, 9
FuncAssociate	Fisher's exact test	None	Not available	Upload from user	22, 27, 28, 30
GOEM	Hypergeometric	None	Tree	37 arrays (Affymetrix only), upload from user	39, 80, 137
FatGO	Percentage	Step-down method, FDR (Benjamini and Hochberg, 1995), FDR (Benjamini and Yekutieli, 2001)	Flat, Tree	Upload from user	15, 46, 68, 105
CLENN	Hypergeometric, $\chi^2$ (binomial)	None	DAG	Upload from user	NA
GOstat	$\chi^2$ , Fisher's exact test	FDR, Sidak	Not available	Upload from user	12, 20, 46, 8
GOStatBox	Hypergeometric, binomial, Fisher's exact test	Benjamini, Holm, Hochberg, Benjamini, FDR	Not available	Upload from user	22, 81, 141, 7
Pathway	$\chi^2$	None	DAG	27 arrays (Affymetrix only), upload from user	1, 1, 1, 1
Ontology Testers	Hypergeometric	FDR	Not available	3 arrays (Affymetrix), upload from user	NA
eGOn	Binomial	None	Tree	Upload from user	30, 45, 88, 95

*sphingolipid transporter activity*

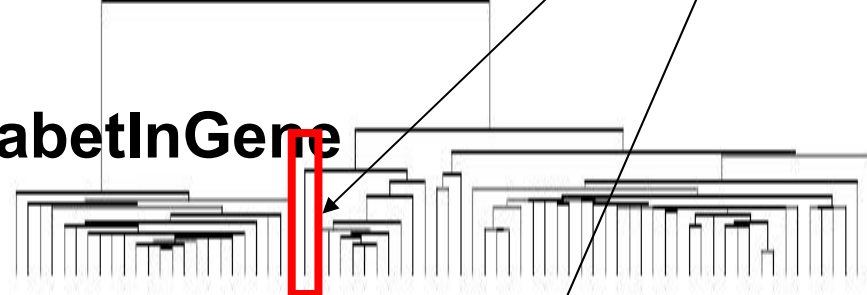
## GlyProt

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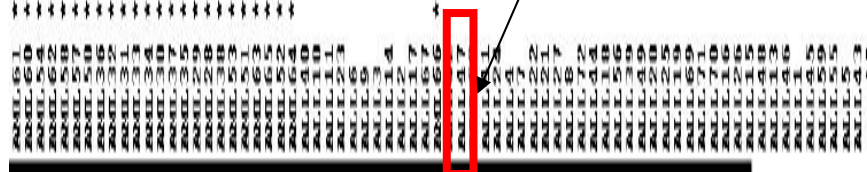
MUC6 Mucin6-mucin6 ligase
MUC2 Mucin core protein (secretory) 2
Muc6-6 Nucleoprotein Muc6-6
Erythrocyte membrane 50kd glycoprotein
GAL Galactonic aldohexase II
NFYA Nuclear factor I/Y
NOMPH1 Nucleoside diphosphate kinase 1
NOMPH2 Nucleoside diphosphate kinase 2
NOMPH3 Nucleoside diphosphate kinase 3
NOMPH4 Nucleoside diphosphate kinase 4
NOMPH5 Nucleoside diphosphate kinase 5
NOMPH6 Nucleoside diphosphate kinase 6
NOMPH7 Nucleoside diphosphate kinase 7
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NOMPH96 Nucleoside diphosphate kinase 96
NOMPH97 Nucleoside diphosphate kinase 97
NOMPH98 Nucleoside diphosphate kinase 98
NOMPH99 Nucleoside diphosphate kinase 99
NOMPH100 Nucleoside diphosphate kinase 100

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## DiabetInGene



## GluChem





# the data involved, and the scientists collecting and using these data, are thereby linked together in a gigantic network

Tool	Statistical model	Correction for multiple comparisons	OO Visualization	Microarrays supported	Time to process 200 genes (s)
Qnto-Express	$\chi^2$ , binomial, hypergeometric, Fisher's exact test	Sidak, Holm, Bonferroni, FDR	Flat, Tree	172 commercial arrays (Affymetrix, SuperArray, Sigma-Genearray, Clontech, PeptideArrays, Qygene, Illumina, NIA); can also upload a user-defined set	7, 8, 14, 28
GolMise	Fisher's exact test	Reference enrichment	Tree, DAG	upload from user	77, 123, 225, 40
DAVID	None	None	Not available	Not applicable	15, 17, 21, 5
EASEonline	Fisher's exact test	Bonferroni	Not available	27 arrays (Affymetrix only); can also upload a user-defined set	15, 19, 34, 5
GeneMerge	Hypergeometric	Bonferroni	Flat or hierarchical structure	Upload from user	6, 6, 6, 2
FuncAssociate	Fisher's exact test	None	Not available	Upload from user	22, 27, 28, 30
OCEM	Hypergeometric	None	Tree	37 arrays (Affymetrix only); upload from user	39, 80, 137
FatGO	Percentage	Step-down BH/FDR (Benjamini and Hochberg, 1995), FDR (Benjamini and Yekutieli, 2001)	Flat, Tree	Upload from user	15, 46, 68, 105
CLENCH	Hypergeometric, $\chi^2$ , binomial	None	DAG	Upload from user	NA
GOstat	$\chi^2$ , Fisher's exact test	FDR, Sidak	Not available	Upload from user	12, 20, 46, 80
GOToolBox	Hypergeometric, binomial, Fisher's exact test	Bonferroni, Holm, Hochberg, Holmset, FDR	Not available	Upload from user	22, 81, 145, 278
GoFisher	$\chi^2$	q-value	DAG	22 arrays (Affymetrix only); upload from user	2, 2, 2, 5
Oncology Testsets	Hypergeometric	FDR	Not available	3 arrays (Affymetrix); upload from user	NA
eGOn	Binomial	None	Tree	Upload from user	20, 45, 88, 95

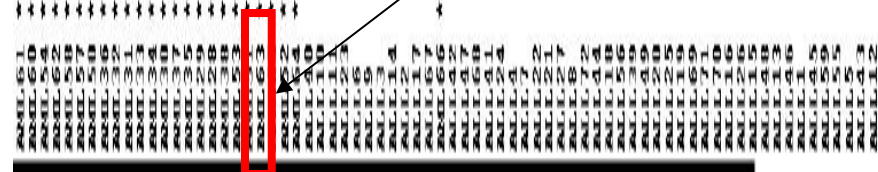
HMG (HMG)-domain ligase  
 HMO2 home oxygenase (decycling) 2  
 Hmab-6 Nucleoprotein Hmab-6  
 Erythrocyte membrane 50kd glycoprotein  
 HAD Carbonic anhydrase II  
 NFYA Nuclear factor I/II  
 HORMADIN PROTEIN HMO-45  
 Homeotic Protein 05, Class I  
 KIAA0194 gene, partial cds  
 HMG Histatin 2, neutrophil  
 HMO Hyaluronidase  
 CRY2 Crystallin C  
 HMOB Bar domain, member 8 (rta 8)  
 HMOX Histatin 1 (lipocortin 2)  
 CRY3A  
 HPI1 integration oncogene  
 I3 component of nucleolus  
 HPI-116-beta  
 Hmab-9-related Sequence  
 HMO2 Alpha mannosidase II isozyme  
 HMO2 oncogene  
 Homolog suppressor-of-white-sprint  
 HMO antigen (h50)  
 HMO-45 protein  
 HMO5 Small proline-rich protein 15  
 HMO5 protein superfamily  
 KIAA0190 gene, partial cds  
 HPI2B Deoxythymidylate kinase  
 Cactinoseptorin antigen precursor  
 LTB Lymphotonicin-beta  
 HMO3 GATA-binding protein 3  
 HMO CDP = Escherichia coli unknown  
 HEMIPOLYIC CYCLININ HMO-1  
 Spinal Muscular Atrophy 4  
 KIAA0230 gene, partial cds  
 Butyrophilin (BPF4)  
 HMO-encoded proteasome LAMP7-H1  
 HMO3 Replication protein 32  
 Clima 22 cDNA  
 CTV6 CTV synthetase  
 HMOQUININ-LIKE PROTEIN HMO  
 (M1q) cDNA  
 HMO calcium-binding protein H13  
 HMO Protein-tyrosine kinase htk  
 HMO (HMO)  
 HMO-1  
 HMO1  
 HMO5 antigen  
 Skeletal muscle abundant protein

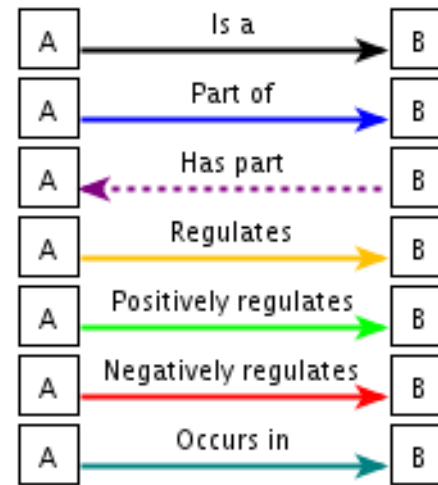
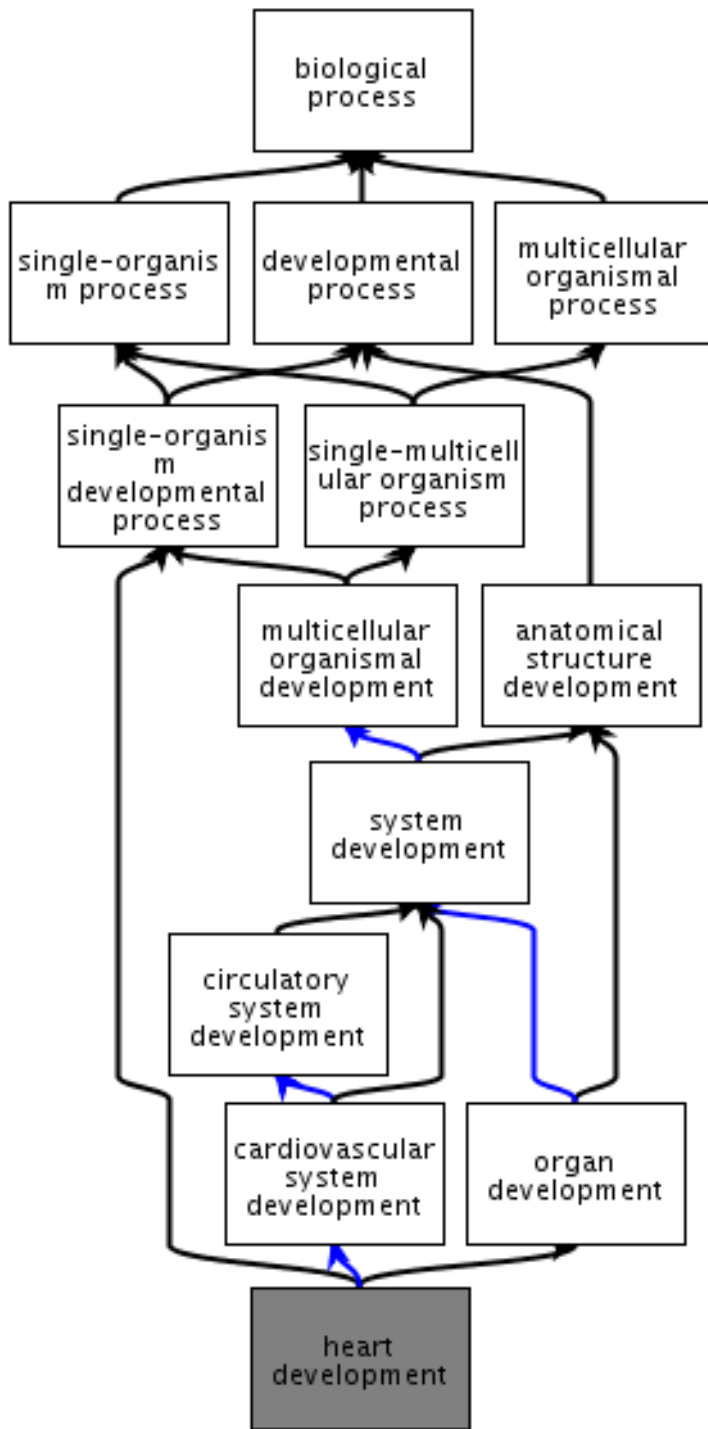
**Holliday junction helicase complex**

**DiabetInGene**



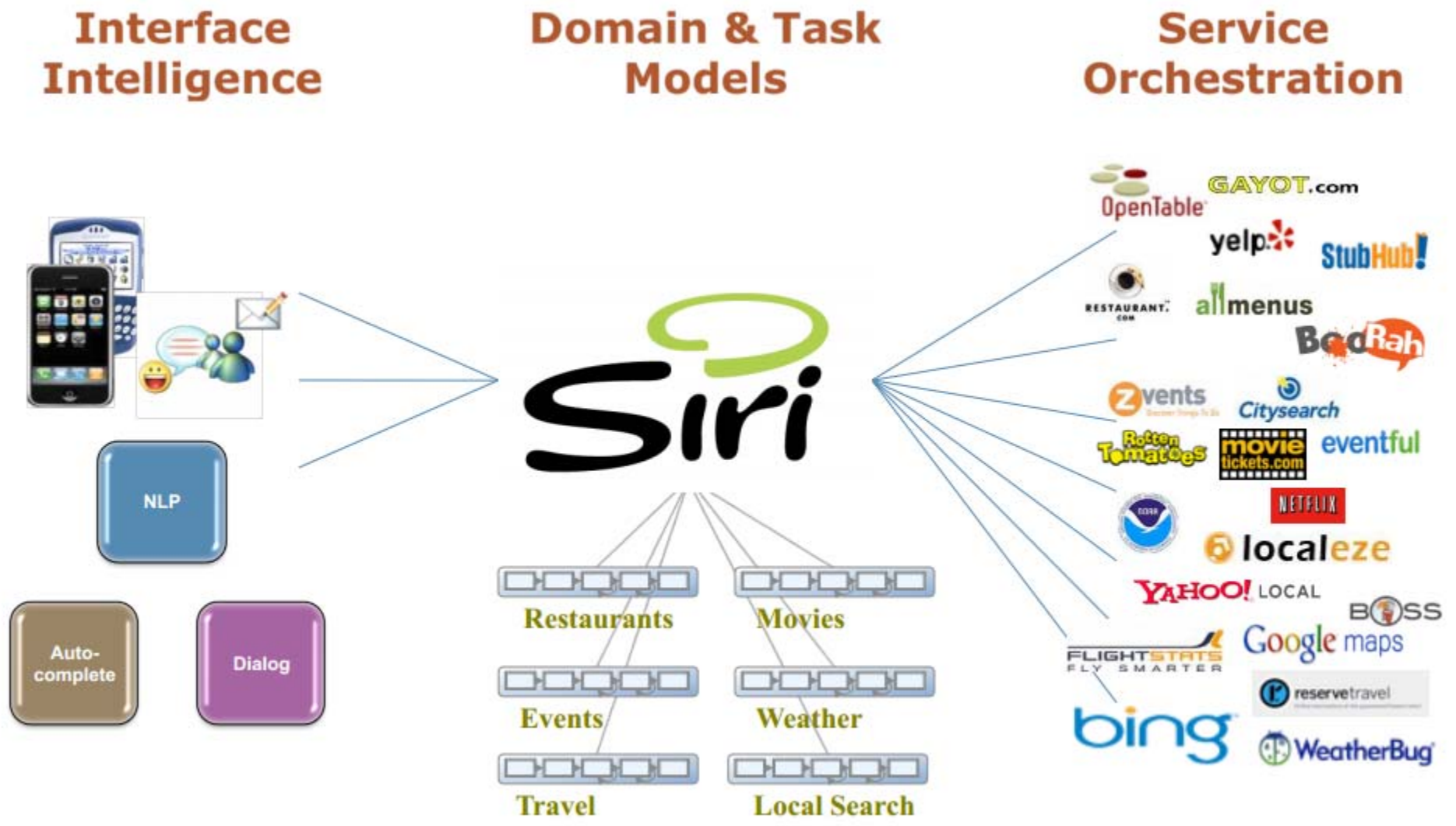
**GluChem**



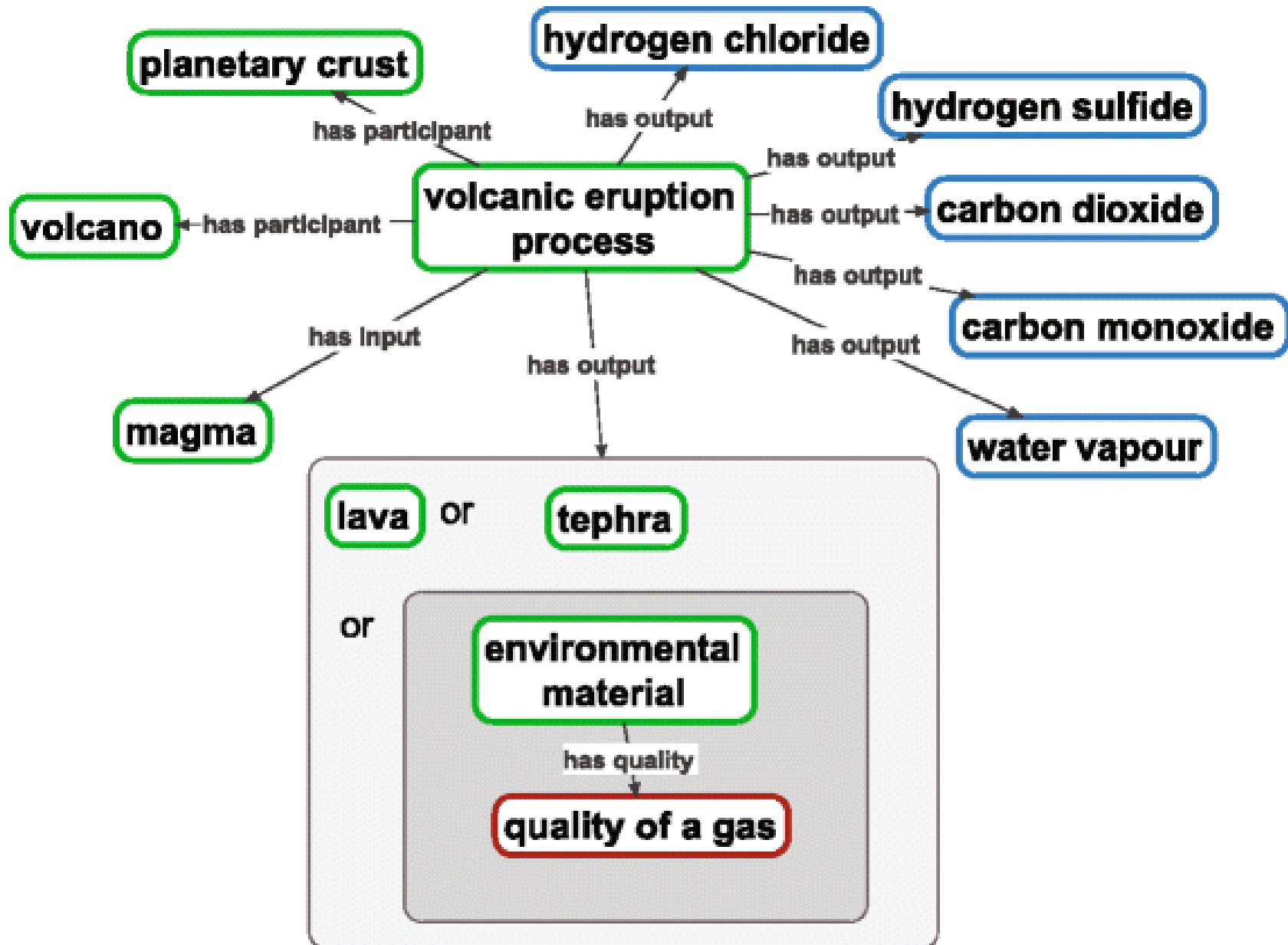


## The Gene Ontology (fragment)

# “Siri: An Ontology-driven Application for the Masses”, Adam Cheyer and Tom Gruber



# ENVO: The Environment Ontology





United Nations Environment Programme  
environment for development



SDG Synergies

Or

# SDG Synergies

SDGs

MEAs

Synergies

Ontologies

## Sustainable Development Goals

# JJ. Gibson (1904-1979)



*The Ecological Approach to Visual Perception, Boston, 1975*

*Wahrnehmung und Umwelt: der ökologische Ansatz in der visuellen Wahrnehmung, München, 1982*

# Gibson: Environments comprehend systems of affordances

affordance = **Angebotscharakter**  
(auch **Aufforderungscharakter**  
oder **Affordanz**)

# affordances

“The affordances of the environment are what it *offers* the animal, what it *provides* or *furnishes*, either for good or evil.”

a glass of beer *affords drinking*

a chair *affords sitting*

a step *affords climbing*

a chin (in the boxing ring) *affords hitting*

a checkbox (*Ankreuzfeld*) *affords checking*

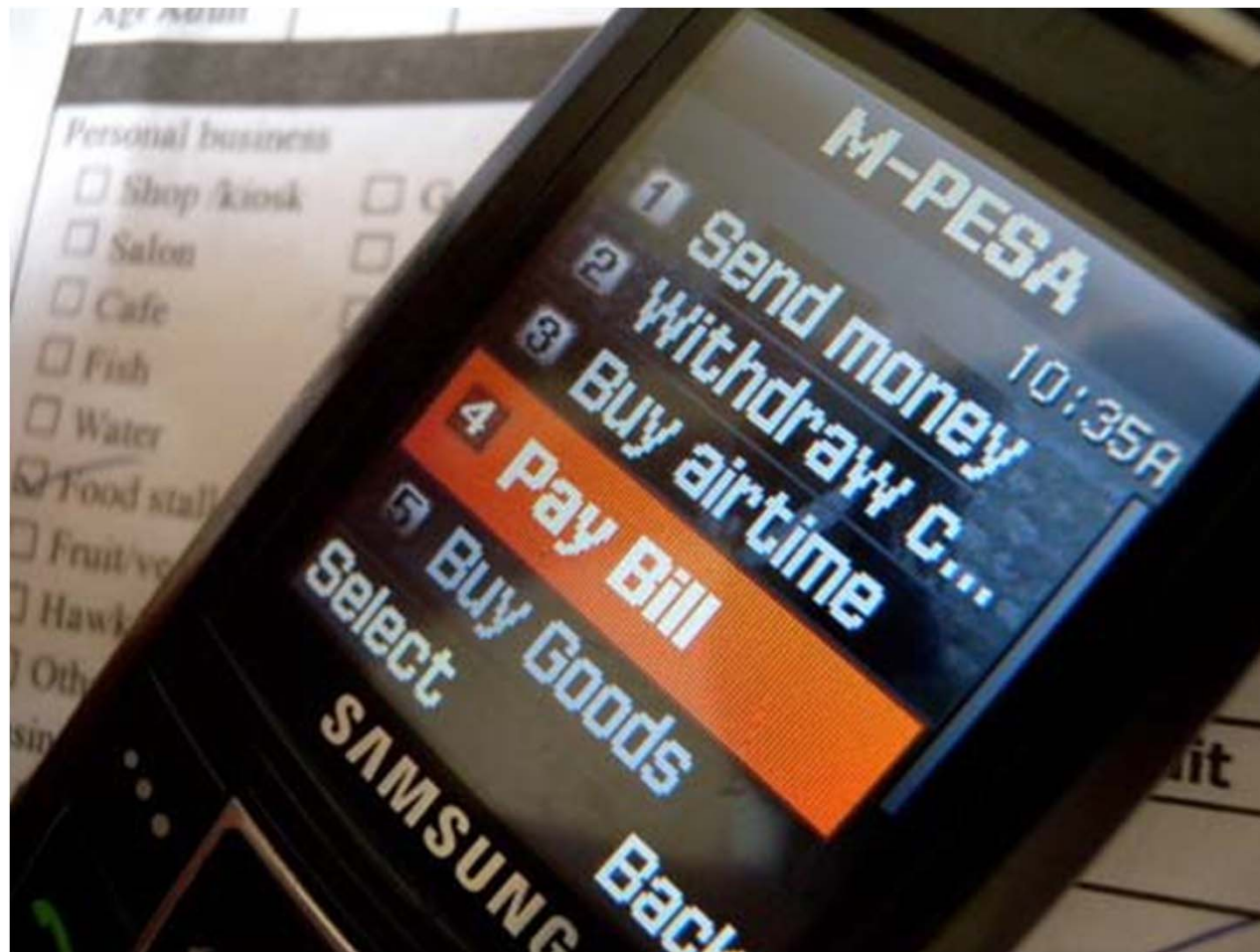
a mobile phone *affords texting*



# Einstimmung

- **Entwicklung:** organisms evolved to fit into environments with these and those systems of affordances
- **Bildung:** for cultural organisms like human beings, we become tuned to the corresponding affordances through training, drill, learning, ...
  - Cultural learning cumulates – leading to ever more complex environments

## a mobile phone *affords* banking



a mobile phone *affords* mating

The image is a promotional graphic for 'Tinder Social'. It features a background photograph of a social gathering at dusk, with a large, colorful piñata in the center. A man in a blue polo shirt is visible on the right side, looking towards the piñata. The text 'tinder social' is overlaid in white, with a flame icon above the 'i' in 'tinder'. Below the brand name, the text 'What are you doing tonight?' is displayed. At the bottom, there are two red buttons: 'Download on the App Store' with the Apple logo and 'Get it on Google Play' with the Google Play logo. A small white checkmark icon is located at the bottom center of the graphic.

tinder social

What are you doing tonight?

Download on the App Store

Get it on Google Play

# a mobile phone *changes family life*



# Digitale Umwelten

**new environments, with new  
kinds of affordances, through  
which *people* are being  
changed in new kinds of ways**

## **People of old were nodes**

in biological networks

in friendship networks


in workplace networks ...

These networks were held together by face-to-face interactions which run at human speed and have a short half life

The consequences of single interactions rarely cumulated in such a way as to have wider ranging effects

**Today everything is different**

**Today everything is different**

The image shows the Schufa logo, which consists of the word "schufa" in a lowercase, sans-serif font. The text is centered within a white rectangular box. This box is set against a background of a horizontal bar with a yellow-to-white gradient. The entire graphic is framed by a light gray border.

**schufa**



Das Unternehmen

Firmenkunden

Privatkunden

**schufa**

Wir schaffen Vertrauen

Unternehmen

Wissenswertes

Verantwortung

Produkte

Presse

Karriere



Suchen



Sie befinden sich hier: [Presse](#) > [Basisinformationen](#) > [SCHUFA macht Kredit möglich](#)

+ Basisinformationen

+ Die SCHUFA & Ich

# SCHUFA macht Kredit möglich



Sie befinden sich hier: [Presse](#) > [Basisinformationen](#) > [SCHUFA macht Kredit möglich](#)

- + [Basisinformationen](#)
- + [Die SCHUFA & Ich](#)

# SCHUFA macht Kredit möglich

... by shaping humans



Sie befinden sich hier: [Presse](#) > [Basisinformationen](#) > [SCHUFA macht Kredit möglich](#)

- + [Basisinformationen](#)
- + [Die SCHUFA & Ich](#)

## **SCHUFA macht Kredit möglich**

**... by shaping humans**

**... by shaping the environment in  
which humans borrow and save**

# SCHUFA is tied to a host of other networks

banking

real estate

credit cards

law

employee rating agencies

the effect of which is to make people more credit-worthy – in other words: more honest



**The Uber App provides a map of your route as you traverse it**

**Calculates the fare and deducts it from your credit card**



**it then allows you to rate your driver for  
punctuality, cleanliness, ...**

**Uber *customers* can then use these ratings  
in making bookings in the future**



But then, when you leave the taxi, the App allows the driver to *rate you*, the customer and these ratings too are stored in the system and used by other *drivers* in the future

*The power of data accumulation*

**Behind the scenes, good  
behavior is being rewarded and  
bad behavior punished**

customers who vomit in the cab,  
or who behave aggressively, will  
find themselves restricted in their  
use of Uber in the future





Uber also digitizes safety. The App gives your daughter a photo, name, and license plate for the stranger who picks her up at 2a.m.

It shares a detailed record of her route; which likewise protects the driver, and ensures that the driver does not get lost in unfamiliar parts of town.



Uber is constantly accumulating vast amounts of information on the micro-details of cities; on prospective drivers, riders, and road conditions; and constantly improving the ways its algorithms instantly present drivers with highly intuitive options – by digitizing transactions

# **Uber makes for better drivers, better cabs, safer rides, better passengers**

– bringing huge advantages especially in third-world countries

AirBNB makes for better lodgings, a wider choice of lodgings, better landlords and better lodgers

Amazon.com makes for more informed consumers, which makes for better products

It also makes for cheaper products, as the information asymmetry between seller and buyer is gradually eroded

## **Tripadvisor makes for better food**

as restaurant ratings are constantly updated by  
ever new customers

Tripadvisor creates a constant competition  
among restaurants

**The internet allows cumulation of the effects of  
single actions**

**Big Data creates the possibility for better  
consumer choices – but also for better  
consumers**

# RateMyProfessors.com



## Martha Nussbaum

Professor in the Law department  
at [University of Chicago](#), Chicago, IL

[ARE YOU MARTHA NUSSBAUM?](#)

[Rate this professor](#)

[Share](#)

[SUBMIT A CORRECTION](#) | [LEARN HOW RATINGS WORK](#)

OVERALL QUALITY

3.6

WOULD TAKE AGAIN

N/A

LEVEL OF DIFFICULTY

3.6

HOTNESS



Top 20 Tags for this Professor

See how other students describe this professor.

[CHOOSE YOUR TAGS](#)



- **Recommend and Be Recommended** – In the following 3 categories: *Professional, Personal, Dating*
- **Peeples Number** – Your Peeples Number is the total number of recommendations you have received in all 3 categories
- **Connections** – Find likeminded connections with high Peeples Number scores with our Nearby feature

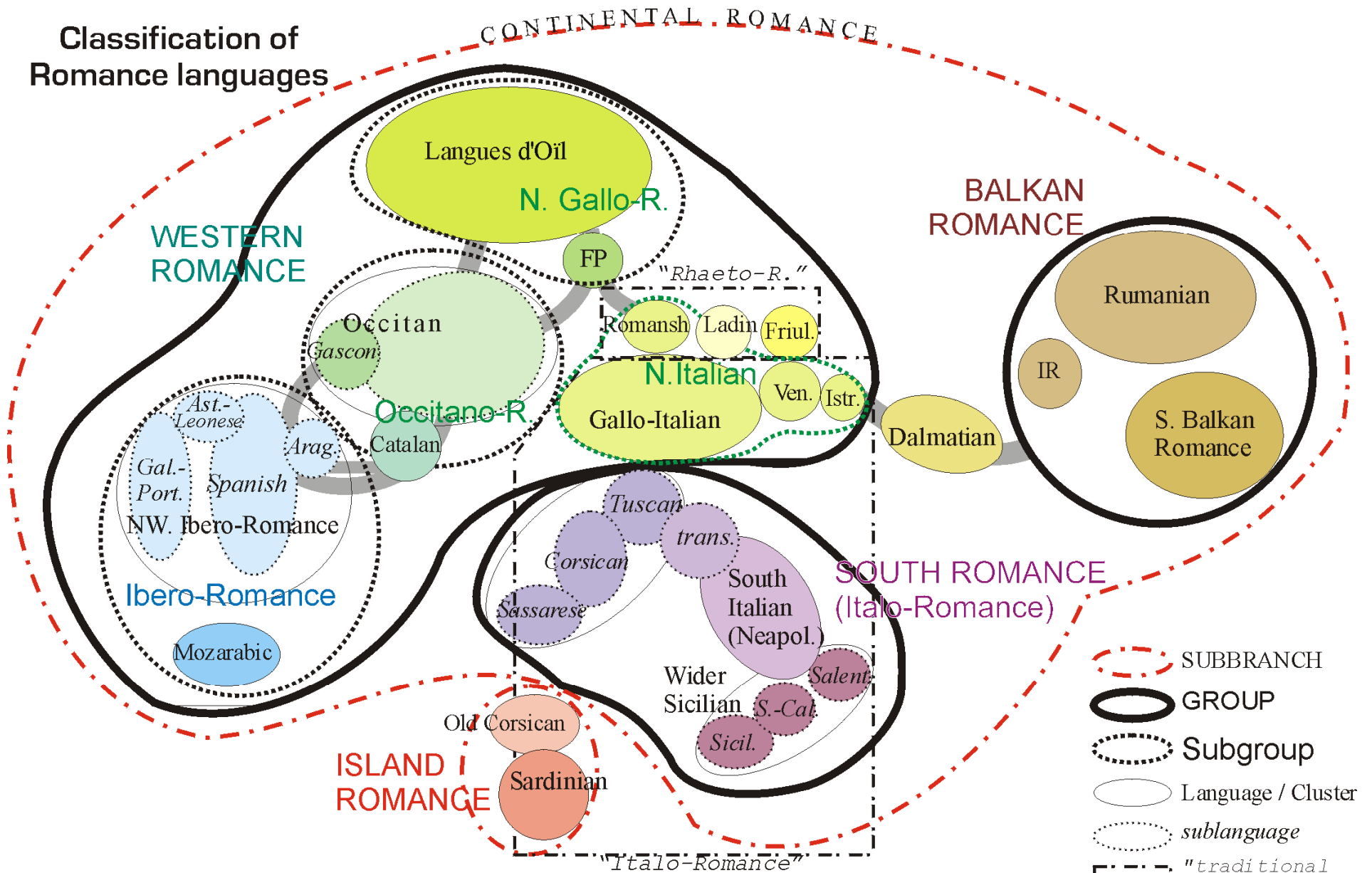
# We are trained to use language

Each person has a set of linguistic competences along multiple dimensions

Persons living in the same community have overlapping sets of linguistic competences – which are what make communication possible

These sets of competences overlap, and merge into each other

# Classification of Romance languages



- SUBBRANCH
- GROUP
- Subgroup
- Language / Cluster
- sublanguage*
- "traditional groupings"*

**All speakers of CONTINENTAL ROMANCE share in common a certain subset of dispositions**



# Das Wörterbuch der Fußballsprache

*Polnisch – Russisch – Englisch – Deutsch*



**Common languages allow individuals to be joined together into small and large communities through speech acts**

**“I pronounce thee man and wife”**

**“Would you like to dance?”**

**“Can you come to dinner?”**

# linguistic affordances

**for human beings the affordances of the environment include**

linguistic sounds

written signs

printed signs



Nowadays they include also  
keyboards and screens

we have competences not only for  
speaking, reading and writing

but also screen (click-) competences

joystick competences

keyboard competences

# neurological re-engineering of human beings through repetitive keyboard action

goes back to the 14th  
century, when the clavichord  
and harpsichord were  
introduced

today repetitive keyboard  
action has the same  
importance to human action  
as speaking or writing



repetitive keyboard action is a principal ingredient of modern kinetic warfare



and of cyberwarfare



HOME

## WWIII? A "Hybrid Geo-Financial War" Between NATO and Russia Is Dangerously Escalating



Submitted by [Tyler Durden](#) on 05/21/2016 22:00 -0400

[BRICs](#) [China](#) [Cohen](#) [Donald Trump](#) [Henry Kissinger](#) [Natural Gas](#) [Poland](#) [President Obama](#) [Ukraine](#)



speech acts and document acts now intermixed with digital acts



# communities can themselves serve as affordances

a family *affords bonding*

a group *affords joining*

an enemy encampment *affords bombing*

Some social institutions involve massively complex networks of sub-institutions held together by networks of speech acts and document acts supporting relations of authority and delegation



**as speech acts and document acts  
and digital acts become ever more  
intermixed in every more complex  
and ever more hierarchical  
networks**

**this creates ever more  
comprehensive civil societies**

# **Social Network Sites as Networked Publics**

Networked publics are not just publics  
networked together,

... they are publics that have been transformed  
by networked media, ...

# The Global Jihadi Archipelago

Scott Atran

Soccer, paintball, camping, hiking, rafting, body building, martial arts training, and other forms of physically stimulating and intimate group action [Graffiti Crews] create a small cultural niche: a bunch of buddies who become a “band of brothers” in a glorious cause (Atran 2010).

# The Global Jihadi Archipelago

Scott Atran

a new kind of transcultural niche that leapfrogs the limits and responsibilities engendered by previous generations within territories of origin. Here, peer communities of imagined kin—bands of “brothers and sisters” drawn willy-nilly from across more than 100 countries and many more ethnic groups—commit in ritual oaths and performance of sublime acts of terror to a new world order



The Global Jihadi Archipelago  
A New Type of Transcultural Niche  
Scott Atran

The internet allows cumulation of the effects  
of single actions

“Publicity hyped by political and media frenzy is the oxygen that fires modern terrorism (Atran [2013](#)), filling a transcultural niche whose ecology ranges over a media landscape (where competition for resources is a struggle for control of information) and a geographical archipelago that spans the globe.”

The Global Jihadi Archipelago  
A New Type of Transcultural Niche  
Scott Atran

the global jihadi archipelago where information from across the world and cyberspace narrows mightily to fit the dreaming ecology of the Caliphate—a transcultural niche, which ... devoted actors of the Islamic State are fighting unto death to make real.

recall Gibson: the environments in which we live provide niches, enclosures, apertures, signposts, pathways, barriers – they *afford* different sorts of actions

# affordances

“The affordances of the environment are what it *offers* the animal, what it *provides* or *furnishes*, **either for good or evil.**”

# DDoS, October 22, 2016

The Internet is under attack. *The New York Times* reported that "major websites were inaccessible to people across wide swaths of the United States on Friday after a company that manages crucial parts of the internet's infrastructure said it was under attack.

# **DDoS, October 22, 2016**

in a troubling development, the attack appears to have relied on hundreds of thousands of internet-connected devices like cameras and home routers that have been infected — without their owners' knowledge — with software that allows hackers to command them to flood a target with overwhelming traffic.