

Cygniac & anjajentzsch

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People

- Knowledge in **minds**
- Transfer by **speech**, sketches

Texts

- Knowledge in **books**
- Transfer by visiting **libraries**, public readings

Texts 2.0

- Knowledge in **mass market** books, films, newspapers, journals, television, radio
- Transfer by replication, **broadcast**

Web 1.0

- Knowledge in **Web pages**, pdf/ps files, passive DBs, directories and lists, some audio
- Transfer by authoring then **browsing, searching**

Web 2.0

- Knowledge in **fluid constructs** (wikis, complex evolving DBs/RDF stores, blogs, social network pages) , web services across all media, distributed across many sites.
- Transfer by **collaborative** construction, active notification, alerts, SMSs, social notification, location awareness, mash-ups ...

Web 3.0

- **Knowledge understood by the web** (KBs, probabilistic KBs, semantically enhanced texts, DBs, services)
- Transferred by **assistive, cooperative software that understands users needs, desires, limitations**, and assembles/derives the right knowledge services

Scarce

Abundant

Overwhelming



Human knowledge evolution



Mortgage Financing
Patent & Other Rights
Computer File System
Management
City Infrastructure
Traffic
Management
Tracking Scientific
Literature
...etc

Overwhelming Problems

- **Human Computer Collaboration**

- Vast power: fast communications, near infinite memory, computational learning (recommendation, data mining)

- Needs infrastructure

- Knowledge in machine understandable form
- Background knowledge to provide that understanding

- Fundamental Change

- Much content not stored in human understandable form (text, audio, diagrams ...) but dynamically combined and synthesized.

Belaboring the point: This change starts now. (Phonebook, Rolodex → Yelp, 4square, gowalla, twitter local, Siri, FB social graph, OdpiralniČasi etc etc).



New Forms of Knowledge



Croatia



inCyc^{beta}

Dubrovnik, Croatia

Dubrovnik, Croatia is a [Croatian city](#). It is in [Croatia](#).

Miscellaneous

Cilipi Airport services Dubrovnik, Croatia.¹

Manually Written Notes

A port and historic city of [Croatia](#).

¹ [AvInfo's IATA/ICAO airport and airline codes webpage](#)

Technical Details

This page was automatically created by Cyc using [automated reasoning and natural language processing](#). Cyc first learned about Dubrovnik, Croatia on December 28, 1987. The [Semantic Web URI](#) for Dubrovnik, Croatia is: <http://sw.opencyc.org/concept/Mx4rvVj6TZwpEbGdrcN5Y29ycA>

Croatia is southwest of [Hungary](#). Croatia was part of [Yugoslavia](#) after 1922 and before 1992.

Group Membership

Abu Dhabi, Dubai, Ajman, Sharjah

:SENTENCE. Croatia is a member of Council of Europe, Customs Cooperation Council, the Organization for the
The United Arab Emirates is south of [the Fumms Islands](#), [Qatar](#), [Das Island](#), [Abu Musa](#), and [Qeshm](#). The United Arab

[How was this page created?](#)

Logistics

OpenCyc (Current): [<http://sw.opencyc.org/concept/Mx4r8qkxXAW-QdmV1JNL5SFyIA>]

OpenCyc (Versioned): [<http://sw.opencyc.org/2008/06/10/concept/Mx4r8qkxXAW-QdmV1JNL5SFyIA>]

http

Search



OpenCyc Collection: shipping container

Unique ID: [Mx4r8qkxXAW-QdmV1JNL5SFyIA]

English ID: [LargePortableCargoContainer]

English Aliases: ["cargo container", "cargo containers", "portable cargo container", "portable cargo containers", "shipping containers"]

A specialization of `StorageConstruct`. Each instance of `LargePortableCargoContainer` is a large (usually about 40' x 8' x 8') metal container used for shipping large quantities of goods across land (e.g., on a large truck) or overseas (e.g., on a cargo ship).

A Type of: storage device

Instance of: spatially disjoint object type, type of object

Subtypes:

Instances:

Same as:

<http://umbel.org/umbel/sc/LargePortableCargoContainer>

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Inferred Index

for

Shipping

order by : [predicate](#) [ontology](#)

filters : [predicate](#) [ontology](#)

index view : [inferred](#) [legal](#)

► [Browsing](#)

► [Editing](#)

All Assertions

(2640)



► [open all](#)

► via [Shipping](#) (46)

► via [ConveyingMaterials](#) (4)

► via [\(TransportViaFn TransportationDevice\)](#) (22)

► via [MaterialHandling](#) (5)

► via [TransportationEvent](#) (33)

► via [DirectedTranslation](#) (14)

► via [Conveying-Generic](#) (27)

► via [Translation-Complete](#) (5)

► via [CausingAnotherObjectsTranslationalMotion](#) (1)

► via [Translation-SingleTrajectory](#) (9)

► via [ControllingAPhysicalDevice](#) (5)

► via [SocialOccurrence](#) (11)

► via [PhysicalEvent](#) (9)

(and

(isa :ACTION [Shipping](#))

(transport :ACTION SUBJECT)

C

on type

[OKWRTRoles](#) [PublicConstant](#) [CycSecureFORT](#)

[ConveyingMaterials](#) [DeliveryServiceEvent](#)

physical location to another. Shipping from the perspective of being done
UPS, the US Postal Service, or Dominoes Pizza Delivery might do."

[canonical](#) [Ship-TheWord](#) 0 [IntransitiveVerbFrame](#) [Shipping](#)

[canonical](#) [Ship-TheWord](#) 0 [TransitiveNPFrame](#) [Shipping](#)

[By transportees\)\)](#)

[TheWord](#) [Verb](#) 0 [Shipping](#)

[TransitiveNPFrame](#)

[ing\)](#)

[cyc](#)

[ge](#)

[ECT\)\)\)](#)

[TransitiveNPFrame](#)

[ge](#)

[nsitiveVerbFrame](#)

Detailed Representations

Update

Croatia

Search

Tools: [Asrt](#) [Comp](#) [Crt](#) [Doc](#) [Hist](#)

Login: [Witbrock](#)



No gloss



☒ Ignore Case



☐ Lucky

Clear

[Nav](#) [Ovlp](#) [Prefs](#) [Query](#) [SubL](#)

Server: xen1g:3640

Purpose: General Use

Inferred Index

for

[Croatia](#)

order by
filters
index vi

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[All Assertions](#) (301)

[close](#)

all

via [Croatia](#) (218)

[isa](#) (12) +

[quotedIsa](#) (7) +

[adjectiveOfCountry](#)

[agreeingAgents](#) arg2 (3)

[broaderTerm](#)

[broaderTerm](#) arg2

[cCFConceptMappingString](#)

[capitalCity](#) (2)

[citizenTypeOfGeopoliticalEntity](#)

[citizens](#) (3)

[cityWithNameInGeoEntity](#)

arg3 (6)

[codeMapping](#) arg3 (5)

[collectionOfCitiesInCountry](#)

[comment](#)

[coreConceptOfDomain](#)

[countryOfCity](#) (10)

[Browsing](#)

[Editing](#)

[All Assertions](#) (301)

[close](#)

all

via [Croatia](#) (218) !

[isa](#) (12) +

[quotedIsa](#) (7) +

[adjectiveOfCountry](#)

[agreeingAgents](#) arg2 (3)

[broaderTerm](#)

[broaderTerm](#) arg2

[citizens](#) : [ZvonimirBoban-SoccerPlayer](#)

[citizens](#) : [GoranVlaovic-SoccerPlayer](#) [DavorSuker-SoccerPlayer](#)

[\(cityWithNameInGeoEntity](#)

[\(CityNamedFn "Zadar" Croatia\) "Zadar" Croatia\)](#)

[\(cityWithNameInGeoEntity](#)

[isa](#) : [CCFCo](#)

[isa](#) : [CCFGe](#)

[isa](#) : [Southern](#)

[EasternB](#)

[isa](#) : [TKBCo](#)

[isa](#) : [CCFGe](#)

[quotedIsa](#) :

[quotedIsa](#) :

[quotedIsa](#) :

[quotedIsa](#) :

[quotedIsa](#) :

[quotedIsa](#) :



Update Comm: Storing and Receiving Agenda: Idle KB: 999 Local: (120) System: 10.131086



Introduction to Cyc

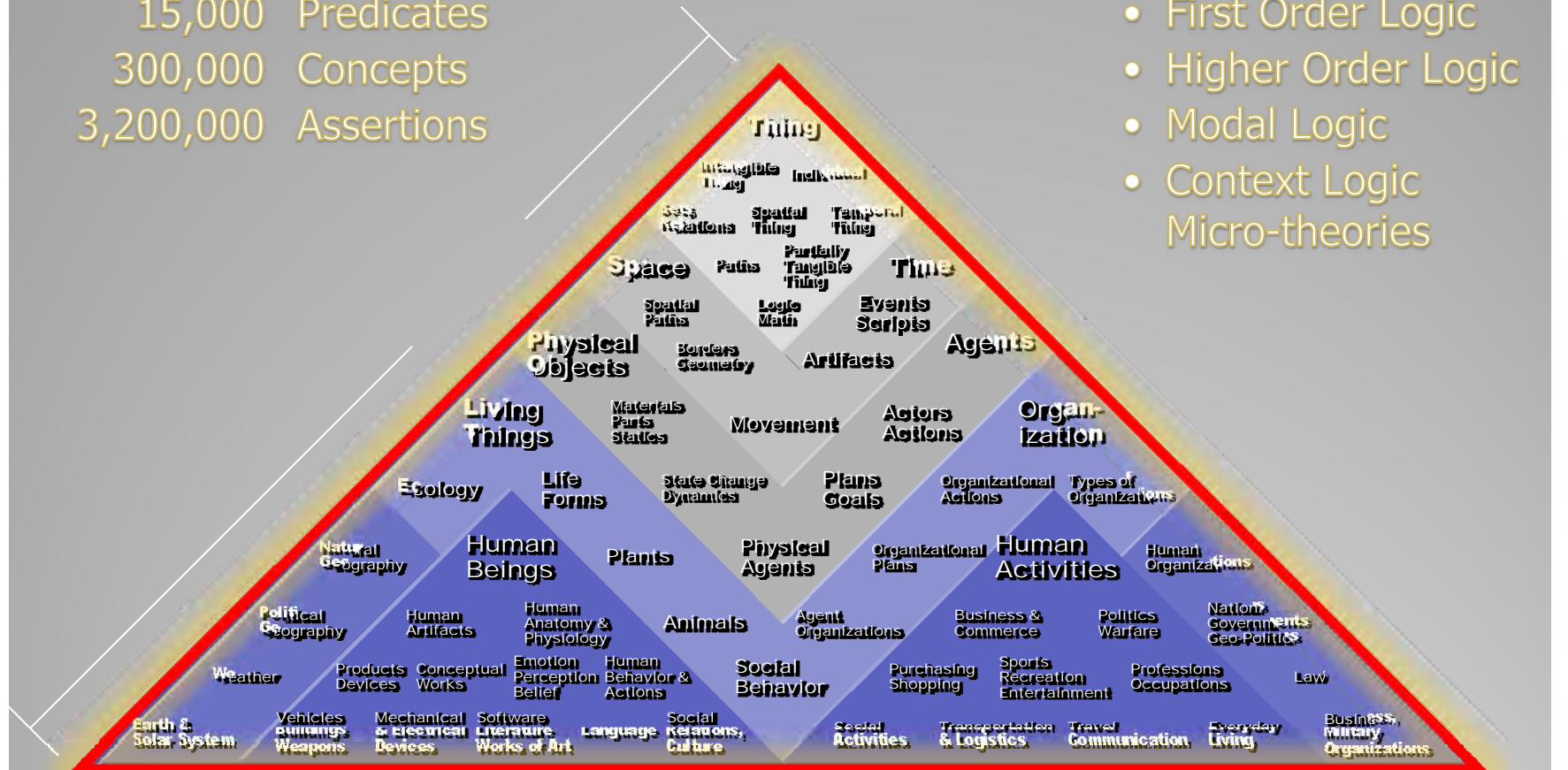
What's Machine Understandable form really?
and what's *that* good for?

Cyc contains:

15,000 Predicates
300,000 Concepts
3,200,000 Assertions

Represented in:

- First Order Logic
- Higher Order Logic
- Modal Logic
- Context Logic
- Micro-theories



General Knowledge about Various Domains

Specific data, facts, and observations

Is it attached to the
inside of the outer object?

- Yes -- Try
#\$connectedToInside

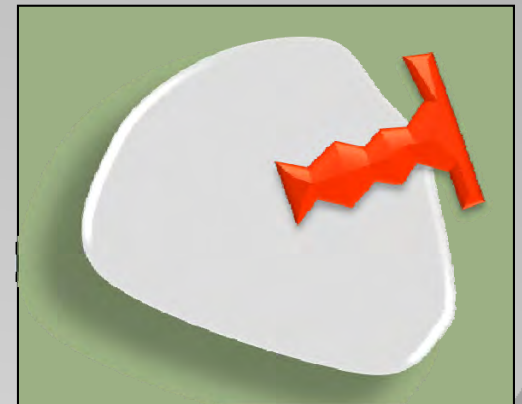


Can it be removed by pulling, if
enough force is used, without
damaging either object?

- No -- Try #\$in-Snugly
or #\$screwedIn

Does the inner object
stick into the outer object?

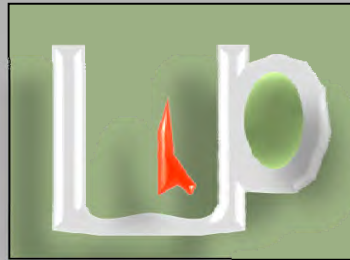
- Yes – Try
#\$sticksInto



Senses of 'In'

- Does part of the inner object stick out of the container?

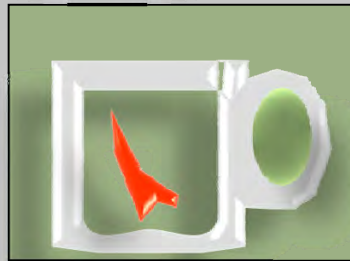
- None of it.
#\$in-ContCompletely



- Yes
#\$in-ContPartially



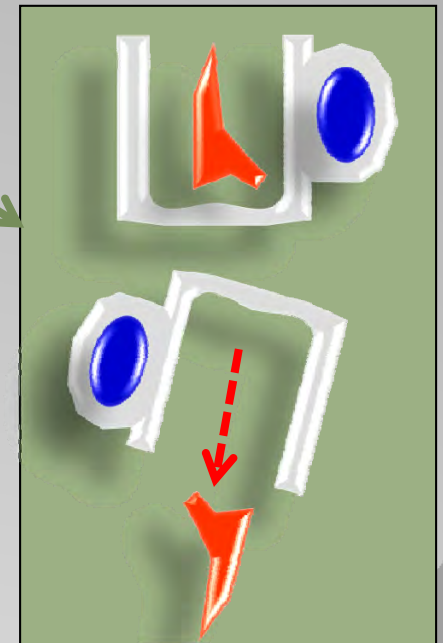
- No
#\$in-ContClosed



- If the container were turned around could the contained object fall out?

Yes

#\$in-ContOpen



For Inference:

Senses of 'In'



- #TransportationEvent
- #ControllingATransportationDevice
- #TransportWithMotorizedLandVehicle
- (#SteeringFn #RoadVehicle)
- #TransporterCrashEvent
- #VehicleAccident
- #CarAccident
- #Colliding
- #IncurringDamage
- #TippingOver
- #Navigating
- #EnteringAVehicle ...



Some Transportation Event Types

Searching for OpenCyc Content

OpenCyc: Croatia (6 concepts)



[Croat](http://sw.opencyc.org/concept/Mx4rvViy3ZwpEbGdrcN5Y29ycA)

<http://sw.opencyc.org/concept/Mx4rvViy3ZwpEbGdrcN5Y29ycA>

[Croatia](http://sw.opencyc.org/concept/Mx8Ngh4rvYkdfpwpEbGdrcN5Y29ycB4rvnNcIpwpEbGdrcN5Y29ycA)

<http://sw.opencyc.org/concept/Mx8Ngh4rvYkdfpwpEbGdrcN5Y29ycB4rvnNcIpwpEbGdrcN5Y29ycA>

[Croatia](http://sw.opencyc.org/concept/Mx4rvnNcIpwpEbGdrcN5Y29ycA)

Croatia: a [CentralEuropeanCountry](#), a [BalkanCountry](#), an [EasternEuropeanCountry](#), and a [SouthernEuropeanCountry](#).

<http://sw.opencyc.org/concept/Mx4rvnNcIpwpEbGdrcN5Y29ycA>

[Croatia national Red Cross/Red Crescent organization](http://sw.opencyc.org/concept/Mx8Ngh4rwPLZ8ZwpEbGdrcN5Y29ycB4rvnNcIpwpEbGdrcN5Y29ycA)

<http://sw.opencyc.org/concept/Mx8Ngh4rwPLZ8ZwpEbGdrcN5Y29ycB4rvnNcIpwpEbGdrcN5Y29ycA>

[Croatian person](http://sw.opencyc.org/concept/Mx8Ngh4rvy05U5wpEbGdrcN5Y29ycB4rvnNcIpwpEbGdrcN5Y29ycA)

<http://sw.opencyc.org/concept/Mx8Ngh4rvy05U5wpEbGdrcN5Y29ycB4rvnNcIpwpEbGdrcN5Y29ycA>

[Croatian person](http://sw.opencyc.org/concept/Mx4rDoU8Yv9ZQdeD0YhJ2FeKpg)

This is the collection of people who are [citizens](#) of [Croatia](#), or participate in its [NationalCulture](#).

<http://sw.opencyc.org/concept/Mx4rDoU8Yv9ZQdeD0YhJ2FeKpg>

EVENT \supset TEMPORAL-THING \supset PARTIALLY-TANGIBLE-THING

Upper
Ontology

$(\forall a, b) a \in \text{EVENT} \wedge b \in \text{EVENT} \Rightarrow$
 $\text{causes}(a, b) \Rightarrow \text{precedes}(a, b)$

Core
Theories

$(\forall m, a) m \in \text{MAMMAL} \wedge a \in \text{ANTHRAX} \Rightarrow$
 $\text{causes}(\text{exposed-to}(m, a), \text{infected-by}(m, a))$

Domain-Specific
Theories

Very specific information
(some indirect, via SKSI)

(ist FtLaudHolyCrossERCASE#403921
(caused CutaneousAnthrax
(SkinLesions Ahmed_al-Haznawit)))

First Order Predicate Calculus: unambiguous; enable mechanical reasoning

Every American has a president.
Every American has a mother.

Higher Order Logic: contexts,
predicates as variables,
nested modals, reflection,...

$\exists y. \forall x. \text{Amer}(x) \Rightarrow \text{president}(x, y)$
 $\forall x. \exists y. \text{Amer}(x) \Rightarrow \text{mother}(x, y)$

Formal Representation for Reasoning



First Order

- {isa ASBFinancialCorp PubliclyHeldCorporation}
- (corporateOfficers ASBFinancialCorp GeraldRJenkins)

With Context

- In Mt : FinancialTransactionMt
(relationAllExists performedBy RepurchaseProgram PubliclyHeldCorporation)

Rule

- In Mt: FinancialTransactionMt
(forAll ?X (implies
 (isa ?X RepurchaseProgram)
 (thereExists ?Y (and (isa ?Y PublicallyHeldCorporation) (performedBy ?X ?Y)))))

Second Order

- {implies
 (and (isa ?SET Set-Mathematical) (cardinality ?SET 1) (elementOf ?THING ?SET))
 (equals ?SET (TheSet ?THING)))}

Modal

- {beliefs Israel {relationInstanceExists possesses Syria ClusterBomb}}

Meta

- {opaqueArgument beliefs 2}

Syntactic Power

Facts and Rules (from 1998, 2003)

Mt : [InternationalOrganizationDataMt](#)
([internationalOrganizationMemberCountries](#)
[AfricanUnion](#) [Congo-Brazzaville](#))
([internationalOrganizationMemberCountries](#)
[UnitedNationsOrganization](#) [Congo-Brazzaville](#))

([implies](#) ([and](#)
([isa](#) ?COUNTRY [IndependentCountry](#))
([territoryOf](#) ?COUNTRY ?LAND)
([geographicalSubRegions](#) [ContinentOfAfrica](#)
?LAND))
([internationalOrganizationMemberCountries](#)
[OrganizationOfAfricanUnity](#) ?COUNTRY))

Republic of the Congo is a member of
Organization of African Unity, the
United Nations, and African Union.

Automated Reasoning

```
(implies (and
  (isa ?COUNTRY IndependentCountry)
  (territoryOf ?COUNTRY ?LAND)
  (geographicalSubRegions ContinentOfAfrica ?LAND)
  (internationalOrganizationMemberCountries
    OrganizationOfAfricanUnity ?COUNTRY)) in
  InternationalOrganizationDataMt
  (territoryOf Congo-Brazzaville
    TerritoryFn Congo-Brazzaville)) in
  WorldPoliticalGeographyDataVocabularyMt
  (properGeographicalSubRegions ContinentOfAfrica
    TerritoryFn Congo-Brazzaville)) in
  WorldGeographyMt :GENLPREDS (genlPreds
  properGeographicalSubRegions geographicalSubRegions)
  in InternationalOrganizationDataMt
  :ISA (isa Congo-Brazzaville IndependentCountry) in
  InternationalOrganizationDataMt
```



beta
Republic of the Congo



InCyc

General:

[Likouala](#), [Niari](#), [Kouilou](#), [Pool](#), and [Bouenza](#) are a geographical subregion of Republic of the Congo.
[Niari](#), [Kouilou](#), [Pool](#), [Bouenza](#), [Likouala](#), [Cuvette](#), [Plateaux](#), and 3 others are a geopolitical subdivision of Republic of the Congo.
[Brazzaville](#), [Cuvette](#), [Plateaux](#), [Sangha](#), and [Lekoumou](#) are a geographical subregion of Republic of the Congo.

- - [Central African Republic](#)
 - and [Democratic Republic of the Congo](#)border on Republic of the Congo.
- Republic of the Congo borders on [Cameroon](#).
- [Gabon](#) and [Angola](#) border on Republic of the Congo.

Republic of the Congo is an [African country](#), a [people's republic](#), and a [republic](#).

- Republic of the Congo is east of [Gabon](#).
- [Democratic Republic of the Congo](#) is east of Republic of the Congo.

Knowledge for People

People

- ([isa](#) [occupation](#) [BioDataPredicate](#))
- ([isa](#) [dateOfDeathEvent](#) [BioDataPredicate](#))
- ([isa](#) [placeOfDeath](#) [BioDataPredicate](#))
- ([isa](#) [citizens](#) [BioDataPredicate](#))
- ([isa](#) [ethnicity](#) [BioDataPredicate](#))
- ([isa](#) [birthPlace](#) [BioDataPredicate](#))
- ([isa](#) [dateOfDeath](#) [BioDataPredicate](#))
- ([isa](#) [birthDate](#) [BioDataPredicate](#))

Agent Location

Mt : [BaseKB](#)

Direction : Backward

- [M](#)([implies](#)
 ([and](#)
 ([genlPreds](#) ?SPEC [hasBeenIn](#))
 ([ist-Asserted](#) ?MT
 (?SPEC ?ARG1 ?ARG2)))
 ([agentLocationDataSentence](#) ?ARG1
 ([ist](#) ?MT
 (?SPEC ?ARG1 ?ARG2))))

Agent Affiliation

- [M](#)([implies](#)
 ([and](#)
 ([genlPreds](#) ?SPEC [affiliatedWith](#))
 ([ist-Asserted](#) ?MT
 (?SPEC ?ARG1 ?ARG2)))
 ([agentAffiliationDataSentence](#) ?ARG2
 ([ist](#) ?MT
 (?SPEC ?ARG1 ?ARG2))))
- [M](#)([implies](#)
 ([and](#)
 ([genlPreds](#) ?SPEC [affiliatedWith](#))
 ([ist-Asserted](#) ?MT
 (?SPEC ?ARG1 ?ARG2)))
 ([agentAffiliationDataSentence](#) ?ARG1
 ([ist](#) ?MT
 (?SPEC ?ARG1 ?ARG2))))

What goes on a inCyc Page?

InCyc HTML Production Rules

- M(implies
 (and
 (isa ?PRED BasicDataPredicate)
 (miniFactSheetFlagHtml ?TOPIC ?FLAG-IMAGE-HTML)
 (?PRED ?TOPIC ?DATA)
 (evaluate ?FLAG-DATUM
 (HTMLTableDataFn
 (TheList
 (TheList Rowspan-HTMLTagAttribute 3)) ?FLAG-IMAGE-HTML))
 (evaluate ?ROW
 (HTMLTableRowFn TheEmptyList ?FLAG-DATUM ?ROW1))
 (evaluate ?ROW1
 (HTMLTableDataFn TheEmptyList
 (BasicDatumParaphraseFn
 (NthInListFn ?DATA 1) ?MT)))
 (evaluate ?ROW2
 (HTMLTableRowFn TheEmptyList
 (HTMLTableDataFn TheEmptyList
 (BasicDatumParaphraseFn
 (NthInListFn ?DATA 2) ?MT))))
 (evaluate ?ROW3
 (HTMLTableRowFn TheEmptyList
 (HTMLTableDataFn TheEmptyList
 (BasicDatumParaphraseFn
 (NthInListFn ?DATA 3) ?MT))))
 (evaluate ?TABLE
 (HTMLTableFn TheEmptyList ?ROW ?ROW2 ?ROW3)))
 (basicDataHTML ?TOPIC ?MT ?TABLE))

Reverence for life aids recovery from heart surgery (Reuters)

Reuters : Having a [deep reverence for life](#) seems [to have influence on](#) health [outcomes after heart bypass surgery](#) [to a study reported today at the American Geriatrics Society meeting in](#) Chicago. This [supports the potential influence](#) "spiritual effect" [on](#) patients' recovery.

investing sport **health** travel occupation device

- ?USER may be interested in ?CONCEPT because ?CONCEPT is a symptom of ?AILMENT-TYPE and ?USER has a case of ?AILMENT-TYPE.
- ?USER may be interested in ?CONCEPT because ?CONCEPT is used to treat ?AILMENT-TYPE and ?USER has a case of ?AILMENT-TYPE.
- ?USER may be interested in ?CONCEPT because ?USER has a case of ?AILMENT-TYPE and ?AILMENT-TYPE primarily afflicts the ?CONCEPT.
- ?USER may be interested in ?CONCEPT because ?CONCEPT is the drug of choice for treating a case of ?AILMENT-TYPE and ?USER has a case of ?AILMENT-TYPE.



CURE Back

Interest of Larry Lefkowitz

Sport

Travel-TripEvent

AilmentCondition

- coronary artery
- coronary artery bypass graft
- percutaneous intervention
- beta blocker
- trinitroglycerine
- angina
- vascular stent
- the Cleveland Clinic main campus
- Mayo Clinic
- stress test
- diagnostic cardiac catheterization
- intravascular ultrasound
- coronary angiogram
- electrocardiogram



0 of 356

Process next Post Auto

Valve Surgery

Search

Semantic Search Results

Intelligent Search

Semantic Search Results

[A. Marc Gillinov, M.D.](#)

A. Marc Gillinov, M.D. Specialties: Minimally invasive mitral valve, aortic valve, and tricuspid valve surgery; mitral [valve repair](#), surgical... Gillinov, M.D. has performed 125 [heart-valve repair](#) operations at http://tomcat/html-content/gillinov_GillinovHeartValveRepair.html (cached)

[Valve Disease](#)

AV Repair or Replace + Other AV Repair or Replacements AV = Aortic
http://tomcat/html-content/Valve_Disease

[Nicholas G. Smedira, M.D.](#)

Nicholas G. Smedira, M.D. Specialties: Heart replacement, off-pump coronary artery bypass...
<http://tomcat/html-content/smedira.html>

[Joseph F. Sabik III, M.D.](#)

Joseph F. Sabik III, M.D. Specialties: Adult heart surgery, off-pump coronary artery bypass...
<http://tomcat/html-content/sabik.html>

[Eric E. Roselli, M.D.](#)

Eric E. Roselli, M.D. Specialties: Adult cardiac and replacement, high-risk valve surgery...
<http://tomcat/html-content/roselli.html>

[Gosta B. Pettersson, M.D., Ph.D.](#)

Gosta B. Pettersson, M.D., Ph.D. Specialties: Aortic and mitral valve repair/replacement...
<http://tomcat/html-content/pettersson.html>

A. Marc Gillinov, M.D.

Specialties: Minimally invasive mitral valve, aortic valve, and tricuspid valve surgery; mitral valve repair, surgical treatment and minimally invasive surgery for atrial fibrillation; off-pump coronary artery bypass surgery; and high-risk mitral valve surgery.

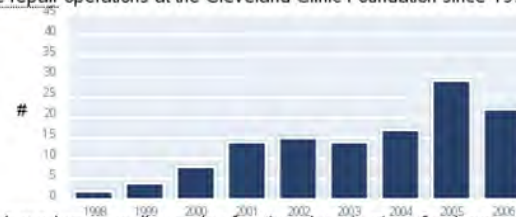
Medical Degree: Johns Hopkins University School of Medicine, Baltimore, Maryland

Special Training: Johns Hopkins University School of Medicine, Baltimore, Maryland

A native Clevelander, Dr. Gillinov spent the summers of 1978 to 1980 dividing his time between working at Cleveland Clinic and playing tennis. He still enjoys both activities.



Gillinov, M.D. has performed 125 [heart-valve repair](#) operations at the Cleveland Clinic Foundation since 1998.



This graph, based on a small sample of patient data, is given for demonstration purposes only.

Content adaptation: heart valve repair

Intelligent Search

coronary artery

Search

Semantic Search Results

A. Marc Gillinov, M.D.

Gillinov, M.D. has performed 316 [coronary artery](#) operations at the Cleveland Clinic... invasive mitral valve, [aortic](#) valve, and tricuspid valve surgery repair, surgical treatment and minimally invasive surgery for atrial fibrillation; off-pump [coronary](#) artery bypass surgery
http://tomcat/html-content/gillinov_GillinovCoronaryArtery.html (cached)

Nicholas G. Smedira, M.D.

and heart-lung transplantation, ventric
grafting, myectomy, reoperations, and
http://tomcat/html-content/smedira_

Gosta B. Pettersson, M.D., Ph.D.

Adult acquired heart disease (includin
complex [coronary artery](#) surgery; aorti
http://tomcat/html-content/pettersson_

Joseph F. Sabik III, M.D.

Joseph F. Sabik III, M.D. Specialties: A
surgery, off-pump [coronary artery](#) bypa
http://tomcat/html-content/sabik_.html

Coronary Disease

Primary isolated CABG refers to a
images... excellent long-term patency
<http://tomcat/html-content/Coronary>

Bruce W. Lytle, M.D.

Bruce W. Lytle, M.D. Chairman, Deba
diseases, reoperations, diseases of th
http://tomcat/html-content/lytle_.html

A. Marc Gillinov, M.D.

Specialties: Minimally invasive mitral valve, aortic valve, and tricuspid valve surgery; mitral valve repair, surgical treatment and minimally invasive surgery for atrial fibrillation; off-pump coronary artery bypass surgery; and high-risk mitral valve surgery

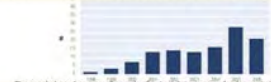
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Gillinov, M.D. has performed 125 heart valve repair operations at the Cleveland Clinic Foundation since 1998.



This graph, based on a small sample of patient data, is given for demonstration purposes only.

A. Marc Gillinov, M.D.

Specialties: Minimally invasive mitral valve, aortic valve, and tricuspid valve surgery; mitral valve repair, surgical treatment and minimally invasive surgery for atrial fibrillation; off-pump coronary artery bypass surgery; and high-risk mitral valve surgery.

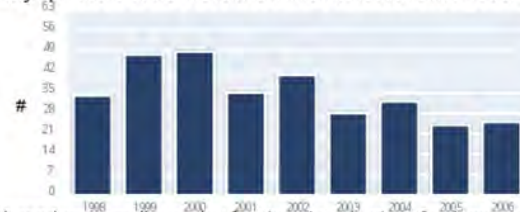
Medical Degree: Johns Hopkins University School of Medicine, Baltimore, Maryland

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A native Clevelander, Dr. Gillinov spent the summers of 1978 to 1980 dividing his time between working at Cleveland Clinic and playing tennis. He still enjoys both activities.



Gillinov, M.D. has performed 316 coronary artery operations at the Cleveland Clinic Foundation since 1998.



This graph, based on a small sample of patient data, is given for demonstration purposes only.

Content adaptation: coronary artery

▼ **Query:** If FAC_24911 is powered down, what is compromised?

Answer: managing personnel data

▼ **Because:**

FILE_1425 is a physical copy of Personnel Organizer Pro.

Personnel Organizer Pro is a personnel management program.

Personnel management programs are primarily intended to be used to manage personnel data.

FILE_1425 is installed on INF_SYS_1425.

FAC_24911 is powered down.

INF_SYS_1425 is an information system located at the facility FAC_24911.

▼ **Detailed Justification:**

▼ Managing personnel data is compromised.

▼ FILE_1425 is incapable of playing the "information used" role in managing personnel data.

▶ **Inaccessible files are incapable of performing their intended functions.**

▶ FILE_1425 is a physical copy of Personnel Organizer Pro.

▼ Personnel Organizer Pro is capable of playing an "information used" role in managing personnel data.

▶ Personnel Organizer Pro is a personnel management program.

▶ Personnel management programs are capable of playing "information used" roles in managing personnel data.

45th's Space Wing Hurricane Preparedness

The Cyc Analytic Environment

Reasoning-based, question answering

The screenshot displays the Cyc Analytic Environment interface. At the top, there are tabs for 'Task Info', 'Document Search', 'Concepts', and 'Queries'. The 'Queries' tab is active. Below the tabs, there is a search bar containing the text 'Find patients with bacteremia after a pericardial window'. To the right of the search bar are 'Find' and 'Stop' buttons. Below the search bar, the 'Search Results' section is expanded, showing a tree view of the query. The tree view includes 'Find patients with bacteremia after a pericardial window' and 'Simple Questions'. Under 'Simple Questions', there are several lines of text: 'The patient ID for PATIENT is _____.', 'PATIENT is the patient involved in _____ and PATIENT is the patient involved in _____.', 'PATIENT is the patient involved in _____ and _____ is a pericardial window.', '_____ is a case of bacteremia.', '_____ involves _____.', '_____ is after _____.', 'PATIENT is the _____ procedure performed on _____.', and '_____ contain _____.'. A context menu is open over the text '_____ is after _____.', showing options: 'Copy Query Text', 'Open', 'Delete', and 'Combine selected queries'. The 'Combine selected queries' option is highlighted. Below the tree view, there is a 'Keyword Search' section and a 'CCF Query Library' section. The 'CCF Query Library' section contains the text 'CAEUser : Generic Medical Research Task Environment' and 'Search History'. A tooltip is visible over the 'Search History' text, containing the text 'Attempt to combine the two queries'.

Task Info Document Search Concepts Queries

Find patients with bacteremia after a pericardial window Find Stop

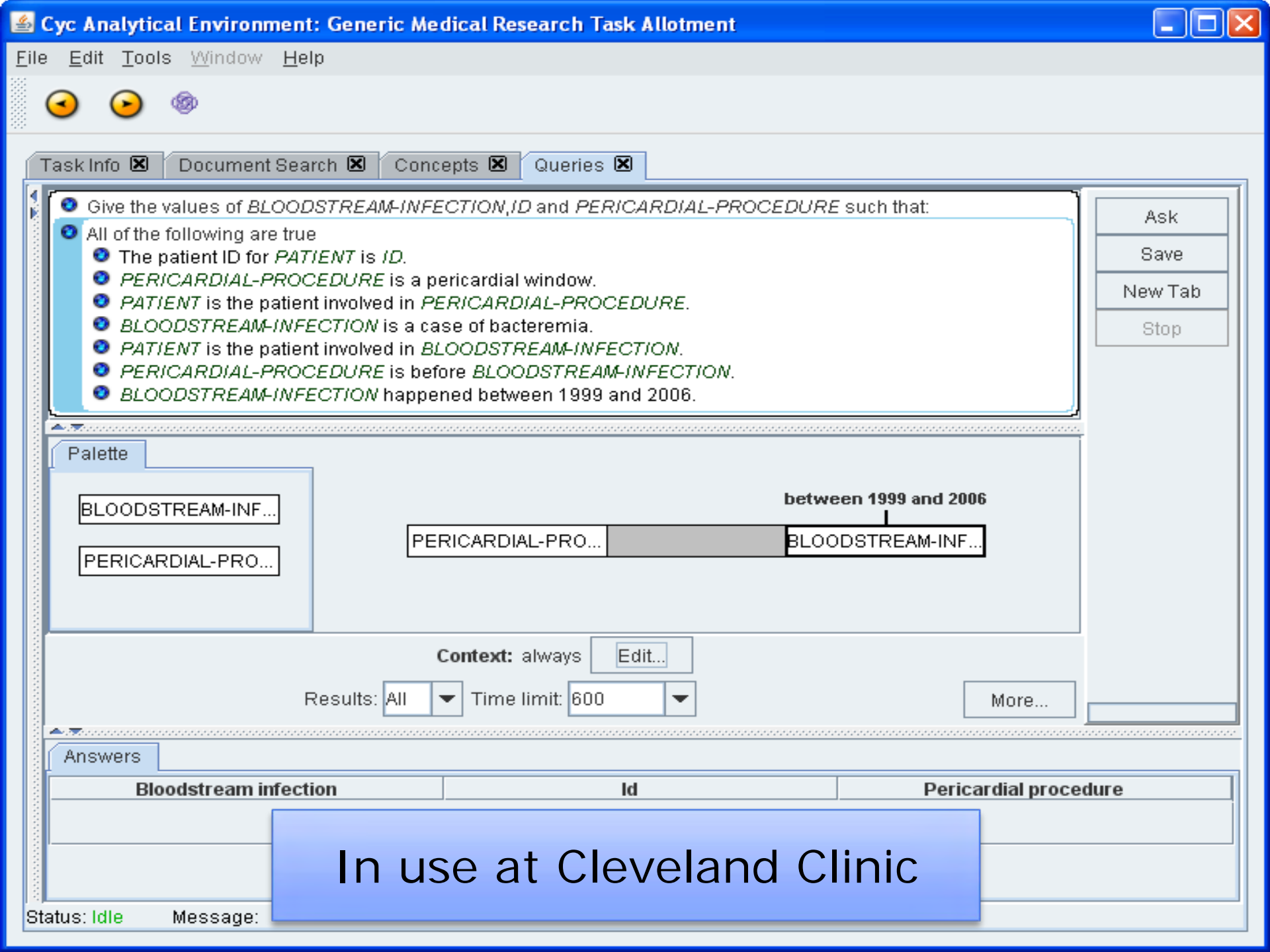
Search Results

- Find patients with bacteremia after a pericardial window
 - Simple Questions
 - The patient ID for PATIENT is _____.
 - PATIENT is the patient involved in _____ and PATIENT is the patient involved in _____.
 - PATIENT is the patient involved in _____ and _____ is a pericardial window.
 - _____ is a case of bacteremia.
 - _____ involves _____.
 - _____ is after _____.
 - PATIENT is the _____ procedure performed on _____.
 - _____ contain _____.
 - Keyword Search
- CCF Query Library
 - CAEUser : Generic Medical Research Task Environment
 - Search History

Copy Query Text
Open
Delete
Combine selected queries

Attempt to combine the two queries

User-assisted query understanding



In use at Cleveland Clinic

Demo Movie: Knowledge Capture & Reuse

Web 3.0 Systems start from Web 2.0-
style learning.

Acquire ground facts, test rule
inferences.

Knowledge Acquisition with CURE

(generateFormulasForElements Terms PubliclyHeldCorporation

Inferred Index

for
filters :
index vie

Palm

From Wikipe

► [Browsing](#) ► [Editing](#)

Palm, Inc

headquar

products s

LifeDrive.

and Palm

of the Tre

operating

Palm OS (

[All Assertions](#) (83) ▼ [close](#)

[all](#)

▼ via [PalmInc](#) (23)

[isa](#) (4) +

[codeMapping](#) arg3 (2)

[companyHasCEO](#)

[companyHasCEO-SKSI](#)

[competitors](#) arg2 (3) +

[hasHeadquartersInRegion](#)

[homepage](#)

[nameString](#) (2)

[programAuthor](#) arg2

[rdfURI](#) (2)

[rdfURIInNamespace](#)

[relationAllInstance](#) arg3

[soleMakerOfProductType](#)

arg2

[stockTickerSymbol](#)

[wikipediaArticleName](#)

▼ via [TechnologyCompany](#)

[meetsSomeConstraintOfTopicTyp](#)

(0)

Individual : [PalmInc](#) (+1)

on the term

[isa](#) : [Individual](#)

[isa](#) : [LegalCorporation](#)

[isa](#) : [HighTechManufacturingEnterprise](#)

[isa](#) : [PubliclyHeldCorporation](#)

[\(codeMapping DBpedia-CMLS "<http://dbpedia.org/resource/Palm_Inc.>"](#)
[PalmInc\)](#)

[\(codeMapping DBpedia-CMLS "<http://dbpedia.org/resource/Palm%2C_Inc.>"](#)
[PalmInc\)](#)

[companyHasCEO](#) : [M](#)([InstanceNamedFn-Ternary](#) "Ed Colligan" [Person](#)
"2b85305e-c786-492f-9e45-94f437c839fe")

[companyHasCEO-SKSI](#) : [\(InstanceNamedFn-Ternary](#) "Ed Colligan" [Person](#)
"2b85305e-c786-492f-9e45-94f437c839fe")

[M](#)([competitors](#) [AppleInc](#) [PalmInc](#))

[M](#)([competitors](#) [Samsung](#) [PalmInc](#))

[M](#)([competitors](#) [Nokia](#) [PalmInc](#))

[hasHeadquartersInRegion](#) : [M](#)([CityNamedFn](#) "Sunnyvale" [California-State](#))

[homepage](#) : [M](#)"http://palm.com"

[nameString](#) : ["Palm, Inc."](#) ["Palm"](#)

[\(programAuthor](#) [WebOS](#) [PalmInc](#))

[rdfURI](#) : ["http://wikicompany.org/wiki/Special:URIResolver/Palm%2C_Inc."](#)

[rdfURI](#) : ["http://dbpedia.org/resource/Palm%2C_Inc."](#)

[\(rdfURIInNamespace](#) [PalmInc](#) [DBpediaResourceNamespace](#) "Palm%2C_Inc.")

[\(relationAllInstance](#) [madeBy](#) [PalmPre](#) [PalmInc](#))

[\(soleMakerOfProductType](#) [PalmPre](#) [PalmInc](#))

[stockTickerSymbol](#) : ["PALM"](#)

PALM

[Employees](#) 1,050 (2008)

Noun Compound Parsing

Renaissance Artists → (SubcollectionOfWithRelationToFn
Artist activeDuringPeriod
TheRenaissance)

Bronze Age Farmers → (SubcollectionOfWithRelationToFn
Farmer activeDuringPeriod
TheBronzeAge)

Kind of TimeInterval

Noun Form: not plural

Kind of Agent-Generic
Noun form

Noun Phrase Parsing

Attributive Adjective & Noun

Yellow Submarine → (SubcollectionWithRelationToFn
Submarine
mainColorOfObject
Yellow)

Sick Child → (SubcollectionWithRelationToFn
HumanChild
stateOfHealth
Sick)

Supporting Lexical Assertions:

(adjSemTrans Yellow-TheWord 0 RegularAdjFrame
(mainColorOfObject :NOUN YellowColor))

(adjSemTrans Sick-TheWord 0 RegularAdjFrame
(stateOfHealth :NOUN Sick))

Assertion Count

rapidly growing list
already many

every book sold by Amazon
any CD ever recorded (almost)

basic facts on every country on the planet
hierarchical dictionaries
(UK, FR, NL)

scientific bibliographies
names of artists & art works
Encyclopedia

names of artists & art works
Encyclopedia

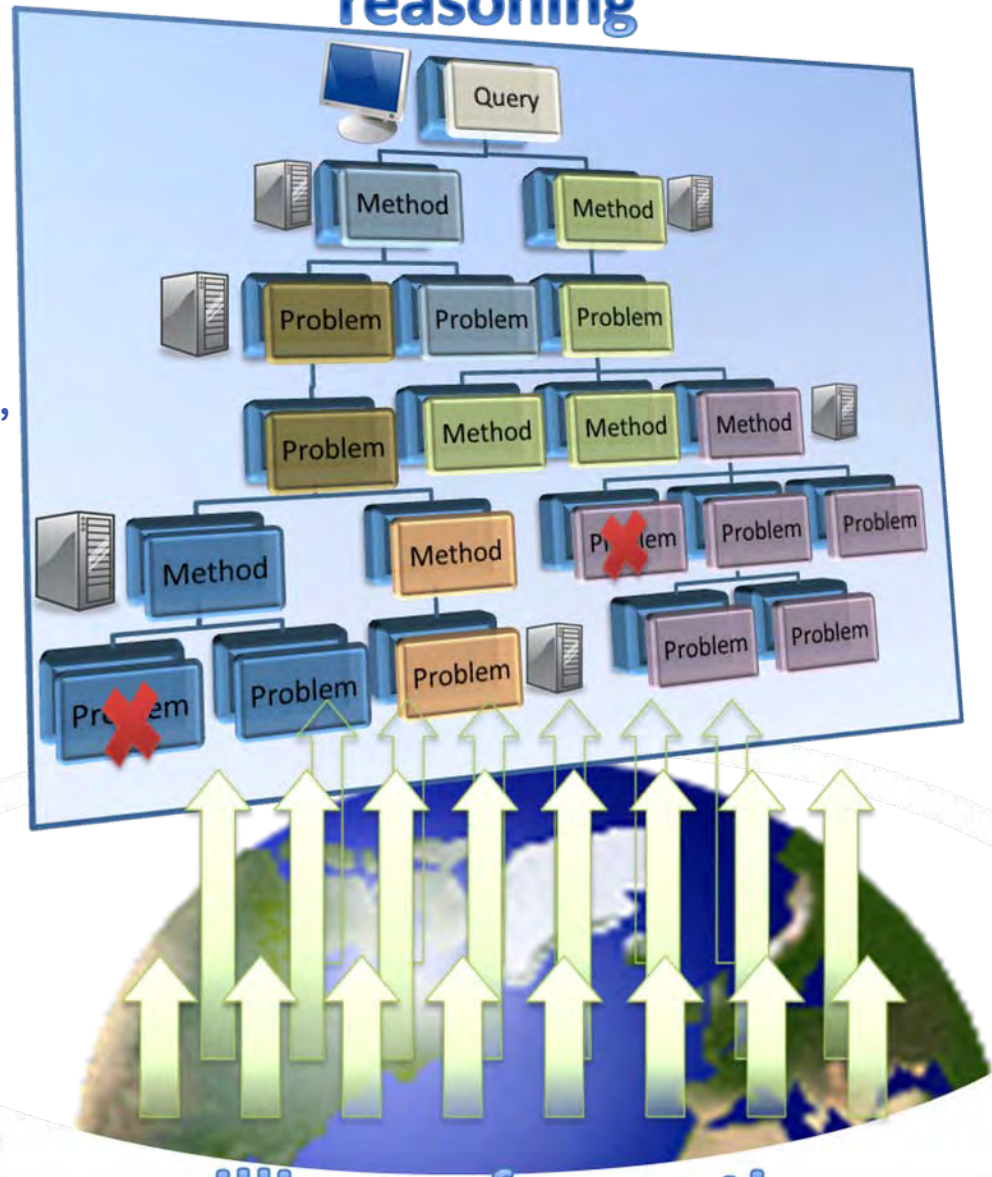
massive distributed incomplete reasoning



Knowledge representations,
inference methods, KA tools,
for broad domain reasoning



Platform for infinitely
scalable reasoning on the
web



Use Case: City on-line



- **Our cities face many challenges**
- **Urban Computing** is the ICT way to



improve quality of life

Is public transportation where the people are?

Personal:

Should we stay in Milan on the way back?

Is there a decent restaurant we can go to with the clothes we came with?

Should I take taxi or subway to aeroport? Any last things we should see on the way?

e are
right now
will be

ing?

moving?

REAL TIME



LAST WEEK

↑ San Giovanni Lat
↓ Celosco

REAL TIME

REAL TIME 13:55

low high

Demo Movie: Knowledge Use

Access ground facts, apply rule inferences.

Knowledge Use with CAE



CorporateBond-InvestmentGrade



isa: [BondTypeByIssuingAgentType](#)

genls: [CorporateBond-Agreement](#)

Context: Union of all contexts

Predicate: [genls](#)

Index:

Parameters updated at 10:38:14 on 07/24/2007

Change Hierarchy Browser Settings

- ... [Agreement](#)
 - ... [AuthorizedAgreement](#) [[UniversalVocabularyMt](#)]
 - ... [DebtSecurity](#) [[UniversalVocabularyMt](#)]
 - ... [Bond-Agreement](#) [[UniversalVocabularyMt](#)]
- ... [AuthorizedAgreement](#) [[UniversalVocabularyMt](#)]
- ... [TradeableSecurity](#) [[UniversalVocabularyMt](#)]
- ... [DebtSecurity](#) [[UniversalVocabularyMt](#)] ... *see above*
- ... [EconomicAgreement](#)
- ... [LoanAgreement](#) [[UniversalVocabularyMt](#)] ... *see above*
- ... [DebtSecurity](#) [[UniversalVocabularyMt](#)] ... *see above*
- ... [FinancialAsset](#)
- ... [TradeableSecurity](#) [[UniversalVocabularyMt](#)] ... *see above*
- ... [InvestmentVehicle](#)
- ... [TradeableSecurity](#) [[UniversalVocabularyMt](#)] ... *see above*
- ... [Obligation](#)
- ... [LoanAgreement](#) [[UniversalVocabularyMt](#)] ... *see above*
- ... [TemporaryUserRightsAgreement](#)
- ... [LoanAgreement](#) [[UniversalVocabularyMt](#)] ... *see above*
- ... [TradeableSecurity](#)
- ... [UnsettledSecurity](#) [[UniversalVocabularyMt](#)]
- ... [DebtSecurity](#) [[FinancialTransactionMt](#)] ... *see above*
- ... [\(MeaningInSystemFn SENSUS-Information1997 "DECOMPOSABLE-OBJECT"\)](#)
- ... [DebtSecurity](#) [[SENSUSMappingMt](#)] ... *see above*
- > [Thing](#)
- ... [\(MeaningInSystemFn SENSUS-Information1997 "DECOMPOSABLE-OBJECT"\)](#)
- ... [CorporateBond-Agreement](#) [[SENSUSMappingMt](#)]
- ... [Bond-Agreement](#)
- ... [CorporateBond-Agreement](#) [[UniversalVocabularyMt](#)]
- ... [CorporateBond-InvestmentGrade](#)
- ... [CorporateBond-InvestmentGrade](#) [[UniversalVocabularyMt](#)] -> ([Bond-Agreement](#), [CorporateBond-Agreement](#))

SelfInvestedPersonalPension



isa: [AccountType](#)

genls: [MoneyPurchasePensionScheme](#), [TaxDeferredAccount](#)

Context: Union of all contexts

Predicate: [genls](#)

Index: 2

Parameters updated at 10:36:12 on 07/24/2007

Change Hierarchy Browser Settings

- ... [BusinessRelatedThing](#)
- ... [BusinessRelatedDocumentOrAgreement](#) [[UniversalVocabularyMt](#)]
- ... [LegalAgreement](#) [[UniversalVocabularyMt](#)]
- ... [Account](#) [[UniversalVocabularyMt](#)]
- ... [FinancialAccount](#) [[UniversalVocabularyMt](#)]
- ... [TaxDeferredAccount](#) [[UniversalVocabularyMt](#)]
- ... [NonResidentSpecifiedFor](#)
- ... [Obligation](#) [[UniversalVocabularyMt](#)]
- ... [LegalAgreement](#) [[UniversalVocabularyMt](#)] ... *see above*
- ... [Policy](#)
- ... [Agreement](#) [[UniversalVocabularyMt](#)]
- ... [AuthorizedAgreement](#) [[UniversalVocabularyMt](#)]
- ... [Account](#) [[UniversalVocabularyMt](#)] ... *see above*
- ... [LegalAgreement](#) [[UniversalVocabularyMt](#)] ... *see above*
- ... [TemporalThing](#)
- ... [BusinessRelatedDocumentOrAgreement](#) [[UniversalVocabularyMt](#)] ... *see above*
- ... [Account](#)
- ... [PersonalAccount](#) [[UniversalVocabularyMt](#)]
- ... [RetirementAccount](#) [[UniversalVocabularyMt](#)]
- ... [MoneyPurchasePensionScheme](#) [[UniversalVocabularyMt](#)]
- ... [FinancialAccount](#)
- ... [RetirementAccount](#) [[UniversalVocabularyMt](#)] ... *see above*
- ... [SelfInvestedPersonalPension](#)
- ... [SelfInvestedPersonalPension](#) [[TheMotleyFoolUKCorpusMt](#)] -> ([MoneyPurchasePensionScheme](#),

Existing Vocab.

TextPrism

Intelligent Information Dissemination



TextPrism:

- Auto-tagging of text *combined with*
- Rich user models *combined with*
- Business rules *combined with*
- Inference

Allows us to quickly dispatch the right information to the right people

Personalized Information Feeds

- Goes beyond pure lexical matches
 - Concepts with multiple lexifications
 - Generalization hierarchy
- Topics of interest are automatically inferred from user profile information
 - Find things the subscriber didn't know – and didn't have to know -- to ask about

TextPrism: Improved Recall

- Subscriber:
 - Yankees fan
 - Owns stock in Apple and Verizon
 - Likes the Grateful Dead
- Possible interests:
 - Jerry Garcia, Bob Weir, Phil Lesh, ... (Grateful Dead members)
 - Boston Red Sox (Yankees' rival)
 - George Steinbrenner (Yankees' owner)
 - FCC, Michael J. Copps (Telecom regulatory agency and chair)
 - iPod, iPhone, MacBook, ... (Apple products)
 - Steve Jobs (Apple CEO)
 -

Improved Recall Examples

- Reduce ambiguities
 - Improve concept identification precision using semantic licensing rules
- Tighten the matching criteria
 - Require the co-occurrence of multiple concepts when selecting matches

TextPrism: Improved Precision

- Without considering context, a reference to “Springfield” is highly ambiguous:

I went to (**#\$AttendingSomething**) a **concert** (**#\$CollectionIntersection2Fn** **#\$PublicEvent** **#\$MusicalPerformance**) in **Springfield** (**#\$SpringfieldCollege** (**#\$CityNamedFn** "Springfield" **#\$Colorado-State**) (**#\$CityNamedFn** "Springfield" **#\$Massachusetts-State**) (**#\$CityNamedFn** "Springfield" **#\$Ohio-State**) **#\$CityOfSpringfieldIL** (**#\$CityNamedFn** "Springfield" **#\$Missouri-State**) (**#\$CityNamedFn** "Springfield" **#\$Virginia-State**)).

However, if a state is mentioned, then references to cities in that state are licensed.

(implies
 (and
 (isa ?CITY City)
 (geographicalSubRegionsOfState ?STATE ?CITY))
 (isLicensedBy ?CITY ?STATE))

Semantic Licensing Examples

When I arrived (~~#\$ArrivingAtAPlace~~) in Virginia (~~#\$Virginia-State~~), I went to (~~#\$AttendingSomething~~) a concert (~~(#\$CollectionIntersection2Fn #PublicEvent #MusicalPerformance)~~) in Springfield (~~(#\$CityNamedFn "Springfield" #Virginia-State)~~).

However, if a state is mentioned, then references to cities in that state are licensed.

When I arrived (~~#\$ArrivingAtAPlace~~) in Massachusetts (~~#\$Massachusetts-State~~), I went to (~~#\$AttendingSomething~~) a concert (~~(#\$CollectionIntersection2Fn #PublicEvent #MusicalPerformance)~~) in Springfield (~~(#\$CityNamedFn "Springfield" #Massachusetts-State)~~).

Semantic Licensing Examples

- Subscriber:
 - Investor
- Possible Interests:
 - Paris, Marseille, Lyon, Toulouse , Nice, ...

But not all articles about Lyon are equally interesting to a tourist.

Tourist care about restaurants, hotels, tourist attractions, events, ...

More Precise Matches

Look for only articles that mention the
place of interest *and* a type of restaurant

```
(implies
  (and
    (genls ?SPEC RestaurantSpace)
    (interestedInVisiting ?USER ?REGION))
  (conceptSetPotentiallyInterestingToForDomainBecause ?USER
    (TheSet ?REGION ?SPEC) Travel-TripEvent
    (and
      (typeIntendedBehaviorCapable RestaurantSpace
        EatingEvent eventOccursAt)
      (interestedInVisiting ?USER ?REGION))))
```

More Precise Matches

The New Russia

Warner LeRoy's doomed incarnation of the Russian Tea Room closed only five short years ago, although in the frantic world of modern-day New York dining, it seems like five decades. As the famous old room sat moldering on 57th Street ...

Reviewer: MW - foodie

Victor Cafe was a real find in Marseille - amongst the scores of restaurants offering the same dishes, it stands out due to its excellent menu ...

Ligue 1 - Marseille focused on title, not Gerets

Coach Eric Gerets's departure at the end of the season will not disturb Marseille's quest for a first league title in 17 years when they take on Toulouse in Ligue 1 on Saturday, the players said.

Bistro Romain

A Quality chain Bistro on the Quais of the Old Port

4 Quai Rive-Neuve
Marseille, 13001

This renowned chain Bistro is conveniently located in the Old Port. The

is a wide selection of dishes at reasonable prices: Beef Cordon
sagna, thick sirloin
Black Breast, ...

Category: French - Marseille Restaurants

Located in the heart of Marseille, this grill offers a buffet of appetizers and a choice of three main courses.

limited and dishes such

Austin Spider House Patio Bar & Cafe

Just North of the UT campus in Central Austin, this bohemian hangout is a must for anyone seeking the quintessential Austin experience. ...

Only Restaurants in Marseille

- Subscriber:
 - Investments in uranium
- Possible Interests:
 - Regions that export uranium and have experiencing civil unrest (e.g., protest marches, civil wars, violent gatherings ...)

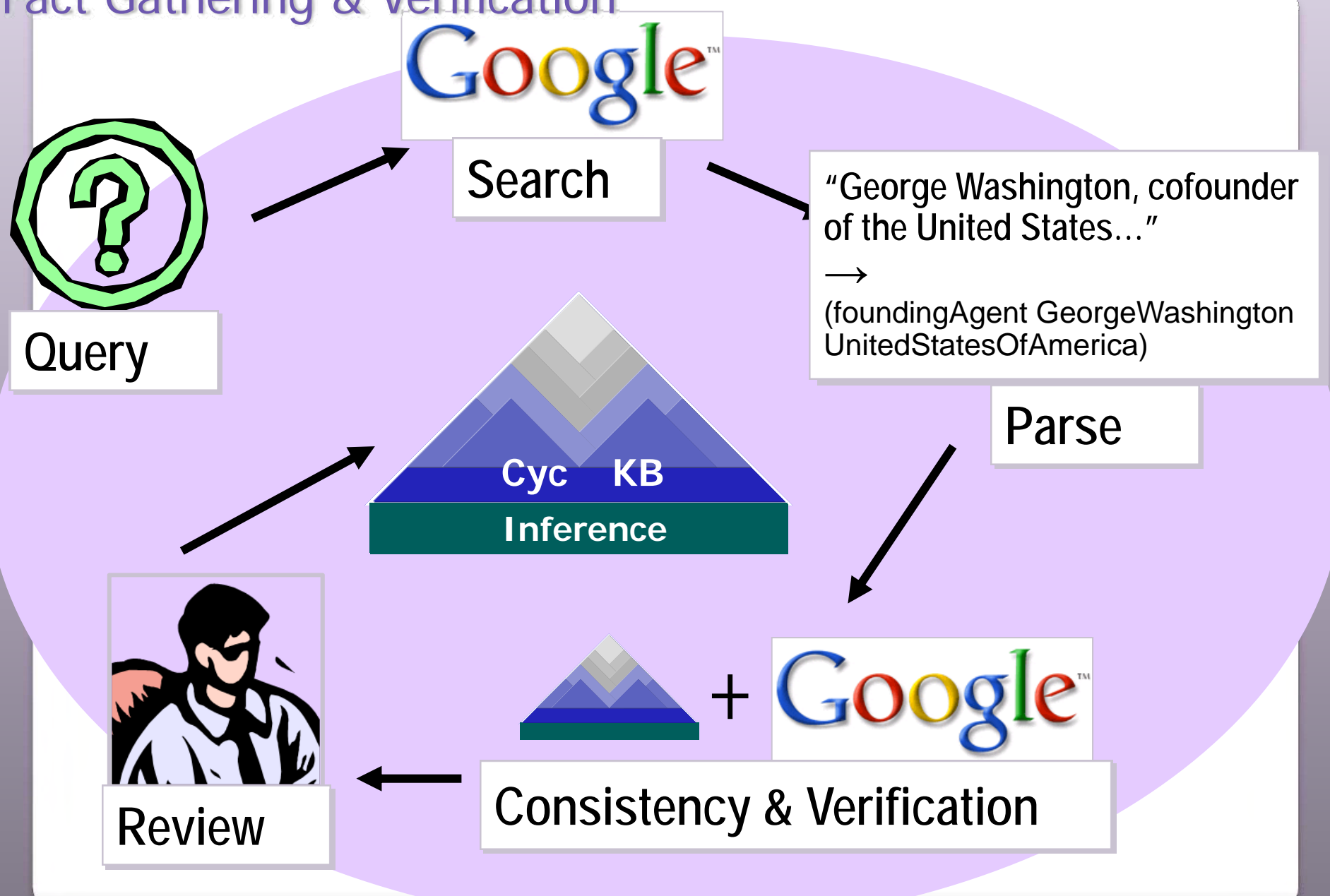
```
(implies
  (and
    (isa ?COMMODITY CommodityProduct)
    (hasInvestmentInterestInCommodityType ?USER ?COMMODITY)
    (exports ?REGION ?COMMODITY)
    (genls ?UNREST-TYPE CivilUnrest))
  (conceptSetPotentiallyInterestingToForDomainBecause ?USER
    (TheSet ?REGION ?UNREST-TYPE) Investing
    (and
      (exports ?REGION ?COMMODITY)
      (hasInvestmentInterestInCommodityType ?USER ?COMMODITY))))
```

More Precise Matches

Demo II: Text Prism



Fact Gathering & Verification



Query

“What are symptoms of Whooping Cough?”



(symptomOfAilment WhoopingCough ?SYMP)

NL Generation

Partial English sentences

“A symptom of whooping cough is ____”

“Whooping cough can cause ____”

“A symptom of Pertussis Bordetella is ____”

“Symptoms (such as _____) of whooping cough”



**Learning Facts
by Search**





Looking for something that matches the argument constraints on the predicate...

"... symptoms of pertussis such as fever and a dry cough ..."

Parse back into existing CycL concepts

(symptomOfAilment WhoopingCough Fever)

(symptomOfAilment WhoopingCough Coughing-AilmentCondition)

Parsing Results



The FACTory

FACTory is an amusing (we hope!) little trivia game that tests your knowledge about everything from sports teams to comedic actors, from geography to emotions. Not only that, but every question you answer brings the world a little closer to a truly intelligent computer.

Play!

We're very pleased to be able to bring you this game, and look forward to your comments and suggestions for this and other efforts in the future.

Or You Could

Make a Suggestion

Help Develop

Thanks, with
Total Score

You

Click Here

How To Play

High Scores



Status

I have 2 answers so far.

I am thinking of a sentence

True

False

Don't know

Graphic design is a field in art.

Doesn't make sense

Status

I believe this is true.



Score: 14

Questions Answered: 2

Submitting ...

Thank you!

Continue ...

Answers: 3
You agreed with: 100%



I now believe this sentence is **true**:
Graphic design is a field in art.

Score: +2

Bonus: +10

Score: 2
Questions Answered: 2

Cyc's Champions

1.	TEV	502
2.	EDO	498
3.	KES	377
4.	AMK	354
5.	SCM	7098
6.	SMC	6524
7.	MSM	5784
8.	MJW	5084
9.	RYU	4809
10.	PIG	4579

Close

Verification by Volunteers



game.cyc.com