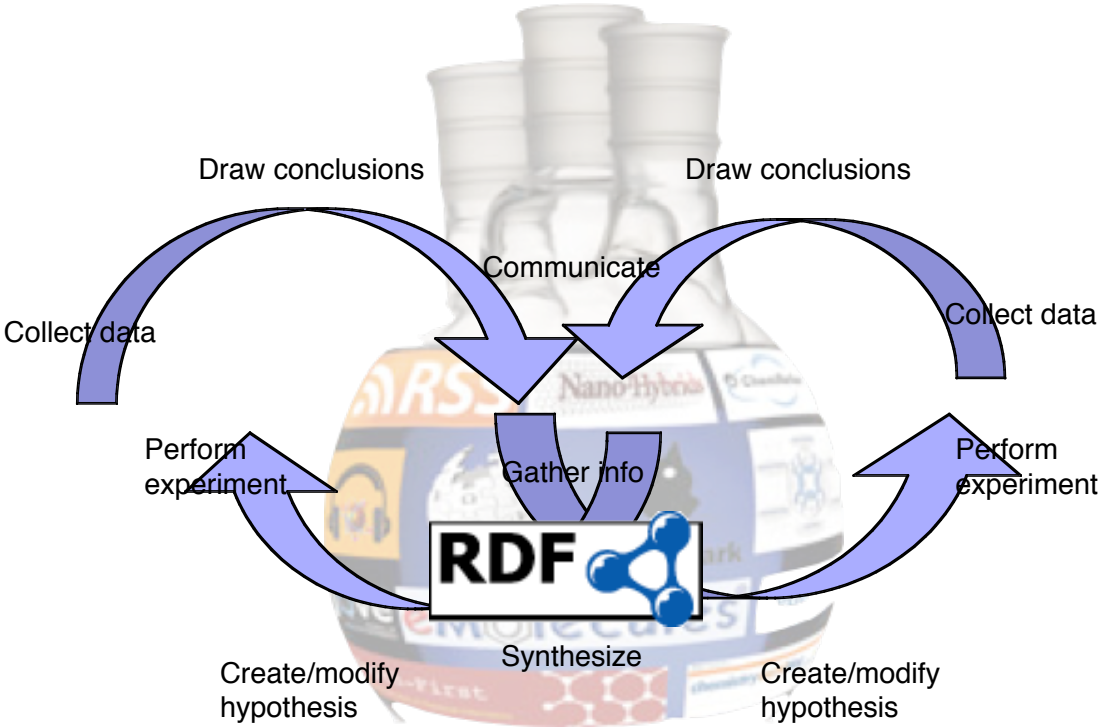
SWANSIOC
Scientific Discourse Representation

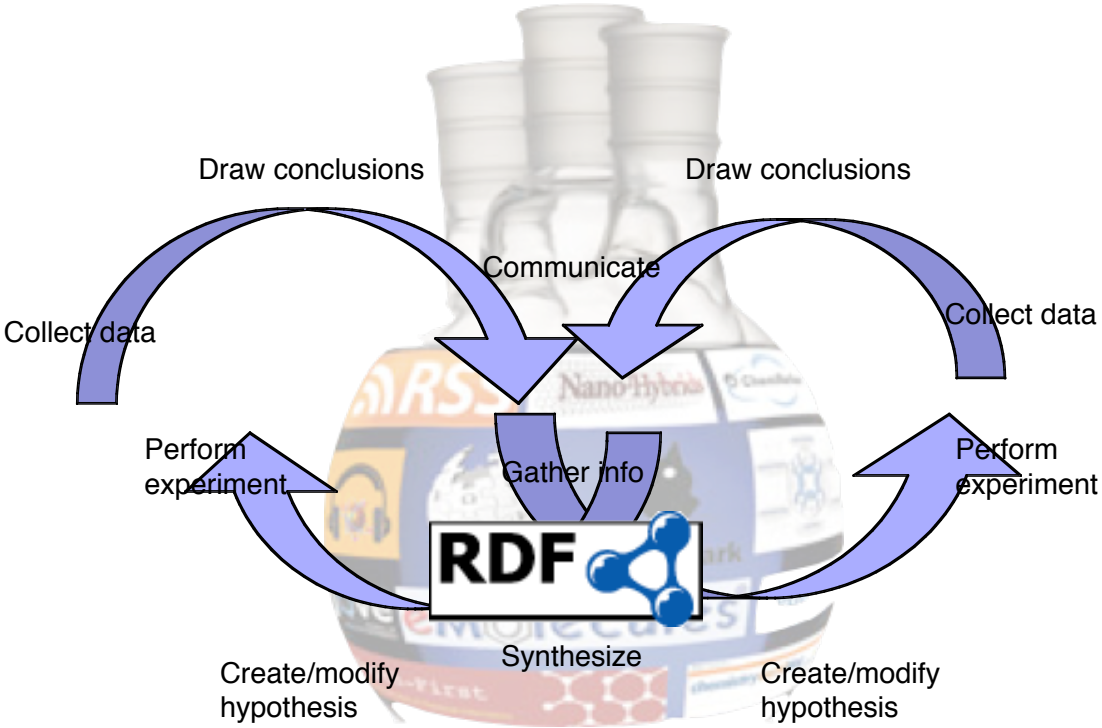
Alexandre Passant, Digital Enterprise Research Institute, Galway
Tim Clark, Massachusetts General Hospital & Harvard Medical School

October 27, 20008


RSS
Nano Hybrids
RDF


RSS
Nano Hybrids
RDF


Draw conclusions
Draw conclusions
Communicate
Collect data
Collect data
Perform experiment
Gather info
Perform experiment
RDF
Synthesize
Create/modify hypothesis
Create/modify hypothesis



Scientific Discourse

Scientific Discourse Project Goals

Provide a Semantic Web platform for scientific discourse in biomedicine

- linked to
  - key concepts, entities and knowledge
- specified
  - by ontologies
- integrated with
  - existing software tools
- useful to
  - Web communities of working scientists.

Strategy

- Stepwise alignment of key ontologies
- Early wins in real applications
- Forward-looking pre-alignments
- Practical validation with scientific users
- Iterative development

Some parameters

- Discourse categories: research questions, scientific assertions or claims, hypotheses, comments and discussion, and evidence.
- Biomedical categories: genes, proteins, antibodies, animal models, laboratory protocols, biological processes, reagents, disease classifications, user-generated tags, and bibliographic references.
- Driving Biological Project: cross-application of discoveries, methods and reagents in stem cell, Alzheimer and Parkinson disease research.
- Informatics use cases: interoperability of web-based research communities with
  - (a) each other (b) key biomedical ontologies (c) algorithms for bibliographic annotation and text mining (d) key resources.

Iteration #1: SWAN+SIOC

- SIOC
  - http://sioc-project.org
  - Represent activities and contributions of online communities
  - Integration with blogging, wiki and CMS software
  - Use of existing ontologies e.g. FOAF, SKOS, DC
- SWAN
  - http://swan.mindinformatics.org
  - Represents scientific discourse (hypotheses, claims, evidence, concepts, entities, citations)
  - Used to create the SWAN Alzheimer knowledge base
  - Active beta participation of 144 Alzheimer researchers
  - Ongoing integration into SCF Drupal toolkit

W3C Member Submission

Submission request to W3C (W3C Team Comment)

Semantically-Interlinked Online Communities (SIOC) Ontology Submission Request to W3C

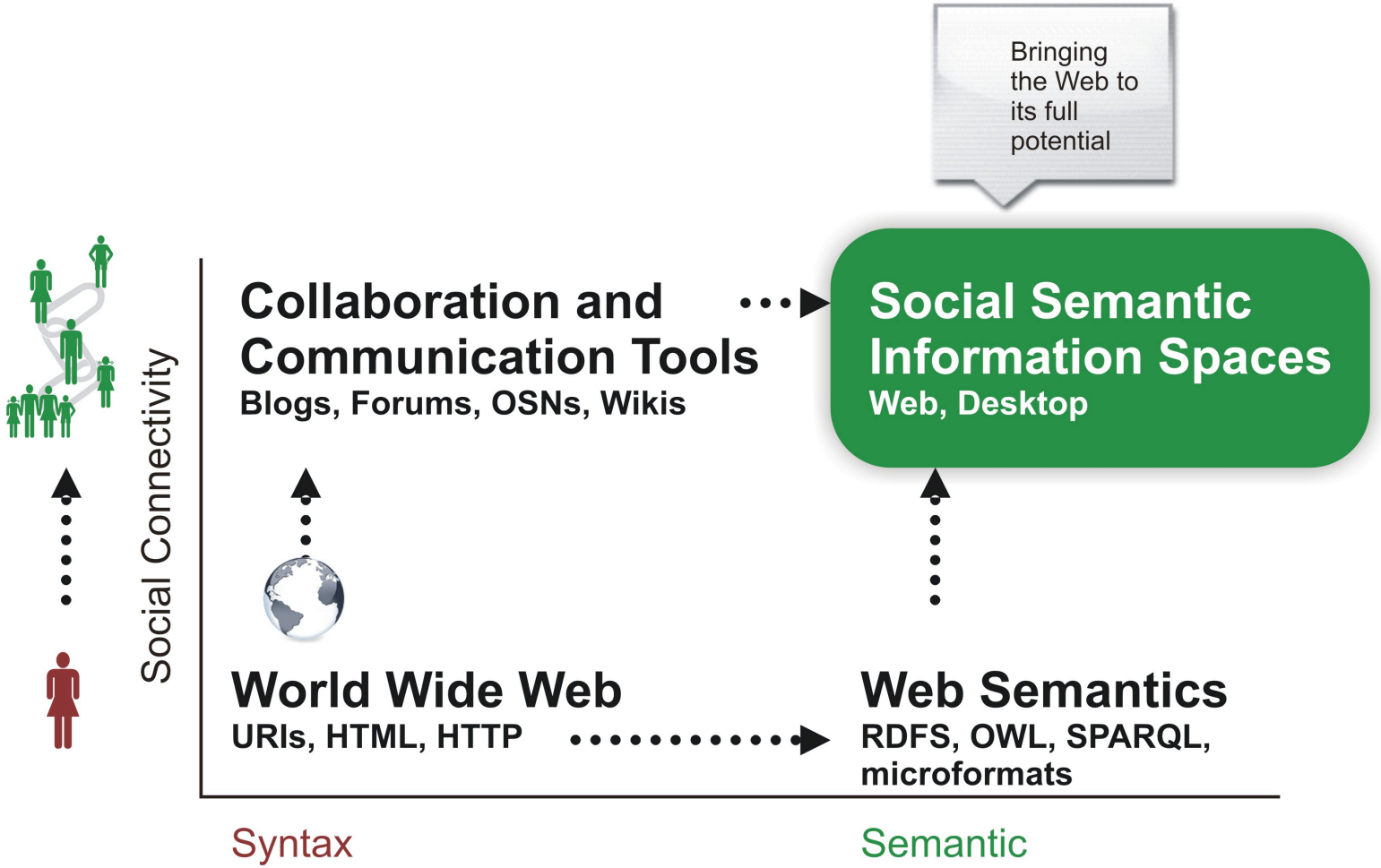
Submitted materials

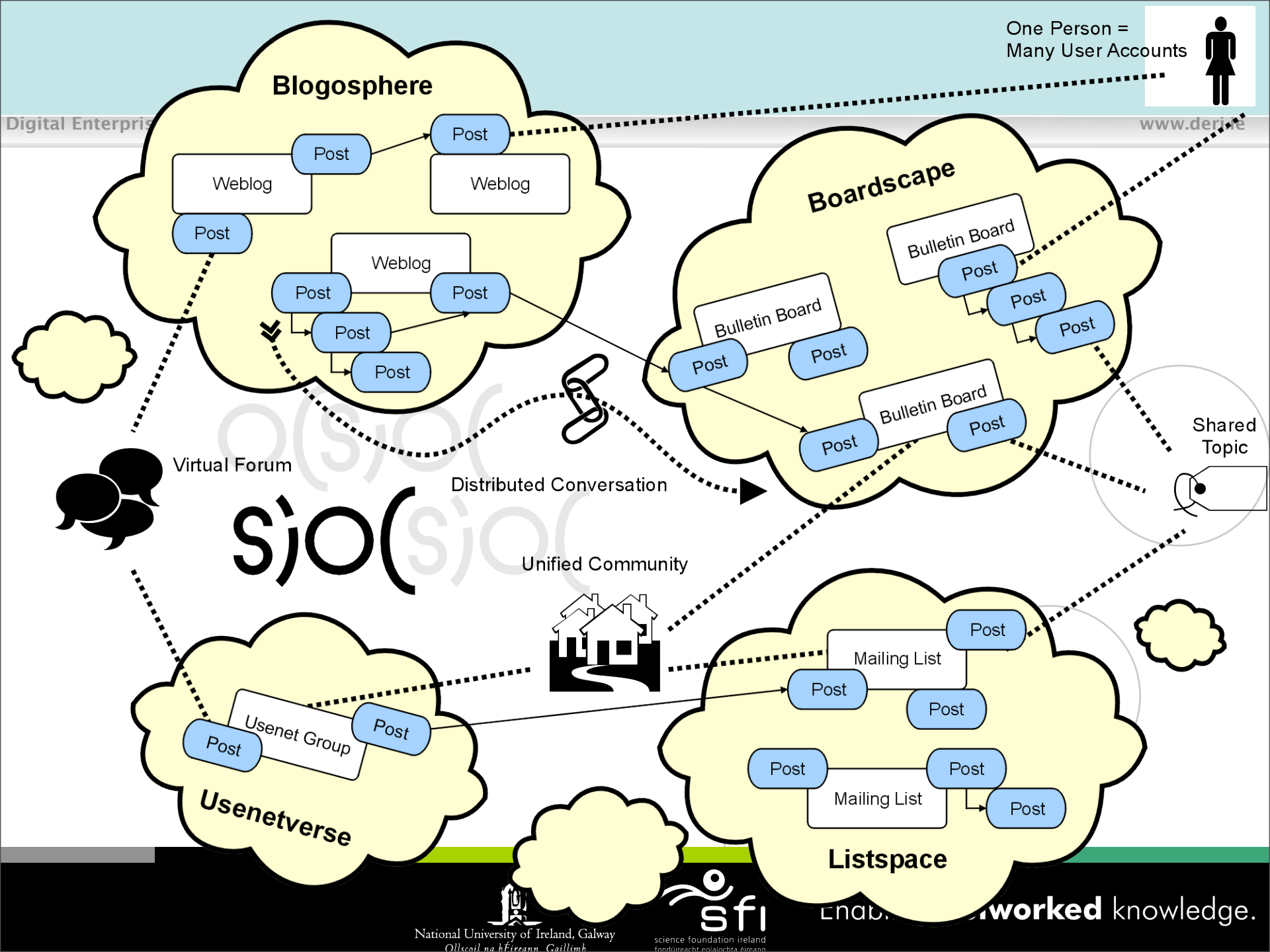
We, W3C Members - *Asemantics S.R.L., DERI Galway at the National University of Ireland, Galway, Ireland, German Research Center for Artificial Intelligence (DFKI) Gmbh, Forschungszentrum Informatik (FZI), Fraunhofer Gesellschaft, Fundación CTIC (Centro Tecnológico para el Desarrollo en Asturias de las Tecnologías de la Información y la Comunicación), OpenLink Software Inc., Opera Software, STFC (Science & Technology Facilities Council), Universidad Politécnica de Madrid, Department of Information and Communication Technology - University of Trento* - hereby submit to the Consortium the following specification, comprising the following documents attached hereto:

1. SIOC Core Ontology Specification
2. SIOC Ontology: Applications and Implementation Status
3. SIOC Ontology: Related Ontologies and RDF Vocabularies
4. Snapshots of Namespace Documents in RDFS/OWL (ZIP Archive):
   - SIOC Core Ontology Namespace [ns.rdf]
   - SIOC Types Ontology Module Namespace [types.rdf]
   - SIOC Services Ontology Module Namespace [services.rdf]

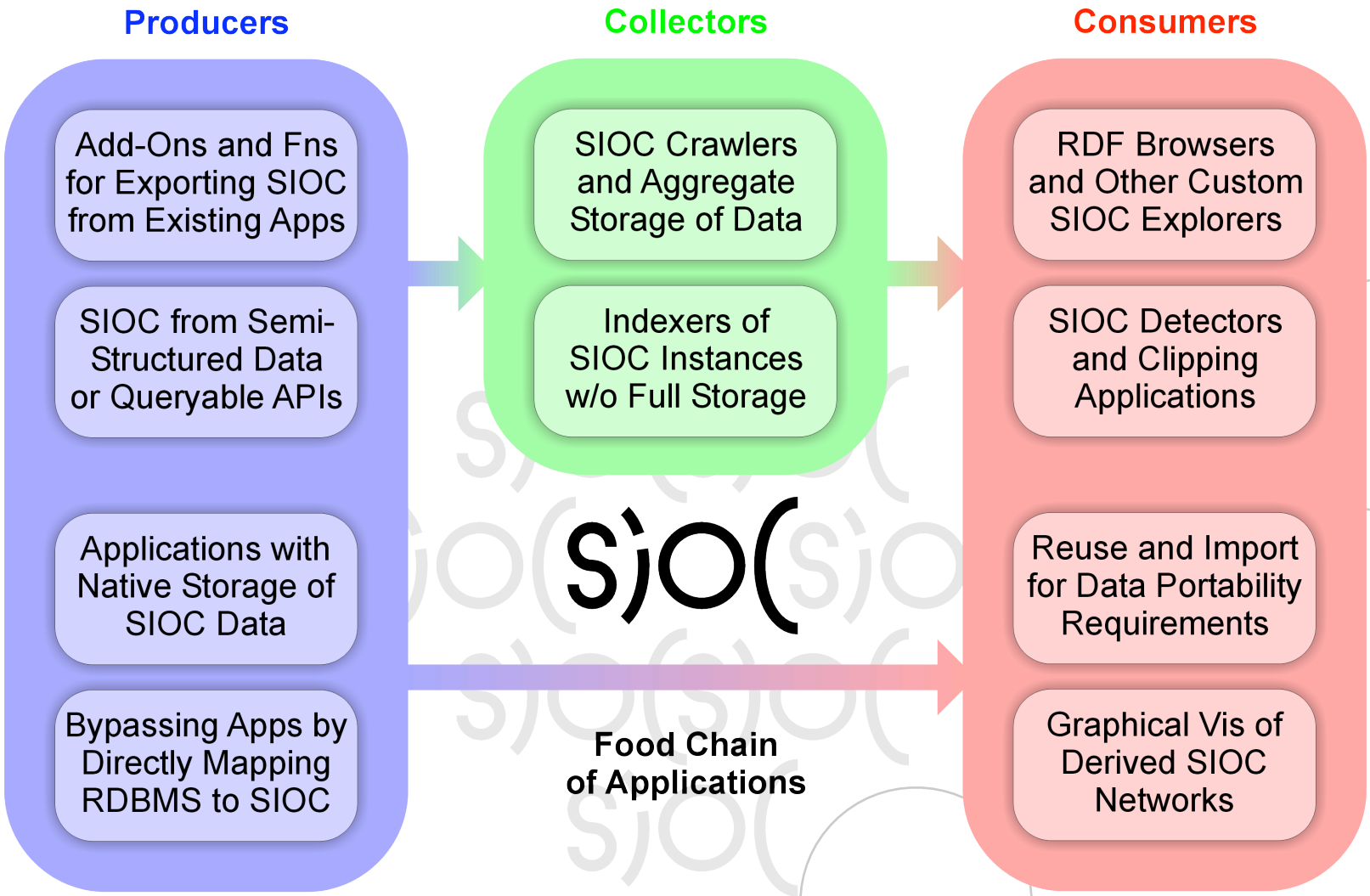
which is referred to as "the Submission". We request the Submission be known as the *SIOC Ontology Submission*.

Social Semantic Information Spaces

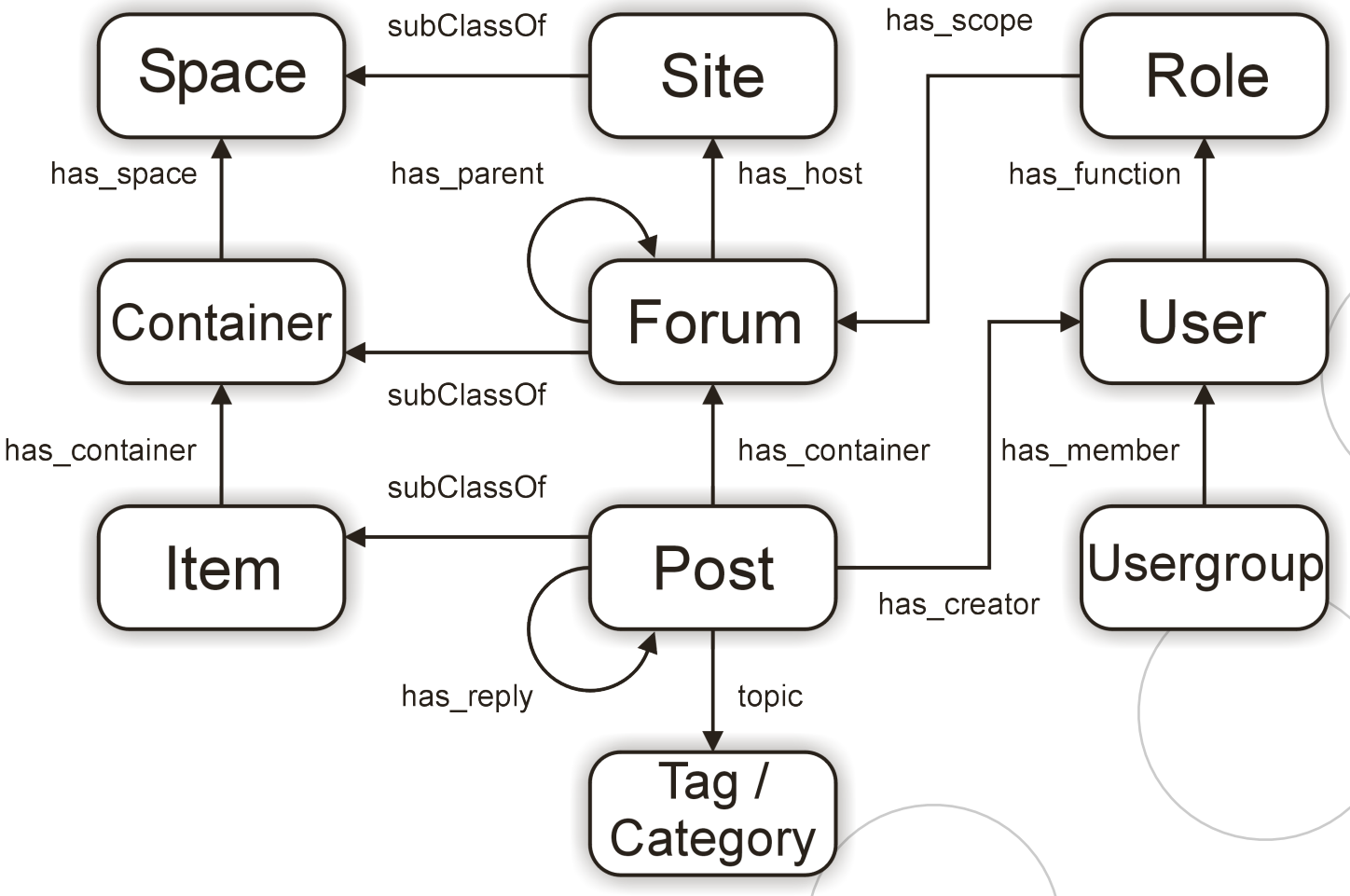



One Person =
Many User Accounts
Blogosphere
Post
Weblog
Boardscape
Bulletin Board
Virtual Forum
Distributed Conversation
Shared
Topic
Unified Community
Usenet Group
Usenetverse
Mailing List
Listspace
National University of Ireland, Galway
science foundation ireland

The SIOC food chain



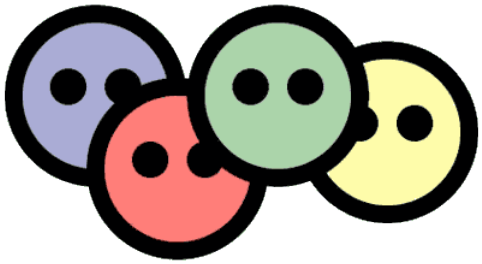
The SIOC Ontology

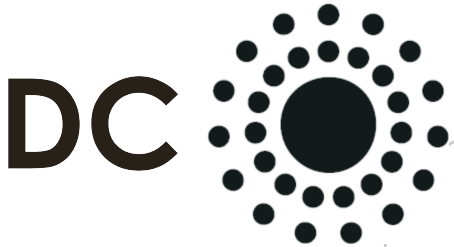


SIOC types

- Social Media Contributions involve different types of content
  - Text, pictures, videos, reviews ...
  - Must be modeled in a different way
- SIOC Types module
  - http://rdfs.org/sioc/types
  - Defining several classes for specific Container and Item
    - Using rdfs:subClassOf, can be used by reasoners
  - Aligned with existing ontologies
    - DCMI ...

SIOC and friends

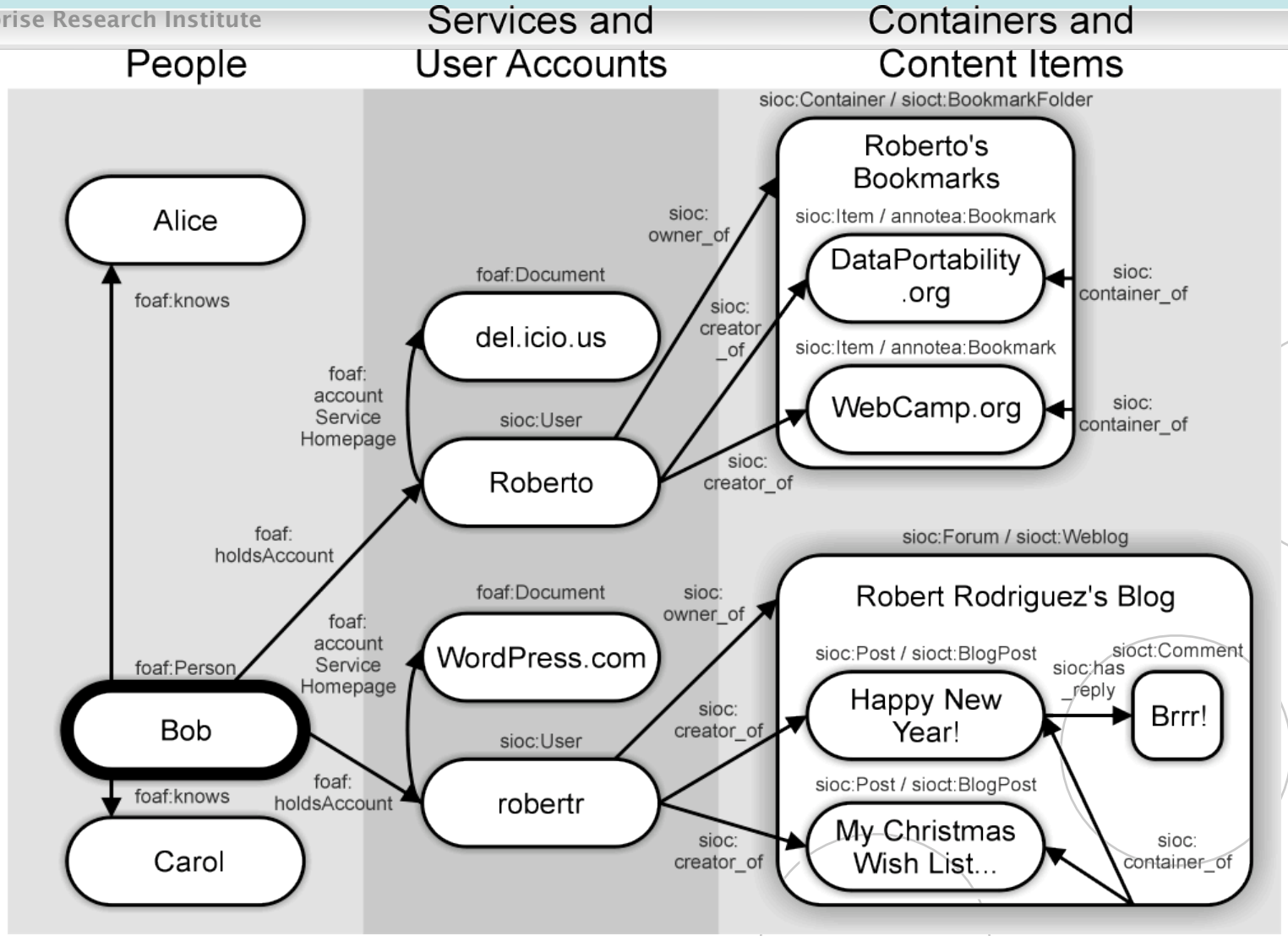




SIOC data example


```
<sioc:Post rdf:about="http://johnbreslin.com/blog/2006/09/07/creating-connections-between-discussion-clouds-with-sioc/">
    <dcterms:title>Creating connections between discussion clouds with SIOC</dcterms:title>
    <dcterms:created>2006-09-07T09:33:30Z</dcterms:created>
    <sioc:has_container rdf:resource="http://johnbreslin.com/blog/index.php?sioc_type=site#weblog"/>
    <sioc:has_creator>
        <sioc:User rdf:about="http://johnbreslin.com/blog/author/cloud/" rdfs:label="Cloud">
            <rdfs:seeAlso rdf:resource="http://johnbreslin.com/blog/index.php?sioc_type=user&amp;sioc_id=1"/>
        </sioc:User>
    </sioc:has_creator>
    <sioc:content>SIOC provides a unified vocabulary for content and interaction description: a semantic layer that can co
    <sioc:topic rdfs:label="Semantic Web" rdf:resource="http://johnbreslin.com/blog/category/semantic-web/"/>
    <sioc:topic rdfs:label="Blogs" rdf:resource="http://johnbreslin.com/blog/category/blogs/"/>
    <sioc:has_reply>
        <sioc:Post rdf:about="http://johnbreslin.com/blog/2006/09/07/creating-connections-between-discussion-clouds-with-s
            <rdfs:seeAlso rdf:resource="http://johnbreslin.com/blog/index.php?sioc_type=comment&amp;sioc_id=123928"/>
        </sioc:Post>
    </sioc:has_reply>
</sioc:Post>
```

Semantics for data portability



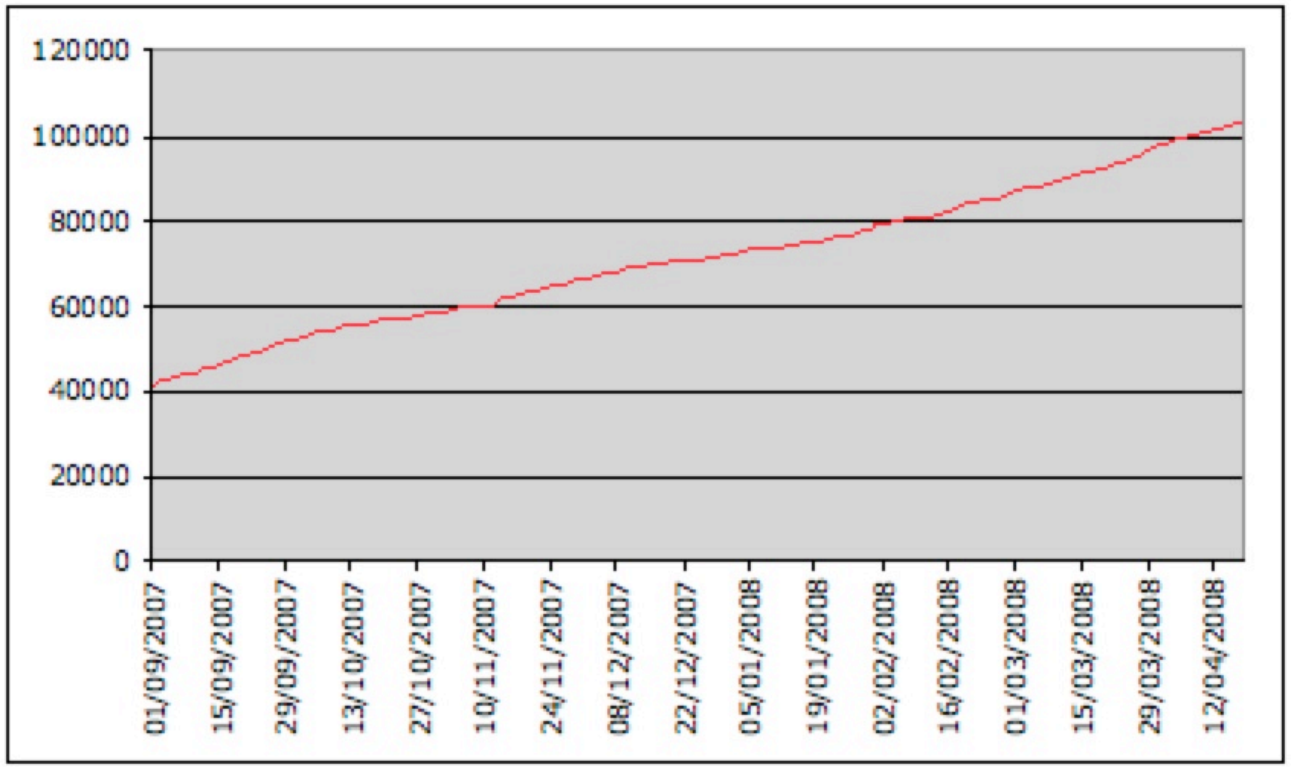
Producing SIOC data

- Over 20 applications for *producing* SIOC data:
  - Many are free and open source
  - Blogs and forums: WordPress, phpBB, Drupal, b2evolution
  - "Legacy" applications: Mailing lists, IRC
  - New media: Twitter, Jaiku, Facebook, Flickr

- APIs for those who may wish to make their own producers:
  - PHP, Perl, Java, Ruby on Rails

SIOC applications

SIOC applications



The SWAN Project

- A **formal ontology** to record and present scientific discourse.
- A **knowledgebase** of hypotheses, claims, evidence, genes and proteins in Alzheimer's Disease research.
- A **community** process built upon Alzforum.
- A **discovery tool** for conflicts, gaps, and missing evidence.
- An **information bridge** to promote collaboration.

SWAN Current Status, October 2008

Ontology

- http://purl.org/swan/1.1/
- Ciccarese et al., *J Biomed Inform* 2008 Oct;41(5):739-51.
- Version 1.2 with SIOC integration nearly complete.

Alzheimer Knowledge Base

- In Public Beta with 144 Alzheimer researchers actively participating.
- Leading Alzheimer researchers & institutes involved - including groups at three pharmaceutical companies.
- Hosted on Alzforum, > 5,000 registered members.

SWAN Alzheimer Knowledge Base beta

Semantic Web Applications in Neuromedicine

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search

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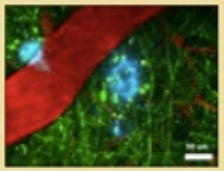

Rapid appearance anc amyloid-beta plaques in a Alzheimer's disease.
Meyer-Luehmann Melanie

click on the title to browse the full content and use the arrows to scroll the list

» Hot Topics (browse all hypotheses)

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- Cell membrane properties play a key role in AD Pathophysiology

» Mechanisms

- Energetics
- Functional Changes of Proteins
- Structural Changes of Proteins

» How to Contribute

- **Build a hypothesis**
- **Critique a hypothesis**
- **Nominate a key paper**
- **Help find connections**
- **Propose new features**
- **Add supporting evidence**

Contact us!

» Knowledge Base

Statements
1323 Research Statements
» 119 Hypotheses
» 21 with Extended annotation
» 98 with Simple annotation
» 1204 Claims
32 Research Questions
26 Comments

Publications
1036 Journal Articles
6 Journal Comments
2 Journal News
30 Web Comments

SWAN Alzheimer Knowledge Base beta

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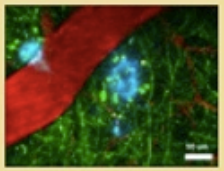

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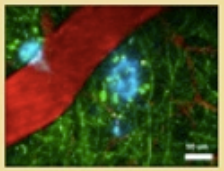

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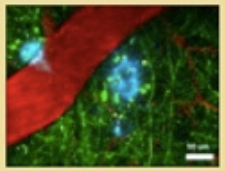

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Inventory of Ideas
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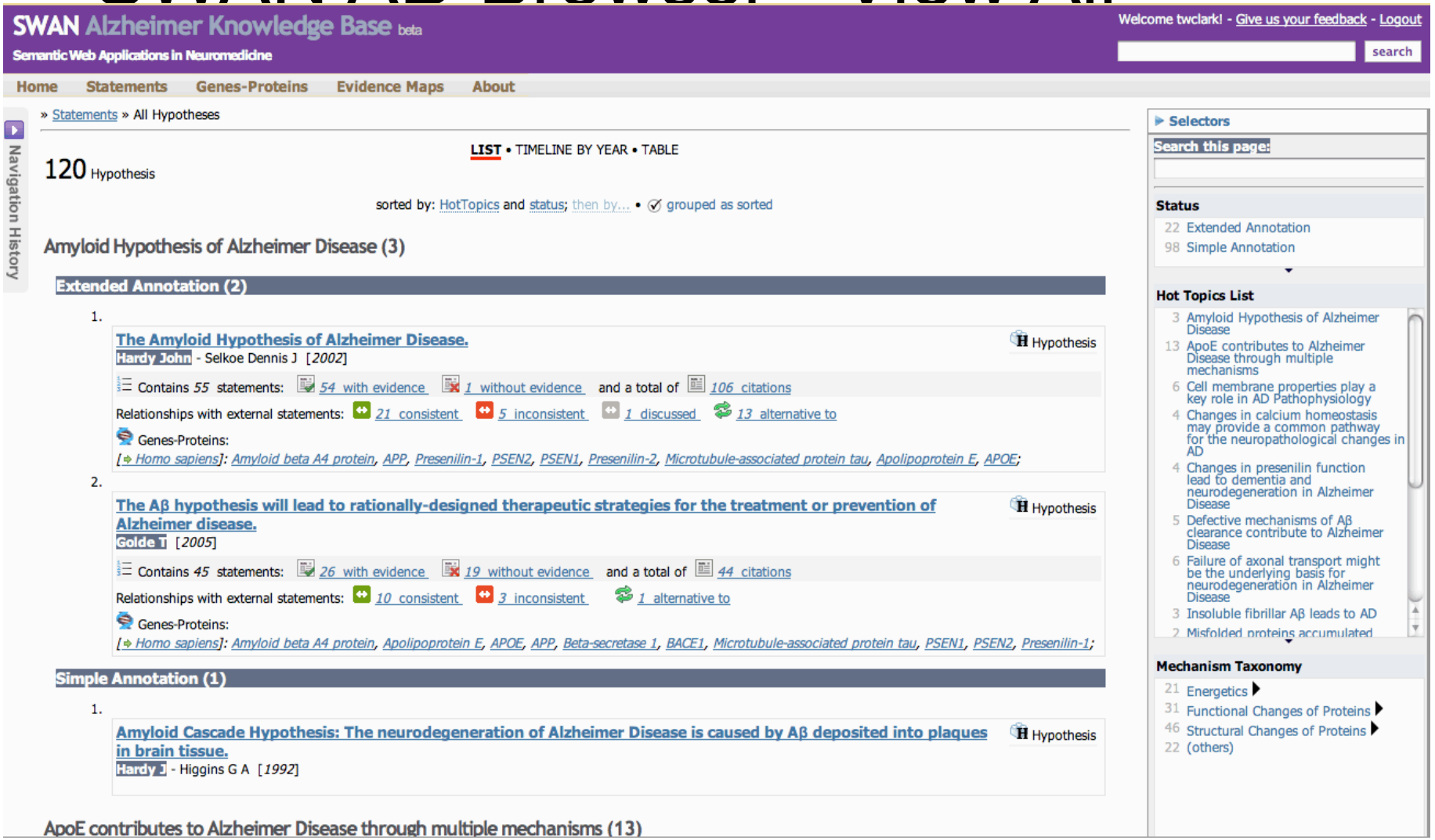
SWAN AD Browser - View All



LIST • TIMELINE BY YEAR • TABLE

6 Hypothesis filtered from 119 originally (Reset All Filters)

sorted by: HotTopics and status; then by... • ✓ grouped as sorted

Soluble oligomeric aggregates of Aß are toxic to neurons and cause AD pathology (6)

Extended Annotation (4)

1. **Naturally secreted oligomers of amyloid beta protein potently inhibit hippocampal long-term potentiation in vivo.** Hypothesis

Walsh Dominic M - Klyubin Igor, Fadeeva Julia V, Cullen William K, Anwyl Roger, Wolfe Michael S, Rowan Michael J, and Selkoe Dennis J [*2002*]

Contains *28* statements: *28* with evidence *0* without evidence and a total of *62* citations

Relationships with external statements: *16* consistent *2* inconsistent *1* discussed

Genes-Proteins: [Homo sapiens]: *APP*, *Amyloid beta A4 protein precursor*, *IDE*, *Insulin-degrading enzyme*, *Presenilin-1*;

2. **Oligomeric amyloid beta ligands (ADDLs) are a molecular basis for reversible memory loss.** Hypothesis

Gong Yuesong - Chang Lei, Lambert Mary P, Klein W L, Lacor Pascale N, Finch Caleb E, Krafft Grant A, and Viola Kirsten L [*2003*]

Contains *46* statements: *46* with evidence *0* without evidence and a total of *106* citations

Relationships with external statements: *15* consistent *4* inconsistent

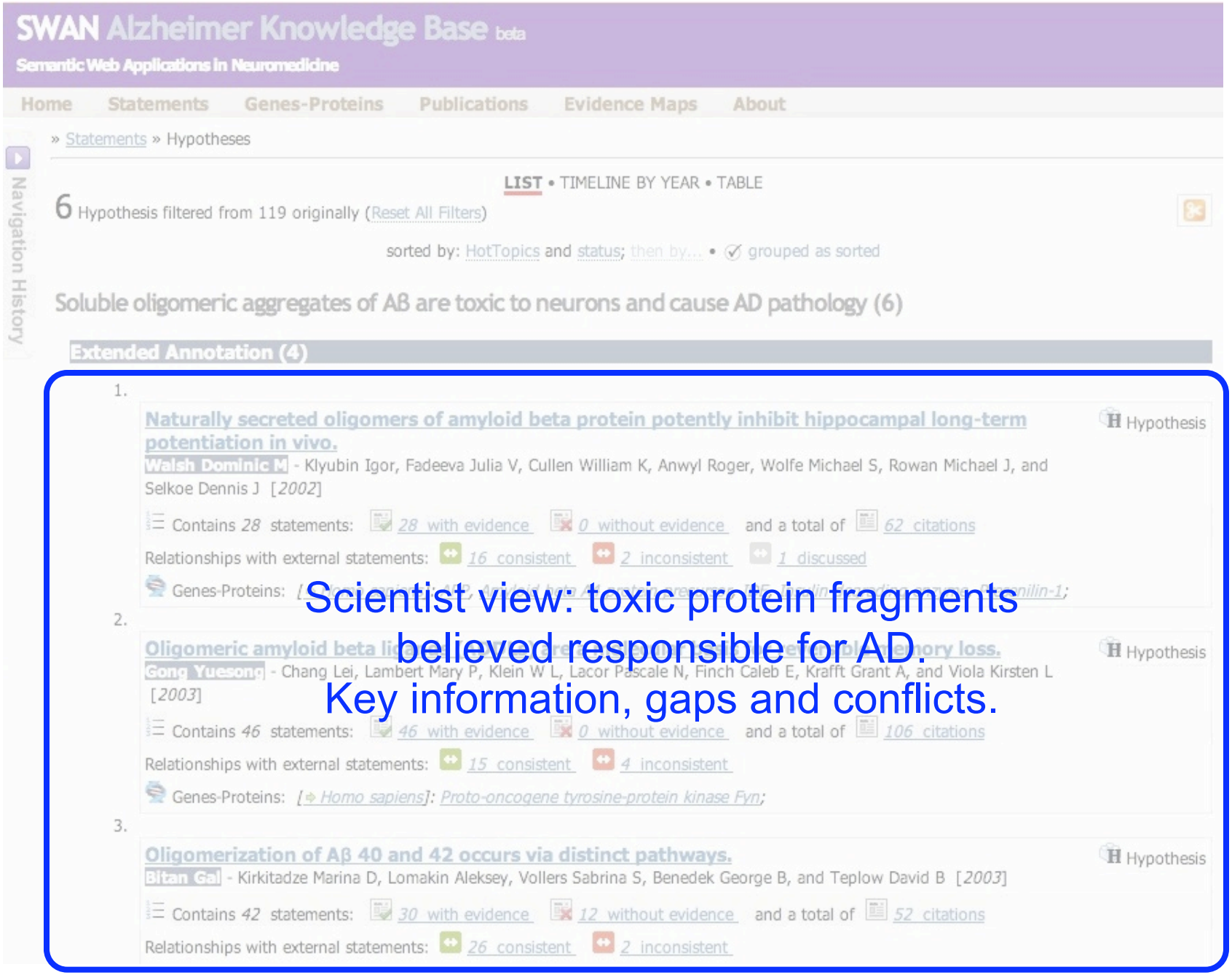
Genes-Proteins: [Homo sapiens]: *Proto-oncogene tyrosine-protein kinase Fyn*;

3. **Oligomerization of Aβ 40 and 42 occurs via distinct pathways.** Hypothesis

Bitan Gal - Kirkitadze Marina D, Lomakin Aleksey, Vollers Sabrina S, Benedek George B, and Teplow David B [*2003*]

Contains *42* statements: *30* with evidence *12* without evidence and a total of *52* citations

Relationships with external statements: *26* consistent *2* inconsistent



Scientist view: toxic protein fragments believed responsible for AD.
Key information, gaps and conflicts.

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Contains *28* statements: *28* with evidence *0* without evidence and a total of *62* citations

Relationships with external statements: *16* consistent *2* inconsistent *1* discussed

Genes-Proteins: [Homo sapiens]: *APP*, *Amyloid beta A4 protein precursor*, *IDE*, *Insulin-degrading enzyme*, *Presenilin-1*;

2. **Oligomeric amyloid beta ligands (ADDLs) are a molecular basis for reversible memory loss.** Hypothesis

Gong Yuesong - Chang Lei, Lambert Mary P, Klein W L, Lacor Pascale N, Finch Caleb E, Krafft Grant A, and Viola Kirsten L [*2003*]

Contains *46* statements: *46* with evidence *0* without evidence and a total of *106* citations

Relationships with external statements: *15* consistent *4* inconsistent

Genes-Proteins: [Homo sapiens]: *Proto-oncogene tyrosine-protein kinase Fyn*;

3. **Oligomerization of Aβ 40 and 42 occurs via distinct pathways.** Hypothesis

Bitan Gal - Kirkitadze Marina D, Lomakin Aleksey, Vollers Sabrina S, Benedek George B, and Teplow David B [*2003*]

Contains *42* statements: *30* with evidence *12* without evidence and a total of *52* citations

Relationships with external statements: *26* consistent *2* inconsistent

For any statement about AD, what is the evidence?

8. **The amyloid cascade hypothesis has been modified to include soluble Aβ oligomers** SHOW Info SHOW 3 Citations: Supporting(3)

9. **Aβ oligomers are undetected in typical pathology assays, and thus constitute missing links in the pathogenic cascade.** SHOW Info SHOW 1 Citations: Supporting(1)

10. **Aβ oligomers applied to brain slices or injected in vivo cause failure of hippocampal LTP.** SHOW Info HIDE 4 Citations: Supporting(4) SHOW 5 Related statements: Consistent(4) Inconsistent(1)

Supporting Evidence

Wang H, Pasternak J, Kuo H, Ristic H, Lambert M, Chromy B, Viola K, Klein W, Stine W, Krafft G, Trommer B
Soluble oligomers of beta amyloid (1-42) inhibit long-term potentiation but not long-term depression in rat dentate gyrus.
Brain research. 2002 Jan 11;924(2):133-40

Gong Y, Chang L, Viola K, Lacor P, Lambert M, Finch C, Krafft G, Klein W
Alzheimer's disease-affected brain: presence of oligomeric A beta ligands (ADDLs) suggests a molecular basis for reversible memory loss.
Proceedings of the National Academy of Sciences of the United States of America. 2003 Sep 2;100(18):10417-22

Walsh D, Klyubin I, Fadeeva J, Cullen W, Anwyl R, Wolfe M, Rowan M, Selkoe D
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Nature. 2002 Apr 4;416(6880):535-9

Lambert M, Barlow A, Chromy B, Edwards C, Freed R, Liosatos M, Morgan T, Rozovsky I, Trommer B, Viola K, Wals P, Zhang C, Finch C, Krafft G, Klein W
Diffusible, nonfibrillar ligands derived from Abeta1-42 are potent central nervous system neurotoxins.
Proceedings of the National Academy of Sciences of the United States of America. 1998 May 26;95(11):6448-53

11. **Soluble Aβ oligomers have been implicated in physical degeneration of synapses.** SHOW Info SHOW 2 Citations: Supporting(2) SHOW 1 Related statements: Consistent(1)

12. **Soluble Aβ oligomers have been implicated in age-dependent onset of memory failure in APP transgenic mice.** SHOW Info SHOW 4 Citations: Supporting(4) SHOW 1 Related statements: Consistent(1)

13. **Memory failure in APP transgenic mice is reversed by anti-Aβ; antibodies, and the memory recovery is rapid, occurring within 24 h of a single injection of antibody, without reducing amyloid plaque load.** SHOW Info SHOW 4 Citations: Supporting(4)

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Are statements inconsistent?
Can an experiment resolve them?

4. Although there are no known mutations of tau in AD, tau mutations cause FTDP-17 (frontotemporal dementia with parkinsonism linked to chromosome 17) and are associated with the development of corticobasal degeneration, progressive supranuclear palsy, and Pick's disease. SHOW Info SHOW 1 Citations: Supporting(1) SHOW 1 Related statements: Consistent(1)
5. Interference with microtubule-dependent axonal transport is one possible mechanism by which altered tau exerts neurotoxicity. SHOW Info SHOW 1 Related statements: Consistent(1)
6. High levels of htau40 (the longest human tau isoform) overexpression in neuroblastoma, primary cortical neurons, and retinal ganglion cells (RGCs) have been reported to block the trafficking of membranous organelles and neurofilaments, suggesting that rates of fast and slow transport are impaired. SHOW Info SHOW 1 Citations: Supporting(1) HIDE 2 Related statements: Consistent(1) Inconsistent(1)

   Consistent statements

   Human wild-type tau (the longest form), expressed about threefold over endogenous levels, induces neural dysfunction in entorhinal cortex at old age (more than 20 months), accompanied by synapse loss and accumulation of hyperphosphorylated tau resulting in a memory deficit, while adult mice (>12 months old) are no different from non-Tg. Takashima A

   Inconsistent statements

   Whether or not axonal transport is impaired depends not only on expression levels, as our Tau-4R mice expressed only about twofold over endogenous mouse tau, and we did not observe aggregates of tau. Van Leuven F
7. By analyzing axonal transport in optic axons from two different lines of mice that either overexpress or lack tau, it was determined that rates of fast and slow transport are not significantly impaired by modulating tau expression. SHOW Info
8. Axonal transport is not necessarily dependent on the presence of tau and is not significantly inhibited by moderately elevated levels of tau. SHOW Info
9. Previous studies showed that brain tau is absent in tau knock-out mice and is overexpressed in 8c mice. SHOW Info SHOW 2 Citations: Supporting(2)

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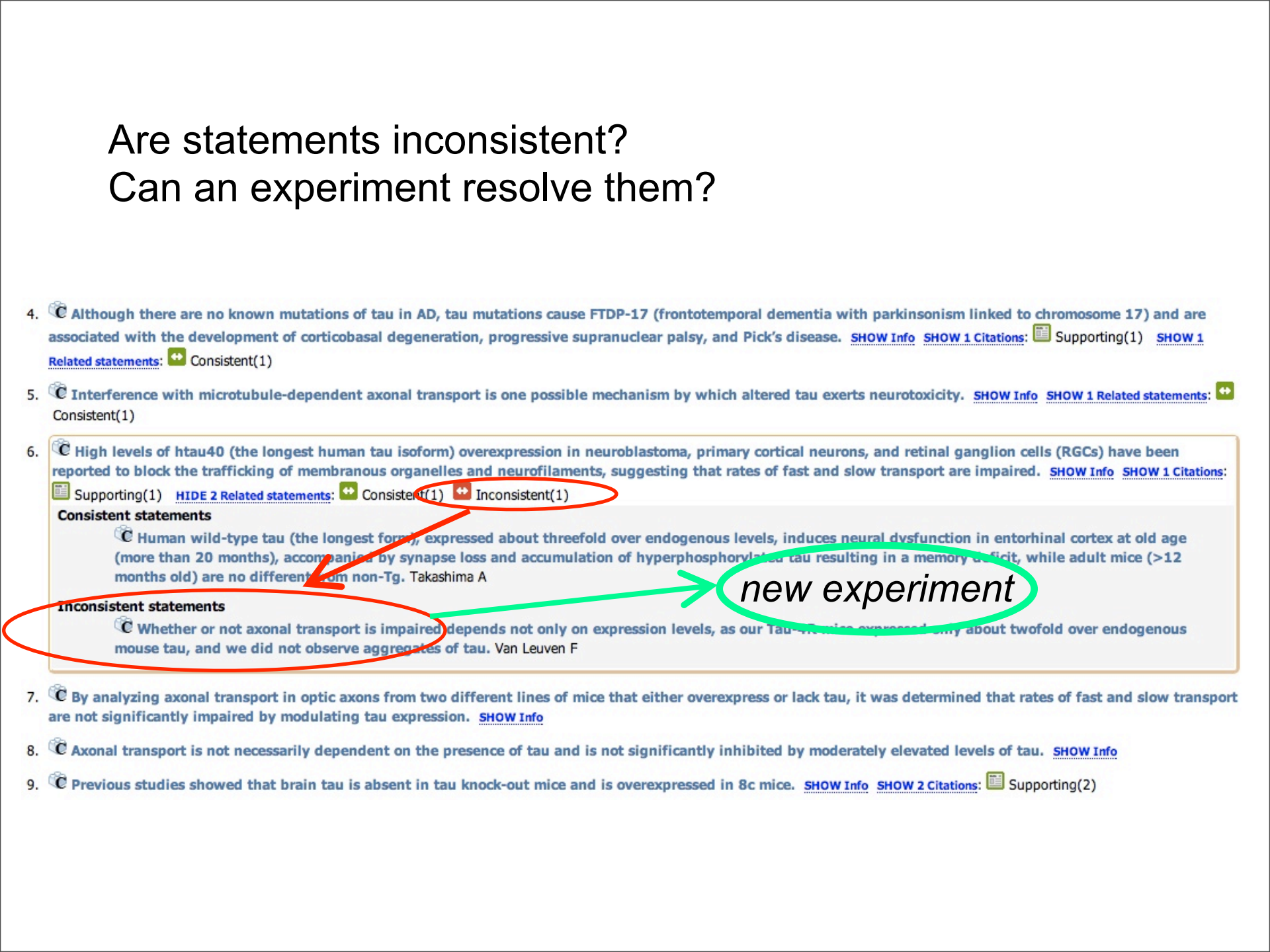

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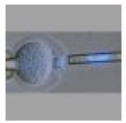
Science Collaboration Framework

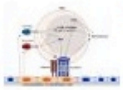
- SCF is a special distribution of Drupal
  - Designed to support biomedical web communities.
  - Collaboration of Harvard, Alzforum, MGH.
  - Initial focus communities: Stem Cells, Parkinson's Disease
- SCF is being developed to work with SWAN ontology.
  - Drupal "Node proxy" architecture reads RDF triples.
  - Specific models for biomedical entities.
- Vision
  - Many SCF-based communities
  - Resource, information and discourse sharing via triple

StemBook

StemBook is a comprehensive, open-access collection of original, peer-reviewed chapters covering topics related to Stem Cell Biology. Read More

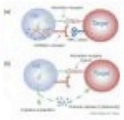

Cellular and nuclear reprogramming

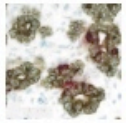

Genomics and proteomics


Renewal

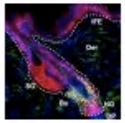

Ectoderm specification and differentiation

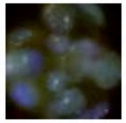

Germ cell and somatic stem cell biology in reproduction


Stem cell immunology

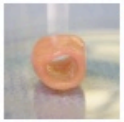

Endoderm specification and differentiation


Mesoderm specification and differentiation


Therapeutic prospects


Epigenetics


Niche biology, homing, and migration


Tissue engineering

News

Behind the Stem Cell Breakthrough

Editorial, *New York Times* 30 November 2007

The stunning announcement by Japanese and American research teams that they have obtained highly promising stem cells without having to destroy an embryo could help free scientists from shackles that have long hobbled their efforts. It is especially important for a critical field of research that is far behind where it could have been if the Bush administration and Congressional conservatives had not thrown up so many roadblocks.

Commentaries

May 30, 2008

Genomic approaches provide insights into the molecular basis of pluripotency

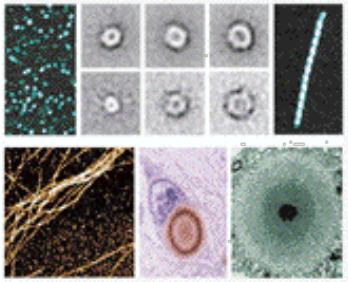
more

Oxidative Stress Hypothesis

By Joe Parkinson

Morbus Parkinson [PD (Parkinson's disease)] is a neurodegenerative disorder affecting dopaminergic neurons in substantia nigra. Mitochondrial respiratory complex I deficiency and oxidative stress have been reported to occur in these neurons, and cytoplasmic aggregates ('Lewy bodies') of α-synuclein and other proteins have been observed in the affected neurons.

Autosomal recessive mutations within the Parkin gene are associated with degeneration of the substantia nigra and locus coeruleus and an inherited form of Parkinson's disease (PD). As loss-of-function mutations in parkin are responsible for a familial variant of PD, conditions that affect wild-type parkin are likely to be associated with increased risk of idiopathic disease. Previous studies uncovered a unique vulnerability of the parkin protein to dopamine (DA)-induced aggregation and inactivation. In this study, we compared several proteins that share structural elements or ubiquitinating activity with parkin. We report that oxidative stress in several cell lines and primary neurons induces the aggregation of parkin into high molecular weight species, at least a portion of which are self-associated homo-multimers.



THE ROLE OF α-SYNUCLEIN IN PARKINSON'S DISEASE: INSIGHTS FROM ANIMAL MODELS
Eleonora Maries et al.,
Nature Reviews | Neuroscience SEPTEMBER 2003 | VOLUME 4 | Page 728

While parkin was preferentially affected by excess DA, each of the E3 proteins tested were made more insoluble by oxidative stress, and they varied in degree of susceptibility (e.g. parkin > HHARI congruent with CHIP > c-Cbl > E6AP). These conditions of oxidative stress were also associated with decreased parkin E3 ligase activity. Similar to recently conducted studies on alphasynuclein processing, both macroautophagy and the proteasome participate in parkin degradation, with the proteasome playing the predominant role for normal parkin turnover and macroautophagy being more important in the degradation of aggregated parkin. These data further highlight the selective vulnerability of parkin to DA-induced modifications, demonstrating for the first time the ability of both endogenous and ectopically expressed parkin to transition into an insoluble state in part through self-association and next page

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References

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Djamgoz MB, Hankins MW, **Hirano J, Archer SN: Neurobiology of retinal dopamine in relation to degenerative states of the tissue.** Vision Res 1997, 37:3509-3529. PubMed | Publisher Full Text

Commentary

View whole discussion

Role of Prostagladin E2 in stem cell development

Added: Wednesday, 22 August, 2007, 15:51 GMT 16:51 UK

Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Aliquam vel mauris. Quisque consequat erat sit amet neque. Cras ut risus nec est blandit suscipit. Vivamus libero diam, iaculis ullamcorper, pretium et, sagittis ac, mauris.

John Doe, Director, BioBlah

Added: Wednesday, 22 August, 2007, 15:51 GMT 16:51 UK

SWAN-SIOC Integration

- SIOC OWL-DL compliance (Core + Types)
- New SIOC Type: OnlineJournal
- SWAN JournalArticle, Citation, DiscourseElement -> SIOC Item
- SWAN WebArticle, WebNews, WebComment -> SIOC Post
- SWAN discourse properties -> SIOC related_to
- SWAN “Tag” replaced by Tag Ontology + MOAT
- SWAN ResearchStatement linked by SIOC “EmbedsKnowledge” to SIOC Items
- Pre-aligning SWAN Citation with BIBO

Looking Ahead

- SWAN 1.2 (Q4 2008)
  - will be aligned with SIOC
- SWAN 1.3 (Q1 2009)
  - plans to align with Biblio
  - will model document-embedded metadata
- SWAN+SIOC
  - will be a joint member submission to W3C

SWAN+SIOC Team

DERI: Uldis Bojars, John Breslin*, Ronan Fox, Alexandre Passant, Mathias Samwald, Holger Stenzhorn

Eli Lilly & Company - Susie Stephens

Harvard Medical School: Paolo Ciccarese, Tim Clark*, Sudeshna Das

Jacobs University: Christophe Lange

Massachusetts General Hospital - Marco Ocana

Yale Medical School - Kei Cheung

* convenors