A pattern language for organising laboratory knowledge on the web

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#labpatterns

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THE UNIVERSITY OF AUCKLAND
NEW ZEALAND
Te Whare Wānanga o Tāmaki Makaurau

Laboratory methods resources

- Experience
- Lab-specific protocols
- Methodology journals
- Research articles
- Technology vendors
- Peer-reviewed video
- Web 2.0

Much of the laboratory knowledge we require is

Diffuse

and

Disconnected

or worse left

Implicit

Some of our laboratory knowledge is effectively inaccessible through being difficult to

Discover

Understand

Reuse

Which in turn has consequences for the

Efficiency

Reproducibility

Quality

of our laboratory science…

My research aims to help

Locate

Understand

(re)Use

Design

Experiment Semantics

Data Semantics

Design Patterns

Structured documentation that captures expert knowledge in a generalisable way…

Solution
Problem
Context
FORCES

* Alexander, C., Ishikawa, S., & Silverstein, M. (1977). *A pattern language: Towns, buildings, construction*. New York: Oxford University Press.
Gamma, E. *et al.* (1995). Design patterns: Elements of reusable object-oriented software. Reading, Mass: Addison-Wesley.

A Design Pattern for Lab Science....

Ingredients
Ingredients
Ingredients

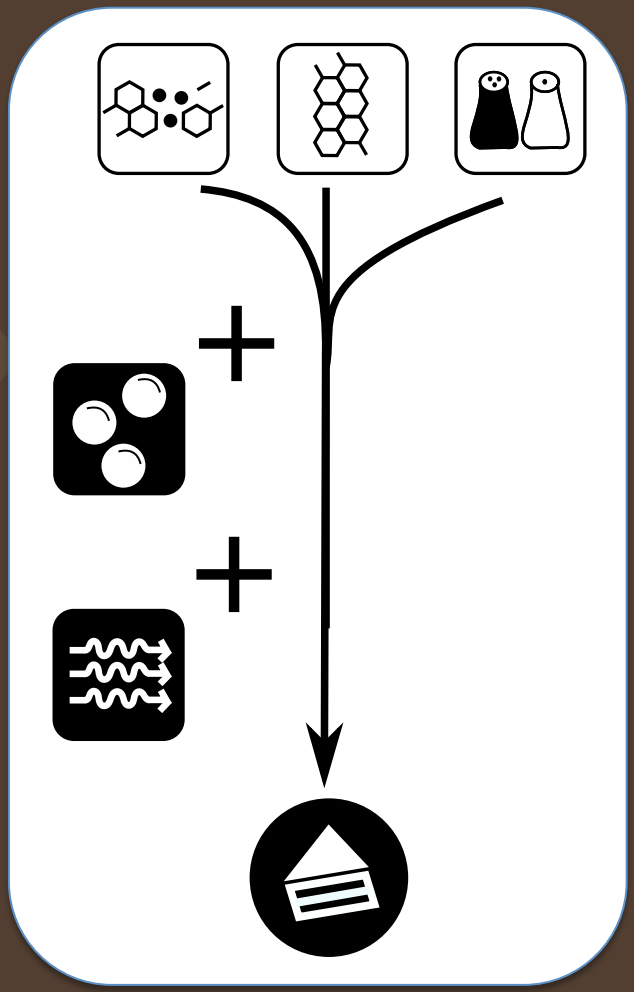
Step 1....
Step 2....
Step 3....

Cake-like Structure

Context, Problem, Solution

Forces:

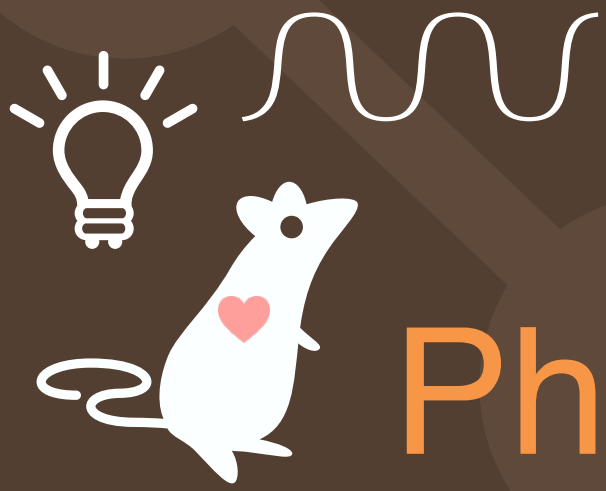
- Structure Providers
- Structure Modifiers
- Flavours
- Aeration
- Heat Transfer



So how can we use design patterns in a

Linked Science

setting?



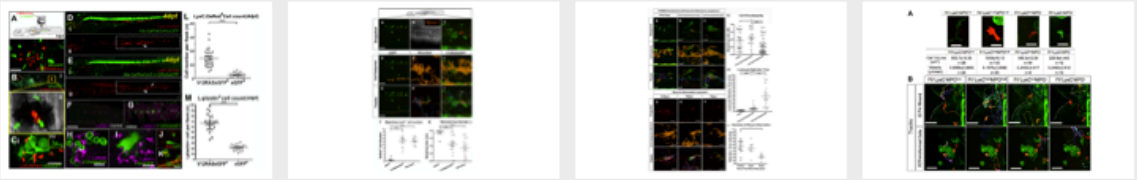
Solution
Problem
Context
FORCES

Photons Alive

RESEARCH ARTICLE

Live Imaging of Innate Immune Cell Sensing of Transformed Cells in Zebrafish Larvae: Parallels between Tumor Initiation and Wound Inflammation

Yi Feng, Cristina Santoriello, Marina Mione, Adam Hurlstone, Paul Martin



“For all of our live imaging studies, larvae were mounted on their sides in 1.5% low melting agarose (Sigma), in a glass-bottomed dish, filled with 0.3% Danieau's solution containing 0.01 mg/ml Tricaine.”

imaging – diagnostic procedure
agarose – material chemical polysaccharide
tricane – aminobenzoic anesthetic agent

http://bioportal.bioontology.org/annotator

Annotation with current ontological terms gives us the

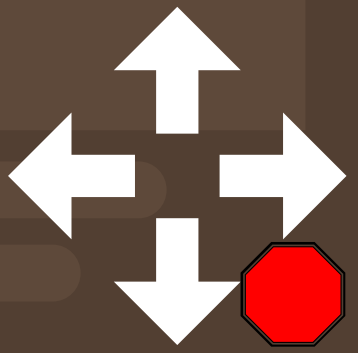
What

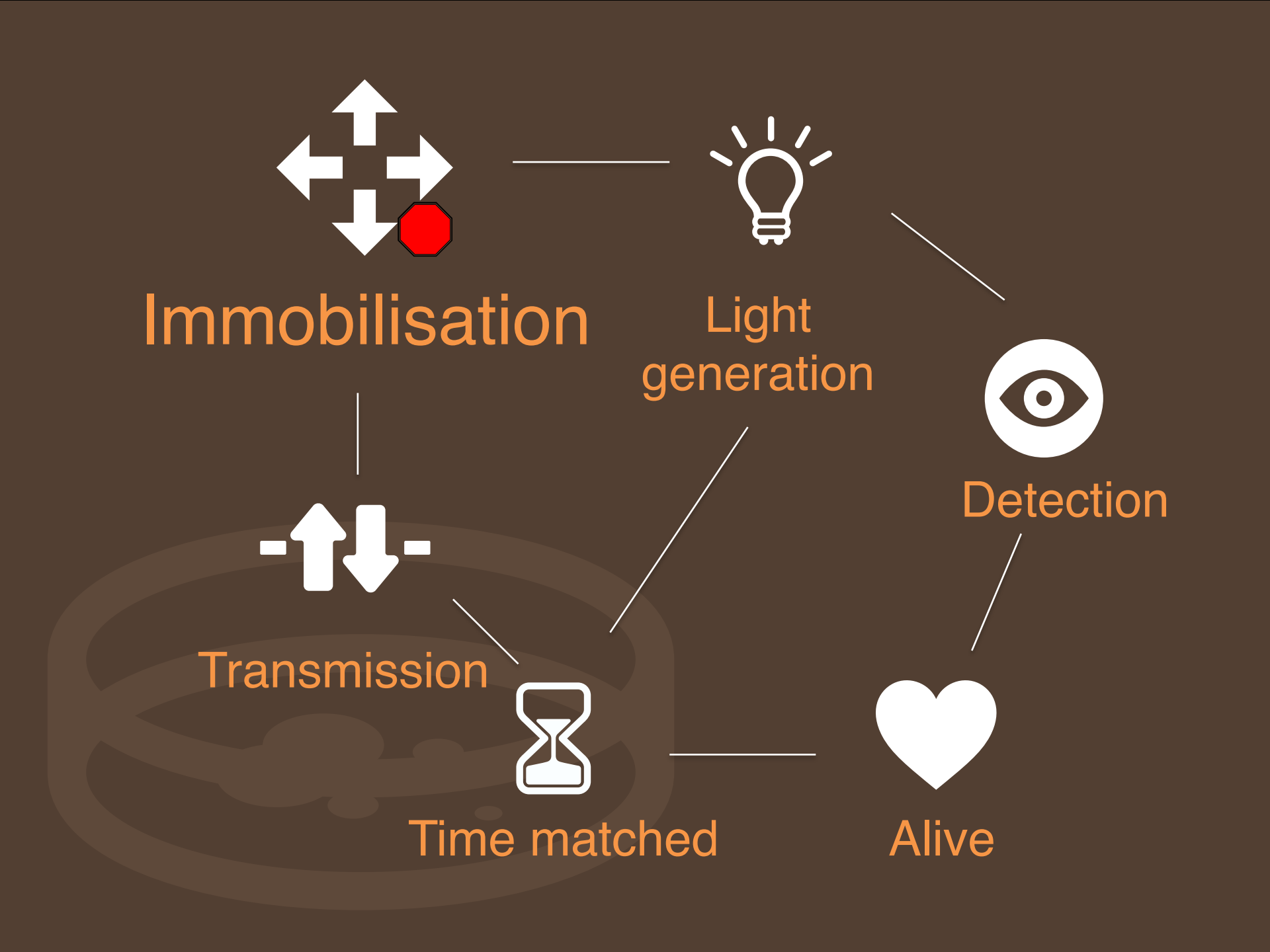
but does not help us understand the

Why

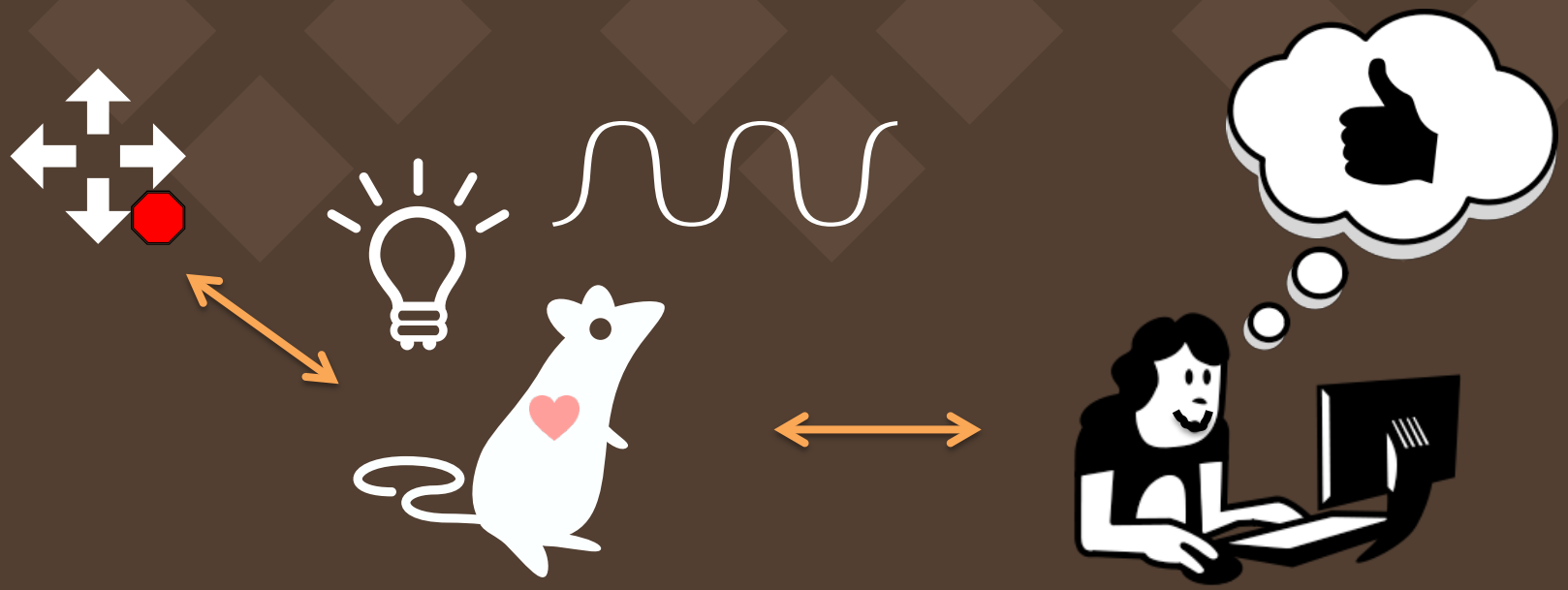
“For all of our live imaging studies, larvae were mounted on their sides in 1.5% low melting agarose (Sigma), in a glass-bottomed dish, filled with 0.3% Danieau's solution containing 0.01 mg/ml Tricaine.”

= immobilisation




Immobilisation
Light generation
Detection
Transmission
Time matched
Alive

"For all of our live imaging studies, larvae were mounted on their sides in 1.5% low melting agarose (Sigma), in a glass-bottomed dish, filled with 0.3% Danieau's solution containing 0.01 mg/ml Tricaine."



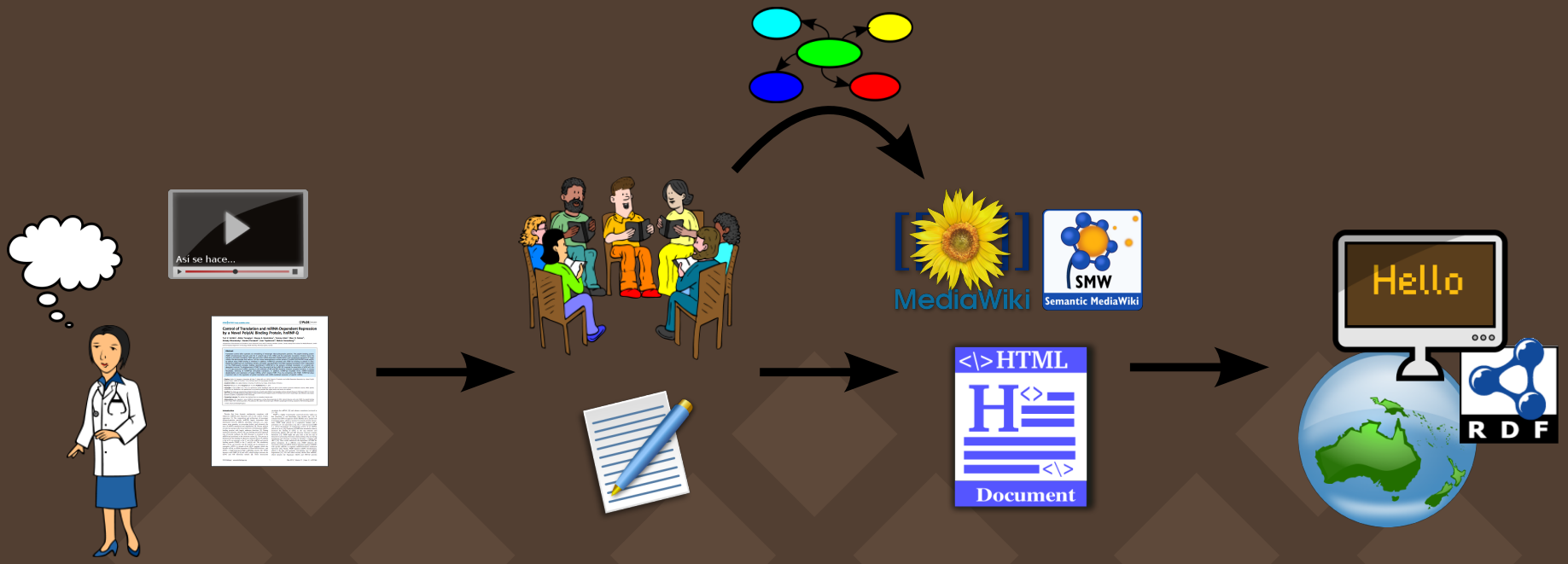
So how can we make laboratory patterns and have them and their

Concepts

exist as

Web Addressable

entities?



Lab Knowledge

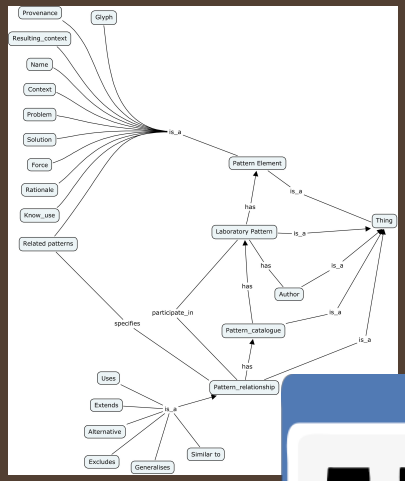
Lab Pattern

Semantic Pattern Wiki

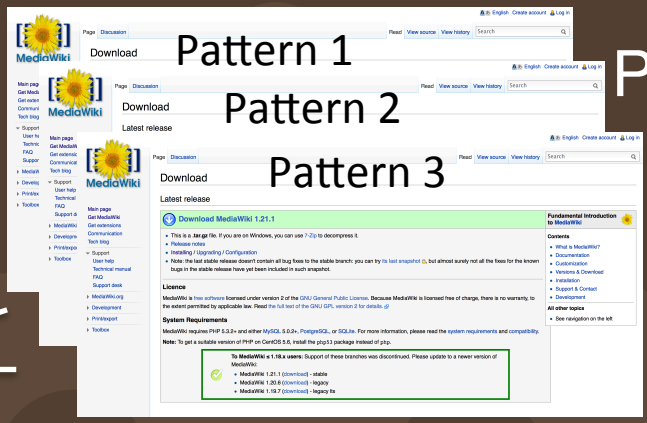
Vocab and Knowledge As Linked Data

A wiki for laboratory semantics

Pattern Schema RDF/OWL

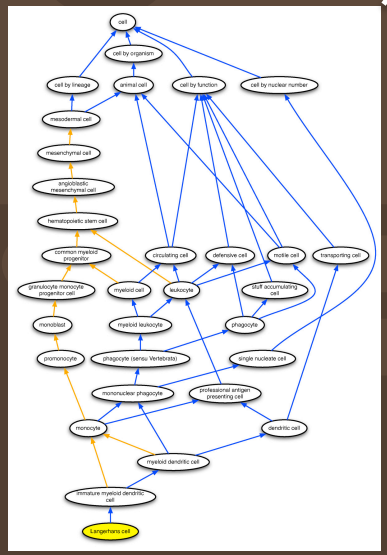


Pattern Wiki Pages



Pattern Author

Semantic Form



Pattern concept and terms in RDF encoding

linked data endpoint

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Thanks!

Contact me if you are a lab person and want to share your knowledge…

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https://sites.google.com/site/labpatterns/home

Acknowledgements

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Dr Fabiana Kubke
Dr Siouxsie Wiles
CeR folks

Pictograms from The Noun Project

Surveillance - Marwa Boukarim
Magnifying glass -Azis Hertanto
Thinking man -Lorie Shaull
Juggle - Johan H. W. Basberg
Blueprint - Dimitry Sokolov
Floppy disk - Monika Ciapala
Cupcake - Christopher Reyes
Beaker, mouse, microbe, petri-dish Timothy Dilich
Wi-fi pencil - Nathan Thomson
Linked graph- Nicholas Menghini
Robot - Julien Deveaux
Arrow - P.J. Onori
Light bulb - Chris Brunskill of SOLIDMEDIA
Transmission -Anna Donlin

Researchers must consult sources repeatedly and

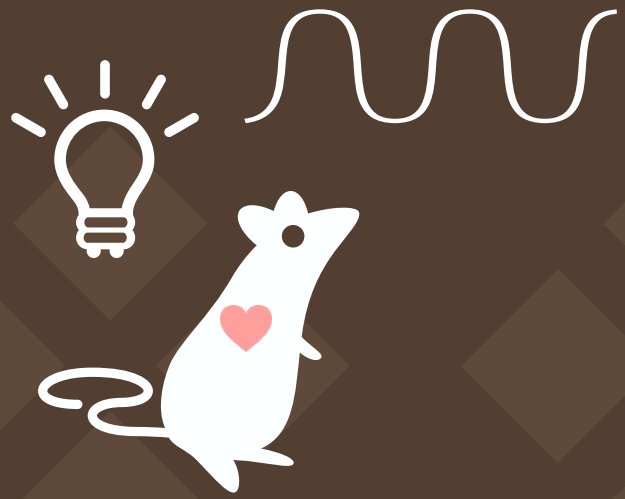
Manually

in a

Human

and

Knowledge Intensive Process



Photons Alive

Context…

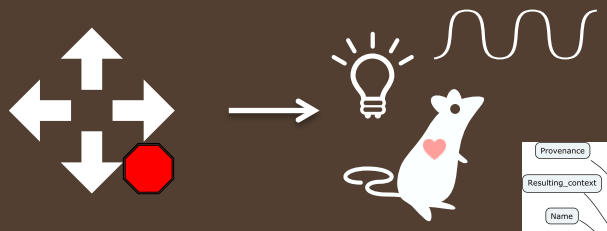
Problem…

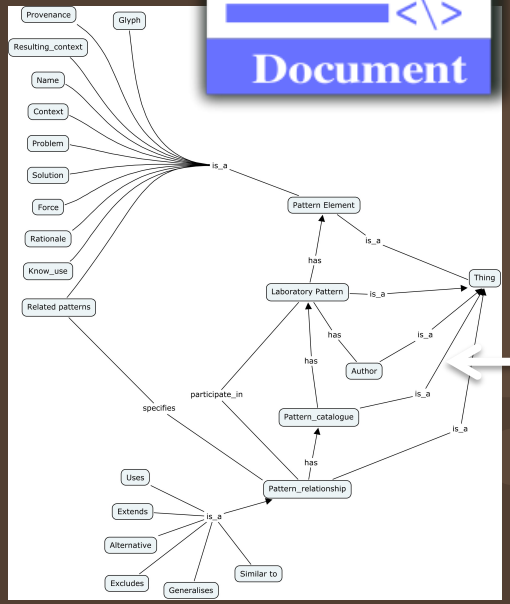
Forces…

Solution…

Find me all know instances of methods containing documents where anesthetics have been used as part of the immobilisation strategy for a live imaging experiment and that also contain the text string “cancer OR tumor* OR invasion”….

A wiki for laboratory semantics





http://lp.com/pattern/x

Pattern_x

has

Force_y

http://lp.com/pattern/force/y

instance_of

http://plos.org/paper/z

So how can we use design patterns in a

Linked Science

setting?

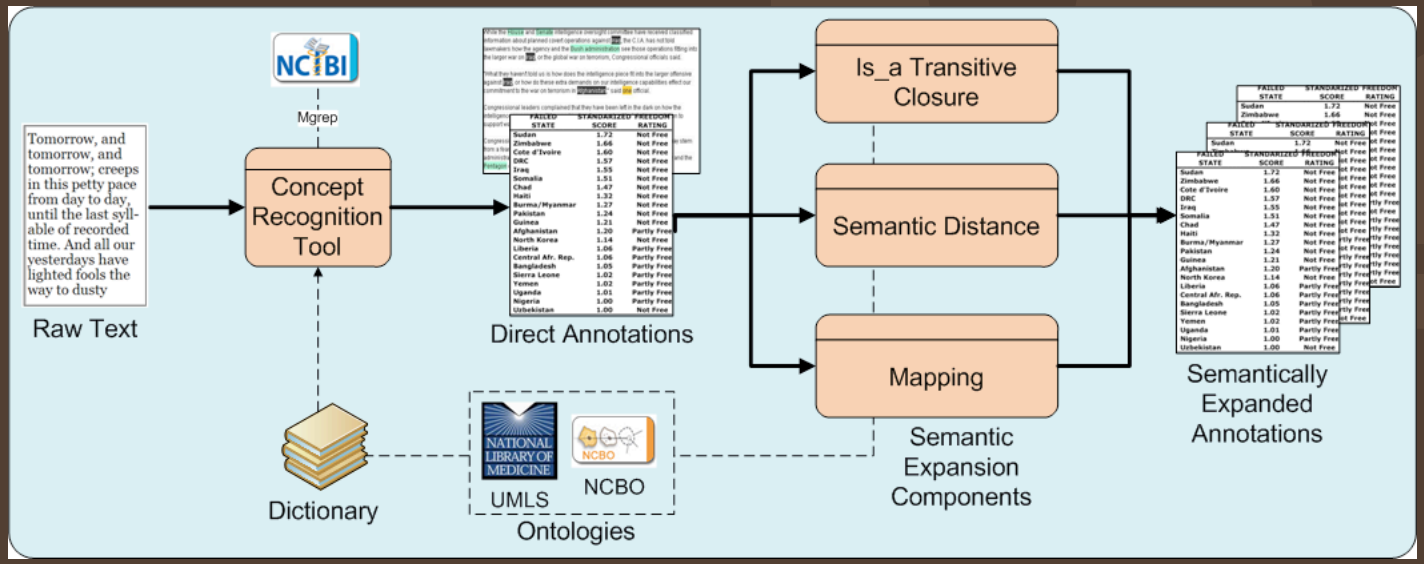
What can they add over existing

Ontologies

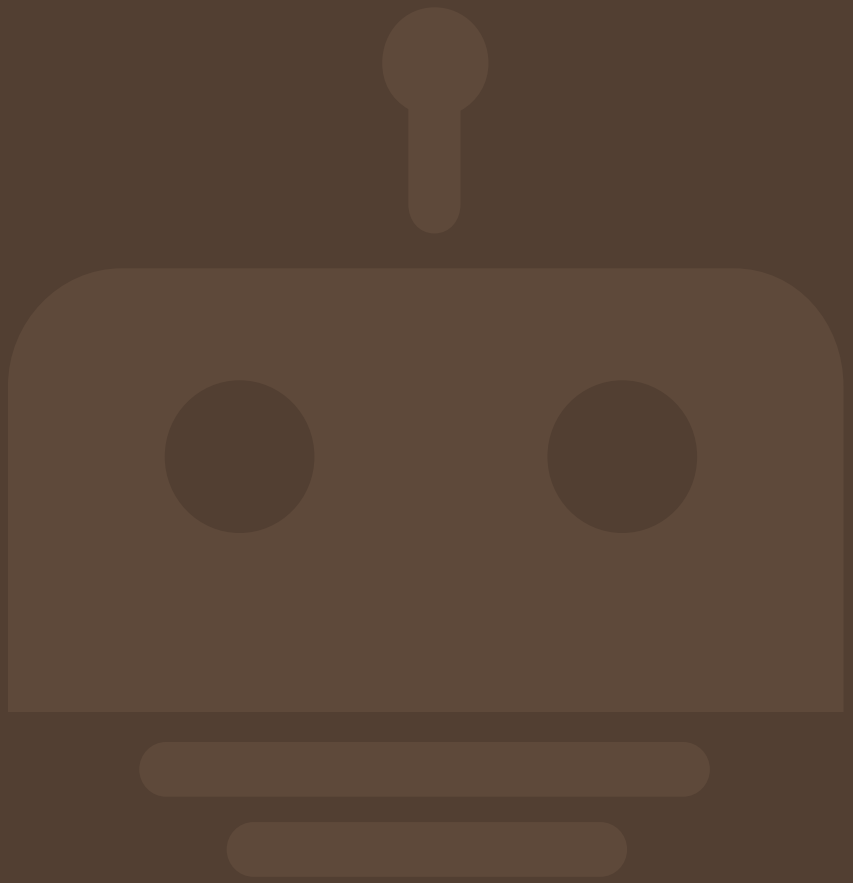
that can help with the semantics of a biological experiment?

"For all of our live imaging studies, larvae were mounted on their sides in 1.5% low melting agarose (Sigma), in a glass-bottomed dish, filled with 0.3% Danieau's solution containing 0.01 mg/ml Tricaine."

NCBO Annotator



Shah et al BMC Bioinformatics. 2009 Sep 17;10 Suppl 9:S14



Semantic wikis can be seen as a microcosm of the Semantic
Web, since users exploit semantic technolo gies while
retaining a very accessible Web collaboration interface.

In summary –
Patterns
Patterns offer us a way to capture and aggregate practical laboratory knowledge that complements current appraches

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