

Stuff you can (and should) do in OWL

```
(defmacro narrow-r-of (class r)
  "All r of class are class, anything with a class as r is a class"
  `(list
    (class ,class :partial (restriction ,r (all-values-from ,class)))
    (sub-class-of (restriction ,r (some-values-from ,class)) ,class)))
```

A "Pattern" (can be expressed in Common Logic too)

```
(defmacro cant-be-part-of (part &rest classes)
  "part can't be part of any of the classes"
  `(progn
    (class ,part :partial
      (restriction !ro:part_of (all-values-from (complement-of (union-of ,@classes)))))))
```

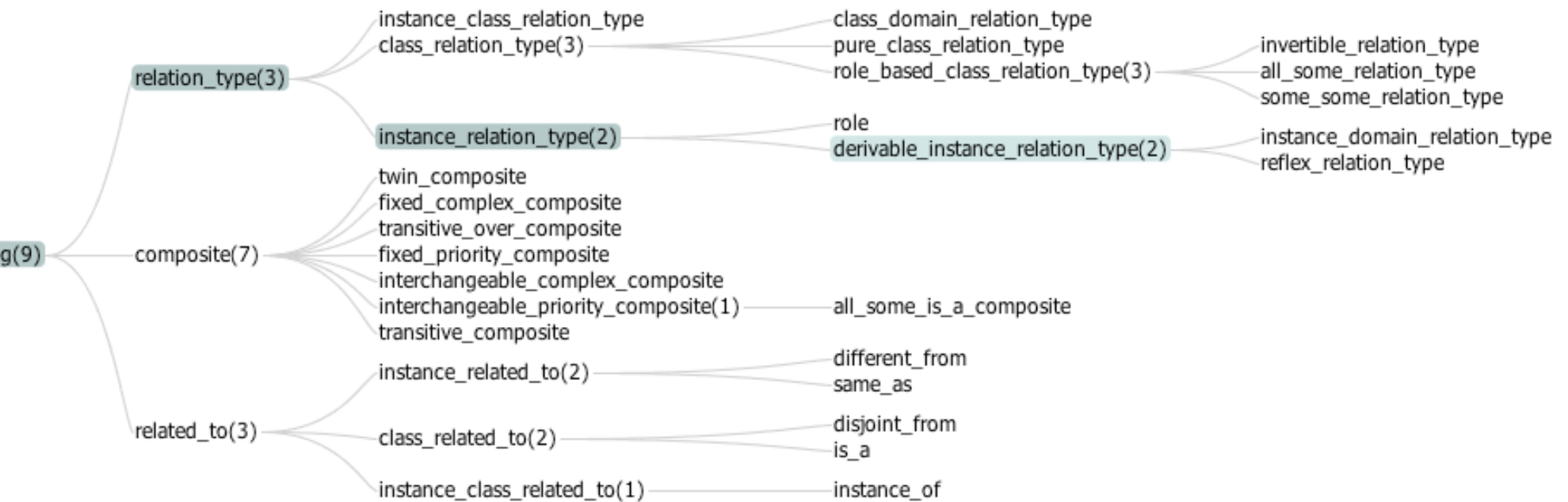
```
(defmacro no-parts (class)
  "Instances of this class can't have parts, or be parts"
  `(progn
    (class ,class :partial (restriction !ro:part_of (max-cardinality 0)))
    (class ,class :partial (restriction !ro:has_part (max-cardinality 0)))))
```

```
(narrow-r-of !snap:IndependentContinuant !ro:part_of)
(narrow-r-of !snap:DependentContinuant !ro:part_of)
(narrow-r-of !snap:Role !ro:part_of)
(narrow-r-of !snap:Quality !ro:part_of)
(cant-be-part-of !snap:TwoDimensionalRegion
  !snap:OneDimensionalRegion !snap:ZeroDimensionalRegion)
(no-parts !snap:Disposition)
```

You write this

You mean this

MetaREL



There are only 3 class-level relations in OWL-DL

- EquivalentClasses
- SubClassOf
- DisjointClasses

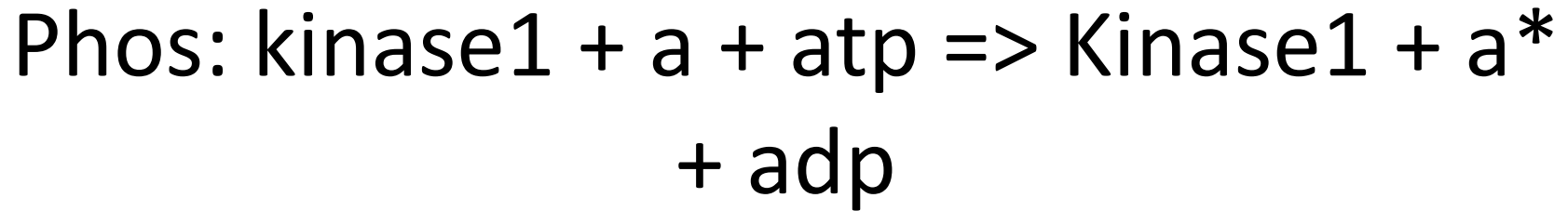
- No way to add more currently

Punning in OWL 2

- The same name can be used as a class and an individual
 - Bird is_a Animal (Class)
 - Bird has_lexical_label “Bird” (Instance)
- Currently read as:
 - Bird-C is_a Animal (Class)
 - Bird-I has_lexical_label “Bird” (Instance)
- From punning to not:
 - A-I sameAs B-I \Leftrightarrow A-C equivalentClass B-C
- OK to use punning if you don't depend on this inference (often you don't)

$$R1: 2 a + b \leq E \Rightarrow c + 3 d$$

- R1 =def Process
- and has_participant exactly 2 a
- and has_participant exactly 1 b
- and has_participant exactly 1 c and
- has_participant exactly 3 d
- and has_participant exactly 1 E
- and is_realization_of (substrate and inheres_in some a)
- and is_realization_of (substrate and inheres_in some b)
- and is_realization_of (product and inheres_in some c)
- and is_realization_of (product and inheres_in some d)
- and is_realization_of <the catalytic_activity>



Phos=def Process

and has_participant exactly 1 a

and has_participant exactly 1 atp

and has_participant exactly 1 adp

has_participant exactly 1 a*

has_participant exactly 1 Kinase1

and is_realization_of (p-acceptor and inheres_in some a)

and is_realization_of (kinase_activity and inheres_in some K)

and is_realization_of (p-donor and inheres_in some ATP)

and is_realization_of (product and inheres_in some adp)

and is_realization_of (product and inheres_in some a*)

a* derives_from a and has_part some phosphate_group

atp has_part exactly 3 phosphate_group

adp has_part exactly 2 phosphate_group

P-acceptor = disposition and realized_in some Phos

P-donor = disposition and realized_in some Phos

Process(3): What is a GO Annotation

the Gene Ontology AmiGO

Advanced Search BLAST search Browse Help

Search GO Terms Genes or proteins Exact Match

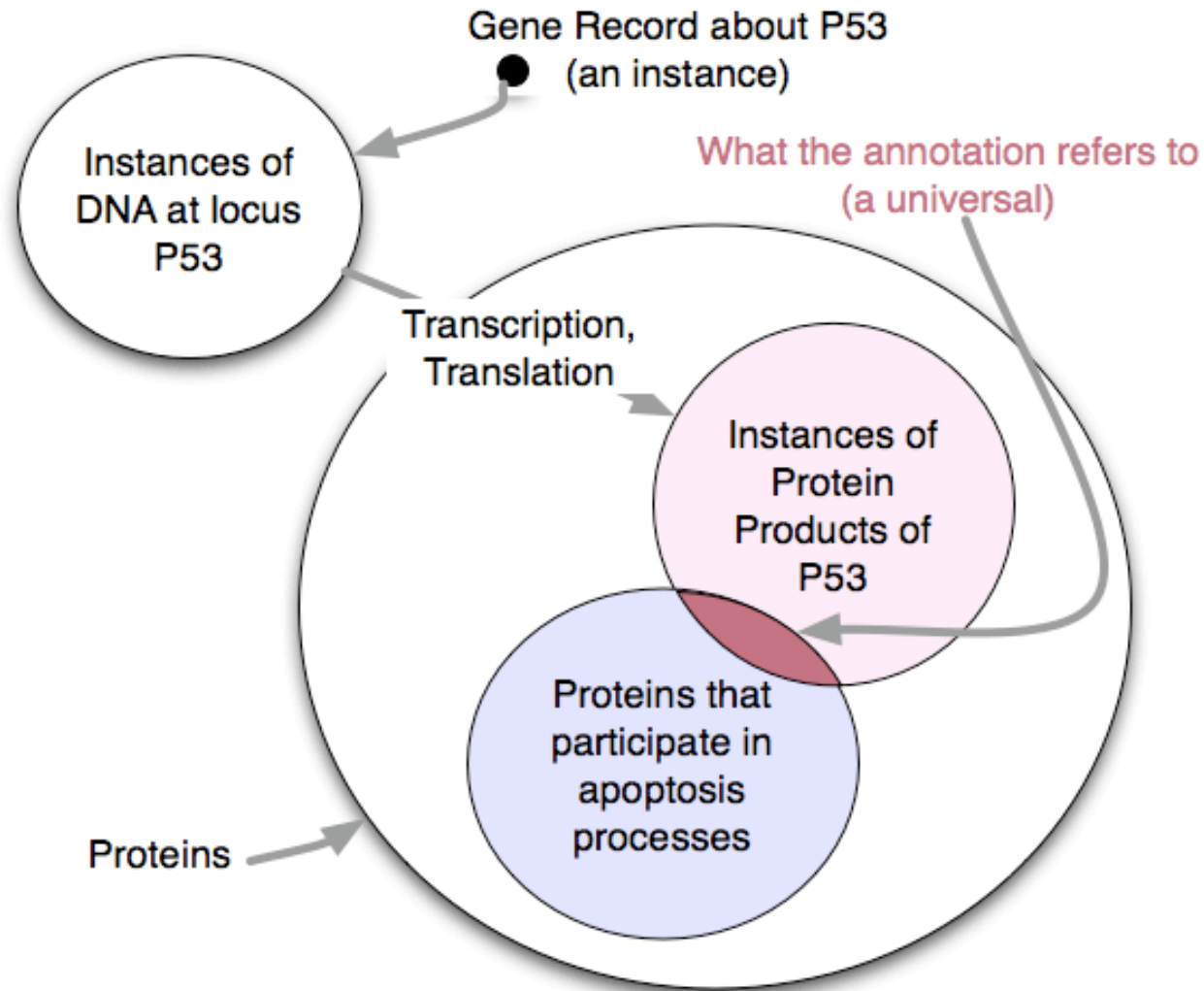
p53

DNA binding [view associations]	molecular function	NAS	FB:FBrf0105495	FlyBase
RNA polymerase II transcription factor activity [view associations]	molecular function	TAS	PMID:11048731	FlyBase
transcription factor activity [view associations]	molecular function	NAS	FB:FBrf0127845	FlyBase
apoptosis [view associations]	biological process	TAS	PMID:10910336	FlyBase
		TAS	PMID:12072176	
		IMP	PMID:16079159	
cell death [view associations]	biological process	IMP	PMID:12672954	FlyBase
determination of adult life span [view associations]	biological process	IMP	PMID:16303568	FlyBase
		IMP	PMID:16303568	

Problems with integrating annotations with other knowledge

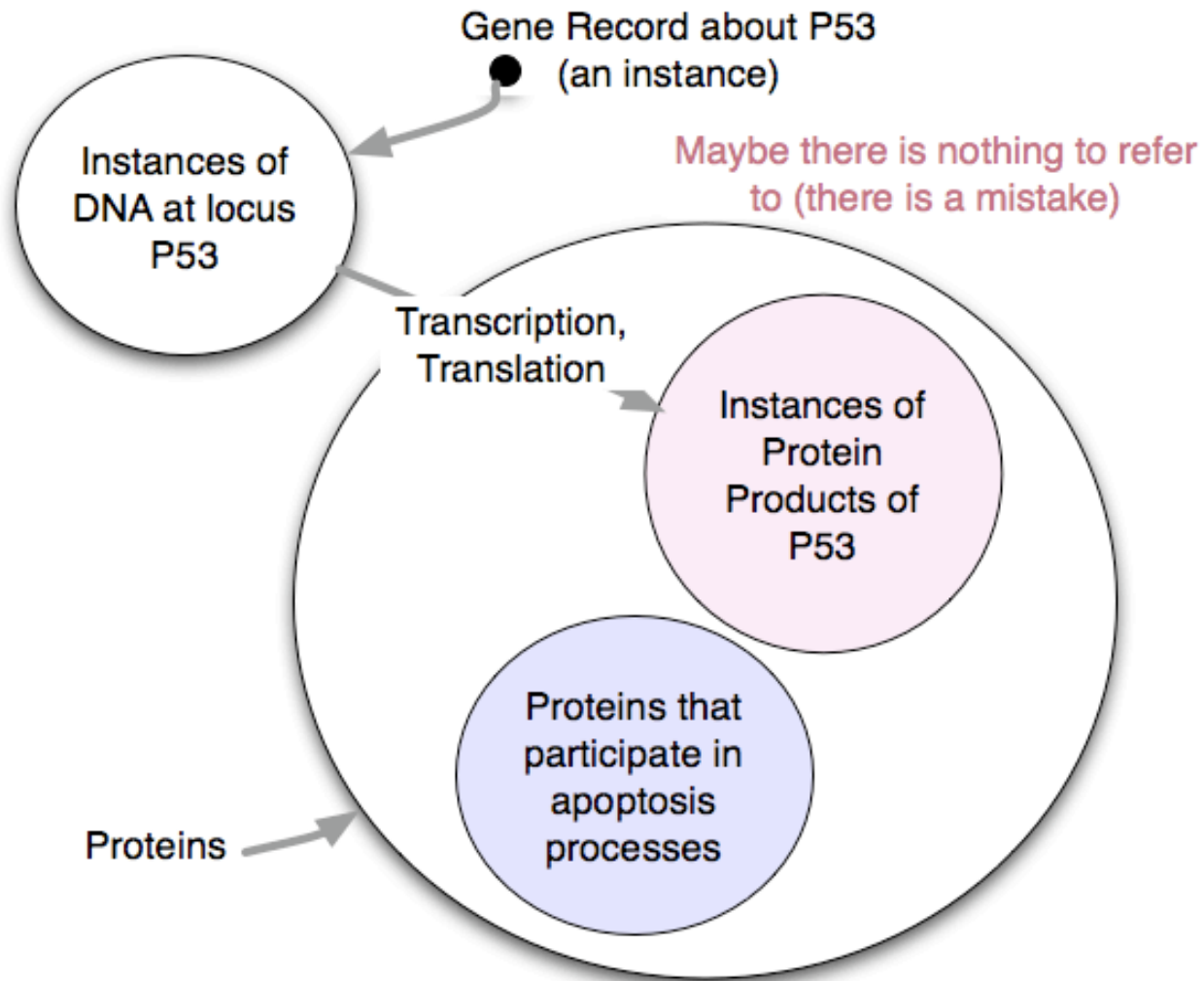
- What are the entities?
- What are the relationships between the process and the entities.
- How can we make All-Some statements involving annotations?

A closer look



Ask me about evidence?

Semantic Web technology and ontology in the service of science



Let our tools help us find mistakes (and other insights) by having representation that is good enough to be wrong.

Expressed formally, and in conjunction with a reasoner, we might find that it can't possibly be there are instances of this class (unsatisfiable)

Some/Some relations are useful too

- If they can be disproved

Subcellular Anatomy Ontology

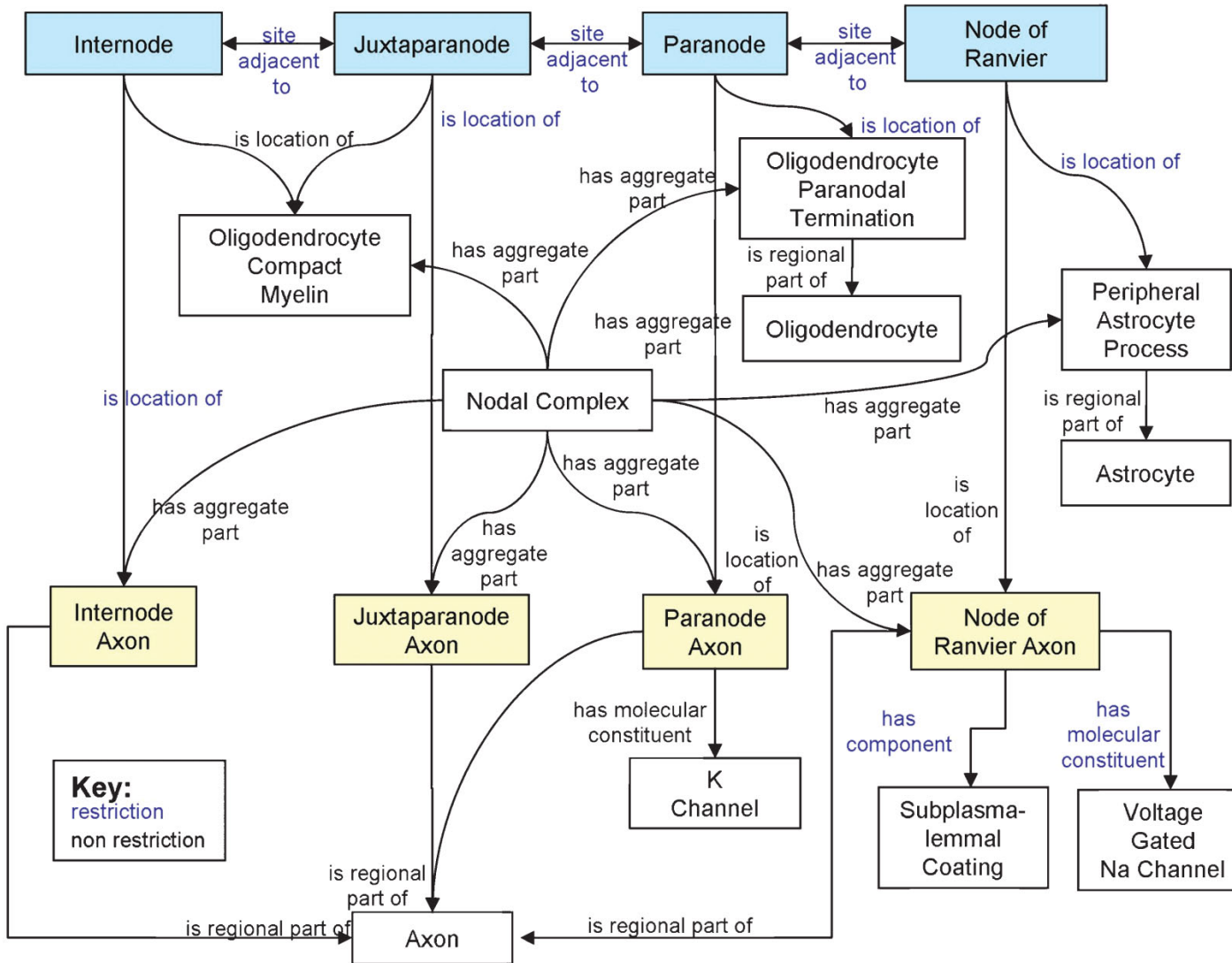


Figure 3. Diagram of a Node of Ranvier instance description in the SAO. The boxes indicate instances of classes that are related to one another as a description of a particular instance of a Node of Ranvier. The blue text indicates relationships that are enforced between classes through the use of OWL restrictions, while the black text indicates relationships defined for this instance alone.

Granularity, scale and collectivity: When size does and does not matter

Table 2A
The property hierarchy for the OWL implementation

Property	Transitive	Domain/Range	Comments
<code>is_part_of/</code> <code>has_part</code>	Y	<code>Physical_entity/</code> <code>Physical_entity</code>	The generic part-whole relation Reflexive and antisymmetric properties not captured directly in OWL.
<code>— is_gross_part_of/</code> <code>has_gross_part</code>	Y	<code>Physical_entity/</code> <code>Physical_entity</code>	The common parent (in effect the disjunction) of measurable portions and determinate parts and other properties indicated by the ellipsis (“...”).
<code>— is_determinate_part_of/</code> <code>has_determinate_part</code>	Y	<code>Physical_entity/</code> <code>Physical_entity</code>	The relation between determinate parts and wholes, e.g., fingers and hands.
<code>— is_portion_of/</code> <code>has_portion</code>	Y	<code>Amount_of_matter/</code> <code>Amount_of_matter</code>	The relation between the water in the bay and the water in the lake. See Section 2.4.3
<code>— is_ingredient_of/</code> <code>has_ingredient</code>	Y	<code>Amount_of_matter/</code> <code>Amount_of_matter</code>	The relation between plasma and blood.
<code>— ...</code>			See Section 2.4.4 and Table 3.
<code>— is_grain_of/</code> <code>has_grain</code>	N	<code>Physical_object/</code> <code>Collective</code>	The relation between a grain and the collective. Represented as a subproperty of <code>is_part_of</code> in OWL as an approximation of <code>propagates_via</code> see Sections 2.2, item 3 and 2.3.