

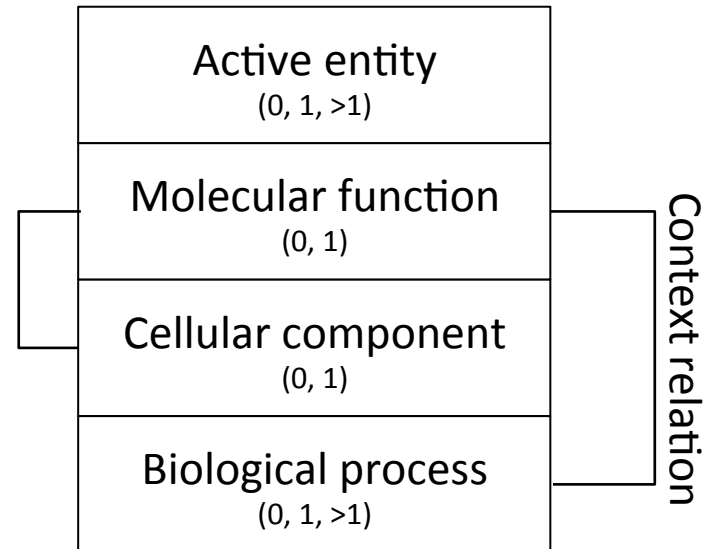
LEGO formalism

Annoton – the annotation unit in LEGO



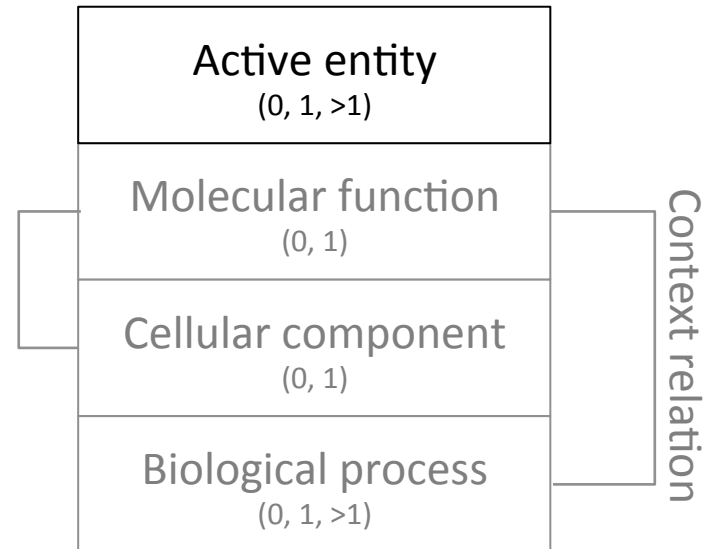
Biological Activity

- *Biological activity* is defined as activities and processes carried out by all biological entities
- It is the molecular function that one or more biological entities are capable of performing, via a particular biochemical mechanism, in a specific cellular location, as part of a biological process.



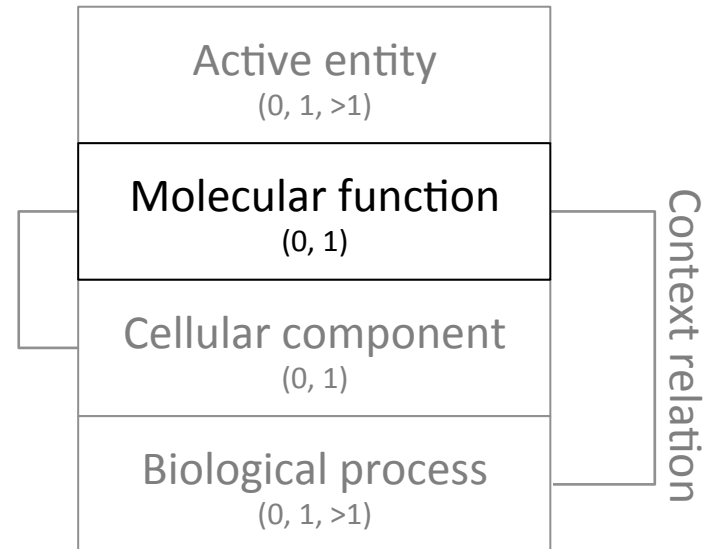
Biological Activity

- A biological entity that is in an active conformation with enough quantity to carry out the molecular function.
- This is usually the gene(s), gene product(s), or a protein complex that is annotated in GO.
- The *active entity* can be 0 (when it is unknown or unspecified), one or more than one.
- When more than one entity is assigned, the following logic operators should be used



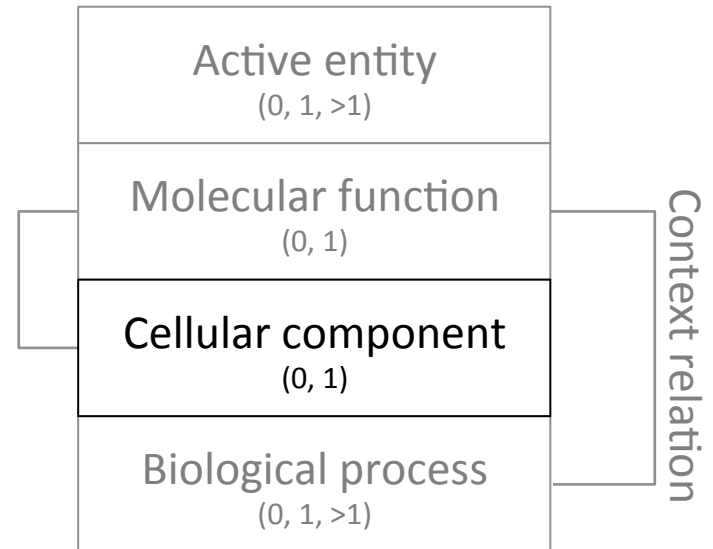
Biological Activity

- The GO molecular function that is carried out by the active entity.
- Each *biological activity* can have 0 (when a root MF term is assigned) or one molecular function term assigned to it. This can be the MF annotation to the gene(s) or gene product(s) in GO annotation.
- When the root MF term is assigned, it means the function is unknown or unspecified. This can be used to indicate a biological process in general while specific function is not specified.
- When a gene or gene product is annotated by more than one GO molecular function terms, they have to be represented by multiple *biological activity* units.



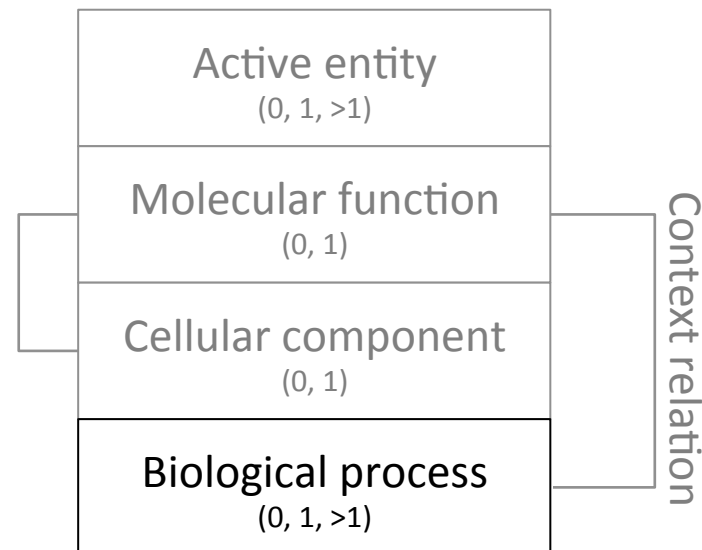
Biological Activity

- The location of the *active entity* when it executes the molecular function.
- This is the GO cellular component annotated to the gene or gene product.
- Each *biological activity* unit can have 0 (when a root CC term is assigned) or one GO cellular component (if unknown, the root CC term is used).



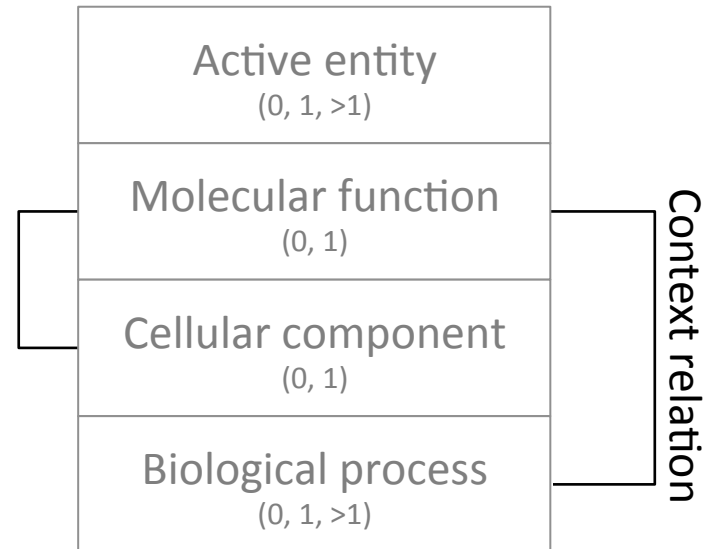
Biological Activity

- The biological process that the molecular function and the *active entity* are involved in or part of.
- This is usually the BP annotation to the gene(s) and gene product(s) in GO.
- Each *biological activity* unit can have 0, one or more than one GO biological process (if unknown, the root BP term is used).
- If there is more than one, the processes must be related to each other via *part_of* or *is_a* relations.



Biological Activity

- Context relation describes the relationship among different classes of information within the *biological activity* unit.
- Part_of
- Located_in



GO annotation

MGI:95294

Found entities

Total: 12; showing 1-10 Results count

Navigation buttons: << < > >> []

Gene/Product	Gene/Product name	Qualifier	Direct annotation	Annotation extension	Source	Taxon	Evidence	Evidence with	PANTHER family	Isoform	Reference
<input type="checkbox"/> Egfr	epidermal growth factor receptor		signal transducer activity		MGI	Mus musculus	IDA		tyrosine-protein kinase receptor	VEGA:OTTMUSP00000005385	MGI:MGI:2182234 PMID:11940581
<input type="checkbox"/> Egfr	epidermal growth factor receptor		protein binding		MGI	Mus musculus	IPI	RefSeq:NP_851411			MGI:MGI:3531070 PMID:15695332
<input type="checkbox"/> Egfr	epidermal growth factor receptor		protein binding		MGI	Mus musculus	IPI	RefSeq:NP_851411			MGI:MGI:3531070 PMID:15695332
<input type="checkbox"/> Egfr	epidermal growth factor receptor		kinase activity		MGI	Mus musculus	IDA				MGI:MGI:3531070 PMID:15695332
<input type="checkbox"/> Egfr	epidermal growth factor receptor		protein binding		MGI	Mus musculus	IPI	UniProtKB:P01133	tyrosine-protein kinase receptor pthr24416	VEGA:OTTMUSP00000005385	MGI:MGI:4948998 PMID:21439278
<input type="checkbox"/> Egfr	epidermal growth factor receptor		epidermal growth factor-activated receptor activity		MGI	Mus musculus	IDA		tyrosine-protein kinase receptor pthr24416	VEGA:OTTMUSP00000005385	MGI:MGI:3032880 PMID:14712229

Active entity
(0, 1, >1)

Molecular function
(0, 1)

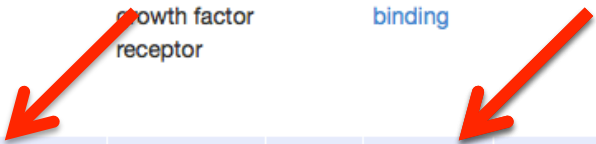
Cellular component
(0, 1)

Biological process
(0, 1, >1)

Context relation

Gene product

Molecular function

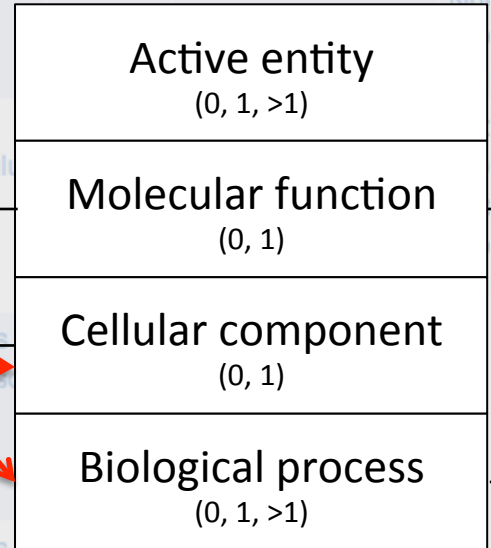


GO annotation

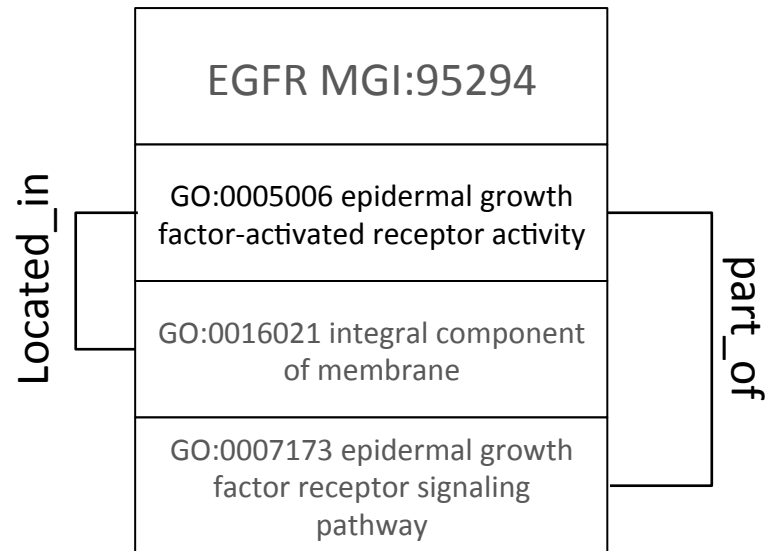
Gene/product	Gene/product name	Qualifier	Direct annotation	Annotation extension	Source	Taxon	Evidence	Evidence with	PAI fa
<input type="checkbox"/> Egfr	epidermal growth factor receptor		positive regulation of fibroblast proliferation		MGI	Mus musculus	IMP		tyrc pro kina reci pth
<input type="checkbox"/> Egfr	epidermal growth factor receptor		epidermal growth factor receptor signaling pathway		MGI	Mus musculus	IDA		tyrc pro kina
<input type="checkbox"/> Egfr	epidermal growth factor receptor		salivary gland morphogenesis		MGI	Mus musculus			
<input type="checkbox"/> Egfr	epidermal growth factor receptor		plasma membrane		MGI	Mus musculus			
<input type="checkbox"/> Egfr	epidermal growth factor receptor		positive regulation of cell proliferation		MGI	Mus musculus	IDA		p k n
<input type="checkbox"/> Egfr	epidermal growth factor receptor		peptidyl-tyrosine phosphorylation		MGI	Mus musculus	IDA		ty p k n

Biological process

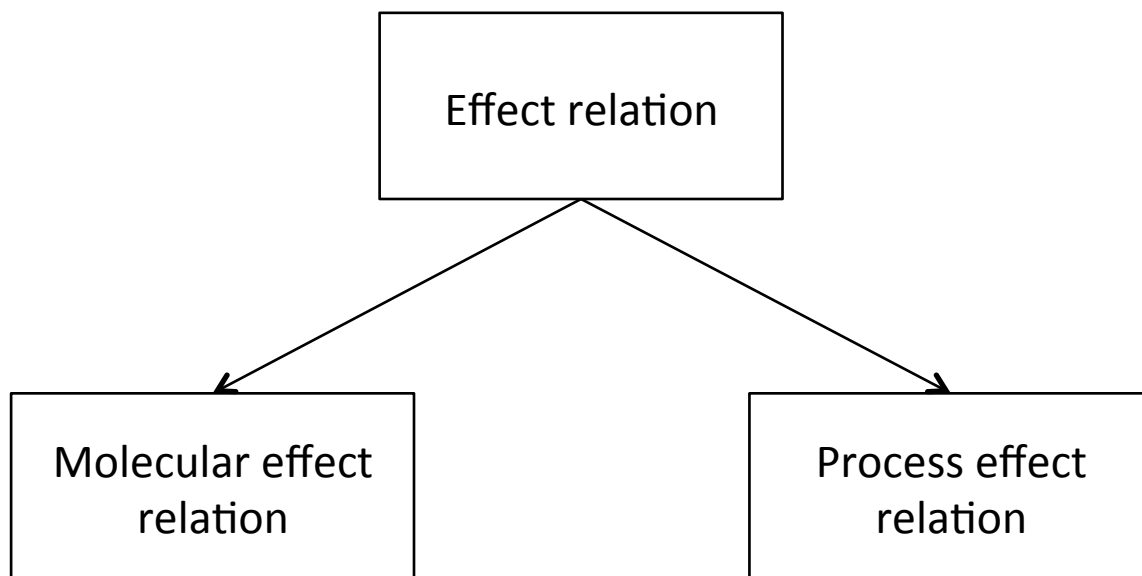
Cellular component



Biological activity



Effect Relation



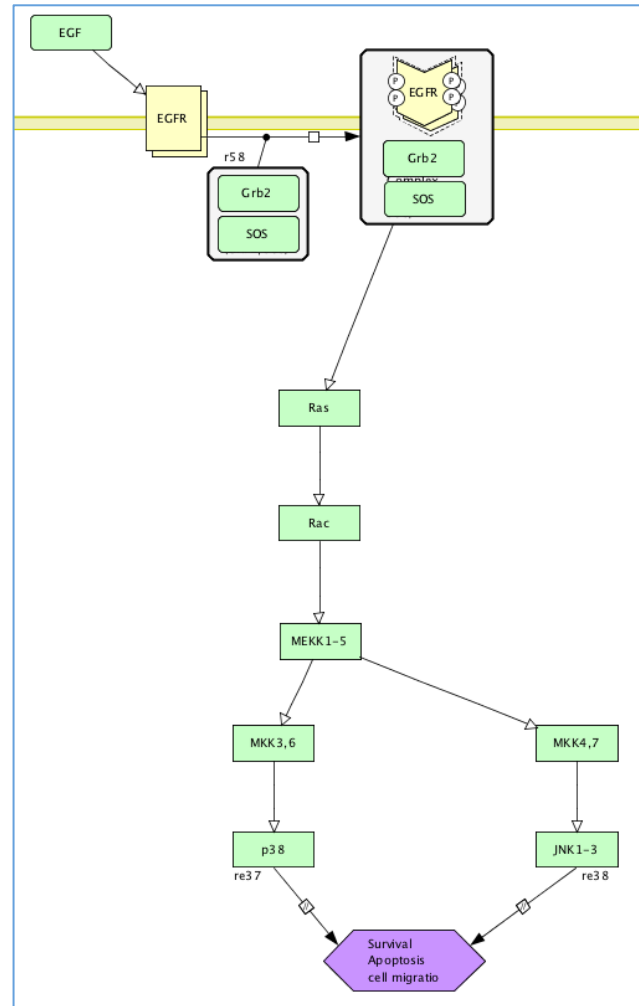
Molecular activity is the target

Outcome is the target

Effect Relation

Molecular effect relation	Process effect relation
Directly activate	--
Directly inhibit	--
Positively regulate	Positively regulate
Negatively regulate	Negatively regulate
Regulate	Regulate
Upstream of	Upstream of
Required for	Required for

EGFR signaling

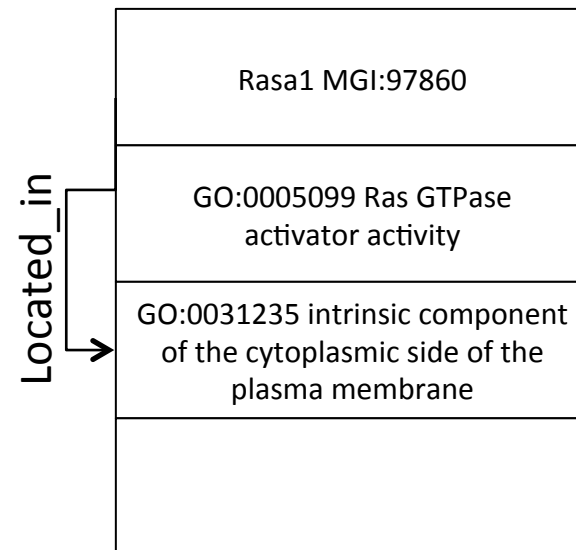


Molecular Activity

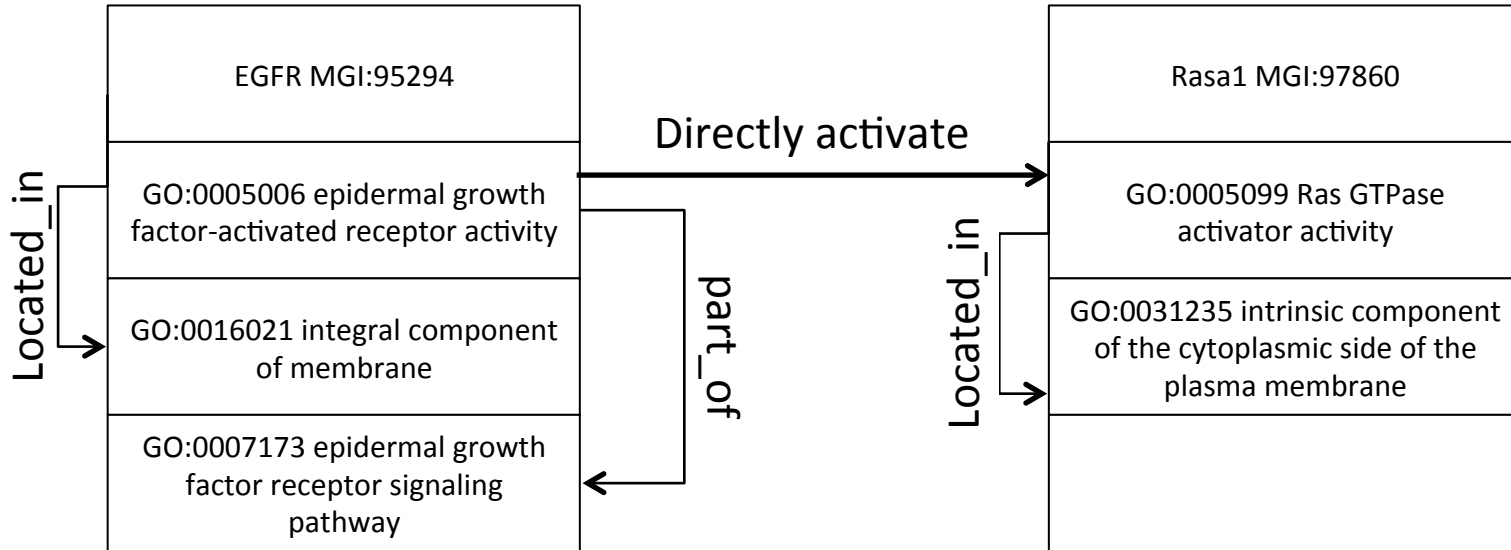
-Rasa1

MGI:97860

<input type="checkbox"/>	Rasa1	RAS p21 protein activator 1	protein binding		MGI	Mus musculus	IPI
<input type="checkbox"/>	Rasa1	RAS p21 protein activator 1	protein binding		MGI	Mus musculus	IPI
<input type="checkbox"/>	Rasa1	RAS p21 protein activator 1	Ras GTPase activator activity		MGI	Mus musculus	IBA
<input type="checkbox"/>	Rasa1	RAS p21 protein activator 1	positive regulation of Ras GTPase activity		MGI	Mus musculus	IBA
<input type="checkbox"/>	Rasa1	RAS p21 protein activator 1	negative regulation of Ras protein signal transduction		MGI	Mus musculus	IBA
<input type="checkbox"/>	Rasa1	RAS p21 protein activator 1	plasma membrane	part_of bone marrow part_of macrophage	MGI	Mus musculus	IDA
<input type="checkbox"/>	Rasa1	RAS p21 protein activator 1	intrinsic component of the cytoplasmic side of the plasma membrane		MGI	Mus musculus	IBA
<input type="checkbox"/>	Rasa1	RAS p21 protein activator 1	cytoplasm		MGI	Mus musculus	IBA

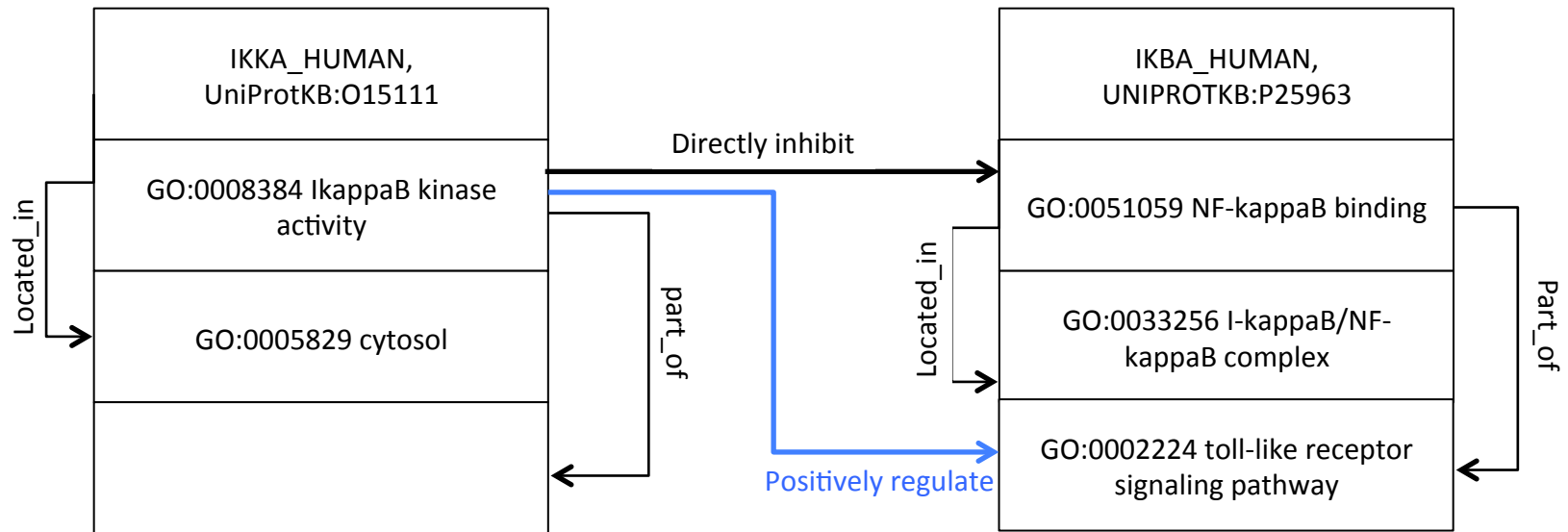


LEGO Model



Epidermal growth factor-activated receptor activity from mouse EGFR, which is an integral component of membrane and is involved in epidermal growth factor receptor signaling pathway, directly activates the Ras GTPase activator activity of mouse Rasa1 that is located in the intrinsic component of the cytoplasmic side of the plasma membrane.

LEGO Model



IkappaB kinase activity from human **IKKA**, which is in **cytosol** and, **directly inhibits** the **NF-kappaB binding activity** of human **IKBA** that is located in the **I-kappaB/NF-kappaB complex** involved in **toll-like receptor signaling pathway** and exerts positive regulation to the pathway.