



FONDO EUROPEO DE DESARROLLO REGIONAL (FEDER)

*Una manera de hacer Europa*

## ROH Ontology Classes, Object Properties and DataType Properties

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## 1. Abstract

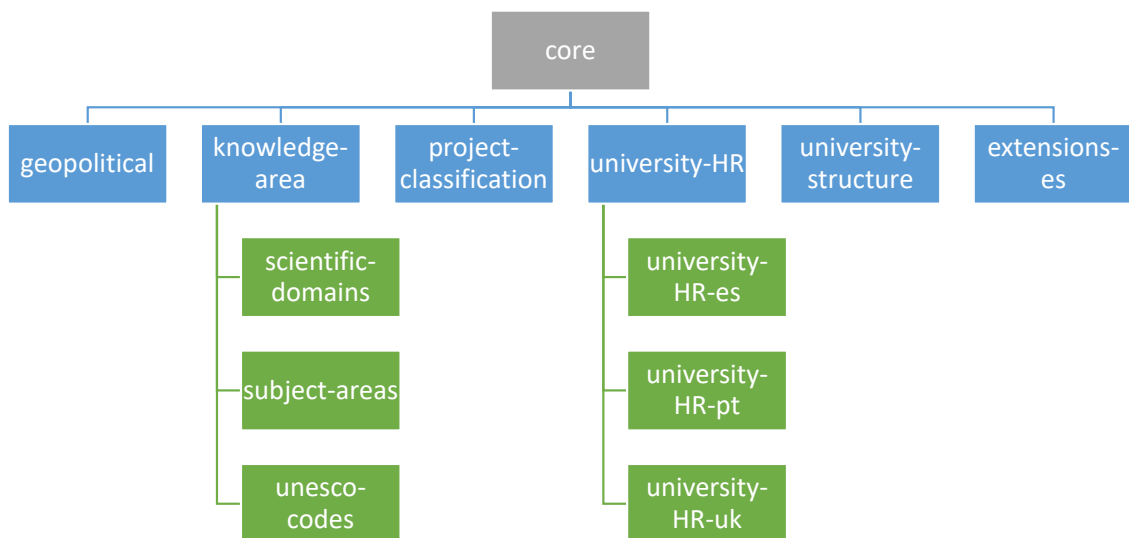
The aim of this document is to provide a bird's eye view on the entities modelled within ROH. The document includes an overview in tabular form for each of the core entities of the network of ontologies ROH, giving details on the object and data properties supported by each of them. This document is meant to be useful when instances of ROH want to be created, since it clearly explains what entity types a given entity type relates with through an object property and what data properties are supported by a given entity type, including details about its associated object types.

This document should be read as a complement to the [ROH Tutorial document](#) which describes more verbosely the purpose of the core entities of ROH and their relationships with other entities in the ontology.

## 2. Ontologies used

The following table lists all ontologies created, which combine entities defined specifically in our core ontology under prefix `roh` with those reused from other well-known and extensively adopted ontologies. Notice that ROH network of ontologies is divided into 2 main parts as depicted in the following figure:

- The generic ontology, **core module**, contains the most important entities and properties to model information in the academic domain. It contains the central part of the network of ontologies. It covers the academic domain, being agnostic to the country or the research organization whose information wants to be modelled with.
- A set of **vertical modules** which include, on one hand, specializations of some academic concepts for a given country domain. For instance, the figure Associate Professor in the Spanish academic domain would be encountered in the vertical module `university-HR-es` and is assigned the URI `http://purl.org/roh/university-hr/es#ProfesorTitularDeUniversida`. On the other hand, these vertical modules, include controlled vocabularies, according to SKOS ontology, for different important areas in the academic domain, namely, geographical locations (`geopolitical`), knowledge areas (including concepts for scientific-domains, subject-areas or `unesco-codes`), classification of project types (`project-classification`), resource positions in universities (`university-HR` for Spain, UK or Portugal), controlled vocabulary with all universities in Spain (`university-structure`) or some extensions for the Spanish university system (`extensions-es`).



The following table illustrates the name spaces of the ontologies used within ROH:

Prefix	Ontology name	Ontology namespace	Ontology website
bibo	Bibliographic Ontology	<a href="http://purl.org/roh/mirror/bibo#">http://purl.org/roh/mirror/bibo#</a>	<a href="http://bibliontology.com/">http://bibliontology.com/</a>
cito	CITO, the Citation Typing Ontology	<a href="http://purl.org/spar/cito#">http://purl.org/spar/cito#</a>	<a href="https://sparontologies.github.io/cito/current/cito.html">https://sparontologies.github.io/cito/current/cito.html</a>
foaf	FOAF: Friend of a Friend Ontology	<a href="http://purl.org/roh/mirror/foaf#">http://purl.org/roh/mirror/foaf#</a>	<a href="http://xmlns.com/foaf/spec/">http://xmlns.com/foaf/spec/</a>
gn	GeoNames Ontology	<a href="http://purl.org/roh/mirror/geonames#">http://purl.org/roh/mirror/geonames#</a>	<a href="http://www.geonames.org/ontology/documentation.html">http://www.geonames.org/ontology/documentation.html</a>
obo-bfo	OBO Foundry, Basic Formal Ontology	<a href="http://purl.org/roh/mirror/obo/bfo#">http://purl.org/roh/mirror/obo/bfo#</a>	<a href="http://www.obofoundry.org/ontology/bfo.html">http://www.obofoundry.org/ontology/bfo.html</a>
obo-ero	OBO Foundry, eagle-i Research Resource Ontology (ERO)	<a href="http://purl.org/roh/mirror/obo/ero#">http://purl.org/roh/mirror/obo/ero#</a>	<a href="https://www.cranfield.ac.uk/wiki/ehs/ehs/eagle-i/ontology">https://www.cranfield.ac.uk/wiki/ehs/ehs/eagle-i/ontology</a>
obo-iao	OBO Foundry, Information Artifact Ontology	<a href="http://purl.org/roh/mirror/obo/iao#">http://purl.org/roh/mirror/obo/iao#</a>	<a href="https://github.com/information-artifact-ontology/iao/">https://github.com/information-artifact-ontology/iao/</a>
obo-ro	OBO Foundry, Relations Ontology	<a href="http://purl.org/roh/mirror/obo/ro#">http://purl.org/roh/mirror/obo/ro#</a>	<a href="http://www.obofoundry.org/ontology/ro.html">http://www.obofoundry.org/ontology/ro.html</a>
owl	OWL Web Ontology Language	<a href="http://www.w3.org/2002/07/owl#">http://www.w3.org/2002/07/owl#</a>	<a href="https://www.w3.org/TR/owl-features/">https://www.w3.org/TR/owl-features/</a>
rdf	The RDF Concepts Vocabulary (RDF)	<a href="http://www.w3.org/1999/02/22-rdf-syntax-ns#">http://www.w3.org/1999/02/22-rdf-syntax-ns#</a>	<a href="https://www.w3.org/TR/rdf-concepts/">https://www.w3.org/TR/rdf-concepts/</a>
rdfs	RDF Schema 1.1	<a href="http://www.w3.org/2000/01/rdf-schema#">http://www.w3.org/2000/01/rdf-schema#</a>	<a href="https://www.w3.org/TR/rdf-schema/">https://www.w3.org/TR/rdf-schema/</a>
roh	Red de Ontologías Hércules / Hercules Network of Ontologies	<a href="http://purl.org/roh#">http://purl.org/roh#</a>	<a href="https://github.com/HerculesCRUE/GnossDeustoOnto/tree/master/Documentation">https://github.com/HerculesCRUE/GnossDeustoOnto/tree/master/Documentation</a>
skos	SKOS Simple Knowledge Organization System	<a href="http://www.w3.org/2004/02/skos/core#">http://www.w3.org/2004/02/skos/core#</a>	<a href="https://www.w3.org/TR/2008/WD-skos-reference-20080829/skos.html">https://www.w3.org/TR/2008/WD-skos-reference-20080829/skos.html</a>
terms	DCMI Metadata Terms	<a href="http://purl.org/dc/terms">http://purl.org/dc/terms</a>	<a href="https://www.dublincore.org/specifications/dublin-core/dcmi-terms/">https://www.dublincore.org/specifications/dublin-core/dcmi-terms/</a>
uneskos	SKOS UNESCO Thesaurus	<a href="http://purl.org/umu/uneskos#">http://purl.org/umu/uneskos#</a>	<a href="https://skos.um.es/unescothes/downloads.php">https://skos.um.es/unescothes/downloads.php</a>
vcard	vCard Ontology - for describing People and Organizations	<a href="http://purl.org/roh/mirror/vcard#">http://purl.org/roh/mirror/vcard#</a>	<a href="https://www.w3.org/TR/vcard-rdf/">https://www.w3.org/TR/vcard-rdf/</a>
vivo	VIVO core ontology	<a href="http://purl.org/roh/mirror/vivo#">http://purl.org/roh/mirror/vivo#</a>	<a href="https://wiki.lyrasis.org/display/VIVO/The+core+ontology+and+its+annotations">https://wiki.lyrasis.org/display/VIVO/The+core+ontology+and+its+annotations</a>

### 3. Concepts modelled

#### 3.1. vivo:AcademicDegree

Prefix	Class	Prefix	Object property (bold indicates explicit Domain, otherwise a Restriction)	Range Class	Prefix	Datatype Property (bold indicates explicit domain; otherwise a restriction)	Range Datatype (if typed)	Range values
vivo	AcademicDegree				vivo	abbreviation	rdfs:Literal	
					roh	title	xsd:string	
roh	BachelorsDegree							

	roh	DoctoralDegree							
	roh	MastersDegree							

### 3.2. roh:Accreditation

Prefix	Class		Prefix	Object property (bold indicates explicit Domain, otherwise a Restriction)	Range Class	Prefix	Datatype Property (bold indicates explicit domain; otherwise a restriction)	Range Datatype (if typed)	Range values
roh	Accreditation		vivo	hasGoverningActivity	foaf:Organization	roh	title	xsd:string	
			vivo	hasSubjectArea	skos:Concept	vivo	description	xsd:string	
			roh	accreditationOf	foaf:Agent				
			roh	issuedBy	roh:AccreditationIssuer				
			vivo	dateIssued	vivo:DateTimeValue				
	roh	AcademicAccreditation				roh	title	xsd:string	
	vivo	Certificate				roh	title	xsd:string	
		roh	Award						
		roh	CourseCertificate						
		roh	LanguageCertificate			roh	language	xsd:string	
						roh	listeningSkill	xsd:string	{"A1", "A2", "B1", "B2", "C1", "C2"}
						roh	readingSkill	xsd:string	{"A1", "A2", "B1", "B2", "C1", "C2"}
						roh	speakingSkill	xsd:string	{"A1", "A2", "B1", "B2", "C1", "C2"}
						roh	spokenInteractionSkill	xsd:string	{"A1", "A2", "B1", "B2", "C1", "C2"}
						roh	writingSkill	xsd:string	{"A1", "A2", "B1", "B2", "C1", "C2"}
	roh	DegreeHomologation	vivo	relates	vivo:AwardedDegree				
	vivo	License							
	roh	ResearchAccreditation							
	roh	SealOfQuality							

### 3.3. roh:Activity

Prefix	Class		Prefix	Object property (bold indicates explicit Domain, otherwise a Restriction)	Range Class	Prefix	Datatype Property (bold indicates explicit domain; otherwise a restriction)	Range Datatype (if typed)	Range values
roh	Activity		roh	participatedBy	foaf:Agent	vivo	identifier	xsd:string	
			bibo	presents	bibo:Document	roh	description	xsd:string	
			vivo	relates	roh:Expense or obo-bfo:Role	vivo	freeTextKeyword	xsd:string	
			obo-bfo	realizes	obo-bfo:Role	vivo	contactInformation	rdfs:Literal	
			vivo	hasSubjectArea	skos:Concept	roh	title	xsd:string	
			vivo	dateTimeInterval	vivo:DateTimeInterval				
			gn	locatedIn	gn:Feature				
	vivo	Competition							
	bibo	Conference				vivo	abbreviation	rdfs:Literal	
	vivo	Course	obo-ro	partOf	vivo:AcademicDegree	vivo	courseCredits	xsd:int	
						vivo	courseHours	xsd:string	

vivo	Exhibit							
bibo	Hearing							
vivo	Internship							
vivo	Interview							
vivo	Meeting							
bibo	Performance							
vivo	Presentation							
vivo	InvitedTalk							
roh	PanelTalk							
roh	ThesisViva							
bibo	Workshop							

### 3.4. foaf:Agent

Prefix	Class	Prefix	Object property (bold indicates explicit Domain, otherwise a Restriction)	Range Class	Prefix	Datatype Property (bold indicates explicit domain; otherwise a restriction)	Range Datatype (if typed)	Range values
foaf	Agent	roh	<b>hasContactInfo</b>	vcard:Organization	vivo	freeTextKeyword	xsd:string	
		roh	<b>hasAccreditation</b>	roh:Accreditation				
		roh	<b>hasRole</b>	obo-bfo:Role				
		foaf	<b>mBox</b>	owl:Thing				
		vivo	<b>relatedBy</b>	vivo:Relationship				
		roh	<b>hasReservable</b>	roh:Reservable				
foaf	Group							
foaf	Organization	roh	<b>hasKnowledgeArea</b>	(skos:Concept and (skos:inScheme some roh:KnowledgeArea))	vivo	<b>identifier</b>	xsd:string	
		vivo	<b>affiliatedOrganization</b>	foaf:Organization	vivo	<b>abbreviation</b>	rdfs:Literal	
		roh	<b>foundationDate</b>	vivo:DateTimeValue	roh	<b>description</b>	xsd:string	
		vivo	<b>hasSuccessorOrganization</b>	foaf:Organization	roh	<b>researchLine</b>	xsd:string	
		vivo	<b>hasPredecessorOrganization</b>	foaf:Organization				
		terms	<b>hasPart</b>	foaf:Organization				
		roh	<b>hasReservable</b>	roh:Reservable				
		roh	<b>hasSpinOff</b>	vivo:Company				
		foaf	<b>homePage</b>	foaf:Document				
		roh	<b>ownerOrganizationOf</b>	roh:Patent Application or bibo:Patent				
		roh	<b>participates</b>	roh:Activity				
		roh	<b>produces</b>	roh:ResearchObject				
		roh	<b>provides</b>	obo-ero:Service				
		roh	<b>grantedBy</b>	roh:FundingAmount				
		roh	<b>hasSpinoff</b>	vivo:Company				
		vivo	<b>dateTimeInterval</b>	vivo:DateTimeInterval				
		gn	<b>locatedIn</b>	gn:Feature				
	roh	AccreditationIssuer <sup>1</sup>	<b>issues</b>	roh:Accreditation				
	vivo	Center						
	vivo	Company	<b>hasCompanyClassification</b>	(skos:Concept and (skos:inScheme some roh:KnowledgeArea))	roh	<b>isStartup</b>	xsd:boolean	
			<b>isSpinoffOf</b>	foaf:Organization	roh	<b>publicCompany</b>	xsd:boolean	

<sup>1</sup> Defined class attending the following restriction Organization and (issues some Accreditation) and (issues only Accreditation)

		roh	LargeEnterprise								
		roh	MediumEnterprise								
		roh	MicroEnterprise								
		roh	SmallEnterprise								
		vivo	Consortium								
		vivo	Department								
		roh	EthicsCommittee	roh	produces	roh:EthicalReport					
		vivo	Foundation								
		roh	FundingOrganization	roh	promotes	roh:FundingProgram or roh:FundingSource					
				roh	funds	roh:Funding					
		vivo	GovernmentAgency								
		vivo	Institute								
		roh	ManagementInstitute								
		roh	ResearchGroup				roh	excellenceLabel	xsd:boolean		
		vivo	University	roh	awards	vivo:AwardedDegree					
		roh	Company	roh	hasCompanyCategorization	roh:CompanyClassification	roh	isStartup	xsd:boolean		
							roh	publicCompany	xsd:boolean		
	foaf	Person		roh	hasKnowledgeArea	(skos:Concept and (skos:inScheme some roh:KnowledgeArea))	vivo	identifier	xsd:string		
				vivo	relates	vivo:AwardedDegree	vivo	researcherId			
				roh	spends	roh:PersonExpense	roh	birthdate	xsd:string		
				roh	hasContract	roh:PersonContract	vivo	eRACommonsId			
				roh	hasCV	roh:CurriculumVitae	roh	description	xsd:string		
				roh	hasPosition	vivo:Position	roh	firstName	xsd:string		
				roh	participates	roh:Activity	roh	gender	xsd:string		
				roh	elegibleFor	roh:Accreditation	roh	researchLine	xsd:string		
				foaf	homePage	foaf:Document	foaf	surname	xsd:string		
				foaf	image	foaf:Image	foaf	name	xsd:string		
				roh	correspondingAuthor		foaf	nickname	xsd:string		
				roh	supervisorOf	bibo:Thesis	roh	taxID	xsd:string		
				roh	teaches	roh:AcademicSubject	roh	title	xsd:string		
				roh	reviews	bibo:Document	roh	ORCID	xsd:string		
				roh	hasMetric	roh:AuthorMetric	vivo	scopusId			
							roh	dedication	xsd:string		{"PARTIAL", "TOTAL"}

### 3.5. skos:Concept & skos:ConceptScheme

Prefix	Class	Prefix	Object property (bold indicates explicit Domain, otherwise a Restriction)	Range Class	Prefix	Datatype Property (bold indicates explicit domain; otherwise a restriction)	Range Datatype (if typed)	Range values
skos	Concept	roh	<b>codeOf</b>	skos:Concept				
		roh	<b>hasCode</b>	skos:Concept				
		roh	<b>hasKnowledgeArea</b>					
skos	ConceptScheme							
	roh	AcademicSubject						
		roh	BachelorsDegreeSubject					
		roh	MastersDegreeSubject					
	roh	AdministrativeEntity						
	roh	CompanyClassification						

roh	Country							
roh	ExpenseClassification							
roh	FundingProgramClassification							
roh	HRCClassification							
roh	KnowledgeArea							
roh	ProjectClassification							
roh	PropertyClassification							
roh	ResearchProblem							

### 3.6. roh:CurriculumVitae

Prefix	Class	Prefix	Object property (bold indicates explicit Domain, otherwise a Restriction)	Range Class	Prefix	Datatype Property (bold indicates explicit domain; otherwise a restriction)	Range Datatype (if typed)	Range values
roh	CurriculumVitae	roh	<b>CVOF</b>	foaf:Person	roh	<b>cites</b>	xsd:string	
					roh	<b>factorH</b>	xsd:string	
					roh	<b>summary</b>	xsd:string	

### 3.7. roh:Expense

Prefix	Class	Prefix	Object property (bold indicates explicit Domain, otherwise a Restriction)	Range Class	Prefix	Datatype Property (bold indicates explicit domain; otherwise a restriction)	Range Datatype (if typed)	Range values
roh	Expense	vivo	<b>dateTimeValue</b>	vivo:DateTimeValue	roh	<b>currency</b>	xsd:string	
		roh	<b>hasExpenseClassification</b>	(skos:Concept and (skos:inScheme some roh:ExpenseClassification))	vivo	<b>description</b>	xsd:string	
		roh	<b>spentBy</b>		roh	<b>expenseModality</b>	xsd:string	
					roh	<b>monetaryAmount</b>	xsd:float	
					roh	<b>title</b>	xsd:string	
roh	PatentExpense							
roh	PersonExpense							
roh	ProjectExpense							
roh	ResearchObjectExpense							

### 3.8. gn:Feature

Prefix	Class	Prefix	Object property (bold indicates explicit Domain, otherwise a Restriction)	Range Class	Prefix	Datatype Property (bold indicates explicit domain; otherwise a restriction)	Range Datatype (if typed)	Range values
gn	Feature	gn	<b>featureClass</b>		gn	<b>geonamesID</b>	rdfs:Literal	
		gn	<b>featureCode</b>	gn:Code	gn	<b>countryCode</b>	rdfs:Literal	
		gn	<b>parentAMD1</b>	gn:featureCode	gn	<b>name</b>	xsd:string	
		gn	<b>parentAMD2</b>	gn:featureCode	gn	<b>population</b>	xsd:integer	
		gn	<b>parentAMD3</b>	gn:featureCode				
		gn	<b>parentAMD4</b>	gn:featureCode				

### 3.9. roh:Funding, roh:FundingAmount, roh:FundingProgram & roh:FundingSource

Prefix	Class		Prefix	Object property (bold indicates explicit Domain, otherwise a Restriction)	Range Class	Prefix	Datatype Property (bold indicates explicit domain; otherwise a restriction)	Range Datatype (if typed)	Range values
roh	Funding		obo-ro	BFO_0000051 (hasPart )	roh:FundingAmount	vivo	identifier	xsd:string	
			vivo	dateTimeInterval	vivo:DateTimeInterval	vivo	description		
			roh	fundedBy	roh:FundingProgram	vivo	freeTextKeyword		
			roh	hasContract	vivo:Contract	roh	publicFunding	xsd:boolean	
			roh	hasKnowledgeArea	(skos:Concept and (skos:inScheme some roh:KnowledgeArea))				
			roh	supports	roh:PersonContract or roh:Project				
	roh	Grant							
	roh	Loan							
	roh	Outsourcing							
	roh	RefundableAdvance							
roh	FundingAmount		obo-ro	BFO_0000050 (PartOf )	roh:Funding	roh	currency	xsd:string	
			vivo	dateTimeInterval	vivo:DateTimeInterval	roh	monetaryAmount	xsd:float	
			roh	grants	foaf:Organization				
vivo	FundingOrganization		roh	promotes	roh:FundingProgram or roh:FundingSource				
roh	FundingProgram		obo-ro	BFO_0000051 (hasPart )	roh:FundingProgram	vivo	description	xsd:string	
			vivo	dateTimeInterval	vivo:DateTimeInterval	vivo	identifier	xsd:string	
			roh	hasFundingProgramClassification	(skos:Concept and (skos:inScheme some roh:FundingProgramClassification))	roh	title	xsd:string	
			gn	locatedIn	gn:Feature				
			roh	promotedBy	vivo:FundingOrganization				
			roh	funds	roh:Funding				
			vivo	relatedBy	roh:Dossier				
roh	FundingSource		roh	funds	roh:FundingProgram				
			roh	promotedBy	vivo:FundingOrganization				

### 3.10. roh:Invention

Prefix	Class		Prefix	Object property (bold indicates explicit Domain, otherwise a Restriction)	Range Class	Prefix	Datatype Property (bold indicates explicit domain; otherwise a restriction)	Range Datatype (if typed)	Range values
roh	Invention		roh	fundedBy	roh:FundingProgram	vivo	abbreviation	rdfs:Literal	
			roh	hasKnowledgeArea	(skos:Concept and (skos:inScheme some roh:KnowledgeArea))	vivo	description	xsd:string	
			terms	hasPart	roh:PatentApplication	vivo	freeTextKeyword	xsd:string	
			roh	hasPatent	bibo:Patent	vivo	identifier	rdfs:Literal	
			roh	hasPropertyClassification	(skos:Concept and (skos:inScheme some roh:PropertyClassification))	roh	title	xsd:string	
			roh	isSupportedBy	roh:Funding				
	geonames	locatedIn			geonames:Feature				
			roh	patentStatus	roh:Submitted or roh:Accepted or roh:Rejected				
			roh	produces	roh:ResearchObject				
			vivo	relatedBy	roh:Dossier				
			vivo	relates	obo-bfo:BFO_0000023 (Role)				
			roh	spends	roh:PatentExpense				
	roh	PatentApplication	roh	ownerOrganization	foaf:Organization				



			roh	patentStatus	roh:Submitted or roh:Accepted or roh:Rejected				
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### 3.11. roh:Metric

Prefix	Class		Prefix	Object property (bold indicates explicit Domain, otherwise a Restriction)	Range Class	Prefix	Datatype Property (bold indicates explicit domain; otherwise a restriction)	Range Datatype (if typed)	Range values
roh	Metric		vivo	dateTimeValue	vivo:DateTimeValue	roh	metricName	xsd:string	
			roh	metricOf					
	roh	AuthorMetric	roh	metricOf	foaf:Agent	roh	citationCount	xsd:integer	
						roh	h-index	xsd:integer	
	roh	DegreeMetric							
	roh	ThesisMetric				roh	cumLaude	xsd:boolean	
						roh	mark	xsd:string	
		roh PhDThesisMetric							
	roh	PublicationMetric				roh	citationCount	xsd:integer	
						roh	impactFactor	xsd:float	
						roh	quartile	xsd:string	{"Q1", "Q2", "Q3", "Q4"}
						roh	ranking	xsd:string	
	roh	ResearchGroupMetric							

### 3.12. roh:Product

Prefix	Class		Prefix	Object property (bold indicates explicit Domain, otherwise a Restriction)	Range Class	Prefix	Datatype Property (bold indicates explicit domain; otherwise a restriction)	Range Datatype (if typed)	Range values
roh	Product					roh	hasTRL	xsd:integer	
	roh	Prototype							

### 3.13. vivo:Project

Prefix	Class		Prefix	Object property (bold indicates explicit Domain, otherwise a Restriction)	Range Class	Prefix	Datatype Property (bold indicates explicit domain; otherwise a restriction)	Range Datatype (if typed)	Range values
vivo	Project		roh	hasKnowledgeArea	skos:Concept and (skos:inScheme some roh:Knowledge Area)	roh	identifier	xsd:string	
			vivo	relates	roh:Audit or obo-bfo:Role	vivo	abbreviation	rdfs:Literal	
			roh	hasContract	vivo:ProjectContract	vivo	description	rdfs:Literal	
			terms	hasPart	vivo:Project	roh	title	xsd:string	
			vivo	participates	roh:Activity	vivo	freeTextKeyword	xsd:string	
			roh	spends	roh:ProjectExpense	roh	modality	xsd:string	
			roh	produces	roh:ResearchObject	roh	needsEthicalValidation	xsd:boolean	
			vivo	relatedBy	roh:Dossier or roh:Justification or obo-bfo:Role	roh	isCompetitive	xsd:boolean	
			roh	isSupportedBy	roh:Funding	roh:	projectObjective	xsd:string	
			gn	locatedIn	gn:Feature				
			vivo	dateTimeInterval	vivo:DateTimeInterval				

		roh	<b>hasProjectCategorization</b>	(skos:Concept and (skos:inScheme some roh:ProjectClassification))				
		roh	<b>hasHRClassification</b>	(skos:Concept and (skos:inScheme some roh:HRClassification))				
		roh	<b>projectStatus</b>	roh:Status (roh:Closed or roh:Open or roh:ProposalSubmitted or roh:Rejected)				
		roh	<b>coordinatedBy</b>	foaf:Agent				
		roh	<b>foreseenJustificationDate</b>	vivo:DateTimeValue				

### 3.14. vivo:Relationship

Prefix	Class		Prefix	Object property (bold indicates explicit Domain, otherwise a Restriction)	Range Class	Prefix	Datatype Property (bold indicates explicit domain; otherwise a restriction)	Range Datatype (if typed)	Range values
<b>vivo</b>	<b>Relationship</b>								
	<b>vivo</b>	<b>AdvisingRelationship</b>	vivo	dateTimeInterval	vivo:DateTimeInterval				
			vivo	<b>degreeCandidacy</b>	vivo:AcademicDegree				
			vivo	hasSubjectArea	skos:Concept				
			vivo	relates	vivo:AdvisorRole or vivo:AdviseeRole or foaf:Person				
		vivo FacultyMentoringRelationship							
		vivo GraduateAdvisingRelationship							
		vivo PostdocOrFellowAdvisingRelationship							
		vivo UndergraduateAdvisingRelationship							
	<b>vivo</b>	<b>AuditingRelationship</b>	vivo	dateTimeInterval	vivo:DateTimeInterval				
			vivo	dateTimeValue	vivo:DateTimeValue				
			vivo	relates	roh:AuditeeRole or vivo:AuditorRole or foaf:Agent				
	<b>vivo</b>	<b>AwardedDegree</b>	roh	<b>awardedBy</b>	vivo:University				
			vivo	dateTimeValue	vivo:DateTimeValue				
			vivo	relates	foaf:Person or roh:AcademicDegree				
	<b>vivo</b>	<b>Contract</b>	<b>vivo</b>	<b>assignedBy</b>	foaf:Organization	bibo	abstract	xsd:string	
			roh	attachment	owl:Thing				
			roh	<b>contractSigningDate</b>	vivo:DateTimeValue				
			vivo	dateTimeInterval	vivo:DateTimeInterval				
			vivo	hasSubjectArea	skos:Concept				
			vivo	relates	roh:Funding or bibo:Patent or foaf:Agent or obo-bfo:BFO_0000023 (Role)				
			vivo	supportedInformationResource	obo-iao:IAO_0000030 (InformationContentEntity)				
		roh PatentContract							
		roh PersonContract							
		roh ProjectContract							
		roh ServiceContract							
	<b>vivo</b>	<b>Position</b>	vivo	dateTimeInterval	vivo:DateTimeInterval	vivo	rank	xsd:int	
			roh	<b>positionOf</b>	foaf:Person	vivo	<b>hrJobTitle</b>		
			vivo	relates	foaf:Organization				
			vivo	relates	foaf:Person				
		vivo FacultyAdministrativePosition							
		vivo FacultyPosition							

		vivo	LibrarianPosition							
		vivo	NonAcademicPosition							
		vivo	NonFacultyAcademicPosition							
		vivo	PostdocPosition							
		vivo	PrimaryPosition							
		roh	ResearcherPosition							
	roh	ReservationRelationship	vivo	dateTimeInterval	vivo:DateTimeInterval					
			vivo	hasSubjectArea	skos:Concept					
			vivo	relates	roh:ReservableConsumerRole					
	roh	SupervisingRelationship	vivo	dateTimeInterval	vivo:DateTimeInterval					
			roh	produces	bibo:Thesis					
			vivo	relates	roh:SupervisorRole or roh:SuperviseeRole or foaf:Person					
		roh	BachelorsSupervisingRelationship	roh	produces	roh:DegreeThesis				
		roh	MastersSupervisingRelationship	roh	produces	roh:MasterThesis				
		roh	PhDSupervisingRelationship	roh	produces	roh:PhDThesis				

Notice that in vertical modules you can find human resource positions associated to different countries.

### 3.15. roh:ResearchObject

Prefix	Class			Prefix	Object property (bold indicates explicit Domain, otherwise a Restriction)	Range Class	Prefix	Datatype Property (bold indicates explicit domain; otherwise a restriction)	Range Datatype (if typed)	Range values
roh	ResearchObject <sup>2</sup>			roh	hasKnowledgeArea	(skos:Concept and (skos:inScheme some roh:KnowledgeArea))				
				roh	correspondingAuthor	foaf:Person				
				roh	producedBy	roh:Project				
obo-iao	IAO_0000030 (Information Content Entity)			roh	correspondingOrganization	foaf:Organization				
	bibo	Collection					bibo	oclnum	rdfs:Literal	
		roh	Dossier	vivo	dateTimeInterval	vivo:DateTimeInterval	vivo	description	rdfs:Literal	
				vivo	relates	roh:FundingProgram or roh:ProjectContract or bibo:Report or vivo:Project	vivo	identifier	xsd:string	
							roh	title	xsd:string	
		bibo	Periodical	vivo	publisher	foaf:Organization	bibo	eissn	rdfs:Literal	
							bibo	issn	rdfs:Literal	
		bibo	Journal				vivo	abbreviation	rdfs:Literal	
		bibo	Magazine							
	bibo	Document		bibo	authorList	rdf:Seq	bibo	abstract	xsd:string	
				roh	correspondingAuthor	foaf:Person	bibo	doi	xsd:string	
				vivo	dateTimeValue	vivo:DateTimeValue	vivo	freeTextKeyword	xsd:string	
				bibo	editorList	rdf:Seq	bibo	pageStart	rdfs:Literal	

<sup>2</sup> Notice that roh:ResearchObject is a defined class, which follows these restrictions: (( (roh:correspondingAuthor some foaf:Person) and (roh:hasKnowledgeArea some (skos:Concept and (skos:inScheme some roh:KnowledgeArea)))) and (roh:correspondingAuthor only foaf:Person) and (roh:hasKnowledgeArea only (skos:Concept and (skos:inScheme some roh:KnowledgeArea)))) or (roh:producedBy only roh:Project). This is, an instance in ROH belongs to class roh:ResearchObject if it meets these restrictions.

				vivo	publishedIn	bibo:Collection or bibo:Book	bibo	pageEnd	rdfs:Literal	
				vivo	publisher	foaf:Agent				
				roh	documentStatus	roh:Accepted or roh:Rejected	roh	title	xsd:string	
		vivo	Abstract							
		bibo	Article				bibo	issue		
			bibo AcademicArticle	vivo	hasPublicationVenue	bibo:Journal	bibo	eanucc13	rdfs:Literal	
			bibo-iao: IAO_0000013 (JournalArticle)	vivo	dateIssued	vivo:DateTimeValue				
				roh	hasMetric	roh:PublicationMetric				
			roh:PeerReviewedArticle							
		roh	BlogPost							
		vivo	ConferencePaper	bibo	presentedAt	bibo:Conference				
			roh: WorkshopPaper							
		vivo	EditorialArticle							
		roh	PeerReviewedArticle							
		roh	PressArticle							
		bibo	AudioVisualDocument							
		roh	RadioProgram							
		roh	TvProgram							
		bibo	Book	vivo	publisher	foaf:Organization	bibo	edition	rdfs:Literal	
							bibo	isbn	rdfs:Literal	
							bibo	iccn	rdfs:Literal	
							vivo	placeOfPublication	rdfs:Literal	
		bibo	Proceedings							
		roh	CaseStudy							
		roh	Catalog							
		bibo	CollectedDocument	terms	hasPart					
		roh	Database							
		bibo	EditedBook							
		bibo	Issue	terms	hasPart	bibo:Article	bibo	issue	rdfs:Literal	
		vivo	ConferencePoster							
		roh	CurriculumVitae	roh	CVOF	foaf:Person	roh	summary	xsd:string	
		vivo	Dataset	cito	isCitedAsDataSourceBy	bibo:Document				
		bibo	DocumentPart	vivo	publisher	foaf:Organization	vivo	placeOfPublication	rdfs:Literal	
		bibo	BookSection				bibo	edition	rdfs:Literal	
			bibo: Chapter							
		roh	EditedPublication							
		foaf	Image							
		roh	Invoice							
		roh	ProformaInvoice							
		bibo	Manual							
		bibo	Patent	vivo	assignee	foaf:Organization	vivo	identifier	xsd:string	
				vivo	dateIssued	vivo:DateTimeValue	roh	modality	xsd:string	
				roh	expirationDate	vivo:DateTimeValue				
				roh	hasKnowledgeArea	(skos:Concept and (skos:inScheme some roh:KnowledgeArea))				
				gn	locatedIn	gn:Feature				
				roh	ownerOrganization	foaf:Organization				

				roh	patentCountry	(skos:Concept and (skos:inScheme some roh:Country))				
				roh	patentInventor	foaf:Person				
		bibo	Report	bibo	distributor	foaf:Organization				
				vivo	publisher	foaf:Organization				
			roh	EthicalReport						
			roh:	EthicalAudit						
			roh:	EthicalValidation						
			roh	EvaluationSummary	roh	evaluationStatus	roh:Final or roh:Provisional			
			roh	Justification	vivo	relates	roh:Project			
			vivo	ResearchProposal	vivo	relates	roh:Justification or roh:ProjectContract or roh:Project or vivo:ResearchProposal			
			roh	TechnicalReport						
		bibo	Thesis	roh	supervisedBy	foaf:Person	vivo	abbreviation	rdfs:Literal	
							vivo	placeOfPublication	rdfs:Literal	
			roh	BachelorsThesis						
			roh	MastersThesis						
			roh	PhDThesis						
		bibo	Webpage							

### 3.16. roh:Reservable

Prefix	Class	Prefix	Object property (bold indicates explicit Domain, otherwise a Restriction)	Range Class	Prefix	Datatype Property (bold indicates explicit domain; otherwise a restriction)	Range Datatype (if typed)	Range values
roh	Reservable	vivo	dateTimeInterval	vivo:DateTimeInterval	vivo	description	xsd:string	
		roh	infrastructureOf	foaf:Agent	vivo	freetextKeyword	xsd:string	
					roh	title	xsd:string	
	obo-ero 0000071 (Software)	vivo	hasSubjectArea	skos:Concept				
	vivo Equipment							
	vivo Facility	pbo-ro	BFO_0000051 (hasPart)	roh:Facility				

### 3.17. obo-bfo:Role (BFO\_0000023)

Prefix	Class	Prefix	Object property (bold indicates explicit Domain, otherwise a Restriction)	Range Class	Prefix	Datatype Property (bold indicates explicit domain; otherwise a restriction)	Range Datatype (if typed)	Range values
obo-bfo	BFO_0000023 (Role) <sup>3</sup>	vivo	dateTimeInterval	vivo:DateTimeInterval	roh	dedication	xsd:string	["PARTIAL", "TOTAL"]
		roh	RO_0000052 (inheresIn)	foaf:Agent	vivo	dedicationPercentage	xsd:float	
					vivo	description	xsd:string	
		roh	hasKnowledgeArea	(skos:Concept and (skos:inScheme some roh:KnowledgeArea))	roh	referencedLaw	xsd:string	
		vivo	relatedBy	roh:PatentApplication or vivo:Project or vivo:Relationship				

<sup>3</sup> Notice that the actual name of this class is opaque, i.e. BFO\_0000023, its associated URI is [http://purl.org/roh/obo/bfo#BFO\\_0000023](http://purl.org/roh/obo/bfo#BFO_0000023)

		obo-bfo	realizedIn	roh:Activity				
		roh	roleOf	foaf:Agent				
	vivo	AdministratorRole						
	vivo	AdviseeRole						
	vivo	AdvisorRole						
	vivo	AttendeeRole						
	vivo	AuditeeRole						
	vivo	AuditorRole						
	vivo	EditorRole						
	obo-ero	ERO_0000225 (EducatorRole)						
	obo-ero	ERO_0000787 (EmployeeRole)						
	roh	ExternalMemberRole						
	obo-ero	ERO_0000224 (FundingRole)						
	vivo	LeaderRole						
	vivo	MemberRole						
	vivo	OrganizerRole						
	vivo	PresenterRole						
	vivo	ResearcherRole						
	roh	ReservableConsumerRole						
	roh	ReservableProviderRole						
	vivo	ReviewerRole						
	obo-ero	ERO_0000783 (StudentRole)						
	roh	SuperviseeRole						
	roh	SupervisorRole						
	vivo	TeacherRole						
	roh	TechnicalSupport						
	roh	ThirdPartyContractorRole						

### 3.18. obo-ero:Service<sup>4</sup> (ERO\_0000005)

Prefix	Class	Prefix	Object property (bold indicates explicit Domain, otherwise a Restriction)	Range Class	Prefix	Datatype Property (bold indicates explicit domain; otherwise a restriction)	Range Datatype (if typed)	Range values
obo-ero	ERO_0000005 (Service)	roh	isProvidedBy	foaf:Organization	vivo	description	xsd:string	
					vivo	identifier	xsd:string	
					roh	title	xsd:string	
	obo-ero	ERO_0000391 (AccessService)						
	obo-ero	ERO_0001261 (AnalysisService)						
	obo-ero	ERO_0001262 (DataAnalysisService)						
	obo-ero	ERO_0000395 (MaterialAnalysisService)						
	obo-ero	ERO_0001261 (AnalysisService)						
	obo-ero	ERO_0001262 (DataAnalysisService)						
	obo-ero	ERO_0000395 (MaterialMaintenanceService)						
	obo-ero	ERO_0001258 (MaintenanceService)						

<sup>4</sup> Associated to IRI [http://purl.org/roh/mirror/obo/ero#ERO\\_0000005](http://purl.org/roh/mirror/obo/ero#ERO_0000005). These classes from obo-ero use opaque IDs, for their instantiation the alphanumeric IDs declared under parenthesis should be used.

		obo-ero	ERO_0001260 (DataMaintenanceService)							
		obo-ero	ERO_0001259 (MaterialMaintenanceService)							
		obo-ero	ERO_0000394 (MaterialProcessingService)							
		obo-ero	ERO_0001263 (MaterialModificationService)							
		obo-ero	ERO_0000396 (MaterialProductionService)							
		obo-ero	ERO_0000392 (StorageService)							
		obo-ero	ERO_0001257 (DataStorageService)							
		obo-ero	ERO_0001256 (MaterialStorageService)							
		obo-ero	ERO_0001255 (SupportService)							
		obo-ero	ERO_0000393 (TrainingService)							
		obo-ero	ERO_0001254 (TransportService)							

### 3.19. roh:Status

Prefix	Class	Prefix	Object property (bold indicates explicit Domain, otherwise a Restriction)	Range Class	Prefix	Datatype Property (bold indicates explicit domain; otherwise a restriction)	Range Datatype (if typed)	Range values
roh	Status	vivo	<b>dateTimeInterval</b>	<b>vivo:DateTimeInterval</b>				
	roh Accepted							
	vivo Cancelled							
	roh Closed							
	roh Final							
	roh Funded							
	roh Open							
	roh ProposalSubmitted							
	roh Provisional							
	roh Rejected							
	roh Signed							
	roh Submitted							
	roh Terminated							
	roh Unfunded							

### 3.20. obo-bfo:TemporalRegion<sup>5</sup>

Prefix	Class	Prefix	Object property (bold indicates explicit Domain, otherwise a Restriction)	Range Class	Prefix	Datatype Property (bold indicates explicit domain; otherwise a restriction)	Range Datatype (if typed)	Range values
obo-bfo	<b>BFO_0000008 (TemporalRegion)</b>							
	obo-bfo BFO_0000038 (OneDimensionalTemporalRegion)							
	vivo	dateTimeInterval	vivo start	<b>vivo:DateTimeValue</b>				
			vivo end	<b>vivo:DateTimeValue</b>				
	obo-bfo BFO_0000158 (ZeroDimensionTemporalRegion)							

<sup>5</sup> The actual URI associated to this concept is: [http://purl.org/roh/mirror/obo/bfo#BFO\\_0000008](http://purl.org/roh/mirror/obo/bfo#BFO_0000008)

		vivo	DateTimeValue				vivo	dateTime	xsd:dateTime	
--	--	------	---------------	--	--	--	------	----------	--------------	--