

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

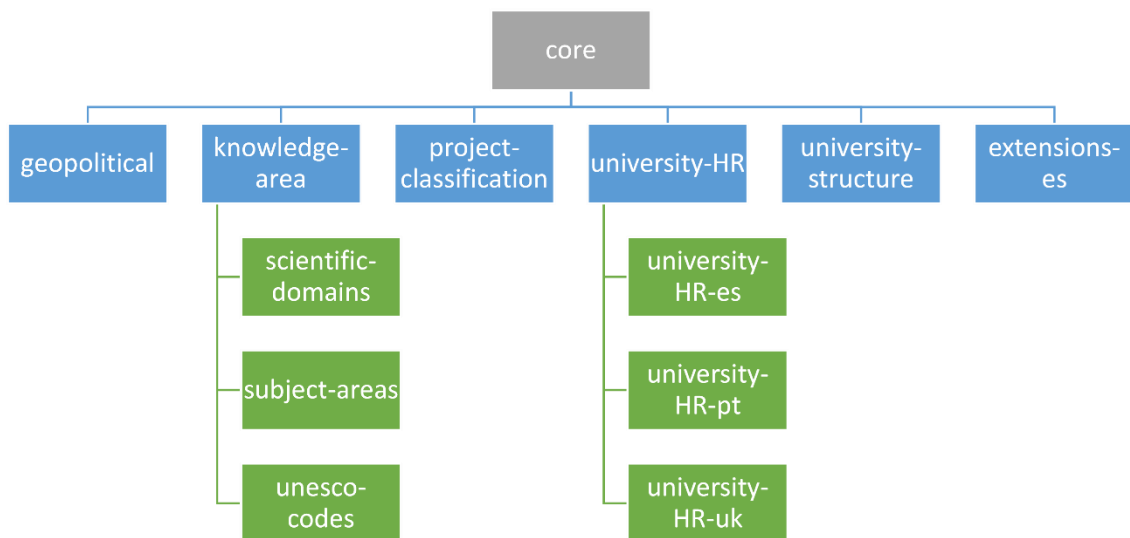
The aim of this document is to provide a bird's eye view on the entities modelled within ROH. The document includes an overview in tabular form for each of the core entities of the network of ontologies ROH, giving details on the object and data properties supported by each of them. This document is 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#ProfesorTitularDeUniversidad`. 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	http://purl.org/roh/mirror/bibo#	http://bibilontology.com/
cito	CITO, the Citation Typing Ontology	http://purl.org/spar/cito#	https://sparontologies.github.io/cito/current/cito.html
foaf	FOAF: Friend of a Friend Ontology	http://purl.org/roh/mirror/foaf#	http://xmlns.com/foaf/spec/
gn	GeoNames Ontology	http://purl.org/roh/mirror/geonames#	http://www.geonames.org/ontology/documentation.html
obo-bfo	OBO Foundry, Basic Formal Ontology	http://purl.org/roh/mirror/obo/bfo#	http://www.obofoundry.org/ontology/bfo.html
obo-ero	OBO Foundry, eagle-i Research Resource Ontology (ERO)	http://purl.org/roh/mirror/obo/ero#	https://open.eoliba.net/erodoc/ontology/erodoc/ontology
obo-iao	OBO Foundry, Information Artifact Ontology	http://purl.org/roh/mirror/obo/iao#	https://github.com/Information-Artifact-Ontology/iao
obo-ro	OBO Foundry, Relations Ontology	http://purl.org/roh/mirror/obo/ro#	http://www.obofoundry.org/ontology/ro.html
owl	OWL Web Ontology Language	http://www.w3.org/2002/07/owl#	https://www.w3.org/TR/owl-features/
rdf	The RDF Concepts Vocabulary (RDF)	http://www.w3.org/1999/02/22-rdf-syntax-ns#	https://www.w3.org/TR/rdf-concepts/
rdfs	RDF Schema 1.1	http://www.w3.org/2000/01/rdf-schema#	https://www.w3.org/TR/rdf-schema/
roh	Red de Ontologías Hércules / Hercules Network of Ontologies	http://purl.org/roh#	https://github.com/HerculesCRUE/ROH/tree/main/sigmaaie/modules/core/doc
roh-es	Extensions of ROH for Spanish academic system	http://purl.org/roh/es#	https://github.com/HerculesCRUE/ROH/tree/main/sigmaaie/modules/extensions-es/doc
skos	SKOS Simple Knowledge Organization System	http://www.w3.org/2004/02/skos/core#	https://www.w3.org/TR/2008/WD-skos-reference-20080829/skos.html
terms	DCMI Metadata Terms	http://purl.org/dc/terms	https://www.dublincore.org/specifications/dublin-core/dcmi-terms/
vcad	vCard Ontology - for describing People and Organizations	http://purl.org/roh/mirror/vcard#	https://www.w3.org/TR/vcard-rdf/
vivo	VIVO core ontology	http://purl.org/roh/mirror/vivo#	https://wiki.lyrasis.org/display/VIVO/The+core+ontology+and+its+annotations
oa	The Web Annotation Data Model		https://www.w3.org/ns/oa

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-es	Sexennial	vivo	dateTimeInterval	vivo:DateTimeInterval			
	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	hasContactInfo	vcard:Kind	vivo	identifier	xsd:string	
			vivo	hasKnowledgeArea	skos:Concept	vivo	description	xsd:string	
			roh	participatedBy	foaf:Agent or vivo:Project	vivo	freeTextKeyword	xsd:string	
			bibo	presents	bibo:Document	roh	title	xsd:string	
			vivo	relates	roh:Expense or obo-bfo:0000023 (Role)				
			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	hasContactInfo	vcard:Kind	vivo	freeTextKeyword	xsd:string	
		roh	hasAccreditation	roh:Accreditation				
		roh	hasRole	obo-bfo:BFO_0000023 (Role)				
		foaf	mBox	owl:Thing				
		vivo	relatedBy	vivo:Relationship				
		roh	hasReservable	roh:Reservable				
	foaf Group							
	foaf Organization	roh	hasKnowledgeArea	(skos:Concept and (skos:inScheme some roh:KnowledgeArea))	vivo	identifier	xsd:string	
		vivo	affiliatedOrganization	foaf:Organization	vivo	abbreviation	rdfs:Literal	
		roh	correspondingOrganizationOf	roh:ResearchObject				
		roh	foundationDate	vivo:DateTimeValue	vivo	description	xsd:string	
		vivo	hasSuccessorOrganization	foaf:Organization	roh	title	xsd:string	
		vivo	hasPredecessorOrganization	foaf:Organization				
		obo-ro	BFO_0000051 (hasPart)	foaf:Organization				
		roh	hasReservable	roh:Reservable				
		roh	hasSpinOff	vivo:Company				
		foaf	homePage	bibo:Document				
		roh	ownerOrganizationOf	roh:PatentApplication or bibo:Patent				
		roh	participates	roh:Activity				
		roh	produces	roh:ResearchObject				
		roh	provides	obo-ero:ERO_0000005 (Service)				
		roh	grantedBy	roh:FundingAmount				
		vivo	dateTimeInterval	vivo:DateTimeInterval				
		gn	locatedIn	gn:Feature				
	roh AccreditationIssuer ¹	roh	issues	roh:Accreditation				
	vivo Center							

¹ Defined class attending the following restriction Organization and (issues some Accreditation) and (issues only Accreditation)

		vivo	Company	roh	hasCompanyClassification	(skos:Concept and (skos:inScheme some roh:KnowledgeArea))	roh	isStartup	xsd:boolean	
				roh	isSpinoffOf	foaf:Organization	roh	publicCompany	xsd:boolean	
			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				
		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	vivo	description	xsd:string	
				roh	hasPosition	vivo:Position	roh	firstName	xsd:string	
				roh	participates	roh:Activity	roh	gender	xsd:string	
				roh	hasMetric	roh:AuthorMetric	roh	researchLine	xsd:string	
				foaf	homePage	foaf:Document	foaf	surname	xsd:string	
				foaf	image	foaf:Image	foaf	name	xsd:string	
				roh	correspondingAuthorOf		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	
							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	codeOf	skos:Concept				
		roh	hasCode	skos:Concept				
		roh	hasKnowledgeArea					
skos	ConceptScheme							
	roh AcademicSubject							
	roh BachelorsDegreeSubject							
	roh MastersDegreeSubject							

roh	AdministrativeEntity							
roh	CompanyClassification							
roh	Country							
roh	ExpenseClassification							
roh	FundingProgramClassification							
roh	HRClassification							
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	CVOF	foaf:Person	roh	cites	xsd:string	
					roh	factorH	xsd:string	
					roh	summary	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	dateTimeValue	vivo:DateTimeValue	roh	currency	xsd:string	
		roh	hasExpenseClassification	(skos:Concept and (skos:inScheme some roh:ExpenseClassification))	vivo	description	xsd:string	
		roh	spentBy		roh	expenseModality	xsd:string	
					roh	monetaryAmount	xsd:float	
					roh	title	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	featureClass		gn	geonamesID	rdfs:Literal	
		gn	featureCode	gn:Code	gn	countryCode	rdfs:Literal	
		gn	parentAMD1	gn:featureCode	gn	name	xsd:string	
		gn	parentAMD2	gn:featureCode	gn	population	xsd:integer	
		gn	parentAMD3	gn:featureCode				
		gn	parentAMD4	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 (has part)	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 (part of)	roh:Funding	roh	currency	xsd:string	
			vivo	dateTimeInterval	vivo:DateTimeInterval	roh	monetaryAmount	xsd:float	
			roh	grants	foaf:Organization				
roh	FundingProgram		obo-ro	BFO_0000051 (has part)	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. vcard:Kind

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
vcad	Kind		roh	contactInfoOf	foaf:Agent				
	vcad	Group							
	vcad	Individual							
	vcad	Location							
	vcad	Organization							

3.11. 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	
			obo-ro	BFO_0000051 (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			

3.12. 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							

3.13. 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							

3.14. 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
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vivo	Project	roh	hasKnowledgeArea	skos:Concept and (skos:inScheme some roh:Knowledge Area)	roh	identifier	xsd:string	
		vivo	relates	obo-bfo:BFO_0000023 (Role)	vivo	abbreviation	rdfs:Literal	
		roh	hasContract	vivo:ProjectContract	vivo	description	rdfs:Literal	
		obo-ro	BFO_0000051 (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:BFO_0000023 (Role)	roh	isCompetitive	xsd:boolean	
		roh	isSupportedBy	roh:Funding	roh:	projectObjective	xsd:string	
		gn	locatedIn	gn:Feature				
		vivo	dateTimeInterval	vivo:DateTimeInterval				
		roh	hasProjectCategorization	(skos:Concept and (skos:inScheme some roh:ProjectClassification))				
		roh	hasHRCClassification	(skos:Concept and (skos:inScheme some roh:HRCClassification))				
		roh	projectStatus	roh:Status (roh:Closed or roh:Open or roh:ProposalSubmitted or roh:Rejected)				
		roh	coordinatedBy	foaf:Agent				
		roh	foreseenJustificationDate	vivo:DateTimeValue				

3.15. 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
vivo	Relationship								
	vivo	AdvisingRelationship	vivo	dateTimeInterval	vivo:DateTimeInterval				
			vivo	degreeCandidacy	vivo:AcademicDegree				
			vivo	hasSubjectArea	skos:Concept				
			vivo	relates	vivo:AdvisorRole or vivo:AdviseeRole or foaf:Person				
		vivo	FacultyMentoringRelationship						
		vivo	GraduateAdvisingRelationship						
		vivo	PostdocOrFellowAdvisingRelationship						
		vivo	UndergraduateAdvisingRelationship						
	vivo	AuditingRelationship	vivo	dateTimeInterval	vivo:DateTimeInterval				
			vivo	dateTimeValue	vivo:DateTimeValue				
			vivo	relates	roh:AuditeeRole or vivo:AuditorRole or foaf:Agent				
	vivo	AwardedDegree	roh	awardedBy	vivo:University				
			vivo	dateTimeValue	vivo:DateTimeValue				
			vivo	relates	foaf:Person or roh:AcademicDegree				
	vivo	Contract	vivo	assignedBy	foaf:Organization	bibo	abstract	xsd:string	
			roh	attachment	owl:Thing				
			roh	contractSigningDate	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-lao: IAO_0000030 (InformationContentEntity)				
		roh	PatentContract						
		roh	PersonContract						
		roh	ProjectContract						
		roh	ServiceContract						
	vivo	Position	vivo	dateTimeInterval	vivo:DateTimeInterval	vivo	rank	xsd:int	
			roh	positionOf	foaf:Person	vivo	hrJobTitle		
			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.

3.16. roh:ResearchResult

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	ResearchResult	roh	hasKnowledgeArea	skos:Concept and (skos:inScheme some roh:KnowledgeArea)	roh	identifier	xsd:string	
		roh	researchResultHasPart	roh:ExperimentalProtocol or roh:Repository or bibo:Document or ero:ERO_0000071 or vivo:Project	roh	title	xsd:string	
		roh	seqOfAuthors	rdf:Seq	vivo	abbreviation	rdfs:Literal	
		roh	hasSucessor	roh:ResearchResult	vivo	description	rdfs:Literal	
		roh	correspondingAuthor	foaf:Person	vivo	freeTextKeyword	xsd:string	
		vivo	dateTimeInterval	vivo:DateTimeInterval	roh	needsEthicalValidation	xsd:boolean	
	roh	ResearchObject ²	correspondingOrganization	foaf:Organization	roh	language	xsd:string	
		roh	hasPartOfResearchResult	roh:ResearchResult				
		roh	producedBy	roh: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
obo -iao	IAO_0000030 (Information Content Entity)	roh	correspondingOrganization	foaf:Organization	roh	language	xsd:string	
	roh Repository	roh	correspondingAuthor	foaf:Person	roh	title	xsd:string	
		roh	hasKnowledgeArea	(skos:Concept and (skos:inScheme some roh:KnowledgeArea))	vivo	description	xsd:string	
		roh	hasReadme	roh:README	bibo	abstract	xsd:string	
		cito	cites	roh:ExperimentalProtocol or ero:ERO_0000071 or roh:Repository or bibo:Document	vivo	freeTextKeyword	xsd:string	
		roh	repositoryHasPart	ExperimentalProtocol or bibo:Document or ero:ERO_0000071				
		roh	hasPredecessor	roh:Repository				
		roh	seqOfAuthors	rdf:Seq				
		roh	hasLicense	vivo:License				
		roh	repositoryStatus	roh:Closed or roh:Open				
		vivo	dateTimeValue	vivo:DateTimeValue				
		foaf	homePage	bibo:Webpage				
	roh BitBucketRepository	roh	hasPredecessor	roh:BitBucketRepository				
	roh GitHubRepository	roh	hasPredecessor	roh:GitHubRepository				
	roh ZenodoRepository	roh	hasPredecessor	roh:ZenodoRepository	bibo	doi	xsd:integer	
					vivo	identifier	xsd:integer	
	bibo Collection				bibo	oclcnum	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	

² Notice that roh:ResearchObject is a defined class, which follows these restrictions: Research or ('part of research result' some 'Research Result') or ('produced by' only vivo:Project)
This is, an instance in ROH belongs to class roh:ResearchObject if it meets these restrictions.

			roh	correspondingAuthor	foaf:Person	bib o	doi	xsd:string	
			roh	correspondingOrganization	foaf:Organization				
			roh	partOfRepository	roh:Repository	ro h	title	xsd:string	
			roh	partOfResearchResult	roh:ResearchResult				
			vivo	dateTimeValue	vivo:DateTimeValue	viv o	freeTextKeyword	xsd:string	
			bibo	editorList	rdf:Seq	bib o	pageStart	rdfs:Literal	
			vivo	hasPublicationVenue	bibo:Collection or bibo:Book	bib o	pageEnd	rdfs:Literal	
			vivo	publisher	foaf:Agent				
			cito	cites	roh:ExperimentalProtocol or ero:ERO_0000071 or roh:Repository or bibo:Document				
			roh	documentStatus	roh:Accepted or roh:Rejected				
		roh	README	roh	readmeOf	roh:Repository or ero:ERO_0000071			
		roh	ExperimentalProtocolResult						
		viv o	Abstract						
		bib o	Article			bib o	issue		
		bib o	Academic Article	vivo	hasPublicationVenue	bibo:Journal	bib o	eanucc13	rdfs:Literal
			obo-lao:IAO_0000013 (JournalArticle)	vivo	dateTimeValue	vivo:DateTimeValue			
				roh	hasMetric	roh:PublicationMetric			
			roh:PeerReviewedArticle						
		ro h	BlogPost						
		viv o	ConferencePaper	bibo	presentedAt	bibo:Conference			
			roh:WorkshopPaper						
		viv o	EditorialArticle						
		ro h	PeerReviewedArticle						
		ro h	PressArticle						
		bib o	AudioVisualDocument						
		ro h	RadioProgram						
		ro h	TvProgram						
		bib o	Book	vivo	publisher	foaf:Organization	bib o	edition	rdfs:Literal
							bib o	isbn	rdfs:Literal
							bib o	iccn	rdfs:Literal
							viv o	placeOfPublication	rdfs:Literal
		bib o	Proceedings						
		roh	CaseStudy						
		roh	Catalog						
		bib o	CollectedDocument						
		ro h	Database						
		bib o	EditedBook						
		bib o	Issue	obo-ro	BFO_0000051 (hasPart)	bibo:Article	bib o	issue	rdfs:Literal
		viv o	ConferencePoster						
		roh	CurriculumVitae	roh	CVOF	foaf:Person	ro h	summary	xsd:string
		viv o	Dataset	cito	isCitedAsDataSourceBy	bibo:Document			
		bib o	DocumentPart	vivo	publisher	foaf:Organization	viv o	placeOfPublication	rdfs:Literal
		bib o	BookSection				bib o	edition	rdfs:Literal

			bibo:Chapter								
		roh	EditedPublication								
		foaf	Image								
		roh	Invoice								
			roh	Proforma Invoice							
		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								

3.17. 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	reservableOf	foaf:Agent	vivo	freetextKeyword	xsd:string	
					roh	title	xsd:string	
	roh	ReservableSoftware						
	vivo	Equipment						
	vivo	Facility	pbo-ro	BFO_0000051 (hasPart)	roh:Facility			

3.18. obo-bfo:BFO_0000023 (Role)

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)³	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				
		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						

3.19. obo-ero:ERO_0000005 (Service)⁴

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	

³ 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

⁴ Associated to IRI 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_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)							
	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)							

3.20. 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	dateTimeInterval	vivo:DateTimeInterval				
	roh	Accepted							
	roh	Cancelled							
	roh	Closed							
	roh	Final							
	roh	Funded							
	roh	Open							
	roh	ProposalSubmitted							
	roh	Provisional							
	roh	Rejected							
	roh	Signed							
	roh	Submitted							
	roh	Terminated							
	roh	Unfunded							

3.21. obo-bfo:TemporalRegion⁵

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_0000008 (TemporalRegion)							
	obo-bfo BFO_0000038 (OneDimensionalTemporalRegion)							
	vivo	DateTimeInterval	vivo start	vivo:DateTimeValue				
			vivo end	vivo:DateTimeValue				
	obo-bfo BFO_0000158 (ZeroDimensionalTemporalRegion)							
	vivo	DateTimeValue			vivo	dateTime	xsd:dateTime	

3.22. roh: ExperimentalProtocol

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	ExperimentalProtocol	roh	correspondingAuthor	foaf:Person	roh	language	xsd:string	
		roh	hasKnowledgeArea	(skos:Concept and (skos:inScheme some roh:KnowledgeArea))	vivo	description	xsd:string	
		roh	produces	roh:ExperimentalProtocolResult	bibo	abstract	xsd:string	
		cito	cites	roh:ExperimentalProtocol or ero:ERO_0000071 or roh:Repository or bibo:Document	vivo	freeTextKeyword	xsd:string	
		roh	partOfResearchResult	roh:ResearchResult	roh	title	xsd:string	
		rog	partOfRepository	roh:Repository				
		roh	hasPredecessor	roh:ExperimentalProtocol				
		roh	seqOfAuthors	rdf:Seq				
		roh	hasLicense	vivo:License				
		vivo	dateTimeValue	vivo:DateTimeValue				
		foaf	homePage	vivo:Webpage				

3.23. obo-ero:Software

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
ero	ERO_0000071	roh	correspondingAuthor	foaf:Person	roh	language	xsd:string	
		roh	hasKnowledgeArea	(skos:Concept and (skos:inScheme some roh:KnowledgeArea))	vivo	description	xsd:string	
		roh	hasReadme	roh:README	bibo	abstract	xsd:string	
		cito	cites	roh:ExperimentalProtocol or ero:ERO_0000071 or roh:Repository or bibo:Document	vivo	freeTextKeyword	xsd:string	
		roh	partOfResearchResult	roh:ResearchResult	roh	title	xsd:string	
		roh	partOfRepository	roh:Repository				
		roh	hasPredecessor	ero:ERO_0000071	roh	programmingLanguage	xsd:string	
		roh	seqOfAuthors	rdf:Seq				
		roh	hasLicense	vivo:License				
		roh	softwareStatus	roh:Final or roh:Provisional				

⁵ The actual URI associated to this concept is: http://purl.org/roh/mirror/obo/bfo#BFO_0000008

		vivo	dateTimeValue	vivo:DateTimeValue				
		foaf	homePage	vivo:Webpage				
	roh	ReservableSoftware						