

 **EUROPEAN JOURNAL OF TAXONOMY**
An Open Access journal for descriptive taxonomy of living and fossil eukaryotes



ISSN 2118-9773

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No 623 (2020)

Handbook of best practice and standards for 2D+ and 3D imaging of natural history collections

Jonathan BRECKO & Aurore MATHYS

Section: *Collection management*; pp. 1–115, 101 figures, 7 tables, 163 references; <https://doi.org/10.5852/ejt.2020.623>

accepted: 16 July 2019; published: 6 April 2020

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Jonathan Brecko, Aurore Mathys

Digitisation workflows: DIGIT-KEY



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Welcome to the DIGIT-KEY application (Delivery 7.2 of the Synthesys+ project)

This key aims to identify the appropriate digitization technique, the accompanying workflow and data pipeline (D7.2.)

Click on the arrow or image to choose which characteristics are necessary in your digitization strategy.



2D/2D+ Digitisation



3D Digitisation



At this point it is more important to know the digitisation pipeline of a specimen independent of the used digitisation technique.

Direct Links

- [Digitisation setups](#)
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Digitisation workflows: DIGIT-KEY



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Welcome to the DIGIT-KEY application (Delivery 7)

This key aims to identify the appropriate digitization technique, the accuracy and resolution of the data. Click on the arrow or image to choose which characteristics are necessary for the digitization process.



2D/2D+ Digitisation



3D Digitisation

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3D digitisation

This part of the key will show how to produce a 3D digital twin of the collection specimen. Although many techniques show an overlap in capability of producing quality 3D models, there are sometimes rather important differences.

The specimen has to be visualised in 3D and:



both internal as external volume has to be digitised



only the surface is of importance

microCT/nanoCT digitisation: list of setups

Search

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in current results



2D/2D+/3D μ CT at MNHN



2D/2D+/3D μ CT at MNCN-CSIC



2D/2D+/3D μ CT/nanoCT at HCMR



2D/2D+/3D μ CT/nanoCT at NHMW



2D/2D+/3D μ CT at RBINS






















2D/2D+/3D μ CT/nanoCT at RBINS

RBINS setups

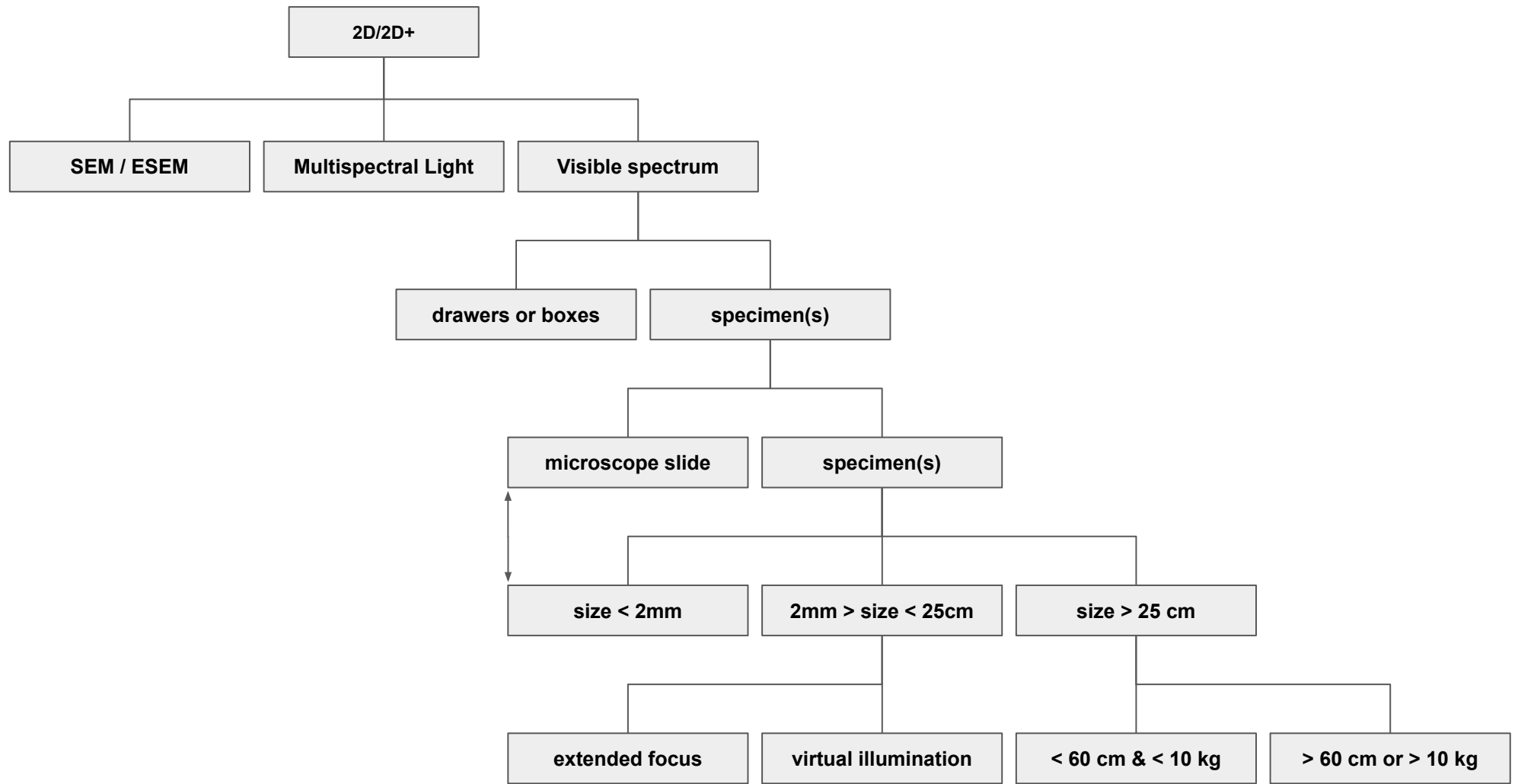
Search

all items in current results

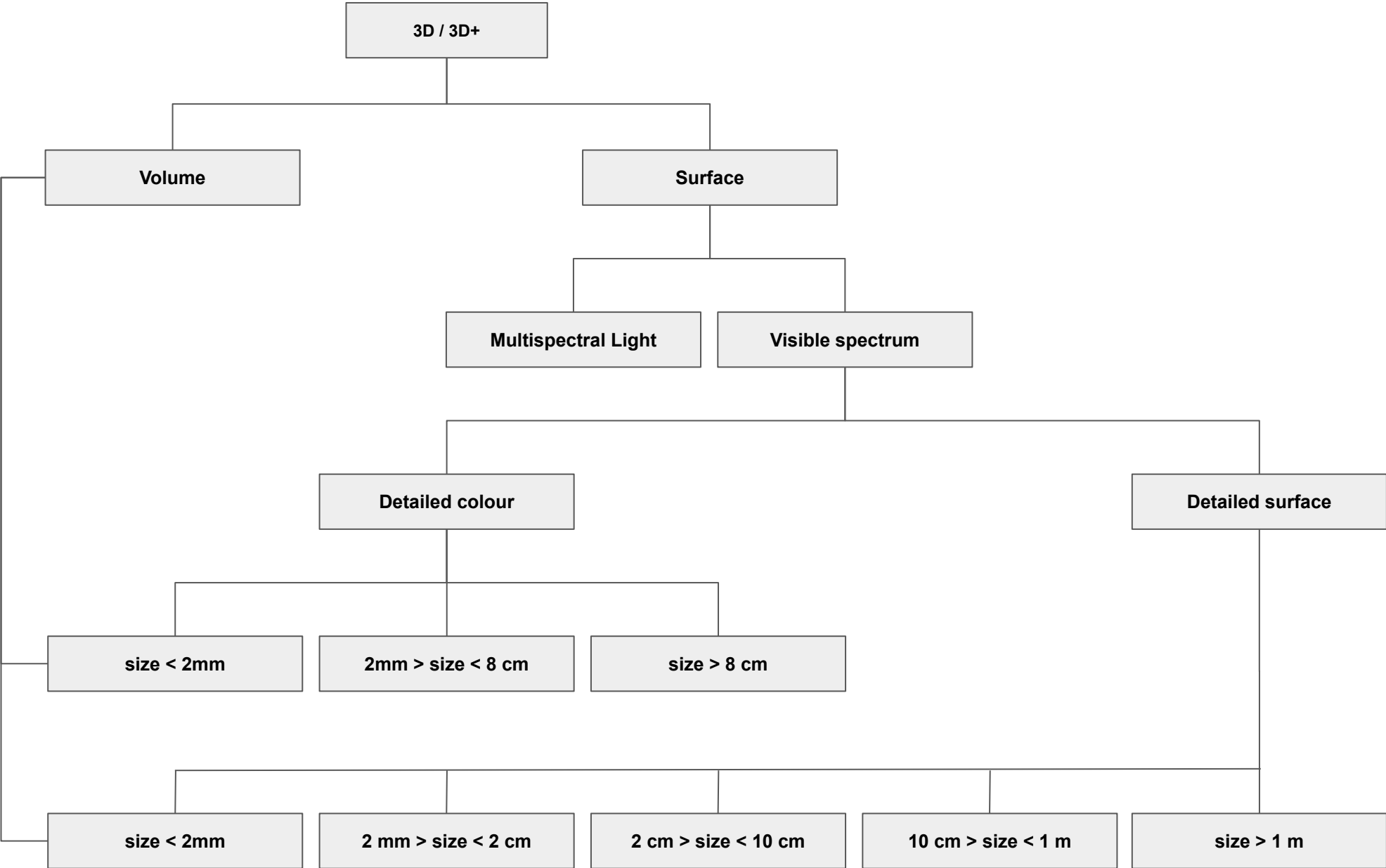
Category

 <p>2D/2D+/3D µCT at RBINS</p>	 <p>2D/2D+/3D µCT/manoCT at RBINS</p>	 <p>3D spectral dome with led panels (RBINS/RMCA)</p>	 <p>Artec Eva portable Structured light scanner (RBINS)</p>	 <p>Artec Spider portable Structured light scanner (RBINS)</p>	 <p>Digitisation of drawers / boxes (RBINS/RMCA)</p>	 <p>Digitisation of large specimens 2D</p>	 <p>HDI Advance (RBINS)</p>
 <p>Keyence VR-5000 Microscope (RBINS)</p>	 <p>Low Cost Focus Stacking (RBINS/RMCA)</p>	 <p>Manual 3D Focus stacking / SIM setup</p>	 <p>MechScan (RBINS)</p>	 <p>Megavision system (RBINS/RMCA)</p>	 <p>Microscope Slide digitisation 2D+ (RBINS/RMCA)</p>	 <p>Modified Flashgun with filters (RBINS/RMCA)</p>	 <p>RTI minidome (RBINS)</p>
 <p>scAnt (RBINS)</p>	 <p>SIM of medium to large specimens (RBINS/RMCA)</p>	 <p>Top view A3 Scanner (RBINS/RMCA) This scanner allows to</p>					

Digitisation workflows: DIGIT-KEY 2D



Digitisation workflows: DIGIT-KEY 3D



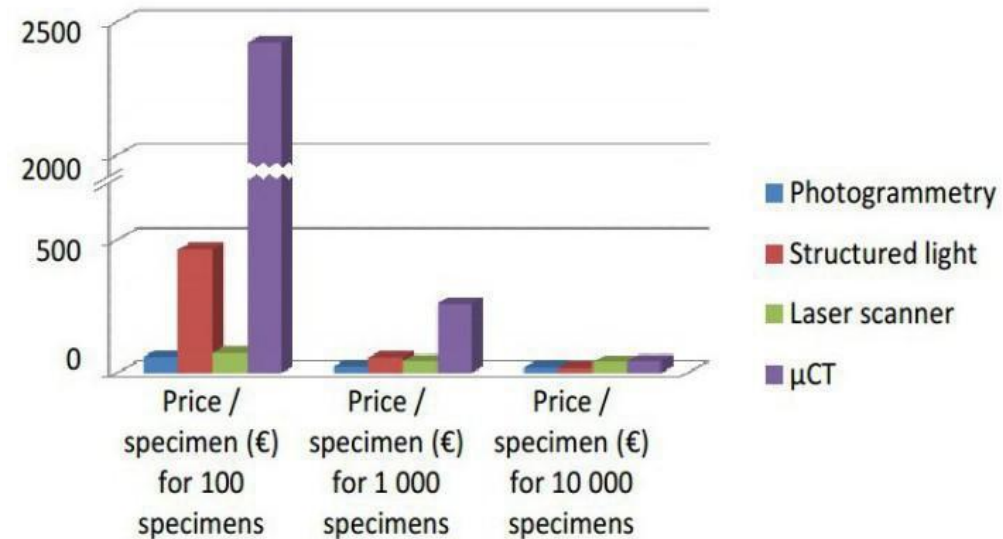
Digitisation workflows

Cost of digitisation for medium size specimens



Graph 1: Cost of the digitisation of 1 middle sized specimen in function of the technique and of the quantity of specimens to be digitised. The cost takes into account the equipment, time of digitisation and salary of the staff.

Cost of digitisation for small size specimens



Graph 2: Cost of the digitisation of 1 small sized specimen in function of the technique and of quantity of specimens to be digitised. The cost takes into account the equipment, time of digitisation and salary of the staff.

Digitisation: Container level

Inventory Box CR2

by mars — last modified Apr 04, 2020 03:07 PM — History Copyright: RBINS / DIGIT-4 Belspo Licence: CC BY NC ND

BE-RBINS-ENT Collection Rophalocera Ronald Brabant

[Switch to multiple tables view](#)



Download as CSV

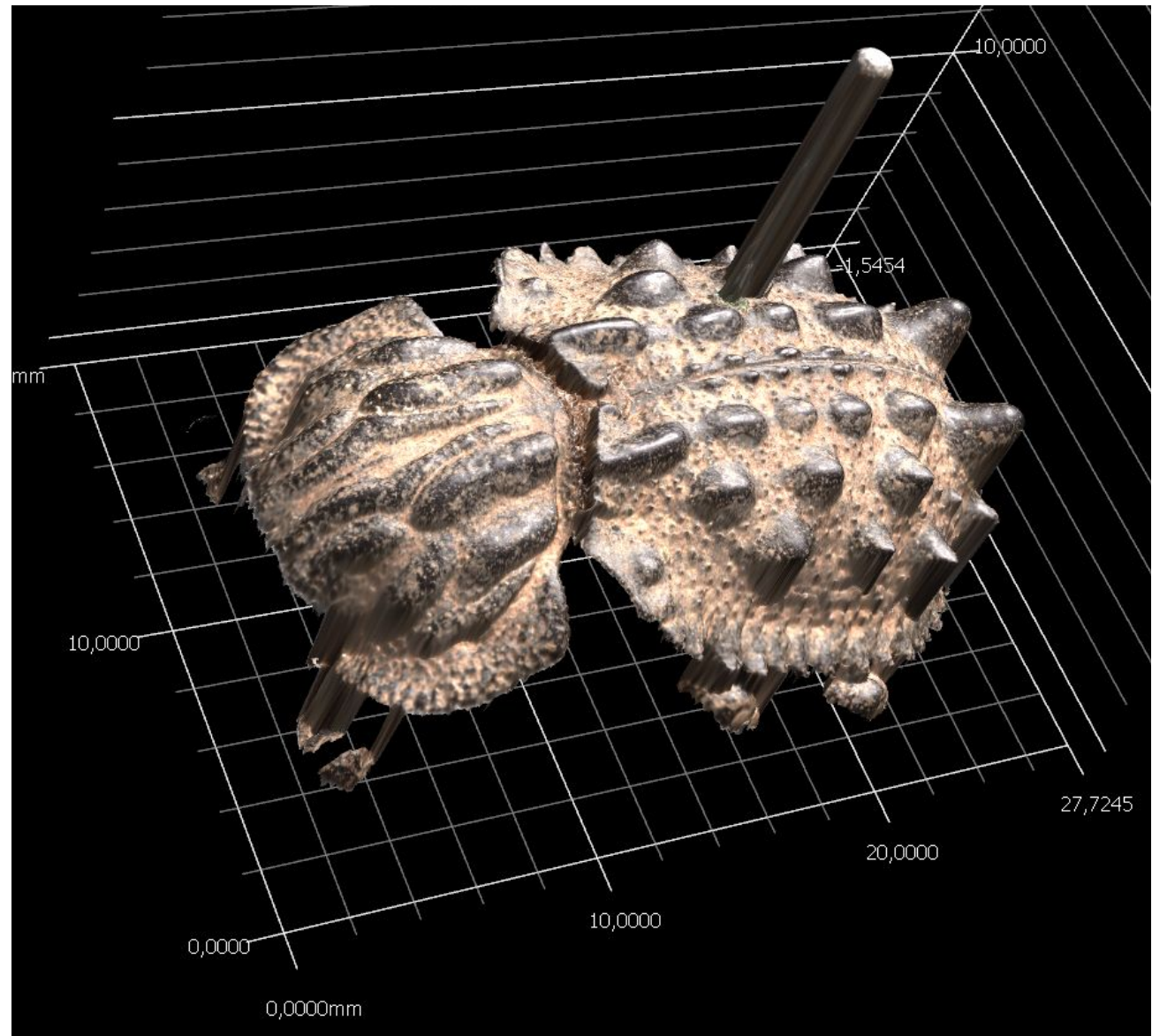
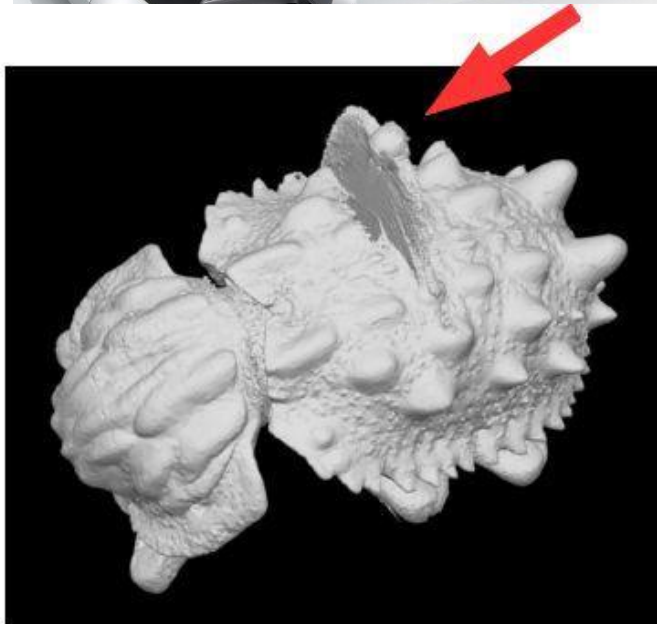
Search:

Stable CETAF Identifier	Cabinet	Specimen ID	Box UID	Taxon	Sex	Stage	Specimen Number	Country	Place	Date of collect	Collector	Determination	Type	Other Labels	Latin Date
https://darwin.naturalsciences.be/darwin/search/view/uuid/820eda4e-45fc-407d-a81d-0cc96dad32bb	CR2	619881		Nymphalidae Rafinesque, 1815 Tithorea tarricina pinthias Godman & Salvin, 1879	male	adult	1	Costa Rica	Ciudad Colón; Finca Hamadryas			Brabant Ronald (Dhr.)	specimen		
https://darwin.naturalsciences.be/darwin/search/view/uuid/27cc605d-23ef-4a59-9fad-a103b52ed95f	CR2	619882		Nymphalidae Rafinesque, 1815 Tithorea tarricina pinthias Godman & Salvin, 1879	female	adult	1	Costa Rica	Finca Hamadryas; Ciudad Colón			Brabant Ronald (Dhr.)	specimen		

Digitisation: 2D+ Specimen level



Digitisation: 3D Specimen level



Pictures: J. Brecko DIGIT-3

Digitisation: 3D Specimen level



RX Solution EasyTom

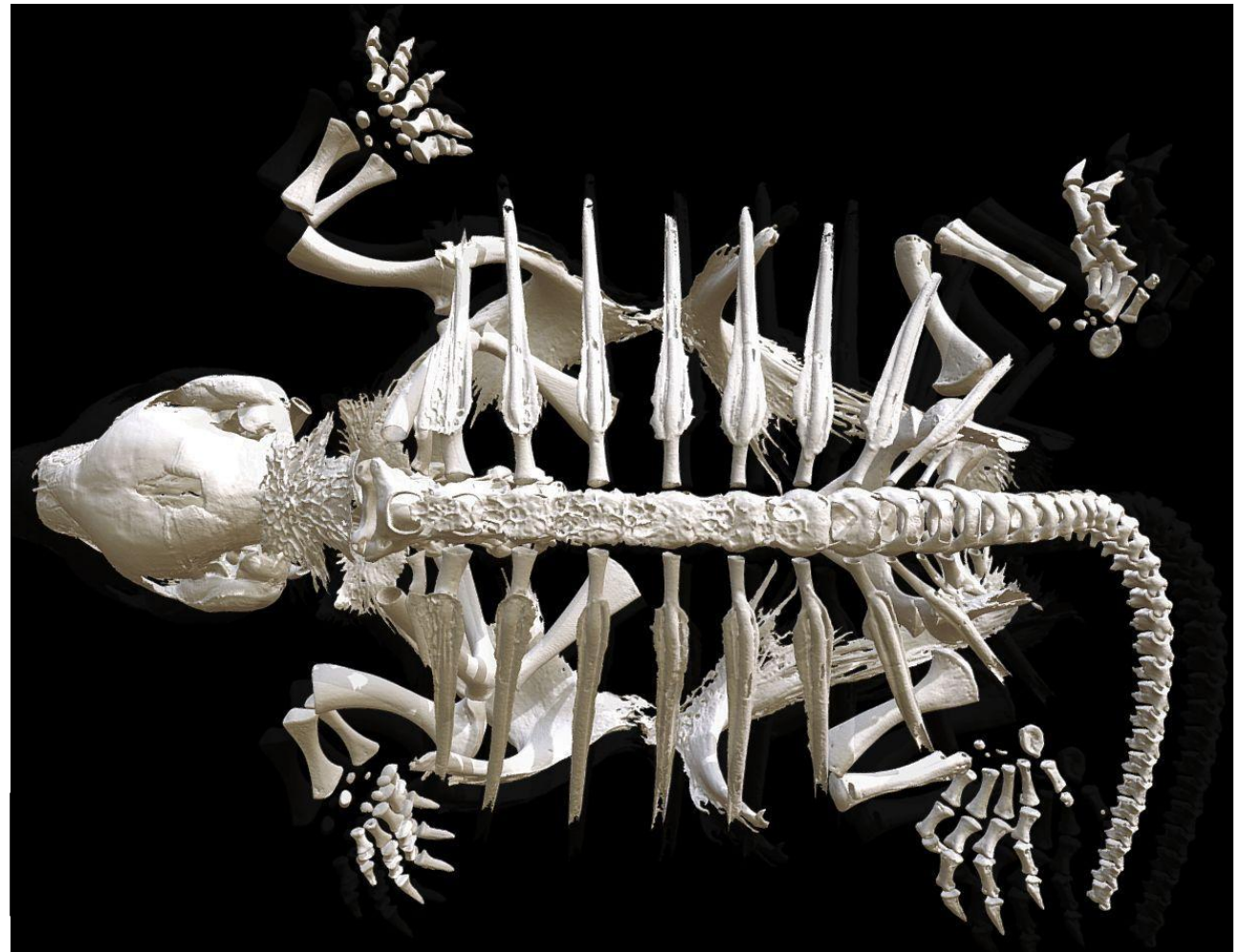
150Kv source

Max 3 μm /resolution

Large & high density samples

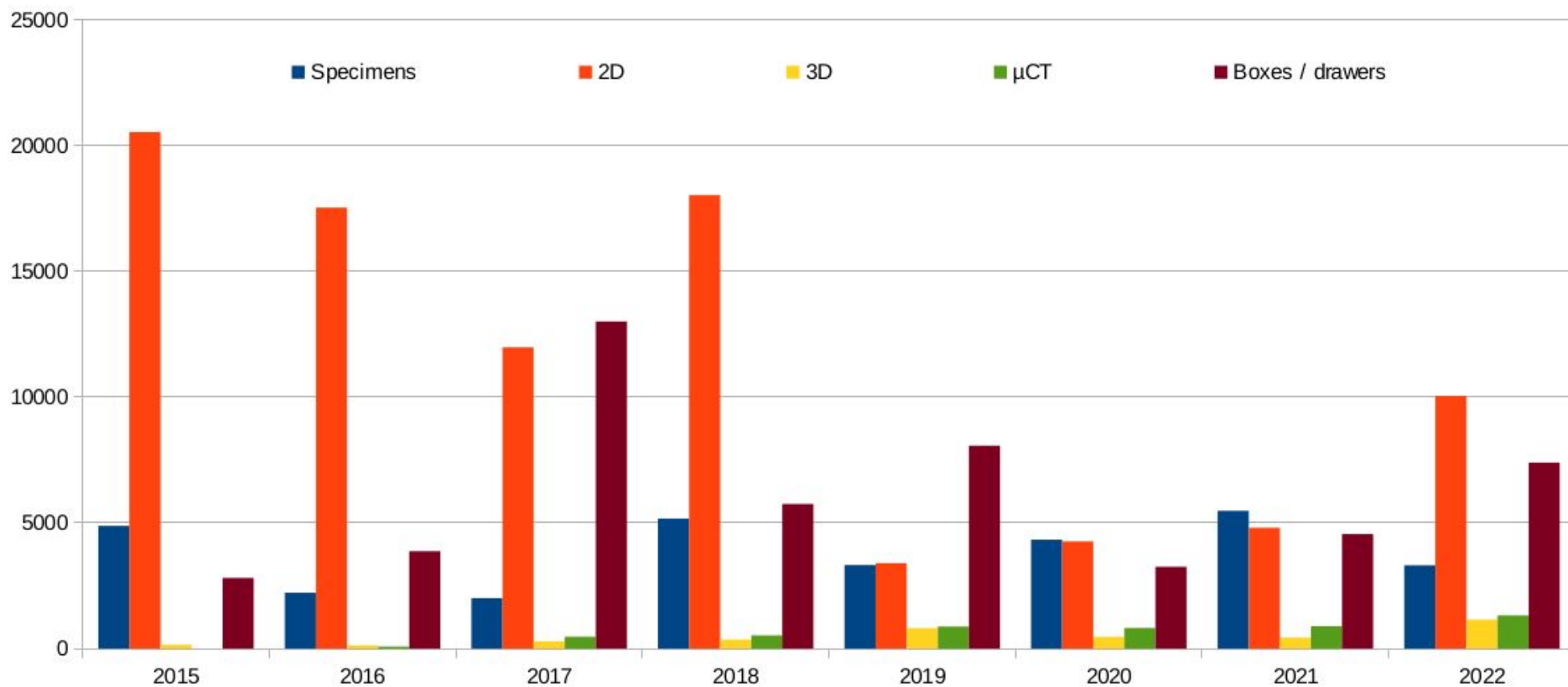
- vertebrates
- fossils
- geology
- large mollusks
- large echinoderms

Pictures: J. Brecko DGIT-3

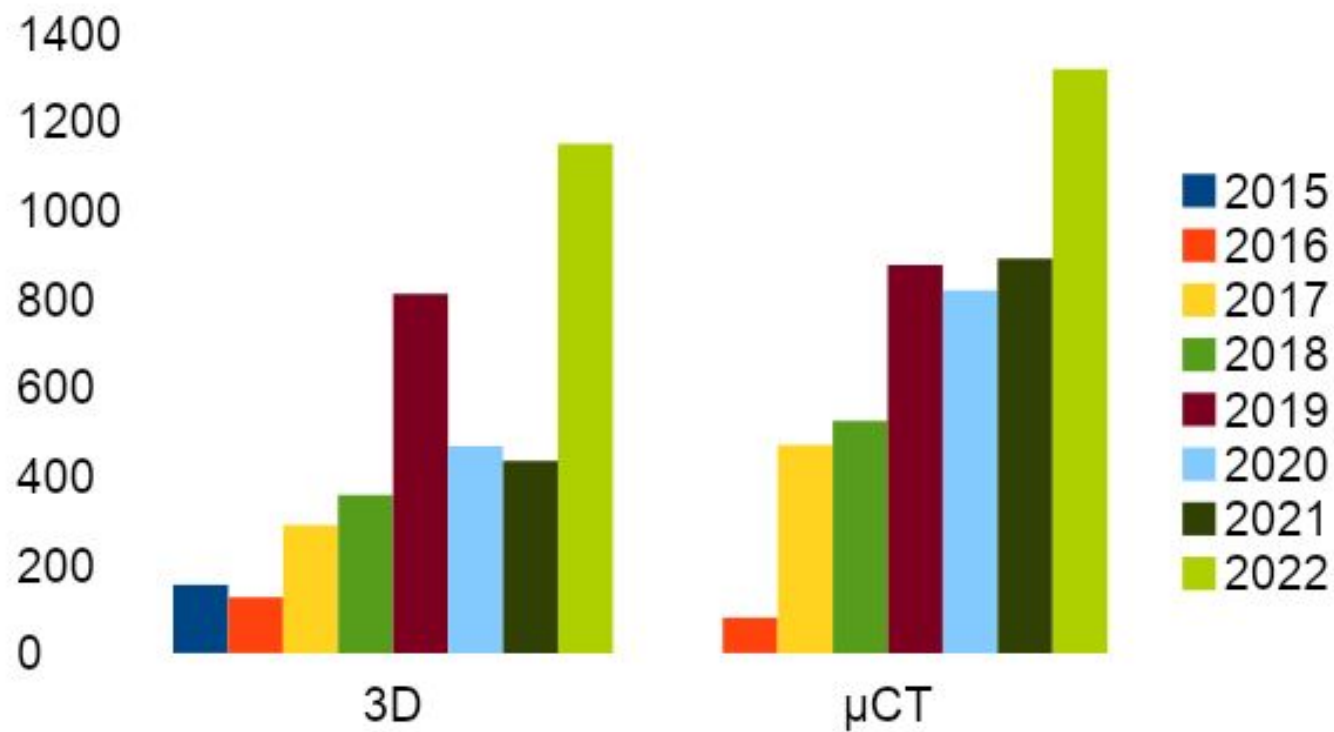


Digitisation: 2015 - 2022

	2015	2016	2017	2018	2019	2020	2021	2022	TOTAL
Specimens	4875	2218	2006	5170	3322	4331	5477	3309	30708
2D	20537	17532	11977	18029	3395	4260	4802	10044	90576
3D	154	126	289	357	811	467	434	1149	3787
μCT	0	80	470	524	875	818	890	1318	4975
Boxes / drawers	2809	3869	13003	5747	8063	3251	4549	7392	48683



Digitisation: 2015 - 2022



ORTHANC : Multimedia



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Sébastien Jodogne

PROFESSEUR

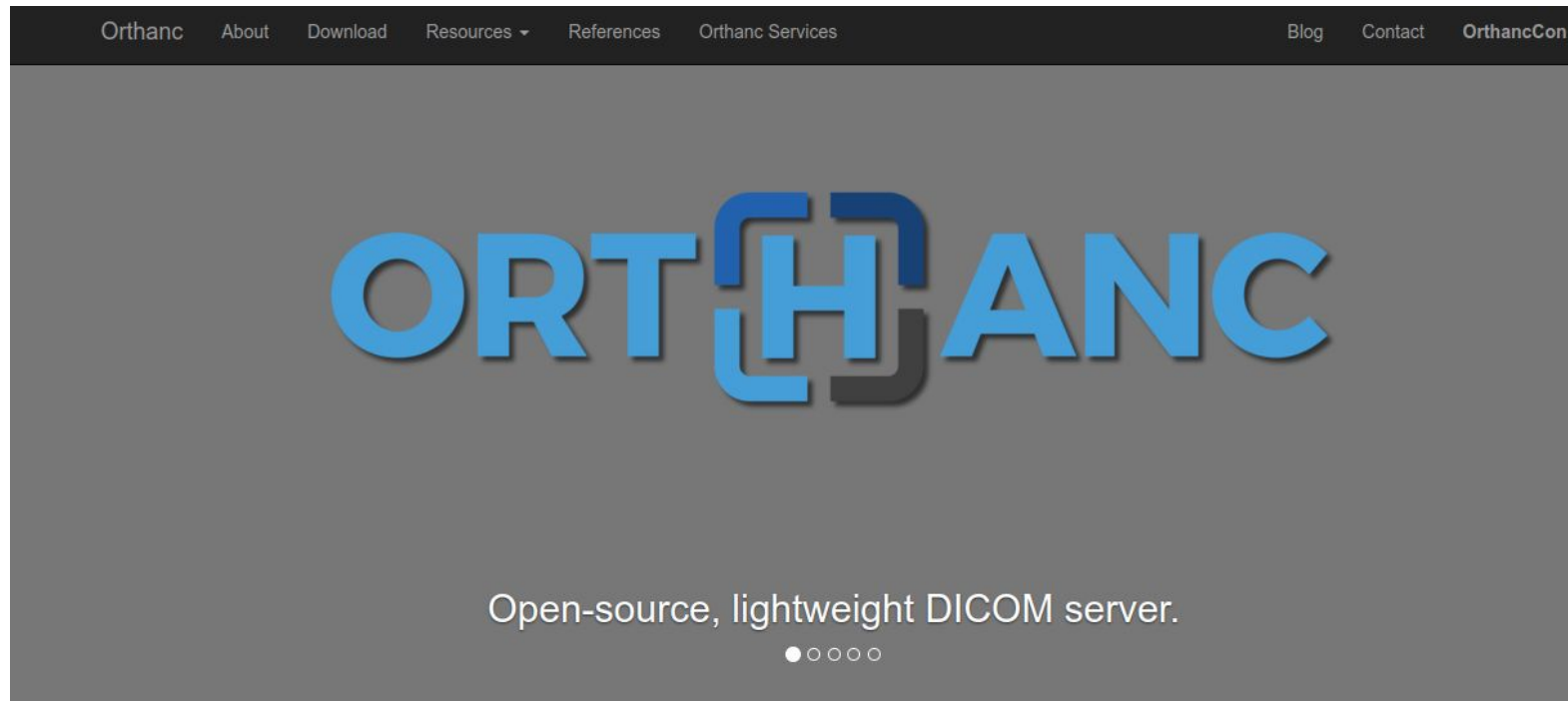


SST/EPL -- *Ecole Polytechnique de Louvain*

SST/ICTM -- *Institute of Information and Communication Technologies,
Electronics and Applied Mathematics (ICTM)*

└─ SST/ICTM/INGI -- *Pôle en ingénierie informatique*

ORTHANC : Multimedia



About

Welcome to the official homepage of Orthanc, the **free and open-source, lightweight DICOM server** for medical imaging from Belgium.

[Learn more »](#)

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Orthanc is **free and open-source** software. Its source code is available to the benefit of hospitals and researchers.

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On Open Collective.

Orthanc Pro

Tailored, **commercial** offers above Orthanc.

ORTHANC : Multimedia



Latest core

 | Sources of Orthanc 1.12.1

 | Release notes for 1.12.1

 | Orthanc for Windows

 | Orthanc for macOS

Other

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 | Browse all downloads

 | Linux Standard Base

 | Vanilla Docker


 | Docker for ops


Packages

 | Orthanc for Debian

 | Orthanc for Ubuntu

 | Orthanc for openSUSE

 | Orthanc for FreeBSD

 **Support Orthanc!** Developing and maintaining the Orthanc ecosystem requires much work. We would be extremely grateful if you could consider funding the project through [Open Collective](#).

Mailing List

To be informed after each new release of Orthanc, please [follow the Orthanc Users discussion group](#).

Licensing

Orthanc originates from [Sébastien Jodogne's](#) research work at the [University Hospital of Liège](#) (Belgium), in the Department of Medical Physics. Orthanc is now primarily developed and maintained by [Osimis S.A.](#), spin-off company of the University Hospital of Liège, and by the research laboratory of Sébastien Jodogne in the [ICTEAM research institute of UCLouvain](#).

The source code of the **Orthanc server** is jointly copyrighted by the University Hospital of Liège, Osimis S.A. and UCLouvain under the [GPLv3+ license](#). Please pay attention to the fact that **Orthanc plugins and viewers** may be released under the more restrictive [AGPLv3+ license](#).

Full information about the licensing of the Orthanc ecosystem is [available in the Orthanc Book](#).

Citing Orthanc

We kindly ask **scientific works and clinical studies** that make use of Orthanc to cite Orthanc in their associated publications. Similarly, we ask **open-source and closed-source products** that make use of Orthanc to warn us about this use. You can cite our work using the following BibTeX entry:

```
@Article{Jodogne2018,
  author="Jodogne, S(\`e)bastien",
  title="The {O}rthanc Ecosystem for Medical Imaging",
  journal="Journal of Digital Imaging",
  year="2018",
  month="Jun",
  day="01",
  volume="31",
  number="3",
  pages="341--352",
  issn="1618-727X",
  doi="10.1007/s10278-018-0082-y",
  url="https://doi.org/10.1007/s10278-018-0082-y"
}
```

ORTHANC : Multimedia



Resources

Read the thorough documentation for Orthanc. Discover plugins.



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[Orthanc Web Viewer plugin »](#)

[Stone Web Viewer plugin »](#)

[PostgreSQL plugins »](#)

[MySQL plugins »](#)

[Stone of Orthanc »](#)

[Whole-Slide Imaging »](#)

[ImageJ interface »](#)

[DICOMweb plugin »](#)

[Osimis Web viewer »](#)


[Full list of plugins »](#)

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 | [Mailing list](#)

 | [Bug tracker](#)

Documentation

 | [Orthanc book](#)

 | [Cheat sheet of the REST API](#)

 | [Detailed REST API \(OpenAPI\)](#)

 | [DICOM conformance statement](#)

Tutorials

- [Understanding DICOM with Orthanc.](#)
- [Beginner's Guide to Orthanc for Microsoft Windows](#), courtesy of Emsy Chan.
- [Implementing a WADO server: CodeProject tutorial to the plugin SDK.](#)

Advanced users

 | [Third-party contributions](#)

 | [Creating plugins](#)

 | [Integration tests](#)

 | [Development roadmap](#)

 | [Contributing to Orthanc](#)

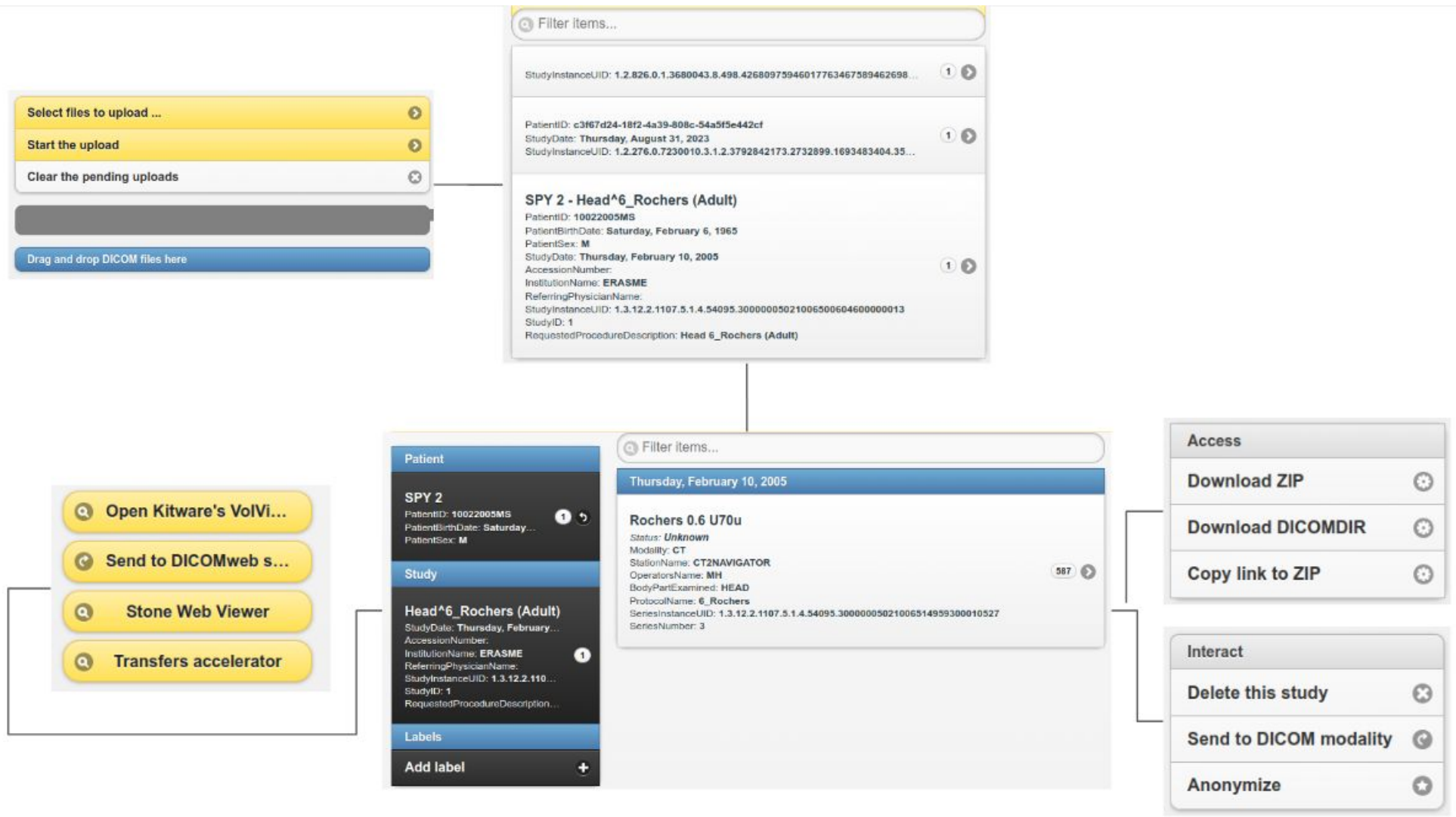
ORTHANC : Multimedia



The screenshot displays the Orthanc web interface with the following components:

- Left Panel (Action Menu):** A vertical list of yellow buttons with search icons:
 - Open Kitware's VolVi...
 - Send to DICOMweb s...
 - Export to NIFTI
 - Stone MPR RT Samp...
 - Stone Web Viewer
 - Transfers accelerator
 - Orthanc Web Viewer
- Central Panel (Patient and Study Details):**
 - Patient:** SPY 2, PatientID: 10022005MS, PatientBirthDate: Saturday..., PatientSex: M.
 - Study:** Head^6_Rochers (...), StudyDate: Thursday, Feb..., AccessionNumber, InstitutionName: ERASME, ReferringPhysicianName, StudyInstanceUID: 1.3.12..., StudyID: 1, RequestedProcedureDescr...
 - Series:** Rochers 0.6 U70u, Status: Unknown, Modality: CT, StationName: CT2NAVIGATOR, OperatorName: MH, BodyPartExamined: HEAD, ProtocolName: 6_Rochers, SeriesInstanceUID: 1.3.12.2.110..., SeriesNumber: 3.
 - Labels:** Add label +
- Right Panel (Instance List):** A list of five instances with a "Filter Items..." search bar at the top.
 - Instance: 1:** SOPInstanceUID: 1.3.12.2.1107.5.1.4.54095.30000005021006514959300010528, ImagePositionPatient: -117.770i-370.770i-222.500, ImageOrientationPatient: 1.000i0.000i0.000i0.000i1.000i0.000, ImageComments:
 - Instance: 2:** SOPInstanceUID: 1.3.12.2.1107.5.1.4.54095.30000005021006514959300010529, ImagePositionPatient: -117.770i-370.770i-222.200, ImageOrientationPatient: 1.000i0.000i0.000i0.000i1.000i0.000, ImageComments:
 - Instance: 3:** SOPInstanceUID: 1.3.12.2.1107.5.1.4.54095.30000005021006514959300010530, ImagePositionPatient: -117.770i-370.770i-221.900, ImageOrientationPatient: 1.000i0.000i0.000i0.000i1.000i0.000, ImageComments:
 - Instance: 4:** SOPInstanceUID: 1.3.12.2.1107.5.1.4.54095.30000005021006514959300010531, ImagePositionPatient: -117.770i-370.770i-221.600, ImageOrientationPatient: 1.000i0.000i0.000i0.000i1.000i0.000, ImageComments:
 - Instance: 5:** SOPInstanceUID: 1.3.12.2.1107.5.1.4.54095.30000005021006514959300010532, ImagePositionPatient: -117.770i-370.770i-221.300, ImageOrientationPatient: 1.000i0.000i0.000i0.000i1.000i0.000, ImageComments:
- Far Right Panel (Action Menus):**
 - Access:** Preview this series (search icon), Download ZIP (gear icon), Download DICOMDIR (gear icon), Copy link to ZIP (gear icon).
 - Interact:** Delete this series (close icon), Send to DICOM modality (refresh icon), Anonymize (star icon).

ORTHANC : Multimedia

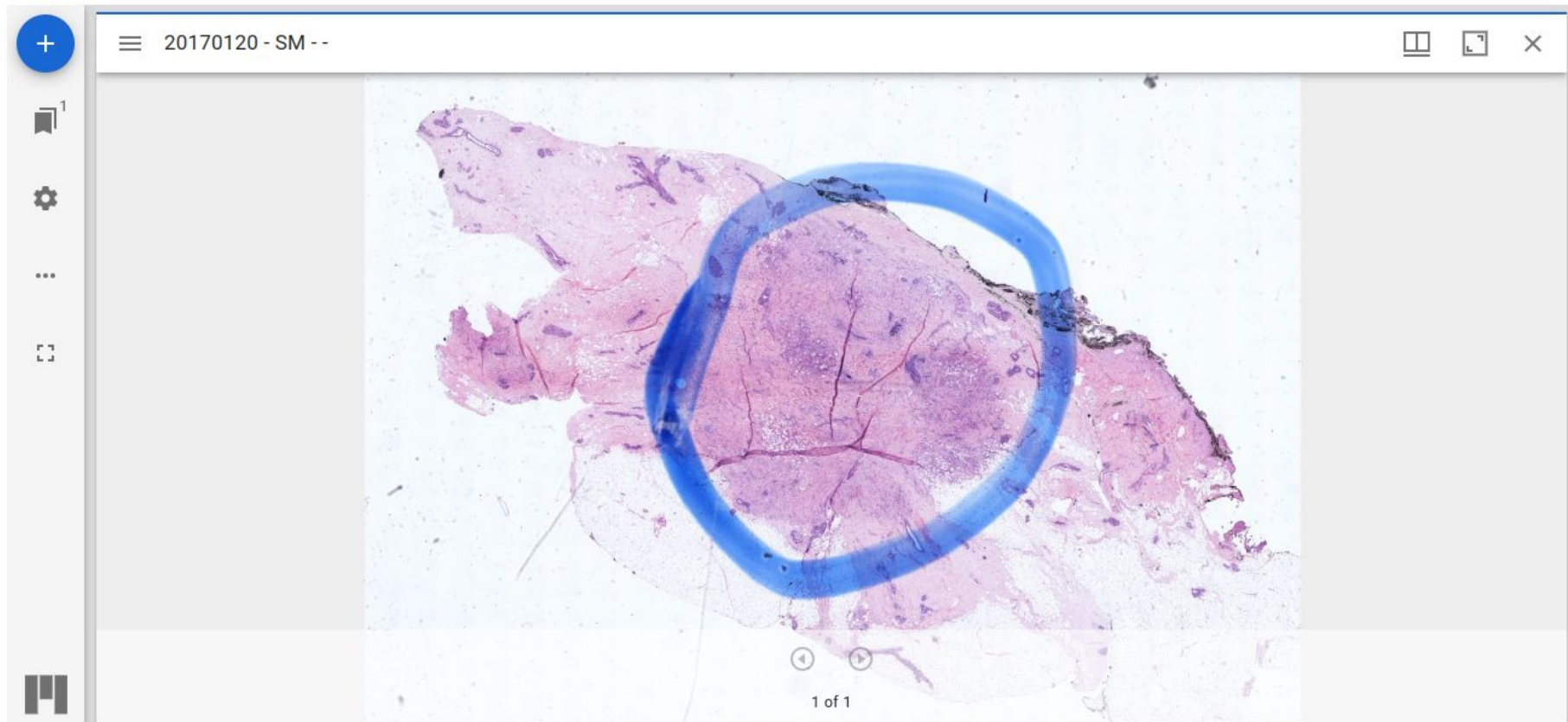
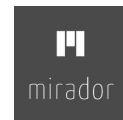


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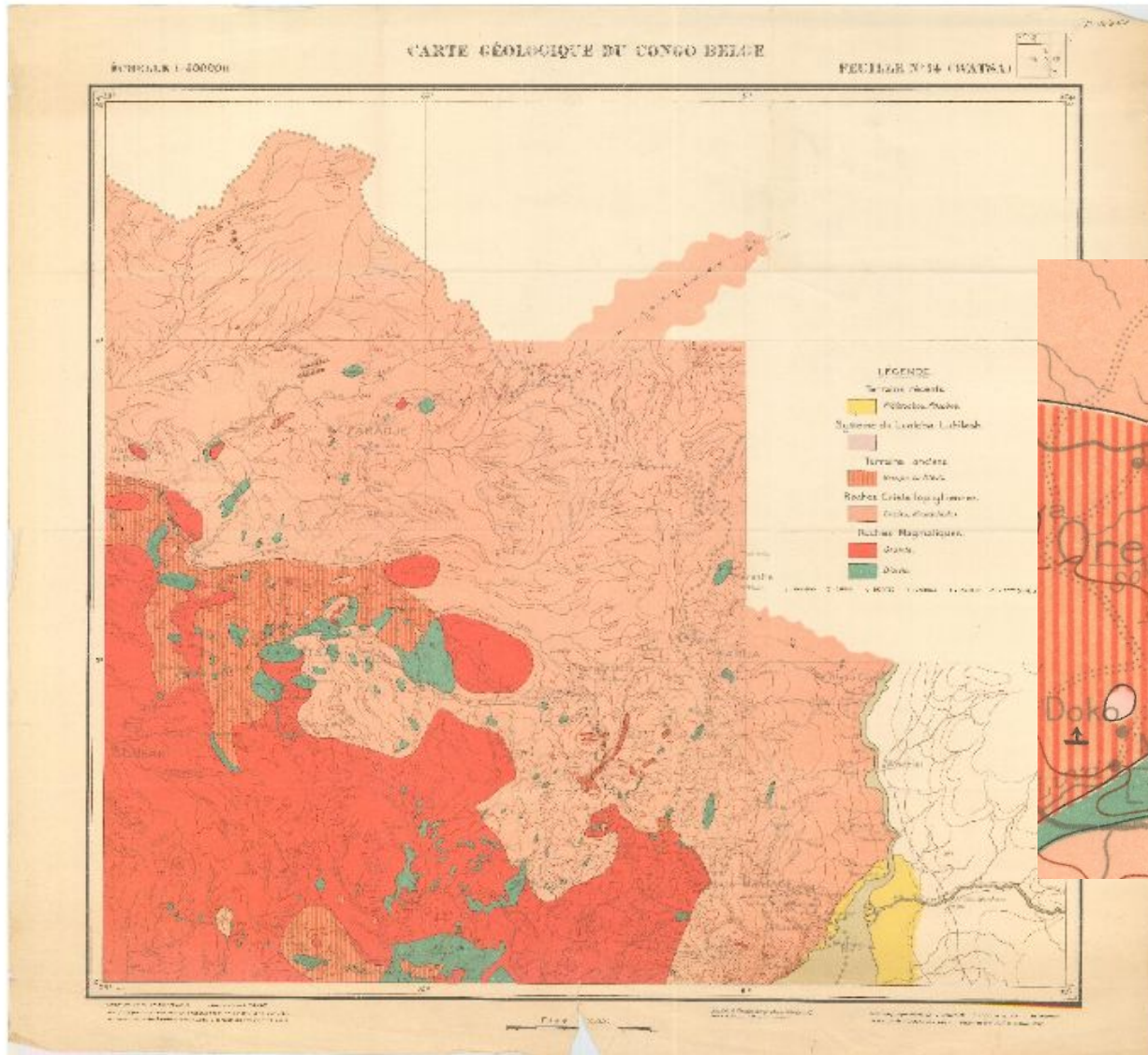
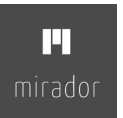
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ORTHANC 2D IIF Mirador Viewer

ORTHANC



ORTHANC : Multimedia



ORTHANC : Multimedia



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ORTHANC CT 2D view

HEAD^6_ROCHERS (ADULT) [20050210]

For patients, researchers and quality assurance. Not for diagnostic usage.

Head^6_Rochers (Adult)
20050210

#3 - 587

SPY 2
10022005MS
19650206 - M

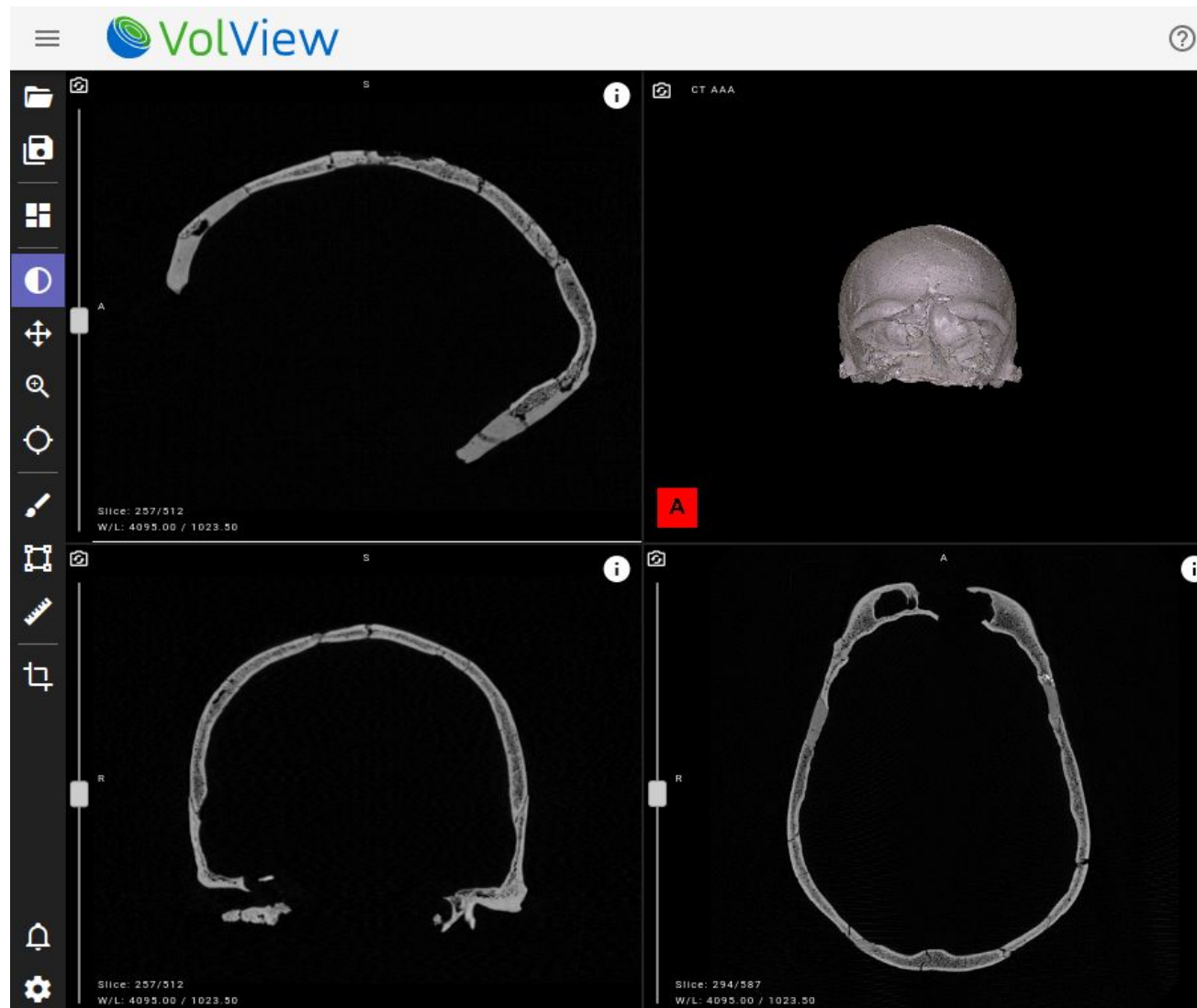
Head^6_Rochers (Adult)
20050210 110454.200590
3 | Rochers 0.6 U70u

Instance number: 294

294 / 587

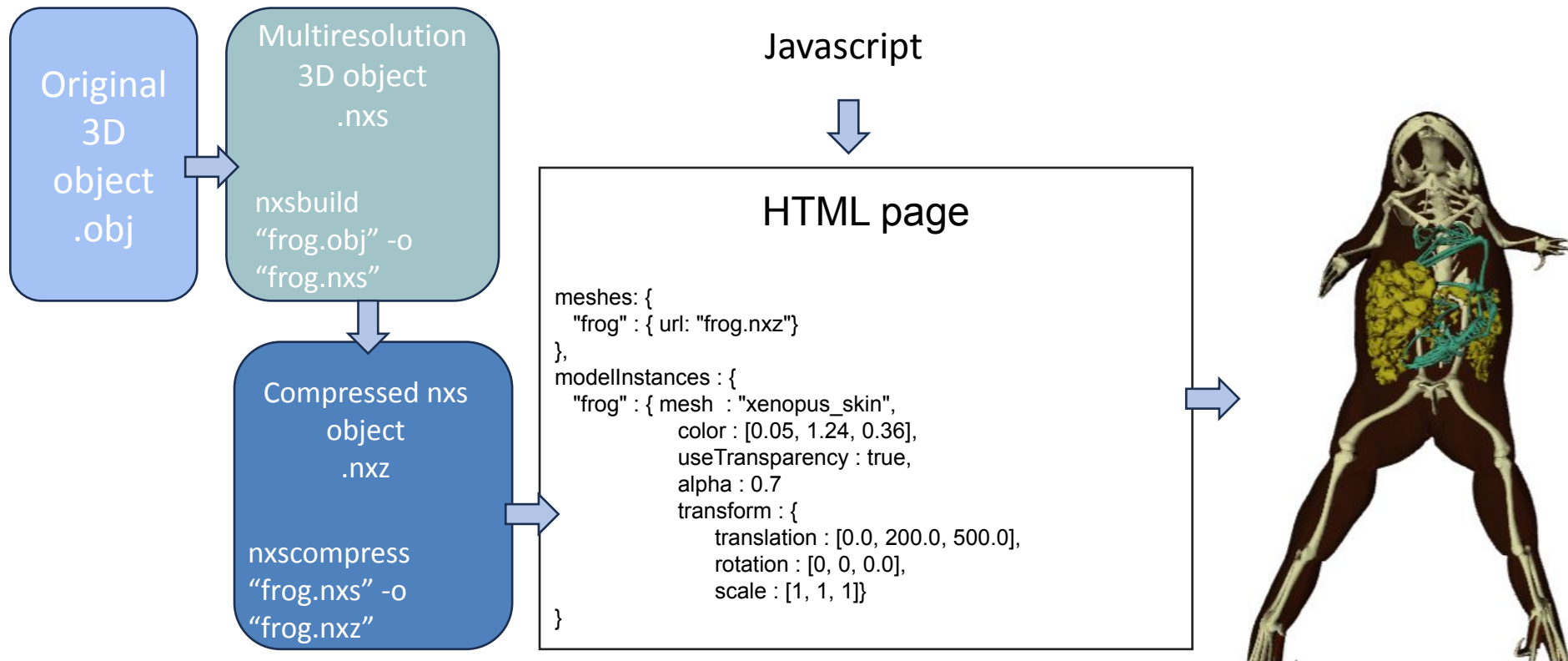
ww/wc: 3000 / 500

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3DHOP: Multimedia

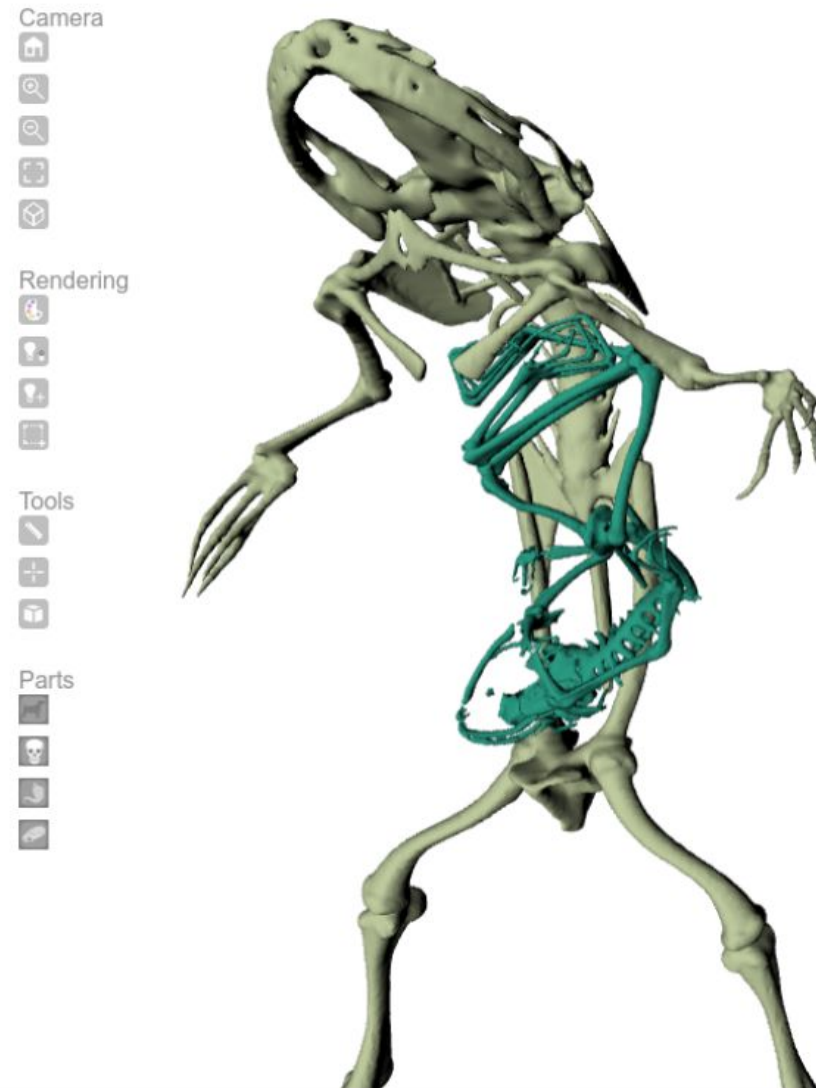
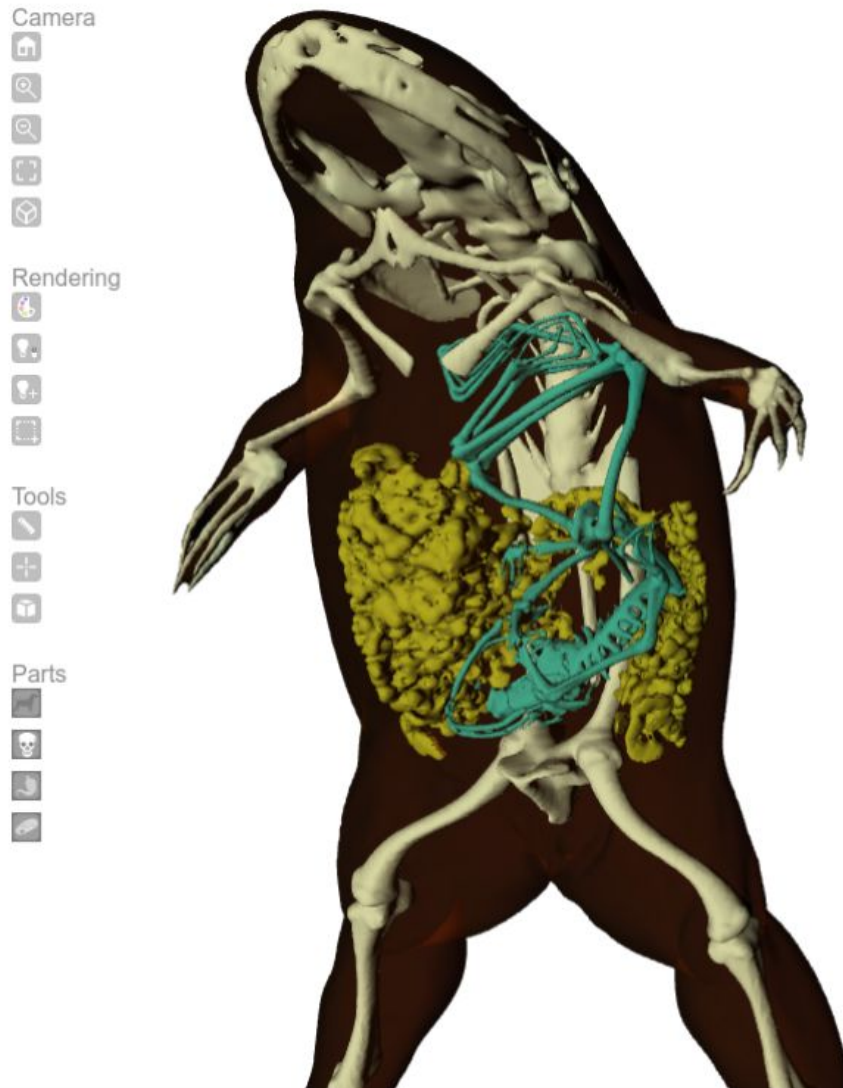
- Open-source framework
- Developed by ISTI (Institute of Information Science and Technologies « Alessandro Faedo », Italy)
- Web interface in html, javascript
- Various 3D object formats.
- Use of Nexus, a c++/javascript library for visualization of multiresolution 3D model structures (ISTI)



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3DHOP

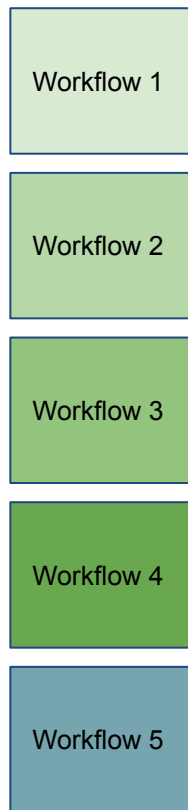


3DHOP view Panthera leo Texture Xnview (Virtualcollections)

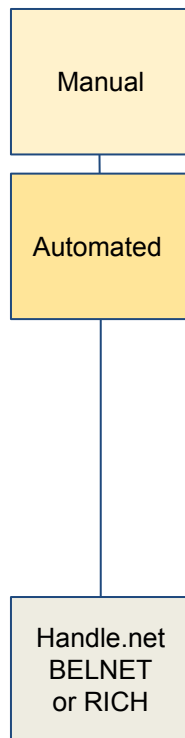


Digitisation workflows

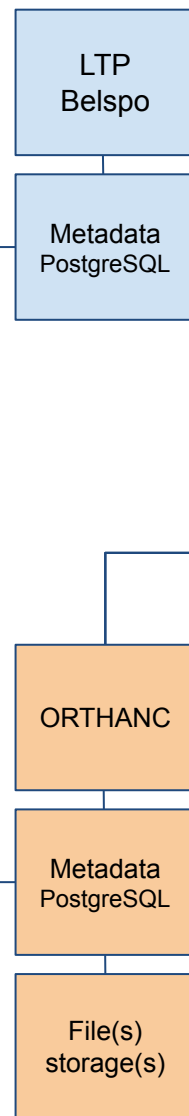
Digitization



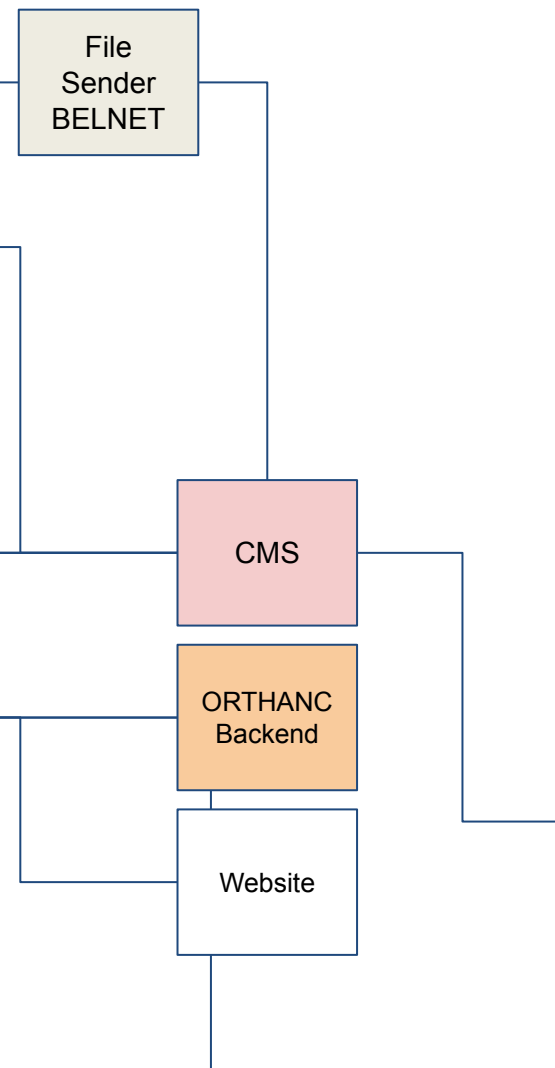
Ingest



LTP



Valorization



Agregation



Offline edition



Mulimedia



Maps



PID



CMS(s)



Agregator



Crowdsourcing



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elasticsearch

