

## VALORISATION PROJECT

### CaseClosed

Closure of the Bernissart Iguanodon Crime Scene



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**FINAL REPORT**

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## **1. SUMMARY**

The CaseClosed valorisation project is directly linked to the Brain.be project *ColdCase: 'Re-opening of the Bernissart Iguanodon crime scene* (2012-2017; BR/143/A3/COLDCASE). Through a coordinated communications strategy, CaseClosed aims at highlighting the exceptional character of the Bernissart locality and at diffusing the scientific information collected during the Coldcase project. It is an invaluable opportunity to reveal a whole ecosystem in its complexity but also to better explain the scientific processes that allowed this information to be gathered. The target audience was both the scientific community and the general public:

- An international workshop was organized at Bernissart on July 1, 2019, together with the European Association of Vertebrate Palaeontologists to inform the palaeontologist community about the main results of the Coldcase project.
- A website is being designed to be used both by the scientific community and by the general public. Its content includes historical and scientific documents, photographs and illustrations of the fossils discovered at Bernissart, and the main results of the ColdCase project. Those documents are from different sources: RBINS, UMONS, Bernissart, mine archives, and private funds.
- Two special volumes including updated information about the Bernissart fossil locality, and dedicated to a wider audience, have been published. A more prestigious book, dedicated to a more specialized audience, will be published in 2023 by the Royal Academy of Belgium.
- The theatre company 'Passeurs de rêves' was invited to re-create the promenade spectacle '*Bernissartensis*, a Cold Case' in six representations at RBINS.

## **2. INITIAL OBJECTIVES AND VALORIZATION FOCUS**

### **Scientific framework:**

Found by coal miners in 1878, the Early Cretaceous Iguanodon Sinkhole – or natural pit - at Bernissart (Belgium) is a unique fossil deposit owing to the quantity and preservation quality of *Iguanodon* (Dinosauria: Ornithischia) skeletons along with other taxa. Although this fossil locality has already been the subject of numerous scientific papers and monographies since its discovery 136 years ago, the processes leading to the local accumulation of so many complete skeletons remained completely unexplained. The aim of the Brain.be Coldcase project was to refine an integrated model for the Bernissart Iguanodon locality that will be used as a framework for evaluating different taphonomic scenarios.

After nearly 4 years of investigations, the recently reopened Bernissart Iguanodon crime scene revealed most of its secrets. The crime scene was characterized. The victims were restudied using modern techniques. Several suspects were indicted and one of them was found guilty, waiting for its trial. Time has come to communicate on the case

From a scientific point of view, the new investigations on the Bernissart locality are exceptional because of the multidisciplinary approach of the researches (investigation of historical sources, biology, geology, geochemistry, modeling,...). These results, are of the greatest interest for either the broader scientific community as for the general public.

### **Valorisation objectives :**

The Bernissart Iguanodons constitute a unique fossil assemblage of worldwide reputation and are also an important part of the Belgian cultural and scientific heritages. In order to valorise the results, we proposed a coordinated communication strategy. The main focus is to highlight the exceptional character of the locality and to spread the scientific information collected during the Coldcase project. It is for us an invaluable opportunity to reveal a whole ecosystem in its complexity but also to better explain the scientific processes that allowed this information to be gathered.

As a consequence, the targeted audience is of two types; first, the scientific community and second the general public. The following actions have been proposed:

Action 1 : the organisation of an international meeting [target → scientific community]

Action 2 : the launching of a website [target → scientific community/general public]

Action 3 : the publication of synthetic books [target → general public]

Action 4 : the creation of a play [target → general public]

### **3. OVERVIEW EXTERNAL COLLABORATIONS**

- European Association of Vertebrate Palaeontology (organisation of the 2019 meeting). As treasurer of the EAVP, Koen Stein is the official representative of this association in the Case Closed project.
- Valentin Fischer (Evolution and Diversity Dynamics lab, ULiège). Co-organizer of the EAVP meeting.
- Compagnie des Passeurs de Rêves: theatre play : « Bernissartensis, une affaire non-classée ». <https://www.passeursdereves.be>
- Lucile Savignat, responsible for tourism and development of Bernissart City.

### **4. GENERATED PRODUCTS AND IMPLEMENTED APPROACH**

#### **Action 1. Organization of an international meeting**

The 17<sup>th</sup> Conference of the European Association of Vertebrate Palaeontologists (EAVP) was organized by RBINS in Brussels from July 2 to 6, 2019 (abstract book available at: [https://drive.google.com/file/d/1UWJeK\\_s00XDdNF83pePD9\\_94lmZi8tpo/view?pli=1](https://drive.google.com/file/d/1UWJeK_s00XDdNF83pePD9_94lmZi8tpo/view?pli=1)). Besides the general conference, a special workshop dedicated to the main results of the Coldcase project was organized at Bernissart on July 1, 2019. A field trip was also organized the same day at La Malogne underground quarry (Cuesmes). The workshop included the following lectures (Annexe 1 is the booklet published at the occasion of this special day, including an introduction of the geology of the Mons Basin and the Bernissart Sinkhole, an introduction of the discovery of the Bernissart Iguanodons, and the abstracts of the different talks):

- Godefroit, P.: *140 years ago: the discovery of the Bernissart Iguanodons*.
- Baele, J.-M., Papier, S., Colbert, C., Dupuis, C., Dupont, N., Kaufmann, O., Martin, T., Spagna, P., & Tshibangu, J.-P. : *The Lower Cretaceous Bernissart Sinkholes; deadly traps or passive gravediggers?*
- Bertozzo, F., Murphy, E., Ruffell, A. & Godefroit, P.: *Cretaceous diseases: a palaeopathological survey of the Iguanodon specimens from Bernissart (Belgium)*.
- Blanco-Moreno, C., De Brito, L. & Prestianni, C. : A new look at the Bernissart flora.
- Olive, S., Taverne, L., Cavin, L., Deesri, U. & Lopez-Arbarello, A.: *The bouillabaisse of Bernissart*.
- Smith, T., Delfino, M., Folie, A., & Martin, J.M.: *Reassessment of Dollo's crocodylomorphs from the Early Cretaceous of Bernissart, Belgium*.
- Stein, K., Hübner, T., Godefroit, P. & Claeys, P.: *Histology and growth of Wealden Iguanodons from Belgium and Germany*.

## Action 2. Let us make it virtual

### General context:

Dinosaurs in general, but *Iguanodon* particularly in Belgium, trigger strong interest from the general public. Because of that, Bernissart became and is still one of the most prestigious palaeontological localities worldwide. The creation of this website represents in our opinion an important step in the divulgation of the results of the Coldcase project. It is however as well an invaluable opportunity to highlight the research going on in the federal institutions.

The website is designed to be useful both to the scientific community and to the general public. Its content includes documents arising from different sources: RBINS, UMONS, Bernissart, mine archives, private funds.

- The historical and scientific documents at the base of the project, including the maps and plans drawn during the 1878-1881 excavations.
- All the available historical documents around the Bernissart Iguanodons.
- Photographs and illustrations of the main fossils that were collected in and around the Bernissart area.
- The main results of the research projects.

### Digitization of the mining maps and drawing:

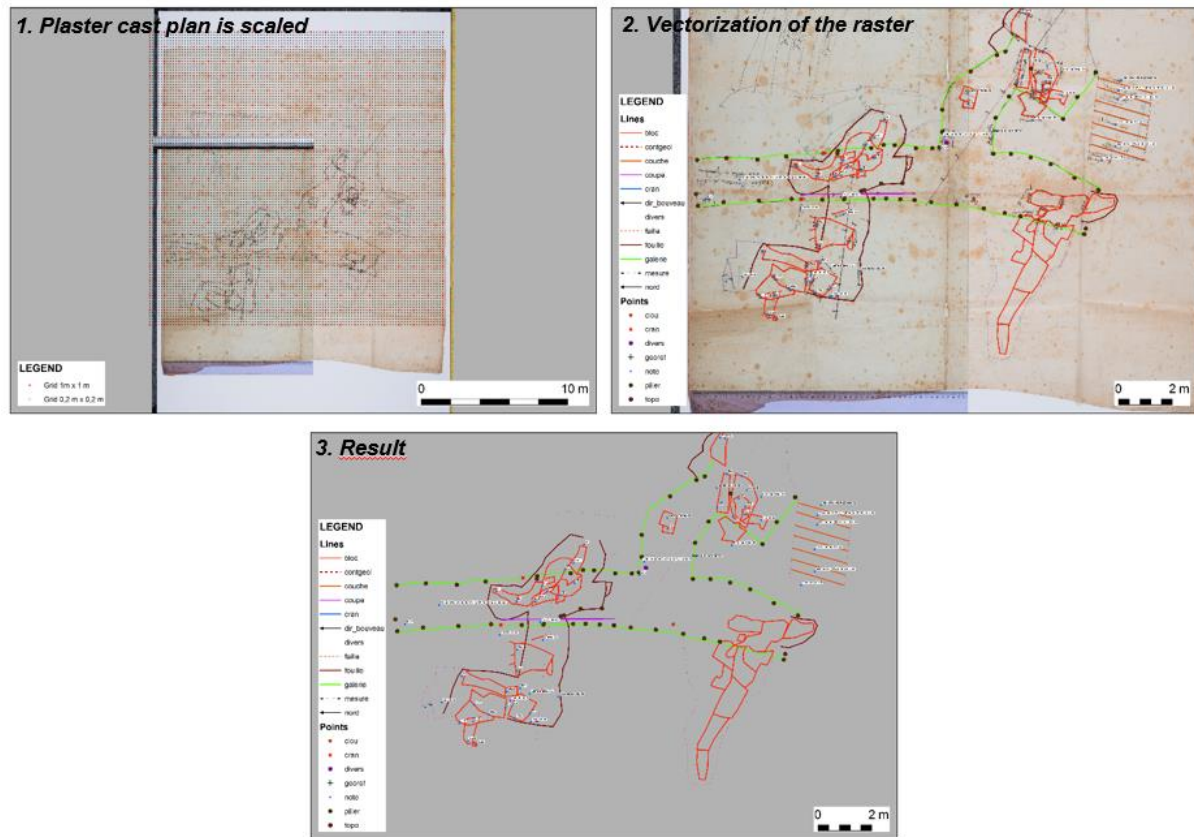
A particular attention was paid to the digitization of the large maps drawn by the Bernissart engineers during the excavations at Bernissart because 3D computed mapping of the deposit based on those precious original documents provides an unprecedented integrated view of the Bernissart site. This task was particularly difficult because of the poor preservation of most of the documents. Part of them had to be stabilized and partly restored by student trainees from ENSAV (Ecole nationale supérieure des arts visuels de La Cambre).

The documents were first digitized (rasterized) either with a digital scanner or by taking pictures under standardized conditions (light and geometry). A special attention was given to minimizing distortion by flattening the documents between a hard board and a glass plate. Most of the original documents have been drawn at a 1:20 scale. Once digitized, they were scaled in order to have real scale in the GIS (Geographical Information System; Fig. 1). Contours, lines, drawings, grids, areas, etc. were then vectorized either automatically, semi-automatically (user-assisted) or manually depending on the quality of the document. Only semi-automatic and manual vectorization methods were possible due to the poor quality of the documents.

All information in the documents was categorized, digitized and recorded in tables for further database search. Example features are plaster cast, excavation contour line, gallery wall, wood pillar, fault, reference nail, comment, etc. Example usage of this database: a user simply enter “lignite” to select the documents in which this keyword appears, allowing for fast and extensive search in the data collection. This step necessitated a thorough examination and comparison of all the documents with many containing raw inscriptions from different authors, which make it difficult to decipher. In addition, bleaching due to aging of these documents have faded, sometimes effaced the information. A particular attention was put on finding reference elements (wood pillars, reference nails, shape of



the galleries and all particular detail of the scene) in order to establish geometrical connections between the different sources of information.



**Fig. 1 – A plan for iguanodon plaster casts after scaling (1) and vectorization (2). (3) shows the resulting vectors without raster background.**

This technique has been applied to the region from which the fossils were unearthed. The skeletons have been replaced as close as possible to their original position along with all documented stratigraphic and mining data. Then extracting views in any desired section helps understanding the geometrical relationships between the fossils and their sedimentological environment, which is crucial for testing the various taphonomical scenarios available so far. Rendering realistic views of the scene will then be easy and potentially provide us with a very attractive mean of disseminating the research to the public.

The database was expanded to features outside the Iguanodon sinkhole for providing a well-documented geological context but also a complete 3D scene at large scale, which could be used for dissemination purposes (Fig. 2). The geological data includes the coal seams, major boundaries such as top Paleozoic basement and the sinkhole walls. Mining and exploration data were added, such as galleries, shafts and boreholes (2002 drilling survey).

In total, 28 skeletons were digitized and geo-located, which is equivalent to ca. 500 plaster casts. Other vectors includes > 1000 lines and > 1000 points for the different features in the documents.

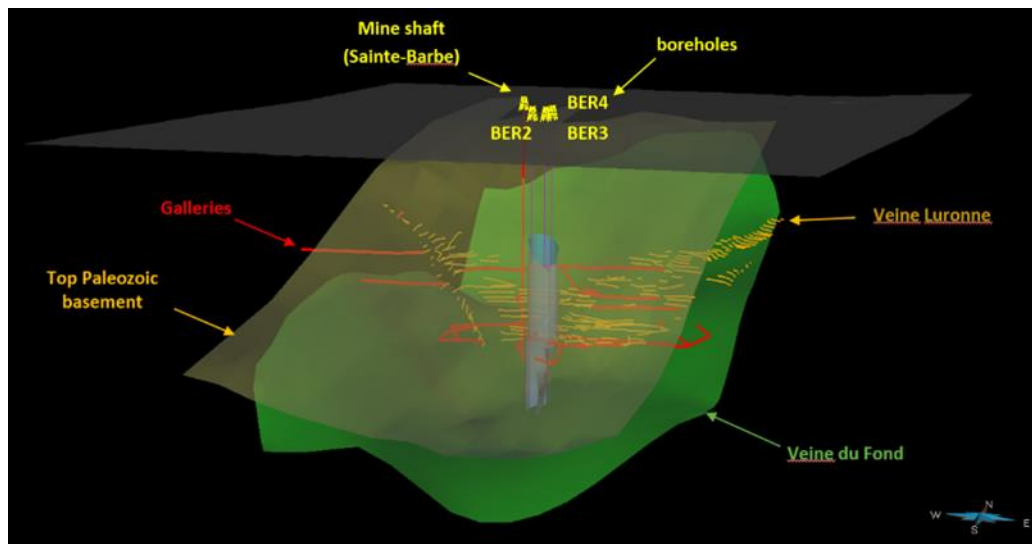


Fig. 2 – Example view of the 3D model depicting the geological and mining context of the Iguanodon sinkhole. The Luronne coal seam is displayed as a series of traces, which is closer to the original data in the mining plans, while the Veine du Fond seam was interpolated as a full surface. The Iguanodon sinkhole is the blue-grey cylinder-like object in the middle. The modeled area is ca. 1 x km.

#### Further steps:

At the beginning of this project, we clearly underestimated the amount of documents related to the discovery of the Bernissart Iguanodons in Belgium. Moreover, the Covid19 crisis considerably slowed down the digitization process. The next steps include the setting up for the architecture of this website and its implementation, with the hiring of an external webcreator that will work together with the different partner of the project. The setting up of the website requires, in 2023 the hiring of an external webcreator that will work together with the different partner of the project.

#### Action 3. Publications of synthetic books for the general public

1) Two special volumes including updated information about the Bernissart fossil locality, and dedicated to a wider audience, have been published at the end of the Coldcase project (Fig. 3):

Godefroit, P. (editor), 2017 (published in 2018). *Il y a 140 ans, la découverte des Iguanodons de Bernissart. Fossiles, hors-série 8*, 74 pp.

Verbeke, R. & Godefroit, P., 2018 (editors). *Wie vermoorde de iguanodons? Alles over de Belgische dinosauriërs. Eos Wetenschap, Special*,

2) A more prestigious book, entitled *La saga des Iguanodons de Bernissart* (author: P. Godefroit), will be edited in 2023 by the Royal Academy of Belgium, with the financial support of the University Foundation. This book is already written and is in the hands of the editor, now.



Fig. 3 – Covers of the special issues of *Fossiles* and *Eos* dedicated to the Coldcase project

#### Action 4. Coldcase comes alive: a theatre performance!

To celebrate the end of the Coldcase project, the theatre company 'Passeurs de rêves' was invited to re-create their promenade spectacle '*Bernissartensis*, a Cold Case', including the results of the present Brain-be project, in the RBINS premises! This spectacle has written and directed by Yves Coumans; this new creation encompasses both the mystery of the discovery of 30 iguanodons in 1878 at Bernissart, its place in the history of paleontology and finally, the results of the latest investigations into the causes of the death of these dinosaurs.

An actress and two actors play successively a beautiful gallery of endearing characters, including an investigator from the border police, the mother of a minor, a minor, an adult minor who participated in the discovery, an archivist, a stratigrapher, Louis De Pauw, preparer at the Royal Museum of Natural Sciences, two English fossil collector, and Mary Anning, famous fossil collector at Lyme Regis, England (Fig. 4). The actors take the audience from room to room. In each place, a rudimentary scenography is installed. In front of the amused audience, the actors change costumes and characters and approach the scenes in quite different styles of play.

Six performances – three in French and three in Dutch – were presented on November 7, 2019, on January 11, 2020, and on February 1, 2020, attracting an enthusiastic audience.





**Fig. 4 – Scenes from '*Bernissartensis, a Cold Case*', by the theatre company 'Passeurs de Rêves' (RBINS Museum, February 1, 2020)**

## **5. IMPACT AND ADDED VALUE OF THE VALORISATION ACTIONS**

**Action 1:** 87 participants from 19 countries attended this workshop. As this workshop was dedicated to the Brain.be ColdCase project, it was a unique opportunity to share the results of this project with the international scientific community and to replace it onto a wider perspective.

As a very concrete result, discussions with Dany Azar (Lebanese University, Beirut) who attended this meeting, quickly led to the initiation of a bilateral collaboration project on the study of the Barremian dysodiles of Lebanon, freshwater deposits of similar age to the Bernissart deposit. Large-scale joint excavations, sponsored by the National Geographic Society (70 000 USD), will begin in September 2023.

**Action 2:** More than 2 000 historical documents have now been digitized, classified, and archived in a large shared Microsoft Excell database, which is the base for the website. Those documents were collected from different sources (RBINS, UMons, Bernissart, mine archives, private funds). They will be fully accessible for researchers and the general public; this project will therefore put the scientific and historical importance of the Bernissart site and the results of the ColdCase project under the spotlight.

**Action 3:** The published books are up-to-date syntheses, accessible for a wider public, dedicated to the Bernissart Iguanodons. They are written in Dutch and French; although they are particularly richly illustrated, they are sold at low price at the RBINS museum shop, so they are a source of additional information for museum visitors wishing to deepen their visit.

The future book that will be edited in 2023 is a more prestigious object dedicated for learned amateurs and scholars.

**Action 4:** A total of 146 external peoples participated in the different performances of the theatre company 'Passeurs de Rêves' at RBINS. It is an innovative interesting new approach to visit the RBINS museum, to interact with the researchers, and to disseminate a scientific message towards a wider audience.

## **6. MEASURES TO MAINTAIN THE COLLABORATION(S)**

From 2020 onwards, up to 2024, the Coldcase partners are included in two additional Brain.be projects based on the Bernissart Iguanodons collection:

- Iguanodon 2.0 (B2/202/P2/Iguanodon 2.0): *Shepherding the Belle-Epoque Bernissart collection into the 21<sup>st</sup> Century*.
- Paradi<sup>2</sup>s (B2/202/P1/Paradi<sup>3</sup>s): *Parasitic diversity, vectors, hosts, and transfers in Early Cretaceous dinosaur-associated vertebrates*.

3D models of the Bernissart Iguanodons will be produced in the scope of the Iguanodon 2.0 projects, which will be included, in low resolution, in the website under construction.

Moreover, two FedTwin proposals have been submitted in 2022.

- Evo-Grow: *Evolution of growth in tetrapods: heterochronic shifts and environmental influences*. Promotors: P. Godefroit (OD Earth & History of Life, RBINS) and J.-M. Baele (Department Geology and Applied Geology, UMons,). This proposal has been selected for funding!
- DinoGeoChem: *Evolutionary changes and variations in dinosaur communities during the Jurassic and Cretaceous using taphonomy and geochemistry*. Promotors: P. Godefroit (OD Earth & History of Life, RBINS) and P. Claeys (Analytical, Environmental & Geochemistry, VUB. Unfortunately, this proposal has not been selected for funding.

Representations of the play '*Bernissartensis, a Cold Case*', by the theatre company 'Passeurs de Rêves', had to cease because of the Covid19. Crisis. Now that this crisis is hopefully over, additional representations at RBINS will be scheduled in 2023.

P. Godefroit (RBINS) and J.-M. Baele (UMons) are scientific advisors in the scope of the renovation of the 'Musée de l'Iguanodon' at Bernissart.