

**BROM
ACKER B**



Bromacker

Window into the past
Glance into the future

THE MOST IMPORTANT FACTS IN BRIEF

The Bromacker ...

... connects the general public with their region and contributes to regional identity.

... networks with existing regional stakeholders.

... is a world-wide unique fossil site.

... inspires and supports young researchers.

... is located between Tambach-Dietharz und Georgenthal in the middle of the German federal state of Thuringia.

... contains fossils from 290 million years ago.

... is meant to be permanently established as a site for cutting-edge research, sustainable education and international tourism.

... is unique because both the tracks and the remains of the track makers of early terrestrial vertebrates and invertebrates can be found here.

... is inexhaustible: new fossils of early tetrapods are constantly being found and new insights into the Permian ecosystem are gained.

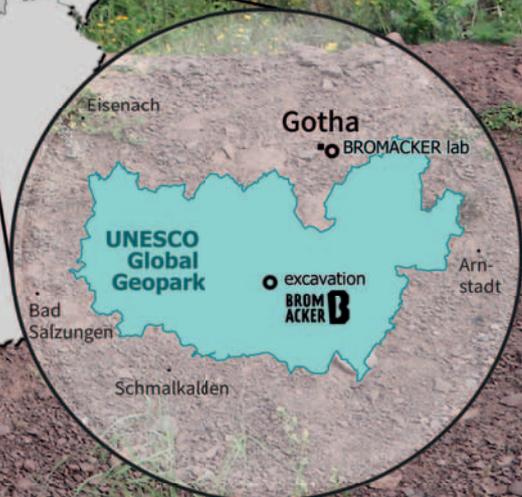
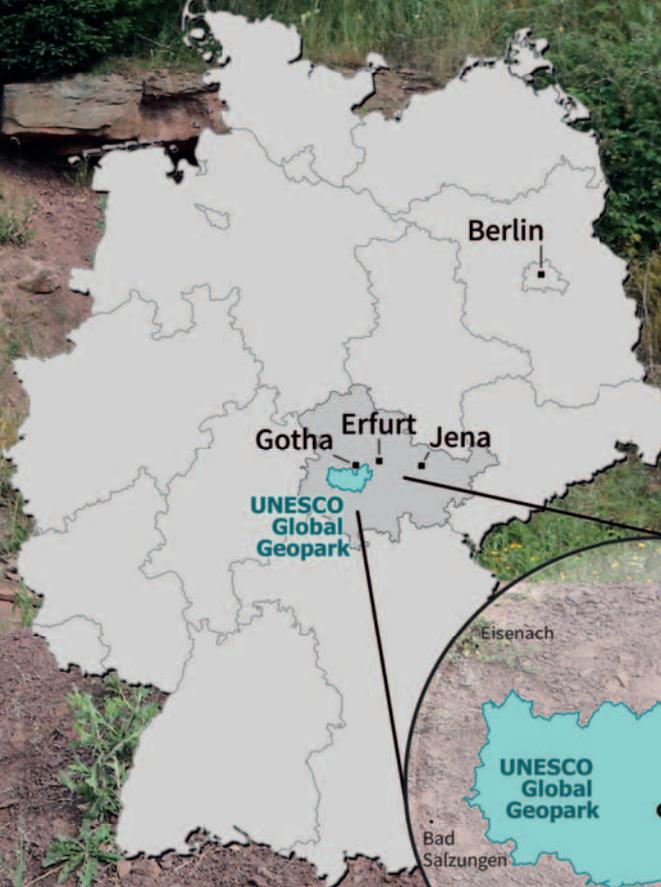
The BROMACKER-project ...

... shows innovative ways of science communication.

... is a science communication project and supports the research of the fossil site.

... conducts international and interdisciplinary research.

... is a collaborative project between four cooperating partner institutions: Stiftung Schloss Friedenstein Gotha, Museum für Naturkunde Berlin – Leibniz Institute for Evolution and Biodiversity Science, Friedrich-Schiller-University Jena and UNESCO Global Geopark Thuringia Inselsberg – Drei Gleichen.





Walzer im Staub

(Waltz in the dust)

This digital illustration was created as part of the palaeo-art competition "The Bromacker lives" 2020/2021 by Sandra Hähle.

Bromacker

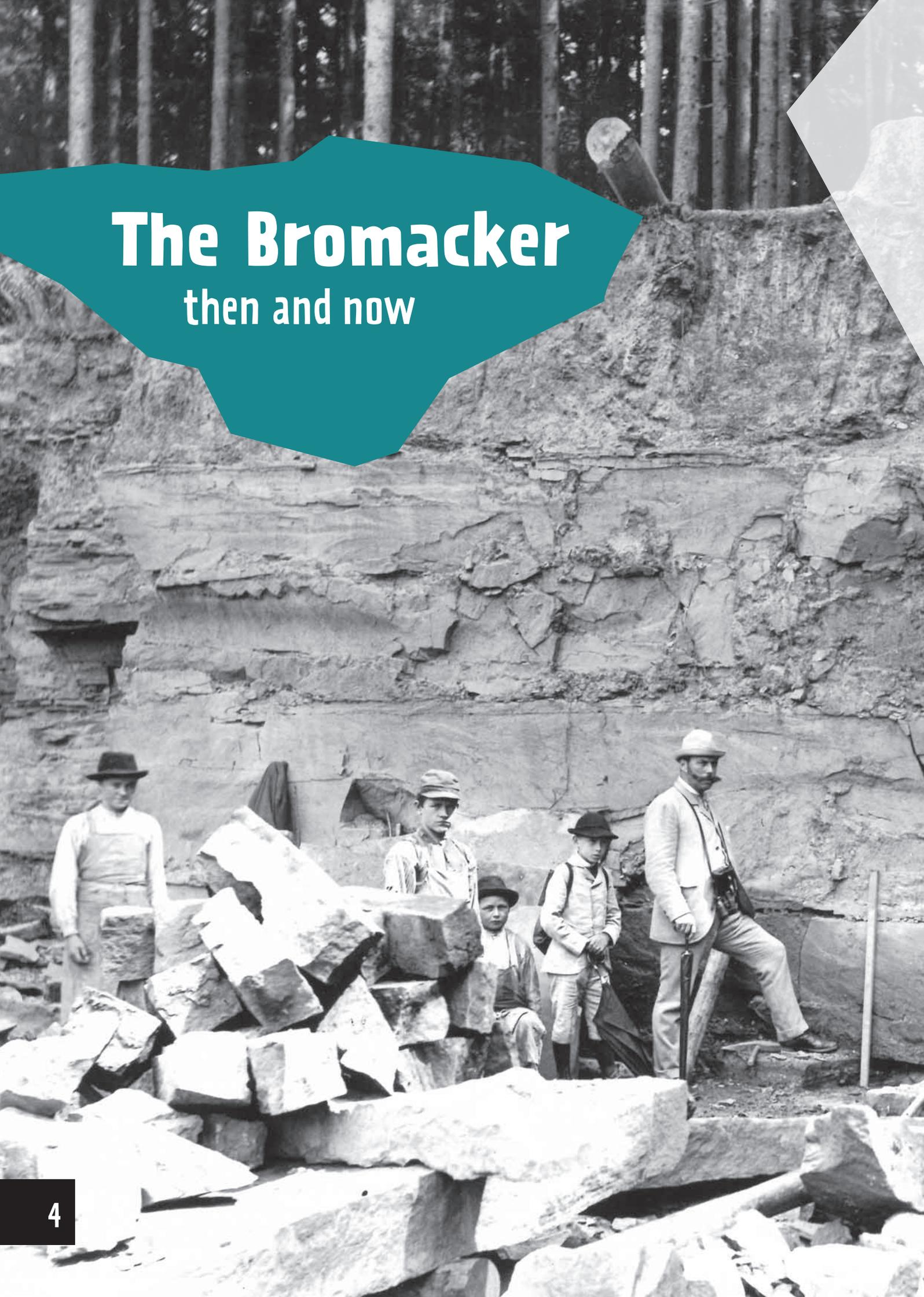
Window into the past
Glance into the future

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The Bromacker

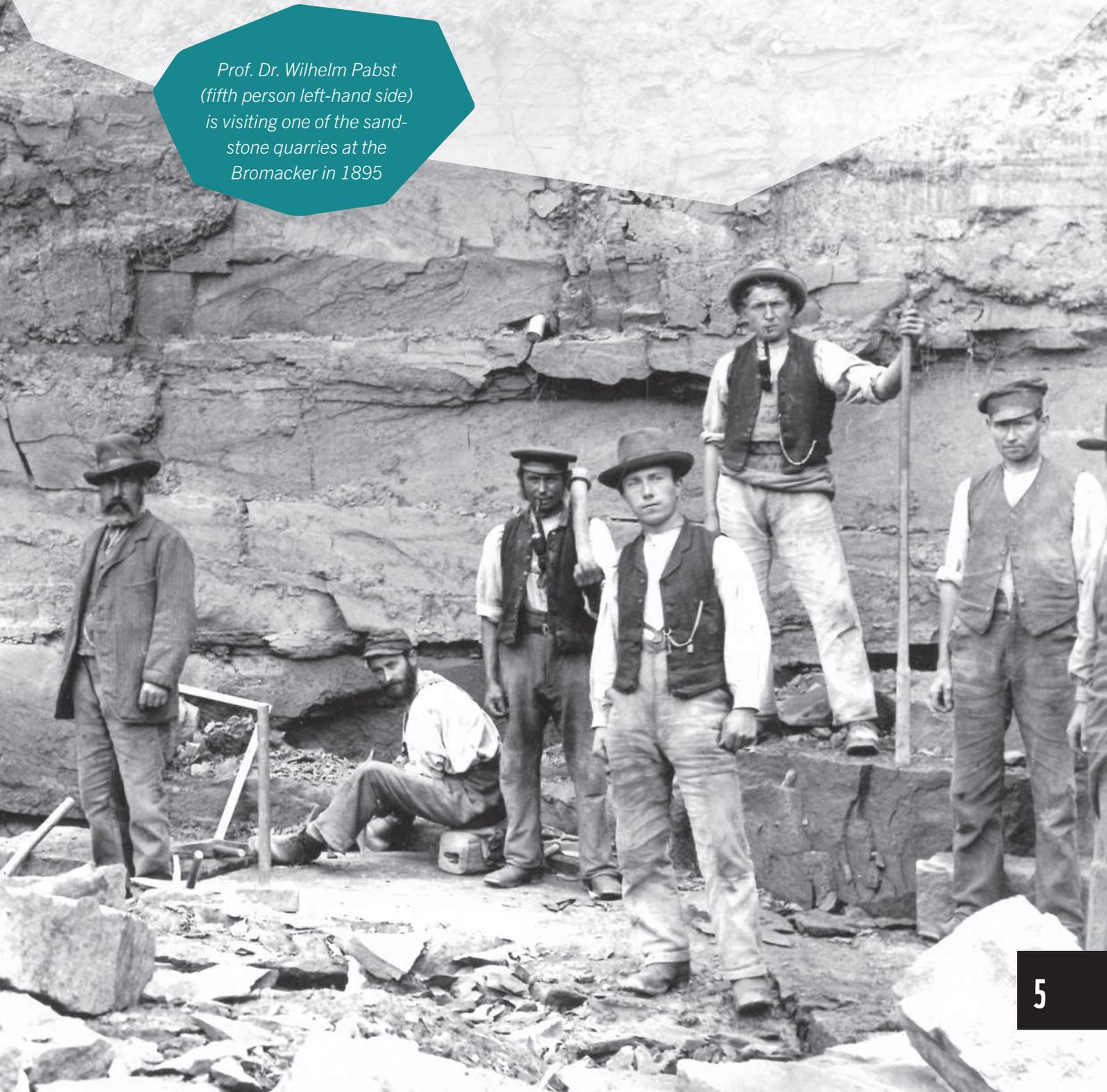
then and now



In 1887, an astonishing discovery was made in Gotha: fossilized footprints of an unknown animal were discovered on a red sandstone slab. Excavated in a quarry near today's Tambach-Dietharz, Germany, the slab was immediately acquired for the Ducal Museum in Gotha. Due to the studies of Wilhelm Pabst, the new curator of the natural history collections, the story of the Bromacker fossil site became famous in 1892.

The quality and number of track finds from the early Permian period, 290 million years ago, enabled Pabst to publish numerous scientific papers and he became one of the very first researchers of fossil traces, a field known as palaeoichnology. To fund Pabst's studies and to continue the collection effort, some of the slabs were sold to other museums and institutions worldwide. In the 1960's, research on fossilized traces was resumed and a lucky find in 1974 changed everything fundamentally.

*Prof. Dr. Wilhelm Pabst
(fifth person left-hand side)
is visiting one of the sand-
stone quarries at the
Bromacker in 1895*



The Bromacker

then and now

In 1974, Dr. Thomas Martens made an interesting discovery as a former geology student – a lithified bone in the layers above the track-bearing sandstones. Since 1978, he carried out regular excavations as a scientific employee of the Museum der Natur Gotha and excavated more and more skeletal finds of early tetrapods. From 1993, he gained the support of palaeontologists from the Carnegie Museum in Pittsburgh, USA, who then participated in the excavations every summer. Many of the early tetrapod skeletons were prepared and scientifically described by the researchers in the US. Until 2010, a total of 12 species of amphibians

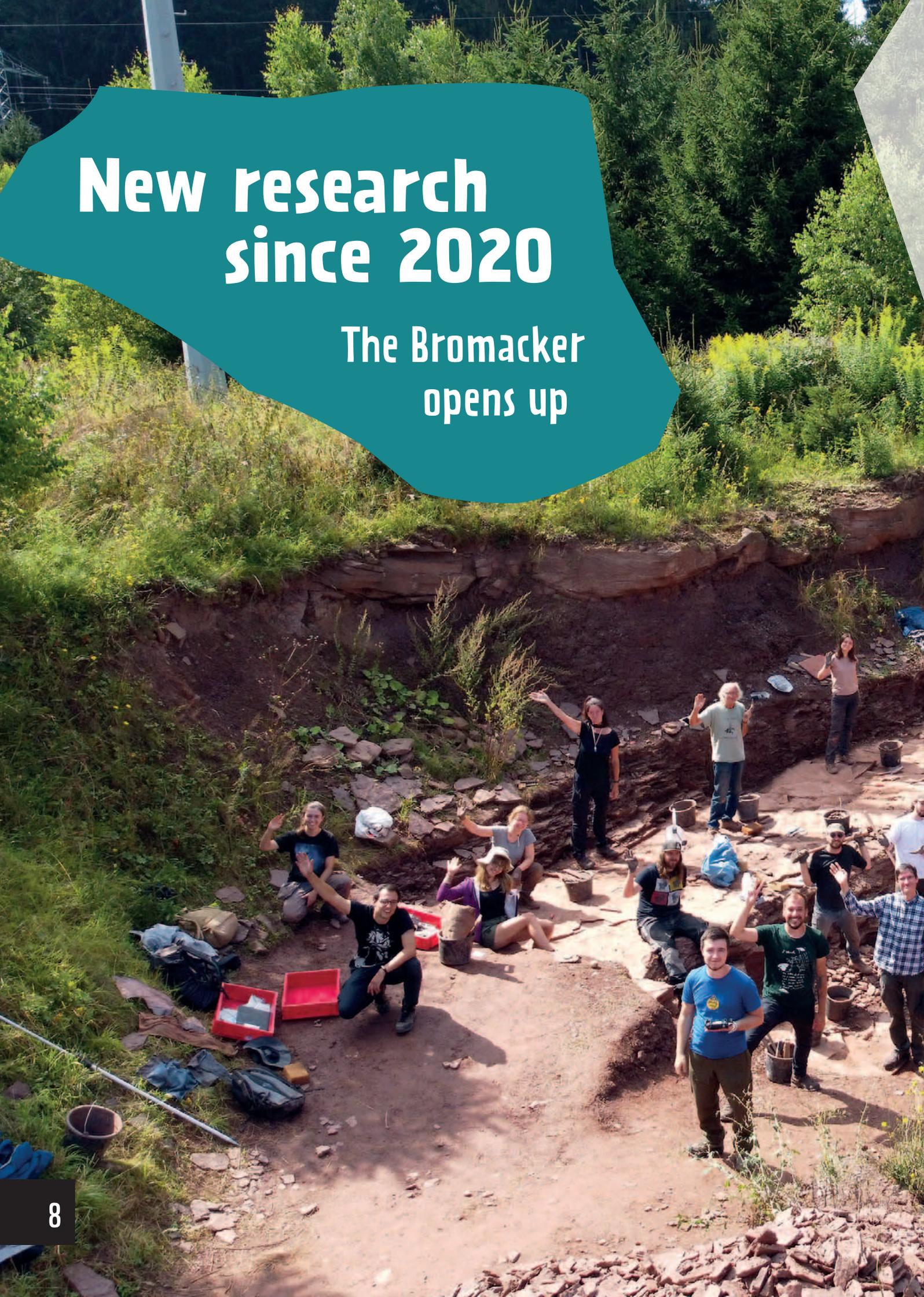
and reptiles had been discovered, of which many are known exclusively from the Bromacker. Another milestone was reached in 2007: scientists were able to match two species of vertebrates from the Bromacker to two corresponding types of footprints found in the underlying sandstone beds. Such an exact correlation of skeletons and footprints is unique worldwide and marks the high preservation quality of the skeletons and tracks at the same place. Since the first discovery, scientists have been working on the reconstruction of this unique Permian ecosystem for decades and still there are numerous mysteries to be solved.

One of the most famous fossils from the Bromacker is known as the “Tambach Loving Pair” – two skeletons of the amphibian species *Seymouria sanjuanensis* – which are embedded together in the sediment.



New research since 2020

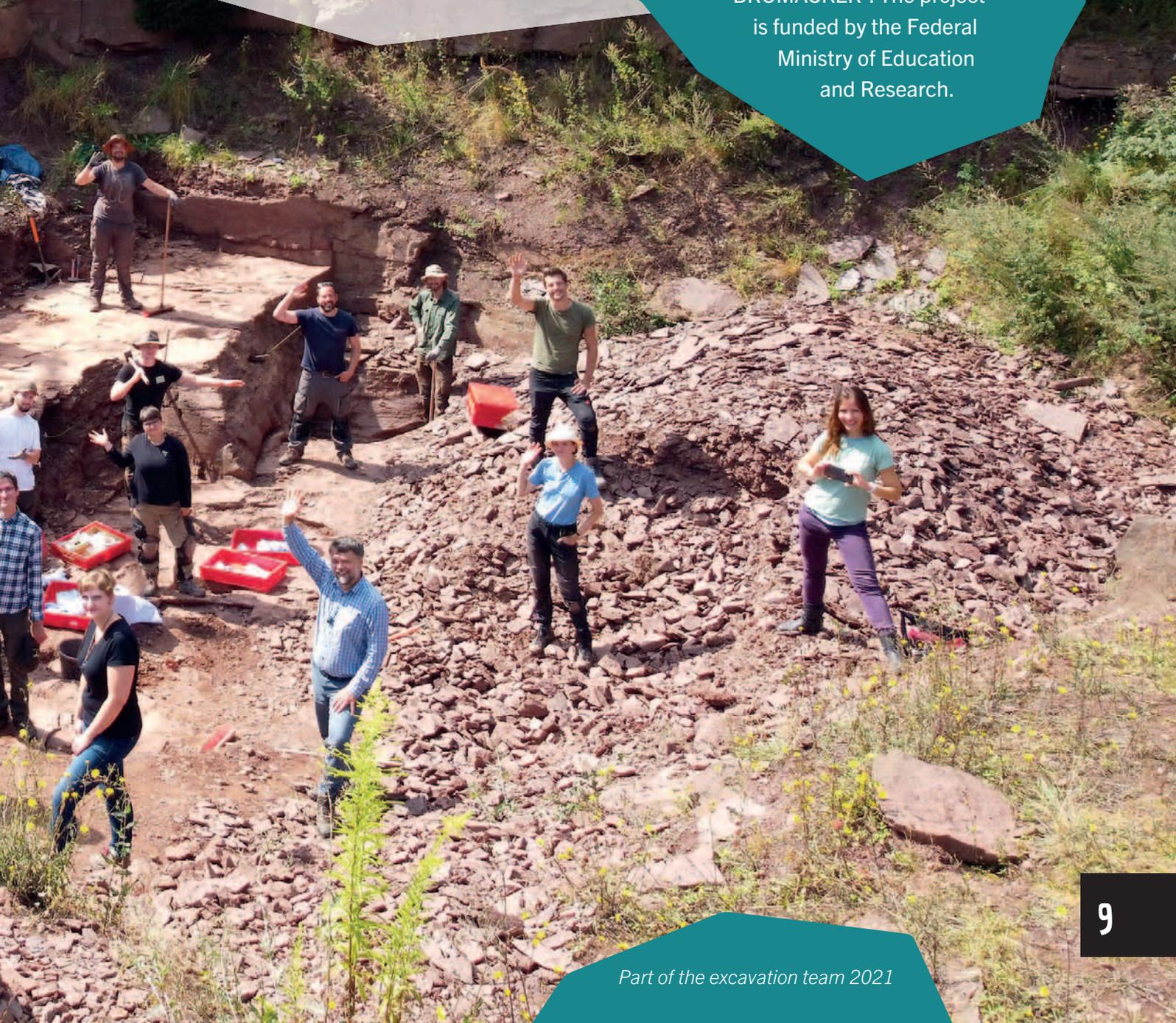
The Bromacker
opens up



The BROMACKER project is dedicated to the reconstruction of the 290-million-year-old Permian ecosystem at the Bromacker. The project started in August 2020 and promotes the German federal state of Thuringia as a research locality. Scientists use modern research methods to explore the history of the earth and bring fantastic finds to light. Through innovative approaches in communicating project content, the perspective of the general public on research will be changed and the understanding of science as a process will be strengthened. The project partners are not only re-thinking

the communication of research results to a broad target group, but also focus on underlying processes of knowledge generation. By giving insights into the everyday work of scientists, the public gains a better understanding of research processes. The project will also develop the Bromacker fossil site as a place of education for a broad target group.

The title of the project is: Opening science: New ways of knowledge transfer using the example of the research project “BROMACKER”. The project is funded by the Federal Ministry of Education and Research.





The Bromacker in dialogue

In addition to cutting-edge research, science communication is a central component of the BROMACKER project. Innovative communication formats are developed to make science more tangible and to provide access to the local natural heritage. The scientists interact directly with a wide variety of target groups. With a scientific approach, the new tools are simultaneously tested and evaluated for

their effectiveness. It will be investigated whether the dialogical opening and presentation of real research results are more suitable to promote the understanding for, and trust in, the work of scientists, than the conventional presentation of research results in professional journals. In addition to innovative and experimental tools, already established formats are used and compared as well.

THE BROMACKER IS FOR EVERYONE

BROMACKER *lab* – discover prehistoric times

Since 2022, visitors of the Stiftung Schloss Friedenstein Gotha can become explorers of prehistoric times at the Bromacker lab. The focus of this interactive exhibition lies on tasks underlying the research processes in the project. The exhibition allows a unique dialogue between the scientists and the visitors.



An open preparation laboratory offers the opportunity to look over the shoulders of the geoscientific preparators as they are working on the original fossils.



The exhibit consists of numerous stations for participation and discovery. Public events and workshops related to the Bromacker or the excavation of fossils take place in the exhibition hall. By presenting the latest research results and constant updates, the exhibition invites visitors to come back again and again.



“A look into the Bromacker’s past holds many secrets. I would like to get as many visitors as possible excited for this great journey through time, as well as our detective work.”

Maria Schulz, geologist, science communicator and curator of the BROMACKER lab in the Stiftung Schloss Friedenstein Gotha

The Bromacker goes digital

www.BROMACKER.de

Developing new target groups requires new approaches - and new media. Digital formats are intended to facilitate access to the Bromacker and the underlying research and to break through traditional barriers. Low-threshold digital and interactive entries to project topics, make the Bromacker an experience and set the scene. Digital media make it possible to revive the fossil site virtually and to further draw the attention of interested individuals to the Bromacker site itself, as well as the entire project online. The development of an interactive website is intended to spark the user's curiosity for research and to stimulate the demand for personal discovery. Working with immersive technology will make the experience seem deceptively real.

The development of a virtual exhibition and experience is intended to give visitors the opportunity to immerse themselves in the research - whether directly at the Bromacker site, in school or in their living rooms.



“We are striving to reach new audiences with our project, too. Therefore, we want to translate the project's content into the digital world, highlighting the uniqueness of the entire process so that everyone can enjoy exploring the Bromacker.”

Anastasia Voloshina,
media curator at the Museum für Naturkunde Berlin

Der Bromacker communicates experimentally

With innovative and experimental methods, the project team aims to explore whether a direct dialogue between scientists and the public has an influence on the knowledge gained within the project. Science becomes “live science” and interested groups of the general public can participate in the research process.

Lifelong learning and discovery of the unique geological heritage at Bromacker are some of the main goals of networking with existing institutions and traditional offers. A visitor platform directly next to the excavation site becomes an additional outlet for communication. Digital applications and the opportunity for an exchange with the researchers complements the tourist attractions at the Saurian Discovery Trail in the UNESCO Global Geopark Thuringia Inselsberg - Drei Gleichen. A new geo-information center is planned already in the Lutherkirche in Tambach-Dietharz, intended to house another exhibition around the finds at the Bromacker fossil site. The Bromacker should establish itself as an internationally known tourist site and complete the existing wide range of tourist attractions, the geoscientific exhibitions and the nature experiences in the region.



“The unique characteristic of the project is the encounter between research and science communication at eye level. Combining both focal points as well as developing innovative formats is a challenge but it is not impossible with such an interdisciplinary team.”

Steffen Bock, biologist and science communicator at the Museum für Naturkunde Berlin



Skull of the type specimen of the early tetrapod *Diadectes absitus*





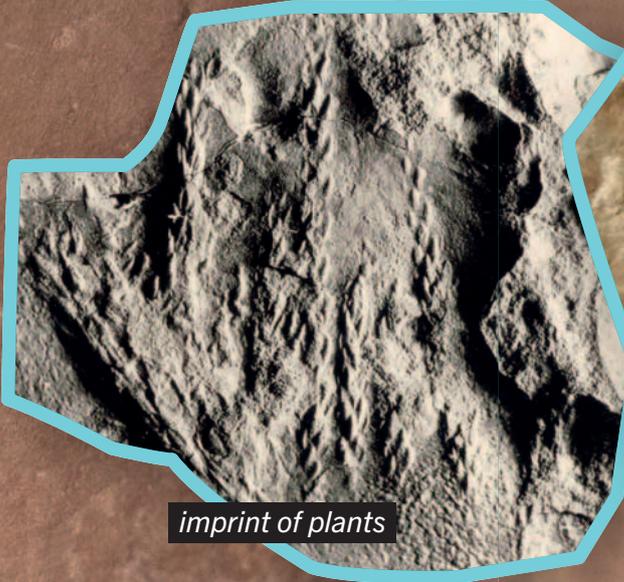
The Bromacker is diverse

All components of the Permian ecosystem at the Bromacker are being studied using modern research methods in addition to conventional approaches. Imaging techniques such as CT scanning, 3D modeling and photogrammetry are also used. The biodiversity – in comparison to the relatively small size of the actual known ecosystem at Bromacker – is impressive. Especially the high number and quality of the about 40 skeletal finds which were already discovered is remarkable. Additionally, there are large numbers of vertebrate tracks, as well as diverse findings of fossil invertebrates and plants. The numerous finds of the last decades and the expected discoveries of upcoming excavations have to be professionally prepared and digitized in order to make them accessible to researchers worldwide.



Tambia spiralis

The biggest trace fossil mystery of the Bromacker



imprint of plants



imprint of an insect wing



*arc-shaped imprint
of a centipede*



*fossilized shells,
only a few millimeters in size*

Fossilized tracks of a terrestrial vertebrate from the Bromacker



“Imagine, there is a world in front of our door which is almost 300 million years old, a completely different world than today, and yet we can see and understand it. And the evidence of the Bromacker tells us about the history of life and our origins.”

*Prof. Dr. Peter Frenzel,
Friedrich-Schiller-University Jena*

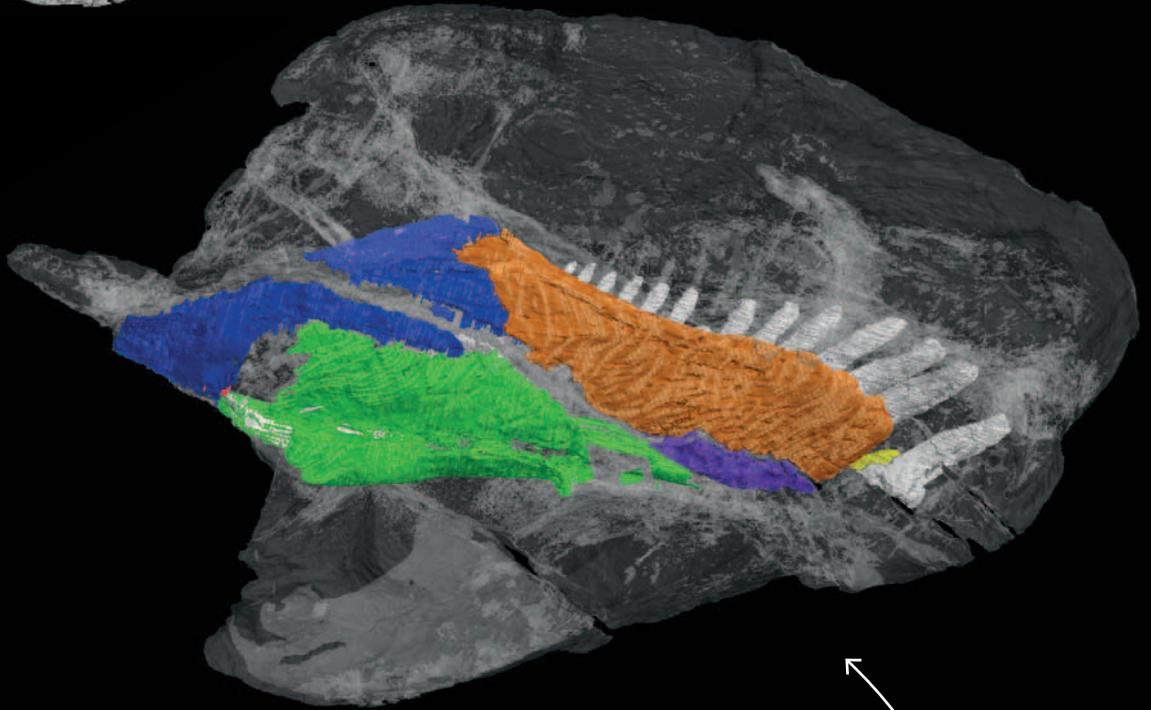


The Bromacker is a model ecosystem

By investigating the fossils and the evidence of biodiversity at the Bromacker, the visualization of the past ecosystem is being reconstructed step by step. The analysis of communities and their geographic distribution allow scientists to draw conclusions about food webs and the complexity and stability of the palaeoecosystem.

In addition to the study of the living environment, the geological and palaeoclimatological context in the region during the Permian are being researched. Profile documentation in the field, two deep boreholes with graphical display, and geochemical analyses will provide basin-wide structural, sedimentological, and palaeontological information around the Bromacker site. The scientists want to find out which parameters determined the palaeoenvironment in which the flora and fauna of this ancient time existed, and how they interacted with each other.

BV Bromacker
BK 2 = MNG-16321 (12)
2004
22,0m - 24,0m



The evolution of herbivores can be studied well at the Bromacker. For this purpose, the scientists conduct functional morphological analyses of their chewing apparatus. Using 3D display technologies (CT scans, photogrammetry, surface scans), detailed 3D models of the skulls and mandibles are being generated.

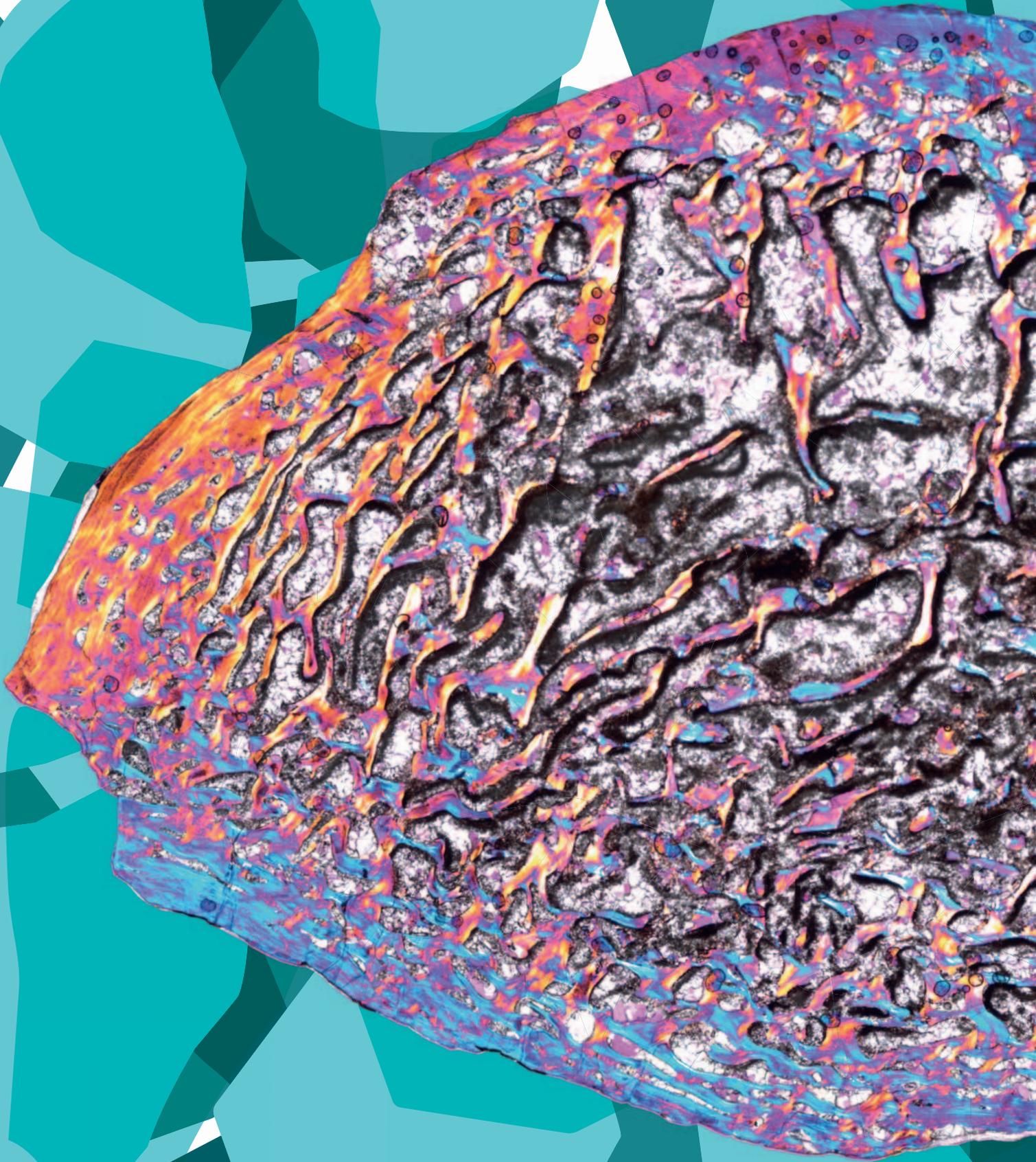
The Bromacker – Research with cutting-edge technology and expertise

The main one-of-a-kind feature of the Bromacker fossil site is the occurrence of trace fossils and body fossils at the same place that can be clearly assigned to each other. This is unique worldwide and enables unsuspected scientific possibilities. The exceptionally well-preserved skeletons and tracks are being scanned and digitally reconstructed.

Computer tomography, photogrammetry and surface laser scanning are just some of the imaging techniques which are being applied. The use of geometric-morphological techniques can provide insights into the biology, locomotion and evolution of the features of track producers. One of the goals in the project is to identify further skeletons and tracks to ideally establish them as so-called index fossils.

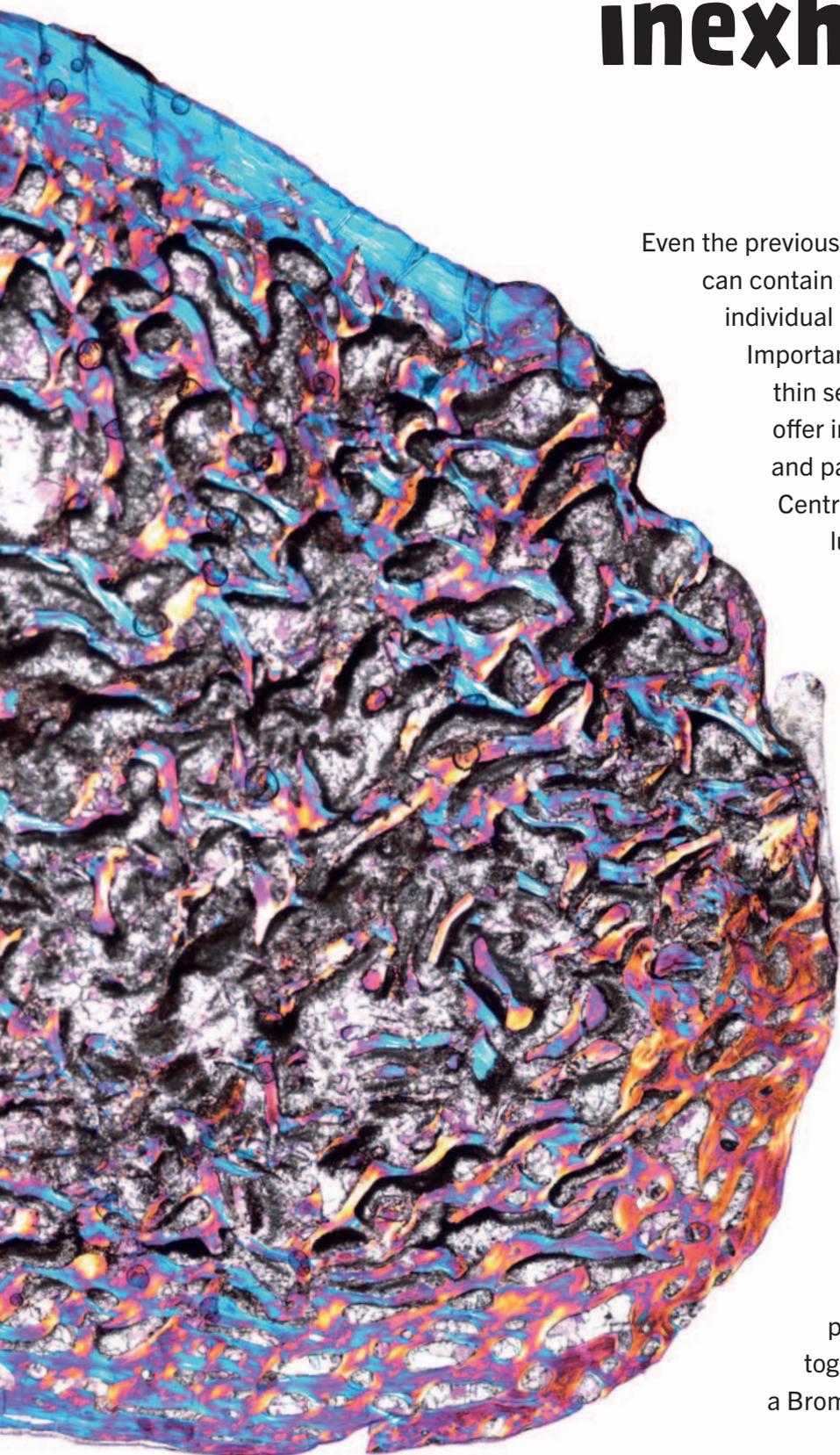
*Programming of the CT
(computer tomograph) scanner at the
Museum für Naturkunde Berlin with
fossils of the Bromacker.*





*Thin section of a bone
of an early tetrapod*

The Bromacker is inexhaustible



Even the previously known species of early tetrapods can contain yet unresolved questions regarding individual development, growth, and lifestyle.

Important tools for this field of research are thin sections from fossilized bones which offer insights into the physiology, growth, and past injuries of the fossil vertebrates.

Central questions about the life and evolution of early terrestrial vertebrates

are concerning the occurrence of sexual maturity or whether the specimen has reached adulthood yet. Furthermore,

the results can provide clues about palaeoecological relationships and living conditions during the Permian. For the first time, statements can be made about

distribution patterns of fossil specimens as well as morphological adaptations to their environment. The

interdisciplinary and international scientific team focuses on the study of biodiversity, the ecosystem, biomechanics, physiology, geology and climate.

Each single field of research perfectly complements the next and together they provide an image of how a Bromacker full of life might have looked like 290 million years ago.

The Bromacker moves even today

During excavations, up to 60 cubic meters of rock are being examined for fossils by the team each year. PhD students, preparators, biologists, geologists and palaeontologists, museologists and undergrad/high school students fill countless boxes with new finds, which go directly to the preparation laboratories of the partner institutes. After professional preparation and scientific processing, the samples are stored according to conservation standards in the collections of the Stiftung Schloss Friedenstein Gotha, where they will remain accessible to help answer future research questions. The amount of material is

inexhaustible and with every excavation new finds are added, which have to be prepared, identified and stored.

The challenge is to bring the limited depot space in the geoscientific collections of the Perthes Forum in Gotha in line with the outstanding potential of new additions to the collection. The Bromacker project aims to develop more space to be able to continue growing.



The Bromacker shall live on

The Bromacker project intends to constitute a location for cutting-edge research in the heart of the German federal state of Thuringia. This is being achieved by connecting research institutions, scientific collections and international cooperations. Furthermore, the visibility of the region with its unique geological heritage will be increased through the development and connection of the tourism infrastructure and the involvement of local small and medium-sized companies on a supra-regional level. This will lead to an increase of regional identity that will have an impact beyond the borders of Thuringia.

The cooperation partners of the BROMACKER project:



Museum für Naturkunde – Leibniz Institute for Evolution and Biodiversity Science

The Museum für Naturkunde Berlin (MfN) is an integrated research museum within the Leibniz Association. The mission of the MfN is to discover and describe life and earth through dialogue with the public. As an innovative communication center, the museum shapes the worldwide scientific and societal discourse about the future of our planet. Alongside knowledge transfer, our research and our collection are the main pillars of the museum's work. The collection comprises over 30 million items covering zoology, palaeontology, geology

and mineralogy and is of highest scientific and historical importance. Over the next few years, a science campus will be established in cooperation with the Humboldt University of Berlin, the Leibniz Association and other partners. The Bromacker has been in focus of several research groups of the MfN for several years. Under the leadership of the palaeobiologist Prof. Jörg Fröbisch, PhD, a team of project coordinators, scientists, preparators and science communicators researches the fossil site in Thuringia with the most modern methods available.



“The Bromacker project is unique, because we reconstruct an entire 290-million-year-old ecosystem with the help of an international team and state-of-the-art research methods, and are sharing the research processes and results experimentally and digitally with the general public.”

*Prof. Dr. Jörg Fröbisch, Museum für Naturkunde Berlin.
Invalidenstraße 43, 10115 Berlin, Germany.
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Stiftung
Schloss Friedenstein
Gotha

Stiftung Schloss Friedenstein Gotha

The baroque castle in the heart of the federal state of Thuringia, Germany was built 1643 –1654. Together with the Ducal Museum, constructed in 1879, the Stiftung Schloss Friedenstein Gotha houses unique collections of art, nature and cultural history. In the baroque and classical apartments, as well as the Ekhof Theater, visitors follow the footsteps of the dukes of Gotha. More than 60 employees work on the development of about one million collection objects with modern depot rooms and restoration laboratories in the Perthesforum. The natural

history collections contain over 400,000 objects, with the geoscientific collections holding approximately 160,000 objects. The first objects of this kind appeared 1657 in the inventories of the Chamber of Art. In the upcoming years, the permanent exhibitions will be redesigned and the collections will be presented in a modern way. The Bromacker team in Gotha consists of the project manager and curator of the geoscientific collections, Dr. Tom Hübner, as well as a geoscientific preparator, a museologist, a science communicator and a scientist.

“You could dig for another 100 years at the Bromacker and still find new species of early tetrapods, insects, and trace fossils. The Bromacker is an inexhaustible treasure trove of knowledge.”

*Dr. Tom Hübner, project manager at the
Stiftung Schloss Friedenstein Gotha, Schlossplatz 1, 99867 Gotha, Germany.
service@stiftung-friedenstein.de, 03621 82340*





UNESCO Global Geopark Thüringen Inselsberg – Drei Gleichen

Founded in 2002, the Thuringian Geopark was awarded the quality seal of a UNESCO Global Geopark in 2021. The area of about 750 km² includes the western part of the Thuringian Forest, and together with the Drei-Gleichen area, parts of its northern foreland in the Thuringian Basin. The scenic and diverse low mountain range landscape includes about 150 geotopes and extraordinary rock and landscape formations to be experienced. A special feature is the Bromacker fossil site, which has the status of a national geotope. 18 “geo”(-logical) routes, well-equipped with information along the way, six “geo” visitor centers, six public mines and caves as well as the

Geological Museum in the castle Ehrenstein in Ohrdruf, which opened in 2022, form a dense information network with geological and cultural aspects. The city of Friedrichroda is responsible for the directorship of the Geopark. In charge of the management of the Geopark is the e.t.a. Sachverständigenbüro Reyer. The Geopark team is working with the partners of the Bromacker project to develop suitable formats to share the research results with the interested general public. Based on the detailed knowledge of the area and the numerous Geopark network partners, the team is furthermore responsible for the technical and logistical support of the researchers.



“What excites me most about the project is that people can participate directly with the discoveries of the scientists through new formats of science communication.”

Sylvia Reyer-Rohde, geologist and head of the Management Office of the UNESCO Global Geopark Thüringen Inselsberg – Drei Gleichen city of Friedrichroda, managing community of the UNESCO Global Geoparks Thüringen Inselsberg – Drei Gleichen, Gartenstraße 9, 99894 Friedrichroda, Germany, 03623 3300



**FRIEDRICH-SCHILLER-
UNIVERSITÄT
JENA**

Friedrich-Schiller-University Jena

Founded in 1548 as a high school in the days of the Reformation, the university was finally recognized as a full university of the empire in 1558. The university consists of 10 faculties of various disciplines and 18,000 students. Research, teaching and the international connection of scientists and projects are all important components of the university. The

Bromacker project is assigned to the Faculty of Chemistry and Geosciences and is headed by the geologist Prof. Dr. Christoph Heubeck at the Geological Institute. A team of students, scientists and professors is dedicated mainly to the palaeoecology of the Bromacker 290 million years ago.

“The collaboration with our cooperation partners allows significant advances regarding our knowledge of the Permian world. It provides valuable impulses for the communication of scientific discoveries and processes of research to the interested general public and for teaching at the university.”

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EDITORIAL: Maria Schulz, Tom Hübner, Steffen Bock, Marco Karthe,
Eva-Maria Bendel, Michael Buchwitz, Mark MacDougall

PICTURES: Druckmedienzentrum Gotha GmbH

FOTOS: Stiftung Schloss Friedenstein Gotha, Friedrich-Schiller-Universität
Jena, Museum für Naturkunde Berlin, Peter Frenzel, Jörg Fröbisch,
Aurore Canoville, Sandra Hähle, Lutz Ebhardt, Alice End, Thomas Wolf,
UNESCO Global Geopark Thüringen Inselsberg – Drei Gleichen,
Stephan Brauner, Jakob Stubenrauch, Peter Mildner,
Thomas Martens

More about
the Bromacker?
Here is our website
www.bromacker.de



... and our
Instagram
"Bromacker_Chroniken"



Bromacker

Window into the past
Glance into the future

Träume auf dem Hochplateau
(Dreams on the high plateau)
This digital illustration was
created as part of the palaeo-art
competition "The Bromacker lives"
2020/2021 by Sandra Hähle.



Learning from the past
for the present and
the future

BROM
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Stiftung
Schloss Friedenstein
Gotha



GEFÖRDERT VOM



Bundesministerium
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und Forschung