



ex nihilo

presents



Children from the Cradle of Humankind

A
Cédric Robion
film

Produced by
Blanche Guichou

In collaboration with
France 5

CONTACT :

BLANCHE GUICHOU

TEL. 0033-6.80.98.56.49

blanche.guichou@agatfilms.com

EX NIHILO / AGAT FILMS & CIE

52 rue Jean-Pierre Timbaud 75011 PARIS

TEL. 0033-1.53.36.32.32

TEL. 0033-1.53.36.32.06

SYNOPSIS

How did humankind emerge? Considering that the subject concerns every single one of us, science is astonishingly hazy on the subject. The French palaeoanthropologist José Braga is on the point of revealing major discoveries that go a considerable way towards answering the question. In an underground cavern at Kromdraai, in South Africa, he has unearthed a fossil deposit that might be the most important ever found. The first specimens found include the remains of two children - the oldest ever found. They date from 2.5 million years ago, and one is human, the other a *Paranthropus* - a member of the hominin genus most closely related to humans. Until now, children's remains had to be excluded from research because scientists did not have the tools to study them. They turn out to hold the missing clue to defining the First Humans and differentiating them from other hominins. The work of excavation and analysis is not yet complete, and the team hope to glean yet more information. These finds are the starting-point for ground-breaking research that may at last reveal the origins of our genus.

Cédric Robion proposes to recount this fascinating archaeological investigation in an exciting, content-rich documentary aimed at a very wide audience. This proposal provides an overview of the project with supporting information about the protagonists and locations and describes how the director intends to tell this amazing story.

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SCHEDULE :

Shooting :	March - October 2020
Editing :	May - December 2020
Postproduction :	March 2021
Planned delivery :	April 2021

PRODUCER'S NOTE

KROMDRAAI is Cédric Robion's latest project. Producing his last three films - which have attracted record audiences every time they have been broadcasted, and have won awards or been shortlisted at all the major international science film festival - was a huge pleasure for me, so I am very excited to be given the task of enabling this talented director to explore the eternal question, "Where do we come from?"

The thing that makes science and archaeology films so fascinating is that their starting-point is always "in the current state of our knowledge" - meaning that there are things we do not know yet. This is especially true of the origins of humankind.

But Cedric has a special sort of luck. Fresh from accompanying the archaeologist Pierre-Henri Giscard on his expedition to the tomb of Genghis Khan, he met Professor José Braga, who was about to embark on an excavation at Kromdraai (South Africa) that he hoped would enable him to learn more about the moment when humans first appeared over two million years ago.

The site was already well known and digs had been conducted there over the years. But there has recently been a considerable progress in geologists' understanding of its structure, and redefining its boundaries revealed treasures that threw long-held theories into question.

Cédric Robion's documentary will find new ways of showing us the remote past unearthed by traditional excavation and resurrected by modelling techniques that recreate the earliest geological layers. It will portray the protagonists in the adventure - and here too, luck has played a part. The expedition leader, José Braga, is a charismatic natural communicator who belongs to the "open research" generation and works with colleagues from a wide range of disciplines.

3D sequences will be used to bring our ancestors alive, helping us share familiar emotions with the first human beings from the distant past. Seeing them in scenes from their everyday lives - hunting, quarrelling and playing - will help us empathize with them. Each stage in the creation of the reconstructions of the humans, the animals they encounter and the landscape they inhabit will be submitted to the palaeontologists, to ensure that the animations are as realistic as possible.

We could not have developed this project without the enthusiastic support of France 5. During the Sunny Side of the Docs' science pitches sessions in La Rochelle in June 2019, the project attracted considerable interest from potential partners. It has strengthened Cedric Robion's ambition, and mine, to rise to the challenge of producing this exciting new documentary with even greater confidence.

BLANCHE GUICHOU

OVERVIEW

A search for our origins

So little is known about the period when the genus *Homo* emerged that the earliest human species does not even have a name. French palaeoanthropologist José Braga, who has spent his entire career attempting to define it, simply calls its members "the First Humans".

It is very hard to say exactly when our ancestor *Australopithecus* disappeared and was replaced by two distinct genera, *Homo* and *Paranthropus*. One by one, the criteria for humanness - features thought to be unique to humans - have been eliminated, as successive finds showed that they were shared by other Hominini (the taxonomic tribe to which all three genera belong).

Clearly, to solve the riddle of our origins, we need to redefine what being human is. The way to do that seems obvious: first, find fossils of "First Humans", "First *Paranthropus*" and "Last *Australopithecus*", then compare them to see how they differ. In practice, the obstacles are almost insurmountable. For a start, virtually no fossils of hominins from the transition period (about 2.5 million years ago) have been found. And the closer you get to the moment when the *Australopithecus* genus split to form two new genera, the less marked the differences between the three become. To overcome these difficulties, archaeologists have to find the all-important fossils and to harness new technologies to help them analyse the specimens from a fresh angle and extrapolate more accurate criteria.

An ideal place to look

Where would you start looking for the first humans? For archaeologists, by far the most obvious place to look is the "Cradle of Humankind" in South Africa. Over a third of all the fossils of ancient hominins have been found in this valley, which is a UNESCO World Heritage Site. This is where the *Australopithecus* and *Paranthropus* genera were discovered.

The site owes its rich archaeological heritage to its highly unusual geology. As geomorphologist Laurent Bruxelles explains it, a network of underground caverns acted as a fossil trap. The cavities were gradually filled by layer upon layer of sediments and animals that made their way down from the surface. Each layer contains a record of a specific period, like shelves in a library.

One of these records is the most complete *Australopithecus* ever found, a skeleton known as "Little Foot" dating back more than three million years, found in a cave at Sterkfontein. This valley has the best preservation conditions anywhere in the world. Even the landscape has remained virtually unchanged. Our earliest human ancestors strode these same hills and roamed among trees just like these.

However, none of the cavities excavated so far has yielded records of **the transition period when our genus came into being - that is, until José Braga's recent discoveries at Kromdraai, not far from Sterkfontein.**

A new approach

The Kromdraai research project is led by Professor Braga and Professor Francis Thackeray, his South African counterpart. Kromdraai is legendary for being the site where Paranthropus was discovered, in the 1930s - a find that exploded the prevailing linear view of evolution by showing that several genera of hominins could exist side by side.

However, since that staggering discovery, little else has been found there, prompting speculation that there might be nothing more to find. Braga and Thackeray do not agree. Using aerial photography and chemical analyses of the substratum, **they succeed in showing that the site is actually ten times bigger than everyone thought.** Their hunch is proved right when a preliminary dig outside the site's historical perimeter **uncovers a spectacular fossil - the jawbone of a human child.** Could it have belonged to a "First Human"? If so, it would be the best-preserved relic of the species ever found and might hold the key to its elusive defining characteristics.

Fossil dating

Fossils this ancient cannot be dated directly from DNA or carbon 14. Their date has to be deduced from the date of the archaeological stratum, or layer, in which they were found. At Kromdraai, that is difficult, because the strata cannot be distinguished with the naked eye: the soil looks like a uniform mass. The layers overlap so inextricably that the only method that stands up scientifically is to conduct a systematic, meticulous excavation of the site.

As the team digs down through the substratum, the geologists analyse the chemical composition, granulometry, orientation and magnetic properties of the sediment for variations so as to identify homogenous strata from the same infill period. All the components of a given layer will be roughly contemporaneous.

Once an archaeological level has been identified, it has to be dated. This delicate task has been entrusted to taphonomist Jean-Baptiste Fourvel. Fourvel specializes in identifying fossilized animal species and working out their connection with their surroundings. He has already been able to establish that the underground cave at Kromdraai was used by carnivores at some point during its long history. In fact, it was used consecutively by several predator species. Most of the fossils found are bones of carnivores and their prey - which included hominins, albeit in much smaller numbers than gazelles. Statistically, only one in 1000 of the fossils found here comes from a hominin.

Layers can be approximately dated by meticulously comparing the fossils with extinct species and species that had yet to appear. In the immediate vicinity of the human jawbone, **Fourvel finds a fang from a sabre-toothed tiger, a prehistoric species that became extinct**

two million years ago. So the fossil jawbone is at least two million years old - a staggering age.

On top of this layer, the team also found a stalagmite - the only one in the Cradle of Humankind to have remained in its original position. This makes it an incredibly valuable time marker. Fossils cannot be dated directly, but the age of limestone deposits can be measured. **This one is 2.3 million years old. This tallies with the taphonomist's estimate based on the animal remains, and narrows down the possible timespan of the sediment.** The jawbone was underneath the stalagmite, so it must be older - but by how much? 100,000 years? 300,000 years? At this stage, it is impossible to say. However, one thing is for certain: **it is the oldest human child ever found - and the most complete fossil of a "First Human".** We are making great strides towards the transition with *Australopithecus*, an estimated 2.5 million years ago.

More hominins from the transition period

The archaeologists hope to find specimens of both "First Paranthropus", our closest relative, and "First Humans" miraculously preserved in this layer. To identify traits that are unique to humans, they have to be able to differentiate between the two genera.

Kromdraai is where *Paranthropus* was discovered - in 1938, a two-million-year-old fossil was found at this site - so it made sense to come here to look for even older specimens. Nothing is known about either the first *Homo* or the first *Paranthropus* species, so there is little likelihood of finding such a specimen.

However, the first dig ends with a stupendous discovery. Near where the human jawbone was found, the team uncovers the skull of an adult female *Paranthropus*. They are stunned by the importance of the find. It dates the emergence of *Paranthropus* in southern Africa several hundred thousand years earlier than was previously thought. For Braga, all the evidence suggests that, contrary to the prevailing view, *Paranthropus* emerged simultaneously in South Africa and East Africa. And since the *Homo* genus was contemporaneous with *Paranthropus*, the Cradle of Humankind may genuinely have been the place where humankind was born.

Analysing the fossils for defining characteristics

The next stage of the research takes place in the laboratory. A virtual 3D model has been made of the skull found at Kromdraai for the purpose of digital comparison with other individuals. **The initial results show that it has some "archaic" characteristics - meaning that they are found in the ancestral *Australopithecus* genus but not in later *Paranthropus* specimens. It now seems certain that the fossil dates from almost exactly the moment when the two genera diverged.**

Next, they compare this "First *Paranthropus*" with the "First Human" jawbone found nearby. The two palaeoanthropologists are jubilant.

The shape of the skull, the teeth and the jaw display several obvious anatomical differences. Using this information, Benjamin Moreno, a Toulouse-based 3D modeller specialising in biotechnology, is able to visualize the earliest individuals of the genera. The archaic *Paranthropus* is highly robust, with a broad face and impressive chewing apparatus - even more powerful than present-day gorillas. That makes sense: *Paranthropus*' exclusively vegetarian diet required teeth that could crack seeds and grind roots.

In contrast, the First Humans were essentially carnivorous. They had slightly larger brains than *Paranthropus* and their teeth were sharper-edged and smaller.

Braga has found other, more recent *Paranthropus* fossils at Kromdraai, including an impressive humerus from a male specimen. Sexual dimorphism - differences between males and females - was very marked in *Paranthropus*, much more so than in *Homo*. The difference is similar to that between present-day gorillas and gibbons.

Primatologists can link certain morphological features to behaviours. Professor Sabrina Krief believes that greater sexual dimorphism results from competition between males and indicates a more hierarchical society. In this scenario, a group of *Paranthropus* is led by one alpha male and all the females are at his disposal. The other males have the choice of submitting, leaving the group or challenging the leader in the hope of overthrowing him.

Conversely, the First Humans, who were much less sexually dimorphic, probably had a more communal way of life that emphasized defence of the clan.

How the hominins died

A new dig commences at Kromdraai. Before delving still deeper into the earth and further back in time, the archaeologists explore every inch of **the section where the female *Paranthropus* skull was found. Close by, they uncover a femur that appears to belong to the same individual.** If so, it will yield invaluable information about her size and how she moved. Another aspect of the bone intrigues Fourvel, the young taphonomist. **It has clearly been gnawed: you can still see the toothmarks. He decides to investigate a death that occurred over two million years ago.**

The cave at Kromdraai was used successively by 25 different carnivorous species. Identifying the killer and reconstructing the crime scene will be a challenge.

Fourvel pursues his investigation in a neighbouring wildlife reserve. **By studying the hunting behaviours of present-day predators, he gleans clues as to how their ancestors hunted.** Unlike humans, big carnivores evolve very slowly, and their behaviour has altered very little over millions of years. The approach Fourvel is using is called "actualism". It is vital for constructing hypotheses, though of course they subsequently have to be tested scientifically.

Fourvel drives through breathtaking scenery in his 4x4. The wardens have given him permission to get up close to the predators while they are feeding. The big cats concentrate on the parts of their prey where there is most meat. They do not bother with the carcass. The African wild dogs, on the other hand, gnaw the bones to extract as much goodness as possible

from their meal. The toothmarks they leave are similar to those found on the *Paranthropus* bone.

On his return to Kromdraai, Fourvel extends the perimeter of the dig. He is rewarded by the discovery of a complete skeleton of a canine species the size of a present-day African wild dog. Fourvel is doubly thrilled: as well as finding the killer of the *Paranthropus*, he has discovered a totally unknown species!

Unlike sabre-toothed tigers, African wild dogs are not super-predators. They only attack weak or isolated individuals. If the First Humans really did have a community lifestyle, it may have protected them from predators of this kind, but a lone *Paranthropus*, driven out by its clan, would be easy prey.

The *Australopithecus* level

Despite the extraordinary discoveries already made, Braga wants to try and get even further. To make absolutely certain that the *Homo* and *Paranthropus* individuals found are representatives of the earliest species of their respective genera, he needs to find a "Last *Australopithecus*" in the level just beneath them. Who knows? Anything could happen. The signs are encouraging. The sedimentologists' analyses of soil samples show that the soil further down has a different composition and orientation, meaning that it could be a different archaeological layer. But what period does it record?

As the excavation progresses, the archaeologists uncover another stalagmite. Braga begins brushing away the surrounding sediment. Suddenly he stops short. He cannot believe his eyes.

At the base of the stalagmite, he has uncovered another hominin fossil. The Kromdraai site really is incredible. This new find defies the laws of probability. As a rule, discoveries like these are extremely rare. The fossil cannot be detached from the sediment in situ: the risk of damaging it would be too high. A large block of sediment containing the fossil is lifted out and transported to the nearby laboratory of Braga's friend Ron Clarke at Sterkfontein. Clarke is a living legend among palaeoanthropologists: he is the man who found the *Australopithecus* specimen known as "Little Foot". Even before the mud is cleared away from the fossil, his practised eye instantly recognizes it and takes in its immense scientific significance. **The fossil is definitely an *Australopithecus*. Its mere presence makes Kromdraai utterly unique, as the only place in the world where the entire *Australopithecus* / *Homo* / *Paranthropus* sequence has been found on a single site.** If one place can be said to record the birth of humankind, this is it.

Why did *Australopithecus* die out?

The geologist Jean-Luc Schneider compares the composition of the *Australopithecus* layer with the layer in which the *Paranthropus* and *Homo* fossils were found. This enables him to work out how the palaeoclimate changed between the two periods. His findings show that

here, as in East Africa, major climate change occurred around three million years ago. It was triggered by a shift in ocean currents following the closure of the isthmus of Panama. The resulting concentration of ice at the poles caused a large section of the African continent to become much more arid. Food became less abundant and thick forest was replaced by open savanna. To avoid extinction, species had to adapt. Although Australopithecines were partly bipedal, they had not entirely abandoned the arboreal lifestyle of the great apes. The loss of trees was fatal to them. The omnivore *Australopithecus* was replaced by two highly specialized genera: the vegetarian *Paranthropus* and the carnivore *Homo*.

The search for a *Paranthropus* child

To take our knowledge of hominins a stage further, Braga has devised a dental analysis protocol. Unfortunately, it can only be used on teeth in the development stage. So he needs to find a *Paranthropus* who died in early childhood to compare it with the little human.

Fired with fresh enthusiasm, the archaeologists recommence excavating the *Paranthropus* and *Homo* layer where it meets the *Australopithecus* layer. They know how lucky they are. This is every archaeologist's dream - discovering where the story of humankind began. In a few centimetres, they go from one world to another. Everything about the two is different: environment, climate and the hominins who lived there... However, excitement aside, this is back-breaking work. The dig is reaching its end and the team are physically exhausted. Their tiredness is compounded by the fact that no fossils have been found for several days. Has Braga's famous luck worn out? **Just as he starts to worry that they may find nothing, the palaeoanthropologist finds exactly what he was looking for - a "First *Paranthropus*" jawbone belonging to an immature specimen, the exact equivalent of the jawbone of the human child.** There is even a piece of the skull attached to it. Braga is hardened by years of fieldwork, but it is an emotional moment. At last everything has come together. **For the first time, he holds all the keys to the transition from *Australopithecus* to *Paranthropus* and *Homo*. The entire way we think about our earliest ancestors is about to be revolutionized.**

Comparison of the children's teeth

Braga's highly innovative protocol uses the Synchrotron's impressive capacities to measure the internal structure of teeth to the nearest micron. Until now, only fossils of adult individuals were used in empirical studies that attempted to isolate the defining characteristics of hominin species. Children's remains were excluded because scientists did not have the technology to decipher the mass of information they contained, even though they knew it might be crucial.

Tooth enamel grows in waves. These show up in the tooth structure as growth lines known as striae, rather like growth rings in tree-trunks. In milk teeth, the Synchrotron can be used to analyse the striae to determine how old the individual was and to identify certain life

events. Particular types of striae indicate when the individual was born and weaned and when it suffered from serious illness and nutritional deficiencies. Incredible as it seems, **new technologies have made it possible to compare the development and everyday lives of *Paranthropus* and *Homo* children over two million years ago.** The gulf between time-scales is dizzying.

The results show that the *Homo* child had a significantly longer developmental period than the *Paranthropus* child. **Weaning occurred much later, and both gestation and early childhood, when the milk teeth were developing, were longer.**

As early as the eighteenth century, naturalists found it troubling that human babies remained immature for so long, compared with other primates. Our lengthy childhood seems at odds with our place at the top of the evolutionary pyramid.

However, a longer childhood means a longer period in which knowledge can be passed on from one generation to the next, language can be learned and tool-wielding skills acquired.

A longer childhood enabled the *Homo* genus to develop a larger brain. Nonetheless, allowing babies to remain vulnerable and totally dependent on their parents for longer represented was a risky adaptation strategy. It implies a complex social organization, in which resources and probably knowledge are shared. The care devoted to young members of a colony is the missing key factor needed to define the *Homo* genus and explain the changes that occurred in its biology during this period.

It was a risky strategy, but we are living proof that the risk paid off. The *Homo* genus has survived into the present, while *Paranthropus* disappeared after "only" a million and a half years of existence, unable to keep pace with changes in environmental conditions.

Humans' ever-increasing cognitive abilities enabled them to develop complex thought and wield increasingly sophisticated tools and weapons. Their status gradually shifted from prey to predator and from carrion-eaters to hunters, until they were ultimately able to establish themselves at the top of the food chain.

DIRECTOR'S STATEMENT

Cédric Robion proposes to combine a strong, coherent, factually accurate narrative that necessarily makes demands on the viewer, given the groundbreaking nature of the research, with imaginative, entertaining, empathetic dramatization.

A uniquely important archaeological investigation

Kromdraai (South Africa) is the only place in the world where fossils of archaic Humans and *Paranthropus* have been found together, in an astonishingly good state of preservation, just above a level containing *Australopithecus* fossils - **the complete *Australopithecus* / *Paranthropus* / Human evolutionary sequence at a single site!** We are clearly close to the point where hominins took separate genetic pathways. If there was ever a place and time to observe this mysterious transition and witness the birth of humankind, it is here and now, at the Kromdraai dig.

The scientific importance of the topic is indisputable, but as the subject for a documentary, it clearly raises a number of questions, starting with how to recount and give visual form to a story that took place 2.5 million years ago - especially as the universal relevance of the subject means that the documentary needs to be accessible to a very wide audience.

Scientists of international calibre who are used to talking about their research

Luckily, we have an excellent cast of protagonists. First among them is Professor Braga. He has a frank, open gaze, speaks clearly and distinctly, and above all, he is one of the world's greatest palaeoanthropologists, and one of the youngest at his level. He jars somewhat in a highly conservative milieu that is sometimes inclined to be a bit pleased with itself. Braga subscribes to an open, cross-disciplinary model of scholarship, in which leading specialists from different fields collaborate harmoniously on the same project. All of them are very comfortable being filmed while they speak. We will film them in their daily life at the base camp as well as at the excavation, to convey what it is like for them as people to take part in an expedition of this kind.

Footage of field work and laboratory research complemented by interactive visuals

Professor Braga's research will provide the main narrative thread. We will chart the stages in his thinking, from the moment when the perimeter of the Kromdraai excavation is extended in 2015 to the publication of his conclusions (scheduled for mid-2021).

At each stage, field work looking for fossils and other clues will be followed up by scenes in the laboratory. Institutional research have made their state-of-the-art technologies

available to help solve the mystery of how our genus came into being. **Diagrams and scientific computer animations will enable us to present ground-breaking scientific concepts in a form that is easy for viewers to grasp.** We will use chronological friezes featuring the archaeological layers corresponding to different periods, adding more details as the investigation progresses. As they are defined for the first time, more species of hominins will be added to the tree of evolution.

A project spanning several years, filmed right from the start

We have spent the last four years filming the progress of the excavation and its most important finds. Each stage of the dig has also been modelled photogrammetrically with the aid of drones. As a result, we have a wealth of scientific data to draw on, giving us plenty of options. For instance, we can use virtual reality to create the impression we are moving around the excavation, show the progress of the dig over several years, contextualize it in a way that conveys its importance or show things that are no longer visible. The scientists will be able to reconstruct the various stages of formation and then erosion of the Kromdraai cave that made it such an effective fossil trap and kept the finds in such an exceptional state of preservation.

Deducing the behaviour of the earliest hominins

The Kromdraai excavation is not yet finished, but the fossils of First Human and *Paranthropus* children already unearthed are the oldest remains of hominin children ever found. New technologies have made it possible to exploit this amazing new piece of the palaeoanthropological puzzle and shed light on the respective lifestyles of the two genera (the length of gestation and early childhood, diet, childcare, social practices, and so on). The primatologist Sabrina Krief will provide additional insights by drawing a parallel with present-day primates. Extrapolating from the links between their physiological traits and behaviour allows us to make deductions about the social structures of First Humans and First *Paranthropus*.

New scientific discoveries enable us to flesh out the animated drama sequences

By incredible good fortune, the two hominin children found at Kromdraai in the same geological layer were the same age and were alive in the same era. This gives us everything we need to step outside the strict boundaries of science and create a storyline with fully-fledged characters, on the premise that these two children from the Cradle of Humankind might have been playmates.

Of course, that immediately begs the question of how to depict the children and the First Human and *Paranthropus* clans they belong to. I ruled out drama sequences using real

actors, which would not have enabled us to achieve sufficient scientific accuracy, in favor of 3D animation. This technical choice will make it possible to incorporate all the details provided by the experts into the reconstruction of the hominins and their surroundings.

The desire to achieve scientific accuracy has in no way lessened our determination to create gripping scenes that will captivate a wide audience.

The animation sequences will immerse us in the danger-filled everyday lives of the earliest human and *Paranthropus* clans in their highly hostile environment, in a way that has never been done before.

All the animated scenes will be submitted to José Braga and Jean-Baptiste Fourvel for validation. Fourvel reconstructs 2.5 million-year-old "crime scenes" on the basis of the toothmarks on the fossilized bones and the predators shown to have been in the vicinity. To construct hypotheses about the behaviour of prehistoric predators, he studies the present-day carnivores most closely related to them, and his expeditions into the heart of several South African wildlife parks will give us the chance to explore these vast, savagely beautiful spaces.

A hyper-realistic backdrop

The exceptional state of preservation of the fossils has resulted from a unique geological characteristic of the site. **Erosion takes place so slowly at Kromdraai that the landscape has hardly changed since humankind first emerged.** This is fantastic for us as documentary-makers, because it provides us with a highly realistic backdrop for our drama sequences. There are good scientific grounds for incorporating our animated characters into the present-day landscape, digitally erasing any elements that would not have been there at that time. **This will enable us to use subjective real camera footage to speed up the action and create an impression of rapid movement.** Some animation sequence will begin with shots of similar landscapes with present-day animals or human beings.

We will never lose sight of our intention when we first embarked on this exciting project - to combine a high degree of factual accuracy with a powerful storyline so as to convey a strong sense of kinship with our first human ancestors.

CEDRIC ROBION

PROFESSOR JOSE BRAGA

French palaeoanthropologist

Professor at the Université Paul Sabatier (Toulouse III) and Professorial Research Fellow at the Evolutionary Studies Institute, University of the Witwatersrand, Johannesburg (South Africa)



Braga's chief research area is the emergence of the first human populations. He has had about 40 articles published in leading international academic journals and sits as an expert on several research boards in France and other countries. His laboratory at Toulouse Natural History Museum specializes in designing innovative tools for fossil analysis with the aid of new technologies.

He has jointly headed the Kromdraai archaeological excavation since 2010. His recent discoveries are about to send shock waves through the cosy circles of palaeoanthropology.

PROTAGONISTS

Professor Francis Thackeray: South African palaeoanthropologist (University of the Witwatersrand, Johannesburg). Joint head of the Kromdraai archaeological excavation.

Professor Thackeray has developed a probability-based method for defining species using the anatomical measurements of the fossils found in the Cradle of Humankind.



Professor Ronald J. Clarke: British palaeoanthropologist (Evolutionary Studies Institute, University of the Witwatersrand, Johannesburg). Professor Clarke is world-famous for his discovery of Little Foot in a cave at Sterkfontein, about a mile from Kromdraai, in 1994. He is working closely with Professor Braga to analyse the finds from Kromdraai. His laboratory is being used for work on the fossils.



Professor Yves Coppens: French palaeoanthropologist (Emeritus professor of the Collège de France).

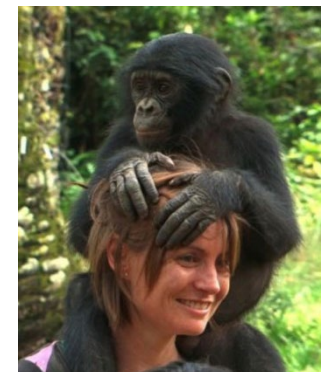
His name is known throughout the world for his discovery of the fossil skeleton Lucy in 1974. Until the discovery of "Little Foot" by Ronald J. Clarke, Lucy was the most complete *Australopithecus* skeleton ever found. He is working closely with Professor Braga to analyse the finds from Kromdraai.



Sabrina Krief : Veterinarian, Primatologist, Professor at the Musée National d'Histoire Naturelle and the Musée de l'Homme in Paris.

Specialist in behavioural ecology of chimpanzees and gorillas.

She also studies chimpanzee interactions with humans through the chimpanzee group in Sebitoli (Uganda), which habitat is under high human pressure.



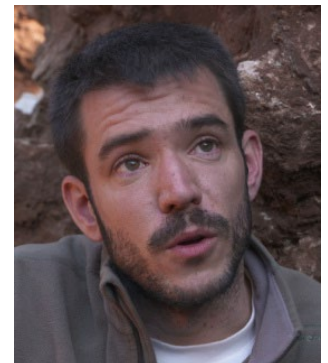
Laurent Bruxelles: French karstologist and geoarchaeologist (Institut National de Recherches Archéologiques Préventives (INRAP), France). Awarded a CNRS bronze medal in 2015.

Bruxelles' previous projects include helping date the hominin fossil Little Foot. At Kromdraai, he has the task of explaining the cave's structural formation and providing confirmatory evidence of the dates of the various sedimentary layers.



Jean-Baptiste Fourvel: French taphonomist, archaeozoologist and palaeontologist (TRACES UMR 5608 Laboratory, Université de Toulouse, France).

Fourvel is a large carnivore specialist. At Kromdraai, his job is to identify the species of fossilized animal remains, to determine what evolutionary stage they had reached, and to study their relationship with their surroundings. By a meticulous process, he is able to estimate the dates of the archaeological layers and work out how hominin remains came to be in the cave at Kromdraai.



Professor Jean-Luc Schneider: French sedimentologist (UMR CNRS 5805, Université de Bordeaux, France).

This eminent geologist is responsible for conducting chemical, magnetic and cosmological analyses of the sediment samples to get a three-dimensional picture of the subsoil and help reconstruct the palaeoenvironment and date the archaeological layers.



Benjamin Lans: French geomorphologist (Tshwane University of Technology, Pretoria, South Africa and Université Bordeaux-Montaigne, France).

Lans' research area is spatial and geomorphological analysis in archaeological and palaeoanthropological contexts. At Kromdraai, Professor Schneider tasked him with creating a 3D model of the subsoil and the sediment types.



Benjamin Moreno: French biotechnology expert (AnatomikModeling SAS, Toulouse, France).

Moreno creates 3D models and digital reconstructions of the fossils under Professor Braga's supervision.



Elisabeth Daynès (optional): French palaeoartist who specializes in reconstructions of prehistoric hominins in the form of anthropomorphic figures. Her many commissions include making mannequins and figures for museums in New York, Los Angeles, Paris and Mexico City and for publications such as *National Geographic Magazine*. She is working with Professor Braga and 3D animators to make sure their reconstructions of First Humans, First *Paranthropus* and Last *Australopithecus* are as accurate as possible.



FILMING LOCATIONS

SOUTH AFRICA

Kromdraai

The most promising of the archaeological sites in the area known as the "Cradle of Humankind", in that it is the only place in the world where the entire *Australopithecus* / *Homo* / *Paranthropus* sequence has been found in one place, Kromdraai offers the best chance of comprehending how the transition from *Australopithecus* to human took place. We have been filming the excavation for several years, both at the dig itself and at the camp where the archaeologists live and work.

Sterkfontein

Sterkfontein, where Ron Clarke found Little Foot, is the best-known archaeological site in the Cradle of Humankind. The Kromdraai fossils will be cleaned and studied in Clarke's laboratory.

The network of underground galleries at Sterkfontein studied by Laurent Bruxelles almost exactly mirrors what the structure of the cave at Kromdraai would have looked like before its ceiling collapsed as a result of erosion.

Fossil room at the University of the Witwatersrand (Johannesburg)

This is the strongroom where all the fossils found in the Cradle of Humankind - the most valuable fossils in the world - are kept. We were fortunate enough to be allowed to film inside the fossil room, accompanied by Professors Braga and Clarke.

Kruger National Park and Rhino and Lion Nature Reserve

Reserves visited by Fourvel to gain insights into the position and state of the Kromdraai fossils by observing the predatory behaviours of large carnivores.

FRANCE

Collège de France (Paris)

Interview with Yves Coppens.

Laboratory of the Natural History Museum and Université Paul Sabatier (Toulouse III)

In his laboratory, Professor Braga devises new scientific protocols to identify additional characteristics specific to the various hominin species.

IMA biotechnology laboratory (Toulouse)

Professor Braga and Benjamin Moreno create digital reconstructions the First Human and *Paranthropus* skulls on the basis of the fossils. These digital doubles are then used to compare the individuals and work out which features are unique to their respective species.

Daynès' studio (Paris) (optional)

This is where palaeoartist Elisabeth Daynès creates the artistic reconstructions of prehistoric hominins on which the 3D animations in the drama sequences will be based.

CEDRIC ROBION

Tel.: +33 (0)659 030539 / cedrobion@gmail.com

Cédric Robion has been making archaeology documentaries for the past 10 years. His background in engineering enables him to understand complex research and present it in a way that is intelligible to a wide audience. He makes creative use of sophisticated technological tools to give visual form to what cannot be seen. He works alongside archaeologists, immersing himself in their day-to-day reality to recreate the intense atmosphere of field expeditions and allow viewers to share the excitement of making scientific discoveries while learning about little-known civilizations.

SELECTIVE FILMOGRAPHY

- 2018 ***Oman, the Archaeological Key to Arabia aka Oman, The Treasure of Mudhmar (52 min) / Planète +***
The civilizations of Mesopotamia and Iran that laid the foundations of Western culture have been extensively researched, but almost nothing is known about the earliest civilizations of the Arabian Peninsula. New technologies and approaches are enabling archaeologists to explore these mysterious cultures and find out about their religions, their political and military systems and their social practices and rituals.

Shortlisted Beirut International Film Festival 2018; Festival Lumexplore 2018; Firenze Archeofilm 2019.

- 2016 ***In Search of the Secret Tomb – Genghis Khan aka The Tomb of Genghis Khan, The Secret Revealed (90 min) / France 5***
For archaeologists, finding the lost tomb of a man who ruled over an empire and founded a civilization is the ultimate dream: it ranks with unearthing the treasure of Tutankhamun. That used to mean setting off with your pickaxe and digging until you found the burial site. However, powerful new technologies and bibliographical research have enabled a team made up of a geomorphologist, an aerial and subterranean imaging expert and an archaeologist to locate a site that may confirm the legends and reveal new information about Genghis Khan.

Grand Prix International Archaeological Film Festival of the Bidasoa (Spain), 2017.

Best Scientific Film Lumexplore (Festival International du film d'exploration scientifique), La Ciotat (France), 2017.

Audience Award International Festival of Archaeological Film, Rovereto (Italy), 2017.

Jury Prize Rencontres d'Archéologie de la Narbonnaise Documentary Festival, Narbonne (France), 2017.

Shortlisted PariScience International Science Film Festival, Paris (France), 2016;

International Scientific Film Festival, Szolnok (Hungary), 2017; Arkhaios Film Festival, Hilton Head Island (USA), 2017; **International Archaeological Film Festival of Castilla y Leon, Zamora (Spain), 2017.**

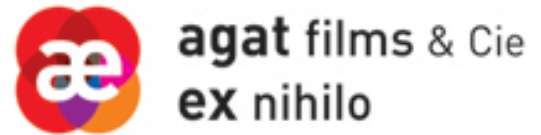
- 2013 ***Warlords of the Frozen Steppes aka In the Frozen Tomb of Mongolia (52 min) / Arte***
In the frozen steppes of the Altai Mountains, a French-Mongolian archaeological expedition prepares to excavate the tomb of a 2300-year-old Scythian warrior. The Scythians of the Eastern Steppe had a ritual practice of burying the dead deep underground. This, combined with extreme climatic conditions, may have preserved their tombs intact for present-day archaeologists to unearth, advancing our understanding of this unknown branch of Scythian civilization.

Grand Prix International Archaeological Film Festival of the Bidasoa 2014.

Shortlisted Thessaloniki Documentary Festival, Greece, at 2014; International Festival of Archaeological Film, Rovereto, Italy, 2014; Torelló Mountain and Adventure Film Fest, Spain, 2014; Festival International du Film de Montagne, Autrans, France, 2013.

PRODUCER

AGAT FILMS & Cie / EX NIHILO – 52 rue Jean-Pierre
Timbaud Paris, France
blanche.guichou@agatfilms.com / +33 (0)680 985649



AGAT Films & Cie / EX NIHILO is a collective of eight producers. It is one of France's leading independent production companies and has twice been named "Best French Television Producer of the Year" by the French producers' association Procirep.

On a day-to-day basis, the eight producers work individually to develop, accompany, produce and promote films, while financial and editorial matters are discussed by the collective as a whole. This works partly because of our affinity with each other, and partly because of our shared conviction that the cultural nature of audiovisual content means that it should not be solely left to the market to determine what is produced.

This approach gives us the necessary solidity and confidence to face the risks inherent in the profession of producer, in our work for cinema and television in the genres of drama, documentary and the performing arts.

The advent of digital technology and the increased number of broadcasting outlets and viewing methods it has brought mean that the producer's role is more essential than ever for high-quality, distinctive programmes to attract sufficient attention to be made and distributed.

BLANCHE GUICHOU

Blanche Guichou produces both documentaries and feature films. She has worked in television for the last 25 years, and has been involved in the production of over 50 television documentaries. She joined AGAT Films / Ex Nihilo in 1995.

For the last 20 years, she has concentrated on producing scientific documentaries that use drama, CGA and graphic treatments of archives and cutting-edge imaging technology, starting in 1998 with *A Flag, What For?* by Axel Clévenot and Patrick Cabouat (16x13 min, La Cinquième), then *Wanderers of the Sky* by Véronique Ataly, Jean-Pierre Luminet and Mathias Ledoux in 1999 (52 min, La Sept Arte).

Her science documentaries include *Atome Sweet Home* by Vincent Gaullier and Raphaël Girardot (52 min, ARTE, 2015), *There's Something about Species* by Denis Van Waerebeke, in coproduction with France 5, Arte, NHK and RTBF (52 min & 90 min, 2008), *Smart Women* by Hervé Nisic and Marina Julienne (52 min, Arte, 2004) and *Nano, the Next Dimension* by Pierre Oscar Levy (52 min, France 5, 2003).

She has produced several documentaries on archaeology, including *Oman, the archeological key of Arabia* (90 min, Planète+, 2018) and *Warlords of the Frozen Steppes* aka *In the Frozen Tomb of Mongolia* by Cédric Robion (90 min, Arte, 2013), *Alesia* by Christian and Gilles Boustani (20 min, 2011) and *Under the Cobblestones, the Middle Ages* by Gilles Savastos (2003).

Her recent productions include two 90-minute documentaries for France 5's "Science Grand Format" slot:

- *Last Call for Titan* by Jonathan Tavel and Frédéric Ramade, which achieved the slot's best viewing figures for an original production in 2017 and attracted record streaming figures for the slot. It also broke the record for viewing figures on NHK (the coproducer).
- Before that, Cedric Robion's *In Search of the Secret Tomb – Genghis Khan* aka *The Tomb of Genghis Khan, The Secret Revealed* by Cedric Robion attracted the "Science Grand Format" slot's highest viewing figures for an original production in 2016. It was shortlisted at numerous festivals and won a number of awards including the Grand Prix at the International Archaeological Film Festival of the Bidasoa, Best Scientific Film at Lumexplore (Festival International du film d'exploration scientifique), the Audience Award at the International Festival of Archaeological Film in Rovereto and the Jury Prize at the Rencontres d'Archéologie de la Narbonnaise Documentary Festival in Narbonne.