2025

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*Philosophy of Science* (2025), **92**, 1076–1085
doi:10.1017/psa.2025.10149

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PHILOSOPHY OF SCIENCE

CONTRIBUTED PAPER

# Parachute Science in Paleontology as Distributive Epistemic Injustice

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(Received 06 January 2025; revised 28 April 2025; accepted 24 July 2025; first published online 08 September 2025)

## Abstract

Paleontology is facing an ethical crisis related to its long history of extractive practices, including a practice now referred to as *parachute science*. In this article, I provide diagnostic criteria for identifying parachute science and illustrate them using the high-profile example of a Brazilian dinosaur fossil, *Irritator challengeri*, acquired by a German museum under dubious conditions. I use this case study to identify three types of harm resulting from parachute science, showing how they can be understood as a case of distributive epistemic injustice. I conclude by using this framework to point toward more ethical paleontological practices.

## 1. Introduction

Parachute science, the practice of going to other countries to conduct research without collaborating with local experts or benefiting them in any way, raises many ethical problems. Parachute science reflects a long legacy of colonial practices that continue to shape research today. Lack of collaboration with local scientists has ethical consequences in scientific research and detrimental epistemic consequences for the science being produced. Ultimately, however, I argue that the main reason why parachute science is problematic is due to the underlying distributive justice issues reflected in the ethical and epistemic spheres.

To illustrate what parachute science looks like, I turn to a case study in paleontology exemplifying the criteria I propose. After looking at the details of the exportation of *Irritator challengeri*, in section 3, I draw out lessons about what sorts of harms result from parachute science using the case study as a reference for illustration. In section 4, I present my main argument that these can be understood as instances of distributive epistemic injustice. Section 5 concludes by sketching out a pathway to more ethical practices, detailing a starting point for meaningful collaboration. In this last section, I reiterate the key takeaways and show how they can be generalized to other fields.

## 2. Criteria for parachute science

A preliminary, although, I will argue, incomplete definition of parachute science, as found in the current literature, is the following: Parachute science, sometimes also known as *helicopter research* or *parasitic science*, refers to situations in which researchers from high-income countries travel to more disadvantaged, low-income countries to collect fossils, artifacts, or other data that are brought back to their foreign institutions, making them more difficult for local communities to access, and then are used for research, publishing, and/or display in those wealthier countries, *without appropriately collaborating with or acknowledging local scientists or contributors* (Minasny et al. 2020; van Groenigen and Stoof 2020; Stefanoudis et al. 2021). Although current research emphasizes the lack of collaboration with local researchers as the key characteristic of parachute science, this characteristic is not sufficient; instead, the practice must also be accompanied by the researcher going outside of their institution's country and producing or acquiring a product that can be associated with an increase in epistemic power. This increase in power can take the form of a new publication for the researcher(s), a new artifact acquired for a museum outside of where the artifact was found, and data being stored outside of the country where they were collected.

In distinguishing between parachute science and the more encompassing category of scientific colonialism (e.g., Cisneros et al. 2022), it is important not to conflate the ethical repercussions of each category. Parachute science is a kind of scientific colonialism insofar as it involves the following:

a. Scientific exploitation of a community's resources, which leads to an unequal distribution of epistemic power

b. A nonreciprocal relationship between researchers and communities where research is being conducted

c. A trade-off of benefits and harms in which the epistemically privileged continue to benefit while the epistemically disadvantaged continue to be harmed[1]

However, these criteria are too broad if we want to be able to pick out what is considered special about parachute science. To be considered parachute science, specifically, as opposed to the more encompassing category of scientific colonialism, a research practice must also satisfy the following two criteria:

1. Research is conducted in a country outside of the researcher's affiliated institutional location.

2. No meaningful collaboration occurs between local researchers and foreign researchers during the design, investigation, or analysis of the research project.

[1] The categories of epistemically privileged and epistemically disadvantaged are created by social structures. The practice of parachute science perpetuates these categories by continuously taking resources away from the disadvantaged. An exploration of how we assign these categories is out of the scope of this article. However, for clarity, when referring to the epistemically disadvantaged, I refer to the local communities experiencing parachute science.

Some flexible criteria that can serve as evidence that no meaningful collaboration is happening are as follows:

2a. Objects are extracted from the land and exported (e.g., artifacts, fossils, rocks).

2b. Objects are studied and analyzed in a country outside of where the objects were acquired.

2c. The products of the data analysis are published or stored outside of the country where the objects were collected.

2d. Physical objects extracted for the research study are eventually displayed or stored in museums outside of the country where the objects were collected.

The first two criteria are necessary to classify a research practice as parachute science. Criteria 2a–2d will be present in some cases of parachute science, but this will depend on what kind of research is being conducted. If more criteria are present during a research endeavor, we can be more certain that the practice in question is an example of parachute science.

## 3. Case study: *Irritator Challengeri* and the harms of parachute science

Oftentimes, analyses of parachute science focus on the legal violations involved but only superficially explore other ethical but nonlegal violations (e.g., the famous case of *Ubirajara jubatus*, which was illegally exported from Brazil; Greshko 2022). However, the characteristics involved in parachute science lend themselves not only to legal analysis but also to ethical analysis. The case of *I. challengeri*, a species of dinosaur that lived 113 to 100 million years ago in the Araripe Basin of Brazil, allows us to focus on analyzing the ethical harms involved in parachute science because the legal standing of the fossil is unclear.[2] *I. challengeri* was originally identified by Martill et al. (1996) based only on an incomplete Spinosaurid skull purchased by the State Museum of Natural History Stuttgart in Germany. In this section, I classify the potential harms inflicted by parachute science into three nonexhaustive categories: nonreciprocal exploitation of local resources, loss of knowledge and heritage for local communities, and increased likelihood of poor epistemic quality. I use the *I. challengeri* case to illustrate the harms of each category in paleontological cases. Let's take them in turn.

### *i. Nonreciprocal exploitation of resources*

The lack of collaboration between researchers and local communities, including local experts, happens along at least three different axes. First, there is a lack of

[2] The fossil of *I. challengeri* was smuggled to Germany in 1990, presumably prior to the establishment of a Brazilian decree in the same year requiring international institutions to collaborate with local institutions and requiring a permit for the exportation of fossils. However, Brazil has been regulating fossil exportations since 1942 as a result of a presidential decree that declares fossils the property of Brazil (Cisneros et al. 2022). The lack of legal clarity in this case is due to Germany's cultural property law, which declares that items must be returned if exported to Germany after 2007 when exported from a country that prohibits the exportation of its artifacts.

collaboration in the early stages of a research investigation, in which researchers design their study. This first stage includes writing research proposals and applying for grants, which usually involve writing research impact statements. Unfortunately, when locals are left out during this early stage, the research design risks excluding their interests and collective priorities. The impact statements can be superficial, can exaggerate the actual impact the research would have on local communities, or may simply just ignore how the research would affect the locals. Relatedly, when the local stakeholders are not involved in this early stage, which in turn creates research-input imbalances, this can result in the research negatively affecting the community. Second, the lack of collaboration during the investigation of the study also leads to harmful effects on the local stakeholders. When locals are not involved during the investigation phase, in which the extraction of resources like fossils and rocks happens, the likelihood of the destruction of land increases, especially in culturally significant locations, given the researchers' ignorance of what is considered to be culturally significant. Third and last, there is a lack of collaboration with local scientists and experts when it comes to analyzing the data and preparing the data for knowledge dissemination via, for example, publication. This last stage of the research project relates more closely to the next category.

In the case of *I. challengeri*, recent and past publications do not make any acknowledgment of having collaborated with the locals. A quick Google search of publications reveals that most authors working with the fossil are of German origin. Other authors' institutions are in Switzerland, the Netherlands, Canada, and England. This lack of collaboration with Brazilian scholars increases the likelihood of running into the problems and potential harms highlighted earlier. The *I. challengeri* case showcases how, in instances of parachute science, the exploitation of resources is nonreciprocal.

### *ii. Loss of knowledge and heritage for local communities*

One criterion for parachute science is that significant objects of knowledge are extracted and then exported outside of the country where they were found. This specific characteristic of parachute science gives rise to epistemic harms related to the production and dissemination of knowledge. The last stage of a research project, in which analysis (i.e., interpretation) of the data, eventual publication of the research project, and other forms of knowledge dissemination occur, lends itself to many lost opportunities for knowledge creation for those local scientists due to the lack of collaboration. It is harder for locals to gain access to the objects of study when they are taken away and not easily available to them. This leaves the communities experiencing parachute science in a precarious situation when trying to conduct research on the exported objects.

When a lack of collaboration amalgamates with a lack of access to research objects as a result of their exportation, the community also loses a part of its paleontological and cultural heritage. This has been the case with *I. challengeri*. Brazilian paleontologist Juan Carlos Cisneros notes in an interview that the fossil "is Brazilian heritage that was used to advance science in a European country. It fits the very definition of colonialism—using valuable resources from other countries to the

benefit of a rich country" (Baker 2023).[3] When local communities do not have access to these materials because they have been exported halfway across the world, there is a real sense of loss, not only at the research level, as has been highlighted, but also more generally at the education level. When local museums are left with empty shelves, children and adolescents lack that potential avenue to develop an interest in paleontology and the geosciences and a deeper understanding of the geological history of their land. Moreover, this also means that an avenue to diversify the field is lost in a feedback loop that exacerbates problems of underrepresentation.

### *iii. Increased likelihood of poor epistemic quality*

So far, I have focused on harms that affect the communities living in the regions in which parachute science happens. The harms associated with the practice of parachute science, however, are not limited only to the local community. Because the practice does not involve meaningful collaboration between foreign and local communities, and in most cases, foreign researchers have a limited amount of knowledge about the country where the research is being conducted, there are potential epistemic harms affecting the research projects themselves and science more generally. One of the most important harms related to science resulting from parachute science is the erosion of trust in science by local communities. Recently, especially as a result of debates related to COVID-19 and anthropogenic climate change, our society has become more familiar with the reasons why having public trust in science is so important. Trust in science is as important in paleontology and geology as it is in issues of public health or environmental policy. A lack of trust in science means that there is a lower uptake of scientific knowledge in communities, and often, this lack of trust, even when irrational, can transfer across different scientific institutions (Oreskes 2019). The erosion of trust in science in local communities also closes down future avenues of ethical scientific research. Here we see another feedback loop at play: The existing lack of collaboration, together with the continued extraction of objects from local communities, leads to a lack of trust in science in these local communities. Not having trust in science means the locals are less likely to want to collaborate with foreign researchers. It is extremely important to develop reciprocal relationships with local communities and researchers to prevent these kinds of pernicious feedback loops.

The lack of collaboration and lack of effort in developing epistemic relationships with the locals means that there is diminished potential for knowledge of future localities of fossils and intriguing rock formations, which is epistemically harmful to all researchers. When we think about this in conjunction with the previous two categories and with how parachute science can lead to the erosion of trust in science in local communities, we end up with locals being less willing to share the information they have. Not only is this detrimental to future science, but it also prevents research areas from flourishing. When researchers disrespect local

[3] People are publicly pushing the German authorities to return the fossil to Brazil. A letter signed by at least 2,000 people (as of October 16, 2023) requesting the repatriation of the fossil has been addressed to the German minister of science. The movement keeps gaining traction, but there has been no response from the German authorities. Many tweets of support for the return of the fossil to Brazil can be found on the website X using #IrritatorBelongstoBR.

communities and their expertise, the locals will be less likely to let other researchers conduct additional studies. Overall, the lack of collaboration and interest in local communities leads to missing out on other information that may be beneficial for the research. For example, in cases where fossils have been extracted from the land and sold in pieces, the locals may have some knowledge about where the different pieces went. However, they may think it is not in their best interest to divulge this information, given the harms that might come about as a consequence. Not having a complete fossil makes all paleontological research more difficult and the possibility for error and uncertainty much higher. In the case of *I. challengeri*, an incomplete fossil, it would be beneficial for science if the locals were willing to share any currently available information or other fossil parts that may potentially complete the skull.

Lastly, in cases where local policies and laws are disregarded and publications are still achieved, partaking in parachute science runs the risk of having the published research be retracted as a result of ethical misconduct. It is still unclear today how retractions affect scientific progress because the articles continue to be read and cited.[4] More importantly, though, the continued use of retracted articles calls attention to the tumultuous relationship between science and ethical research practices. One clear way that the retraction of articles does affect science is by harming the reputation of the authors, their affiliated institutions, and the journals where the articles were published originally. This can lead the public to question not only the retracted article but also anything else associated with those institutions. Parachute science is harmful to scientific endeavors because of the effects it has but also because the practice itself violates the structure of what good science involves.

## 4. Distributive epistemic (in)justice

The previous section has shown that there is a rich tapestry of harms in the practice of parachute science. This section argues that these harms should be understood and tackled as a problem of injustice. I adopt a specific notion of injustice stemming from Gürol Irzik and Faik Kurtulmuş's framework of distributive epistemic justice in the production of scientific knowledge (Kurtulmuş and Irzik 2017; Kurtulmuş 2020; Irzik and Kurtulmuş 2021). When talking about distributive epistemic injustice, I mean the unfair distribution of the epistemic good of knowledge, including lack of access to education, expert advice, and information (Coady 2010; Fricker 2017). According to Irzik and Kurtulmuş, scientific research ought to satisfy the following four requirements of epistemic distributive justice:

a. Science should produce the knowledge citizens need in order to reason about the common good, their individual good, and pursuit thereof.

b. Science should produce the knowledge those serving the public need to pursue justice effectively.

[4] There is good reason to retract papers when there is ethical misconduct even if the effects of the retraction are unknown.

c. Science should be organized in such a way that it does not aid the willful manufacturing of ignorance.

d. When making decisions about epistemic risks, scientists should make sure that there aren't social groups or weighty interests that are neglected. (Irzik and Kurtulmuş 2021, 1)

The three categories of harms involved in parachute science—nonreciprocal exploitation of resources, loss of knowledge and heritage for local communities, and increased likelihood of poor epistemic quality—suggest that cases of parachute science fail to satisfy all the requirements of distributive epistemic justice outlined by Irzik and Kurtulmuş. The harms produced by parachute science suggest that, in such cases, paleontological institutions fail to meet the requirements of distributive epistemic injustice. While Irzik and Kurtulmuş seem primarily concerned with institutional injustices within individual countries, the relevant injustice here concerns a scientific institution that operates globally or at least internationally.[5]

When citizens do not have access to the materials necessary for knowledge creation at the education and research level, and they have an overall reduced level of knowledge production because of the lack of collaboration between foreign and local researchers, science as an institution is failing to produce the knowledge that citizens need for the pursuit of the good, and the researchers are willfully creating ignorance. Moreover, the locals' lack of access to the materials is not accidental, given that the objects of knowledge are taken away, oftentimes illegally. When foreign scientists and researchers ignore stakeholders' interest in the design, extraction, investigation, and dissemination of a research project, they are partaking in distributive epistemic injustice, given that they are not producing adequate knowledge for justice pursuits. The research-input imbalances created by parachute science mean that the research being produced and acted upon for policy creation, for example, cannot possibly lead to the effective pursuit of justice. The erosion of trust in science by locals leads to poor-quality research; this also reflects a failure to produce the knowledge necessary for the pursuit of justice. At a minimum, the knowledge necessary for the pursuit of justice for the locals will not be produced or will be much more delayed in production, given their reluctance to cooperate with researchers. Furthermore, such a lack of trust in science leads to a lack of uptake of scientific knowledge in the community that does not trust the experts, meaning that even in instances where the knowledge is created, the locals do not use it for their pursuit of justice. As the last requirement points out, social groups and weighty interests should not be neglected when they are at the forefront of those who will be affected. When research leaves out stakeholders, they are left ill-equipped to deal with the consequences of the research performed. When considering all the categories of harm, we can conclude that parachute science fails to meet the necessary conditions put forth by Irzik and Kurtulmuş for distributive epistemic justice.

[5] Elabbar 2023 makes a convincing case that Irzik and Kurtulmuş's concept can be extended to global scientific institutions such as the Intergovernmental Panel for Climate Change.

## 5. Conclusion: Steps toward meaningful change

After exposing the many negative aspects of parachute science, we must explore possible solutions to eliminate this exploitative practice or at least begin to take the steps needed to prevent or mitigate the harms. In the *I. challengeri* case, the authors of a recently published study on this dinosaur included an "Ethics Statement" acknowledging that it might be unethical to work with Brazilian specimens outside of Brazil (Schade et al. 2023).[6] They conclude, however, that their research is ethically justified because *I. challengeri* is publicly available in Germany, and they are also making their data free and open to the general public. This ethics statement and the authors' post hoc rationalization for carrying out their research are clearly inadequate within the framework of distributive epistemic injustice. When dealing with parachute science, we must require scientists to go beyond giving vacuous ethics statements that only superficially address the problem and simply act as a way to absolve the scientists of any ethical wrongdoing. To truly address the harms produced by parachute science, we must refer back to the framework of distributive epistemic justice and have solutions that address these harms.

Parachute science must be addressed at an institutional level because it is an instance of distributive epistemic injustice. If scientific institutions presume the legitimacy to act at a global level, stakeholders affected by such institutions should be able to hold them accountable to standards of distributive epistemic injustice. Institutions involved in the creation of scientific research, such as colleges and universities, journal publishing houses, academic societies, grant agencies, museums, and academic foundations, therefore, must develop the necessary infrastructure to promote collaboration between scientists and local communities where the fossils are found. In cases related to grant disbursement, institutions should include a necessary clause requiring collaboration with the locals that is codified in the grant terms.

A fundamental requirement to prevent parachute science is to develop collaborations where there are none between foreign researchers, local researchers, and communities. In order to develop mutually beneficial collaborative relationships, there must be mutual transparency and trust. Developing transparent relationships may be straightforward, but it is something that has been lacking in instances of parachute science. It is important to inform the locals of what kind of research is taking place and how it may have positive or negative effects. Part of being transparent involves being honest about the ramifications of the research and being informed about the possible significance the research may have to local communities. Scientists must be careful not to overestimate any positive effects or underestimate negative effects. Developing trust, however, is a much more difficult task because the communities experiencing parachute science have historically been wronged by the scientists conducting research on their land. A growing literature exists related to the development of trust between Indigenous communities and non-Indigenous peoples. I borrow from some of this literature, given the parallels present in cases where Indigenous communities have been wronged and epistemically disadvantaged

[6] The article was initially taken down from the journal that published it (*Palaentologia Electronica*) after a lot of public backlash. However, it has now been reuploaded to the journal following an internal review.

communities have been harmed.[7] For example, Kirkness and Barnhardt (1991) suggest that to develop relationships of trust between Indigenous people and non-Indigenous people, there must be mutual respect and reciprocity in relationships, and non-Indigenous people must aid Indigenous people in exercising responsibility over their own lives. Simons et al. (2021) talk about the importance of "bearing witness" when collaborating with Indigenous communities, which requires storing and caring for the history witnessed; discussing it with our respective communities; witnessing the complicity involved in participating in oppressive systems; and being subjected to a continuous evaluation of trustworthiness, allowing researchers to be held accountable to Indigenous communities. When talking more generally about necessary steps for collaboration between academic researchers and local community members, Bollettin et al. (2023) emphasize the importance of creating symmetrical dialogues that support self-determination in local communities. This support of self-determination can be seen as a coproduct of research planning and defining priorities during the design stage of a scientific project.

What rings clear about creating meaningful change to prevent parachute science is that institutions must help build the foundations necessary to conduct the research they wish to perform overseas. The taxonomy of harms I propose here can be extended beyond the *I. challengeri* case to other areas of science, given that the same harms—namely, nonreciprocal exploitation of resources, loss of knowledge and heritage for local communities, and increased likelihood of poor epistemic quality—will be present when parachute science is involved even when outside of paleontology. Understanding parachute science as a form of distributive epistemic injustice allows us to further examine how the harms produced by the practice can show up in other fields. To come up with solutions, we must be creative but always keep in mind that parachute science is not a reflection of individual researchers but rather a reflection of the structures of global institutions.

**Acknowledgments.** Many thanks to Alisa Bokulich, Miguel Ohnesorge, and Aja Watkins for helpful feedback on this project.

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**Cite this article:** Castillo Brache, Leticia. 2025. "Parachute Science in Paleontology as Distributive Epistemic Injustice." *Philosophy of Science* 92 (5):1076–1085. https://doi.org/10.1017/psa.2025.10149