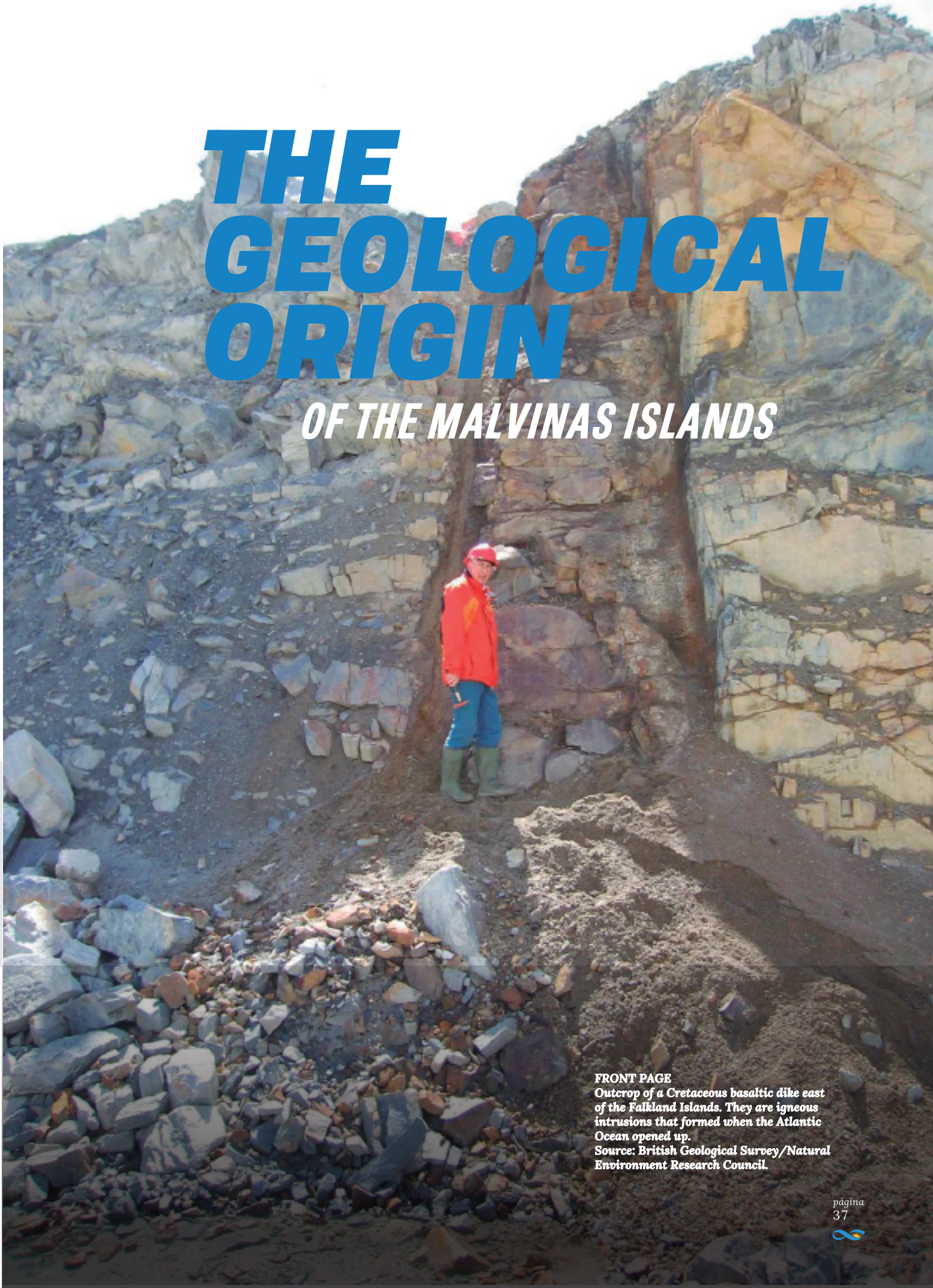
THE GEOLOGICAL ORIGIN

OF THE MALVINAS ISLANDS



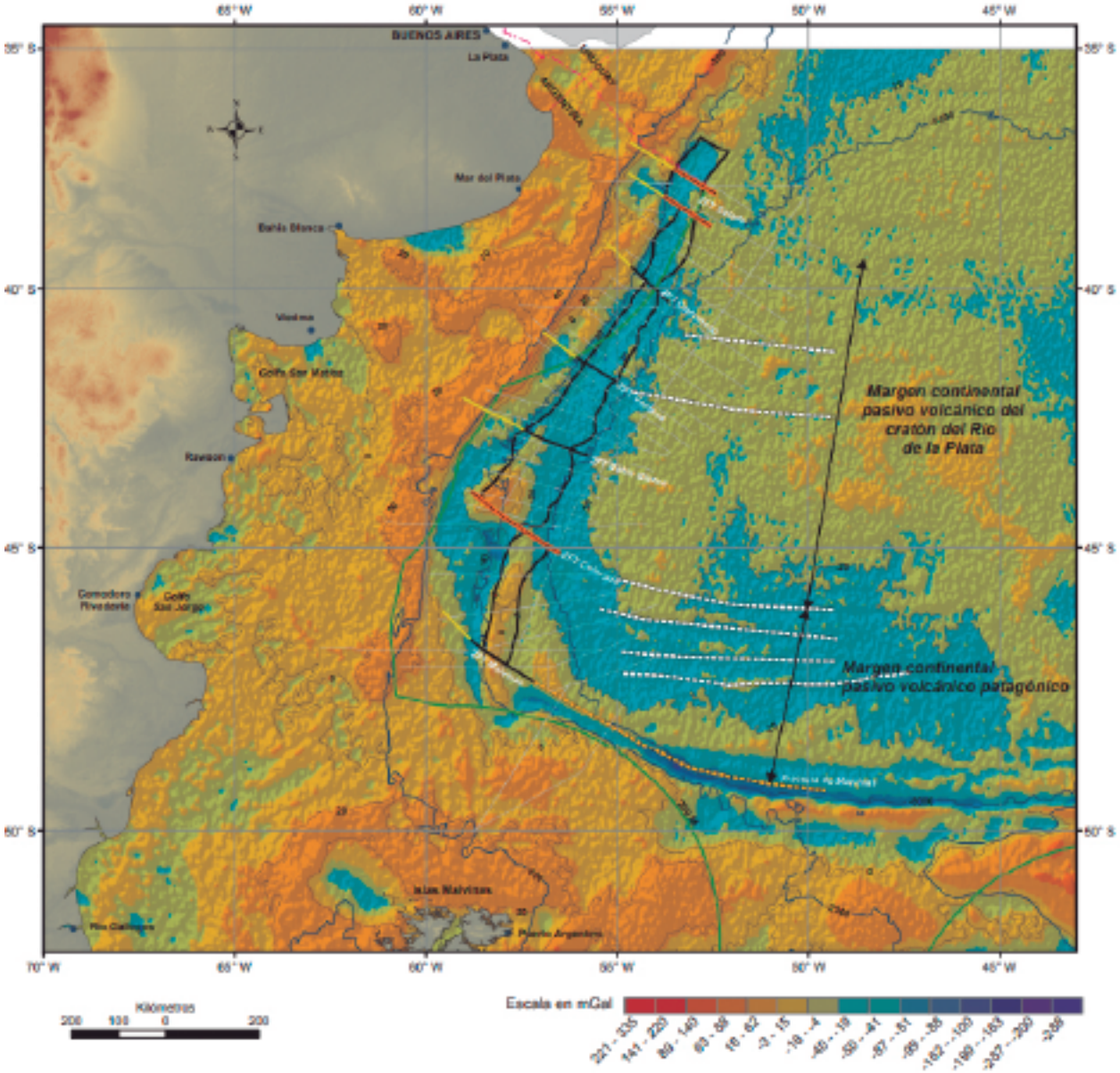
FRONT PAGE
Outcrop of a Cretaceous basaltic dike east of the Falkland Islands. They are igneous intrusions that formed when the Atlantic Ocean opened up.
Source: British Geological Survey/Natural Environment Research Council.

In looking for examples of islands that form part of a continental country, we think of the Hawaiian islands that became territory of the United States, or Easter Island, a part of Chile. These islands are surrounded by open ocean, thousands of miles from the countries that govern their sovereignty (3,758 km and 3,686 km respectively). The tectonic process known as subduction thickened the tectonic crust and formed these islands following successive volcanic eruptions.

When looking for local examples with similar characteristics, it's impossible not to think of Malvinas. Differing from preceding examples, however, no volcanoes gave birth to these islands. The islands are part of the continental platform, meaning that they are part of the South American continent. (FIGURE 1). Their status as islands is purely due to sea level and topography, with the islands representing a geologic high point, surrounded by depressions which have been filled by ocean. In other words, if the sea level was to drop a substantial amount, they would connect with the rest of Argentina.

In reality, this required drop is some hundreds of meters. It has not happened, nor is it predicted to occur in the near geologic future. However, this same process did occur with the large island of Tierra del Fuego, allowing for the migration of plants, animals, and people. At this moment of continental connection, the distance between the coast of the Malvinas Islands and the rest of Argentina was lower. There is evidence (albeit debated), that this could have helped the first canoers of the area to reach the islands.

Figure 1.
The Malvinas Islands as part of the continental shelf.
Source: COPLA.



y la del resto de la Argentina era menor y existe evidencia (aunque muy discutida) de que esto podría haber ayudado a los pueblos canoeros a llegar hasta ellas.

The successive populations of Malvinas, from Spanish, English, and Creoles, are the pillars of discussions about sovereignty in the islands. The other pillar, which uses an association with the Argentine continental shelf as evidence, is muddled with legal arguments about claimed territory, and has little to do with geology. In scientific language, continental shelves belong to continents and tectonic plates, but not to countries. When speaking about the Argentine continental shelf, from a geological perspective, we would actually speak of the Western South American Margin, with that same shelf and slope shared by Argentina, Uruguay, and Brazil up to Venezuela.

However, and despite the objectivity that should prevail, there is a history of bias in British Scientific publications to disconnect the Malvinas islands from South America, joining them instead with… Africa. These publications don't discuss (logically) the current proximity of the islands to South America, but their origin: the hypothesis holds that the islands are allochthonous to the continental shelf, that is, they were formed in a distant place and plate tectonics placed them where they are today. Even a basic understanding of geology might cause us to raise our eyebrows and reflect on these ideas. While South America and Africa were parts of the same continent 150 million years ago, to say that the Malvinas Islands came from the African continent would not be entirely accurate, and the full story is more complicated. Those of allochthonous origin argue that the islands are a tectonic microplate ("Falkland/ Lafonia microplate") that broke off from East Africa, rotated 180 degrees, and migrated west to its current position.

This hypothesis has evolved as time has passed. It was initially proposed in 1952 by the South African geólogist Du Toit and later modified by Adie. Both argued that Malvinas is a continuation of the Cape system in Africa and that, in turn, this was connected to the Ventania system. As the vergence of the Cape system did not coincide with that of the rocks found in Malvinas, it was necessary to introduce the counterclockwise rotation of the plate.

It should be clarified that we are talking about a time when plate tectonics was an incipient paradigm, barely understood and accepted, and not only were the mechanisms of continental drift unknown, but it was also not known whether they actually happened. Du Toit and Adie don't deserve criticism for their proposal 70 years ago, but there are others who further developed this theory that are more culpable. In 1986, Mitchell et al. published an article in the journal Nature on this same model of the allochthonous Malvinas. The evidence that Mitchell et al. presented was based on a paleomagnetic study of igneous rocks from Malvinas called basaltic dikes. This analysis is founded upon study of the magnetism of certain minerals to determine continental drift, and whether or not rotations occurred. Today, only those in the British community continue to use Mitchell's publication as the absolute truth on the origin of the Malvinas Islands.

The renowned Argentinian geologist Víctor Ramos (FIGURE 2) compiled the evolution of the Malvinas Islands' allochthonous origin theory and maintains that Mitchell's evidence is not only not convincing, but also untenable.

In addition, he reaffirms that Mitchell's work should not have been accepted in an international journal due to his biased interpretation of paleomagnetic observations.

Figure 2.
Dr. Víctor Ramos

Ramos' counter argument was based on marine seismic observations, since a 180-degree tectonic rotation would have generated a suture in the crust that would separate the islands from the rest of the platform. That is, there would be at least the incipient formation of oceanic crust (FIGURE 3).

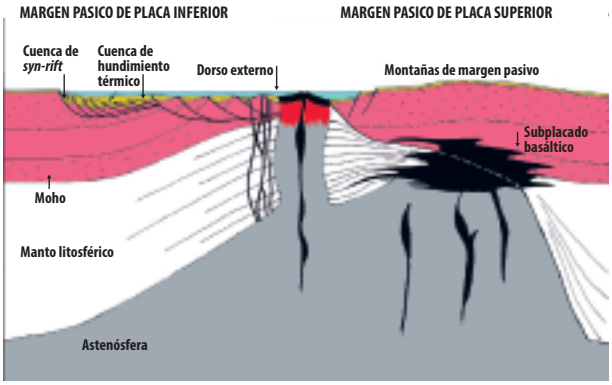


Figure 3.
Diagram of a rift (fracture zone, opening and cracking of the earth's crust) in its advanced stage originating in a zone of weakness of a continental plate.
Source: Ramos 1996.

The marine seismic shows no evidence of this suture or crust. Ramos, on the other hand, offers evidence based on the geochronological study of zircons that the Malvinas Islands have remained together with South America since the Permian, or 100 million years before the tectonic separation of Africa and South America.

Paradoxically, the striking resemblance of the Malvinas Islands to Patagonia was described for the first time by an Englishman passing through. Charles Darwin himself described the similarity of the quartzites (sedimentary rocks) of Malvinas with those of Cape Blanco in Santa Cruz, both Silurian and Devonian in age. One of Darwin's observations corresponds to a relatively recent geological process, but unique in the world: the "rivers of stone". These are rock deposits originally brought by glaciers and reach extraordinary dimensions worldwide of up to 5,500 meters long and 1,400 meters wide. Although their genesis is not fully understood, rock rivers progress through cycles of freezing and snow melting.

The Malvinas Islands lack no motivation for interest. Perhaps before, we did not consider their geology to be one of them, but ideas of belonging to a place are directly tied to the land. Knowing more about the geology of the Malvinas Islands brings us closer to their history, their origin, and to an understanding of the resources present in a world we hold so close.

GLOSSARY

SUBDUCTION: Process by which the oceanic lithosphere is submerged in the mantle along a convergent zone.

ALÓCTONO: escribes a rock or a deposit located far from where it was formed. Not native to the place where it was formed.

VERGENCY: Direction of the deformation of a rock due to tectonic efforts. Direction and sense of tectonic transport, on a regional scale, which are expressed in larger structures (folds and faults).

PALEOMAGNETISM: : Study of the remnant magnetism of rocks (volcanic and sedimentary) from previous times, which allows knowing the relative position of the poles in the past times and establishing a scale of successive and alternating time intervals, some of the normal polarity and others of reverse polarity. Natural remanent magnetism in rocky bodies. The permanent magnetization acquired by a rock that can be used to determine the location of the magnetic poles and the latitude of the rock at the time it became magnetized.

GEOCHRONOLOGY The branch of geology that studies the absolute or numerical and relative age of rocks and the events that have happened in the history of the Earth. Science that aims to determine the age and chronological succession of geological events in the history of the Earth.

LECTURA SUGERIDA

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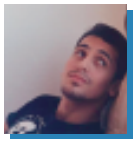

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