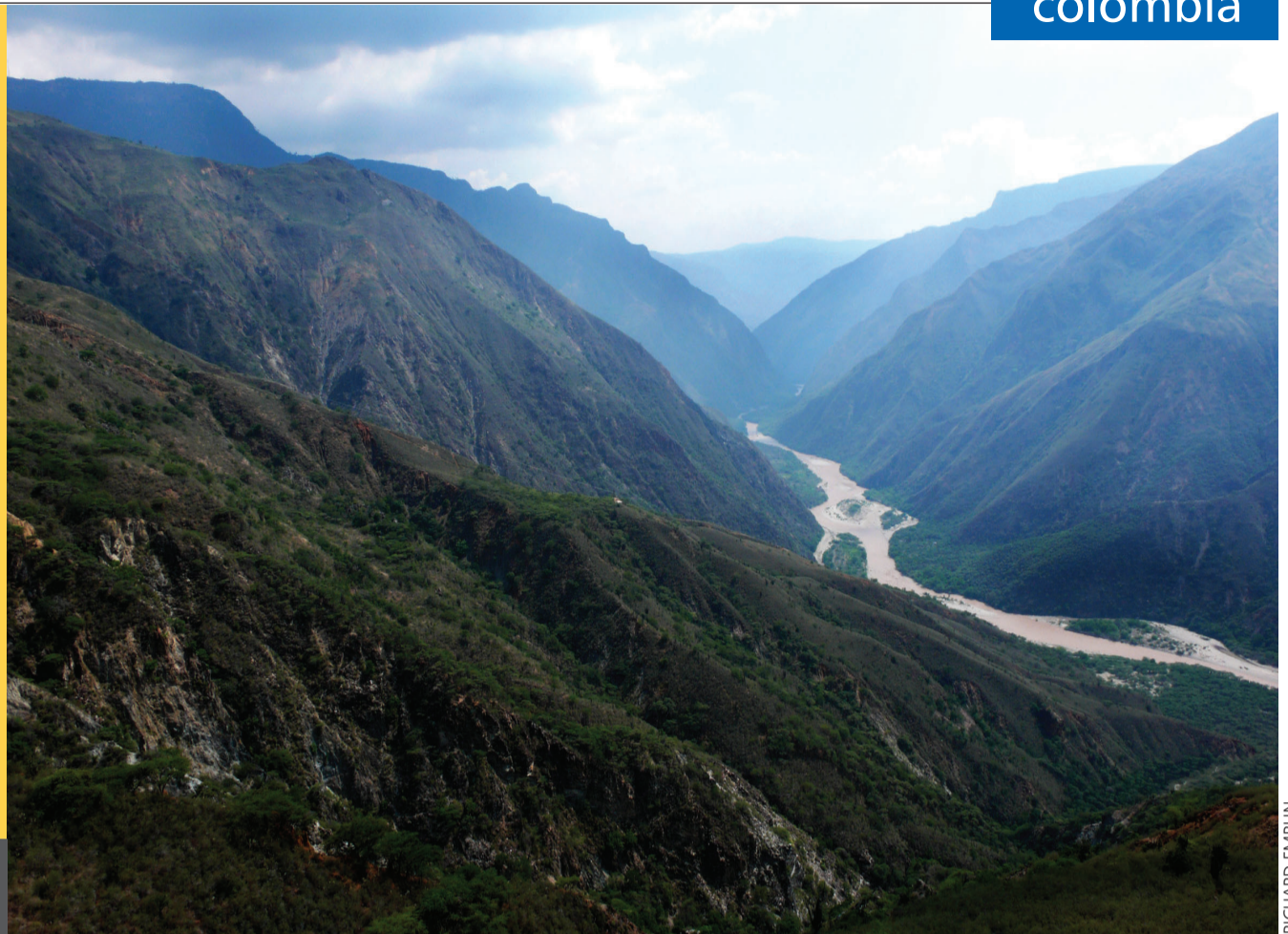


As a country with noticeable seismic activity, geologist Carlos Vargas has made an important scientific discovery with his documented 'Caldas Tear.'

BY RICHARD EMBLIN



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The 'Tear' that keeps us together

Observed from the ground, Colombia is a fractured nation. River valleys break through canyons, *cordilleras* rise from tropical basins and snow-capped volcanoes loom over cities and windswept plateaus.

Just looking at the country, from let's say, the side of a road, or the thatched terrace of a coffee farm, one can evidence how powerful tectonic movements dating back hundreds of millions of years have pushed and shoved our topography.

Geologist Carlos Alberto Vargas of the Universidad Nacional has crossed Colombia researching the seismic activity of his country, as well as the riches that lie beneath the earth's surface. "I am fortunate to be able to work in such an active place as Colombia," states this geologist who last month published with University of Houston colleague Paul Mann, an important scientific paper which goes deep in explaining Colombia's seismic composition; and the identification of what they coined the 'Caldas tear.'

The 'Caldas Tear' is a break in a earth's slab that separates two subducting plates and accounts for curious features such as a "nest" of seismic activity beneath central Colombia and which pushes high-grade mineral deposits to the surface. Published in the Bulletin of the Seismological Society of America (BSSA), under the title: 'Caldas Tear' resolves puzzling seismic activity beneath Colombia' the Vargas-Mann partnership bases its research on recorded earth-

quake data from the National Seismological Network - and which after years of analysis - shows a defined fault that cuts east - west across the central part of the country.

Tectonic activity in Colombia comes down to the movement of three massive plates: the Caribbean, the Panama and the Nazca. The subducting beneath the country in the north of the Caribbean plate, and in the south of the Nazca, leaves a Panama plate colliding with the country in the central regions. Between the relentless eastward push of the arched Panamanian and the slow down turn of the Nazca, the 'Caldas Tear' essentially releases built up tectonic pressure from the southern part of the country and acts as a tectonic buffer for potentially devastating earthquakes.

Understanding the Caldas Tear and how it cuts through the heart of the coffee region into the middle Magdalena River valley has huge impact for the millions living in the nation's capital who believe a "Big one" is on the cards. The existence of the tear however may be a blessing well disguised states the scientist as "it reduces the seismicity of Bogotá."

One of the curious aspects of the Caldas Tear is the ongoing displacement of Colombia's volcanoes: While in the east-central region the Nevado del Ruiz, Tolima and Huila are active, in north-western Boyacá, near Paipa and Iza, the volcanoes lie dormant. For Vargas, the Caldas Tear defines the northern most

limit of Colombia's active volcanic front; and the presence of east-west aligned volcanic rocks suggests that the tear may have penetrated the earth's upper crust.

Having studied more than 100,000 seismic events to identify this rupture, Professors Vargas and Mann are convinced that the thick crust of the Panama block also acts as an indenter, not subducting but rather pushing an entire country eastwards. And as the indenter breaks the crust it aggravates the so-called 'Bucamaranga Nest' of seismic activity some 160 kms deep. Hence, towns at the epicenter of this 'Nest' such as Mesa de Los Santos may experience up to 40 tremors each day.

In the south of the country (and across the Caldas divide) a Cauca Nest is more superficial, generating potentially devastating quakes such as one which struck Popayan back in 1983. According to Mann in the scientific journal, "the indenter is an incredibly important feature for Colombia and for assessing its earthquake hazard."

The Caldas Tear is also reflected in the rugged terrain near the Magdalena River. As the river flows north from its cold origins in the Andean highlands, the river valley narrows, becoming a steep gorge near Honda, Tolima, and where the tear is most evident. "Everything we know comes from the surface," states Vargas as he points to photographs taken of the Cauca River near Supia as it reduces to a narrow channel only 150



meters wide and the Magdalena River near Honda which becomes a series of rapids as it enters a 250 meter wide gorge. Beyond the Caldas Tear, the river valleys open up once again before joining the plains of the Colombian Caribbean.

The Vargas-Mann study examines in detail seismicity along corridors as well as the tomographic profiling of a country in constant motion. The existence of the Caldas Tear is also good news for exploration companies in search of rich mineral deposits such as gold, platinum and copper as reserves in sedimentary layers are pushed closer to the surface.

Thanks to Vargas' theory, Colombia's economic engine has fuel for the future and we can sleep a little better at night knowing that there's a tear out there that keeps us together.