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STEM

Didactic Module of Colombian Emeralds and the Perspective of Geoparks: An Alternative for Conservation and Sustainable Management in Boyacá, Colombia

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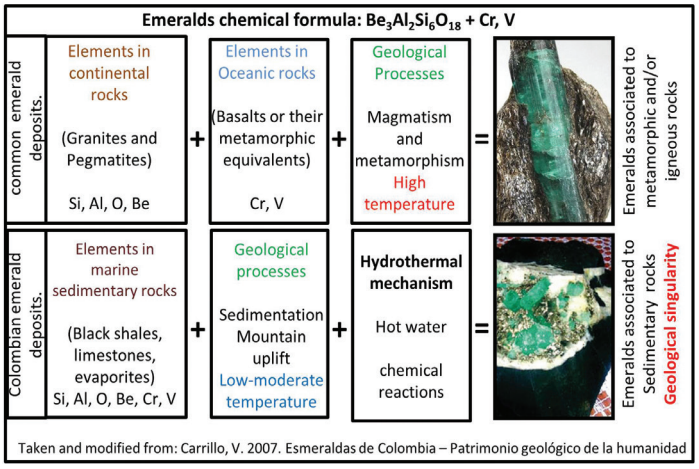
Colombian emeralds are a geological singularity. These particular emeralds are the only scientifically recognized exception to the model which establishes that emeralds are crystallized as a product of a granitic intrusion in a mafic sequence. Colombian emerald deposits are found in sedimentary rocks (black shales), implying that they are the result of a completely different process. Despite the emeralds' high scientific value, this nonrenewable resource is vulnerable to the economic, social, and political conditions in Colombia.

Our bibliographic research and the results of the survey we implemented have led us to conclude that the scientific relevance of Colombian emeralds is widely unknown outside the academic world and that there is a lack of outreach material about the emeralds that conveys scientific knowledge designed for nonspecialists.

Our bibliographic research led us to several sources that illustrate how the inadequate management of this natural resource has triggered poverty and violence in the Boyacá, Colombia, region, where emerald deposits are located. We can compare this scenario with other regions, such as Geoparks, recognized by the United Nations Organization for Education, Science and Culture (UNESCO), where sustainable management of natural resources is achieved from an interdisciplinary perspective, considering the economic, scientific, and didactic value of a territory as well as the human-environment interaction.

Interdisciplinary projects require an understanding of different branches of the sciences, not only by those in the academic community, but also by nonspecialists (including those in the state and business sectors). With this in mind, as an additional contribution we designed a didactic module of Colombian emeralds, titled "Every Rock Tells a Story: The Story of Colombian Emeralds," which includes a web page (https://sites.google.com/site/emeraldsgeologicalheritage/) and two datapacks that can be visualized as a graphic timeline in the Time Scale Creator Java package developed at Purdue University (available at https://engineering.purdue.edu/Stratigraphy/tscreator/index/index.php).

Research advisor Jim Ogg writes: "Estefania, a dedicated exchange student, worked with my team to compile a user-friendly educational visualization module on both the setting and culture of Colombia's emeralds and on the geologic history of Colombia and adjacent regions. This outstanding dual-language (English/Spanish) suite will also be invaluable to geoscientists and oil and gas companies."



This diagram summarizes the processes of the formation of emeralds, globally recognized. It also illustrates why Colombian emeralds are a geological singularity—a geological heritage of humanity. Image taken and modified from Carrillo, V. (2007), *Esmeraldas de Colombia—Patrimonio geológico de la humanidad.*

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