

LUDOVIC MRAZEC – PETROLOGIST

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Abstract. Ludovic Mrazec (1867–1944) was an outstanding Romanian geologist, professor of mineralogy and petrography at the Bucharest University, founder and director of the National Geological Institute for 25 years, founder of the national Geological Society, author of fundamental papers on igneous and metamorphic rocks from the South Carpathians and Mont Blanc massif.

Keywords: Ludovic Mrazec, mineralogy, petrography, South Carpathians, Mont Blanc.

Résumé. Ludovic Mrazec (1867–1944) a été un remarquable géologue roumain, professeur de minéralogie et pétrographie à l'Université de Bucarest, fondateur et 25 ans directeur de l'Institut Géologique de Roumanie, fondateur de la Société Géologique de Roumanie, auteur de publications fondamentales sur les schistes cristallins et les roches magmatiques des Carpathes Méridionales et du massif du Mont Blanc.

Mots-clés: Ludovic Mrazec, minéralogie, pétrographie, Carpathes Méridionales, Mont Blanc.

INTRODUCTION

It is my task to present the contributions of Ludovic Mrazec in petrography. Before my speech, twice ideas from the speech delivered at the celebration of one hundred years from the birth of the scientist, were quoted here by the academician Dan Rădulescu, in 1967 director of the Geological Institute of Romania. I will quote a larger part of that text, since it is the link between our speeches of today. I have also chosen it for a better understanding of Mrazec's personality in the frame of our present session.

“It is very unusual to have such deep knowledge – even if not complete – of a man you have never met, and to feel it not tributary to what others have written about him, but as a direct spiritual contact you had with him. And always, in such cases, the achievement is not yours, or of those who have written about him, but his own, of the man who from the mist of the years and from the turmoil of events always succeeds to appear enlightened by his scientific doings and work.

For our generation, of those who have not met him, Ludovic Mrazec was not a great but a distant figure, imposing but estranged by the elapsed time. We have all succeeded to “know” him, in reality, during our student years, in the atmosphere of the Mineralogy laboratory of the Bucharest University, of the library where we are today, or in the hundreds of printed pages, in which his most valuable ideas about the geology of the Romanian land are crystallized. L. Mrazec achieved something very rarely happening: to break the distance between generations that do not meet, to influence the thoughts of researchers who followed him after tens of years, to have disciples he had never met” (Rădulescu, 1968).

THE ALPS AND THE SOUTH CARPATHIANS

We are in 2018 and of course we search any subject of interest on internet. I did this and I found a site dedicated to libraries, showing which of those located near your place have the publications of a named author. Mrazec's publications extended over more than 50 years, from 1892 to

1944. I found a more comprehensive list than we knew and also a list of those who have written about Mrazec. The name of the site is Worldcat, and those interested can go on in this research.

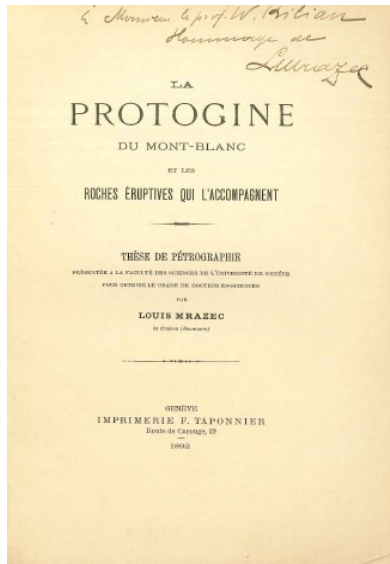


Fig. 1. Ludovic Mrazec's PhD thesis, 1892.

RECHERCHES GÉOLOGIQUES ET PÉTROGRAPHIQUES
SUR LE
MASSIF DU MONT-BLANC

PAR

Louis DUPARC

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ET

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INTRODUCTION

Le travail que nous présentons au public scientifique est le résultat des recherches que nous poursuivons collectivement depuis sept années sur le Massif du Mont-Blanc. Nous avons, il est vrai, communiqué au fur et à mesure nos résultats nouveaux en plusieurs notes, publiées en partie dans les *Archives* de Genève, en partie dans d'autres revues scientifiques; mais nous avons pensé que le moment était venu de réunir en un seul faisceau ces divers mémoires et d'exposer dans un travail d'ensemble ce qui nous a paru se dégager de nos recherches. Cette

Fig. 2. Duparc and Mrazec, 1898.

I will start with his PhD thesis, elaborated at Geneva University with Professor Duparc, defended in 1892, when he was 25 years old. This was preceded by several notes, written alone or with Duparc, incorporated into the thesis and representing a subject present in the main trend of European geology, Mont Blanc being not only the highest mountain in Europe, but also a special subject in geology, a Carboniferous granite massif intruding as a fan the crystalline schists envelope, raising difficult questions of genesis and structural geology.

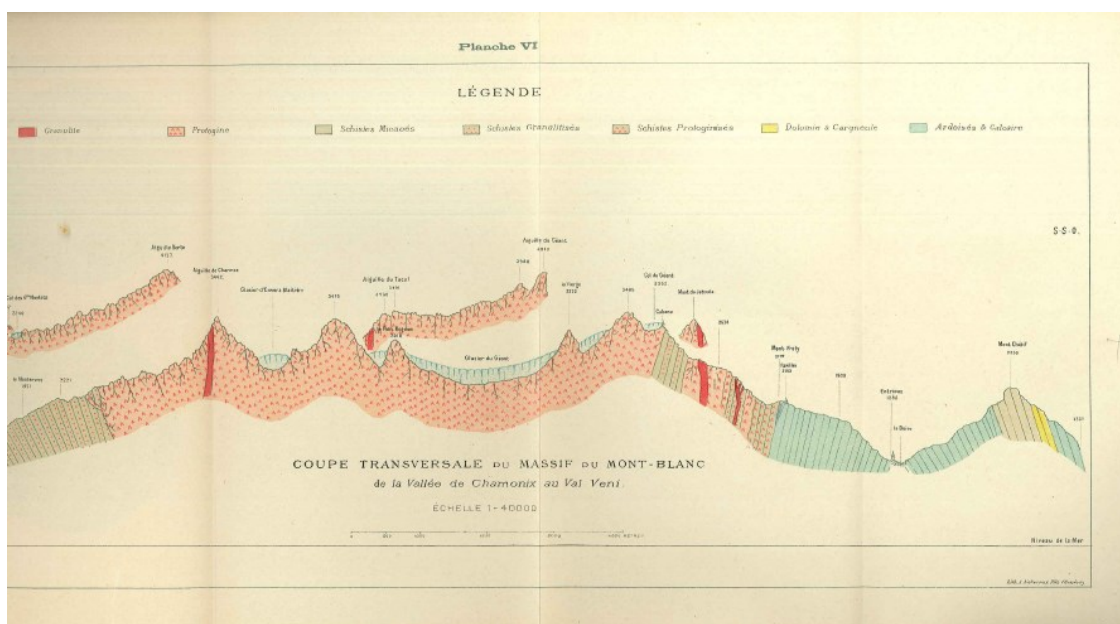


Fig. 3. Mrazec 1892: Crosssection of the Mont Blanc massif.

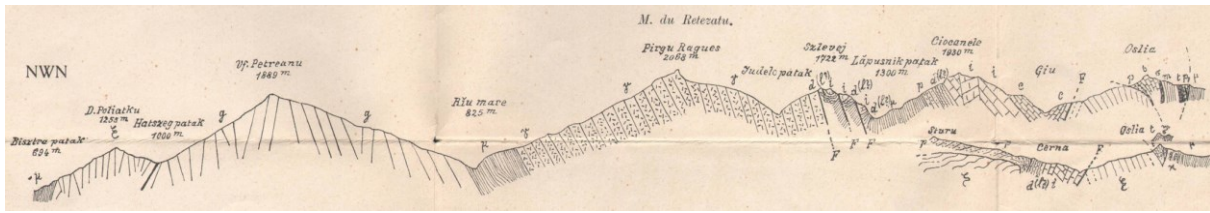


Fig. 4. Mrazec 1904: Crossection of the Retezat massif.

Maybe it is not surprising that the particular geological section that I have chosen for my presentation – from the many of his thesis – is resembling much the one he published 11 years later for the Retezat granite massif in the South Carpathians, with reverse plunging contacts on both sides.

We find Mrazec again in 1898, with Duparc, in a much quoted synthesis on the Mont Blanc granite massif, translated also into English and reprinted several times, proving his essential contributions: Duparc had published several notes with different students, but he wrote the synthesis only with Mrazec.

As it has already been mentioned, Mrazec did not stay to teach at Geneva University in Switzerland, where he could have had a bright academic career, but preferred to come back home. Next year, 1893, he ran for, and won a position of professor at Bucharest University where, along with teaching, he continued what he had done in the Alps: to study granite massifs and crystalline schists. For this he went to the mountains of Romania in 1900 where igneous and metamorphic rocks prevailed – the South Carpathians. Together with his student and later assistant, Gheorghe Munteanu-Murgoci, his main coworker for a decade, he published several mineralogical or petrographical notes, on the cordierite gneisses from Căpățîni Mts., or the wehrlite from Ursu Mountain, but also others about the geology of Vulcan and Parâng Mountains, preparing the geological synthesis of the South Carpathians that will follow in 1903.

Later in his life, after leaving his responsibilities as director of the Romanian Geological Institute, or Minister of Industry of Romania, he returned to mineralogy and petrology and published the results of their research together with Dan Giușcă – our professor in the 1960's, the academician who best wrote about Mrazec –, his assistant and coworker in his late years. He commented the significance of primary epidote in igneous rocks as not a common accessory mineral in general, a subject that he had studied particularly in the Mont Blanc granite, but also in more occurrences. In the 1990's, an International Geological Correlation Program dedicated to epidote granites continued the line of judgment of Mrazec and Giușcă from the 1930's. The early contributions of Ludovic Mrazec in mineralogy and petrography were commented by the academician Radu Dimitrescu (1997) in a study published in *Analele Academiei Române, Ludovic Mrazec petrograf*, of which I quote a part well fit here:

“What interests us today in the petrographical work of professor Ludovic Mrazec is to see how a researcher, trained in the Western Alps, defined step by step the ideas essential until now about the crystalline basement in Romania, using a language which we can very easily translate in our much more evolved terminology. At the beginning of the 20th century certain main lines had already been designed, his bright student Murgoci could step on stage, later followed by the students of the «Basel school», all guided by the man who was the patriarch of the Romanian petrography”.

After ten years of studies in Romania, in 1903, at the 8th International Geological Congress in Vienna, Ludovic Mrazec enters, at 36 years, the first range of world geologists. He presented the paper *Sur les schistes cristallins des Carpates Méridionales*, with a map from Timiș and Cerna rivers to Prahova valley and cross sections from the rivers Mureș and Olt northwards, to the southern hills, at a time when the crest of the mountains was a border separating Romanians from different states, but not geology. Placing the references at the beginning of his text, he stressed that this synthesis is based on

his own work of 10 years, alone or with Duparc and later Murgoci, his brilliant assistant, for whom in 2022 we will also celebrate 150 years of his birth. Here Mrazec laid the foundations of the geological cartography of the South Carpathians, separating several stratigraphical units and, for the crystalline basement, two main lithological units. At the end of the 18 pages paper, he added that during the printing time he learned about Schafarzik's map-drawing on Banat, for the Austro-Hungarian Geological Survey, who had also used a twofold classifications of the crystalline schists in the Țarcu Mts.

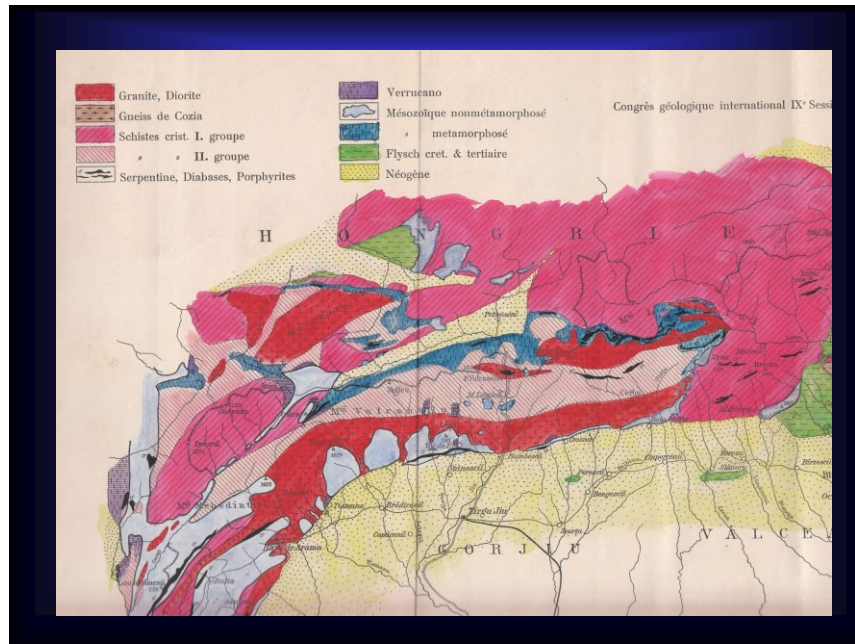


Fig. 5. Mrazec 1904: Geological map of the South Carpathians.

It is hard to imagine that this map, presenting the structure of the South Carpathians from the Danube to Prahova valleys on some 30,000 km² was done only in ten years by a few men, Mrazec and Murgoci first (it is true that before them were also Mathei Drăghiceanu and Gregoriu Ștefănescu), and present such details of the local geology. It is the cornerstone of the cartographic image of an important segment of the Alpine Belt in Europe up to now. It presents a large mass of crystalline schists (with NE–SW directed signature on the map) eastwards from the Olt transversal valley and northwards of the Lotru longitudinal valley, but also outcropping in the Godeanu Mts. and the Mehedinți Plateau: it is Group One separated by Mrazec, of high grade crystalline schists. Marked by NW–SE directed signatures, and crossed by granite massifs marked by crosses, is his Groupe Two, of low grade crystalline schists. This is the major contribution of Mrazec in petrography: to have separated on mineral parageneses the metamorphic rocks of the South Carpathians, considered by him Variscan, and in geological cartography to have mapped the two divisions along contours valid up today. The Variscan basement is covered by younger Mesozoic sedimentary deposits, unmetamorphosed on the southern slope of Vulcan and Parâng Mts, but weakly metamorphosed on the northern slopes of these mountains. This stratigraphic model was changed in the 1950–60's by geologists considering the metaconglomerates, metasandstones, marbles and slates from the mentioned northern Vulcan and Parâng Mts, and also from the Retezat and Țarcu Mts., as Palaeozoic; our work in the last 30 years has brought back Mrazec and Murgoci's stratigraphic model, documenting the Mesozoic age of the mentioned low-grade metamorphosed sedimentary deposits.

Why a high-grade metamorphic basement overlies the above mentioned Mesozoic deposits was found by Gh. Munteanu Murgoci only two years later and presented first at the Académie des Sciences of Paris, in 1905, and in a more elaborate form in 1910, at the 11th International Geological Congress, in Stockholm. The geological map (between Prahova – Danube – Timok valleys) and cross-sections overlap those of Mrazec from 1903, but the Group Two with its Mesozoic cover from the Parâng, Vulcan, Retezat, Țarcu, Cernei, Almăj massifs, named *Autochtone*, is separated here by an overthrust plane from the overlying Group One and its Mesozoic cover, representing the *Getic Nappe*, covering the Făgăraș, Sebeș, Poiana Ruscăi, Semenik, Godeanu, Locva and Kučaj massifs.

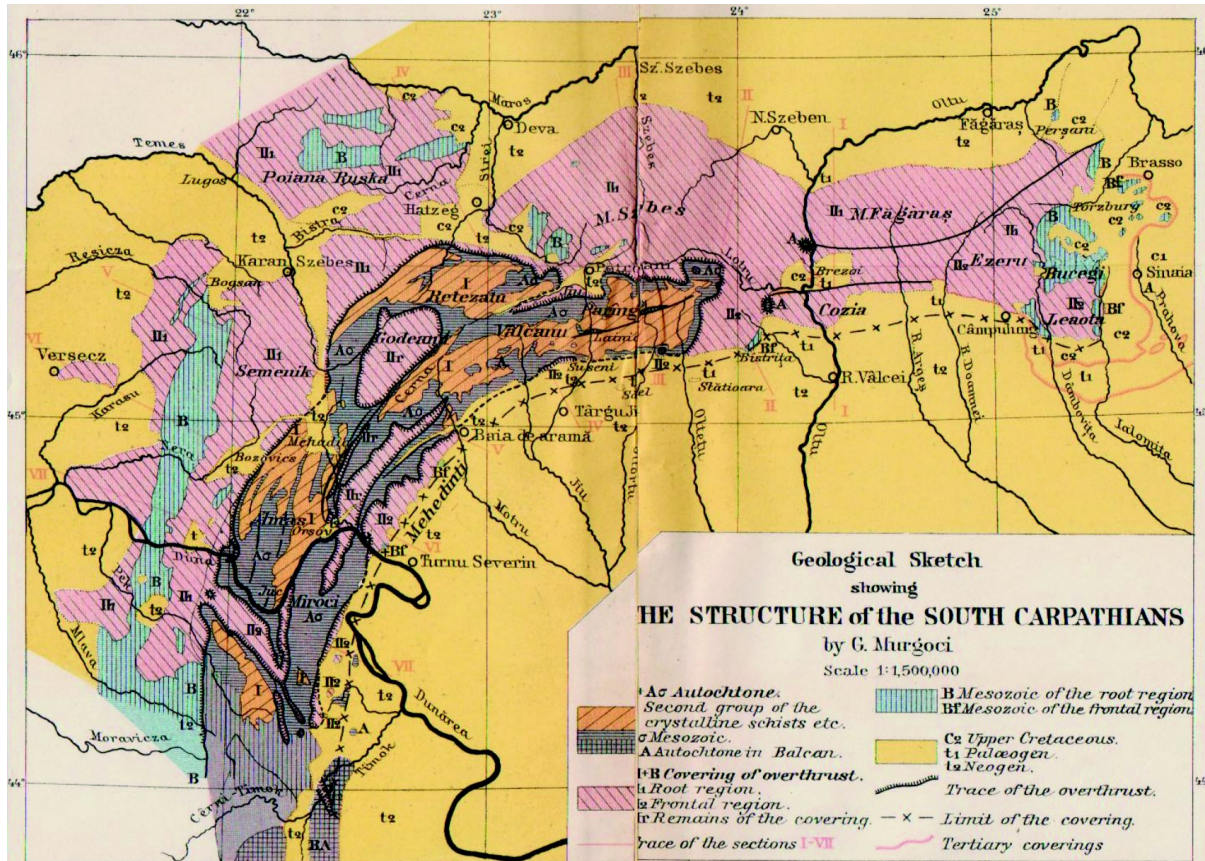


Fig. 6. Murgoci 1910: Geological map of the South Carpathians.

I am showing here both maps of the South Carpathians, as they are complementary, the petrographic work of Mrazec being upgraded by the tectonical interpretation of Murgoci. The first map represents an evidence and its principle was never questioned, but the Murgoci model was rejected by many during the first half of last century, till its general acceptance in 1961, at the fifth Carpathian-Balkan Geological Association Congress from Bucharest and the field trip to the South Carpathians. Between the two main leaders of Romanian geology there was an exchange of ideas, common mapping and publications, and after the premature death of Murgoci (March, 1925) the main defender of his bright idea was Mrazec, till his death in 1944. Thanks to his Swiss connections, he supported the acceptance in the 1930's for PhD studies in Basel of Romanian students for the South Carpathians: Șt. Ghika-Budești in the Eastern Parâng Mts., G. Paliuc in the Western Parâng Mts., G. Manolescu in the Vulcan Mts., N. Gherasi in the Țarcu and Godeanu Mts. They mapped in detail (scale 1: 50,000) the area that Mrazec and Murgoci had surveyed 30 years before and confirmed their early

geological synthesis. These PhD students were also helped by the young Swiss scholar Albert Streckeisen, who succeeded to Murgoci at the geology chair in the Polytechnic School of Bucharest. Streckeisen published in 1934 a new synthesis on the South Carpathians, including his work and that of the four students, in which he not only confirmed the Mrazec-Murgoci stratigraphical and tectonical model but also developed it with an important extension, the *Upper Nappes* from the Făgăraș, North Sebeș and Poiana Ruscăi Mts, later named *Supragetic Nappe(s)*. In 1940 Al. Codarcea confirmed in Banat the Getic Nappe but also separated a part from the Autochthonous (named by him *Danubian Autochthonous*), the *Severin Nappe*, constituted of Late Jurassic–Early Cretaceous turbidites and ophiolites, overlying Danubian Late Cretaceous turbidites. This refined model is at the basis of the 1: 200,000, 1: 500,000 and 1: 1,000,000 maps of the Geological Institute of Romania for the South Carpathians and is widely used in national or international synthesis of the Alpine belt in South-East Europe.

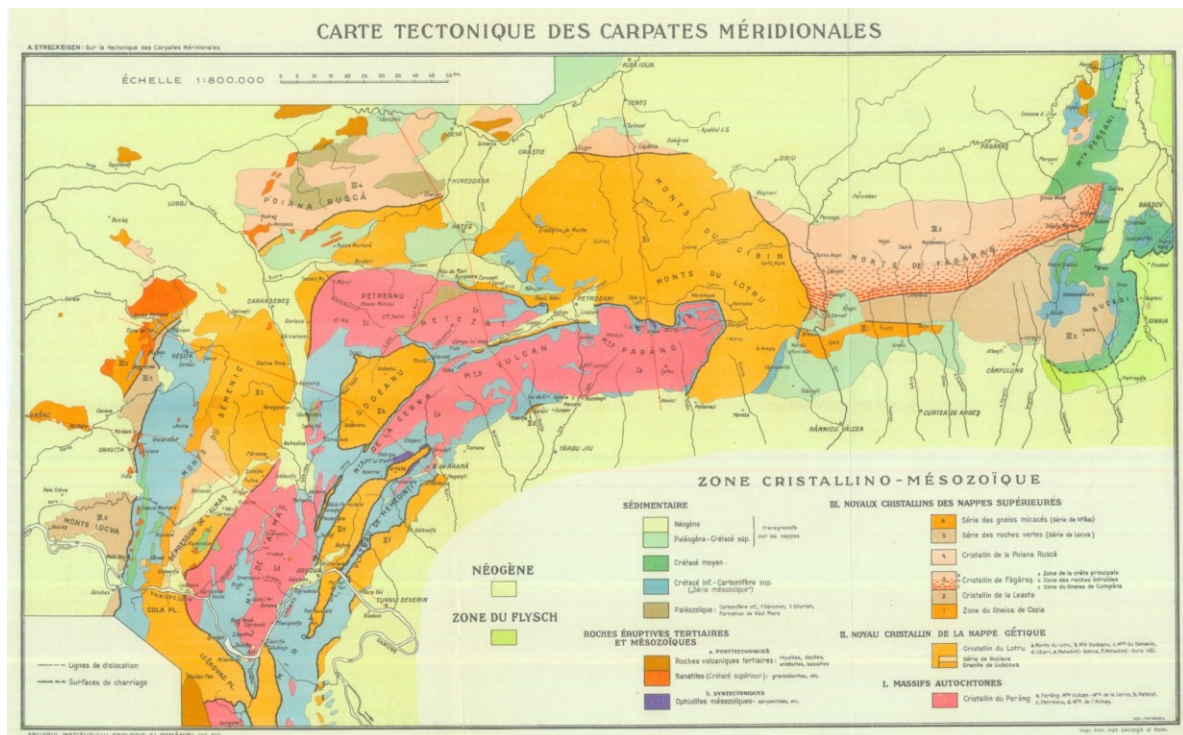


Fig. 7. Streckeisen 1934: Geological map of the South Carpathians.

I quote again one of my professors, the academician Dan Giușcă, mentioned earlier as the last assistant and coworker of Ludovic Mrazec, more qualified than any of us to comment the Mrazec – Murgoci cooperation at the beginning of the 20th century: “*without diminishing at least the genius of Munteanu – Murgoci, we have to acknowledge that the way was also paved by the perennial work and synthesis of the two geologists, where the natural systematization by Mrazec of crystalline schists in two groups had a leading role*” (Giușcă, 1971).

As the link between generations was mentioned in our present meeting, I am going to end on the same note I began: Ludovic Mrazec has the unique role to connect geologists either if they knew him alive or not; we are the third generation and here in the aula there are also representatives of the fourth one, a fifth one and more generations will come, but we are all the disciples of the Master born 150 years ago.

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