physical optics get involved. Several causes are usually mixed together, however often one dominates the others, which then merely provide a nuance to the general color appearance.

Isolated ions from the first series of transition elements are undoubtedly the most common cause of color in minerals and gems. They may be a component of the mineral, which is then intrinsically colored, or simply appear as impurities, which is often the case in gems. The major elements involved are vanadium (V), chromium (Cr), manganese (Mn), iron (Fe) and copper (Cu), and to a much lesser extent cobalt (Co) and nickel (Ni). Rarely, rare earth ions may also be at the origin of the tint (mostly cerium (Ce), praseodymium (Pr), neodymium (Nd) and uranium (U)). At planetary scale, iron dominates by the shear volume of rocks it colors. Important factors include the identity of the element, its valence state, the nature of the ligands (mostly oxygen, though), the coordinance (octahedral, tetrahedral or otherwise) and the details of the environment of the ion at the atomic scale (the "crystal field"). For example Fe_2+ often gives a bottle-green tinge to minerals (such as peridot and some amphiboles) and Cr_3+ emerald-green colors, but both may also induce a purple-red tint (respectively in garnet and ruby).

Color centers result frequently from natural irradiation, and may be treated as pseudoatoms. They could be intrinsic defects (for example a vacancy: the neutral carbon vacancy colors diamond blue). But often, such defects trap impurities. Diamond and fluorine are colored almost exclusively by color centers. One of the most complex examples is amazonite, the turquoise-blue potassium feldspar, colored by a combination of lead and water.

There is a charge transfer when several atoms forming molecular orbitals are involved in light absorption. It may happen between two atoms (oxygen-"metal") or a more extended cluster. These processes are often very directional, inducing strong pleochroism. They are also very efficient: a small concentration of clusters (10 to 100 ppm) may induce a strong, broad absorption, as is the case for the blue color of sapphire cause by Fe-Ti charge transfer. However, on the contrary to common belief among gemologists, the Fe-Ti charge transfer confers more often a brown tint. The Fe_2+ – Fe_3+ charge transfer gives a blue color to many minerals and gems (cordierite, some aquamarines and sapphires, blue amphiboles, etc.)

A small number of gems have invariable intrinsic colors explained through band theory, which involves all atoms in the crystal: these could be metallic gems ("marcassite", actually pyrite), semimetals (graphite, a common inclusion) or semiconductors (cuprite or red sulfides).

Relatively rarely, the electronic structure is not involved, but rather the texture of the mineral, through optical effects. Diffraction is well-known in opal and labradorite, but scattering may be comparatively more common in gems (moonstone, blue chalcedony and agate, blue and violet halite, etc.) or even contribute to some rock tints. Finally, a mineral might color another as an inclusion (hematite makes near-colorless feldspars and quartz red) and poorly crystallized silica (agate, common opal) is almost only colored by inclusions.

Types of lithological sequences and successions in the tuff and gypsum subformations of low Badenian from Piatra Verde (Slănic-Teişani)

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This paper presents the diagnosis and interpretation of the sulphatic-evaporitic facieses from the Southern side of Eastern Carpathians, Slănic syncline, in Badenian deposits at Piatra Verde. The succession of evaporitic facieses, with different gravity flow stages facies modelling and basin evolution by means of sequential stratigraphy.