Nowadays, **the CMOS electronics basing on silicon** remains the major part of modern technology, however **its limitations become more and more apparent**. Although the material science is developing at incredible rate, serious counterparts of silicon for commercial applications are yet to be established. Therefore, inspecting novel materials with unique properties and hosting a variety of elementary excitations is imperative to sustain a rapid technological progress. In this project, we will study **the opto-electronic properties of chromium trihalides ($CrCl_3$, $CrBr_3$, CrI_3)**, aiming to combine the methods of magnetism and optical spectroscopy to achieve control over fundamental interactions and excitations in solids. The choice of materials is motivated by the current state-of-the-art in the research of two-dimensional layered magnetic materials that allows us to make educated predictions of potential findings.

The major aspect of our investigation is to unveil the correlations between the emergent magnetisation and the optical response of these materials. Two types of magnetic interaction are predicted in the layered magnetic materials, i.e. **ferromagnetism** and **antiferromagnetism**, which are related to a mutual order of spins (magnetic moments). The former one can be in general described as spontaneous magnetization: a net magnetic moment (spins are aligned parallel) is present in the absence of an external magnetic field, while a structure in the latter one (spins are aligned antiparallel) corresponds to a vanishing total magnetization when no external magnetic field is applied. Recently, it was demonstrated that both types of magnetic orders can be achieved depending on a number of CrI_3 layers. We want to broaden these research to **all the members of chromium trihalides family by performing of different types of optical experiments**. For example, investigating the layer-dependent evolution of emission spectra, studied as a function of temperature and magnetic field, will grant us insight into the alternation of both magnetic and electronic properties with the number of layers for all the representatives of this family of materials. Moreover, it is planned to test the possibility of changing the character of the magnetic interactions (ferromagnetic vs antiferromagnetic) with light by studying the vibrational modes present in these materials.