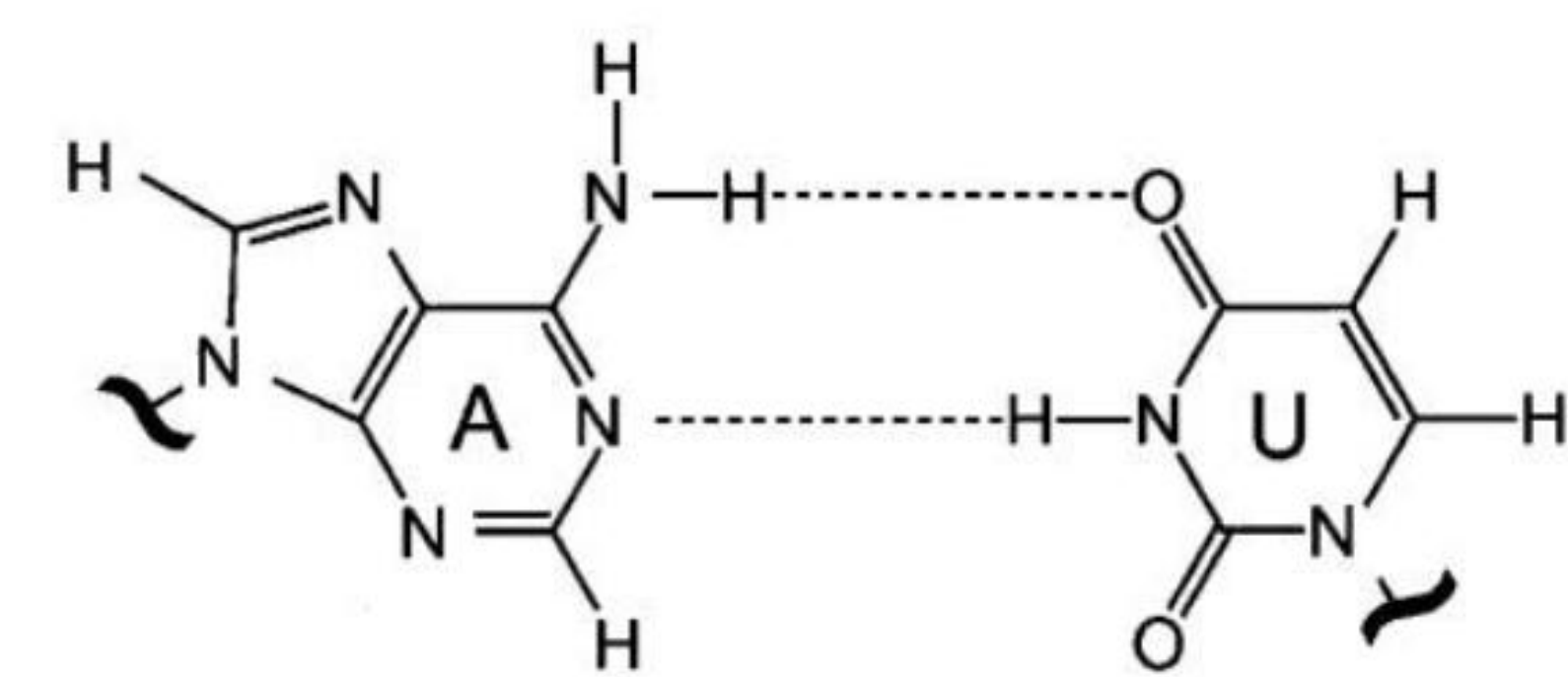
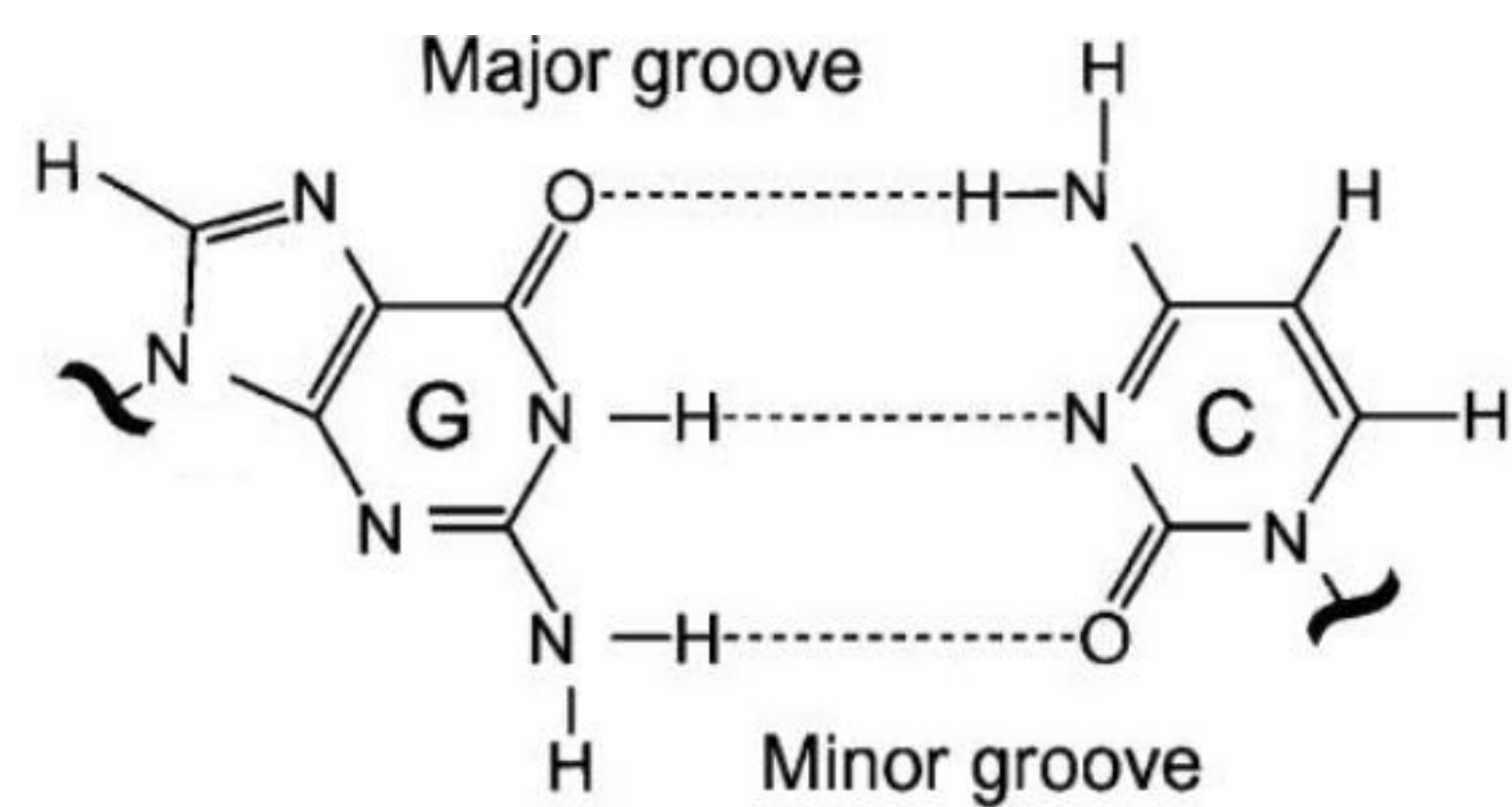


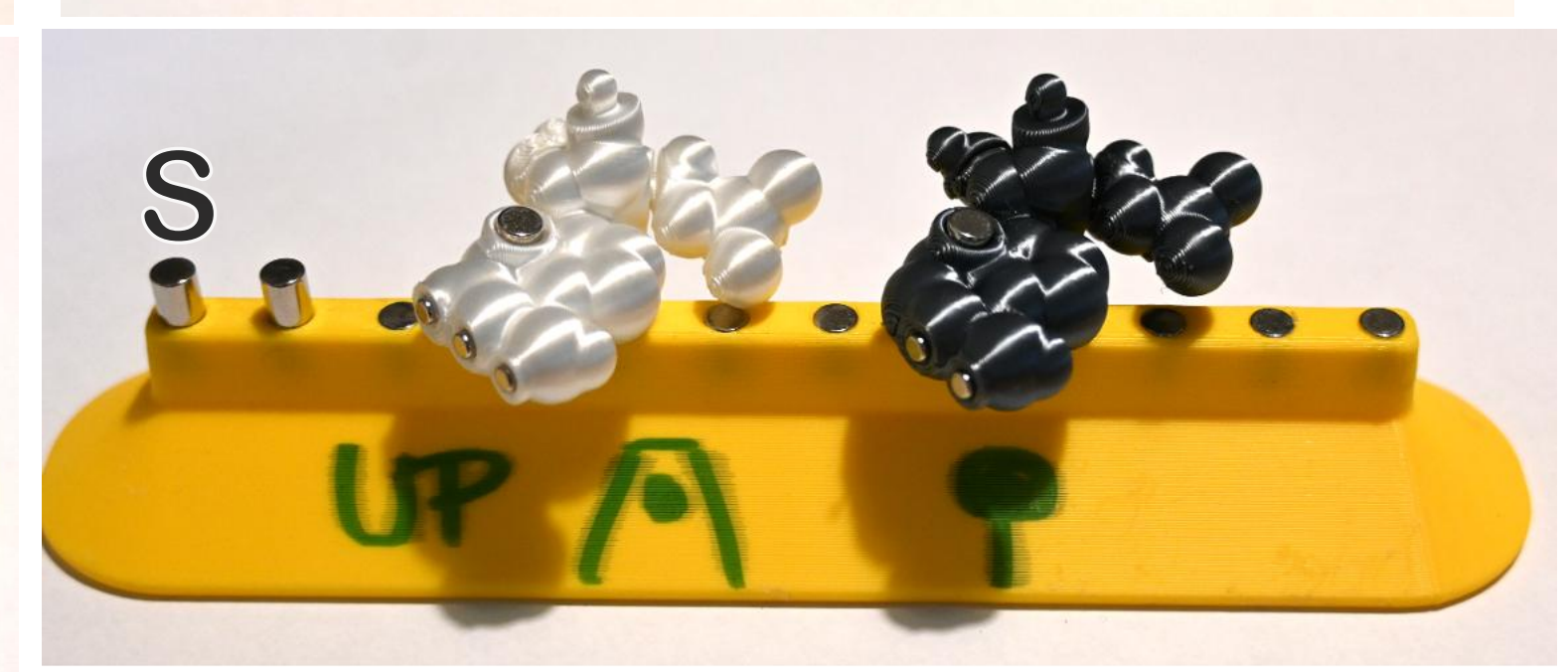
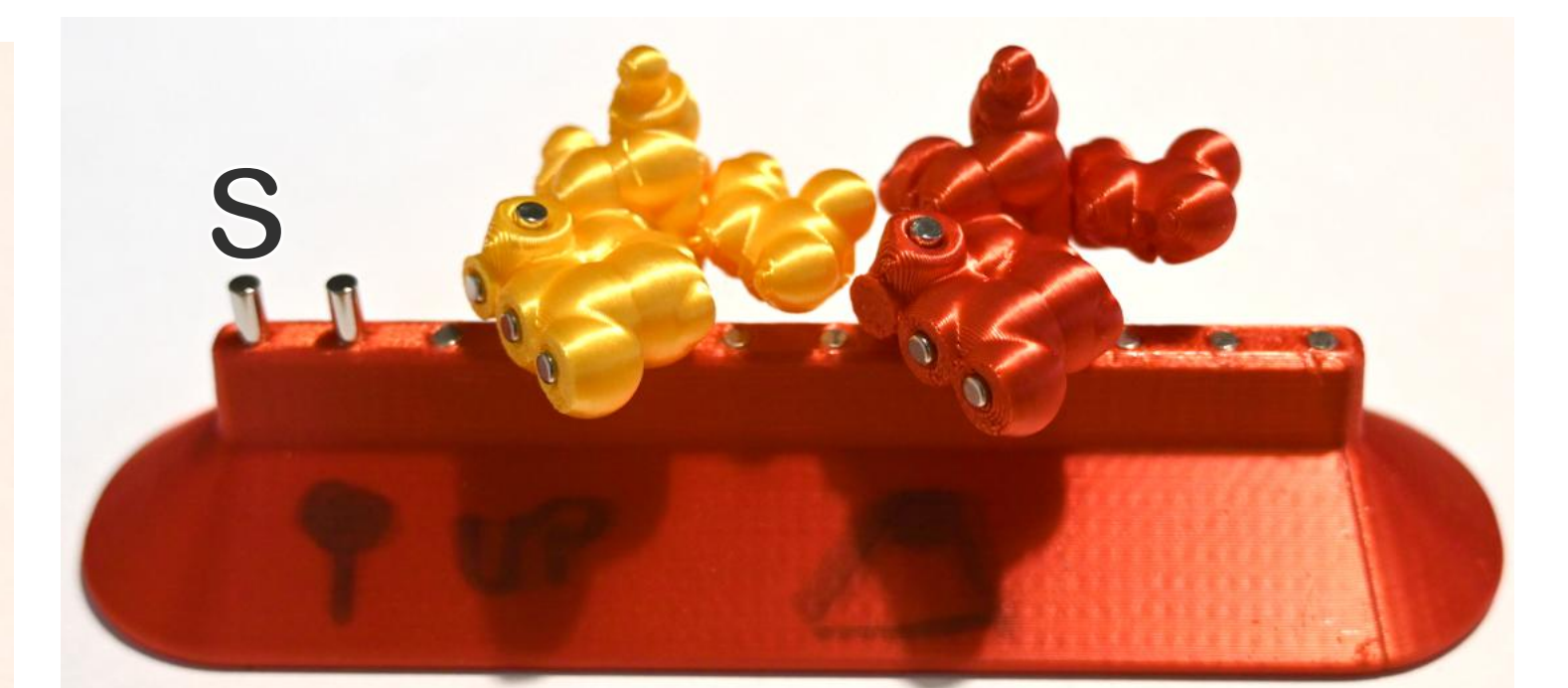
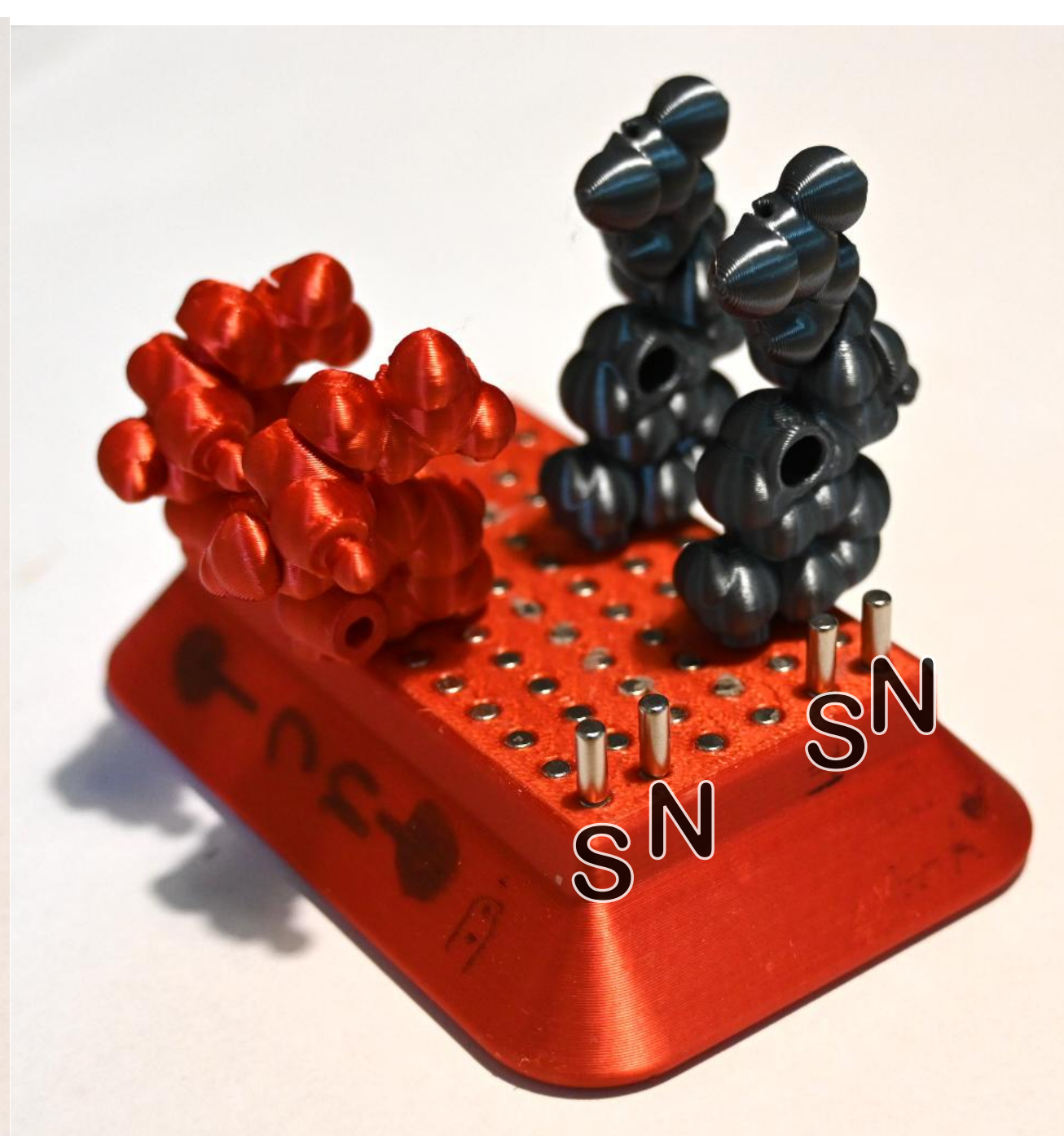
# 3D printed magnetic RNA



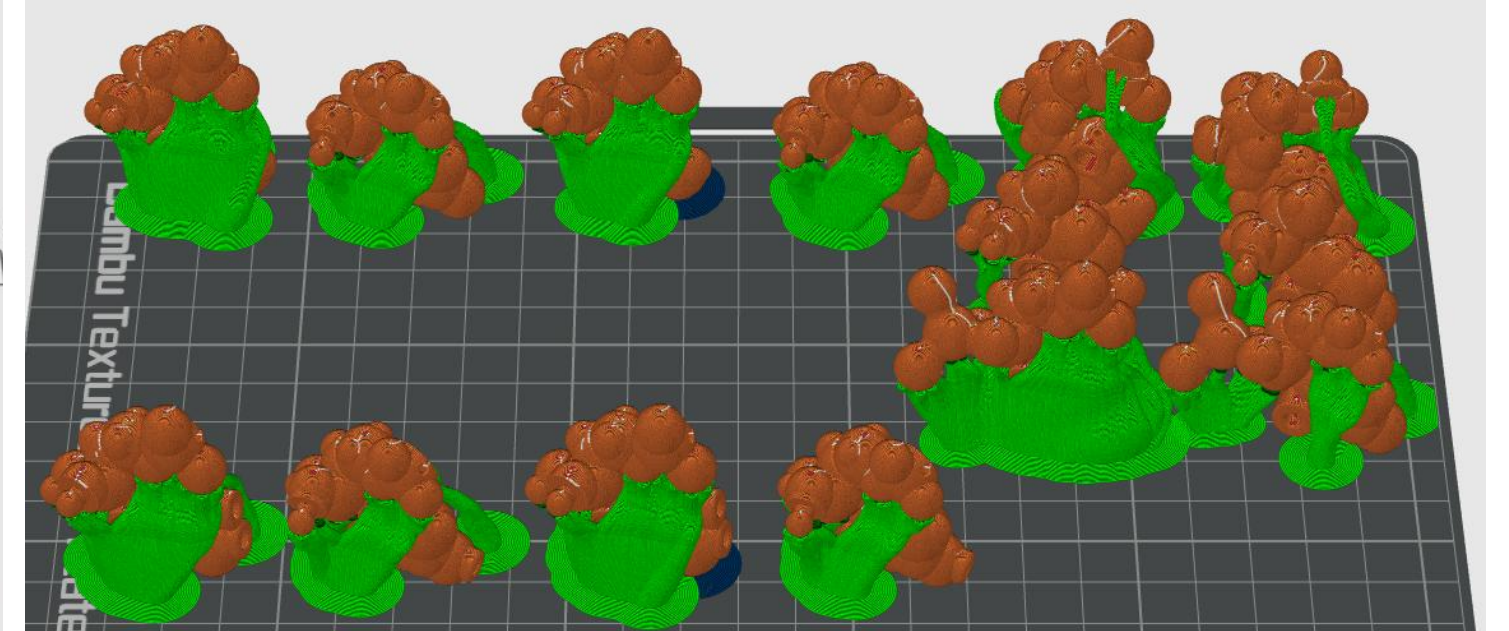
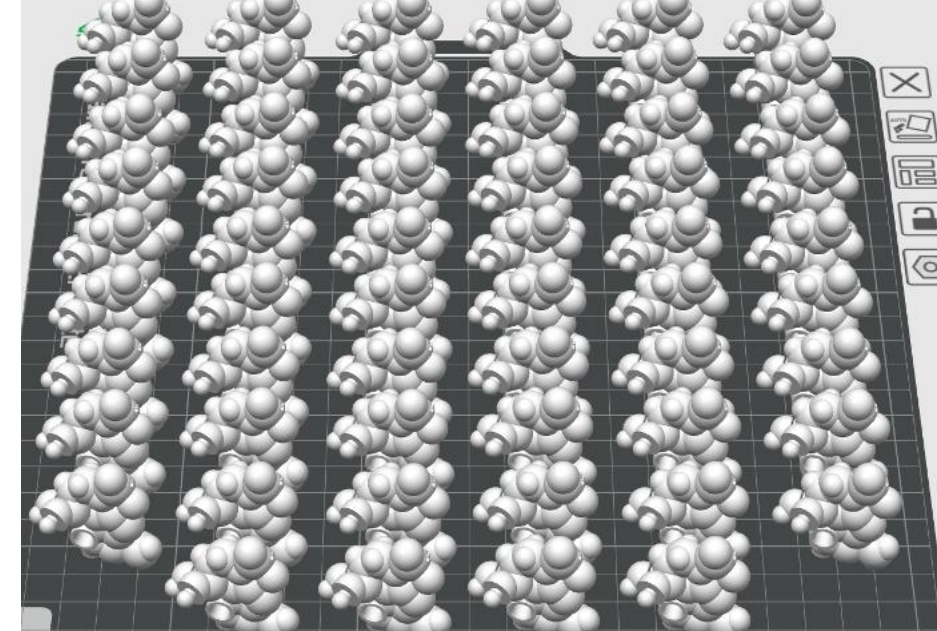
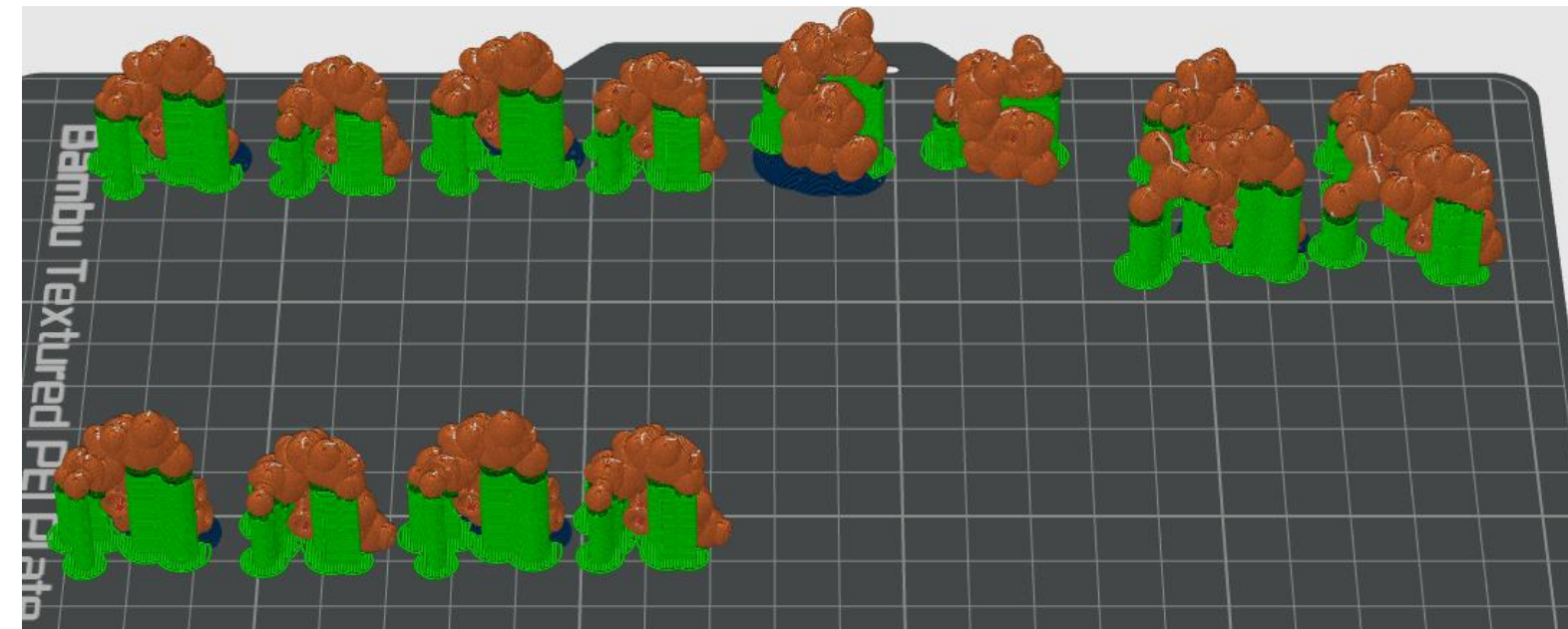
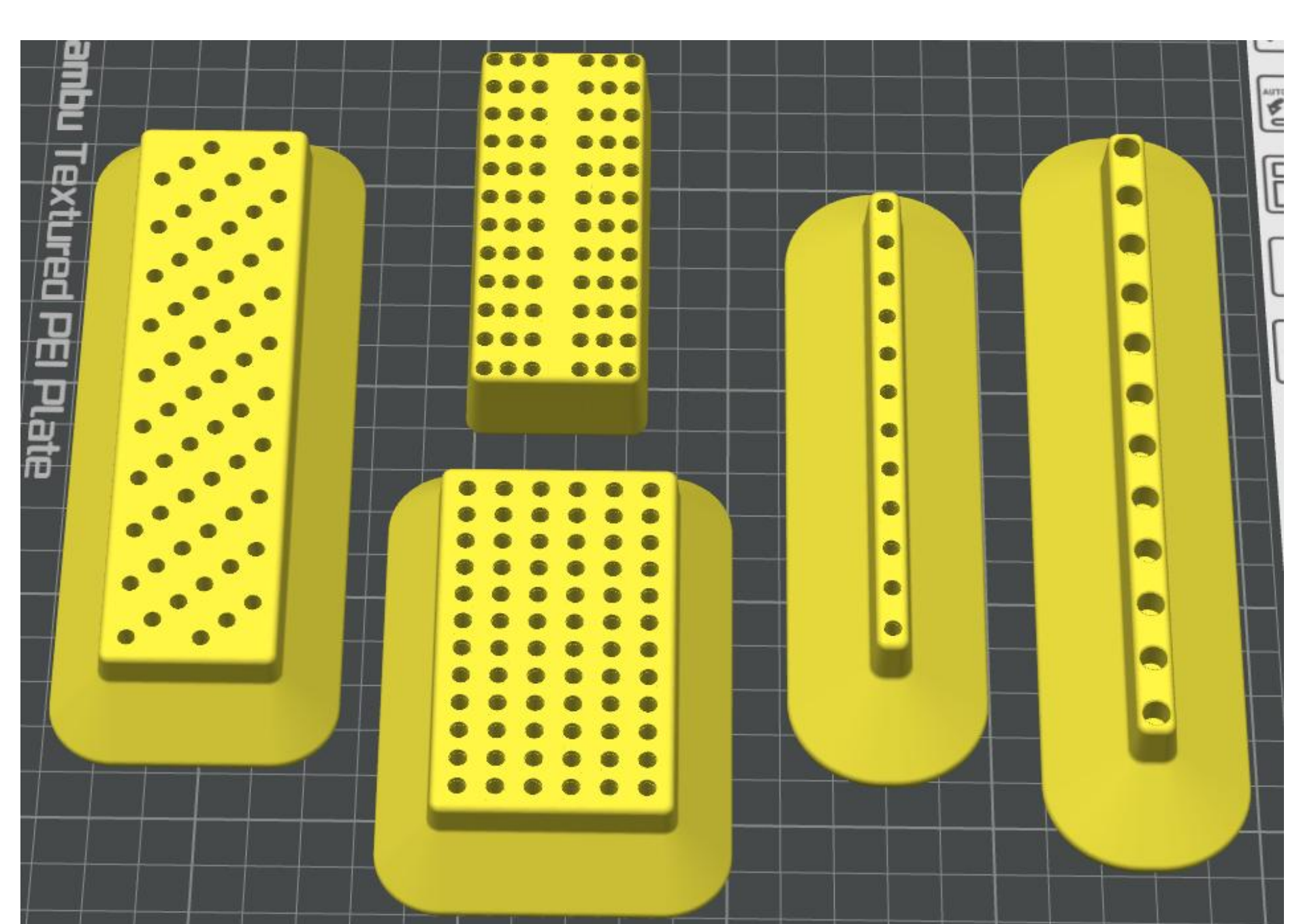
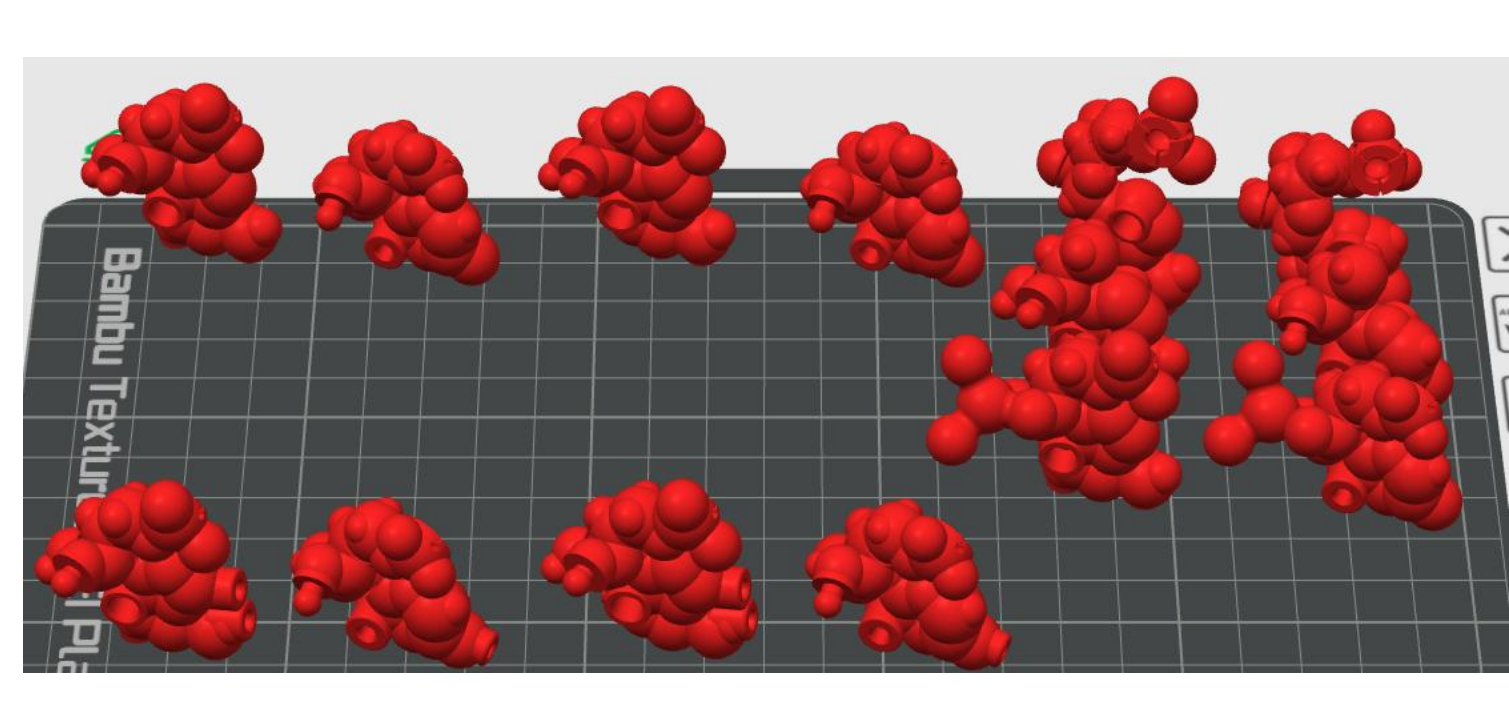
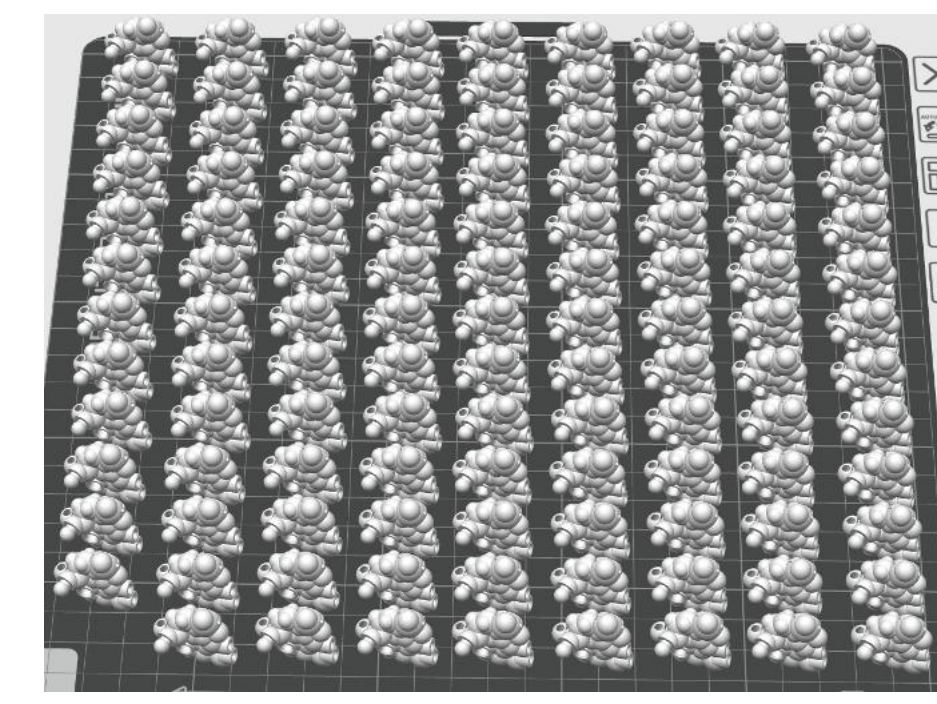
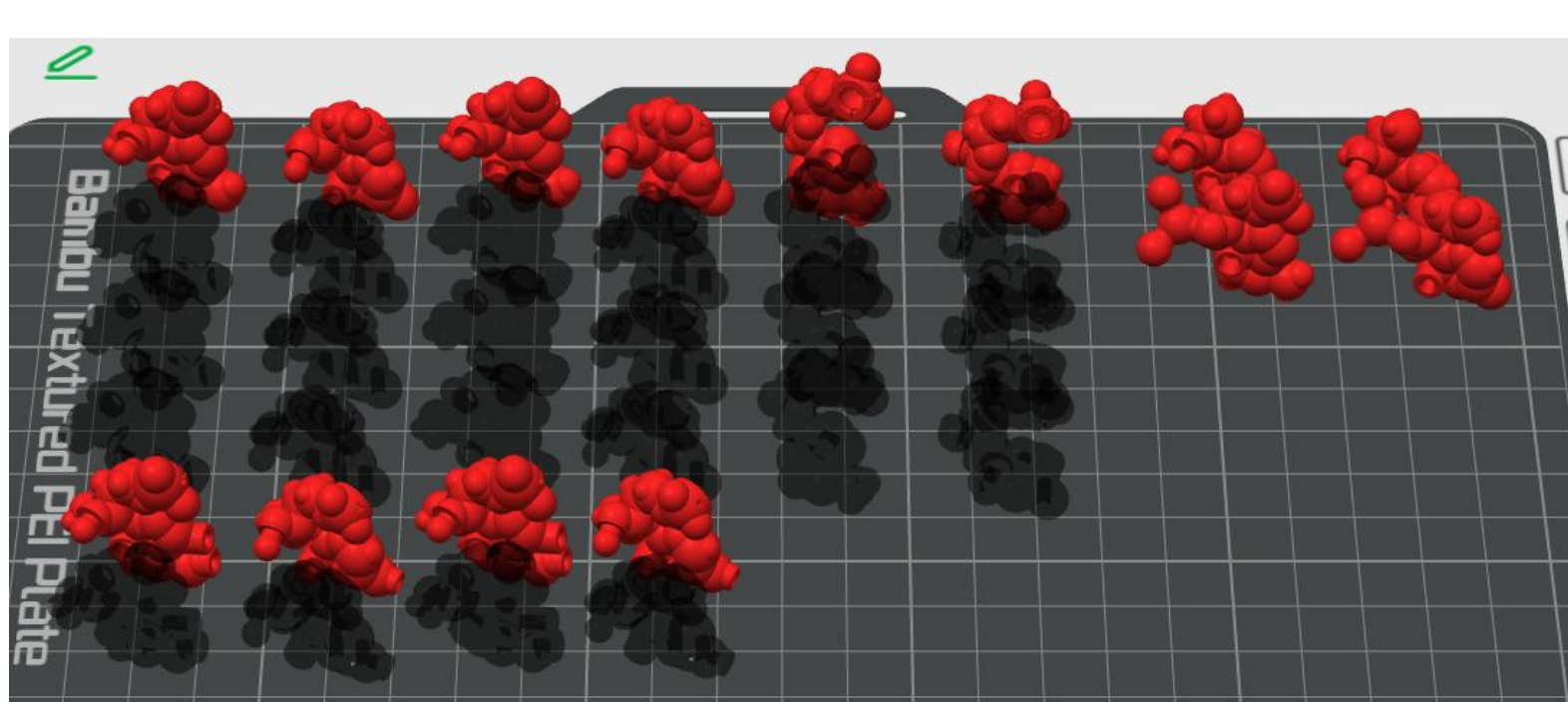
You can play the RNA world with 3D printed bases that implement realistic forces by the use of magnets. You can print them and insert magnets to create realistic 3D models of your favorite RNA.



Proton acceptance and donation in base pairing is implemented by the north and south poles of the magnets. The RNA's orientation from the 5' to the 3' end is modelled by the magnets' polarity running along the RNA. This implements the base pairs' strong stacking interactions due to their hydrophobic effect. The linking phosphate is a knob, linking base pairs into a sequence like Lego blocks. The atom positions are taken from crystal structures.



The magnets are best inserted into the 3D-printed bases with the help of structures containing complementary magnets. The base-pairing magnets are on the left: D3x8mm for the large RNA and D2x6mm for the small RNA. The stacking magnets are on the right: D5x6mm for purines and D3x6mm for pyrimidines (D3x4mm and D2x4mm for the small RNA).



You can download the .3mf, .stl and .ipt files for printing in 3D from our homepage: [www.molecular-evolution.de/magnetic-rna](http://www.molecular-evolution.de/magnetic-rna) (QR code). We also provide a smaller RNA version for 2 mm diameter instead of 3mm magnets, as well as large and small bases with 5'OH ends, 2'3'-cyclic phosphate and mirrored chirality bases. RNA named "Complex" provides magnet holdings for Hooksteen base pairing and magnet holes inside a rotatable 2'OH, as well as a rotating glycosylic bond.

