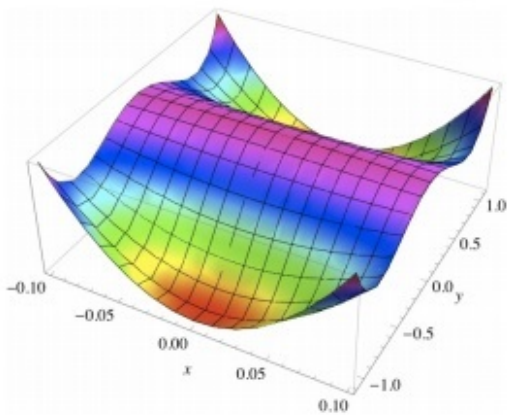
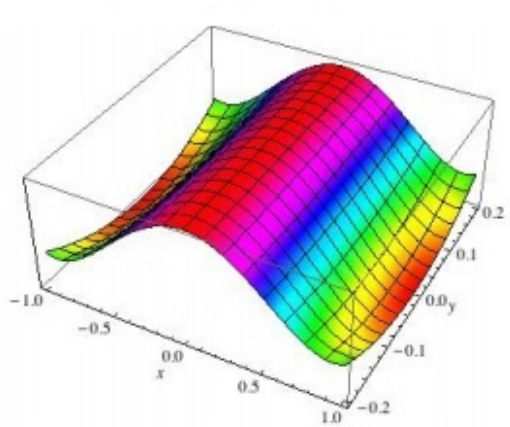
These mythical entities of quantum field physics, which have resisted being detected for decades, seem, at least in theory, to get simpler when they are described in complex spaces.





Monopoles in non-Abelian gauge invariance theories are one of the most prominent configurations in Yang-Mills-Higgs field theories.

They have been extensively analysed since the 70’s because of close connections with the problem of confinement of quarks and gluons (which is one of the greatest open questions in the field of high energy physics).

The equations that describe these objects are extremely complicated and it has only been possible to solve them for the case in which the Higgs field self-interaction potential is cancelled. This is why, for the case in which a non-trivial Higgs potential exists (originally considered by Gerard 't Hooft and Alexander Polyakov) the only known solutions are numerical, despite much effort by many researchers who seek analytical solutions.

Physics researchers at CECs, Fabrizio Canfora and Gianni Tallarita , realised that if instead of studying monopoles in flat regions with no boundary (which is the most studied case), one analyses monopoles that lie within tubular limited regions (whose sections are spheres) the equations can be solved even when there is a non-trivial Higgs self-interaction potential.

“We have constructed the first example of this kind and it has probably not been found before because intuition does not tell us that considering monopoles in more complicated topologies simplifies the equations”, states Canfora.

Reference: Canfora, F.; Tallarita, G. (2014) *Constraining monopoles by topology: an autonomous system* . Journal of High Energy Physics DOI: 10.1007/JHEP09(2014)136