

## Quaternions, vector analysis and beyond

**Tekin Dereli**  
*Koç University*  
*Physics Department*

W. R. Hamilton was one of the most famous mathematicians of all times. His name is still with us in modern physics where a central concept is “the Hamiltonian”. Hamilton discovered the algebra of quaternions in 1843 and thought that all the laws of classical physics can be given in terms of them. On the other hand the algebra of vectors was discovered by an unknown school teacher H. Grassmann in 1844. His discovery went almost unnoticed till the end of 19<sup>th</sup> century when Maxwell’s electrodynamics was re-formulated using vectorial quantities on the 3-dimensional Euclidean space. However, the most powerful extension of Grassmann’s ideas was due to W. L. Clifford (1878). I will briefly comment on the uses of Grassmann and Clifford algebras in recent theories of physics.