



DEPARTMENT OF PHYSICS AND PHYSICAL
OCEANOGRAPHY COLLOQUIUM

“Magnetic Monopoles”

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The subject of magnetic monopoles has intrigued and fascinated the physics community dating back to the early twentieth century. Dirac, first, piqued interest in this subject by providing a theoretical argument demonstrating that the existence of magnetic monopoles requires not only that electric charge be quantized but also that the electric and magnetic couplings be inversely proportional to each other, i.e. weak/strong duality. Subsequently, t'Hooft and Polyakov showed that within the context of the spontaneously broken Yang-Mills gauge theory $SO(3)$ magnetic monopole solutions of finite mass must necessarily exist and furthermore possess an internal structure. Consequently, Montonen and Olive conjectured that there was an exact weak/strong, electromagnetic duality for the spontaneously broken $SO(3)$ gauge theory. More recently, this conjecture has become credible in the broader context of $N=2$ or $N=4$ Super Yang-Mills theories.

In this presentation, I shall, first, review the Dirac monopole and its natural extension to spontaneously broken Yang-Mills gauge theories. In addition, I shall describe an explicit procedure for constructing new magnetic monopole solutions in an arbitrary Yang-Mills gauge theory, emphasizing in particular the gauge groups $SU(N)$ and G_2 . I shall then discuss these new solutions and their relationship to the Montonen-Olive duality. Finally, I shall heuristically relate the Montonen-Olive duality to Type IIB superstring theory.

Friday, November 21, 2008

2:00 PM

DeLoach Hall, Room 212

Refreshments will be served at 1:45 PM

