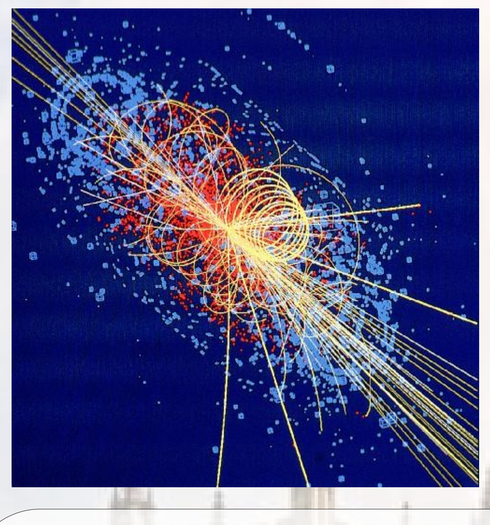
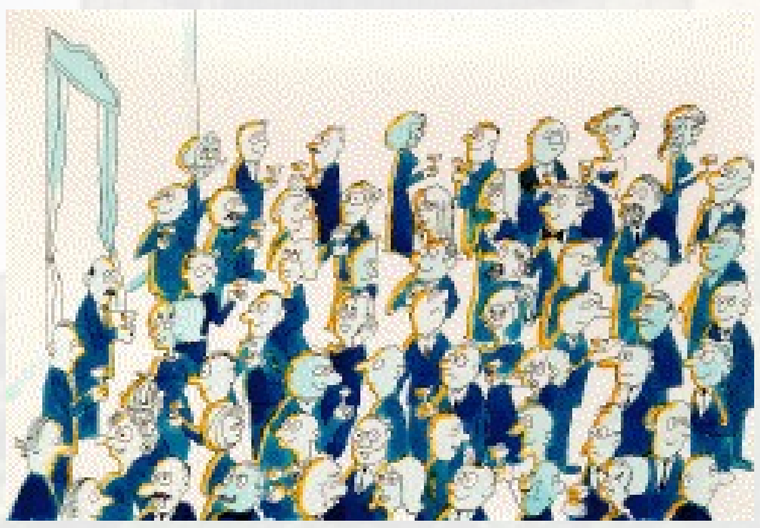
Durham University

THE HIGGS BOSON

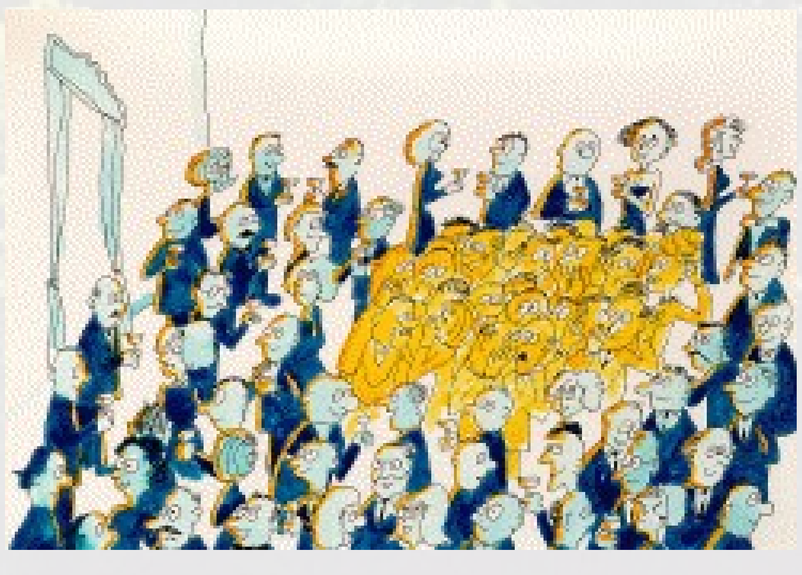


In 1964, Peter Higgs suggested the existence of a new field (now called the Higgs field) to explain why particles have mass. Without this new field, the standard model predicts that elementary particles should be exactly massless, which is clearly not the case. The Higgs mechanism explains mass by saying that the Universe is filled with the Higgs field. This field interacts with particles (like quarks and electrons) and slows them down, just like shooting a pea through treacle. Interacting with the Higgs field gives the particles mass.

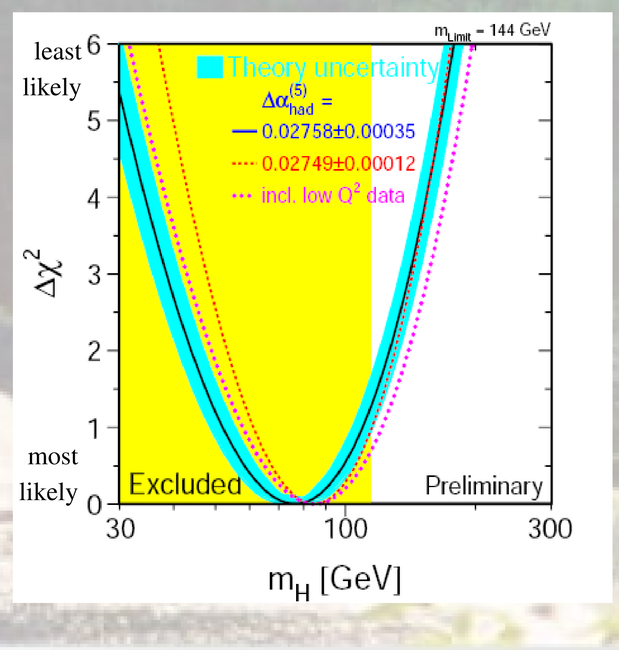
The Higgs boson would be experimental evidence of the Higgs mechanism. The Higgs field doesn't just interact with particles – it also interacts with itself. This self-interaction is the Higgs boson. The analogy most often used is to think of the Higgs field as a room full of physicists. Suddenly, Einstein walks into the room and everyone gathers around him. This makes it very difficult for Einstein to walk through the room – he (the particle) has acquired mass by interacting with the physicists (the Higgs field).



In this analogy, the Higgs boson itself is explained by imagining someone at one side of the room starting a rumour. The other physicists cluster around the rumour. This 'clump' of physicists is the Higgs boson: the field is interacting with itself, giving rise to the massive Higgs boson.



Although we are yet to directly detect a Higgs boson, there is a vast amount of indirect evidence that its mass is low enough to enable it to be seen at the LHC. In order to understand the origin of mass completely we need to study and measure it in detail, looking at the way in which it interacts with other particles. The ILC should be able to make these precision measurements, and maybe even point the way to new physics beyond the standard model.



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contact person at Durham: G.Moortgat-Pick