view from the top david wark

Hunt for Higgs... or *two* pints of lager and a packet of crisps

Particle physicists are not used to feeling the full force of the world's media as we did earlier this month when the first beams were circulated in the Large Hadron Collider at Cern. But we do welcome the chance to show the world the excitement and value of cutting edge science.

However, 'naysayers' with their "balancing view" are never far behind such announcements; if a cancer cure were discovered tomorrow, it would be only a short time before articles appeared bemoaning the economic downturn for drug companies and the loss of nursing jobs.

So, your editorial, *Large hype collusion*, was bound to come [*RF 10/9/08, p2*]. I should probably just look the other way, but responding provides a great opportunity to make a few points about the real costs and benefits of our research (*see letters, p3*).

Briefly, to remind those who gave the editorial the attention it deserved, it claimed that: the LHC will not get us much closer to an understanding of the origins of the universe; there hasn't been much progress in establishing a unified theory of general relativity and electromagnetism since Einstein's death; the day of "atom-smashers" has passed; and particle physics' "era of exalted status is drawing to an end".

Over the past 40 years, physicists have taken a huge step towards a unified theory of all interactions among particles by producing a unified understanding, called the Standard Model, of electromagnetism and the weak interaction. This not only unifies these interactions, it predicts the existence of an entirely new force (the weak neutral force), a prediction that has been stunningly verified. It also predicts that the mass of fundamental particles arises from their interaction with a new entity called the Higgs field.

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The verification of this last prediction is one basic reason for the LHC because knowing whether the field actually exists is critical to understanding any physics that lies beyond it. The contradictory quotes published alongside the editorial—one from a Nobel Laureate stating that he didn't believe in the Higgs particle, and another from a brilliant young Harvard theorist saying he has bet a year's salary that it does—nicely illustrate the fact that there is no theoretical agreement, and that the experiments are the key to any deeper understanding of the universe.

One thing particle physicists learn when working on huge projects is how to meld together potentially fractious groups of people into effective collaborations capable of more than the sum of their parts. Sadly, this is one bit of knowledge exchange where we occasionally fail, as some scientists would rather squabble over the scraps on the table than to work together to make sure there is enough for everyone.

Particle physics is not, in absolute terms, that expensive. The individual projects are expensive, but there aren't very many of them, and they take a long time, so the cost per scientist per year is not out of line with other sciences. It is not the cost of particle physics that limits resources for other areas—it is the fact that we spend too little on science and technology as a whole.

The Cern budget is roughly that of a large UK university, and it is spread among 63 contributing countries—surely, given the number of universities in the world, we can afford to have one place like CERN with its unique ability to attack the most fundamental questions?

The UK particle physics budget amounts to about one pint of beer per person in the UK per year, which scarcely seems to qualify as "exalted status". For that pint, the subject has given us the world wide web and other technologies, such as major advances in medical imaging. It inspires young people to learn about science and technology and, therefore, feeds the student pipeline upon which all sciences (and the UK economy) depend, and it even has an impact on the biggest problems facing us, such as climate change. For instance, Cern and its LHC are directly supporting the technological development of the fusion energy project, the International Thermonuclear Experimental Reactor (ITER).

As for the impossibility of building ever-bigger colliders, there are limits to most technologies—but we will still gain by pushing towards those limits, which often seem to move as we get cleverer. Let's not forget, please, that the field is called 'particle physics', not 'great big collider physics'. We already also use other, complementary techniques to attack these fundamental questions; I have had a reasonably successful career as a particle physicist and I have never worked on a collider.

If particle physics has any "exalted status", it is because of the inherent importance of the questions it addresses, which drives some people to attack them any way they can—and that isn't going to draw to an end.

More to say? Email comment@ResearchResearch.com

David Wark is professor of high energy physics at Imperial College, London and at Rutherford Appleton Laboratory in Oxfordshire.