B R Webber – RAE 2008 23/10/06

Research Outputs

1) "HERWIG 6: An Event generator for hadron emission reactions with interfering gluons (including supersymmetric processes)"
G. Marchesini (Milan Bicocca U. & INFN, Milan), P. Richardson (Cambridge U., DAMTP), M.H. Seymour (Rutherford), B.R. Webber + 4 others, JHEP 0101:010,2001.
This paper has had a large impact (over 400 citations) since it describes a simulation program used by most high energy collider experiments. Marchesini and I developed the underlying theory and wrote the program in 1987 and the other authors (students and postdocs) contributed improvements over subsequent years.

2) "QCD matrix elements + parton showers"
S. Catani (CERN), F. Krauss (Cambridge U.), R. Kuhn (Dresden, Tech.U. & Dresden, Max Planck Inst.), B.R. Webber, JHEP 0111:063,2001.
This paper formulated the very popular "CKKW" method for matching leading-order matrix elements to the all-orders parton shower approximation (85 citations). Catani and I worked out the theory and it was implemented first by Krauss and Kuhn in their program SHERPA.

3) "Matching NLO QCD computations and parton shower simulations"
Stefano Frixione (Annecy, LAPP), Bryan R. Webber, JHEP 0206:029,2002.
The "MC@NLO" method, formulated and applied to vector boson pair production in this paper, is still the only fully-implemented way of combining next-to-leading order QCD with parton showers without double-counting. It is therefore cited and used very widely (over 100 citations).

4)"Distinguishing spins in supersymmetric and universal extra dimension models at the Large Hadron Collider"
Jennifer M. Smillie (Cambridge U.), Bryan R. Webber, JHEP 0510:069,2005.
Although only a year old, this paper has had a big impact (34 citations to date) since it shows that spin correlations can provide useful information to distinguish between new types of physics at a hadron collider. Previously it had been argued that a lepton collider was necessary for this.

Reserves

5) "Matching NLO QCD and parton showers in heavy flavor production"
Stefano Frixione (INFN, Genoa), Paolo Nason (INFN, Milan), Bryan R. Webber, JHEP 0308:007,2003.
This paper extends the work of (3) above to heavy quark production, which resolved an important discrepancy between theory and experiment in this process (over 100 citations)

6) "CHARYBDIS: A black hole event generator"
C.M. Harris (Cambridge U.), P. Richardson (CERN), B.R. Webber, JHEP 0308:033,2003.
The possibility of black hole production at the LHC in theories with extra spatial dimensions has aroused much interest. CHARYBDIS is the state-of-the-art simulation of that process (35 citations)

Esteem Indicators

2001	Elected Fellow of The Royal Society
2001–06	Editor, Journal of High Energy Physics
2001–07	Scientific Policy Committee, CERN
2001	Invited talk at Run II Workshop, Fermilab, USA
2002–03	Chair, P.P.A.R.C. Review Panel on High Performance Computing
2003	Scientific Staff, Theory Group, CERN, Geneva
2003	Invited lecturer in CERN Academic Training Programme
2004	Visiting Professor, Yukawa Institute, Kyoto, Japan
2004	Invited talk at Workshop on LHC Event Generation, KEK, Japan

2004–06 Senior Visitor Prof M Karliner, Tel Aviv
2005 Invited talk at SLAC Summer Institute on Particle Physics, Stanford, USA
2005 Invited talk at Gribov Memorial Meeting, Budapest, Hungary
2005–06 CERN Council Strategy Group and Preparatory Group
2006 Invited talk at Wilhelm und Else Heraeus Seminar, Dresden, Germany
2006 Invited talk at IFT Training Workshop on LHC Physics, Madrid, Spain
2006 Invited talk at FRIF Meeting on Physics in the LHC Era, Paris, France

HEP Theory Group Activity

The theoretical side of the Cavendish High Energy Physics group has established and maintained an international reputation in two main areas: quantum chromodynamics and beyond-Standard-Model phenomenology. In the period since 1 January 2001 our main work in QCD has concerned the structure functions of the proton, the resummation of enhanced terms to all orders in perturbation theory, and the matching of such resummations (including numerical shower simulations) to fixed-order results. In BSM physics we have been working on black hole production in theories with extra spatial dimensions and on developing good discriminators between different BSM scenarios. In all this we work closely with experimentalists, especially the Cavendish ATLAS team.