

UNIVERSITY OF YORK

Presentation address by Professor W. K. Hayman on the occasion of the conferment of the honorary degree of Doctor of the University upon Professor Christopher Zeeman on 8 July 1988

My Lord and Chancellor,

It is a privilege to present Erik Christopher Zeeman for an honorary Doctorate of the University of York.

Chris Zeeman joined the R.A.F. direct from school. After the war he went to Christ's College, Cambridge to become a Wrangler in Mathematics and later a fellow of Gonville and Caius College and Lecturer at the University. He specialised in knotty problems in topology and solved a long-standing conjecture of Poincare. In 1964 Chris became Foundation Professor and Director of the Mathematics Research Centre at the University of Warwick. What he did there has been an inspiration to mathematicians throughout the U.K. He not only built up an excellent department, but also, by series of "years" in different branches of mathematics, drew a large number of distinguished visitors from all over the world to Warwick. They came to regard this new university as a home from home. There has always been a lively interchange between the Research Centre and other institutions so that the whole British mathematical scene has benefited. Chris showed himself to be a superb organiser and charming host, arranging comfortable accommodation for the families of his visitors. There was a large blackboard in every office. The S.E.R.C. recognised the value of this and supported Zeeman generously.

However, the work at Warwick was only one of many activities. Chris' energy is boundless and

"Whatever his weight in pounds shillings and ounces
he always seems bigger because of his bounces".

He has lectured all over the world from Moscow to New Zealand and was twice invited to address the International Congress of Mathematicians. On the second of these occasions at Vancouver so many would-be listeners could not get in that Chris had to repeat his lecture by popular request. The applause at the end was such that a rather sour Philosopher was heard to remark that "Zeeman's premises will barely support his conclusions".

Christopher's enthusiasm and clarity make him an ideal expositor. He gave the first series of Christmas lectures on Mathematics at the Royal Institution in 1978, and after the interest this roused he helped to start the Master Classes for young mathematicians. This very successful enterprise has now spread from London to many other centres, including York, and to other Sciences such as Physics.

Let me now say a little about Christopher Zeeman's work. He is a topologist and started life by specialising in knot theory. It is said that a topologist is a man who knows the difference between an orange and a bicycle tyre. Chris is particularly interested in the case when the tyre is thinned out to be a rubber band, but with a knot in it. No matter how we twist or pull the band we cannot turn it into a simple unknotted band. However it is a consequence of a theorem of Chris' that we can always unknot it by going into the fourth dimension. Moreover a p -dimensional string can always be unknotted in $p+3$ dimensions. Thus the surface of a sphere, which is a two-dimensional string, can be unknotted in five dimensions.

In recent years Chris has been very interested in catastrophe theory. This was invented by the French mathematician Rene Thom. There has always been a strong link between Zeeman and Thom. In fact Chris first research student Terry Wall met fame and fortune (in this case Fellowship of the Royal Society and a Chair at Liverpool) by settling a question left open by Thom. Suppose now that we have a situation in which the outcome depends on a number of parameters, preferably less than six. Catastrophe theory predicts in what circumstances small changes in the parameters result in large changes or catastrophes in the outcome. The simplest example is the S-curve. Imagine that a gentle pressure from behind impels you along the bottom loop from right to left. When you come to the vertical bit you suddenly jump to the top loop. If my small daughter annoys me, I do nothing for a long time except get more and more red in the face. Suddenly it is too much and I give her a slap in the face. Catastrophe has occurred. An example with two parameters, mentioned by Lorenz, concerns fear and rage in a dog. If the fear predominates, he will run away; if rage, he will bite me. Among many other applications described by Chris are stability in boats and the onset of anorexia nervosa. There are in up to five dimensions, i.e. at most five parameters, only a limited number of ways in which catastrophe can occur. All these ways can be classified and that is the strength of the theory as a model.

Chris combines to an unusual degree the abilities of an abstruse and original scientist and those of an inspiring leader. His Fellowship of the Royal Society and the Brazilian Academy, four honorary doctorates and many Prizes testify to the former. He is the President of the London Mathematical Society and about to become Principal of Hertford College, Oxford. He will doubtless rejuvenate that ancient University and bring it successfully into the next Millennium.

We in York have been fortunate in our link with Chris Zeeman through his first wife, the late Professor Salter of the English Department. When he came to York he often included a visit to the Mathematics Department. He has helped and advised its members and contributed to our activities by talks to staff and students, such as his lecture in the University Open Course on Catastrophe Theory. We are happy to be able to cement these bonds and, if gratitude is a sense of favours to come, as the French Philosophers claim, we look forward to many years of close association with this great and charming graduate.

I have the honour to present Erik Christopher Zeeman for the degree of Doctor of the University *honoris causa*.