mary tumour viruses unless a susceptible cell which can be grown in culture is identified. There is no short cut. All the available cell lines will have to be tested.

But does the discovery of this virus particle in human milks have any implications for the treatment of what is after all the most prevalent cancer of adult females in many populations? It has to be admitted that in the short term there are precious few. Charney and Moore's suggestion that it might be possible to immunize against human breast cancer using the mouse virus as immunogen will cause more than eyebrow raising in many a tumour immunology laboratory. If the chief route of transmission of the human virus is through milk it might conceivably be possible to mount screening programmes for the virus in milks, the results of which might indicate cases in which breast feeding should be discouraged. And if the baby's first contact with the virus is in its mother's milk it might just be possible to devise some immunotherapy. On the other hand, should the virus be vertically transmitted in the sex cells, as in some strains of mice, or by passage across the placenta, immunotherapy would almost certainly prove useless in the face of immunological tolerance. Indeed, the problems of dealing with any vertically transmitted virus disease are at present intractable. It remains, however, an article of faith among tumour virologists that an understanding of the cause of cancer should at least facilitate the design of tailor-made chemotherapeutic agents. That, and the possibility that a screening procedure for this human virus in milk might provide another parameter for the early diagnosis of breast cancer, provides a realistic perspective to these most exciting discoveries.

Bright Future for European Particle Physics

Now that the final decision to build a large proton accelerator in Europe has been taken, it is only natural to speculate about the steps forward which may be achieved in elementary particle physics during the next decade or so. Many physicists, however, will point scathingly at the apparent plethora of expensive high energy devices now working or planned throughout the world. How is it possible to justify on scientific grounds the construction of the intersecting storage rings at Geneva, the 200 GeV synchrotron at Batavia and now the accelerator at Geneva ?

There is no one word answer to this, of course, but a number of justifications can be put forward. Both the existing CERN and Brookhaven machines have been producing protons of comparable energy (about 30 GeV) for more than ten years and one would have been forgiven for suggesting at their inception that there would be wastage of money and resources. As it turned out, nothing has been further from the truth and both laboratories are continuing to make maximum use of their available potential with few signs of repetition.

Experience with the CERN machine in particular should convince those persons who require a definite statement of scientific intent that not only is such a statement difficult to formulate but also it will almost certainly be changed out of all recognition as time passes. The CERN machine was conceived originally as a means of searching for the antiproton but the antiproton was discovered before it was even commissioned.

The intersecting storage rings at CERN must now be regarded very much as a window on the future; to a great extent the programme of research at the new accelerator will be determined by what is discovered with them. In fact, the decisions whether or not to increase the 300 GeV to 400 GeV and eventually to 800 GeV by adding and changing magnets may of necessity depend on the experiments at the storage rings.

Having made the point that all the best laid plans are likely to be modified by future events, there can be little harm in indulging in some crystal gazing. One of the chief questions which particle physicists would like to answer is not how, but why, some particles can be so successfully classified by the SU(3) and SU(6) group theoretical approaches which have dominated high energy physics recently.

Some particles have been theoretically predicted—not always from SU(3) and SU(6)—but have not so far been detected experimentally. The discovery of these could well be an important contribution from the new accelerator. The controversial quark, in which most physicists find it hard to believe because of its non-integral electronic charge, is an obvious candidate for an intensive search; it may be, however, that the quark is discovered before the European accelerator comes into operation and, in that case, quark physics will become one of the important fields of experimental study at the accelerator from the beginning.

Many physicists have a much deeper and more intuitive belief in the intermediate boson which is thought to mediate the weak interaction (responsible for the decay of many semi-stable particles) in much the same way as the photon mediates the electromagnetic interaction. If it exists, this boson can almost certainly be produced in neutrino interactions and is being actively searched for in neutrino beams at accelerators throughout the world. Pairs of intermediate bosons can also theoretically be produced in proton–proton interactions and there is the distinct possibility that they may first be seen at the Geneva storage rings.

The Dirac magnetic monopole is yet another candidate for revelation by either the storage rings or the 300 GeV accelerator, but it has not excited sustained interest over the years and the interactions which might produce it are not really known. Its signature would be very characteristic, however, because its ionizing power at relativistic speeds is thought to be about 10^8 greater than any other charged particle.

Perhaps the most exciting advance will be a revelation of the structure of the nucleon. It is already clear from electron and neutrino scattering that the nucleon structure is granular and that the grains have a distribution of masses. Some theoreticians have explained this "granularity" in terms of the quark, and yet others have suggested that they are manifestations of new particles called partons. The situation is curiously similar to that in which Rutherford found himself earlier in this century.