eicosanoids such as prostaglandins and leucotrienes such as lipoxin A(3). It is thanks to Corey's contributions that many of these important pharmaceuticals are commercially available.

To perform the total syntheses successfully, Corey was also obliged to develop some fifty entirely new or considerably improved synthesis reactions of reagents. It is probable that no other chemist has developed such a comprehensive and varied assortment of methods which, often showing the simplicity of genius, have become commonplace in the synthesising laboratory. His systematic use of different types of organometallic reagent has revolutionised recent techniques of synthesis in many respects. He has also in recent years introduced a number of very effective enzyme-like catalysts. These chiral catalysts give only one mirror isomer of the target product, in certain types of synthetically important reaction. The chiral catalysts are simple and easy to recover, and can in some case be used in their own production.

Nobel Prize for Medicine

The 1990 Nobel Prize in medicine will go jointly to Joseph E. Murray of the Brigham and Womens Hospital in Boston and E. Donnal Thomas of the Fred Hutchinson Cancer Center in Seattle for their outstanding clinical work into organ and cell transplantations. The Nobel Committee said that the work of these two doctors gives hope to those tens of thousands of ill people who can be cured or given a decent life when other methods have failed.

Thomas has been successful in grafting bone marrow from one individual to another. Bone-marrow transplantation can cure patients with leukaemia and other blood cancers and some severe blood disorders, who would otherwise die. Patients who survive two and a half years (and 60 per cent do) after the operation have a normal life expectancy.

Murray did the first human kidney transplant between identical twins. He also pioneered kidney transplantation with kidneys obtained from deceased persons. His work has paved the way for transplanting other organs like heart, lung and liver.

Murray was born on 1 April 1919 and was trained as a plastic surgeon. His interest in transplants was kindled during World War II when he grafted skin onto wounded soldiers. In the 1950s he began kidney-transplant experiments on dogs. In 1954 Murray achieved the first successful human kidney transplant, which involved identical twins. He then started experimenting with new drugs to suppress the immune system. Such drugs allowed him to use kidneys from relatives of patients and, later, even from cadavers. Now thousands of patients have kidney transplants each year, and the new kidney survives and thrives for at least ten years in 70 per cent of the patients.

Thomas, born on 5 March 1920, first did bone-marrow transplants in dogs. He used drugs and radiation to suppress the recipient's marrow. Successful transplants in humans are more difficult to achieve. But Thomas persisted, and, learning to match tissue types and using immunosuppressive drugs, achieved the first successful bone-marrow transplant in humans in 1970. Thomas has built the world's largest bone marrow transplant unit at the Fred Hutchinson Cancer Center, where doctors perform 350 transplants a year.

Both Murray's and Thomas' successes have resulted from great improvements in ability to match organs to recipient's tissues so that the new organs are not rejected, and from the use of immunosuppressive drugs.

This year's award has evoked some surprise for being a recognition of clinical work; the Nobel Committee has tended to favour basic scientific research. Transplantations also tend to be a controversial subject on account of their high cost and the ethical and social questions they raise. But none of this can take away the value of the work of Thomas and Murray.

Fields medals 1990

The highest award to which a mathematician can aspire is the Fields medal, an award comparable in many respects to a Nobel prize in the prestige it confers. J. C. Fields, who set up a trust for the gold medals that constitute the award, said that they should be made in recognition of work already done and as an encouragement for further achievements on the part of the recipient. This has been interpreted to mean that the medal should be given to young mathematicians (generally those under the age of 40), a tradition that has been closely followed since the first two medals were awarded in 1936. The Fields medals are given out only every 4 years, at the quadrennial convening of the International Congress of Mathematicians. The medal carries a cash award of $15,000 Canadian. The way medallists are selected has come in for criticism from some mathematicians, as, unlike in the case of Nobel prizes, the names of the committee members who select the Fields medal-winners were not made public. ICM argued that keeping the committee names private eased pressure on them to choose well-known figures. This year, however, the names of the members of the committee, chaired by Prof. Ludwig D. Faddeev, are known.

This year's winners announced at ICM in Kyoto, Japan, include

– Vladimir Drinfeld of the Institute for Low Temperature Physics and Engineering in Kharkov, USSR. Drinfeld's recent work has focused on the theory of quantum groups, a branch of mathematical physics.

– Vaughan Jones of the University of California at Berkeley. He discovered the 'Jones polynomial', an equation that provides the best method to date for helping mathematicians to distinguish knots from one another.

– Shigefumi Mori of Kyoto University in Japan, whose work in algebraic three-dimensional manifolds recently resulted in the extension of classical theory of algebraic surfaces to three dimensions.

– Edward Witten of the Institute for Advanced Study at Princeton. Most recently, Witten has explored the relations between quantum field theory and the differential topology of two and three-dimensional manifolds.