Speech of

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Co-Winner of the 1994 King Faisal International Prize
for
MEDICINE
(Medical Applications of Genetic Engineering)

Your Royal Highness Prince Abdullah bin Abdul Aziz,
Your Royal Highnesses,
Your Excellencies,
Distinguished Guests,

I am honoured to be awarded, and to accept, the King Faisal International Prize, for many reasons. First, it is an honour to be judged to have carried out scientific and medical work of importance to mankind in the field of molecular genetics. The achievement of an award such as this, which is internationally recognised, not only is an honour to me, but to all of those with whom I have worked over the past thirty years. Second, it is a particular pleasure to receive this award in a country which is new to the scientific and medical arena, where only fifty years ago the hospitals and universities which we see in Riyadh could not even have been dreamt of. Third, I am particularly grateful to share this prize with my old friend French Anderson - French and I share certain personal qualities, one of which has been a willingness to disregard the conventional ways of doing things - we are

both mavericks, for better or for worse, but I think that both of us have shown that sometimes this is a good way to break new paths in science.

My early experiences explain why I am rather amused when people tell me how lucky I am to work in a field like human molecular genetics, where there is a great deal of interest and money for grants. It was not always like this. I started my academic life as a chemist, and in 1959 I started by post-graduate research in molecular biology while at University College London. It is difficult to describe how outrageous this was thought to be at the time. The Professor told me that I was crazy to want to work on DNA. There was no one in the Department who could supervise me (though two young lecturers, Tony Mathias and Bob Rabin, both good protein chemists, tried their best). At my first lecture, there were four people in the audience. It was thought that genetics could apply to bacteria or to plants, but that humans were too difficult to analyse. And this was true at the time.

The change came with new gene isolation techniques, which have been called "gene cloning". Using this techniques, it is possible to trick a small virus from a bacteria to accept a segment of human DNA and to reproduce it many millions of times. This is important for industrial production of genes and proteins - it has been used to transfer better drought resistance into plants, and has given healthier farm animals. My interests were different - I knew it would be possible to use this technique to study individuality, the changes between one person and another which makes them different. Every DNA that is isolated should have a personal nametag on it, because in its sequence are the characteristics that are passed from parent to child - including those responsible for health and disease.

We first studied the diseases that cause the very common blood diseases sickle cell anaemia and thalassaemia, and we isolated the genes which cause these diseases when they have minute changes in their sequence. The work of Professor Mohsen El-Hazmi, of the School of Medicine in Riyadh, was a part of the international effort leading to this. Such discoveries allow the identification of carriers and the offering of accurate diagnosis at any time during life, even very early in pregnancy. They are international in nature, and scientists from many countries take part. A conference which I organised in Crete in 1978, which Professor El-Hazmi and Professor Saud Sejeny, of Jeddah, attended, was also attended by scientists from 30 other lands. In this way we put into practice our international commitment, in which we see both knowledge and the application of knowledge for human good as being available to all, whatever their nationality or religion or colour, and whether they are male or female, young or old. The principle of equality is under attack from many sides, and it must be defended because it is fundamental to good science and good medicine.

I then gave up my studies of thalassaemia and worked on

muscular dystrophy and cystic fibrosis. This was a difficult decision, a leap into the dark,which was very risky because I had little knowledge of these diseases, and because the protein that malfunctioned had not been identified. Trying to use the person-specific nature of isolated gene sequences to study a disease was difficult in 1980 not only because the techniques were poorly developed, but also because the top people in genetics denied that the approach could work, in theory and in practice. These are times when friends matter, and I would mention that the Medical Research Council and the Cystic Fibrosis Research Trust in Britain were unfailing in their support when it mattered, and my colleagues Kay Davies, Steve Humphries, and Charles Coutelle showed great faith in our common ideals during this period.

After showing, with others, that the technique could work for several diseases - cystic fibrosis, muscular dystrophy, Alzheimer's disease - it became very important to defind how this information could be used to help the way in which people live, to improve the lot of those of whom we are a part. One important conclusion which cannot be stated too often is that knowledge is of value to humankind, because all valid knowledge enriches us as a people. The search after knowledge is an ethical and positive thing in itself. However, we want more - and the offering of genes to treat diseases is now on the way.

Many people in all lands become worried when they hear about human gene technology. Genetics involves our sense of nationality, of race, of sex and of family, so it is not surprising that it raises fears. However, the new genetics - the use of genes to treat serious diseases in those suffering from an inherited handicap - does not seem to me to raise ethical issues. We are speaking of somatic gene therapy, and do not propose to alter inheritance. We are using a natural gene from natural man, so this is essentially a more "green" and environmentally friendly way of offering treatment. We are hoping to improve the quality of life for many people and their families. We should defend our science and our medicine and proclaim that this effort, to apply the new genetics for the benefit of humankind, is one of the most ethical efforts which can be imagined. This is also the commitment of the King Faisal Foundation and of the International Prize, and I accept it on behalf of myself and my research group in that spirit, the spirit of the universal and ethical application of science and medicine to meet the needs of people everywhere.