

RAFAEL VICUÑA

First of all, I would like to express my profound gratitude to His Holiness John Paul II for appointing me a new member of the Pontifical Academy of Sciences. I receive this appointment with the greatest honour and I wish to declare my commitment, dedication and faithfulness to the aims of this highly prestigious institution.

I would also like to thank the members of the Academy for their support and I confirm my intention to actively contribute with the highest interest and motivation to those activities where the Academy may feel my input would be helpful.

Science represents one of the most prominent endeavours of humankind. For several centuries it has demonstrated that it is the most reliable tool that exists for unlocking the secrets of nature. From this perspective, it represents one of the fundamental supports of our cultural progress. At the same time, science has led to the development of new technologies which have had a dramatic impact on agriculture, industry, and medicine, as well as on everyday life, thereby bringing about the social progress of humanity. Nowadays science advances so fast that we are increasingly confronted with scenarios that could not have been foreseen some years ago.

Unfortunately, we do not seem to dedicate enough time to reflecting about the implications of the new discoveries, or even about the new capabilities, acquired by scientists in their laboratories. For example, the ability to manipulate cells and genes has opened up new horizons in agriculture and human reproduction. At times, some of these advances challenge our consciences and provoke dilemmas – we are faced with what we technically able to do *versus* doing what are we morally obliged to do. Therefore, institutions such as this Academy, which are devoted to deep reflection about the consequences of new knowledge, are more essential than ever in the provision of guidelines to the scientific community and society as a whole.

I will now say a few words about my academic career in the hope that this may help you to envisage how I might better serve this Academy. I have been attached to science ever since I finished high school thirty-four years ago. This has been not an easy engagement, since scientific research has very seldom been considered a worthwhile activity in Latin American countries. However, I strongly believe that scientific research is necessary to reach both intellectual autonomy and economic progress. Guided by this conviction, throughout this period I have been involved in various activities directed towards the strengthening of science in Chile. At the national level, I have participated several times in committees appointed by the government to discuss science programmes. I have also frequently served as an advisor to Congress in the analysis of legislation involving scientific issues. At the Pontifical Catholic University of Chile, the place where I work full time, I have served as dean of research and as vice-president for academic affairs, being responsible for the co-ordination of the research activities of our sixteen different Faculties. In the accomplishment of these duties I have gained some experience in the drawing up and administration of science policies.

With respect to the research fields that I have explored, during my Ph.D. studies in New York I worked on DNA replication in bacteria, which I continued to do for some years after my return to Santiago in 1978. Thereafter, I moved to the realm of thermophilic bacteria, being attracted by the amazing capability of these micro-organisms to thrive at temperatures

around 80 °C. My work encompassed the characterisation of some extrachromosomal DNA elements and also some enzymes involved in the metabolism of DNA in thermophilic bacteria. Fifteen years ago, after sabbatical leave supported by a Guggenheim fellowship in Madison, Wisconsin, I switched to my present field of interest, which is the biodegradation of lignin. Lignin is the second most abundant deposit of organic carbon in the biosphere and therefore its metabolism is a key component of the carbon cycle on earth. This macromolecule is closely associated with cellulose in the plant cell wall, providing plant tissues with mechanical strength and protecting them against microbial attack. Lignin is an insoluble polymer with a highly irregular structure, properties that make its biodegradation a very special biochemical process. My laboratory is approaching this fascinating problem by studying the ligninolytic system of a fungus which is particularly aggressive towards lignin in natural environments. We are characterising the enzymes that attack the polymer and studying both the structure and expression of the genes encoding them. Although our research can be considered as basic, it has some biotechnological connotations. One of its main applications is in the pulp and paper industry, the major process of which involves the removal of lignin from the wood and thus the release of the cellulose fibres. We have already worked with local companies with the end result of making their processes more efficient and environment-friendly.

Although, as I have just mentioned, my research in the laboratory deals with lignin biodegradation, I also manage to find the time to follow other subjects with great enthusiasm. One of them is the origin of life on earth. I had the privilege of attending a meeting on this subject which was held in Trieste last September. I also have a special interest in the subject of human evolution, which occupies much of my social reading. In addition, the Human Genome Project and its ethical and social implications have also commanded a great deal of my attention, especially during the current year.

Once again, I sincerely thank you all for your support and I restate my intention to dedicate my best efforts to serving the Pontifical Academy of Sciences with loyalty and responsibility.