CITATION

read by Prof. Dr. Gerhard Röbbelen, Göttingen, Germany
at the occasion of presenting the

GCIRC SUPERIOR SCIENTIST AWARD

to

Fu Tingdong

Institute of Crop Genetics and Breeding
Huazhong Agricultural University
Wuhan 430070, People's Republic of China

Excellencies, Mr. President, respected members of GCIRC, esteemed assembly, my dear colleague, Professor Fu!

It is my great privilege and my particular pleasure tonight to herewith announce that the GCIRC Board of Directors has decided to present the 1991 Superior Scientist Award of GCIRC to:

Professor Fu Tingdong, from the
Institute of Crop Genetics and Breeding
Huazhong Agricultural University in Wuhan
People's Republic of China

in recognition of his outstanding and most effective contributions to the development of hybrid cultivars in rapeseed. His first discovery of the Polima male sterility and his resolute elaboration toward a functional cytoplasmic male sterility (CMS) system paved the way for a straight forward utilization of heterosis, considerably increasing the genetic performance potential of the rapeseed crop.

In substantiating this decision may I be allowed to briefly review for you the objective of this GCIRC award as well as the personal development and achievements of our distinguished laureate.

The idea of a GCIRC Superior Scientist Award was raised during a meeting of the Board of Directors in July 1955 in Cambridge, England. Although the association, as Article 2 of its Statutes says, is set out to support research at a scientific and technical level and to further studies and experiments concerning the improvement of the rapeseed industry in a more practical, economy-directed manner, it was felt that the development of the rapeseed industry during the last 2 or 3 decades had been crucially dependent on superior scientific innovations, without which technical progress would not have been feasible. In order to mark such major scientific breakthroughs the Board decided to found this award, consisting of a medal and a certificate as well as of the opportunity for the laureate to deliver a lecture in a plenary session of the Congress.

The first laureate to receive the GCIRC Superior Scientist Award was Professor Dr. B.R. Stefansson from the University of Manitoba Canada, honouring his outstanding work and innovations for a new rapeseed crop, which nowadays is known worldwide as "Canola". This award was presented at the 7th International Rapeseed Congress in Poznan, Poland. He was among the first to

trace and utilize the zero erucic acid and low glucosinolate genes for the development of high performing rapeseed varieties. He put special emphasis on the simultaneous increase of oil and protein contents and on the reduction of the destabilizing linolenic acid in the oil.

Nomination of candidates for the second award was solicited in July 1990 by letter to all members of the Board of Directors of the GCIRC Secretariat. The International Scientific Committee responsible for administering the award consisted of Prof. J.M. Bell, President of the present Congress, Dr. P. Vullioud (Switzerland), Chairman of the GCIRC Working Group of Agronomy, and myself, G. Röbbelen, being Professor of Plant Breeding at the University of Göttingen in Germany. Despite the fact that the first laureate had been a plant breeder and that the Award Committee included one nutritionist, one agronomist and only one plant breeder, the 1991 laureate proposed and finally selected out of a group of several candidates by the Board of Directors, again has been a plant breeder. At this point in time I don't want to reflect too much on reasons why the first two GCIRC laureates represent plant breeding because I am fully convinced many more fields of research and experimentation have contributed greatly to the present world standard of the rapeseed industry. Maybe plant breeding offers some initial or central keys to essential developments, such as desired quality traits and acceptable yields of harvested products, before the agronomist and the processor can prove their skills or the trader and economist their cleverness in their fields of activity.

However, if you would follow up the proceedings of the GCIRC Working Group of Plant Breeding under the distinguished chairmanship of Prof. R.K. Downey, then you will notice that in the first decennium of GCIRC from 1970 to 1980, the main points of discussion were dealing with quality traits of rapeseed. By the 8th Rapeseed Congress (1983) in Paris the plant breeders, in a special working session, reviewed the potential and status of hybrid breeding in rapeseed. I still keep a clear picture of that happening, where the general consensus was that several genetic systems for controlled pollination in rapeseed were then available and that it would take just two or three more years to have an effective and functioning CMS system ready for application. If only recently, the Polima system of Prof. Fu became the first to be widely utilized by rapeseed breeders worldwide, then this proves not only that plant breeding usually takes more time and effort than is often expected but also that the final establishment of a biological material requires an awful lot of sensitivity, continuity and patience, characters which Europeans would always ascribe without reservation to the Chinese people in general.

Success in plant breeding, however, is also much dependent on mounting the right horse. In the case of Prof. Fu, I must emphasize that it has been the honourable Professor Li Houli who initiated all rapeseed breeding work at the Huazhong Agricultural University in Wuhan and who also taught the young Fu riding. If the GCIRC award would have been available two decades ago, Professor Li Houli would have been the "Superior Scientist" in our field to deserve it.

Fu Ting-Dong graduated from the Agronomy Department of the Huazhong Agricultural University in 1960. As a student of Professor Li Houli he took his undergraduate studies in the specialty of genetics and crop breeding and finished his Ph.D, thesis in 1965. He went abroad to do research and study in

rapeseed breeding at the University of Göttingen in Germany from June 1981 to February 1982. Since then he has been engaged in genetics and breeding of rapeseed in his home University of Wuhan. Fu Ting-Dong began studies on breeding of self-incompatible (SI) lines and CMS lines of Brassica napus and their hybrids in 1971, exactly twenty years ago. The first SI line and its hybrid were licensed in 1975. This success earned an Award of National Science and Technology at the Chinese National Scientific and Technological Congress in 1978. In order to overcome the problems of multiplication of the SI lines which were normally reproduced by bud pollination by hand, Fu developed maintainers and restorers of SI lines in B. napus, and set up a "three line" SI system which made it very convenient to produce hybrids after Hu and An first reported the use of common salt solution for overcoming the self-incompatibility in B. napus. He also conducted research on using common salt (NaCl) and found the optimum concentration of salt, time and method of spraying the solution.

Fu Ting-Dong recalls finding, on the 20th of March, 1972, 19 spontaneous male sterile plants in the variety "Polima", which was grown in germplasm materials on the experimental field in Wuhan. Test-crosses with 45 varieties were done in the spring of the same year. The details of this discovery and some sampled seeds were presented to colleagues of the Agricultural Science of Hunan Academy who utilized this Polima CMS, developing the CMS line "xian ai A" and setting up the "three lines" in 1976. Breeding with this "three line" system of Polima CMS and systematic studies, including inheritance, anatomy, cytoplasmic effects, heterosis and the environmental effect on the sterility, were continued in Wuhan in the working group of Fu Ting-Dong. The first low erucic acid hybrid "Huaza No. 2" was released in 1985. By now, more than forty double-low restorers of Polima CMS have been developed and several double-low hybrids of Polima CMS are in yield trials at present.

This work of Fu Ting-Dong was rewarded with the Natural Scientific Advance Award by the National Education Committee of China, and with the award of the "Superior Expert" by the Agriculture Ministry of China. From 1979 to 1982 Fu was a member of the group in charge of studies and utilization of heterosis in rapeseed in China. From 1985 to now he has been the Director of the Chinese co-operating research group on rapeseed heterosis, being responsible for all respective organizations, adjustments and implementation .

Recently Fu Ting-Dong and his group gained some important further results on their Polima CMS: (1) They found three types of sterile lines of Polima CMS, i.e. high-temperature sterile lines, low-temperature sterile lines and stable sterile lines. This suggested that it is determined by the nucleus whether or not Polima CMS sterile lines are sensitive to temperature or not. Thus Fu was able to obtain sterile lines of Polima CMS with high stability by choosing suitable maintainers. Moreover, it proved to be easier to get sterile spring lines with high stability than winter types. (2) The anther development of Polima CMS sterile lines was shown to be inhibited at the archesporial cell stage, i.e. having no differentiated microsporangium, and thus the anther development of Polima CMS differed from that of ogu CMS and genic male sterility. (3) The inheritance of Polima CMS involved one pair of major genes and many modified genes. On the other hand, the major fertility restorer (Rf) genes of Polima CMS exist in B. napus, B. juncea and B. campestris, indicating that the Rf genes are located on

the A genome. (4) On the basis of these breeding practices with Polima CMS, Fu proved the hypothesis that it is easy to find CMS's and their restorers in the centre of origin in primitive materials, but not in areas far from the origin centre in the highly developed crop populations.

From all this it is evident that the that the Polima system of Fu Ting-Dong is the first CMS system effectively used worldwide, is not just a chance event, but results from a most devoted and intensive research program which he indeed started in Wuhan and continues up to date.

The scientific results of Professor Fu Ting-Dong are documented in more than 20 papers published on the topic since 1975. Some selected titles read as follows:

Preliminary report on the breeding of self-incompatible line of Brassica napus. Science and Technology of Oil Crops. 1975 (4): 77-83.

The utilization of heterosis for the self-incompatible hybrids in Brassica napus. Acta Genetica Sinica 1977 (1): 42-48.

The inheritance of self-incompatibility and its application to utilization of heterosis of Brassica napus. Journal of Huazhong Agricultural University, 1981 (1): 1-2.

Breeding of maintainer and restorer of self-incompatible lines of Brassica napus. Eucarpia Cruciferae Newsletter, 1981 (6): 9-11.

Studies on overcoming the self-incompatibility of Brassica napus by chemicals. Journal of Scientific Research and Education of Agriculture, 1984 (2): 24-29.

Discovery and studies on polima cytoplasmic male sterility in Brassica napus. Proc. 7th Inter. Rapeseed Congress, 11-14 May, 1987, Poznan, Poland, 69-78.

Some investigation on polima cytoplasmic male sterility in Brassica napus. Eucarpia Crucifww Newsletter, 1987, 12: 46-47.

The studies on the genetical effect of male sterile cytoplasma of rapeseed (Brassica napus L.). Oil Crop of China, 1989 (3): 5-9.

Relationship between the origin and wolution of rapeseed and the development of cytoplasmic male sterile "three lines". Oil Crops of China, 1989 (1): 7-10.

Studies on "three line" polima cytoplasmic male sterility developed in Brassica napus. Plant Breeding, 1990, 104: 115-120.