

## ADDRESS BY THE CHAIRMAN OF THE SCIENTIFIC COMMITTEE

Yang sangat saya hormati:

Bapak Gubernur Kepala Daerah Tingkat Satu Bali, Prof. Dr. Ida Bagus Oka,  
Bapak Direktur Jenderal Pendidikan Tinggi, Departemen Pendidikan dan Kebudayaan,  
Prof. Dr. Sukadji Ranuwihardjo,  
Bapak Rectores Magnifici Institut Teknologi Bandung dan Universitas Udayana, masing-masing  
Wiranto Arismunandar dan I.G.N.P. Adnyana, dan hadirin yang mulia,

Your Excellency, Ladies and Gentlemen,

It gives me great pleasure to participate in this inaugural ceremony of the 143rd Symposium of the International Astronomical Union and to speak on behalf of the Scientific Organizing Committee, welcoming all of you to the symposium.

Today we are especially honoured to have this symposium opened by Prof.Dr. Sukadji Ranuwihardjo, Director General of Higher Education, and in the presence of the Governor of Bali, Prof.Dr. Ida Bagus Oka, which demonstrates the thorough understanding of the Indonesian Government to the importance of astronomy and of this symposium. It is a privilege to have this symposium in your country.

Astronomical research of the present century has had many contributions from Indonesia, both from the results that have originated from the Observatorium Bosscha in Lembang, as well as from the solar eclipse stations located in this country within the path of total eclipses. Most of us are aware of the work carried out in the past that is associated with important personalities in astronomical history. The names of Pannekoek, Wallenquist, de Sitter and van Albada bring to our minds the efforts of the past. In the trail blazed by these men of distinction come the efforts of the present. Twelve astronomers and over 70 students in Lembang and Bandung, with the vigour of confidence and enthusiasm that comes from accomplishment. Located on the equator, Indonesia is privileged to have access to nearly the whole sky, which offers so much promise. And with the continued support that astronomy in this country has from the authorities, your accomplishments of the future are bound to be even greater. Among your accomplishments of the past are the organization of the 2nd Asian Pacific Regional IAU Meeting in 1981, and of IAU Colloquium No. 80 on "Double Stars, Physical Properties and Generic Relations" in 1983, both hosted in Bandung.

In many ways, this symposium symbolizes the spirit of Astronomy, where friendly cooperation overrides the inhibiting influences of national boundaries. Seated here are 118 astronomers from 18 different countries, covering a range of latitude and longitude. They come from institutions having diverse facilities. Their principle common motive is to get together with their counterparts from different places, to learn, to discuss, and to plan new approaches that will take us further in the question of understanding the appearance and evolution of massive stars. Here is astronomy, the forerunner of all sciences, at its best.

Symposia of this kind have played a very important role in the activities of the International Astronomical Union. Hot massive stars were discussed in Argentina (1971, IAU Symposium No. 49), Canada (1978, IAU Symposium No. 83), Mexico (1981, IAU Symposium No. 99) and Greece (1985, IAU Symposium No. 116). Those symposia, together with additional colloquia and workshops on the subject have been the principle fora that have witnessed the announcements of discovery and contributed to the stimulus for the future. This symposium will follow that tradition.

123 years ago, the French astronomers Wolf and Rayet discovered the spectacular appearance of the emission-line-dominated spectra of three stars in the constellation Cygnus. Ever since, those stars, and the numerous other ones which have been discovered later, have

been called Wolf-Rayet (WR) stars. It took astronomers and physicists 65 years (Edlén) to figure out the identification of the emission line spectra, and another 10 years (Gamow) to realize the meaning of the two spectral sequences of WR stars, the nitrogen and the carbon sequences.

Because it takes time for light to travel, looking at stars means looking back in time. In that respect astronomers could be considered historians. When we look at the Sun, we see the light that left the Sun 8 minutes ago. The light from the nearest WR star, however, the star  $\gamma$  in the constellation Vela, left that star more than 1400 years ago, that is, at the time when Indonesia was a Hindu-Javanese empire, governed by raja's. The light from the most remote known WR star in our Galaxy travelled to us during as many as 40.000 years. The light of the WR stars in the Large Magellanic Cloud, our neighbouring galaxy, travelled about 170.000 years, which means, that light left the LMC at the time that alongside the Solo River in Central Java, in the village of Trinil, the Homo Trinilensis was living, also called the Phitecantropus Erectus, an early variety of the Homo Sapiens.

Homo Sapiens nowadays knows that WR stars represent a conspicuous phase in the evolution of hot massive stars and that they have many extreme properties. They are among the most luminous stars: with an energy output typically 100.000 times that of the Sun, and very hot: with surface temperatures of about 5 to 20 times that of the Sun. They have very strong stellar winds wherein their characteristic emission line spectra originate, and which make them lose matter to their environments at rates of one solar mass in only 100.000 to 10.000 years. Their surface chemical composition looks highly anomalous, dominated by helium, nitrogen and carbon rather than hydrogen. In the past decades it has been recognized that mass loss due to stellar wind and mass transfer in double stars significantly influences the evolution of massive stars. WR stars release so much matter by their strong stellar winds or during bulk-ejection of shells of matter, that some of them show extended nebulae around them, which give us additional handles to study the energy house keeping and evolution of their central WR stars. WR matter can even be traced on Earth. Observations of cosmic rays and of meteorites have revealed isotopic ratios of elements which can only have formed in the interior of massive stars like WR stars. This could imply that the interstellar cloud in which our solar-system once formed, contained traces of matter of nearby pre-solar WR stars.

Ladies and Gentlemen, we are indeed grateful to the Indonesian authorities, to the Rectores of the Institut Teknologi Bandung and of the Universitas Udayana in Denpasar, and to our Indonesian colleagues, for organizing this symposium here. I am confident that we will have a very useful, constructive and delightful week of lectures, discussions and deliberations. On behalf of the Scientific Organizing Committee, I express our gratitude to our hosts and extend my good wishes for a highly successful symposium.

Terima kasih: Thank you very much.

*Karel A. van der Hucht*