Adriaan Blaauw at 80

S.R. POTTASCH, Kapteyn Laboratorium, Groningen, Netherlands

On 12 April 1994, Adriaan Blaauw celebrated his 80th birthday. He neither looks nor acts this age: he still spends much of his time actively engaged in scientific work. His impact on (European) astronomy has been great and it is useful to examine it more closely.

Short Sketch of his Career

Adriaan was born in Amsterdam in 1914. In 1932 he began his studies of Astronomy at Leiden University. He became an "Assistant" at the Kapteyn Institute in Groningen in 1938, although he was officially still a student at Leiden, obtaining his "doctoraal" degree there in 1941. He spent the war years in Groningen, moving to a staff position at Leiden in October 1945. He defended his thesis "A study of the Scorpio-Centaurus Cluster" in 1946 at Groningen (advisor, P.J. van Rhijn). In 1948 Adriaan became Associate Professor of Astronomy at Leiden University. He resigned from this position in 1953 to accept a similar position at the University of Chicago (Yerkes Observatory) where he remained for four years. During the last year of his stay he was also Associate Director of Yerkes and MacDonald Observatories.

At the end of 1957 Adriaan returned to the Netherlands as Professor at Groningen University and Director of the Kapteyn Institute, which he remained until 1970. His growing involvement with ESO (see below) led to his formal "half-time" appointment as Scientific Director of ESO in 1968. In 1970 he reversed these associations, becoming Director General of ESO and part-time Professor at Groningen. This situation lasted five years, after which Adriaan returned to the Netherlands, but this time as Professor at Leiden. He retired from there in 1981 to settle in his beautiful, centuries old, farmhouse in the province of Drenthe, not far from Groningen University. Here he became Advisor to the Department of Astronomy, a function which he actively fulfils at present.

Scientific Research in Astronomy

Adriaan's name is mostly associated with investigations on massive stars, the O and B-type Stars. Of these we summarize (1) the observational confirmation of the occurrence of stellar groups of recent formation, (2) the discovery of the process of sequential star formation, and (3) his work on the class of early-type stars with anomalously high velocities, the "runaway" stars. These investigations would bear fruit also in studies of the star formation process.

1. In the late 1940's, there was accumulating evidence that besides the majority of stars with ages of the order of that of the solar system, to be counted in billions of years, the ages of the most massive stars in the Galaxy would have to be counted in millions of years only. The evidence was based, on the one hand, on the new understanding of stellar nuclear energy sources (closely related to work on nucleosynthesis in the years during and immediately after the Second World War) and, on the other hand, on the study of the structures and equilibrium conditions of loose stellar groups, the Stellar Associations. Adriaan studied known OB-Associations and identified new ones (the Sco-Cen, the Per OBII, the Lac OBI Associations), and provided direct confirmation of these very young ages by means of investigations of their internal motions. These revealed a general expansion, confirming that they are unbound systems that must have been born only millions of years ago. An important implementation of these various lines of evidence was that star formation in the Galaxy must still be going on today.
2. His study of the structures and stellar content of the OB Associations revealed that these consist of spatially separated subgroups, separated in age by intervals of several millions of years, and this led him to the conclusion that star formation occurs stepwise. The process has since become known as "sequential star formation", and is now recognized as a general characteristic of the formation of massive stars. In many cases there is close association of the youngest of these subgroups with the interstellar molecular cloud medium from which the association has emerged. Examples are the Sco-Cen Association with at least four subgroups formed over the last 15 million years, and the Orion OBI Association with four subgroups formed over the past 12 million years.
3. Regarding the runaway stars, it was already know in the early 1930's that early-type stars have small random velocities. However, about 10 % of the O stars have high radial velocities which did not fit into the universal property of slow moving luminous stars. The possibility that these motions were due to undiscovered spectroscopic binaries was ruled out, as was the possibility that they were due to systematic atmospheric motions. A study of the proper motions indicated that at least some of these stars had transverse motions which were equally large. Adriaan concluded that these high velocities were real motions in space.
   How had these motions originated and why was there a clear-cut dichotomy between fast and slow moving stars? An important clue was that these runaway stars were mostly single stars. Adriaan suggested that these stars had originally been part of a massive binary system which had suddenly been disrupted because the primary of the system became a supernova, so that the component was released at a velocity of the order of the orbital velocity. This relatively simple solution was first published in 1961. An interesting aspect of these studies is that for nearby runaway stars with accurate proper motions it is possible to identify the OB Association from which the star originated. In such cases the epoch of the supernova explosion can be fixed with high accuracy (of the order of several tenths of a million years) and it is also possible to determine the distance, and hence the absolute magnitude of the star with high accuracy. These studies therefore also bear fruit in other ways, for instance for stellar astrophysicists working on models of atmospheres of early-type stars. A recent example is his study of the bright runaway star Zeta Puppis.

Some Details on the Association with ESO

Discussion about the need for a joint European observatory in the southern

hemisphere first began to take form after the last war. In 1953 at a conference on galactic structure in Groningen (IAU Symposium 1), informal talks were held the day before the conference began among various European astronomers about the possibilities. Adriaan took part in these discussions but just after this conference he accepted the position at Yerkes Observatory. Because he expected to remain there he took no further part in the ESO planning until the end of 1957, at which time he returned to Europe as Professor of Astronomy (and Director of the Kapteyn Institute) at Groningen. Although a "statement of intent" had been signed in 1954, only limited progress was made in the early years. Positive was the beginning of site testing in South Africa. The financial basis remained weak and dependent on voluntary contributions of the future member states. In October 1957 the committee of astronomers which was meeting periodically (about once a year) to discuss the project assumed a more formal form with the appointment of a Chairman (Oort) and a Secretary (Bannier). In May 1959 Adriaan succeeded Bannier as Secretary of this "provisional council" until succeeded by Heckmann in 1963. During this period substantial progress had been made in the organization of ESO, leading to the signing of the Convention in October 1962.

Adriaan continued to be involved in the development of ESO. At the beginning of 1968 this was formalized by his appointment as Scientific Director of ESO. This was a "half-time" function and he combined it with his work in Groningen by driving to and from Hamburg (where ESO had its headquarters at the time). In January 1970 he succeeded Heckmann as Director General. His position at Groningen became "part-time" and he remained Director General of ESO until the beginning of 1975 and continued as advisor for some time after that. He is the author of "ESO's Early History" which was published in 1991.

Astronomy and Astrophysics: a European Journal

The founding of *Astronomy and Astrophysics* took place in 1968 for essentially the same reasons ESO was formed: the individual European countries could not compete in this case with the large American journals. Europeans began to feel that their work was not widely read and some were considering publishing their best work in the *Astrophysical Journal*. The initiative to merge the national journals came, as might be expected, from their editors, especially J.-L. Steinberg and myself. A meeting took place in April 1968 of astronomers from Belgium, Denmark, France, Germany and the Netherlands to prepare a possible merger. It was immediately clear that scientifically the difficulties of such a merger were relatively minor (but not non-existent). A much greater problem were the financial and administrative aspects. If the same procedure had been followed as by the creation of ESO, a journal might have been formed many years before.

Adriaan, as ESO representative at the meeting, suggested circumventing the difficult procedure. He offered the services of ESO as "legal person" responsible for the financial and administrative state of the journal. This would make it easy for national governments to make financial contributions to an international organization, since an official treaty already existed. A Board of Directors with representatives of the sponsoring countries was set up, which took over the financial and administrative dealings of the journal. The editors were then only responsible for the scientific dealings of the journal. The Board fixed general policy (e.g. which languages were acceptable, who were to be the editors) but was not involved in the processing of articles. Adriaan was elected the first Chairman of the Board of Directors in October 1968 and held the position until March 1979. When he resigned, the journal was well established and both financially and scientifically "healthy".

Other European and International Activities

Since 1981 Adriaan has been associated with the Hipparcos satellite project, as Chairman of the Scientific Evaluation Committee. In this position he has worked closely with the scientists who have designed and built the instrument. In particular he has advised on many aspects of the scientific programme. This association was "natural" since Adriaan's scientific research is closely related to the Hipparcos goal. The fruits of this association will only be known in detail in the coming years as the Hipparcos data are released for publication.

Mention must also be made of Adriaan's work for the International Astronomical Union, of which he was President from September 1976 to August 1979. He is especially remembered for his efforts to include China and the vast majority of Chinese astronomers as members of the IAU. These efforts bore fruit as Chinese membership was confirmed at the Patras meeting in 1982. A discussion of the details of these negotiations as well as a general history of the IAU has just been completed by Adriaan and should be available before the General Assembly of this year.

Non-Astronomical Scientific Activity

Adriaan has also been scientifically active in a field quite different from astronomy: the early history of farmers-settlements. It started with research on the history of the structure and inhabitants of the 17th-century farmhouse he acquired and restored in the 1960's. This gradually developed into his systematically investigating aspects of the history of a nearby village, typical for the settlements in the north-east of the Netherlands. These studies were based on archival data in Dutch State Archives. After having published several articles in professional History Journals, he published a book on the village Westervelde in 1987, in which he covered cultural, agricultural and social aspects in the 17th, 18th and 19th century. This study has turned out to be useful in courses on legal anthropology at Groningen University.

Concluding Remarks

The picture describes an international, and especially European-oriented astronomer. The European orientation has partly to do with the fact that astronomy has turned rapidly to large projects which can no longer be supported by individual institutes or even small countries. It has partly to do with larger historical (and political) changes.

Finally, I personally would like to thank Adriaan for one of his minor decisions: his invitation in 1962 to me to come to Groningen, without which I would not have become a "European" astronomer.