

## C. Zwaan 1928 – 1999

Cornelis (“Kees”) Zwaan died in his house at Doorn, The Netherlands, on June 16, 1999 from cancer. He underwent major surgery in March 1998 but recovered so fast that we and his other friends expected to have him with us much longer. It is hard to realize that he is gone.

Zwaan studied physics and astronomy at Utrecht University during 1946–1954 and then became a physics teacher during five years, interrupted by military service. In fact, Zwaan was a life-long educator, as a boy teaching bird and plant lore to his younger brother Joost, as a professor teaching stellar atmospheres and radiative transfer to many generations of Utrecht students, and in particular, as a PhD adviser teaching a long procession of graduate students<sup>1</sup> how to tackle astrophysics. Many of the latter remained in the field — no other Utrecht astrophysicist has fathered such a “school”. In addition, he inspired a great many colleagues in their research, both at Utrecht and elsewhere.

In 1965 Zwaan defended his own thesis, *“Sunspot Models — A Study of Sunspot Spectra”*, supervised by M.G.J. Minnaert. The content is characteristic. On one hand, painstaking analysis of how scattered light upsets sunspot spectroscopy; on the other, scenarios of how sunspots assemble and even a sunspot-related flare mechanism — a typical Zwaan mix of both meticulous detail and bold thinking. The combination made his research both daring in regularly attacking new topics, and solid in doing so with sufficient depth — always with eagerness, dedication and admirable discipline.

The Zwaans (Kees married Prisca van Diggelen in 1954, an evidently harmonious partnership) spent 1966–1967 at Sacramento Peak, a rich experience that made them lovers of the US South-West (turning Kees into a bolo-tie wearer to the dismay of his Dutch relatives). Above all, it gave Kees opportunity to study active region morphology on the large film collection at the Big Dome. He became an expert “solar naturalist”, recognizing structural and evolutionary patterns in solar magnetism much as he knew his birds and plants, displaying uncanny

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<sup>1</sup> Rob Rutten (1976), Henk Spruit (1977), Albert Greve (1978), Frans Middelkoop (1982), Aad van Ballegoijen (1982), Barto Oranje (1985), Hans Brants (1985), Karel Schrijver (1986), René Rutten (1987), Karen Harvey (1993), Louis Strous (1994) and Ken Tapping (1995); as co-adviser Han Uitenbroek (1990), Jo Bruls (1992), Jos van Geffen (1993) and Nick Hoekzema (1997), at the University of Amsterdam Jan van Paradijs (1975) and Ankie Piters (1995).

intuition to the less experienced. Also, the American frankness suited Kees and Prisca well — many of their colleagues-turned-friends are from overseas, and many have enjoyed splendid hospitality at Doorn.

Zwaan became university lecturer (associate professor) upon his return to Utrecht in 1968, full professor in 1980. The early seventies saw large involvement in JOSO, then at the heydays of site selection. Zwaan inspired Rob Hammerschlag to start on his open solar telescope, a long development that finally came to first light in 1997. Together, they site-tested sandy beaches off the Algarve and Zwaan even inspected the tiny Ilhas Selvagens, championing such sea-level sites, but eventually the JOSO telescopes went to the Canary Island volcano's. In the meantime, Zwaan, Nigel Weiss and Aad Fokker had combined JOSO and CESRA into the Solar Physics Section of the European Physical Society with Zwaan as founding chairman.

Zwaan's research with his students concentrated initially on NLTE line formation and sunspot spectroscopy but diversified soon, expanding to both solar and stellar magnetic activity as a two-way street utilizing their complementarity. His interests ranged from small-scale structures to stellar dynamos and from intrinsically weak magnetic fields in the solar photosphere to the merging of magnetically-braked binaries. He was directly involved in the development of the fluxtube paradigm, stimulated discussions of a boundary-layer dynamo, initiated cool-star polarimetry, pioneered in diagnosing sunspot nests, and led a sequence of coworkers in studies of stellar chromospheric activity including participation in the Mount Wilson H&K monitoring program.

Zwaan contributed to many papers, but rarely as first author and often satisfied with just an acknowledgment. Browsing through the on-line ADS compilations of who cited which Zwaan paper through the years quickly shows that his citation record ranks very high and that it covers an impressive variety of topics. Stellar magnetism is the thread linking them together, but they range widely across solar and stellar astrophysics.

Zwaan completed his last major project only recently: co-authoring a textbook "*Solar and Stellar Magnetic Activity*" with one of us (CJS). It will appear this autumn and is intended as an introductory overview for graduate students and non-solar astrophysicists. Most of the pages written by Zwaan convey his awe for the inspiring questions that stellar magnetism furnishes to all of us as it did to him throughout his career. We are fortunate that his voice will live on through these pages.

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