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Obituary

Jan Amesz (11 March 1934 – 29 January 2001)

On January 29, 2001, Jan Amesz suddenly died of complications after lung surgery, just a few weeks after the first diagnosis of his illness. Jan was born in Gouda on March 11, 1934. Graduating from high school (gymnasium) in Gouda in 1951, he entered Utrecht University where he started his studies in chemistry. In his farewell lecture, at the occasion of his retirement in 1999, Jan wryly commented on his time at the university, marked by a lack of modern chemical equipment and by an outdated curriculum. Nevertheless, Jan became interested in doing research when working as a student for a Minor in Biophysics when working with Lou Duysens' research group in the Biophysics Laboratory of the Physics Department. He made significant contributions to developing a new method and constructing a new apparatus, resulting in a publication, entitled 'Fluorescence spectrophotometry of reduced phosphopyridine nucleotide in intact cells in the near-ultraviolet and visible region' [Biochim Biophys Acta (1957) 24: 19–26]. This method is more specific than absorption difference spectroscopy and has been used extensively for studying the reduction and oxidation kinetics of this universal intermediate (now named nicotinamide-adenine-dinucleotide) not only in photosynthetic cells, but also in a variety of other organisms.

Jan received his Masters with honors, and decided to obtain a PhD degree working with Lou Duysens who had accepted an appointment as associate professor of biophysics in Leiden a few years earlier. These were hectic days. The biophysics department consisted of Lou, Jan and one or two technical assistents, housed in one room in the old Kamerlingh Onnes Laboratory, home of the Department of Physics at the Leiden University. Here, Lou continued to improve his sensitive fluorescence and absorption difference spectrometers that he devised as a PhD student at Utrecht University, and that had contributed so much to elucidating the mechanism of energy transfer and subsequent trapping by the reaction center. Meanwhile, Jan concentrated on utilizing absorption difference spectroscopy to hunt for intermediates. That intermediate steps in the photosynthetic conversion of light to energy in plants had to exist could be inferred from the dependence of oxygen yield on the wavelength of incident light (the Emerson effect) and on the pulse regime (duration and delays) when using pulsed illumination. A large part of the work described in Jan's thesis, entitled 'Intracellular reactions of nicotinamide-dinucleotide in photosynthetic organisms', concerned the oxidation/reduction reactions of NADP+ and NADPH, and of cytochromes in photosynthesis. Just a few years before, Calvin and Benson had elucidated the carbon fixation cycle (for which Calvin received the Nobel prize in 1961) using the ^{14}C labeling method introduced by Ruben and Kamen after their discovery of ^{14}C in 1940. The connection of this cycle with the plant photosystems, however, was still largely unknown. It came as a great surprise that cytochrome was involved as one of the intermediates. Based on action spectra of $NADP^{+}$ reduction, cytochrome oxidation, and photosynthetic activity, it was postulated that photosynthesis in green plants is brought about by two primary light reactions, operating in series and driven by different pigment systems. With careful experimentation Lou and Jan succeeded in interpreting a host of puzzling observations. Reduction and oxidation of the cytochrome reflects which photosystem is more active; this can be regulated by changing the wavelength of the incident light. Although the notion of more than one photosystem had been proposed earlier, it seems indisputable that the work of Jan and Lou provided the first solid evidence for it. [For a personal account of this important discovery, see the article by Lou Duysens in Photosynth Res (1989) 21: 61–79.] Jan's work thus contributed much to what is now textbook knowledge.

After receiving his PhD in 1964 with honors, Jan went from 1966–1967 as a research fellow to the Carnegie Institution of Washington in Stanford, California, where he collaborated in particular with D.C. Fork. In his farewell lecture Jan describes this period as a happy and fruitful time. He worked mostly on photoreactions involving the primary donor P700 in Photosystem I and Cyt *f*, resulting in no fewer than 14 papers coauthored with Fork.

Coming back to Leiden as an assistant professor, Jan was soon promoted to associate professor in 1968. He continued working on Photosystem I, but gradually his interest shifted to Photosystem II, especially its acceptor side. One of the papers he himself particularly liked was the demonstration of the two-electron gate [Velthuys BR and Amesz J (1974) Charge accumulation at the reducing side of system 2 of photosynthesis. Biochim Biophys Acta 333: 85–94; an identical model was independently proposed by Bouges-Bocquet B (1973) Biochim Biophys Acta 314: 250–256]. In the course of time he extended his research activities to photosynthetic bacteria, first primarily the purple non-sulfur bacteria. Here, he carefully charted the pathways of energy transfer by relatively simple experiments such as fluorescence excitation measurements, and investigated the ratio of antenna systems to reaction centers. The latter topic continued to have his interest, as witnessed by a recent publication [Permentier HP et al. (2000) Photosynth Res 64: 27–39]. When Hans van Gorkom was tenured in 1976, Jan decided to leave the supervision of Photosystem II research to him, and initiated a new research field, the photosystem of green bacteria. This field would constitute his major, but not exclusive, interest for the remainder of his career. He had many contributions to this field, especially in the development of isolation procedures, the study and analysis of pigment composition, and the investigation of energy and electron transfer pathways in green bacteria. A significant recent achievement was the isolation of an active reaction center core-complex from green sulfur bacteria, which sofar had been elusive.

Jan always tried to be at the technological edge, both with regard to instrumentation and to biochemical preparations. An example of the former is the research on electrochromism, together with the late Bart de Grooth. Another example is his work at cryogenic temperatures, initiated with Jan Visser, which resulted in an extremely versatile and powerful instrument consisting of a helium flow cryostat integrated with a single beam spectrometer. This instrument would record absorption, fluorescence, linear dichroism and circular dichroism spectra down to liquid helium temperatures with minimal adjustments. The set up is fully operational up to this day and still yields exciting new material, as can be seen in the thesis of Hjalmar Permentier. Examples of advanced biochemistry can be found in the many papers Jan's group produced on a variety of reaction center preparations, and on the accurate determination of the pigment composition of reaction centers and antenna systems.

Jan was promoted in 1980 to full professor in biophysics. When Lou Duysens retired in 1986, Jan took over full responsibility for Lou's group. Now Jan immersed himself in the ins and outs of ultrafast laser spectroscopy, and was able to continue and extend the benchmark work on kinetics that Lou had carried out during his long tenure. Again, Jan's group, co-supervised by Thijs Aartsma, built sophisticated new equipment, culminating in a femtosecond absorption difference spectrometer with a time resolution of 16 fs. With this, and other new laser equipment, state-of-the-art experiments were carried out on a great variety of photosynthetic preparations. Attention was focussed especially on preparations of green and heliobacteria. Until a decade ago this field was the domain of just a few groups. Jan realized the attractiveness of working on organisms with small antenna complements, such as the heliobacteria, which form a paradigm of Photosystem I.

Jan's research on heliobacteria and green sulfur bacteria led to the identification of 8^1-hydroxy-chlorophyll *a* as electron acceptor in *H. chlorum* [Van de Meent EJ et al. (1991) Biochim Biophys Acta 1058: 356–362], and of 13^2(R)-chlorophyll a in the case of *Chl. tepidum* and of *Ptc. aestuarii* [Van de Meent EJ et al. (1992) Biochim Biophys Acta 1102: 371–378]. A significant achievement was the isolation of an active reaction center core complex of these species of green sulfur bacteria. In addition to 16 BChls *a*, these RCC complexes were shown to contain four Chls *a* per RCC. RCC complexes of heliobacteria also contain a complement of Chl *a* pigments. Time-resolved measurements on these complexes in Jan's groups provided additional evidence that one or more of these Chls *a* serve as electron acceptors in charge separation [Schmidt KA et al. (2000) Biochemistry 39: 7212–7220; Neerken S et al. (1998) Biochemistry 37: 10792–10797; Neerken S et al. (1999) Biochemistry 38: 13216–13222]. Evidence was obtained for direct charge separation upon direct excitation of Chl *a* 670. It thus seems that the recently resolved structure of the electron transfer chain in PS I [Jordan P et al. (2001) Nature 411: 909–917] is conserved in the reaction centers of heliobacteria and green sulfur bacteria.

In a significant number of species the antenna absorption is red-shifted with respect to that of the reaction center. Potentially, the excitation could get trapped in the antenna at low temperatures. This puzzling question was addressed by Jan through accurate determination of the efficiency of charge separation in various species. The yield of charge separation upon excitation of the antenna was surprisingly high at low temperature in all species, independent of the excitation wavelength [Kleinherenbrink FAM et al. (1992) Biochim Biophys Acta 1099: 175–181]. The small overlap between antenna emission and reaction center absorption is apparently sufficient to induce efficient energy transfer to the reaction center.

Jan recently contributed to a variety of other subjects, such as the successful simulations of the optical properties of the FMO complex [Vulto SIE et al. (1998) J Phys Chem B 102: 10639–10635; Vulto SIE et al. (1999) J Phys Chem B 103: 8153–8161], the study of the exciton character of the optically excited states in LH2 [Kennis JTM et al. (1997) J Phys Chem B 101: 8369–8374], and a carefull study of the role and efficiency of different types of carotenoids in light-harvesting of purple bacteria (M. König, H.P. Permentier, J. Amesz and J. Overmann, in preparation). All these examples show that Jan was still very much in tune with the current developments in research, and was able to contribute at the highest level.

Summarizing Jan's achievements it is fair to say that they paralled the amazing increase in our understanding of the photosynthetic primary reactions over the past 40 years. At several points Jan's contributions have been crucial, and they will have a lasting impact on the field. In addition to his great gifts as a scientist, Jan was an able administrator. In 1980 he assumed the responsibilities of chairman of the Department of Biophysics. Jan would carry this burden for more than 15 years, during which he had to face significant changes in the organisation of the university. Budget cuts were rife, and Jan was challenged to defend the position of the department in an increasingly competitive environment. The strong research effort in biophysics, particularly in photosynthesis, is due in no small measure to the untiring efforts of Jan, his ability to build consensus and persuade his colleagues that biophysics has a valid and worthy place in the Physics Department. Within the university he served in several posts, amongst others as chairman of the division of Physics and Astronomy. He was a member of the Royal Dutch Academy of Sciences, in which he served terms as President of the Standing Committee for Biochemistry and Biophysics, and of the Section for Biochemistry and Biophysics. Jan served in several functions, including that of chairman, in the Dutch Society for Biophysics. At the international level Jan was member of numerous organizing committees of international conferences, workshops and summerschools. He has been associate editor of *Photosynthesis Research*, *Plant Science* and *Biochimica Biophysica Acta*, and was co-editor of several books on photosynthesis research. Since 1996 he was coordinator of a TMR research network on 'Green Bacterial Photosynthesis' of the European Community. Last but not least, he was member of the Standing Committee for the Life and Environmental Sciences (LESC) of the European Science Foundation, a post Jan held until his untimely death.

Jan would carry out all these scientific and administrative tasks seemingly without effort. With a high sense of duty and great efficiency he was able to do an amazing amount of work in a short time, a characteristic which doubtless was taken advantage of now and again. Yet, Jan had always time for his students and his collaborators, who could drop in any time to discuss scientific and other matters. After his formal retirement in 1999 Jan cut down his administrative duties almost completely, but scientifically he remained fully active. Especially with his last two graduate students, Hjalmar Permentier and Sigi Neerken, he had intensive contacts, planning experiments and discussing the results on a daily basis. He now also had more time to sit with the students of the department at lunch or coffee time and challenge them on all sorts of questions. With his sharp mind and sense of humour Jan usually got the better of them in heated discussions that he clearly enjoyed. Evident from his high spirit and enthousiasm, those last years were happy ones, not in the least because he could devote his full attention to his great passion for science.

We will remember Jan as an exemplary scientist, a fine colleague, and an inspiring teacher. He leaves his wife Ank, his children Stella, Robert and Bas, and his grandchildren, to whom we extend our deepest feelings of sorrow and sympathy.

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