

Curriculum vitae

Name: Ivo Henricus Marie van Stokkum

Date of birth: February 11, 1962.

Married: on July 25, 1988 with Eva-Maria Kintzel. Children: Yentl (1991) and Mari (1993).

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From 1979 until 1984 physics study at the University of Nijmegen. Bachelors degree in physics and chemistry in April 1982 (cum laude). Masters degree in experimental physics in September 1984 (cum laude). From October 1984 until October 1988 investigating the auditory brain stem of the grassfrog in the Laboratory of Medical Physics and Biophysics at the University of Nijmegen. Ph.D. degree in natural sciences on September 13, 1989 (with Prof. dr. C.C.A.M. Gielen). Since December 1989 UD (universitair docent, comparable to assistant professor) in the Department of Physics and Astronomy, Faculty of Sciences, of the Vrije Universiteit, Amsterdam. First in the Physics Applied Computer Science group, since October 2005 in the Biophysics group.

Grants

FOM beleidsruimte 1991, *Parameter estimation in physical models* (main applicant, oio)

STW 1993, *PRBA based corneatopography* (main applicant F.C.A. Groen)

ALW investment grant (1995/6) *Spectrot temporal measurement and on-line analysis of pico/nanosecond fluorescence from photoactive systems*. kf 252.5 (main applicant)

FOM beleidsruimte 1999 *Two-dimensional femtosecond spectroscopy* (main applicant R. van Grondelle)

NWO Computational Science 2002, *A Problem Solving Environment for hierarchical modelling of time resolved spectra* (main applicant, oio and scientific programmer, 245 kEuro)

NWO From Molecule to Cell 2003, *Time flies: Molecular understanding of the functioning of a new type of photoreceptor protein in Bacillus subtilis from initiation to organismal response* (main applicant R. van Grondelle)

NBIC Biorange 2006 *Bioinformatics for Metabolomics and Fluxomics* (175 kEuro, main applicant J.H.G.M. van Beek)

NWO investment grant 2008, *A facility for advanced laser-based microscopy to study living, biological systems at the Laser Centre, VU University Amsterdam* (main applicant E.J.G. Peterman)

NWO ALW 2009, *Resolving the proton transfer pathway in GFP* (main applicant M.L. Groot)

FES TBSC project 2-4, 2010, *From proteins to the thylakoid membrane* (580 kEuro, main applicant R. van Grondelle)

NWO FOM/ALW Proposal 10TBSC24, 2010, *Expanding society's toolbox to harvest solar energy: Creating multi-scale computational models to optimize oxygenic photosynthesis* (778 kEuro, main applicant K.J. Hellingwerf)

Ph.D. student supervisor

R. Pribić, 1992-1996, Promotores: prof.dr.ir. F.C.A. Groen (VU), prof.dr.ir. A. van den Bos (TUD), Copromotor: dr. I.H.M. van Stokkum

K.M. Mullen, 2004-2008, Promotor: prof.dr.ir. H.E. Bal (VU), Copromotor: dr. I.H.M. van Stokkum

J.J. Snellenburg, 2010-

Ph.D. thesis committees

T.S. Scherer, Chemistry UvA, 1994
L.M.P. Beekman, Biophysics VU, 1997
X.Y. Lauteslager, Chemistry UvA, 1998
F.M. Vos, Physics Applied Computer Science VU, 1998
M.E. van Brederode, Biophysics VU, 1999
F.J. Kleima, Biophysics VU, 1999
H. Naus, Atomic Physics VU, 2001
O. Larsen, Biophysics VU, 2002
B. Gobets, Biophysics VU, 2002
J. Hendriks, Chemistry UvA, 2002
F.L. de Weerd, Biophysics VU, 2003
E. Papagiannakis, Biophysics VU, 2004
C.D. de Wit, Biophysics VU, 2007
R. Berera, Biophysics VU, 2007
G. Balkowski, Chemistry UvA, 2008
D.M. Germans, Physics Applied Computer Science VU, 2008
C. Bonetti, Biophysics VU, 2009
S. Laptenok, Biophysics WU, 2009 (copromotor)
P. Zoon, Chemistry UvA, 2009
N. Pawlowicz, Biophysics VU, 2009
A. Rupenyan, Biophysics VU, 2009
K.C. Toh, Biophysics VU, 2010
T.A. Cohen-Stuart, Biophysics VU, 2010
T. Binsl, Bioinformatics VU, 2011

Invited Lectures

Troisième Cycle de la Physique en Suisse Romande, July 2004 and March 2005.
Modeling natural and artificial photosynthesis workshop, Lorentz Center Leiden, March 2011.

Teaching

Bachelor courses

(compulsory, except for TIMNW)

1st year:

Programming in Mathematica (N)

TIMNW: Applied Computer Science for Medical Natural Sciences (together with Jan Mulder)

2nd year:

Programming and Simulation (N) (together with Jan Mulder)

TISBI: Applied Computer Science for Science Business and Innovation

Project System Modelling (together with Jan Mulder and Theo Faes) (N)

3rd year:

Modelling for SBI

Master courses

Basic Models Biological Networks (master Bioinformatics and master Systems Biology) (together with Frank Bruggeman, Bas Teusink, and Joost Hulshof)

Modelling and Simulation for Medical Sciences (together with Ger Stienen, Theo Faes, Jan de Munck)

Editorial service and review

Reviews for *J. Phys. Chem. A* and *B*, *Anal. Chim. Acta*, *Chem. Phys.*, *Chem. Phys. Lett.*, *Journal of Photochemistry and Photobiology A: Chemistry*, *J. Statistical Software*. Guest editor *J. Statistical Software*.

Committees

Member of the Examenscommissie FEW

Chair of the Onderdeelcommissie FEW

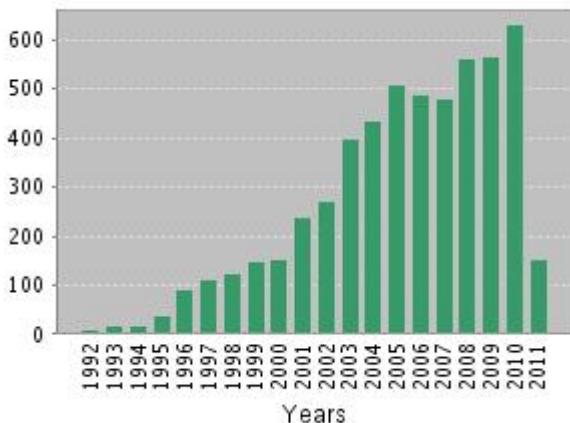
Former member of educational committees, research committee of Physics and Astronomy. Former member of the board of the Netherlands' working group Bioinformatics.

Former chair of the VPR (public relations) committee of the Medical Natural Sciences studies, VU

Summary of research

Applied systems theory has been a corner stone of my research. It started with the development of a new representation of non-stationary stochastic point processes as applied to communication of electric pulse fish. This resulted in a cum laude graduation. Modelling the responses of auditory neurons to a multitude of stimuli resulted in a quantitative mechanistic model that described the measured neuronal selectivity. After the doctorate a new field was entered, modelling and parameter estimation of (time-resolved) spectroscopic data. My first Ph.D. student defended her thesis "Parameter estimation in mathematical models for spectroscopic observations" in 1996. In close collaboration with experimentalists in the Amsterdam area, new methodologies have been developed. These methods have been successfully applied to high-throughput time-resolved spectroscopic data from a multitude of complex chromophoric systems and chromophore-protein systems. The methods have become a corner stone for the analysis of these spectroscopic data, as exemplified by the close collaboration with many Ph.D. students and post-docs. This work has resulted in over 221 publications.

Citations in Each Year



My Hirsch index is 44, and the total number of citations is over 5479. In part of the publications I was first (24) or second (66) or last (7) author. In the remainder, the data analysis and modelling of the complex system under study comprised an essential part of the publication. The most important collaborations have been with members of the groups of Van Grondelle (Biophysics, VUA) and Hellingwerf (Microbiology, UvA). In the past year I have also been collaborating with Van

Amerongen (WUR), and with the new Biophysics VUA professor, Croce. Other collaborations have been with analytical and physical organic chemists, atomic, theoretical and medical physicists, and microbial physiologists.

During the past decade a prototype Problem Solving Environment (PSE) for Hierarchical Modelling of Time-Resolved Spectra has been developed. This environment encompasses the methodology developed during the many successful case studies. It enables both global and target analysis of time-resolved spectra. Global analysis describes the data with a small number of decay rate constants, and their decay associated spectra, which contain the amplitudes of the exponential decays at each wavelength. This corresponds to a kinetic scheme with independently decaying components. However, in a complex system the underlying kinetic scheme is in general much more complicated. To arrive at a more realistic kinetic scheme additional model assumptions are needed, which are based upon physicochemical knowledge. This is a typical example of an inverse problem. To solve this problem a simultaneous analysis of many different experiments using a target model is mandatory. This is termed target analysis. In practice the number of different experiments can be up to 100, and the number of independent data points is typically \sim 100000. This massive amount of data is then summarized by a kinetic scheme with 10-100 kinetic parameters, and 100-1000 spectral parameters. Based upon the plausibility of the estimated parameters, a choice between competing models can be made. In this way the experiments result in a mechanistic understanding of the underlying photo(bio)physics or photo(bio)chemistry. Target analysis methods have been successfully applied to identify and characterize the dynamics of pigment-protein complexes, which are examples of small molecular networks. Gradually the biophysics group of prof. Van Grondelle is investigating also larger photosynthetic complexes, aggregates, membranes, and whole cyanobacteria (together with prof. Van Amerongen, WUR).

My second Ph.D. student defended her thesis "Separable nonlinear models: theory, implementation and applications in physics and chemistry" in 2008. Together with two scientific programmers we are extending the Hierarchical Modelling methodology and implementing the PSE in a cross platform statistical package based upon the R statistical environment. The future aim is to integrate our methodology and PSE also with data analysis in Bioinformatics and Systems Biology.

I am a member of the *Netherlands Institute for Systems Biology (NISB)* and participate in the *Towards Biosolar Cell (TBSC)* programme.

Systems biology of photosynthesis

I am the PI to supervise the oio (Joris Snellenburg) in the FES TBSC project *From proteins to the thylakoid membrane*. Recently a joint FOM/ALW proposal of six NISB PI's in collaboration with two WUR PI's entitled *Expanding society's toolbox to harvest solar energy: Creating multi-scale computational models to optimize oxygenic photosynthesis* has been granted. Here I will also supervise an oio. Together with these two oio's I will develop a PSE for *Systems biology of photosynthesis*. In this PSE models can be developed to describe all thylakoid membrane processes which provide the input (ATP and NADPH) to the Calvin-Benson cycle. The parameters for these models will be estimated by the PSE from sophisticated time-resolved spectroscopical experiments done here and in collaborating groups. Regulatory processes which modify this input, like nonphotochemical quenching (NPQ), are particularly challenging. The main model organism will be a cyanobacterium, *Synechocystis sp. PCC 6803*. The short term goal is a systems biology description of the thylakoid membrane processes of this cyanobacterium. The long term goal is to fine tune this organism to produce fuel.