



DUNDEE

Wellcome Trust Biocentre

Professor Cornelis J Weijer, FRSE

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Professor Yves Brun
Systems Biology/Microbiology Faculty Search
Department of Biology
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Reference for Dr Till Bretschneider

Dear Professor Brun,

Dr Till Bretschneider has asked me to send you a reference on his behalf to support his application for an Assistant Professorship in Systems Biology/Microbiology in the Department of Biology and Biocomplexity Institute

I have known Till since his early days in University of Munich. Till started to work with me as a Diploma student in 1993 in the Zoological Institute in Munich. He came highly recommended by the Director of Undergraduate Studies as being by far the best student in his year. He wanted to work on a more theoretical subject and I suggested that he could perform model calculations to understand three dimensional cAMP wave propagation dynamics in the migrating slug of the social amoebae *Dictyostelium discoideum*. He obtained very interesting results and these were published in the Proceedings of the National Academy of Sciences (USA), where he was first author. From my interactions with him during this time it was clear to me that he was an exceptionally talented student and based on this I offered him a PhD position in my laboratory, which he accepted. During the first year of his PhD I moved from Munich to Dundee to take up a position in the Wellcome Trust Biocentre of the School of Life Sciences, University of Dundee, which ranks among the top 2-3 Institutes for Life Science Research in the UK.

Till moved to Dundee for the remaining 2 years of his PhD. During his PhD work he developed a cell based mathematical model to describe the interactions between cell-cell signaling and cell movement, during the development the social amoebae *Dictyostelium discoideum*. His work resulted in two further


excellent first author publications and he obtained his PhD in 1998. During his Diploma and PhD period Till worked very independently and was highly motivated and always tried to obtain the best possible results. I rank him as one of the top two PhD students, the other being an experimentalist, from 15 that have finished their PhD under my supervision. Most members of my laboratory work experimentally on the molecular details of chemotactic cell movement in Dictyostelium and in the chick embryo. We use a variety of specialized fluorescence microscopy techniques to measure biochemical processes in chemotactically moving Dictyostelium cells. This meant that Till had close contacts with several experimentalists, and this sparked an interest in image processing and analysis, which he has pursued in his further career.

After he finished his PhD he decided for personal reasons to return to Germany, to take up a position in the group of Professor Wolfgang Alt in Bonn. In Bonn he performed more modeling studies and more importantly started an independent experimental approach to investigate the mechanisms underlying cell motility. During this time he developed methods to analyse moving cells in time-lapse microscopic images. Some of the innovative methods, which he developed seemed highly suitable to analyse in vivo biochemical processes such as localized phosphatidyl-inositide (3,4,5) phosphate production in moving Dictyostelium cells and this resulted in another joint publication with my group.

After a few years in Bonn he recognized that it would be essential to keep closer contact with experimental sciences and he applied for a Max Planck postdoctoral fellowship, which enabled him to work with Dr Gunther Gerisch in the Max Planck Institute for Biochemistry, Martinsried. Their collaborative work on the spatio-temporal analysis of dynamics of the actin cytoskeleton in moving Dictyostelium cells using TIRF (total internal reflection microscopy) has resulted in amazing results, showing conclusively that actin polymerisation can spread as propagating waves from several sites in a living cell. Till has been the driving force behind the analysis and interpretation of these data which have been published and are about to appear in leading scientific journals. He has now started to develop detailed mathematical models of the underlying molecular dynamics of the actin myosin cytoskeleton.

In summary Dr Till Bretschneider is an exceptionally talented, highly original and motivated researcher. He has shown particular strength in the analysis of complex biological problems. He has extensive expertise in mathematical modeling, data analysis and data visualization, much sought after characteristics. Furthermore he has a deep understanding of experimental work a rare combination of qualities. On a personal level he is very friendly, open, integer and interacts well with others and will make an ideal colleague. Till seems to fit almost all the characteristics that you require according to your advertisement and I recommend him in the strongest possible terms. In my view Till could be a tremendous asset to your Department. If you require any other information please do not hesitate to contact me directly.

Yours sincerely



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**Letter of Reference for Dr. Till Bretschneider
to Support his Application for a Faculty Position in Systems Biology at
Indiana University, Bloomington**

Till Bretschneider has joined our research group on Cell Dynamics in April 2001 as a fellow for Mathematical Biology of the Schloessmann Foundation. Since April 2003 he holds a position as a Research Scientist in the Schwerpunktprogramm 1128 “Optical Analysis of the Structure and Dynamics of Supramolecular Complexes” of the Deutsche Forschungsgemeinschaft. Till is the principal investigator in this project and has taken the theoretist’s part in our experimentally based group. He is currently analyzing the structure and dynamics of the membrane-anchored actin network, in particular the self-organization of travelling actin waves by the regulated assembly of cytosolic proteins.

In this project, four papers have been published, a fifth one is at the final stage of preparation. These investigations are focussed on the sub-second dynamics of actin networks in live cells, on the localization of regulatory proteins and on their functional relationship to cell motility and phagosome trafficking.

In addition to this work, Till has independently collaborated with Kurt Anderson, head of the imaging facility at the Max-Planck-Institute of Molecular Cell Biology (CBG) in Dresden (now head of a new facility at the Beatson Institute for Cancer Research in Glasgow, UK), and with Jan Faix, a colleague at Munich University (now a professor at the Medical University in Hannover, Germany).

In the past, the modelling of scroll waves generated by cyclic-AMP signals in the differentiating multicellular organism of Dictyostelium has been one of Till’s principal

subjects. As a member of the Sonderforschungsbereich “Non-linear partial differential equations” of the Deutsche Forschungsgemeinschaft at the University of Bonn he developed computer programs to quantitatively analyze changes of cell shape in response to chemical signals. These programs became valuable tools, in our as well as in other groups, for the analysis of altered cell functions in mutant cells that are deficient in specific cytoskeletal proteins.

Till soon received a key position in our group, thanks to his mathematical expertise and his imagination in developing tools for the extraction of quantitative parameters out of large sets of experimental data. He is exceptionally cooperative and enjoys to distribute his excellent knowledge and practical experience in advanced image analysis and in the modelling of pattern formation based on non-linear interactions in biological systems.

Till participates also efficiently in the teaching activities of our group. He supervised undergraduates and co-supervised graduate students. Till is always ready to develop sophisticated strategies to analyze data sets of live-cell imaging, and did so recently for shear-flow experiments performed in collaboration with an EMBO short-term fellow from CEA, Grenoble. In daily work, everybody in the laboratory profits from his assistance and advice. I am pleased to strongly recommend Till Bretschneider for a faculty position with a focus on computational systems biology and modelling of intra- and intercellular networks.

Martinsried, 28. November 2005

Dr. Günther Gerisch
Director Emeritus of the Cell Biology Department



References

Letters of recommendation have been sent by:

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