

Dirk Pette, remembered for his pioneering muscle research

Eur J Transl Myol 34 (2) 12681, 2024 doi: 10.4081/ejtm.2024.12681

Dirk Pette, remembered for his pioneering muscle research

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Abstract

It is with great sadness that we learned of the passing of Prof. Dr. Dr. h.c. Dirk Pette. He passed away suddenly and unexpectedly on June 4, 2022. Dirk was an outstanding professor of biochemistry at the University of Konstanz, Germany and an internationally renowned researcher in the field of skeletal muscle biology. His research on electrical stimulation has had a profound impact on our understanding of myofiber type specification and the enormous adaptive potential of skeletal muscle. Under Dirk's leadership, new biological questions in the field of neuromuscular biology have developed into multidisciplinary approaches using advanced physiological, cell biological, and biochemical techniques. Dirk's research laboratory was frequently visited by a large number of national and international collaborators who familiarized themselves with the technically demanding stimulation protocols and bioanalytical techniques to study the intricate details of the highly complex process of fast-to-slow muscle transitions. Importantly, fundamental studies on the physiological effects of changes in innervation patterns on muscle phenotype have provided the scientific evidence base for a variety of innovative clinical applications. The skeletal muscle research community has lost one of its leading figures and an outstanding teacher of protein biochemistry. He leaves an inspiring legacy in the field of basic and applied myology. Dirk will be missed by his colleagues and by many students of neuromuscular biology and beyond.

Key Words: Dirk Pette; muscle biochemistry; neuromuscular electrical stimulation; skeletal muscle plasticity.

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It was with great sadness that we learned of the loss of Prof. Dr. Dr. h.c. Dirk Pette who passed away suddenly and unexpectedly on the 4th of June 2022 (Figure 1). Dirk was an outstanding Professor of Biochemistry at the University of Konstanz, Germany and an internationally renowned researcher in the field of skeletal muscle biology. His electrical-stimulation research had a profound impact on our understanding of myofiber type specification and the enormous adaptive potential of skeletal muscle. Dirk was born on the 14th of February 1933 and studied Medicine in Hamburg and Geneva. After

completing his medical doctorate in 1958, he received his habilitation in 1963 in Physiological Chemistry at the University of Marburg. As Professor and Chair of Biochemistry in the newly founded University of Konstanz, Dirk taught enzymology, bioenergetics and metabolic biochemistry in the Faculty of Biology from 1967 to 1999. He had a remarkably broad knowledge of protein chemistry, biochemical pathways and their regulation. His undergraduate classes were exceptionally well received and based on the concept of research-based teaching and accompanying practical sessions with

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Figure 1. Dirk Pette, November 26, 2016. Born on the 14th of February 1933, he passed away suddenly on the 4th of June 2022.

elaborate bioanalytical experiments. His detailed approach to both teaching and research embodied the ‘New Biology’ initiative at the University of Konstanz in the late 1960s that defined the modern biological sciences less by its methodology but more by its scientific subject matter. Under Dirk’s leadership, new biological questions in the field of neuromuscular biology developed into multidisciplinary approaches using advanced physiological, cell biological and biochemical techniques. Dirk’s research laboratory was frequently visited by a large number of national and international collaborators who familiarized themselves with the technically challenging stimulation protocols and bioanalytical techniques to study intricate details of the highly complex process of fast-to-slow muscle transitions. Importantly, the fundamental studies of the physiological effects of changes in innervation patterns on the muscle phenotype provided the scientific basis of evidence for a variety of innovative clinical applications. Dirk was generous with his time helping young scientists with grant writing, designing papers and developing new techniques. Writing sessions were frequently interrupted with coffee breaks discussing wider societal issues and telling anecdotes of the more humorous side of academic life. Dirk had a keen interest in biochemical methods for single muscle fiber analysis. His initial focus on histochemistry and immunohistochemistry moved quickly to advanced quantitative micro-methods. Microphotometry and microbiochemical assays were established as ideal techniques to assess metabolic enzyme activity levels in fast versus slow myofibers. Starting in the 1970s, a lifelong collaboration with Gerta Vrbová established chronic electrostimulation as an ideal model system to evaluate the influence of motor neuron activity on distinct

muscle phenotypes. Their elaborate studies characterized in detail the time course of skeletal muscle transitions at various levels of molecular and cellular organization. This included the effects of neuronal stimulation and hormonal influences on the density and isoform expression patterns of key proteins involved in the excitation-contraction-relaxation cycle, ion homeostasis and bioenergetic pathways. A remarkable result of electrostimulation studies was the finding that young versus old muscles showed relatively comparable levels in certain aspects of tissue plasticity. Thus, the initial aging process of voluntary muscles does not appear to be triggered intrinsically, but aging-related degeneration of the musculature seems to be at least partially initiated by external factors such as impaired innervation patterns. These topics of fundamental importance for promoting healthy muscles were brought to a general audience by Dirk in a well-received publication in 1998 as part of a series of presentations held in Konstanz, entitled ‘Alter Muskel rostet nicht’ (old muscles don’t get rusty). Dirk published over 300 influential scientific papers on various aspects of biochemistry and chaired two highly successful collaborative research centers of the German Science Foundation from 1973 to 1998 focusing on ‘Biological interfaces and specificity’ and ‘Mechanisms of cellular communication’. For his excellence in research, he received the Robert Feulgen Prize of the German Society for Histochemistry in 1972, the J.B. Wolffe Honorary Lecture of the American College of Sports Medicine in 1984, the “Dirk Pette Symposium” of the Royal Danish Academy of Sciences in Copenhagen in 1999, an honorary doctorate from the University of Waterloo, Canada in 2000 and the Duchenne-Erb Prize of the German Society for Muscular Diseases in 2005. He was editor of highly quoted journals, including *Histochemistry and Cell Biology* and *Reviews of Physiology, Biochemistry and Pharmacology*. His books with a broad focus on ‘Plasticity of Muscle’ (Berlin, 1980)¹ and ‘The Dynamic State of Muscle Fibers’ (Berlin, 1990)² are well designed overviews of the importance of skeletal muscle adaptations. An excellent review by Dirk Pette on muscle plasticity summarized and critically discussed in a 2002 article set the scene for further studies on the molecular and cellular basis that underlies muscle adaptations and fiber type specification over the last two decades of myology research.³ Among the many coauthors of his numerous publications, he often published original papers and key reviews with Gerta Vrbová.⁴⁻⁷ With Gerta he also was a key speaker at the Padua Muscle Days (PMD), recently renamed Padua Days on Muscle and Mobility Medicine (Pdm3). The last time he was in Thermae of Euganean Hills, Padua, Italy was for the 2017 Conference still accompanied by his beloved wife Fanny and Gerta (Figure 2).⁸ But we older people were lucky enough to meet him when we were all very young, precisely in 1983 at the 1st Vienna International Workshop on Functional Electrical Stimulation – Basics, Technology and Application. Vienna (Austria) October 19-22, 1983 (Figure 3)⁹ and then at his Constance Conferences in Germany in 1979 and 1989.^{1,2} At the 1st Vienna

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Figure 2. Dirk Pette at the 2017 Padua Muscle Days: Translational Myology for Impaired Mobility – Thermae of Euganean Hills, Padua, Italy, March 23-25, 2017. From left to right: Ugo Carraro, Fanny Pette, Gerta Vrbová, and Dirk Pette.



Figure 3. First Vienna International Workshop on Functional Electrostimulation – Basics, Technology and Application. Vienna (Austria) October 19-22, 1983.

International Workshop on Functional Electrical Stimulation in Vienna he was the keynote speaker and, as session chair, he allowed one of us to continue his presentation to fill the time of a missing speaker. An unforgettable emotion.¹⁰

The skeletal muscle research community has lost one of its leading figures and an outstanding teacher of protein biochemistry. He leaves an inspirational legacy in the field of basic and applied myology. Dirk will be missed by his colleagues and many students of neuromuscular biology and beyond.

Key information on Dirk Pette's outstanding scientific work and selected references

For full details see the PubMed Data Base for Dirk Pette at the link: https://pubmed.ncbi.nlm.nih.gov/?term=Pette%20Dirk&sort=date&sort_order=desc.

Article in the newspaper Südkurier (3 August 2019) on Dirk Pette's extraordinary achievements as a scientist and educator: Der emeritierte Professor Dirk Pette über den Exzellenz-Erfolg der Uni Konstanz: "Den Grundstein haben wir damals gelegt". <https://www.suedkurier.de/region/kreis-konstanz/konstanz/Der-emeritierte-Professor-Dirk-Pette-ueber-den-Exzellenz-Erfolg-der-Uni-Konstanz-Den-Grundstein-haben-wir-damals-gelegt;art372448,10234136>

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Article by Dirk Pette on the research-informed teaching philosophy that formed the basis of the 'New Biology' concept; as part of a series of essays by friends and companions of the University of Konstanz (50 year anniversary).

Pette D. Eine neue Biologie am Konstanzer Sonnenbühl' <https://www.uni-konstanz.de/universitaet/ueber-die-universitaet-konstanz/profil/50-jahre-universitaet-konstanz/uni-kon-sonderausgabe-zum-jubilaeum/texte/>

Presentation by Dirk Pette to a general audience as part of a series of talks held in Konstanz. An accompanying booklet, published in 1998 by the University of Konstanz, summarizes the main points of his presentation on muscle plasticity and its relevance for promoting healthy aging.

Pette D. Alter Muskel rostet nicht. Konstanzer Universitätsreden, Band 196 (Sund, H., ed.). UVK Universitätsverlag Konstanz GmbH. 1998. ISBN 3-87940-640-5

List of abbreviations

CIR MYO, Interdepartmental Research Centre of Myology
EJTM, European Journal of Translational Myology
IIM, Interuniversity Institute of Myology
Pdm3, Padua Days on Muscle and Mobility Medicine
PMD, Padua Muscle Days

Acknowledgments

The authors thank the Armando & Carmela Mioni-Carraro Foundation for Translational Myology, Padua, Italy for covering the publication costs.

Funding

None.

Conflict of interest

The authors disclose no conflicts of research interest.

Ethics approval and consent to participate

Not applicable.

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Submitted: 21 May 2024.
Accepted: 21 May 2024.
Early access: 22 May 2024.

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