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- **Personal Information:**

Date and place of birth:	June 10, 1963, Ahnsen, Germany
Citizenship:	German
Family status	Married / Prof. Cordula Boden

- **Education and Scientific Career:**

1982-88	Studies in physics, University of Hannover
1988	Degree thesis in physics, University of Hannover “Charge exchange processes for generation of inversion in short wavelength lasers”, grade: excellent
1992	Ph.D., University of Hannover (supervisor: H. Welling/B. Wellegehausen) “Novel methods for the generation of short wavelength coherent radiation”, grade: distinction – summa cum laude
1988-92	Research staff, University of Hannover
1992-98	Head of research & development, Laser Zentrum Hannover
1997	Habilitation and venia legendi in experimental physics, University of Hannover “Ultrastable diode-pumped solid-state lasers”
since 1998	Professor - Chair for Applied Physics, Friedrich Schiller University Jena
since 2003	Director of the Fraunhofer Institute of Applied Optics and Precision Engineering
since 2009	Member of the Directorate of the Helmholtz Institute Jena
2009-15	Member of the Executive Committee of the Fraunhofer Gesellschaft
since 2015	Group Chairman of Scientific and Technical Council of the Fraunhofer Gesellschaft

- **Interdisciplinary affiliations and administrative experience**

Member of the supervisory board of Jenoptik AG
Member of the supervisory board of ARRI AG
Member of the advisory committee of DocterOptics SE
Member of the investment board bm-t/MFT Thüringer Aufbaubank
Founder and partner of the company Guided Color Technologies GmbH, Jena
Founding member and board of directors of optics cluster OptoNet e. V. Jena
Stakeholder of the European Photonics 21 platform
Director Max-Planck-School of Photonics
Member of the board of the Wissenschaftliche Gesellschaft für Lasertechnik
Member of the board of the Abbe School of Photonics
Consultant for the German Ministry of Education and Research (BMBF), Referat QT
General chair, general co-chair, program chair of international conferences

Guest editor, trustee and referee for renown international journals
Reviewer for national and internal funding organizations

- **Grants / Awards (a selection)**

Lothar Späth Preis
"…for his pioneering work in the development of advanced ultrafast laser systems…"
Kaiser Friedrich Award
"…for the development of imaging solutions in cancer diagnostics…"
Fellow of the Max-Planck-School of Photonics – Max Planck Gesellschaft
"…for his outstanding scientific contributions in photonics…"
ERC-Advanced Grant – EU
"…for the combination of petawatt (PW) peak powers with megawatt (MW) average powers based on fiber technology"
Gottfried Wilhelm Leibniz Prize of the German Research Foundation - DFG
"…for outstanding contributions in the field of high power diode-pumped solid state and fibre laser technology"
Fellow of the Optical Society of America
"… for outstanding work and leadership in high power solid state and fibre laser technology and pioneering contributions to the development in laser micromachining"
Fellow of the SPIE
"… for pioneering work in the field of fibre lasers and amplifiers"
Friedrich-Kaiser Research Award
"… for advanced solutions in cancer diagnostic imaging"
Schott-Award of the Zeiss Foundation
"… for pioneering work in the field of microstructured optical fibres and fibre lasers"
Leibinger-Innovation Award (Trumpf-Laser)
"… for important contributions in fibre laser technology"
Thuringian Research Award for Applied Sciences
"… for outstanding work and leadership in the development of advanced techniques in microscopy"
Röntgen-Prize, Justus-Liebig-Universität Gießen
„… for the investigation of novel nonlinear processes to generate short wavelength radiation"
WLT Prize (Wissenschaftliche Gesellschaft für Lasertechnik)
"… for pioneering work in the generation of short wavelength coherent radiation"
Elected member of acatech – German National Academy of Science and Engineering
Order of Merit of the Free State of Thuringia

- **Teaching activities**

since 1998 Lecturer at the University of Jena, Germany
Experimental Physics, Structure of Matter, Fundamentals of Laser Physics, Physics of Atoms and Molecules, Thin Film Optics, Integrated Optics

- **Major contributions to the early careers of excellent researchers**

Prof. Andreas Tünnermann has supervised more than 250 Bachelor, Master and Diploma theses in photonics. Since 1998, he was acted as supervisor of 100 completed PhD theses in experimental physics. Several alumni from his research group are now professors or established in leading positions in industry. He is a mentor to young scientists and has established an exemplary system to promote the independent scientific personal development of young scientists by the establishment of early career junior research groups. He was one of the first chairs in physics, who started junior professorships at his institute.

- **Examples of leadership in industrial innovation or design**

Prof. Andreas Tünnermann is founder of the company Guided Color Technolgy working in the field of integrated optics, which has been acquired by Jenoptik. He is a sought-after expert in the optics and photonics industry and a member of the supervisory boards of listed companies. He is founder and member of the board of directors of the industry driven cluster OptoNet Jena, one of the most dynamic regional optics clusters in Europe. Today, OptoNet represents companies with more than 14,000 employees and a total turnover of bn€ 3.6 around the city of Jena – prominent partners include companies such as Zeiss, Jenoptik and Schott.

Track record

Prof. Andreas Tünnermann, affiliated with the Friedrich Schiller University Jena and the Fraunhofer Institute for Applied Optics and Precision Engineering, enjoys an excellent reputation in the laser physics community, and is currently leading one of the most creative and productive laser research groups in the world. The research interests of Andreas Tünnermann are focused on fundamental principles as well as sophisticated technical aspects and applications associated with the tailoring of light. He has a unique combination of considerable experience in the development of continuous-wave and pulsed solid-state lasers, including waveguide lasers, and profound knowledge of nonlinear optics in waveguide structures and volume-optical media. This blend of experience and knowledge has attracted considerable attention and manifests itself in more than 650 peer-reviewed publications in reputable journals, in addition to more than 250 invited talks including plenary talks and tutorials at prestigious national and international conferences (**h-index: 78**). In addition, he is inventor or co-inventor of more than **20 granted patents/applied patents in the field of photonics**.
His early developments on high-power diode-pumped solid-state lasers with diffraction-limited beam quality are widely recognized, his work on monolithic Nd:YAG non planar ring lasers enabled them to become key elements in modern high-precision metrology [Opt. Comm. 115, 5-6, 511 (1995)]. Later in his career, Prof. Tünnermann focused on rare-earth-doped fibers as gain medium architecture. In 1995, his group at the Laser Center Hannover demonstrated the extraction of 9.2 W power from a Neodymium-doped fibre laser with diffraction-limited beam quality [Opt. Lett. 20, 578-580 (1995)]. At that time, this record result changed the view of fiber lasers in the entire laser community: from laboratory curiosity to a laser scheme with extraordinary potential.
Applying novel fiber designs and experimental strategies, Andreas Tünnermann and his team were able to scale the output power of these systems to the multi-kW range [Opt. Lett. 36, 3118–3120 (2011),]. This groundbreaking work yielded a variety of developments in laser technology and has found many advanced applications in basic science and industry. Major laser companies have adopted these concepts to develop advanced solid-state lasers.
Based on advanced ytterbium-doped photonic crystal fibers, ultrafast laser systems have been developed in his laboratories, delivering world record average powers as high as 1 kW and pulse energies well above 1 mJ in the 1 µm wavelength region [Opt. Lett. 35, 94-96 (2010); Opt. Lett. 32, 3495-3497 (2007)]. This performance, in particular the significantly higher repetition rate compared to conventional femtosecond lasers, allows for unique approaches in several application fields.
In this vein, Andreas Tünnermann is also known for his pioneering work in utilizing high power femtosecond lasers for material processing [Appl. Phys. A 63, 2, 109 (1996), 1093 citations]. In collaboration with his co-workers he demonstrated new prospects for ultra precise laser-based microstructure technology. Due to the rapid progress in this field, thought is currently geared to “real-world” industrial applications for these ultrafast lasers. It is worthy of mention that Prof. Stefan Nolte (also affiliated with the IAP Jena), together with colleagues from Bosch and Trumpf, was awarded the prestigious German “Zukunftspreis” in 2013. Andreas Tünnermann has been mentor of Stefan Nolte since his very first career steps in Hannover 15 years ago. Key elements within these developments include the above-mentioned ultrafast high-performance fiber lasers. Applying these lasers, typical machining times could be reduced by more than one order of magnitude [Opt. Lett. 30, 2754 (2005); Opt. Lett. 32, 3495 (2007); Appl. Phys. A 94, 19 (2009)].
Starting from this expertise on laser-matter interaction, Andreas Tünnermann established a junior research group (Junior Prof. Alexander Szameit) devoted to three-dimensional integrated optical devices and fundamental quantum-optical phenomena [e.g. Nature Photonics 7, 153 (2012), Nature Physics 5, 271 (2009)].
Most recently, Andreas Tünnermann has again broken new ground: applying the technique of coherent combination, he was able to demonstrate pioneering experiments on the scalability of ultrafast fiber laser systems [Opt. Express 19, 25379-25387 (2011); Opt. Lett. **38**, 2283-2285 (2013)]. Today’s record peak

power has been pushed to 22 GW, which is far beyond the capability of a single fiber system. This outstanding work is proving that the technique of spatially separated amplification will be the basis for novel performance realms of ultrafast lasers in general and makes his team confident that high repetition rate multi-TW-class table-top fiber laser systems will be realized in the near future.

10 representative journal publications (2006 – 2019)

- T. Eidam, S. Hanf, E. Seise, A. Tünnermann, et al., “Femtosecond fiber CPA system emitting 830 W average output power,” Opt. Lett. 35, 2, 94 (2010).
- F. Röser, T. Eidam, J. Rothhardt, A. Tünnermann, et al., “Millijoule pulse energy high repetition rate femtosecond fiber chirped-pulse amplification system,” Opt. Lett. 32, 24, 3495 (2007).
- T. Eidam, C. Wirth, C. Jauregui, A. Tünnermann, et al., “Experimental observations of the threshold-like onset of mode instabilities in high power fiber amplifiers,” Opt. Express 19, 14, 13218 (2011).
- F. Stutzki, F. Jansen, T. Eidam, A. Tünnermann, et al., “High average power large-pitch fiber amplifier with robust single-mode operation,” Opt. Lett. 36, 5, 689 (2011).
- A. Klenke, S. Breitkopf, M. Kienel, T. Gottschall, T. Eidam, S. Hädrich, J. Rothhardt, J. Limpert, and A. Tünnermann, “530 W, 1.3 mJ, four-channel coherently combined femtosecond fiber chirped-pulse amplification system,” Opt. Lett. **38**, 2283-2285 (2013).
- C. Jauregui, J. Limpert, and A. Tünnermann, ”High-power fibre lasers,” Nature Photonics 7, 555–559 (2013).
- I. Pupeza, S. Holzberger, T. Eidam, H. Carstens, D. Esser, J. Weitenberg, P. Rußbüldt, J. Rauschenberger, J. Limpert, Th. Udem, A. Tünnermann, T. W. Hänsch, A. Apolonski, F. Krausz & E. Fill, “Compact high-repetition-rate source of coherent 100 eV radiation,” Nature Photonics 7, 608–612 (2013)
- S. Hädrich, A. Klenke, J. Rothhardt, M. Krebs, A. Hoffmann, O. Pronin, V. Pervak, J. Limpert & A. Tünnermann, “High photon flux table-top coherent extreme-ultraviolet source,” Nature Photonics 8, 779–783 (2014)
- M. Chemnitz, M. Gebhardt, C. Gaida, F. Stutzki, J. Kobelke, J. Limpert, A. Tünnermann, M.A. Schmidt, "Hybrid soliton dynamics in liquid-core fibres," Nature Commun. 8, 42 (2017).
- C. Stihler, C. Jauregui, A. Tünnermann, J. Limpert, "Modal energy transfer by thermally induced refractive index gratings in Yb-doped fibers," Light-Sci. Appl. 7, 59 (2018).

A complete publication list of Prof. Andreas Tünnermann can be found at:
http://www.iap.uni-jena.de/Institute/People