



Debbie Senesky

Assistant Professor of Aeronautics and Astronautics and, by courtesy, of Electrical Engineering

CONTACT INFORMATION

- **Administrator**

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Bio

BIO

Debbie G. Senesky is an Assistant Professor at Stanford University in the Aeronautics and Astronautics Department and by courtesy, the Electrical Engineering Department. In addition, she is the Principal Investigator of the EXtreme Environment Microsystems Laboratory (XLab). Her research interests include the development of nanomaterials for extreme harsh environments, high-temperature electronics, and robust instrumentation for Venus exploration. In the past, she has held positions at GE Sensing (formerly known as NovaSensor), GE Global Research Center, and Hewlett Packard. She received the B.S. degree (2001) in mechanical engineering from the University of Southern California. She received the M.S. degree (2004) and Ph.D. degree (2007) in mechanical engineering from the University of California, Berkeley. Prof. Senesky recently chaired the 2018 Women in Aerospace Symposium (WIA2018) at Stanford University. She has served on the technical program committee of the IEEE International Electron Devices Meeting (IEEE IEDM), International Conference on Solid-State Sensors, Actuators, and Microsystems (Transducers), and International Symposium on Sensor Science (I3S). She is currently the co-editor of three technical journals: IEEE Electron Device Letters, Sensors, and Micromachines. In addition, she currently serves on the board of directors of the non-profit organization Scientific Adventures for Girls. In recognition of her research, she received the Emerging Leader Abie Award from AnitaB.org in 2018, Early Faculty Career Award from the National Aeronautics and Space Administration (NASA) in 2012, Gabilan Faculty Fellowship Award in 2012, and Sloan Ph.D. Fellowship from the Alfred P. Sloan Foundation in 2004.

Prof. Senesky's career path and research has been featured on the People Behind the Science podcast, the Future of Everything radio show, Space.com, and NPR's Tell Me More program. More information about Prof. Senesky can be found at <https://xlab.stanford.edu>, on Instagram (@debbiesenesky), and on Twitter (@debbiesenesky).

ACADEMIC APPOINTMENTS

- Assistant Professor, Aeronautics and Astronautics
- Assistant Professor (By courtesy), Electrical Engineering
- Affiliate, Precourt Institute for Energy

HONORS AND AWARDS

- Selected Participant, Stanford Faculty Entrepreneurial Leadership Program (2019)
- Emerging Leader Abie Award in Honor of Denice Denton, AnitaB.org (2018)
- Selected Participant, US Frontiers of Engineering Symposium, National Academy of Engineering (2016)

- Golden Reviewer, IEEE Electron Devices Letters (2015)
- Early Faculty Career Award, National Aeronautics and Space Administration (NASA) (2012)
- Frederick E. Terman Faculty Fellow, Stanford University (2012)
- Gabilan Faculty Fellow, Stanford University (2012)
- Sloan Ph.D. Fellowship, Alfred P. Sloan Foundation (2004-2006)

BOARDS, ADVISORY COMMITTEES, PROFESSIONAL ORGANIZATIONS

- Technical Advisor, Boreal Space (2019 - present)
- Faculty Advisor, Stanford Chapter, National Society of Women Engineers (SWE) (2018 - present)
- Editor, Micromachines (Journal) (2017 - present)
- Advisory Board, UC Berkeley, Department of Mechanical Engineering (2016 - present)
- Editor, IEEE Electron Devices Letters (2016 - present)
- Board Member, Scientific Adventures for Girls (2015 - present)
- Editor, Sensors (Journal) (2015 - present)

PROGRAM AFFILIATIONS

- Stanford SystemX Alliance

PROFESSIONAL EDUCATION

- B.S., University of Southern California , Mechanical Engineering (2001)
- M.S., University of California, Berkeley , Mechanical Engineering (2004)
- Ph.D., University of California, Berkeley , Mechanical Engineering (2007)

LINKS

- How do we build electronic materials that can survive radiation?: <https://aa.stanford.edu/news/how-do-we-build-electronic-materials-can-survive-radiation>
- Debbie Senesky receives the 2018 Emerging Leader Abie Award: <https://news.stanford.edu/thedish/2018/08/14/debbie-senesky-receives-the-2018-emerging-leader-abie-award/>
- Interview on "Exploring Venus": <https://engineering.stanford.edu/magazine/article/debbie-senesky-developing-electronics-extremes-space>
- New nano devices could withstand extreme environments in space and on earth: <https://news.stanford.edu/2017/03/28/new-nano-devices-withstand-extreme-environments-of-space/>
- Meet our Faculty: <https://news.stanford.edu/2016/12/20/meet-stanford-faculty/>
- Interview on People Behind the Science: <http://www.peoplebehindthescience.com/dr-debbie-senesky/>
- Debbie Senesky receives a 2012 NASA Early Career Faculty Award: https://www.nasa.gov/directorates/spacetech/strg/2012_space_tech_opps_senesky.html

Teaching

COURSES

2018-19

- Lightweight Structures: AA 151 (Spr)
- Smart Structures: AA 280 (Win)

2017-18

- 3D Printed Aerospace Structures: AA 119N (Aut)
- Analysis of Structures: AA 240B (Win)
- Smart Structures: AA 280 (Spr)

2016-17

- 3D Printed Aerospace Structures: AA 119N (Aut)
- Analysis of Structures: AA 240B (Win)
- Smart Structures: AA 280 (Spr)

2015-16

- Analysis of Structures: AA 240B (Win)
- Smart Structures: AA 280 (Spr)

STANFORD ADVISEES

Postdoctoral Faculty Sponsor

Caitlin Chapin, Saleh Kargarrazi

Doctoral Dissertation Advisor (AC)

Chen Liu

Master's Program Advisor

Jiya Janowitz

Publications

PUBLICATIONS

- **500 degrees C SiC PWM Integrated Circuit** *IEEE TRANSACTIONS ON POWER ELECTRONICS*
Kargarrazi, S., Elahipanah, H., Saggini, S., Senesky, D., Zetterling, C.
2019; 34 (3): 1997–2001
- **Strain Effect in Highly-Doped n-Type 3C-SiC-on-Glass Substrate for Mechanical Sensors and Mobility Enhancement** *PHYSICA STATUS SOLIDIA A-APPLICATIONS AND MATERIALS SCIENCE*
Hoang-Phuong Phan, Tuan-Khoa Nguyen, Toan Dinh, Cheng, H., Mu, F., Iacopi, A., Hold, L., Dzung Viet Dao, Suga, T., Senesky, D. G., Nam-Trung Nguyen
2018; 215 (24)
- **High Responsivity, Low Dark Current Ultraviolet Photodetectors Based on Two-Dimensional Electron Gas Interdigitated Transducers** *ACS PHOTONICS*
Satterthwaite, P. F., Yalamarthy, A., Scandrette, N. A., Newaz, A. M., Senesky, D. G.
2018; 5 (11): 4277–82
- **Highly sensitive pressure sensors employing 3C-SiC nanowires fabricated on a free standing structure** *MATERIALS & DESIGN*
Hoang-Phuong Phan, Dowling, K. M., Tuan Khoa Nguyen, Toan Dinh, Senesky, D. G., Namazu, T., Dzung Viet Dao, Nam-Trung Nguyen
2018; 156: 16–21
- **Highly sensitive 4H-SiC pressure sensor at cryogenic and elevated temperatures** *MATERIALS & DESIGN*
Tuan-Khoa Nguyen, Hoang-Phuong Phan, Toan Dinh, Dowling, K. M., Foisal, A., Senesky, D. G., Nam-Trung Nguyen, Dzung Viet Dao
2018; 156: 441–45
- **A Single Input Multiple Output (SIMO) Variation-Tolerant Nanosensor.** *ACS sensors*
Moon, D., Kim, B., Peterson, R., Badokas, K., Seol, M., Senesky, D. G., Han, J., Meyyappan, M.
2018
- **Tuning Electrical and Thermal Transport in AlGaIn/GaN Heterostructures via Buffer Layer Engineering** *ADVANCED FUNCTIONAL MATERIALS*
Yalamarthy, A., So, H., Rojo, M., Suria, A. J., Xu, X., Pop, E., Senesky, D. G.
2018; 28 (22)
- **Graphene-enhanced gallium nitride ultraviolet photodetectors under 2 MeV proton irradiation** *APPLIED PHYSICS LETTERS*
Miller, R. A., So, H., Chiamori, H. C., Dowling, K. M., Wang, Y., Senesky, D. G.
2017; 111 (24)

- **In situ ultraviolet shock radiance measurements using GaN-on-sapphire photodetectors** *REVIEW OF SCIENTIFIC INSTRUMENTS*
Miller, R. A., Cruden, B. A., Martinez, R., Senesky, D. G.
2017; 88 (11): 115004
- **Highly antireflective AlGaIn/GaN ultraviolet photodetectors using ZnO nanorod arrays on inverted pyramidal surfaces** *APPLIED SURFACE SCIENCE*
So, H., Lim, J., Suria, A. J., Senesky, D. G.
2017; 409: 91-96
- **Lithography-free microfabrication of AlGaIn/GaN 2DEG strain sensors using laser ablation and direct wire bonding** *MICROELECTRONIC ENGINEERING*
Dowling, K. M., So, H., Toor, A., Chapin, C. A., Senesky, D. G.
2017; 173: 54-57
- **Profile Evolution of High Aspect Ratio Silicon Carbide Trenches by Inductive Coupled Plasma Etching** *JOURNAL OF MICROELECTROMECHANICAL SYSTEMS*
Dowling, K. M., Ransom, E. H., Senesky, D. G.
2017; 26 (1): 135-142
- **Suppression of Persistent Photoconductivity in AlGaIn/GaN Ultraviolet Photodetectors Using In Situ Heating** *IEEE ELECTRON DEVICE LETTERS*
Hou, M., So, H., Suria, A. J., Yalamarthy, A. S., Senesky, D. G.
2017; 38 (1): 56-59
- **LOW-TEMPERATURE AND PRESSURE RESPONSE OF InAlN/GaN RING-SHAPED HIGH ELECTRON MOBILITY TRANSISTORS**
Chapin, C. A., Miller, R. A., Chen, R., Dowling, K. M., Senesky, D. G., IEEE
IEEE.2017: 786-89
- **ZnO nanorod arrays and direct wire bonding on GaN surfaces for rapid fabrication of antireflective, high-temperature ultraviolet sensors** *APPLIED SURFACE SCIENCE*
So, H., Senesky, D. G.
2016; 387: 280-284
- **Wafer-level MOCVD growth of AlGaIn/GaN-on-Si HEMT structures with ultra-high room temperature 2DEG mobility** *AIP ADVANCES*
Xu, X., Zhong, J., So, H., Norvilas, A., Sommerhalter, C., Senesky, D. G., Tang, M.
2016; 6 (11)
- **DC characteristics of ALD-grown Al₂O₃/AlGaIn/GaN MIS-HEMTs and HEMTs at 600 degrees C in air** *SEMICONDUCTOR SCIENCE AND TECHNOLOGY*
Suria, A. J., Yalamarthy, A. S., So, H., Senesky, D. G.
2016; 31 (11)
- **A microfabricated sun sensor using GaN-on-sapphire ultraviolet photodetector arrays** *REVIEW OF SCIENTIFIC INSTRUMENTS*
Miller, R. A., So, H., Chiamori, H. C., Suria, A. J., Chapin, C. A., Senesky, D. G.
2016; 87 (9)
- **Rapid fabrication and packaging of AlGaIn/GaN high-temperature ultraviolet photodetectors using direct wire bonding** *JOURNAL OF PHYSICS D-APPLIED PHYSICS*
So, H., Senesky, D. G.
2016; 49 (28)
- **Continuous V-Grooved AlGaIn/GaN Surfaces for High-Temperature Ultraviolet Photodetectors** *IEEE SENSORS JOURNAL*
So, H., Lim, J., Senesky, D. G.
2016; 16 (10): 3633-3639
- **Interdigitated Pt-GaN Schottky interfaces for high-temperature soot-particulate sensing** *APPLIED SURFACE SCIENCE*
So, H., Hou, M., Jain, S. R., Lim, J., Senesky, D. G.
2016; 368: 104-109
- **Strain- and temperature-induced effects in AlGaIn/GaN high electron mobility transistors** *SEMICONDUCTOR SCIENCE AND TECHNOLOGY*
Yalamarthy, A. S., Senesky, D. G.
2016; 31 (3)

- **Low-resistance gateless high electron mobility transistors using three-dimensional inverted pyramidal AlGaIn/GaN surfaces** *APPLIED PHYSICS LETTERS*
So, H., Senesky, D. G.
2016; 108 (1)
- **4th International Symposium on Sensor Science (I3S2015): Conference Report.** *Sensors*
Seitz, P., Senesky, D. G., Schöning, M. J., Hauser, P. C., Moser, R., Herzig, H. P., Melesse, A. M., Broderick, P. A., Eugster, P. T.
2015; 15 (9): 24458-24465
- **4H-SiC N-Channel JFET for Operation in High-Temperature Environments** *IEEE JOURNAL OF THE ELECTRON DEVICES SOCIETY*
Lien, W., Damrongplait, N., Paredes, J. H., Senesky, D. G., Liu, T. K., Pisano, A. P.
2014; 2 (6): 164-167
- **Operation of ohmic Ti/Al/Pt/Au multilayer contacts to GaN at 600 degrees C in air** *APPLIED PHYSICS LETTERS*
Hou, M., Senesky, D. G.
2014; 105 (8)
- **Temperature sensor based on 4H-silicon carbide pn diode operational from 20 degrees C to 600 degrees C** *APPLIED PHYSICS LETTERS*
Zhang, N., Lin, C., Senesky, D. G., Pisano, A. P.
2014; 104 (7)
- **Characterization of gallium nitride microsystems within radiation and high-temperature environments** *Conference on Reliability, Packaging, Testing, and Characterization of MOEMS/MEMS, Nanodevices, and Nanomaterials XIII*
Chiamori, H. C., Hou, M., Chapin, C. A., Shankar, A., Senesky, D. G.
SPIE-INT SOC OPTICAL ENGINEERING.2014
- **Emerging GaN-based HEMTs for mechanical sensing within harsh environments** *Conference on Sensors for Extreme Harsh Environments*
Koeck, H., Chapin, C. A., Ostermaier, C., Haeberlen, O., Senesky, D. G.
SPIE-INT SOC OPTICAL ENGINEERING.2014
- **Characterization of Irradiated and Temperature-compensated Gallium Nitride Surface Acoustic Wave Resonators** *Conference on Sensors for Extreme Harsh Environments*
Shankar, A., Angadi, C., Bhattacharya, S., Lin, C., Senesky, D. G.
SPIE-INT SOC OPTICAL ENGINEERING.2014
- **Effects of radiation and temperature on gallium nitride (GaN) metal-semiconductor-metal ultraviolet photodetectors** *Conference on Sensors for Extreme Harsh Environments*
Chiamori, H. C., Angadi, C., Suria, A., Shankar, A., Hou, M., Bhattacharya, S., Senesky, D. G.
SPIE-INT SOC OPTICAL ENGINEERING.2014
- **Solar-Blind Photodetectors for Harsh Electronics** *SCIENTIFIC REPORTS*
Tsai, D., Lien, W., Lien, D., Chen, K., Tsai, M., Senesky, D. G., Yu, Y., Pisano, A. P., He, J.
2013; 3
- **Advances in silicon carbide science and technology at the micro- and nanoscales** *JOURNAL OF VACUUM SCIENCE & TECHNOLOGY A*
Maboudian, R., Carraro, C., Senesky, D. G., Roper, C. S.
2013; 31 (5)
- **Surface acoustic wave devices on AlN/3C-SiC/Si multilayer structures** *JOURNAL OF MICROMECHANICS AND MICROENGINEERING*
Lin, C., Chen, Y., Felmetsger, V. V., Lien, W., Riekkinen, T., Senesky, D. G., Pisano, A. P.
2013; 23 (2)
- **Characterization of Gallium Nitride Heterostructures for Strain Sensing at Elevated Temperatures** *9th International Workshop on Structural Health Monitoring (IWSHM)*
CHAPIN, C. A., Chiamori, H. C., Hou, M., Senesky, D. G.
DESTECH PUBLICATIONS, INC.2013: 1621-1628
- **MEMS Piezoelectric Energy Harvesters for Harsh Environment Sensing**
Lai, Y., J., Li, W., C., Lin, C., M., Felmetsger, V., V., Senesky, D., G., Pisano, A., P.
2013

- **Robust Sensors for Structural Health Monitoring within Harsh Environments** *9th International Workshop on Structural Health Monitoring (IWSHM)*
Senesky, D. G.
DESTECH PUBLICATIONS, INC.2013: 45–50
- **4H-SiC Metal-Semiconductor-Metal Ultraviolet Photodetectors in Operation of 450 degrees C** *IEEE ELECTRON DEVICE LETTERS*
Lien, W., Tsai, D., Lien, D., Senesky, D. G., He, J., Pisano, A. P.
2012; 33 (11): 1586-1588
- **AlN/3C-SiC Composite Plate Enabling High-Frequency and High-Q Micromechanical Resonators** *ADVANCED MATERIALS*
Lin, C., Chen, Y., Felmetsger, V. V., Senesky, D. G., Pisano, A. P.
2012; 24 (20): 2722-2727
- **Micromachined aluminum nitride acoustic resonators with an epitaxial silicon carbide layer utilizing high-order Lamb wave modes**
Lin, C., M., Chen, Y., Y., Felmetsger, V., V., Vigevani, G., Senesky, D., G., Pisano, A., P.
2012
- **Wide Bandgap Semiconductors for Sensing within Extreme Harsh Environments** *Symposia on Low-Dimensional Nanoscale Elect and Photonic Devices 5 and State-of-the-Art Program on Cpd Semicond 54 (SOTAPOCS)*
Senesky, D. G.
ELECTROCHEMICAL SOC INC.2012: 233–38
- **Epitaxial Graphene Growth on 3C-SiC(111)/AlN(0001)/Si(100)** *Electrochemical and Solid-State Letters*
Hsia, B., Ferralis, N., Senesky, D., G., Pisano, A., P., Carraro, C., Maboudian, R.
2011; 14 (2): K13-K15
- **Active Materials for New Energy Efficient Window Glazing Technology: Feasibility Study** *Technical Report for Lawrence Berkeley National Laboratory and Department of Energy*
Senesky, D., G., Lee, E., Selkowitz, S.
2011
- **MEMS Strain Sensors for Intelligent Structural Systems.** *New Developments in Sensing Technology for Structural Health Monitoring*
Senesky, D., G., Jamshidi, B.
edited by Mukhopadhyay, S.
Springer-Verlag.2011: 63–74
- **High-Q aluminum nitride Lamb wave resonators with biconvex edges** *Applied Physics Letters*
Lin, C., M., lai, Y., J., Hsu, J., C., Chen, Y., Y., Senesky, D., G., Pisano, A., P.
2011; 99: 143501
- **Low-Temperature, Ion Beam-Assisted SiC Thin Films With Antireflective ZnO Nanorod Arrays for High-Temperature Photodetection** *IEEE Electron Device Letters*
Lien, W., C., Tsai, D., S., Chiu, S., H., Senesky, D., G., Maboudian, R., Pisano, A., P.
2011; 32: 1564 - 1566
- **Quality factor enhancement in Lamb wave resonators utilizing AlN plates with convex edges**
Lin, C., M., Lai, Y., J., Yen, T., T., Hsu, J., C., Chen, Y., Y., Senesky, D., G.
2011
- **Nanocrystalline SiC Metal-Semiconductor-Metal Photodetector with ZnO Nanorod Arrays for High-Temperature Applications.**
Lien, W., C., Tsai, D., S., Chiu, S., H., Senesky, D., G., Maboudian, R., Pisano, A., P.
2011
- **MEMS Sensors for Down-Hole Monitoring of Geothermal Energy Systems**
Wodin-Schwartz, S., Chan, M., W., Mansukhani, K., Pisano, A., P., Senesky, D., G.
2011
- **AlN thin films grown on epitaxial 3C-SiC (100) for piezoelectric resonant devices** *Applied Physics Letters*
Lin, C., M., Lien, W., C, Felmetsger, V., Hopcroft, M., A., Senesky, D., G., Pisano, A., P.
2010; 97: 141907

- **Synthesis of narrowband AlN Lamb wave ladder-type filters based on overhang adjustment**
Yen, T., T., Lin, C., M., Hopcroft, M., A., Kuypers, J., H., Senesky, D., G., Pisano, A., P.
2010
- **Growth of Highly C-Axis Oriented AlN Films on 3C-SiC/Si Substrate**
Lin, C., M., Lien, W., C., Felmetsger, V., Senesky, D., G., Hopcroft, M., A., Pisano, A., P.
2010
- **Characterization of Aluminum Nitride Lamb Wave Resonators Operating At 600°C For Harsh Environment RF Applications**
Yen, T., T., Lin, C., M., Zhao, X., Senesky, D., G., Hopcroft, M., A., Pisano, A., P.
2010
- **Ohmic Contact With Enhanced Stability to Polycrystalline Silicon Carbide Via Carbon Interfacial Layer**
Liu, F., Hsia, B., Senesky, D., G., Carraro, C., Pisano, A., P., Maboudian, R.
2010
- **MEMS Sensing in an In-Cylinder Combustion Environment**
Wodin-Schwartz, S., Hopcroft, M., A., Senesky, D., G., Pisano, A., P.
2010
- **Aluminum Nitride as a Masking Material for the Plasma Etching of Silicon Carbide Structures**
Senesky, D., G., Pisano, A., P.
2010
- **Growth of 3C-SiC/AlN/Si(100) layered structure with atomically abrupt interface via modified precursor feeding procedure** *Electrochemical and Solid-State Letters*
Lien, W., C., Cheng, K., B., Senesky, D., G., Carraro, C., Pisano, A., P., Maboudian, R.
2010; 13 (7): D53-D56
- **Genetic Algorithm Optimization for MEMS Cantilevered Piezoelectric Energy Harvesters**
Lai, Y., J., Senesky, D., G., Pisano, A., P.
2010
- **Surface acoustic wave propagation properties in AlN/3C-SiC/Si composite structure**
Lin, C., M., Chen, Y., Y., Felmetsger, V., V., Yen, T., T., Lien, W., C., Senesky, D., G.
2010
- **Epitaxial Growth of 3C-SiC on AlN/Si (100) via Methyltrichlorosilane-based Chemical Vapor Deposition**
Lien, W., C., Cheng, K., B., Senesky, D., G., Carraro, C., Pisano, A., P., Maboudian, R.
2009
- **Harsh Environment Silicon Carbide Sensors for Health and Performance Monitoring of Aerospace Systems: a Review** *IEEE Sensors Journal*
Senesky, D., G., Jamshidi, B., Cheng, K., B., Pisano, A., P.
2009; 9 (11): 1472-1478
- **Electrodeposition of Permalloy in Deep Silicon Trenches without Edge-Overgrowth Utilizing Dry Film Photoresist**
Park, S., W., Senesky, D., G., Pisano, A., P.
2009
- **A Silicon Carbide Resonant Tuning Fork for Micro-Sensing Applications in High Temperature and High G-Shock Environments** *Journal of Micro/Nanolithography, MEMS, and MOEMS*
Myers, D., R., Cheng, K., B., Jamshidi, B., Azevedo, R., G., Senesky, D., G., Chen, L.
2009; 8 (2): 21116
- **High Resolution Silicon Carbide Strain Gauge at 600°C**
Cheng, K., B., Myers, D., R., Jamshidi, B., Azevedo, R., G., Jones (aka Senesky), D., G., Mehregany, M.
2008
- **Low Temperature Ion Beam Sputter Deposition of Amorphous Silicon Carbide for Vacuum Encapsulation**
Jones (aka Senesky), D., G., Azevedo, R., G., Chan, M., W., Pisano, A., P., Wijesundara, M., B. J.

2007

- **A SiC MEMS Resonant Strain Sensor for Harsh Environment Applications** *IEEE Sensors Journal*

Azevedo, R., G., Jones (aka Senesky), D., G., Jog, A., V., Jamshidi, B., Myers, D., R., Chen, L.

2007; 7 (4): 568-576

- **Ion Beam Sputter Deposition of Silicon Carbide for Vacuum Encapsulation**

Jones (aka Senesky), D., G., Pisano, A., P.

2007

- **Silicon Carbide Coated MEMS Strain Sensor for Harsh Environment Applications**

Azevedo, R., G., Zhang, J., Jones (aka Senesky), D., G., Myers, D., R., Jog, A., V., Jamshidi, B.

2007

- **Fabrication of Ultra Thick Ferromagnetic Structures in Silicon**

Jones (aka Senesky), D., G., Pisano, A., P.

2004

- **MEMS Rotary Engine Power System**

Fernandez-Pello, A., C., Pisano, A., P., Fu, K., Walther, D., Knobloch, A., Martinez, F.

2002