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## Short CV

**Christian Baumgartner**, PhD has been Professor and Head of the Institute of Health Care Engineering with European Testing Center of Medical Devices at Graz University of Technology, Austria. He received his MSc (1994) and PhD degree (1998) from Graz University of Technology, Austria, his habilitation degree in Biomedical Engineering from UMIT, Tyrol, Austria (2006). Diploma in organ and conducting (1998) from the Conservatory of Graz, Austria. From 1998-2002 Dr. Baumgartner held a R&D systems engineer position at Tecan.com, where he co-developed confocal fluorescence laser scanning systems for microarray applications. From 2007-2008, he joined the Barnett Institute of Chemical and Biological Analysis, Northeastern University and Harvard Medical School, Boston, MA, where Dr. Baumgartner worked in the field of bioinformatics for biomarker discovery. In 2009, he was appointed Full Professor and Director of the Institute of Electrical and Biomedical Engineering at UMIT Tirol. Since 2015 he is the Head of the Institute of Health Care Engineering with European Testing Center of Medical Devices at Graz University of Technology, Austria. Dr. Baumgartner is the author of more than 200 publications in refereed journals, books and conference proceedings, and patents and is a reviewer for more than 40 scientific journals. He served as a deputy editor of the Journal of Clinical Bioinformatics, is Associate Editor of Frontiers in Physiology-Computational Physiology and Medicine, section editor of Sensors (section biomedical sensors), co-section editor of IMIA Yearbook of Medical Informatics (sensors, signals and imaging informatics), and is an editorial board member of Cell Biology and Toxicology and Methods of Information in Medicine. He teaches and has taught more than 20 courses in physics, biology, electronics and electrical engineering, computer science, biomedical engineering, and medical device act. His main research interests include biomedical sensors, cellular electrophysiology and signal processing, biomedical modeling and simulation, clinical bioinformatics, machine learning and computational biology, and medical device development, safety and regulatory affairs.

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### SELECTED PUBLICATIONS IN:

#### **Computational and Experimental Electrophysiology**

- [1] Baumgartner C. The world's first digital cell twin cancer electrophysiology. A digital revolution in cancer research? *J Exp Clin Cancer Res.* 2022, 41, 298.
- [2] Langthaler S, LozanovicSajic J, Rienmüller T, Weinberg S, Baumgartner C. Ion channel modeling beyond state of heart: A comparison with a system-theory based model of the shaker-related voltage-gated potassium channel Kv1.1. *Cells.* 2022, 11, 239.
- [3] Langthaler S, Rienmüller T, Scheruebel S, Pelzmann B, Shrestha N, Zorn-Pauly K, Schreibmayer W, Koff A, Baumgartner C. A549 In-silico 1.0: A first computational model to simulate cell cycle dependence current modulation in the human lung adenocarcinoma. *PLoS Comput Biol.* 2021, 17(6), e1009091.
- [4] Handler M, Schier P, Fritscher K, Raudaschl P, Chacko LJ, Glückert R, Saba R, Schubert R, Baumgarten D, Baumgartner C. Model-based vestibular afferent stimulation: Modular workflow for analyzing stimulation scenarios in patient specific and statistical vestibular anatomy. *Front Neurosci.* 2017, 11, 713.
- [5] Kienast R, Handler M, Stöger M, Daniel B, Hanser F, Baumgartner C. Modeling hypothermia induced effects for the heterogeneous ventricular tissue from cellular level to the impact on the ECG. *PLoS ONE.* 2017, 12(8), e0182979.
- [6] Kienast R, Stöger M, Handler M, Hanser F, Baumgartner C. Alterations of field potentials in isotropic cardiomyocyte cell layers induced by multiple endogenous pacemakers under normal and hypothermal conditions. *Am J Physiol Heart Circ Physiol.* 2014, 307(7), H1013-23.

#### **Biomedical Sensors**

- [1] Keller K, Leitner C, Baumgartner C, Benini L, Greco F. Fully-printed flexible ultrasound transducer for medical applications. *Adv Mater Technol.* 2023, 2300577
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- [4] Leitner C, Hager PA, Penasso H, Tilp M, Benini L, Peham C, Baumgartner C. Ultrasound as a tool to study muscle-tendon function during locomotion: A systemic review of application. *Sensors.* 2019, 19(19), 4316.
- [5] Buchhold N, Baumgartner C. A new adaptable, optical high-resolution 3-axis sensor. *Sensors.* 2017, 17, 254.

#### **Medical Image Analysis**

- [1] Lara Hernandez KA, Rienmüller TM, Juárez I, Pérez M, Reyna F, Baumgartner D, Makarenko VN, Bockeria OL, Maksudov M, Rienmüller R, Baumgartner C. Deep learning-based image registration in dynamic myocardial perfusion CT imaging. *IEEE Trans Med Imaging.* 2022

[2] Leitner C, Jarolim R, Englmaier B, Kruse A, Lara A, Konrad A, Su E, Schröttner J, Kelly L, Lichtwark G, Tilp M, Baumgartner C. A Human-Centered Machine-Learning Approach for Muscle-Tendon Junction Tracking in Ultrasound Images. *IEEE Trans Biomed Eng.* 2022, 69(6), 1920-1930.[3] Lara Hernandez KA, Rienmüller TM, Baumgartner D, Baumgartner C. Deep learning in spatiotemporal cardiac imaging: A review of methodologies and clinical usability. *Comp Biol Med.* 2021, 130, 104200.

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[2] Baumgartner C, Spath-Blass V, Niederkofler V, Bergmoser KM, Langthaler S, Lassnig A, Rienmüller T, Baumgartner D, Asnani A, Gerszten RE. A novel network-based approach for discovering dynamic metabolic biomarkers in cardiovascular disease. *PLoS ONE.* 2018, 13(12), e0208953.

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#### **Regulatory Affairs**

[1] Baumgartner C (ed.), Harer J (ed.), Schröttner J (ed.). *Medical Devices and In Vitro Diagnostics: Requirements for Europe.* Springer Nature, Cham, 2023, XVII, pp. 665, ISBN: 2731-0493, eISBN: 2731-0507.

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#### **Contributions to Clinical Papers**

[1] Baumgartner C. The impact of ChatGPT in clinical and translational medicine. *Clin Transl Med.* 2023, 13(3), e1206.

[2] Robbins JM, Peterson B, Schraner D, Tahir UA, Rienmüller T, Deng S, Keyes M, Daniel Katz, Beltran PMJ, Jacob L, Barber JL, Baumgartner C, Carr SA, Ghosh S, Shen C, Jennings L, Ross R, Sarzynski MA, Bouchard C, Gerszten RE. Plasma proteomic profiles of cardiorespiratory fitness. *Nat Metab.* 2021, 3(6), 786-797.

[3] Lewis GD, Wei R, Liu E, Yang E, Shi X, Martinovic M, Farrell L, Asnani A, Cyrille M, Ramanathan A, Shaham O, Berriz G, Lowry PA, Palacios I, Tasan M, Roth FP, Min J, Baumgartner C, Keshishian H, Addona T, Mootha VK, Rosenzweig A, Carr SA, Fifer MA, Sabatine MS, Gerszten RE. Metabolite profiling of blood from individuals undergoing planned myocardial infarction reveals early markers of myocardial injury. *J Clin Invest.* 2008, 118(10), 3503-3512.

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## **Research outputs**

### **Vascularised organoids: Recent advances and applications in cancer research**

Zhou, R., Brislinger, D., Fuchs, J., Lyons, A., Langthaler, S., Hauser-Funke, C. A. E. & Baumgartner, C., 5 Mar 2025, In: *Clinical and Translational Medicine*. 2025, 15, p. 1-25 25 p., 70258.

### **Biointegration of soft tissue-inspired hydrogels on the chorioallantoic membrane: An experimental characterization**

Kainz, M., Polz, M., Ziesel, D., Nowakowska, M., Üçal, M., Kienesberger-Feist, S., Hasiba-Pappas, S., Winter, R., Ghaffari-Tabrizi-Wizsy, N., Karger, S., Rienmüller, T. M., Fuchs, J., Terzano, M., Baumgartner, C. & Holzzapfel, G., Apr 2025, In: *Materials Today Bio*. 31, 101508.

### **Transforming Precision Medicine: The Potential of the Clinical Artificial Intelligent Single Cell Framework**

Baumgartner, C. & Brislinger, D., 6 Jan 2025, In: *Clinical and Translational Medicine*. 2025, e70096, p. 1-5 5 p., e70096.

### **Machine and deep learning-based detection of the stapedius reflex for automatic cochlear implant fitting**

Desoyer, C., Proksch, J., Berger, P. & Baumgartner, C., 12 Dec 2024, p. 1-4. 4 p.

### **Finite Element Simulations of Effective Stimulated Volume in Rat Brain Optoelectronic Stimulation**

Rienmüller, T., Valente, V., Ziesel, D., Polz, M., Langthaler, S., Lenk, K., Nowakowska, M., Baumgartner, C. & Ücal, M., 1 Oct 2024, In: *Current Directions in Biomedical Engineering*. 10, 3, p. 13-16 4 p.

### **Shedding Light on Cardiac Excitation: In Vitro and In Silico Analysis of Native Ca<sup>2+</sup> Channel Activation in Guinea Pig Cardiomyocytes using Organic Photovoltaic Devices**

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### **Comparison of membrane potential changes in different cell cycle phases of MCF-7 human breast cancer cells using flow cytometry**

Langthaler, S., Schreibmayr, W., Strohmaier, H., Pelzmann, B., Rienmüller, T. M., Scherübel, S., Zorn-Pauly, K., Shrestha, N., Gorischek, A. & Baumgartner, C., Jun 2024, In: *Molecular Oncology*. 18, Suppl. 1, p. 132-133 EACR23-0761.

### **The bioelectric mechanisms of local calcium dynamics in cancer cell proliferation: An extension of the A549 in-silico cell model**

Langthaler, S., Zumpf, C., Rienmüller, T. M., Shrestha, N., Fuchs, J., Zhou, R., Pelzmann, B., Zorn-Pauly, K., Weinberg, S. & Baumgartner, C., 6 May 2024, In: *Frontiers in Molecular Biosciences*. 11, 1394398, 20 p., 1394398.

### **Continuous Health Monitoring on Shared Mobility Devices: A Health-eScooter Prototype**

Warnecke, J. M., Baumgartner, C., Breitner, M. H., Briechele, D. F., Deserno, T. M., Heumann, M., Johns, M., Picker, A., Rausch, A. & Wolf, L., 3 Jan 2024, *Proceedings of the 57th Annual Hawaii International Conference on System Sciences, HICSS 2024*. Bui, T. X. (ed.). p. 3485-3494 10 p. (Proceedings of the Annual Hawaii International Conference on System Sciences).

### **Minitrack: Healthcare Applications for Personal Vehicles**

Deserno, T. M., Baumgartner, C., Breitner, M. H. & Rausch, A., 2024, *Proceedings of the 57th Annual Hawaii International Conference on System Sciences, HICSS 2024*. Bui, T. X. (ed.). IEEE Computer Society, p. 3483-3484 2 p.

### **Comparative Analysis of Mechanical Water Level Tank and Human Fluid Flow**

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### **Consideration of Kv ion channels as first-order systems**

Lozanovic, J., Langthaler, S., Rienmüller, T. M., Polz, M., Ziesel, D., Schröttner, J. & Baumgartner, C., 1 Dec 2023, In: *Current Directions in Biomedical Engineering*. 9, 2, p. 31-33 3 p.

### **Photovoltaic Stimulation Induces Overdrive Suppression in Embryonic Chicken Cardiomyocytes**

Polz, M., Ziesel, D., Shrestha, N., Pelzmann, B., Lang, P., Scheruebel, S., Ueçal, M., Kornmueller, K., Schröttner, J., Derek, V., Opančar, A., Glowacki, E. D., Baumgartner, C. & Rienmüller, T. M., 1 Dec 2023, In: *Current Directions in Biomedical Engineering*. 9, 2, p. 12-15 4 p.

### **Investigating Cardiac Activity Modulation through Multielectrode Arrays and Organic Photovoltaic Devices**

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### **Inducing Overdrive Suppression in Chicken Cardiomyocytes Using Photovoltaic Devices and Multielectrode Arrays**

Ziesel, D., Polz, M., Shrestha, N., Pelzmann, B., Lang, P., Scheruebel, S., Kornmüller, K., Ücal, M., Binter, K., Rath, T., Opančar, A., Derek, V., Baumgartner, C. & Rienmüller, T. M., Oct 2023, (E-pub ahead of print).

### **Fully Printed Flexible Ultrasound Transducer for Medical Applications**

Keller, K., Leitner, C., Baumgartner, C., Benini, L. & Greco, F., 25 Sept 2023, In: *Advanced Materials Technologies*. 8, 18, p. 1-9 2300577.

### **Medical Devices and In Vitro Diagnostics: Requirements in Europe**

Baumgartner, C. (Editor), Harer, J. (Editor) & Schröttner, J. (Editor), 27 Aug 2023, 1 ed. Cham: Springer Nature Switzerland AG. 665 p. (Reference Series in Biomedical Engineering)

### **Regulatory Framework for Medical Devices and IVDs in Europe**

Baumgartner, C., Schröttner, J. & Müllner, P. S., 27 Aug 2023, *Medical Devices and In Vitro Diagnostics: Requirements in Europe*. 1 ed. Cham: Springer Nature Switzerland AG, p. 1-37 37 p. (Reference Series in Biomedical Engineering ).

### **Safety Requirements for Medical Devices in Compliance with European Standards**

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### **The Notified Body: The Conformity Assessment Body for Medical Devices in Europe**

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### **A regulatory challenge for natural language processing (NLP)-based tools such as ChatGPT to be legally used for healthcare decisions. Where are we now?**

Baumgartner, C. & Baumgartner, D., 7 Aug 2023, In: *Clinical and Translational Medicine* . 13, 8, 4 p., e1362.

### **Machine and Deep Learning Dominate Recent Innovations in Sensors, Signals and Imaging Informatics**

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### **Frequency Modulation of Cardiac Activity Through External Stimulation with Multielectrode Arrays and Organic Photovoltaic Devices**

Ziesel, D., Polz, M., Shrestha, N., Pelzmann, B., Lang, P., Scheruebel, S., Kornmueller, K., Ücal, M., Binter, K., Rath, T., Trimmel, G., Opančar, A., Derek, V., Baumgartner, C. & Rienmüller, T. M., 28 Jul 2023, (E-pub ahead of print).

### **The world's first digital cell twin in cancer electrophysiology: A new direction in cancer research (Part 1): Innovative Cancer Science, 12-15 June 2023, Torino, Italy**

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### **A System Theory Based Digital Model for Predicting the Cumulative Fluid Balance Course in Intensive Care Patients**

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### **Deep learning-based image registration in dynamic myocardial perfusion CT imaging**

Lara Hernandez, K. A., Rienmüller, T. M., Juárez, I., Pérez, M., Reyna, F., Baumgartner, D., Makarenko, V. N., Bockeria, O. L., Maksudov, M., Rienmüller, R. & Baumgartner, C., 1 Mar 2023, In: IEEE Transactions on Medical Imaging. 42, 3, p. 684-696 13 p.

### **The opportunities and pitfalls of ChatGPT in clinical and translational medicine**

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### **Validation of Electrical Signaling in In Vitro Cell Cultures on Multielectrode Arrays through Simultaneous Calcium Imaging**

Ziesel, D., Shrestha, N., Polz, M., Ücal, M., Scheruebel, S., Kornmueller, K., Schindl, R., Baumgartner, C. & Rienmüller, T. M., 10 Jan 2023, (Accepted/In press).

### **ChatGPT in Medicine: Ark of the Covenant or Pandora's Box? Present status and future perspectives: how, what, who and where?**

Marín-Castañeda, L. A., Chejfec-Ciociano, J. M., Verhoeven, V., Baumgartner, C., Fijačko, N., Štiglic, G., Gosak, L., Arnaout, M. M., Manohar, N., Prasad, S. S., Bhattacharya, K., Cho, W. C., Hirosawa, T. & Lee, Á., 2023, (Submitted) In: Journal of Medical Internet Research .

### **Best Research Papers in the Field of Sensors, Signals, and Imaging Informatics 2021**

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### **The world's first digital cell twin in cancer electrophysiology: A digital revolution in cancer research?**

Baumgartner, C., 11 Oct 2022, In: Journal of Experimental and Clinical Cancer Research. 41, 1, 6 p., 298.

### **Properties of a Fully Printed Ultrasound Transducer on Flexible Substrate**

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### **Electromyography device**

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### **Assessment of accuracy and glycemic control of FGM and CGM and impact on mental well-being**

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### **Holistic Equivalent Circuit Model for Capacitive Extracellular Stimulation**

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#### **In-silico model for the photoinduced stimulation of voltage-gated ion channels on Organic Photocapacitors**

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#### **Temperature-induced modulation of the electrophysiological behavior of A549 lung cancer cells**

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#### **The Kv10.1 voltage-gated ion channel modeling based on control system theory**

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#### **System identification and mathematical modeling of the pandemic spread COVID-19 in Serbia**

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#### **A Systematic Review of the Transthoracic Impedance during Cardiac Defibrillation**

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#### **Ion Channel Modeling beyond State of the Art: A Comparison with a System Theory-Based Model of the Shaker-Related Voltage-Gated Potassium Channel Kv1.1**

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#### **Review on subthreshold electrical stimulation to promote plasticity in neuronal networks**

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#### **A Human-Centered Machine-Learning Approach for Muscle-Tendon Junction Tracking in Ultrasound Images**

Leitner, C., Jarolim, R., Englmaier, B., Kruse, A., Lara Hernandez, K. A., Su, E., Schröttner, J., Kelly, L. A., Lichtwark, G. A., Tilp, M. & Baumgartner, C., 24 Nov 2021, (E-pub ahead of print) In: IEEE Transactions on Biomedical Engineering . 2022, 69(6), p. 1920-1930 10 p.

#### **Anforderungen an Medizinprodukte: Praxisleitfaden für Hersteller und Zulieferer**

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