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Work Package 1

Enhancing S&T excellence capacity of ODTÜ MEMS

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Table of Contents

1 INTRODUCTION.....3

2 MOBILITY ACTIVITIES.....3

2.1 Progress and Achievements.....4

2.2 Foreseen Activities7

3 TRAINING AND EDUCATION ACTIVITIES7

3.1 Progress and Achievements.....8

3.2 Impact of the activities:13

3.3 Foreseen Activities14

4 CONCLUSIONS14

1 INTRODUCTION

The OrChESTRA Project is dedicated to promoting innovation and collaboration in the fields of microfluidics and biosensors. Central to this initiative are two fundamental elements: mobility activities and training/education activities. These elements are strategically designed to facilitate the exchange of knowledge and best practices among the partners, enhancing the scientific performance and innovation capacity of the ODTÜ MEMS team and fostering collaborative research endeavours.

Mobility activities, organised under Task 1.2, aim to establish a dynamic two-directional exchange program. This includes both incoming visits from experts at partner institutions to ODTÜ MEMS and outgoing missions of ODTÜ MEMS researchers to these institutions. A total of 16 visits, constituting 8 staff exchanges, have been planned. These exchanges are pivotal in sharing insights and methodologies specific to microfluidics and biosensors, especially focusing on organ-on-a-chip platforms, thus enhancing the collective expertise and fostering peer-to-peer collaborations.

In parallel, Task 1.3 focuses on training and education activities, with ODTÜ MEMS playing a central role in organising a series of on-site and virtual training sessions, including summer and winter schools. These educational activities are designed to strengthen the scientific and technological (S&T) capacity within ODTÜ MEMS and extend learning opportunities to the broader ecosystem, including other researchers and students associated with the partner institutions. Through seminars, workshops, and hands-on sessions conducted by experienced professionals, participants gain insights into important research topics, including fluid handling, imaging techniques, sensor systems, and synthetic biology-based biosensors.

As these activities are undertaken, the OrChESTRA Project aims not only to advance research in microfluidics and biosensors but also to create a sustainable ecosystem of innovation and collaboration. This report provides a comprehensive overview of the progress made in mobility and training/education activities, underscoring the tangible outcomes achieved and the forward momentum towards achieving the project's overarching goals.

2 MOBILITY ACTIVITIES

Central to the OrChESTRA Project's strategy are the mobility activities, which are designed to facilitate a robust exchange of expertise and innovation. With Task 1.2, ODTÜ MEMS aims to orchestrate a series of two-directional staff exchanges, including both incoming visits from experts and researchers of partner institutions to ODTÜ MEMS and outgoing missions of ODTÜ MEMS' researchers to these institutions. This comprehensive initiative plans to involve a total of 8 staff exchanges, equating to 16 individual visits, with the primary goal of boosting scientific performance and fostering collaborative innovation. The initial focus areas of these exchanges, defined in collaboration with partners, include thermoplastics, 3D cell culturing methods, biosensors, and the integration of silicon-based sensing elements with plastic microfluidics. Each mission will conclude with a report from both the visiting expert and the host organization, contributing to an annual consolidation of insights and advancements.

2.1 Progress and Achievements

Despite facing significant challenges in facilitating mobility activities, primarily due to visa complications for Turkish researchers, considerable progress has been made in laying the foundational groundwork for these exchanges. The following highlights the strategic efforts and preparatory achievements made during this period:

Identification of researchers: A comprehensive process was undertaken to identify researchers from each partner institution who are pivotal for the mobility activities. This crucial step ensures that once the visa issues are resolved, the project is ready to proceed without delay, maximizing the impact and efficiency of the exchanges.

The following researchers have been identified for the possible collaboration and staff-exchange activities:

Researcher	Main research topics	Organisation
PhD, M.O.A.	• Particle synthesis (QDs, UCNPs, Au NPs) • Molecularly imprinted polymers • Electrochemistry and photoelectrochemistry • Surface modification & functionalization • Biosensors (paper-based sensors, mass sensors) • Circulating Tumor Cells & ctDNA • Lab-on-a-chip • Organ-on-a-chip	ODTÜ MEMS
PhD Candidate, Z.Ç.	• BioMEMS • Microfabrication • Electrode design • Electrochemistry • Lab-on-a-chip • Organ-on-a-chip • Membrane production • Dielectrophoresis • Circulating tumor cells & ctDNA • Microfluidics • Micro Sensors • MEMS process design and development	ODTÜ MEMS
PhD Candidate, A.C.A.	• MEMS process design and development • Microscale neural interfaces • Piezoelectric energy scavenging • Organ-on-a-chip • Lab-on-a-chip • Microfluidics • BioMEMS • Micro sensors and actuators	ODTÜ MEMS
PhD Candidate, E.S.	• Cell culture • Virology • Molecular cloning • Immunoassay development • ELISA • PCR • Recombinant protein synthesis • Organ-on-a-chip	ODTÜ MEMS

Researcher, M.O.G.	• Fabrication of microfluidic devices • Micro injection molding • Additive manufacturing • Design for additive manufacturing • Tool design • Polymers	ODTÜ MEMS
Prof. H.W.	• Microfluidics technology • Microfabrication • Soft matter • Rheology • Hydrogels • Cell and tissue mechanics	TU/e
Prof. J.d.T.	• Microfluidics technology • Microfabrication • Lab-on-Chip • Organ-on-Chip • Microactuation	TU/e
Prof. B.G.	• Lab-on-Chip • Organ-on-Chip • Digital microfluidics • Electrowetting • Gut-on-chip	TU/e
PhD, H.E.A.	• Lab-on-Chip • Organ-on-Chip technologies • Valorization • Organ-on-Chip consultancy	TU/e
PhD Candidate, M.J.B.	• Cancer-on-Chip • Organ-on-Chip • Cancer invasion versus ECM • Vasculature on chip	TU/e
PhD Candidate, K.B.	• Microfluidics technology • Microfabrication • Soft matter, rheology, hydrogels, cell and tissue mechanics	TU/e
Prof., I.C.F.P.	• Biomaterials • Micro and nanotechnology • Microfabrication • Sensors and actuators • Soft microvalves • Stimuli-responsive materials • Microfluidics	TU/e
Post-doctoral researcher, M.K.A.	• Digital microfluidics • Lab-on-a-Chip • Microfluidics technology • Electrowetting	TU/e
PhD Candidate, M.Ö.	• Lab-on-Chip • Organ-on-Chip • Digital Microfluidics • Electrowetting	TU/e
PhD Candidate, O.S.	• Lab-on-Chip • Organ-on-Chip • Digital Microfluidics • Electrowetting	TU/e

PhD Candidate, S.G.	• Microfluidics Technology • Microfabrication • Lab-on-Chip • Organ-on-chip	TU/e
PhD Candidate, P.Z.	• Microfluidics Technology • Microfabrication • Lab-on-Chip • Organ-on-chip	TU/e
PhD Candidate, G.A.	• Microfluidics Technology • Microfabrication • Lab-on-Chip • Brain-on-Chip	TU/e
R&D Engineer, PhD, R.T.	• Microfluidics Technology • Microfabrication	IMEC
Researcher, PhD, B.D.	• Brain-on-Chip • Organ-on-Chip	IMEC
R&D Manager, PhD, D.B.	• Organ-on-Chip • Brain-on-Chip	IMEC
R&D Project Manager, PhD, L.Z.	• Microfluidics Technology • Microfabrication • Lab-on-Chip	IMEC
Program Manager, PhD, C.L.	• Lab-on-Chip • Microfluidics Technology	IMEC
Group Leader, PhD, C.D.	• Sensors • Bioanalytics • Wearables • CRISPR/Cas diagnostics • Point-of-care testing	UFR
PhD Candidate, N.U.	• CRISPR-based electrochemical biosensors • Molecular cloning: Gibson assembly • Bacterial protein expression & purification • Phytochrome B-based optogenetics and OptoAssays	UFR
PhD Candidate, M.J.	• CRISPR-based electrochemical biosensors • Microfluidic multiplexed chip fabrication	UFR
MSc Candidate, B.S.	• CRISPR-Cas12-based DNA detection • Programming	UFR

Development of a Collaborative Framework: Recognizing the temporary barrier to physical mobility, efforts have been redirected towards establishing a robust framework for collaboration. This includes the initiation of online meetings among identified researchers to discuss common fields of study and prepare for future project applications. This proactive approach not only maintains the momentum of collaboration but also strengthens the consortium's readiness for immediate action once mobility becomes feasible.

Addressing Visa Challenges: Acknowledging visa complications as a primary barrier, concerted efforts have been initiated to facilitate the visa application process. This includes the preparation and issuance of invitation letters, which are essential for visa applications, demonstrating a proactive stance in tackling administrative hurdles.

Preparatory Work for Staff Exchanges: Despite the direct mobility activities being on hold, substantial preparatory work has been completed to lay the groundwork for successful staff exchanges. This preparatory

phase included defining the initial topics for these exchanges, which cover a wide range of cutting-edge areas. These topics have been determined to modelling the microenvironment for organ-on-chip applications, gut-on-a-chip, microscopic artificial organs/organoids, microfluidic chip design and fabrication, organ/organoid microenvironment, organ-on-chips for studying tissue barriers, particle manipulation using microfluidics, CRISPR-based assays, membrane fabrication for organ-on-chip applications, electrode design and implement for organ-on-chip applications. These efforts have ensured that the thematic areas for exchange are well-aligned with the project's objectives, focusing on crucial aspects of microfluidics and biosensors.

Adaptation to Challenges: The project has shown remarkable adaptability in the face of unforeseen challenges. By shifting towards virtual engagements and collaboration, the project continues to foster knowledge exchange and partnership development, ensuring that the goals of mobility activities are still pursued with vigour and determination.

2.2 Foreseen Activities

Online meetings have been scheduled to enable collaborative project identification among partner institutions. These meetings aim to refine the focus of upcoming staff exchanges by identifying and agreeing upon specific research projects that align with the shared goals of the participating institutions. Efforts are underway to streamline the staff exchange calendars, ensuring that all planned visits are well-coordinated and efficiently managed. This includes establishing clear timelines and schedules for upcoming visits, which are set for the second half of 2024 and throughout 2025. In terms of specific exchanges, ODTÜ MEMS researchers are planned to visit IMEC and TU/e in the third and fourth quarters of 2024, as well as the second and third quarters of 2025. Conversely, researchers from TU/e, IMEC, and UFR are planned to visit ODTÜ MEMS during the same quarters of 2024 and 2025. These visits are expected to foster direct interaction and deeper collaboration, enhancing the exchange of knowledge and expertise between the teams. These planned activities are designed to maximise the benefits of staff exchanges, enhancing the scientific output and collaborative impact of the OrChESTRA Project. By addressing logistical challenges and focusing on joint project development, the project aims to build a robust framework for ongoing and future collaborations, significantly advancing the field of microfluidics and biosensors.

3 TRAINING AND EDUCATION ACTIVITIES

Parallel to the mobility initiatives, Task 1.3 encompasses a broad spectrum of training and education activities aimed at bolstering the S&T capabilities within ODTÜ MEMS and its ecosystem. This task envisages a mix of 6 on-site and 10 virtual training sessions, alongside 1 summer and 1 winter school, all designed to cater not only to ODTÜ MEMS researchers but also to the broader research community, including other researchers and students within the ecosystem of ODTÜ MEMS and partner institutions. The training sessions, led by project-partner experts and, where necessary, external experts, cover crucial topics within microfluidics such as fluid handling, imaging techniques, flow simulation tools, and sensor and imaging systems for real-time cell monitoring in microfluidic chips. The summer/winter schools, that will be hosted at the coordinator's premises, promise an immersive learning experience with lectures from seasoned experts and researchers, scientific workshops, site visits, and social events, focusing on commercially available organ-on-a-chip platforms, microfluidic applications, fabrication methods for devices, and synthetic biology-based biosensors.

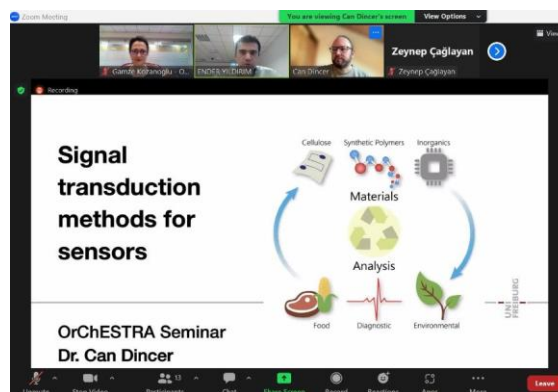
3.1 Progress and Achievements

The OrChESTRA Project has made significant progress in strengthening the S&T capacity within ODTÜ MEMS through an array of training and education activities. The project has successfully executed a blend of on-site and virtual training sessions, leveraging the expertise of renowned specialists in the field. The details of the accomplishments achieved are given below:

Seminar 1: Transduction methods in Sensing

An online seminar on “Transduction methods in Sensing” by Dr. Can Dinçer (UFR), which provided an in-depth exploration of sensing mechanisms, attended by researchers and students alike on 26 May 2023.

The presentation provided the basics of different signal transduction methods for sensing. It started with the optical and electrochemical readout techniques, most commonly used ones for chemo- and biosensors. Herein, the role of materials and modifications of surfaces/electrodes were given. Next, it introduced other types of signal transduction such as mechanical (including microgravimetric), thermometric and magnetic signal transduction methods. Moreover, the participants learned multimodal analysis, employing two or more different signal detection techniques, along with their advantages and bottlenecks. Finally, the most important sensor characteristics (such as sensitivity, selectivity, etc.) were explained.

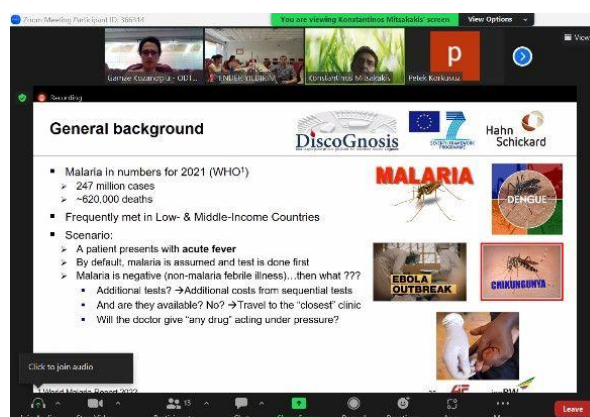


Short bio of Dr. Can Dinçer: Having completed his studies in microsystems engineering, Can Dincer received his PhD degree with summa cum laude from the Technical Faculty of the University of Freiburg in 2016. He is currently junior research group leader at the Freiburg Centre for Interactive Materials and Bioinspired Technologies (FIT) and at the Department of Microsystems Engineering (IMTEK) of the University of Freiburg. In September 2019, he is joined the editorial team of the journal “Biosensors and Bioelectronics” as an Associate Editor.

Seminar 2: Point-of-need applications of centrifugal microfluidics

A comprehensive presentation on “Point-of-need applications of centrifugal microfluidics” by Dr. Konstantinos Mitsakakis (UFR), conducted virtually on 16 June 2023, which shed light on the latest advancements in centrifugal microfluidics.

This presentation provided overview on centrifugal microfluidics. Some selected case study scenarios were presented in order to demonstrate the broad applicability of centrifugal microfluidics in the field of global health. Indicatively tropical diseases, respiratory tract infections, vector disease carriers’ diagnostics under a One Health approach was discussed. Technologically, it was focused on protein and nucleic acid analysis as well as sample preparation based on the centrifugal microfluidics. The importance of emerging trends in diagnostics such as the use of non-invasive saliva testing, with its challenges and advantages experienced with centrifugal microfluidics were discussed.



Short bio of Dr. Konstantinos Mitsakakis: Dr. Mitsakakis is a physicist with MSc on Nanoscience & Nanotechnology. He acquired his doctoral degree working on the development of a multi-analyte acoustic biosensing platform for cardiac markers. He joined the University of Freiburg and Hahn-Schickard in 2011 as a Humboldt Post-Doctoral Fellow. He then coordinated the FP7 project DiscoGnosis (fever diagnostics) and the H2020 project DIAGORAS (point-of-care diagnostics of oral & respiratory infections). He has been a partner in the H2020 projects DMC-MALVEC (malaria vector control), HorizonEU project HOLICARE (Africa-tailored diagnostics) and the Eurostars project Respiotic (PCR- and immunoassay-based diagnostics of respiratory infections). His research interests are in the field of micro/nanotechnology for life sciences, biosensor technologies, microfluidics, lab-on-a-chip and microanalytical systems, as well as point-of-care diagnostics. Since 2016 he is Group Leader International Business Development and author of >40 publications.

Seminar 3: Therapeutic drug monitoring of antibiotics with multiplexed biosensors and data-driven analysis

A face-to-face session on “Therapeutic drug monitoring of antibiotics with multiplexed biosensors and data-driven analysis” by Can Dinçer (UFR), on 12 September 2023, which offered practical insights into the application of biosensors in drug monitoring.

This presentation provided a basic understanding of personalized antibiotherapy, including monitoring of administered drug, infection status and organ failure. In the first part, a novel machine learning based approach to quantitatively measure the impact of therapeutic drug monitoring (TDM) on the recovery process of sepsis patients. This framework enables tracking of the treatment's efficacy and patient response dynamically. The proof-of-concept study used the data from a clinical trial investigating the effectiveness of TDM-guided piperacillin/tazobactam antibiotic therapy versus a fixed dosing strategy. This work proved the positive impact of TDM on patient recovery rates, for the first time, by unravelling the intricate connections between therapy effectiveness and clinically relevant data.



In the second part, an electrochemical microfluidic multiplexed biosensor along with a synthetic-biology-based antibody-free assay for on-site therapeutic drug monitoring of antibiotics was presented. The platform is evaluated with an animal study, where antibiotic concentrations are quantified in different matrices including whole blood, plasma, urine, saliva, and exhaled breath condensate (EBC). The clearance and the temporal evaluation of antibiotic levels in EBC and plasma are demonstrated for the first time. The validation of the findings with gold-standard measurements demonstrates the suitability of the system as a low-cost, rapid, and sample-independent tool to shift the paradigm of the “one size-fits-all” strategy for combating antibiotic resistance.

Seminar 4: Controlled ATPS Droplet Formation and Capture Using Microfluidics

Insightful seminar focusing on “Controlled ATPS Droplet Formation and Capture Using Microfluidics” was given by Dr. Hans Wyss (TU/e) on 21 September 2023.

The presentation provided an overview of a new experimental tool developed at TU Eindhoven for controlling and studying the formation and behavior of so-called "water-in-water droplets", formed by liquid-liquid phase separation. The formation of such structures has recently been shown to play an important role in intra-cellular organization, as the driving mechanism for the formation of membraneless organelles. However, a detailed examination of water-in-water droplets proves difficult using the existing methods known from water-in-oil or oil-in-water droplet systems, which rely on surface tension for the droplet formation process. Moreover, after droplets have been created it is difficult to protect them against coalescence.



To address these restrictions, we have developed a new strategy that enables the direct in-situ generation and trapping of water-in-water droplets in dead-end microfluidic chambers, where droplet sizes and concentrations within the droplets can be precisely controlled. Besides enabling a detailed control over droplet properties and the ability to study these structures over long periods of time, our platform also enables the study of inter-communication between droplets in separate fluidic chambers, which can be precisely controlled by introducing pneumatically activated valves into our devices. Due to its unique advantages compared to existing approaches, we expect our method to be highly useful for discovering and studying novel aqueous two-phase systems and for comprehensive studies on liquid-liquid phase separation in the fields of bioengineering, chemical engineering, and synthetic biology.

Short bio of Dr. Hans Wyss: Hans Wyss received his PhD from the Materials Department at ETH Zurich, Switzerland, where he worked on ceramic suspensions and gels. In his undergraduate education, he studied experimental physics at the Physics Department of ETH Zurich. Before joining TU/e in 2009, Hans worked as a postdoctoral researcher in the Experimental Soft Matter group at Harvard University. He is currently employed as an associate professor in the Microsystems section in the Department of Mechanical Engineering at Eindhoven University of Technology; his research group "Microfluidics and Soft Matter" focuses on the use of microfluidic technologies for experimentally studying and controlling the behavior of soft and biological materials. He has developed several new experimental tools for the study of such materials, including the methods "Capillary Micromechanics" and "Strain-Rate Frequency Superposition," which are used to probe the viscoelastic behavior of soft and biological materials. Hans regularly collaborates with a range of international groups from countries including the United Kingdom, Switzerland, Hong Kong, China, Korea, and the United States.

Seminar 5: Multi-functional HD-MEA Platform for in vitro and in vivo Neuronal Network Characterization

On November 3, 2023, Dr. Hasan Uluşan from ODTÜ MEMS delivered a seminar on the “Multi-functional HD-MEA Platform for in vitro and in vivo Neuronal Network Characterization”.

In this presentation, technological details and applications of the multi-functional high-density microelectrode array (HD-MEA) platform developed in Bio Engineering Laboratory of ETH Zurich was explained. Throughout the presentation several neuroscientific questions were tried to be answered by considering



measurements of the exact timing and occurrence of single-cell action potentials, their propagation speed, and trajectories along axons, the release of neurotransmitters at synapses, tissue properties, and surface adhesion with the newly developed HD-MEA platform. The HD-MEA platform can be used to simultaneously and rapidly perform electrophysiological recordings, impedance imaging, and electrochemical measurements. During the presentation we learn how this platform can be used to culture different types of electrogenic cells *in-vitro* including primary neurons from rat embryos, induced pluripotent stem cells (iPSCs), mouse/primate retinas, brain slices, cardiomyocytes, and organoids. Characterization of the cultured cell by using the multi-functionality of the HD-MEA were described with details to identify single cell and network level activity, the correlation between cells, growth of the cell network, cell adhesion, and disease tracking for patient-derived cells. Moreover, integration of HD-MEA with 3D electrodes for *in-vivo* recordings of brain signals of animal models was further explained during the presentation.

Short bio of Dr. Hasan Uluşan: Hasan Uluşan received the B.Sc., M.Sc., and Ph.D. degrees in Electrical and Electronics Engineering from METU, Ankara, Turkey in 2011, 2013, and 2018, respectively. Between 2019-2023, he was a Postdoctoral Researcher with Bio Engineering Laboratory, Department of Biosystems Science and Engineering, ETH Zürich, Switzerland. Between 2023-2024 he worked as a Lead Researcher at METUMEMS Center Ankara, Turkey. In 2024, he joined the Electrical and Electronics Engineering Department at METU, where he is currently working as an Assistant Professor. Dr. Uluşan won the 2019 Ph.D. Thesis of the Year Award from IEEE Turkey Section and received the TÜBİTAK 2232 International Fellowship for Early-Stage Researchers. His research interests include integrated circuits and systems design, especially for low-power applications, biosensor interfaces, neuroscience, neurological and cardiological disease modelling, power management circuits for energy harvesting systems, and mixed-signal circuits and systems for wearable and implantable medical applications.

Seminar 6: Microfluidic Processor for Cancer Diagnosis and Multiplexed Cell Staining on Tissue Sections

On November 10, 2023, a seminar titled 'Microfluidic Processor for Cancer Diagnosis and Multiplexed Cell Staining on Tissue Sections' was given by Martin A. M. Gijs from EPFL. Conducted face-to-face, this seminar provided groundbreaking insights into the application of microfluidic technologies in cancer diagnostics, highlighting their potential to revolutionize how tissue samples are processed and analysed. The seminar marked a significant advancement in the field, showcasing innovative approaches to multiplexed cell staining critical for accurate cancer diagnosis.

Biomarker analysis plays a pivotal role in cancer diagnosis, prognosis, and treatment prediction. The quantitative evaluation of biomarker expression in tumour tissues holds significant clinical importance for tailored cancer therapies. In this presentation, a novel microfluidic tissue processor designed to accurately quantify biomarker expression on tissue sections is discussed. Enabled by its ultra-rapid and uniform fluidic exchange, this device facilitates precise evaluation of biomarker expression levels. Specifically, the technology was utilized to assess human epidermal growth factor receptor 2 (HER2) expression across tissue samples. Moreover, a quantitative method capable of identifying ten distinct immuno-markers within the same tumour section is introduced. The findings underscore the clinical potential of microfluidics in facilitating accurate biomarker expression analysis. This technique promises to serve as a diagnostic tool, furnishing clinicians with more reliable data upon which to base future treatment strategies.



Short bio of Prof. Dr. Martin A.M. Gijs: Martin A.M. Gijs received his degree in physics in 1981 from the Katholieke Universiteit Leuven, Belgium and his Ph.D. degree in physics at the same university in 1986. He joined the Philips Research Laboratories in Eindhoven, The Netherlands, in 1987. Subsequently, he has worked there on micro- and nano-fabrication processes of high critical temperature superconducting Josephson and tunnel junctions, the microfabrication of microstructures in magnetic multilayers showing the giant magnetoresistance effect, the design and realisation of miniaturised motors for hard disk applications and the design and realisation of planar transformers for miniaturised power applications. He joined EPFL in 1997. His present interests are in developing technologies for novel magnetic devices, new microfabrication technologies for microsystems fabrication in general and the development and use of microsystems technologies for microfluidic and biomedical applications in particular.

3.2 Impact of the activities:

The series of seminars organised by the OrChESTRA Project have played a crucial role in advancing knowledge and fostering collaboration within the field of microfluidics and biosensors. These seminars, led by experts from partner institutions and ODTÜ MEMS, have provided an invaluable platform for disseminating cutting-edge research findings and exploring innovative applications.

The seminars have significantly enhanced the educational landscape for all participants, particularly MSc and PhD students. Attendees have gained deeper insights into advanced topics such as transduction methods in sensing, centrifugal microfluidics applications, and the latest in technologies for cancer diagnosis. The

knowledge shared has not only broadened the understanding of current technologies but has also sparked new ideas for research and application, contributing to the academic growth of participants.

The seminars have also served as a catalyst for networking among researchers from diverse backgrounds and institutions. These interactions have laid the groundwork for future collaborations, potentially leading to co-authored publications, joint research grants, and collaborative projects. Such partnerships are invaluable, as they combine diverse skills and perspectives to tackle complex research questions more effectively.

3.3 Foreseen Activities

Looking ahead, a commitment to the continuous advancement of research and training initiatives is upheld by the OrChESTRA consortium. As part of this commitment, the continuation of both face-to-face and online activities is ensured, providing a flexible and accessible learning environment for all participants. These ongoing sessions, designed to sustain the momentum of educational outreach, allow for continuous engagement and knowledge sharing across our network.

Moreover, a significant upcoming event in our training calendar is to be highlighted: the "Organ-on-Chip Masterclass," scheduled for July 2024. "Designed for researchers at ODTÜ MEMS and open to external participants, this hands-on training session will focus on the practical applications and emerging innovations within the organ-on-chip domain. Participants will be provided with in-depth exposure to this cutting-edge technology, enhancing both their practical skills and theoretical understanding. This event underscores the commitment of the OrChESTRA Project to maintaining a forefront position in microfluidics research and training, aligning with our goals to foster an ecosystem rich in innovation and collaborative spirit.

By continuing a robust schedule of activities and introducing specialised training such as the Organ-on-Chip Masterclass, the commitment to developing a sustainable ecosystem of advanced research and educational excellence is reinforced by the OrChESTRA Project.

4 CONCLUSIONS

The concerted efforts in mobility and training activities under the OrChESTRA Project have laid a solid foundation for advancing the fields of microfluidics and biosensors. Despite challenges such as visa issues that have impeded the planned mobility exchanges, the project has demonstrated resilience and adaptability, successfully redirecting efforts towards virtual collaborations and preparatory work. The training and education activities have been notably successful, delivering a range of seminars that have significantly enhanced the scientific and technological capacity of participants.

The engagement in these activities has fostered a robust community of practice among researchers from ODTÜ MEMS and partner institutions, enhancing collaborative ties and nurturing a culture of innovation. The forthcoming "Organ-on-Chip Masterclass" and the continuation of both virtual and in-person training sessions are poised to further this momentum, ensuring sustained impact and advancement in research and application.