



## Bio electromagnetics: An Overview of the Field with a Focus Protein Electrodynamics & Terahertz Medicine

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### Abstract:

Bio electromagnetics concerns the interaction with electromagnetic fields and waves with biological entities, from the molecular to the organismal. This seminar will provide a brief overview of this rapidly advancing field including some of the key medical applications of such technologies. Specific results concerning protein electrodynamics and terahertz medicine will also be discussed. In particular, it is well known that proteins exhibit dynamic behavior with their normal modes specifically vibrating at terahertz frequencies. These motions are essential to protein function and because these macromolecules are charged the existence of such vibrations suggest the possibility of specific interaction with electromagnetic radiation in the terahertz band. Time-domain spectroscopic experiments were performed identifying specific absorption of terahertz radiation ( $\sim 0.8\text{THz}$  and  $1.3\text{THz}$ ) by met-hemoglobin as well as potential interactions between high frequency and low frequency modes (e.g. Stokes shift). This proof-of-concept result suggests that these protein spectroscopic signatures can serve as the basis of a novel form of molecular medical imaging; likewise terahertz-modulated manipulation of such motions may underlie new forms of therapy. Other collaborative studies now underway, including THz imaging of Cancer and Alzheimer's disease tissues will also be highlighted.

### Biography:

Dr. Ogan Gurel serves as Chief Medical Officer for Psomagen USA (a division of MacroGen) and holds academic appointments as a Visiting Professor at the Solbridge International School of Business and Visiting Teaching Professor at DGIST (Daegu Gyeongbuk Institute of Science & Technology), with previous DGIST positions as Vice-Chair & Distinguished Invited Professor in the Management of Innovation. In the innovation world, Dr. Gurel is also Chief Scientific Officer for FRT - Field Robot Technology, Chief Marketing Officer for Eidware / SoundMind (Seoul), Advisor for the CREST-Malaysia Digital Health Cluster and a Venture Partner at The Yozma Group, with previous executive roles as CEO at NovumWaves (Seoul), Acting Chief Medical Officer at Nessa Hearing (Singapore), and Advisor at Frasen (Seoul). Ogan served over four years as a Director in the CTO office (MOT & Open Innova-



tion groups) at the Samsung Advanced Institute of Technology (SAIT). Dr. Gurel's over 35 years of experience spans multiple sectors: biomedical science, clinical medicine, strategy consulting, marketing, business development, executive management, marketing, and R&D management, with domain expertise in medical devices, digital healthcare, healthcare IT, molecular biophysics, and medical imaging. Prior to surgical training at the Massachusetts General Hospital, he obtained an MD degree Alpha Omega Alpha from Columbia University, also doing graduate work in structural biology (M.Phil degree) and earned a Bachelor's in Biochemical Sciences cum laude from Harvard College. Authoring 14 peer-reviewed scholarly papers, presenting nearly 200 conference proceedings and co-inventor on ten patent applications (four granted), Dr. Gurel has also given keynote addresses and other speeches at business and scientific conferences and seminars worldwide.

### Publication of speakers:

- Structure of the active core of human stem cell factor and analysis of binding to its receptor kit.
- SSA-MOA: a novel CTC isolation platform using selective size amplification (SSA) and a multi-obstacle architecture (MOA) filter.
- Tertiary Structure of Bacteriorhodopsin Positions and Orientations of Helices A and B in the Structural Map.

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