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Experts to Review the Applicants of the Post of Associate Professor of Medical Electronics

On Monday the 9th of April the Teaching and Research Council of Tampere University of Technology decided that the experts to review the applicants for the post of Associate Professor of Medical Electronics will be:

Professor Robert Plonsey,
Duke University, Durham, U.S.A.

Professor Åke Öberg
Dept. of Biomedical Engineering
University Hospital, Linköping, Sweden

According to the rules for filling the post, the experts have two months' time to give their expert opinion.

Visitors at the Ragnar Granit Institute

Professor Hiie Hinrikus from the Institute of Radio and Telecommunication, Tallinn Technical University, Estonia visited the Ragnar Granit Institute on the 4th of May. Professor Hinrikus is the Chairman of the Estonian Society for Medical Physics and Medical Engineering. This national society was established at the end of the year 1993 due to the encouragement of the Ragnar Granit Institute.

Professor Michael Jaffrin from Universite de Technologie de Combiegne, France, visited the Institute on Friday, May 20.

Applicants to the Post of Assistant of Biomedical Engineering

The following persons have applied for the post of Assistant of Biomedical Engineering:

Lic. Tech Jari Hyttinen, RGI
Dipl.Eng. Rami Lehtinen, RGI
Dipl.Eng. Tarmo Lipping, TUT and
Tallinn Technical Univ.
M.Sc. Noriyuki Takano, RGI
Dipl.Eng. Jari Viik, RGI

Intensive Course on Bioelectromagnetism at Tartu University

Professor Jaakko Malmivuo gave an intensive course at Tartu University on 16.- 20.5. The course comprised 25 hours of lectures on bioelectromagnetism. There were about 50 participants form Estonia, Latvia and Lithuania. The participants represented all educational levels ranging from second year university students to professors and several different professions from electronics and physics to medicine. According to the evaluation of the course the participants were very satisfied with the course and delighted with the possibility to receive information on this field of science.

Research Projects at the Ragnar Granit Institute: 3.
Development of Aimed ECG Leads for Ischemia Diagnosis

Electrocardiographic leads should possess properties which respond to changes in the heart's electrical activation generated by various heart diseases. The objective of this study is to examine possibilities to develop new, so- called aimed ECG leads capable of detecting local myocardial activation. Here the leads are intended to indicate and localize myocardial ischemia.The main principle was to retain the standard clinical procedure, i.e., to construct the new leads using the 12-lead ECG system. *The benefit of aimed ECG is increase in signal to noise ratio: the normal myocardial activation can be considered as noise disturbing the detection the injury source*.

In his MSc thesis in 1986 Jari Hyttinen had constructed a hybrid thorax model by com puterizing a physical model developed by Stanley Rush. The project to construct new aimed ECG leads was started in 1987. A theoretical analysis of the injury sources arising at the boundary between the ischemic and normal myocardium indicated that mainly radial sources are generated. The hybrid thorax model was utilized to obtain sensitivity of ECG leads in the detection of radial and tangential sources. The results obtained supported the theoretical analysis and an optimization scheme and procedures to develop leads with high local radial or tangential sensitivity were developed by Jari Hyttinen in his licentiate thesis.

In 1990 he visited the University of Tasmania, Australia working on computer modelling of the human thorax for the inverse ECG transfor mation. The model based on finite difference method (FDM) was adopted to the aimed lead project. The modelling procedures were ex tended, for example a method of reciprocal energization to solve the lead field of ECG leads was developed. This method was utilized pre sumably for the first time with a computer model. The FDM model facilitates studies of the effects of anatomical variation.

Preliminary clinical validation of the new leads employing a relatively small database was performed by Jari Viik in his MSc thesis. His results were consistent with the theory. Also, a larger clinical data base is available. Unfortu nately, the material does not contain ischemia localization. Complete clinical validation of the new leads has not been conducted. New accu rate data is being measured and a project to reanalyze the reference angiography data is unfolding providing the material for validation.

New methods to construct aimed ECG leads have been developed. In his PhD thesis "Development of Regional Aimed ECG Leads Especially for Ischemia Diagnosis" Jari Hyttinen has devised an optimization scheme and a method of singular value decomposition (SVD). The new regional aimed leads have a signifi cantly higher proportion of their sensitivity in one region compared to the standard ECG. For example, the posterior radial sensitivity is more than tripled compared to the most sensitive lead of the 12-lead ECG and almost 70% higher compared to lead V9. In the future, the method of SVD will provide a fast procedure to construct patient adapted aimed ECG leads obtained from patient tailored FDM thorax models. Also, a method to construct new ischemia sensitive leads based on clinical material has been devised. This procedure and the results will be presented in Jari Viik's licentiate thesis to be completed in autumn 1994.

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