# LÉKAŘ A TECHNIKA – CLINICIAN AND TECHNOLOGY

VOLUME 47 • NUMBER 2 • JUNE 2017

# The scientific journal of the Czech Society for Biomedical Engineering and Medical Informatics and the Faculty of Biomedical Engineering, Czech Technical University in Prague

Lékař a technika – Clinician and Technology is the oldest regularly appearing specialist journal dealing with new findings in research, development, production and implementation of medical technology. Since 1970, it has been publishing original research articles and review papers by authors, who present topical and newly discovered information in the field of medical technology.

# Editor-in-Chief: Karel Roubík, PhD

Czech Technical University in Prague Faculty of Biomedical Engineering Kladno, Czech Republic

phone: +420-603-479-901 e-mail: roubik@fbmi.cvut.cz

#### **Deputy Editors:**

## Thomas E Bachman, MSc

Economedtrx

Lake Arrowhead, California, USA phone: +1-951-236-4890 e-mail: tbachman@me.com

# Jakub Ráfl, PhD

Czech Technical University in Prague Faculty of Biomedical Engineering Kladno, Czech Republic

phone: +420-728-229-991 e-mail: rafl@fbmi.cvut.cz

# **Editorial Board:**

## Vladimir Blazek, PhD

RWTH Aachen University Aachen, Germany

# Radu Ciorap, PhD

"Grigore T. Popa" University of Medicine and Pharmacy Iași Faculty of Medical Bioengineering Iași, Romania

# Silvia Conforto, PhD

Roma Tre University, Engineering Department Roma, Italy

# Paul Dixon, PhD

Vyaire Medical, Respiratory Solutions Engineering London, UK

#### Radovan Hudák, PhD

Technical University of Košice Faculty of Mechanical Engineering Košice, Slovak Republic

#### Michael B. Jaffe, PhD

Cardiorespiratory Consulting, LLC Cheshire, Connecticut, USA

#### Christian Kollmann, PhD

Medical University of Vienna Center for Medical Physics & Biomedical Engineering Imaging Physics & Quantification – Ultrasound Vienna, Austria

# Norbert Noury, PhD

University of Lyon Institute for Nanotechnologies of Lyon Lyon, France

# Marek Penhaker, PhD

VŠB-Technical University of Ostrava Faculty of Electrical Engineering and Computer Science Ostrava, Czech Republic

# Ivo Provazník, PhD

Brno University of Technology Faculty of Electrical Engineering and Communication Brno, Czech Republic

# Jozef Rosina, PhD

Charles University in Prague 3rd Faculty of Medicine Prague, Czech Republic

# Martin Rožánek, PhD

Czech Technical University in Prague Faculty of Biomedical Engineering Kladno, Czech Republic

# Simo Saarakkala, PhD

University of Oulu Faculty of Medicine, Research Unit of Medical Imaging, Physics and Technology Oulu, Finland

# Ali Selamat, PhD

University of Technology Malaysia Center of Communication and Information Technologies Johor Bahru, Malaysia

#### Vladimír Sobota, MEng

Maastricht University Faculty of Health, Medicine and Life Sciences Maastricht, The Netherlands

#### Tomasz Szczapa, MD, PhD

Poznań University of Medical Sciences Department of Neonatology Poznań, Poland

#### Milan Štork, PhD

University of West Bohemia Faculty of Electrical Engineering Plzeň, Czech Republic

## Christiane Thielemann, PhD

University of Applied Sciences Faculty of Engineering, BioMEMS Lab Aschaffenburg, Germany

#### Milan Tyšler, PhD

Slovak Academy of Sciences Institute of Measurement Science Bratislava, Slovak Republic

### Jana Vránová, PhD

Charles University in Prague 3rd Faculty of Medicine Prague, Czech Republic

# Jozef Živčák, PhD

Technical University of Košice Faculty of Mechanical Engineering Košice, Slovak Republic

# **Editorial Office:**

Ing. Ida Skopalová

phone: +420-224-355-053 e-mail: skopalova@fbmi.cvut.cz

## Ina. Eva Kokešová

phone: +420-224-359-745

e-mail: eva.kokesova@fbmi.cvut.cz

# Managing Editors: Ing. Veronika Huttová

phone: +420-607-716-092

 $e\hbox{-}mail: veronika.huttova@fbmi.cvut.cz\\$ 

# **MUDr. Ing. David Macků** phone: +420-603-913-822

e-mail: mackudav@fel.cvut.cz

**Lékař a technika – Clinician and Technology** journal is indexed in the following international databases: SCOPUS (Elsevier), EMBASE/Excerpta Medica (Elsevier), IndexCoper-

nicus, and Bibliographia Medica Cechoslovaca.

The opinions expressed in articles are those of authors and do not necessarily reflect the views of the publishers or the Czech Society for Biomedical Engineering and Medical Informatics.

Since 2008, The Clinician and Technology is jointly published by the Czech Society for Biomedical Engineering and Medical Informatics, a member of Czech Medical Association of Jan Evangelista Purkinje (Sokolská 31, 120 26 Praha 2, Czech Republic), and the Faculty of Biomedical Engineering, Czech Technical University in Prague (nám. Sítná 3105, 272 01 Kladno, Czech Republic).

The journal is registered in the Czech Republic, act MK ČR E 5085.

Article submission charge or Article processing charge (APC, publication fee) is not required from authors. Publishing in Lékař a technika – Clinician and Technology journal is free of charge.

Manuscripts should be sent using the journal management and publishing online system available at http://ctj.fbmi.cvut.cz/.

#### **Copyright Notice:**

Authors who publish with this journal agree to the following terms:

- 1. Authors retain copyright and grant the journal right of the first publication with the work simultaneously licensed under a Creative Commons Attribution License (https://creativecommons.org/licenses/by/3.0/) that allows others to share the work with an acknowledgement of the work's authorship and initial publication in this journal.
- 2. Authors are able to enter into separate, additional contractual arrangements for the non-exclusive distribution of the journal's published version of the work (e.g., post it to an institutional repository or publish it in a book), with an acknowledgement of its initial publication in this journal.
- 3. Authors are permitted and encouraged to post their work online (e.g., in institutional repositories or on their website) prior to and during the submission process, as it can lead to productive exchanges, as well as earlier and greater citation of published work (See The Effect of Open Access at http://opcit.eprints.org/oacitation-biblio.html).

Lekar a technika

Clinician and Technology

ISSN: 0301-5491 (Print)
ISSN: 2336-5552 (Online)

Frequency: 4 issues per year

Published: since 1970

Publishers Czech Medical Association of J. E. Purkinje,

Prague, Czech Republic

Czech Technical University in Prague, Faculty of Biomedical Engineering

Website: http://ctj.fbmi.cvut.cz/