

---

## Editorial

# Progress in Biomedical Research – Physics and Engineering for Life

B. HENSEL

Zentralinstitut für Biomedizinische Technik,  
Friedrich-Alexander-University Erlangen-Nuremberg,  
Erlangen, Germany

Biomedical research requires the highly interdisciplinary efforts of clinicians, engineers, and scientists working hand-in-hand for the benefit of their patients. Common tasks are defined in everyday clinical practice. Physicists work on the fundamental problems, show the feasibility of the solutions, and provide a basis for the engineering of devices and novel forms of therapy. The latter become part of clinical practice and the circle of "Physics and Engineering for Life" is completed.

Based on his understanding of the ultimate importance of rapid changes in research and development, Prof. Dr. Max Schaldach first published *Progress in Biomedical Research* six years ago as an open platform for vigorous interdisciplinary communication and discussion. Its topics include all aspects of physiology and pathophysiology of the cardiovascular system, as well as basic research, engineering developments, and clinical practice. Thus, they include all of the steps necessary for the successful development of medical devices and novel forms of therapy in this field.

We look back on six fruitful years of *Progress in Biomedical Research*. During this time visionary and controversial ideas have been presented, discussed, revised, and further pursued. Many of these ideas have become essential elements of daily clinical practice.

Recently in 2001, the readers of *Progress in Biomedical Research* are provided with insights into the current state of basic research [1,2]. Several articles have documented how the concept of fractal coating of iridium surfaces has resulted in the highly improved performance of pacemaker leads. Other articles have discussed both the suitability of fractal-coated leads [3] in clinical use corresponding to the concept of

Evidence-Based Medicine (EBM), as well as the potential medical applications and approaches for future clinical research [4]. Another topic was coating coronary stents with silicon-carbide. A series of articles provided a detailed overview of the scientific background of the coating, as well as the highly enhanced clinical performance of stents [5].

Additional focal points that have been presented include intracardiac signals [6], intracardiac impedance measurements [7] as a sensor signal for rate-adaptive pacing, and wireless telecardiology (Home Monitoring) [8] in connection with pacemaker technology.

*Progress in Biomedical Research* covers all specializations within the field of cardiology that benefit from the latest developments in biomedical engineering, such as interventional cardiology [9], ablation [10], and the diagnosis of cardiovascular diseases [11]. Rapid developments in biomedical engineering are particularly evident in the field of electrotherapy of the heart, which has become a standard therapy in the treatment of bradycardias and tachyarrhythmias. Therefore, further development of pacemakers [12] and implantable cardioverter-defibrillators (ICDs) [13] is an important focus of the journal. In particular, studies have shown that electrotherapy is also expected to be effective in the treatment of atrial fibrillation [14] and congestive heart failure [15].

Biomedical researchers continue to develop a deeper understanding of the most complex system in nature, namely, the inner "workings" of man, in an effort to exert a medically appropriate influence on the system. The ultimate goal of these efforts is to detect, or even predict instabilities that occur in the many closely

associated physiologic control loops, and to subsequently provide methods and devices that reestablish stable behavior.

Modern biomedical research means "Physics and Engineering for Life"; it stimulates innumerable questions and generates additional, intellectually engaging projects. Although the complexity of the problems in our discipline might initially raise doubts about our success, we nevertheless have to muster our courage to face these challenges. *Progress in Biomedical Research* will continue to provide a forum for the discussion of these problems and stimulate research in this vital and fascinating field.

## References

- [1] Schier M, Hensel B. Description of cardiac hemodynamics using a physical model: pressure-volume diagrams and the effect of AV delay. *Prog Biomed Res.* 2002; 7: 42-48.
- [2] Bieberle T, Hensel B, Schaldach M. Information transfer in a sinus node cell model. *Prog Biomed Res.* 2001; 6: 94-101.
- [3] Novák M, Kamarýt P, Dvorák I et al. Long-term performance of a high-impedance fractal-coated bipolar ventricular lead with 1.3-mm<sup>2</sup> electrode. *Prog Biomed Res.* 2001; 6: 178-181.
- [4] Merkely B. Developing a new electrode system for detection of the repolarization processes of the heart. *Prog Biomed Res.* 2001; 6: 417-425.
- [5] All articles. *Prog Biomed Res.* 2001; 6: 182-255
- [6] Pfeiffer D. The ventricular evoked response in pacemaker therapy. *Prog Biomed Res.* 2001; 6: 71-80.
- [7] Vijay N, De Metz K, Dolan M et al. A prospective multicenter study demonstrating safety and effectiveness of closed loop stimulation. *Prog Biomed Res.* 2001; 6: 397-401.
- [8] Stellbrink C, Filzmaier K, Mischke K et al. Potential applications of home monitoring in pacemaker therapy – a review with emphasis on atrial fibrillation and congestive heart failure. *Prog Biomed Res.* 2001; 6: 107-114.
- [9] Schmidt W, Behrens P, Behrend D et al. Experimental study of peripheral, balloon-expandable stent systems. *Prog Biomed Res.* 2001; 6: 246-255.
- [10] Károlyi I, Otto T, Hansen C et al. Advanced mapping and navigation techniques for radiofrequency ablation. *Prog Biomed Res.* 2001; 6: 435-438.
- [11] Simor T, Toth L, Petro K et al. Magnetic resonance imaging for the etiology diagnostics of ventricular arrhythmia. *Prog Biomed Res.* 2001; 6: 348-352.
- [12] Lawo T, Lemke B, Barmeyer J. First implantation of the Triplos LV three-chamber pacemaker: A case-report. *Prog Biomed Res.* 2001; 6: 25-30.
- [13] Atie J, Saad EB, Andréa E et al. Recent advances in dual-chamber ICD therapy. *Prog Biomed Res.* 2001; 6: 132-136.
- [14] Anelli-Monti M, Mächler H, Grasser B et al. Septal versus non-septal right-atrial pacing. *Prog Biomed Res.* 2001; 6: 276-279.
- [15] Christ G. Cardiac resynchronization in congestive heart failure. *Prog Biomed Res.* 2001; 6: 256-263.

### Contact

Prof. Dr. B. Hensel  
 Zentralinstitut für Biomedizinische Technik  
 Friedrich-Alexander-Universität Erlangen Nürnberg  
 Turnstraße 5  
 D-91054 Erlangen  
 Germany  
 Telephone: +49 9131 85 22 805  
 Fax: +49 9131 27 196  
 E-mail: bernhard.hensel@biomed.uni-erlangen.de