

September 24th – 28th, 2007, Margarita Island, Venezuela  
24 al 28 de Septiembre de 2007, Isla de Margarita, Venezuela

# IFMBE Proceedings

Müller-Karger · Wong · La Cruz (Eds.)

Volume 18

IV Latin American Congress  
on Biomedical Engineering 2007,  
Bioengineering Solutions  
for Latin America Health



CLAIB  
2007

IV Congreso Latinoamericano  
de Ingeniería Biomédica,  
CLAIB 2007, Soluciones  
de Bioingeniería para  
la salud en América Latina



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The International Federation for Medical and Biological Engineering, IFMBE, is a federation of national and transnational organizations representing internationally the interests of medical and biological engineering and sciences. The IFMBE is a non-profit organization fostering the creation, dissemination and application of medical and biological engineering knowledge and the management of technology for improved health and quality of life. Its activities include participation in the formulation of public policy and the dissemination of information through publications and forums. Within the field of medical, clinical, and biological engineering, IFMBE's aims are to encourage research and the application of knowledge, and to disseminate information and promote collaboration. The objectives of the IFMBE are scientific, technological, literary, and educational.

The IFMBE is a WHO accredited NGO covering the full range of biomedical and clinical engineering, healthcare, healthcare technology and management. It is representing through its 58 member societies some 120.000 professionals involved in the various issues of improved health and health care delivery.

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## IV Congreso Latinoamericano de Ingeniería Biomédica, CLAIB 2007, Soluciones de Bioingeniería para la salud en América Latina

24 al 28 Septiembre de 2007

Isla de Margarita, Venezuela

## Editors

Carmen Müller-Karger  
Departamento de Mecánica  
Universidad Simón Bolívar  
Valle Sartenejas  
Caracas 1080A, Venezuela  
E-Mail: cmuller@usb.ve

Alexandra La Cruz  
Departamento de Computación y  
Tecnología de la Información  
Universidad Simón Bolívar  
Valle Sartenejas  
Caracas 1080A, Venezuela  
E-Mail: alacruz@usb.ve

Sara Wong  
Departamento de Electrónica  
Universidad Simón Bolívar  
Valle Sartenejas  
Caracas 1080A, Venezuela  
E-Mail: swong@usb.ve

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## About IFMBE

The International Federation for Medical and Biological Engineering (IFMBE) was established in 1959 to provide medical and biological engineering with a vehicle for international collaboration in research and practice of the profession. The Federation has a long history of encouraging and promoting international cooperation and collaboration in the use of science and engineering for improving health and quality of life.

The IFMBE is an organization with membership of national and transnational societies and an International Academy. At present there are 52 national members and 5 transnational members representing a total membership in excess of 120 000 worldwide. An observer category is provided to groups or organizations considering formal affiliation. Personal membership is possible for individuals living in countries without a member society. The International Academy includes individuals who have been recognized by the IFMBE for their outstanding contributions to biomedical engineering.

### *Objectives*

The objectives of the International Federation for Medical and Biological Engineering are scientific, technological, literary, and educational. Within the field of medical, clinical and biological engineering its aims are to encourage research and the application of knowledge, and to disseminate information and promote collaboration.

In pursuit of these aims the Federation engages in the following activities: sponsorship of national and international meetings, publication of official journals, cooperation with other societies and organizations, appointment of commissions on special problems, awarding of prizes and distinctions, establishment of professional standards and ethics within the field, as well as other activities which in the opinion of the General Assembly or the Administrative Council would further the cause of medical, clinical or biological engineering. It promotes the formation of regional, national, international or specialized societies, groups or boards, the coordination of bibliographic or informational services and the improvement of standards in terminology, equipment, methods and safety practices, and the delivery of health care.

The Federation works to promote improved communication and understanding in the world community of engineering, medicine and biology.

### *Activities*

Publications of IFMBE include: the journal *Medical and Biological Engineering and Computing*, the electronic magazine *IFMBE News*, and the Book Series on Biomedical Engineering. In cooperation with its international and regional conferences, IFMBE also publishes the IFMBE Proceedings Series. All publications of the IFMBE are published by Springer Verlag. The Federation has two divisions: Clinical Engineering and Health Care Technology Assessment.

Every three years the IFMBE holds a World Congress on Medical Physics and Biomedical Engineering, organized in cooperation with the IOMP and the IUPESM. In addition, annual, milestone and regional conferences are organized in different regions of the world, such as Asia Pacific, Europe, the Nordic-Baltic and Mediterranean regions, Africa and Latin America.

The administrative council of the IFMBE meets once a year and is the steering body for the IFMBE: The council is subject to the rulings of the General Assembly, which meets every three years.

Information on the activities of the IFMBE can be found on the web site at: <http://www.ifmbe.org>.

## Foreword

Welcome to the IV Latin American Congress on Biomedical Engineering, CLAIB2007, *Bioengineering solution for Latin America health*. This event gathers Biomedical Engineering scientists from the Americas and other continents, presenting their latest research results.

This Year CLAIB will take place on Venezuela's Margarita Island September 24th through 28th. Margarita is "The Pearl of the Caribbean", an ideal place to enjoy the tropical winds, famous beaches, and Venezuelan hospitality and food.

Every third year, worlds and especially Latin-American bio-engineering experts gather at CLAIB to develop a shared vision to advance human welfare, showing the products of their efforts and creativity. These multidisciplinary specialists form a synergistic team whose results contribute to the development of new technologies.

This CLAIB follows the successful meetings held in Joao Pessoa (Brazil, 2004), Habana (Cuba, 2001) and Mazatlán (Mexico, 1998). CLAIB is sponsored primarily by the Regional Council of Biomedical Engineering for Latin America (CORAL), and the International Federation for Medical and Biological Engineering (IFMBE).

We will make every effort to make CLAIB 2007 a memorable event and that each participant will contribute to a CLAIB full of good experiences and memories.

We look forward to meeting you all in Margarita Island.

### **Professor Carmen Müller-Karger**

Representing the Organizing Committee

President of the Scientific Committee CLAIB2007

## Prefacio

Bienvenidos al IV Congreso Latinoamericano de Ingeniería Biomédica, CLAIB2007, *Soluciones de Bioingeniería para la salud en América Latina*. Este evento reúne a científicos e ingenieros biomédicos de América y otros continentes, con el objetivo de presentar los resultados de sus últimas investigaciones.

Este año CLAIB se celebrará en la Isla de Margarita en Venezuela entre el 24 y el 28 de Septiembre. Margarita es considerado "La perla del Caribe" y es un lugar ideal para disfrutar de los vientos tropicales, sus famosas playas y la comida y hospitalidad Venezolana.

Cada tres años, los expertos en ingeniería biomédica del mundo y especialmente los de Latino América se reúnen en CLAIB para desarrollar una visión compartida de los avances en el bienestar de la humanidad, mostrando los productos de sus esfuerzos y creatividad. Estos especialistas multidisciplinarios forman un grupo sinérgico que contribuye al desarrollo de nuevas tecnologías.

Este CLAIB representa la continuación de los exitosos encuentros anteriores que se realizaron en Joao Pessoa (Brasil, 2004), Habana (Cuba, 2001) y Mazatlán (México, 1998), respectivamente. CLAIB está patrocinado especialmente por el Consejo Regional de Ingeniería Biomédica para América Latina (CORAL) y la Federación Internacional para la Ingeniería Médica y Biológica (IFMBE).

Nosotros estamos haciendo todos los esfuerzos para hacer de CLAIB2007 un encuentro memorable, y nos sentimos confiados de que la presencia de cada uno de los participantes van a garantizar un CLAIB lleno de buenas experiencias y buenos recuerdos.

Esperamos verlos en la isla de Margarita.

### **Profesora Carmen Müller-Karger**

En representación de Comité Organizador

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## Conference details

### Name:

IV Latin American Congress on Biomedical Engineering

### Slogan:

*Bioengineering solution for Latin America health*

### Short name:

CLAIB 2007

### Venue:

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September, 24 – 28, 2007

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Carmen M. Müller-Karger  
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### Nombre:

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### Lema:

*Soluciones de Bioingeniería para la salud en América Latina*

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Carmen M. Müller-Karger  
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