The GIOME is a multidisciplinary multi-scale effort to gain new insight in the function of the gastrointestinal tract. The term comes from “GI” (the organ) and “-ome” (as a whole). The GIOME is a completely new concept derived from the human physiome project.

GIOME is a series of interdisciplinary and multi-scale research works aiming to gain new insight into the function of the gastrointestinal tract. The term comes from “GI” (gastrointestinal organ) and “-ome” (as a whole). GIOME is a completely new concept derived from the human physiome project. GIOME is the quantitative description of the functioning organism in normal and pathophysiological conditions. The GIOME project is a multi-centric, integrated program to design, develop, implement, test, document, archive and disseminate quantitative information and integrative models of the functional behavior of the GI tract.

Physiome is the quantitative description of the functioning organism in normal and pathophysiological conditions. The GIOME project is a multi-centric, integrated program to design, develop, implement, test, document, archive and disseminate quantitative information and integrative models of the functional behavior of the GI tract. The GIOME describes the physiological dynamics of the normal intact GI tract and is built upon interdisciplinary approaches with application to GI diseases. The development of comprehensive models of the GI tract is key to pharmaceutics and design of drugs and interventional procedures, in the aim of better predicting the results of treatments. There is a special focus on development of new medical devices and technologies including computational models.

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The mission of GIOME is quite simple but demanding. The mission is to bring modeling and neuro-mechano-physiology of the GI tract and other soft tissues to the World! The visions and goals will be reached through an interdisciplinary effort.

GIOME研究的任务很简单但是极具挑战性。GIOME研究的主要任务是建立胃肠道及其他软组织的“神经机械感应生理学”模型和理论。该项目的愿景及目标将通过跨学科研究实现。

The GIOME Center has a solid foundation and a great position from which to contribute to academia, business development and society. It will focus on what is unique to the GIOME platform that is being developed. To reach the visions and to maintain focus, we will prioritize quality, R&D, supervision, networking and continued development.

GIOME中心有一个坚实的基础并对于促进学术、企业和社会发展都具有重要意义。GIOME中心将专注于正在发展的对于GIOME平台所特有的技术和领域。为了实现这个目标并展现并保持GIOME的特色，我们将会强化质量、研发、监督管理、合作网络及可持续发展。
Interdisciplinary work has much to offer science and society. The major leaps often occur in the interface between disciplines which is a core element in the strategy of the GIOME.

People with different educational background and experience can contribute with their unique competencies. Each person evaluates a problem from a different angle and by joining forces new ideas arise. Since each person is unique, the leadership structure varies from time to time dependent on the project and the people involved.

Exchange and collaboration with other partners are key to success in such a model. Students and scientists stationed in another academic environment or in a company for a period of time will return with a new mind and visitors will also challenge current concepts and provide new ideas.
Continue ongoing studies and initiate a sufficient number of new studies every year in the field of gastroenterology with focus on neuro-mechano-physiological mechanisms relation to functions of the gastrointestinal sphincters, pain mechanisms in functional gastrointestinal diseases, and tissue remodeling associated with diabetes, intestinal obstruction, diverticulosis and constipation.

OBJECTIVES AND GOALS

Based on the mission and vision, the objectives and major goals for GIOME are to:

1. **Interact with public institutions and commercial partners for development and consultancy with mutual benefits.**
   
   與公共機構和商業開發以及諮詢合作夥伴進行互惠互利的互動。

2. **Develop at least one new technology every 2-3 years with significant impact in basic and clinical science and with potential to be commercialized.**
   
   在2-3年內至少研發一項對基礎及臨床研究具有重要影響且具有商業價值的新技術。

3. **Interact with public institutions and commercial partners for development and consultancy with mutual benefits.**
   
   與公共機構和商業夥伴進行開發和諮詢合作，實現互利互惠。

4. **Publish the results in highest ranked scientific journals in the fields of gastroenterology, biomechanics, bioengineering and physiology**
   
   將科研成果發表到在胃腸病學、生物力學、生物工程及生理學領域具有極高聲譽和影響力的學術期刊。

5. **Gain achievements and win awards.**
   
   取得重要成就並獲取相關獎項。
The GIOME is organized in units according to specific purpose and function. Each unit has its own focus but working closely together for the GIOME mission and vision.

根据明确详细的科研目的及功能,GIOME由不同的研究组组成,每一个研究组都有自己的目标,但是所有研究组都必须携手合作以GIOME的使命和愿景为目标。
Hans Gregersen was born in Denmark where he obtained his MD and Dr.m.sci (PhD) degrees. He worked at universities in Denmark, Norway, Ireland, USA and China as professor in gastrointestinal physiology, bioengineering, biomechanics and medical device innovation. Hans Gregersen established the Mech-Sense Center in 2003 and the Idea Clinic in 2008 at Aalborg Hospital, and the GIOME in 2013. Hans Gregersen served as the executive director of the Sino-Danish University in Beijing from 2010 to 2013 during the establishment phase and instilled 7 new master degree programs.

From January 2013 Hans Gregersen was nominated as a distinguished foreign expert in the 1000 Talent program in China and became professor at Chongqing University. Hans Gregersen was appointed professor at Chinese University of Hong Kong and at the Prince of Wales Hospital in Hong Kong in 2016.

Hans Gregersen contributed several innovations from his research among them the EndoFLIP device that was commercialized for diagnosis of gastro-esophageal reflux disease and the multimodal technology for pain diagnosis. Other inventions are the Fecobionics expulsion test and the Fungibionics obesity therapy.
Professors Liao Donghua and Jingbo Zhao consistently played key roles in the development of the GIOME as co-directors. Professor Donghua has developed several innovative models of gastrointestinal function and remodeling and is in charge of the computational projects. Professor Zhao’s core competence is in remodeling of the gastrointestinal tract due to diabetes and intestinal obstruction as well as animal experimental models.
GIOME has educational activities on several levels. The majority of are courses on the postgraduate level and span from herb biochemistry, electromechanics, neurophysiology, imaging and modeling to clinical research.

Supervision of PhD students and master students are on an individual basis face-to-face or by videoconferences and with supervisors from professors as well as by post-docs.

Quite often guest professors are take part in supervision and gives lectures. In the future it is the plan to offer a structured program of courses at an international level.

The course program will include courses in innovation, medical device technology, endoscopy and strategic management in academic institutions.
GIOME has several laboratories in addition to the access to facilities at collaborating institutions.

GIOME 中心拥有数个实验室，此外还可以使用合作机构拥有的设备。

**FACILITIES**

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<tr>
<th>Cell culture lab</th>
<th>Biomechanics lab</th>
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<tr>
<td>细胞培养实验室</td>
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<tr>
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GIOME has several offices and provide good conditions and the newest office equipment for students, scientists and visitors.

GIOME 中心有几个条件完善的办公室，可以给学生、研究者及来访的学者提供最新的办公设备。

**IMPORTANT EQUIPMENT AND TECHNOLOGIES**

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<tr>
<th>Multimodal pain stimulation technology</th>
<th>Advance anorectal expulsion test (Fecobionics)</th>
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<tr>
<td>多模式疼痛激发技术</td>
<td>先进的肛肠排洞性检测(Fecobionics)</td>
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<tr>
<th>Functional luminal imaging probe (endoFLIP)</th>
<th>Expandable endoluminal therapy for obesity (Fungibionics)</th>
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<tr>
<td>功能性腔内成像探头</td>
<td>肥胖症的腔内膨胀疗法(Fungibionics)</td>
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<th>Tri-axial mechanical testing equipment</th>
<th>Endoscopic ultrasound equipment</th>
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<tr>
<td>三轴向力学测试机</td>
<td>超声内镜设备</td>
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The main facilities of GIOME are in Hong Kong and Aarhus, Denmark with numerous partners and collaborators worldwide in academia and R&D.
Based on basic and clinical science the key persons behind the GIOME have developed several new technologies and innovations in the past. Well-known examples are:

- The impedance planimeter
- The multimodal pain model
- EndoFLIP
- Advanced smooth muscle analysis
- The tri-axial test machine
- Advanced anorectal expulsion test (Fecobionics)

Current innovations span a wide range from devices to treat obesity and gyroscope catheters to laboratory equipment such as robotic machines for collections of insulin-producing cells based on image analysis.

Innovations and translational science
Fecobionics is one of the most recent innovations from GIOME and is considered to have a huge potential in clinical diagnostics and therapy of anorectal disorders. Fecobionics is a very advanced anorectal expulsion test. It combines several clinical tests such as the balloon expulsion test, anorectal high-resolution manometry and defecography with its advanced pressure measurements, geometric profiling and anorectal bending measurements. It is by far the test that comes closest to the defecation as it takes place in healthy volunteers and patients with constipation and fecal incontinence. The word Fecobionics comes from fecal and bionics which means electronics in biology. A bionic device imitates a physiological process without interfering with the process.

Fecobionics has already proven valuable for studying the normal defecation process that can be divided into several phases. It is currently under investigation for its diagnostic value in patients suffering from constipation and fecal incontinence. Fecobionics is also considered useful as a technology for biofeedback training in dysynergia patients.

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The idea for the multimodal technology originated from Professor Asbjørn Drewes and Professor Hans Gregersen at the Mech-Sense Center in Denmark. The probe based technology is useful for differentiating pain mechanisms in the GI tract by mechanical, thermal and chemical stimulation.

The technology has been used in many experimental pain studies. The major clinical application is in studies of functional GI disorders such as functional chest pain, non-erosive reflux disease (NERD) and irritable bowel syndrome (IBS). As an example it can be used to differentiate patients with pain and symptoms of unknown origin into subgroups that need different types of treatment. It also proved to be useful in phase 3 studies of new drugs.

The functional luminal imaging probe (FLIP) is an impedance-based technology to study sphincters and narrowing regions in internal organs. It was originally developed by Dr. Barry McMahon and Professor Hans Gregersen and the technology was successfully tech-transferred to Irish company Crospon and commercialized.

The EndoFLIP invented by McMahon and Gregersen. Courtesy of Crospon Ltd

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FLIP has been mainly used for research purposes including endoscopic studies and for clinical research on various gastrointestinal diseases. It has also been used for various other applications such as studying the effects of different treatments on the gastrointestinal tract.

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Private-Public Partnerships (PPPs) are important for economic development, not least for bringing innovations and early stage ideas born at universities to the market. Companies have a demand for obtaining knowledge and recruiting talented students from academia whereas universities need focus on applications. GIOME promotes collaboration and partnerships with industrial partners and welcome interested parties to join. Collaboration can have different forms such as consultancy agreements, R&D agreement, IP agreements, and test services. GIOME employees serve as consultants for several multinational medical device companies. Furthermore, GIOME techtransferred technologies like the FLIP technology that is now commercialized. Furthermore, several companies originated in work done at GIOME.
Newer publications can be found in databases such as http://www.ncbi.nlm.nih.gov/pubmed or by contacting employees at the GIOME center.


Reviews


Books

Newer publications can be found in databases such as http://www.ncbi.nlm.nih.gov/pubmed by contacting employees at the GIOME center.