

If you have any **questions** please contact the individual institutions directly or the spokesman of the alliance, Prof. Dr. Hugo Hämmerle of the NMI Natural and Medical Sciences Institute, by telephone at +49 7121 51530-11 or e-mail him at haemmerle@nmi.de

➤ We are **innovation**

Passionate **research**.
Connective **thinking**. Reliable **action**.



➤ An alliance of innovations



Deputy Minister-President
and Minister of Finance and Economics
of the state of Baden-Württemberg

With a share of 5.1 percent of the gross domestic product spent for research and development, Baden-Württemberg is at the top of the list in Europe and worldwide. Baden-Württemberg's strength in research is an important asset in global competition.

This strength is mainly due to the high corporate spending for research activities and based on the fact that small and medium-sized companies, among which there is a large number of "hidden champions", are major contributors to the market of innovations. The huge success of Baden-Württemberg's innovation system is also due to its powerful and well-balanced research infrastructure. In addition to the universities and universities of applied sciences with their focus on fundamental research, the south-western part of Germany is characterised by its sound network of institutions with close relations to the industry. By supporting these institutions, the state contributes to the

strengthening and further development of this research landscape. Twelve legally independent research institutions with close industry relations have come together and formed the Innovationsallianz Baden-Württemberg. These institutions are to develop technologies relevant for the industry and to support the companies with their research work, to help them translate innovative ideas into marketable products and processes.

Thanks to their high scientific quality and decades of experience, the institutes of the Innovationsallianz BW are important technology suppliers to the industry and especially medium-sized companies. They are indeed an outstanding and indispensable pillar of Baden-Württemberg's innovation landscape.

Dr. Nils Schmid, MP

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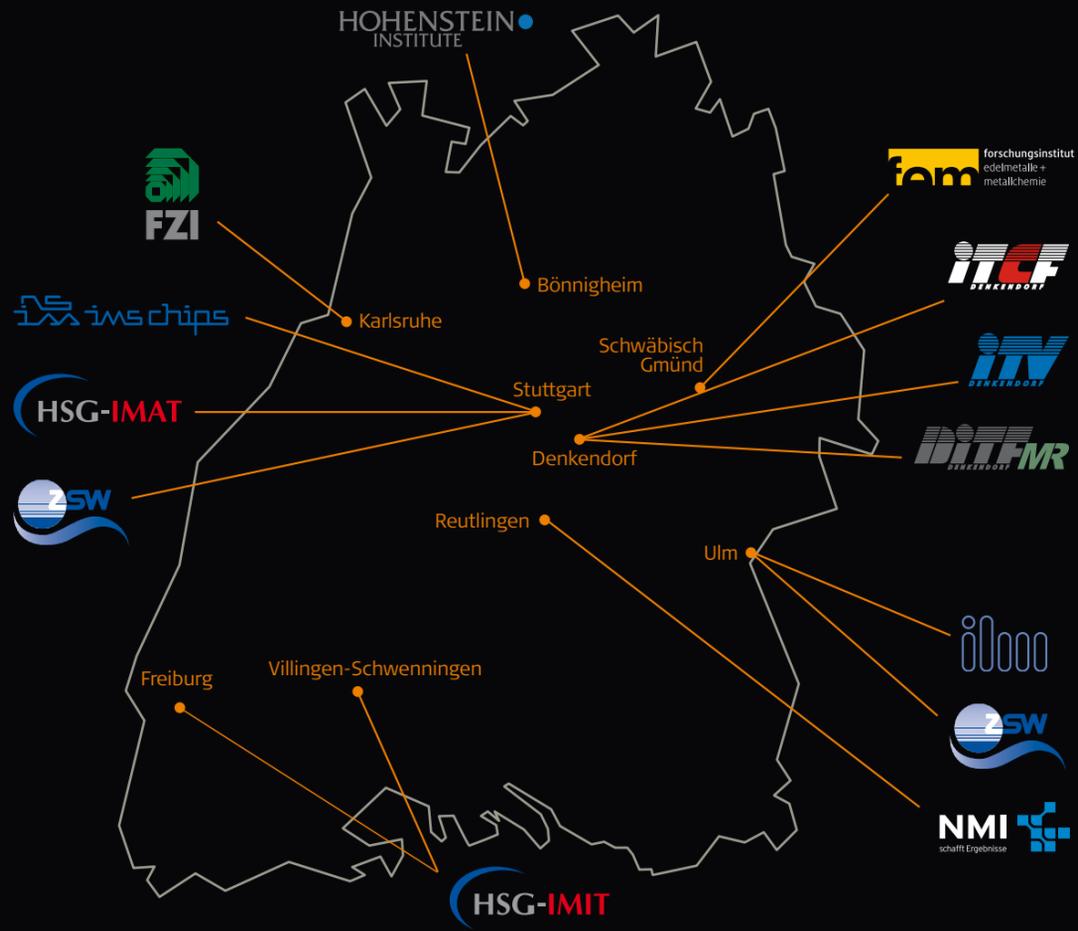
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www.innbw.de

innBW's 12 independent research institutes are supported by the Ministry of Finance and Economics.



innBW in Baden-Württemberg

We are intelligence



The 12 member institutes of innBW not only cover a very broad range of topics but are also spread across the state of Baden-Württemberg.

The institutes closely cooperate with universities and universities of applied sciences in the state. Many professors working for innBW institutes also teach at these universities and ensure an intensive knowledge transfer from fundamental to applied research.

innBW is an **innovation lighthouse**. Technologies for a better tomorrow, in important **forward-looking industries**, often start there.

Many new innovative enterprises started as **spin-offs**.

innBW conducts **comprehensive basic research** which is funded by the state of Baden-Württemberg.

innBW has extensive experience in building **project-based networks and cooperations** and often plays a central role in them.

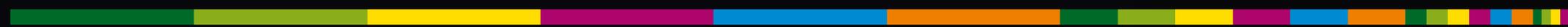
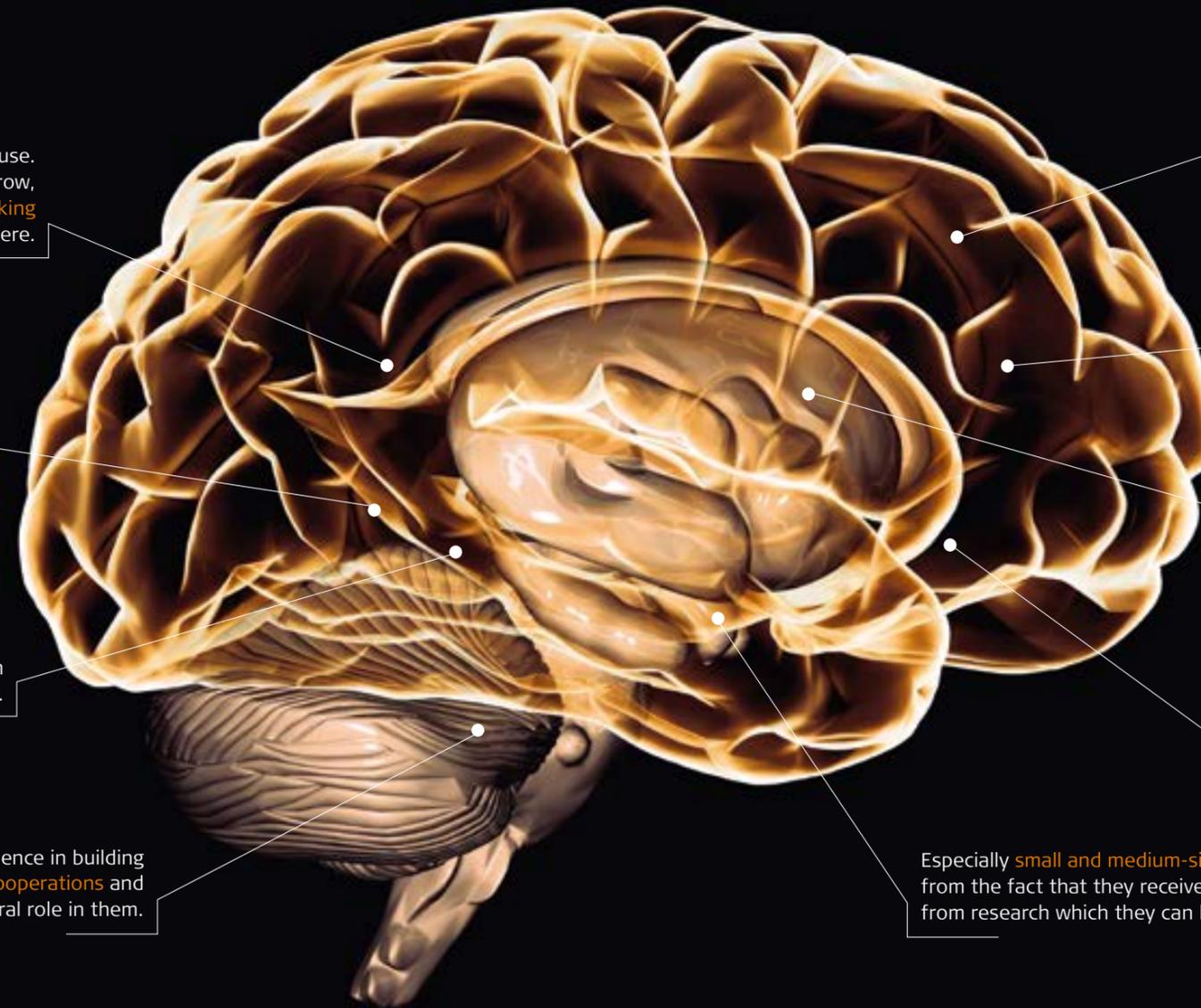
innBW in figures 2012:
1,156 employees
2,220 industry projects each year
 Total turnover: **EUR 109 million**

Passionate **research**.
 Connective **thinking**. Reliable **action**.

innBW sees itself as a **bridge between industry and science** and has its focus on the needs of medium-sized and large enterprises.

The main duty of innBW is the **transfer** of results from fundamental research at universities, for example, into marketable products, processes and services.

Especially **small and medium-size enterprises** benefit from the fact that they receive access to findings from research which they can hardly develop on their own.



➤ Future and cross-sectoral technologies

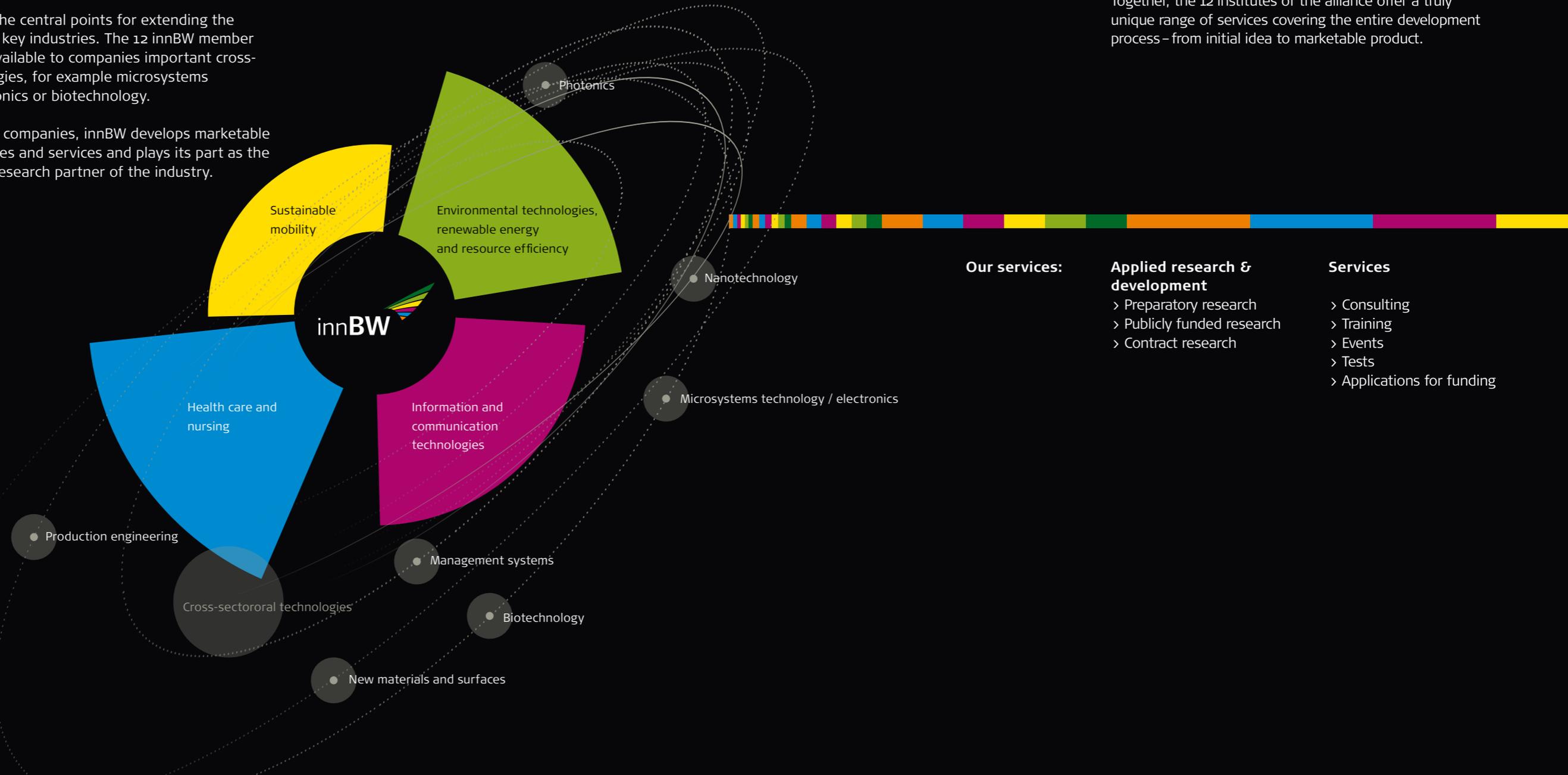
Innovationsallianz Baden-Württemberg has identified four future areas of research for itself.

These represent the central points for extending the innovativeness of key industries. The 12 innBW member institutes make available to companies important cross-sectoral technologies, for example microsystems technology, photonics or biotechnology.

Together with the companies, innBW develops marketable products, processes and services and plays its part as the mastermind and research partner of the industry.

➤ We deliver innovative know-how

Every institute of the innBW innovation alliance has its own technical focus and a very specific profile of competencies. Together, the 12 institutes of the alliance offer a truly unique range of services covering the entire development process – from initial idea to marketable product.



Health care and nursing

Many medical success stories are based on the research done by us in the areas of health care and nursing, to continuously improve the quality of life of many people. Our extensive research portfolio includes many aspects and several of our highlights are presented here.

Retina implant

Unique microchip featuring 1,600 electrodes that electrically stimulate the nerve cells in the retina to create a rough image of objects.



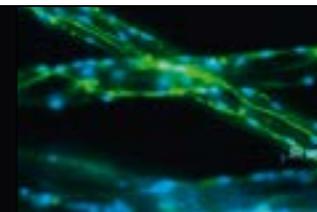
Highlights for the industry

Retina chips for blind persons

Making blind people see again is an age-old dream of mankind. In 2013, Retina Implant AG received marketing authorisation in Europe for a retina implant. Patients suffering from a genetic disease causing the gradual degeneration of the light-sensitive rods and cones can recognise objects again or identify large letters with the help of this chip.

It took 18 years to develop the product from the first idea to the finished and approved product, which involved a collaboration between the NMI and IMS CHIPS institutes and the University of Tübingen.

Retina Implant AG, founded in 2003, turned the patented research findings into a product and obtained marketing authorisation for it. Our institutes and employees are proud to have been involved in this project from the start.



Nerve conduits

To treat nerve defects, which are often the results of accidents, ITV Denkendorf in cooperation with NMI in Reutlingen and the Tübingen hospital run by an employer liability insurance company developed a nerve conduit.



Innovative mattress brings relief for allergic persons

The Wellmed Allergocare mattress includes flexible textile heating elements to create hygrothermal conditions that prevent the settling of dust mites.



Optical dental impression

As an alternative to silicone impressions, ILM developed for a dental company an optical 3D scanner for precise and non-contact measurement of tooth topology.



↗ Sustainable mobility

This forward-looking topic gains more and more importance because it deals with the managing of increasing traffic and environmental protection at the same time. This is why we have been involved in research and development in this area for years and have gained a great amount of experience to be able to stay at the top in the future as well.



Intelligent lightweight construction

Highly rigid carbon components with integrated sensors are the basis for cars with an improved energy balance and they also provide the opportunity to permanently monitor their functions.



↗ Highlights for the industry

Highly rigid lightweight structures for the cars of tomorrow

Sustainable mobility is closely connected with lightweight construction. Ultra-light fibre composite components offer special potential for weight and functional optimisation. The two Denkendorf institutes, ITCF and ITV, develop lightweight components, from fibre to surface, their functionalisation, and finished parts.

A new carbon fibre developed by ITCF on the basis of renewable raw materials features a positive environmental balance and excellent mechanical properties while being more cost-efficient in production. It is processed further at the ITV centre for lightweight components. This centre makes available the full process chain, including design and simulation, textile and preforming processes, and production and component testing. This creates new highly rigid fibre composites meeting extreme performance requirements.



Semi-autonomous user-adaptive cars

FZI conducts research on fundamental processes, methods, and technologies for future driver assistance systems and intelligent vehicles. The test vehicle drives autonomously and is fully equipped with measuring instruments and high-performance computers for testing new functions.



Measure, evaluate and develop

Optimal driving conditions through smart vehicle seats. The development of innovative materials and products also requires the development of new measuring methods that meet new specifications and requirements.



Auto-Stack Tool

Fuel cell drive systems are more efficient than combustion engines and may use fuel from re-newable energy sources. ZSW's Auto-Stack Tool can be used to develop and test automotive fuel cells within a process-capable brand-independent testing environment.



Resources, energy and environmental technologies

In times where raw materials are becoming scarcer and more expensive, new options must be examined and new strategies developed to maintain the competitiveness of companies and to reduce environmental impacts. This area holds enormous potential and we are proud to be part of this development.



ZSW's power-to-gas plant transforms green electricity into quality gas with a methane content of 99%.



Highlights for the industry

Store green electricity as natural gas

As the share of renewable energy grows, the need for storage technology grows as well, which allows the permanent use of wind and solar energy. ZSW developed the new »Power-to-Gas« technology: It transforms water and carbon dioxide (CO₂) into substitute natural gas using wind or solar power. This renewable type of methane gas may then be used in industrial settings, for buildings or transport.

It is fed into the natural gas grid which has a storage capacity of several months. Audi also presented this technology as part of their »Audi balanced mobility« programme. They recently put into operation a 6 MW Power-to-Gas plant. As users of this new gas-powered model fill their tanks at natural gas stations, the amount of renewable energy used in production is fed into the grid.



World-record solar cell using thin-film technology

Using solar energy efficiently: ZSW's CIGS thin-film technology can do this. With a lab-cell world record efficiency of 20.8 %, thin-film technology now beats the technology which uses multicrystalline silicon.



Polar bear pavilion

Energy efficient construction following nature's example. Researchers at ITV Denkerdorf developed a textile membrane building featuring an outstanding energy efficiency and loss-free heat storage. This Polar Bear Pavilion is a textile and energy self-sufficient building with a futuristic architecture.



High-performance fibres

ITCF spins high-performance fibres that can be finer than spider silk, more stable than steel or extremely heat-resistant, depending on the requirements. Due to their extraordinary properties, they are key components in the development of new materials for lightweight construction.



Information and communication

Networks are becoming more and more important and many achievements facilitate our everyday lives and have become indispensable. Developments that were formerly dismissed as utopian visions of the future have become daily routines. Therefore, we passionately conduct research to find new and better ways of interaction for the benefit of all people.



Non-contact ECG sensors detect biosignals without direct skin contact.



Highlights for the industry

ECG without skin contact

Since 2007 FZI has worked on the development of capacitive ECG electrodes and examined options for use in different medical and non-medical applications. Analogue circuit technology is combined with modern semiconductor components. This technology detects the electric field of the heart and measures ECG signals through a person's clothes. This makes ECG systems more comfortable and compatible. Sensors may be integrated into everyday objects, for example a TV chair, which opens up completely new perspectives for telemedical applications. Within the BMBF-funded IN-SITEX project, FZI, the Daimler AG and other partners from industry examine options for integrating this technology into vehicle seats to create driver assistance systems that can detect stress or sleepiness via the heart rhythm.



ChipFilm™ – ultra-thin microchips make electronic products flexible.

This award-winning new production method allows ultra-thin flexible silicon microchips. Currently under development are complex in-film systems with integrated thin chips, thin-film components and organic electronics.



3D compliant video glasses

In cooperation with Visenso GmbH and Micromountains Applications AG, HSG-IMIT developed a cost-efficient system for detecting head movements. This system can be used together with the 3D compliant Zeiss Cinemizer video glasses for presenting multi-media contents and games.



Capacitive sensors

With high precision capacitive inclination sensors, Leica laser measuring tools cannot only measure lengths but also heights. After having successfully transferred this technology to 2E mechatronic, HSG-IMAT together with a medium-sized Baden-Württemberg company is currently developing level sensors for washing machines and dish washers.

↗ Cross-sectoral technologies

Cross-sectoral technologies are not only applied in individual areas but are also used in many fields or industries. Often, cross-sectoral technologies are used to improve products first and then result in innovations that are based on the specific advantages of these technologies. The institutes belonging to the Innovationsallianz Baden-Württemberg concentrate on seven especially important cross-sectoral technologies.

Here we show you some examples for ground-breaking innovations from the wide range of applications of these essential cross-sectoral technologies.

↗ Nanotechnology Exhaust air catalysts for small enterprises



An innovative method is used to recycle metal scrap into high-quality catalyst material which helps to protect the environment. Efficiency with hydrocarbons is more than 90 percent.



↗ Microsystem technology / electronics Higher security for card readers



Utilising the latest energy efficient and resource friendly inkjet printing technology, HSG-IMAT together with Schmid Technology and ddm Hopt+Schuler developed extremely cost-efficient intrusion sensors for security monitoring of debit and credit card readers.



↗ New materials and surfaces Bulk metallic glasses



The development of new alloys and production methods are key areas of interest in the department of metals science. Current R&D projects involve precious metal alloys, for example bulk metallic glasses for watches, jewellery and functional materials, new production processes, for example selective laser melting, thermodynamic simulation of material that can be used to optimise casting processes or materials for biomedical applications.



↗ Biotechnology Biosystems for preclinical research



NMI offers a wide range of technologies for identifying and validating molecular target structures (targets) for medicines development. Patient-specific gene libraries are searched to accelerate the functional testing of potential active ingredients for treating oncological diseases, lung diseases and diseases of the central nervous system.



↗ Photonics Avalanche warning device



ILM has unique knowledge and experience in correlating optical properties of matter to its microstructure and composition. This is used to develop devices not only for medical diagnostics, but also for quality control in food production, or for the analysis of snow depth profiles.



↗ Production technology Production platform for microsystems



PRONTO – series production of microsystems for medium-sized enterprises and research institutions. PRONTO combines the potential available at these institutes to develop and produce microsystems, for example customised components for KMU Metec AG's braille displays.



↗ Management systems Cross-company cooperation in smart networks



Making knowledge productive – with this objective in mind, DITF-MR assists enterprises in the development of new knowledge-intensive products and services. Key areas are cross-sectoral innovation and value adding processes of small and medium-sized enterprises. DITF-MR provides concepts, methods and tools tailored to suit the needs of such dynamic company networks.





Research Institute for Precious Metals and Metal Chemistry



The Research Institute for Precious Metals and Metal Chemistry (fem) in Schwäbisch Gmünd, established in 1922, is an independent non-profit institute and operates in the area of surface technology, metallurgy and precious metals. It is the only independent institute for precious metals research world-wide and deals with the various issues of material science and surface technology in interdisciplinary, publicly funded research projects.

Competencies/areas of business

- > Physical metallurgy, material testing, precious metals research
- > Electrochemistry, electroplating, corrosion
- > Light metal surface technology
- > Plasma surface technology, Material physics
- > Analytics



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Research Center for Information Technology at the Karlsruhe Institute of Technology



The FZI Research Center for Information Technology at the Karlsruhe Institute of Technology is a non-profit institution for applied research in information technology and technology transfer. Its task is to provide businesses and public institutions with the latest research findings in information technology. It also qualifies young scientists for their career in academics or business as well as self-employment.

Competencies/areas of business

- Concepts, software, hardware and systems in the areas of
- > Energy
- > Health Care
- > Knowledge and information services
- > Mobility
- > Automation and robotics
- > Production and logistics



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Hohenstein Institut für Textilinnovation gGmbH



The Hohenstein Institute, with a total of about 500 employees at their Bönningheim site and 40 contact offices world-wide, is among the most important independent research and testing institutions in the textile sector. Its core competencies are not only the application-oriented research and development of innovative products and processes but also a wide range of tests and certifications.

Competencies/areas of business

- > Functionalised textiles
- > Medical textiles
- > Hygiene and biotechnology
- > Fit and workmanship
- > Personal protective equipment
- > Textile care
- > Wear and sleep comfort
- > UV protection
- > Colorimetry and white metrics
- > Odour analysis



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Institute for Micro Assembly Technology



HSG-IMAT stands for industry-relevant application-oriented development and research in the area of microsystem technology. Together with partners from industry, HSG-IMAT establishes new products and technologies, especially in the areas of automotive engineering, sensor technology, life sciences, automation, medical engineering and lighting engineering. Prototypes, small and first series are manufactured at the IMAT TransferFab. HSG-IMAT is certified in accordance with the ISO9001:2008 quality management standard.

Competencies/areas of business

- > Plastics technology for micro components
- > MID technologies
- > Printed micro structures
- > 3D micro assembly
- > Sensors + Actuators
- > Modeling + Reliability



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➤ HSG-IMIT

Institute of Micro
and Information Technology



HSG-IMIT stands for industry-relevant application-oriented development and research in the area of microsystems technology. In good cooperation with industry, we realise innovative products and technologies in the areas of sensor technology, energy harvesting, lab-on-a-chip diagnosis or medical engineering. Our service range also includes the production of samples, small series and the start of production. HSG-IMIT is certified in accordance with the ISO9001:2008 quality management standard.

Competencies/areas of business

- › Sensor development:
Concept & design, simulation, production, verification & testing
- › System integration:
Actuators, microdosage, energy harvesting, sensor fusion, low-power electronics, wireless communication, testing systems
- › Sensor and system production:
Packaging of integrated circuits, process development, small series production
- › Diagnostic platforms



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➤ ILM

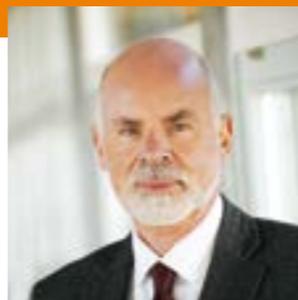
Institute for Laser Technology in Medicine
and Measurement Technique



The focus of research at the ILM – an institute at the University of Ulm – is the area of applied photonics and optics. Their core field of business is medicine and dentistry. The ILM develops new optical methods for medical diagnostics and therapy. This is complemented by the field of surface measurement technology, surface technology and optical analytics. The institute's excellent engineering team professionally translates concepts into physical devices. The laser therapy centre allows clinical tests to be conducted in-house.

Competencies/areas of business

- › Optical measurement technology and surface technology
- › Dental / medical diagnostics and therapy
- › Optical analytics (process and quality control)



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➤ IMS CHIPS

Institut für Mikroelektronik
Stuttgart



The Institut für Mikroelektronik Stuttgart (IMS CHIPS) is involved in research and small series production in the areas of silicon technology, customised circuits (ASIC), nanopatterning and image sensor technology. The institute sees itself as a partner of small and medium-sized companies and cooperates with global leaders in the semiconductor and supplier industries. IMS CHIPS is also active in the area of professional development and training.

Competencies/areas of business

- › Microchips and microsystems:
ASICs and systems for the industrial sector, life sciences and aerospace
- › CMOS image sensors: full-range solutions for applications in the industrial sector, safety engineering and medical technology
- › Nanotechnology: diffractive optical elements, stencil masks, replication masters
- › Silicon technology: CMOS production line, add-on processes, chip assembly line, wafer and IC test systems



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➤ ITCF

Institute of Textile Chemistry
and Chemical Fibres Denkendorf



ITCF Denkendorf conducts basic and application-oriented research along the textile production chain – from molecule to material. For this, the institute's focus is on the development of sustainable processes and materials on the basis of synthetic and natural polymers. Among ITCF's core competencies are the synthesis of fibre polymers, fibre production using every important spinning methods, and the finishing of textiles.

Competencies/areas of business

- › Chemical fibres (polymer synthesis, spinning methods, technical yarns, cellulosic fibres, biopolymer fibres)
- › Textile chemistry (textile finishing, surface modification, printing technology, coating and laminating, smart textiles, cellulose chemistry)
- › Smart materials and high-performance fibres (nano-technology, carbon fibres, ceramic fibres, functional fibres, composite materials)
- › Analytics



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Institute of Textile Technology and Process Engineering Denkendorf



ITV Denkendorf is one of the largest textile research centres in Europe and conducts fundamental and application-oriented research across and beyond the entire textile production chain – from raw material to final product. Their focus is on the development of technical textiles for the forward-looking areas of health and medicine, mobility and traffic, environment and traffic, and also information and communication.

Competencies/areas of business

- › Fibre and yarn technology
- › Surface and structure technology
- › Functionalisation
- › Smart Textiles
- › Lightweight construction
- › Process technology and simulation



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Center for Management Research of the German Institutes for Textile and Fibre Research Denkendorf



DITF-MR develops and elaborates concepts, methods and instruments for supporting strategic and operative management as well as new internal and external organisational structures for companies and networks. The results of our work are process and method innovations as well as systems to improve efficiency, innovation capability and sustainable business success. We focus on best practices and pilot systems that can be transferred to companies and value-adding networks in the textile industry.

Competencies/areas of business

- › Innovation management
- › Design and development
- › Management of added value in networks
- › Sustainability and intelligent energy management
- › Development and adaptation of management methods and IT-based tools for the textile industry



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Natural and Medical Sciences Institute at the University of Tübingen



NMI conducts application-oriented research where bioscience and material science meet and features a unique and interdisciplinary spectrum of competencies. It provides R&D services for the health industry and Baden-Württemberg's key industries which are mechanical engineering, toolmaking and automotive. The NMI is well-known beyond the state's borders as a business incubator for start-up companies.

Competencies/areas of business

- › Pharma & biotechnology:
Targets and biomarkers for the identification of active ingredients, diagnostics, bioanalytics, electrophysiology
- › Biomedical engineering:
Implants, biosensors, biomaterials, cleanliness, regenerative medicine
- › Surface and material technology:
Micro and nanoanalytics, coatings, adhesive bonding systems



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Centre for Solar Energy and Hydrogen Research Baden-Württemberg



ZSW is one of the leading institutes for applied research in the areas of photovoltaics, renewable fuels, battery technology and fuel cells, and energy system analysis. We break ground for new technologies to enter the market. From material research to the development of prototypes and production processes, application systems, quality tests and market analyses, we cover the entire value-adding chain. Our truly comprehensive expertise is important for our partners from the industry and our key to success.

Competencies/areas of business

- › Photovoltaics
- › Renewable energy sources such as hydrogen and methane
- › Battery and fuel cell technology
- › Economic analysis of energy systems



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