

Edition 2022 / 2023

CLIB

networking biotechnology
creating sustainability

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Let us Shape the Future Together!

Dear CLIB members and friends,

Twelve more months, marked by the global COVID-19 pandemic, lie behind us. Some restrictions and new realities we have become accustomed to, some things continue to be painful interventions in our professional and private lives. For a cluster like CLIB, the restrictions and uncertainties regarding the organisation of face-to-face events and meetings are certainly the most serious intrusion. The informal exchange with our members and partners during breaks and evening events has always been an important aspect of our networking. And this direct contact with you: that is what we miss the most. As efficient and goal-oriented as digital formats are, it often is the undirected discussions away from the lectures and moderated panels that are so inspiring and which lead to serendipitous collaborations and partnerships. So we very much hope that this direct exchange will be possible more often again in the new year.

We can all contribute to making face-to-face events a reality again by getting vaccinated. By setting a good example and taking advantage of what biotechnology has made possible in such a short time. We should be encouraged by the speed and efficiency with which mRNA-based vaccines have been developed and produced and are now being adapted again to new virus variants. And we can also take pride in what biotechnology can achieve. Let us keep this example in mind when we look at the challenges that await us elsewhere as well.

Climate change is and remains the most pressing issue of our time. A comprehensive transformation of our economy, our everyday life, indeed of our entire society will be necessary to counter climate change, to mitigate its consequences and to preserve an environment that is worth living in for us and our descendants. We at CLIB want to contribute to this transformation: By helping to bring biotechnology solutions into application and developing more and more building blocks for a bioeconomy and circular economy. With every new biotechnological development, every new sustainable process that comes into use, every new product based on renewable carbons, we move a little closer to this goal.

Biotechnology and the chemical industry are central elements of this transformation and the COVID-19 pandemic has shown what they are capable of when the courage to innovate, the willingness to take entrepreneurial risks and sustainable investments come together. With this in mind, let us look positively to the new year and see the upcoming change as an opportunity. Or to say it with Albert Einstein:

*"More than the past I am interested in the future,
for I intend to live in it."*

Let us shape this future together!



Dennis Herzberg



Karl-Heinz Maurer

CLIB: Networking Biotechnology – Creating Sustainability

CLIB is an international open-innovation cluster of large companies, small- to medium-size enterprises (SMEs), start-ups, academic institutes, and universities, as well as other stakeholders active in biotechnology and the circular- and bioeconomy as a whole. In our non-profit association, the members shape our cluster's interests and activities, and we work to promote industrial biotechnology in sustainable processes. We are active since 2008 and have built a strong and trustworthy network since then. Together with our members we are putting our mission into practice – **networking biotechnology, creating sustainability.**

Our membership of about 100 organisations comprises an international share of about 25 % (see figure 1). We are based in Düsseldorf, in the state of North-Rhine Westphalia (NRW): the chemistry and industry heartland of Germany, well connected to the neighbouring chemical regions of the Netherlands and Belgium. We do not see ourselves as a regional, but an international cluster, connected by a joint vision for biotechnology in a sustainable circular bioeconomy. We aim to network our members within and beyond the cluster to initiate new research and business projects. Our goal is to network stakeholders along and across value networks and to identify new opportunities. In this regard, we try to include diverse industries and markets such as biotechnology, chemistry, food and feed, home and personal care, textiles, and others into our network. At CLIB, we link feedstock owners with technology providers, processing industries, and consumer industries, and this also is reflected in our membership structure.

An innovative field like the bioeconomy also needs scientific excellence. This is why our network integrates universities and universities of applied science. They have strong track records in basic research, applied research and experience in creating spin outs. Some of them have set up platforms to create novel technologies and to generate new scientific insights crucial for biotechnological processes and products. The research and technology organisations (RTO) in our network have a dedicated applied focus, such as the German Fraunhofer Institutes and several of our international RTOs. These organisations build the foundations for new knowledge and inventions to overcome the technical hurdles in scaling biotechnological processes.

An invention only becomes an innovation if it can be commercialised, and especially start-ups and SMEs benefit from access to a thriving ecosystem comprising experts and facilities essential for bringing an innovation to market. To this end, CLIB seeks to include within its network competence in intellectual property (IP) and legal issues, techno-economic evaluation, process development, and scale-up. Our members also include investors, consultants, infrastructure providers, pilot plants, and other networks.

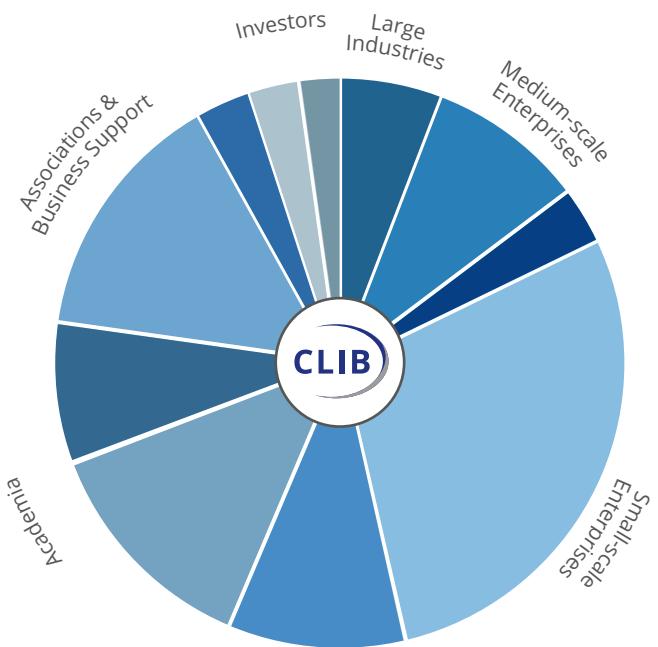


Fig. 1: CLIB members. Categories subdivided in national / international members

Both the circular- and the bioeconomy are a worldwide trend requiring a global approach. Our members and strong partners in Germany, Europe, China, and Canada are the cluster's links to global markets. We have CLIB contact points at our partners' offices in Canada, China, and Russia. It is in these regions, and Europe, that most of our activities are centred.

CLIB is also active on the European level: in the public-private partnership Biobased Industries and its successor, the Circular Biobased Europe (CBE) JU of Horizon Europe, and the 3Bi intercluster ([see page 18](#)). Closer to home, CLIB has worked to form strong trilateral contacts between its German home state of NRW, The Netherlands, and Flanders. The well-established BIG-Cluster initiative has led to several R & D & I projects and to long-standing collaborations between the three regions. More locally, the Circular-Bio ([p. 23](#)) project connects areas in NRW and the Netherlands to specifically connect cross-border value chains by bringing diverse stakeholders together.



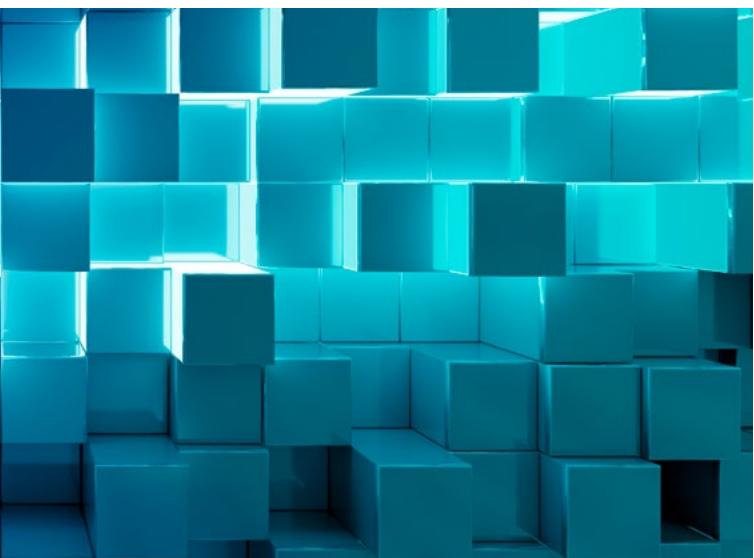
CLIB Strategy

CLIB has a hard-earned and well-deserved reputation of being creative, credible, independent, competent, and authentic. Our members appreciate our reliability, neutrality, and competence in the fields of industrial biotechnology, project management, funding opportunities, and networking. As a synthesis of this reputation and as an incentive to improve further, we commit ourselves to our mission statement:

"As a reliable and competent partner we will deliver value to all our stakeholders, by professional networking within industrial biotechnology, across disciplines, regions, and nations; bringing together the expertise and knowledge needed to create sustainable products and processes, and to support the circular bioeconomy."

Networking biotechnology – creating sustainability
In four words, this claim summarises the mission of CLIB. In discussions with our members, networking is our most praised core business and strength. As for every vibrant cluster, this includes the identification and acquisition of new members. At a time when traditional boundaries between sectors are becoming increasingly blurry, it is more important than ever to engage new committed partners, fill in missing skills, and incorporate new approaches. It is, however, equally important to connect the existing network and to create additional value beyond the sum of its members.

While few words have been used as frequently in recent years, sustainability is still considered the most important driver for CLIB. This is what we measure novel trends, technologies, and ideas by. To foster sustainability for people, planet, and profit, industrial biotechnology is one key element.



CLIB e. V.

CLIB is a registered association under German law, based in Düsseldorf, NRW. The main bodies of our association are the Extended Board, the Advisory Board, and the annual General Assembly.

Our Extended Board ([see page 35 – 37](#)) has 12 seats, with each group of members (industry, SME, academia, and others) represented by three seats. The Extended Board meets at regular intervals throughout the year to make strategic decisions, and it elects the Executive Board of four chairpersons. CLIB receives strategic input from an international Advisory Board made up of eight experts from academia and industry ([see page 38 – 39](#)). The General Assembly is called once a year to give members an overview of current activities and strategy and to allow them to comment and provide input.

At the CLIB office in Düsseldorf or from their desks at home, a team of nine employees shapes, drives, and delivers the cluster activities.

In our work as CLIB team, both terms go hand in hand: a network must be created sustainably to meet future requirements. Without strong partners, sustainability cannot be achieved for a complete industry, let alone for a global community. To live up to our mission statement, our activities, actions, and projects are centred on five strategic elements: networking, regulatory framework, technology transfer, scale-up, and education (see figure 2).

Networking

It almost goes without saying that networking is our core business. We connect our members with one another, along and across value chains, sectors, and disciplines. We also open the cluster to input from external partners and stakeholders and work together with trusted associations to attract new ideas and impulses. Thereby, we provide our members with new opportunities in business, networking, and partnering. At CLIB, we have designed and implemented a structured networking process ([see pages 12 – 13](#)) to connect matching stakeholders and to provide a fruitful, constructive setting in which to exchange ideas and form project consortia.

After two years of COVID-19 pandemic, with different restrictions in place, the added value of networks and reliable contacts has become even more prominent. Society, science, and industry need personal connections and exchange to develop new ideas, projects, and products.



Fig. 2: The five elements of the cluster's strategy.

Therefore, CLIB will continue to do everything possible to support our members in these difficult times and to be a multiplier and mediator of information. Even though the combination of face-to-face meetings and online formats is here to stay, we are really looking forward to sharing a coffee with our fellow members.

Framework

The implementation of the bioeconomy and the circular economy needs a supporting regulatory framework on regional, national, and EU levels. For years, CLIB has been active at all these levels to promote the potential of bio-based and alternative feedstocks and bio(chemical) processes, as well as to help identify technologies and market requirements. Although biotechnology must stand on its own two feet without subsidies, a positive regulatory framework can accelerate the implementation of a sustainable, bio-based economy. That includes the certification of bio-based products, the use of side- and waste-streams for the circular bioeconomy, combined chemical-biotechnological approaches, and a focus on cradle-to-cradle product evaluation. If implemented correctly, initiatives such as the EU's Green Deal and the related policy initiatives can be a decisive turning point.

Still, there is no level playing field for the circular bioeconomy to compete with existing technologies. The latter have often been directly subsidised, benefitted from regulation and tax benefits, and their sustainability cost is often being borne by the taxpayer or society. To help develop to a circular bioeconomy, we need to harmonise new technologies and regulation. Although it should be

self-evident, politics and policies must be based on facts - a realisation that we have been sorely lacking at some points recently. This also includes opening up to new, but also changed scientific knowledge and judging technologies in an evidence-based manner. To adopt these new technologies, industry needs sufficient planning certainty and a clear regulatory framework in which investments can be made.

Due to the success stories of biotechnology in addressing the current pandemic, the field has received a lot of attention in the political landscape and in public perception. Surprisingly however, there has been little emphasis on the importance of biotechnology in addressing climate change, at least at the national level. We see it as our job to remind society of the other beneficial and much-needed facets of biotechnology. There is an important momentum which we want to seize to advance the sector: to create societal benefits on a foundation of sustainable, sound circular bioeconomy.

Technology transfer

For a successful bioeconomy, ideas developed in science labs need to be swiftly translated into application. Despite an excellent science scene in NRW, it is still rare for ideas to enter the market. Accordingly, we actively support technology transfer from academia to SMEs and industry as we have done in the CLIB Competence Centre Biotechnology (CKB). In several projects, we help to identify and exploit industrially relevant knowledge.

Start-up companies are considered to be very effective instruments for technology transfer as they can explore new grounds flexibly and innovatively. To promote their creation, it has proven very important to anchor the idea of entrepreneurship and of creating a spin-off in the minds of young scientists at an early stage of their career. Over the past years, we have established ourselves as an important contact point for start-ups. We offer coaching and support to start-ups and give them opportunities to pitch their ideas to relevant stakeholders. Our annual G-BiB competition for pre-post doc stage entrepreneurs has already coached over 30 start-up ideas and seen several young teams launch their research into a marketable idea. Through our structured networking process, we can match technology developers with their downstream value chains and can initiate and evaluate consortia. For this purpose, CLIB maintains close contact with various regional and national initiatives that support young founders.

Scale-up

Scale-up is a major hurdle to successful technology transfer, demonstration, and market entry. It is not only the challenge to scale up a process from the lab and low technology readiness level (TRL) to an industrially relevant environment and high TRL, but even to produce enough sample material for testing a novel molecule or substance. The latter is essential to gain reference customers, secure off-take agreements, and convince investors to finance a scale-up project. Many ideas and young companies fail in the notorious “valley of death” between lab scale and market entry.

At CLIB, we are targeting various points in the scale-up process to help build a bridge across this valley for individual companies, but also for the entire community. Different pillars support this bridge, helping build the road from basic principles to competitive manufacturing. To allow for a good start at low TRL, we set up project consortia with the product already in mind and integrate our academic partners into industrial networks to guide the research in the direction of application. We also support projects that explicitly promote scale-up such as ALIGN ([see page 26](#)) and can supply industrial partners in the consortium with the necessary quantities for material testing.

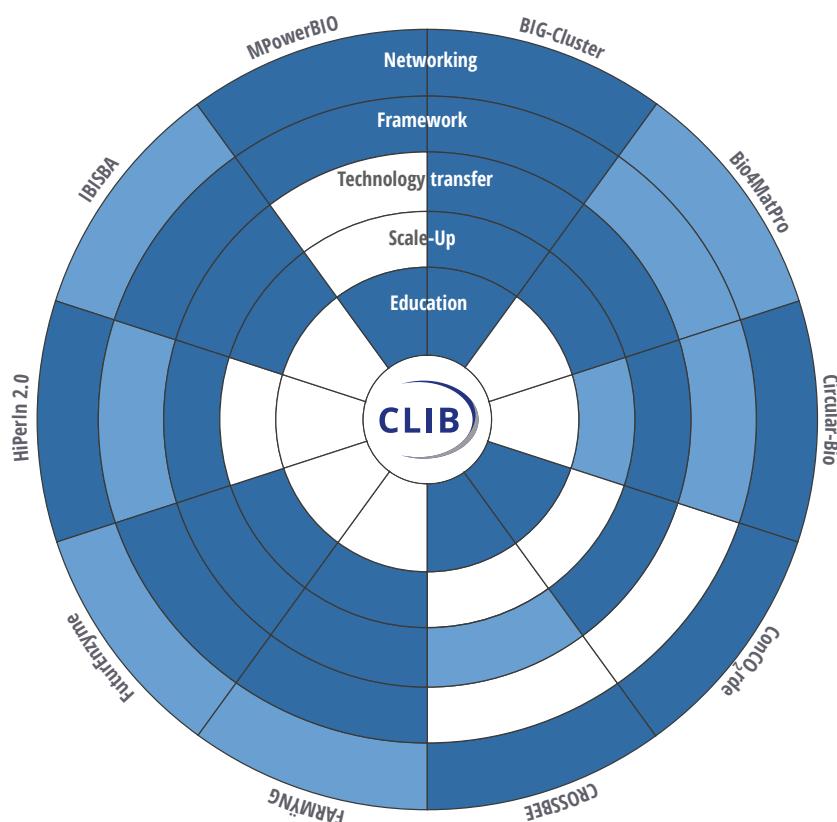


Fig. 3: Classification of projects according to the cluster's strategic elements. Shades of blue indicate the elements mainly pursued within each project.

When the concepts outgrow their infancy and become technologies, they also outgrow typical academic labs and the scale offered there. This is where projects leave the safe ground in academic space and start their journey across the valley of death, needing the right equipment and lab space to develop further to higher TRL. To strengthen the next bridge pillar, we strive to establish laboratory spaces specially tailored to the needs of young biotech companies, so-called accelerators, such as in the upcoming Bio4MatPro project. This planned accelerator concept is also associated with a strong mentoring approach, so that the start-ups receive not only equipment but also contacts. These steps already require a considerable investment on the part of the spin-off or SME. The Dutch-German Network Circular Bioeconomy offers support to SMEs by co-financing testing and feasibility studies and enhancing their integration with chemical processes and in chemical parks. Moreover, CLIB and other European partners collaborate in the MPower-BIO project to specifically support SMEs to find the right investors.

The final steps of scale-up are the most challenging – at least financially. The processes – or rather their companies - must prove that they can hold their promises on an industrial scale. To cope with this last stretch, the Ministry of Economic Affairs, Innovation, Digitalization and Energy of the state of NRW (MWIDE NRW) has allocated 30 million euros to establish a scale-up centre for bioprocesses in NRW. Over the past year, we have evaluated needs, opportunities and risks of the biotech community and translated them into recommendations for technical equipment, strategic alignment, and business models. Once it is built, this Bio Scale-up Center NRW will support the final stretch of the bridge, allow companies to scale-up their biotechnology processes towards competitive TRL level and, thereby, to cross the “valley of death” successfully.





Education

The most important “resource” for a sustainable circular bioeconomy and its underlying biotechnological landscape are well educated professionals, who are optimally prepared for the challenges ahead. A dedicated education approach is crucial for fields such as biotechnology as well as the circular- and bioeconomy, in which multiple scientific disciplines intersect. Only through specialised initiatives can new professionals be trained, who are experts in their own disciplines but are also able to take a holistic approach to a process, product, or value chain. CLIB especially supports the collaboration of academia and industry in applied research and brings in their expertise in technology transfer, scale-up and entrepreneurship via accompanying, supporting, and teaching students and PhD students in several R & D & I projects in Germany and Europe ([see page 29](#)).

CLIB provides added value to its members by integrating them into an international network of academia, investors, SMEs, and industry and by building knowledge in relevant topics, markets, and technologies as well as trends in biotechnology and green chemistry. The cluster provides access to specialists in the fields of biology, biotechnology, chemistry, and engineering, and helps to create novel business models through the formation of networks and the analysis of novel value networks in biotechnology and circular bioeconomy. The formation of tailored consortia, the provision of information on current calls and strategy processes in the field of the bioeconomy and circular economy, and the support of demo or pilot projects and processes help CLIB members to realise new research, demonstration, and innovation projects either in consortia or in bilateral contacts.

To fulfil our mission statement, we always seek to ensure that all our projects address two or more of our strategic elements. New projects are measured by how well they fit into the CLIB strategy to add value to our members (see figure 3).

Member Benefits

The CLIB team works to bring benefits to the cluster's members. Like all networks, we depend on our members, and can only act as an amplifier of your own commitment. We invite you to become involved and contact us regarding your requests or wishes. We are always ready to get in touch with you and discuss how we can support you.



CLIB is a networker

We connect our members to each other and create an innovative matrix through carefully chosen additions to our network. Our experience of more than 13 years gives us fast and reliable contacts to partners, experts, and investors. Even in the digital age personal contact is as important as ever so we organise numerous events and workshops for our members. When we cannot organise these as in-person events, due to physical distances or currently the Corona pandemic, we provide online event and networking formats to allow for as close a personal contact as possible.

Like many other things, CLIB does not stay the same. Technological leaps, changing framework conditions and global trends constantly require foresighted adaptation. What has not changed over the past years and will not change in the future is our diligence, our trustworthiness, and our enthusiasm to shape the future of the circular bioeconomy together with our members!



CLIB is a scout

We keep our eyes and ears open for our members. Through our well-developed international and interdisciplinary network, we - as trained scientists – are able to provide information on developments and innovations in the technologies and markets relevant to the circular bioeconomy. We are close to the current and future developments in several initiatives and keep the wishes and interests of our members in mind.



CLIB is a globetrotter

We believe that global challenges require international consortia. As one of the BIG-Cluster core partners, we can establish contacts to provide access to Dutch and Belgian fund-raising options. We partner with clusters across Europe in the 3Bi Intercluster and are active in pan-European initiatives. To support and further expand the already existing international network, we have organised delegation trips for our members to many different areas of the world, including China, Brazil, and Russia. Recently we signed a Memorandum of Understanding with Innovation et Développement économique Trois-Rivières (IDE Trois-Rivières), Quebec, Canada.



CLIB is an advisor

As door opener, we support start-ups in identifying their intellectual property, developing their business model, and finding investors with different risk acceptances and investment volume: we help young enterprises to cross the infamous "valley of death". We also make efforts to promote and educate future biotechnologists through innovative programs, events, and coaching.



CLIB is an architect

We turn ideas into projects and innovation into inventions. Not only do we have vast experience in consortium building and grant applications, but we also coordinate large projects in areas of strategic interest and high relevance for us and our members.



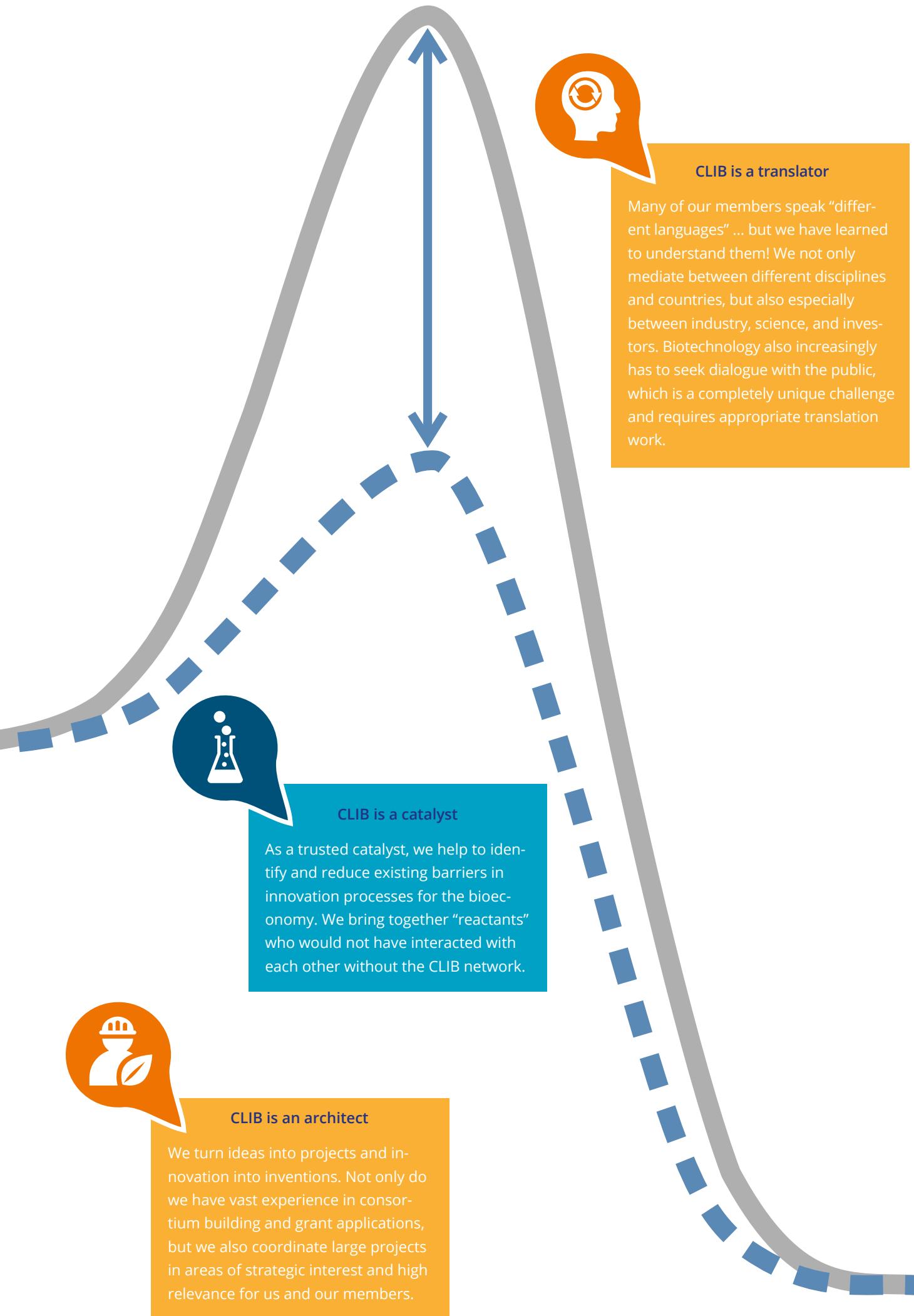
CLIB is a catalyst

As a trusted catalyst, we help to identify and reduce existing barriers in innovation processes for the bioeconomy. We bring together "reactants" who would not have interacted with each other without the CLIB network.



CLIB is a translator

Many of our members speak "different languages" ... but we have learned to understand them! We not only mediate between different disciplines and countries, but also especially between industry, science, and investors. Biotechnology also increasingly has to seek dialogue with the public, which is a completely unique challenge and requires appropriate translation work.



Structured Networking Process

Our structured networking process is designed to connect our members along and across value chains, sectors, and disciplines. We provide a fruitful, constructive setting in which to exchange ideas and to initiate new research and business projects. All this following our claim **networking biotechnology – creating sustainability**. We have developed a series of event formats that span the range from conferences to bilateral talks. Through this process, we help individual members to find the right partners, build trust, and share information that can lead to new ideas, opportunities, and projects.

Our CLIB International Conference CIC showcases emerging trends and connects them to markets. Especially relevant topics are taken up and presented in greater detail during forum events, which usually are attended by 40 to 60 people and are also seen as scouting opportunities for larger companies. They also involve non-members as input-givers. Roundtable meetings are held with a smaller group of about 10 to 15 invited experts; these meetings cover specific topics and build consortia,

Research collaborations

CIC & CND

Two big events form the framework for the CLIB year. At the beginning of each year, CLIB organises the large CIC, which provides our cluster members and all friends and partners of the CLIB network the opportunity to gain information about new topics and trends, and to exchange ideas about innovative technologies and methods. The conference also offers the possibility to meet face-to-face with the international CLIB family. Before each CIC, the CLIB team identifies the demands of their members and chooses innovative topics to focus on. Through the CIC, a platform for cross-sectoral communication and exchange between different industries and disciplines is created. Afterwards, CLIB analyses the most important topics discussed during the conference and uses this information when planning the subsequent forum events. Each autumn, CLIB invites all members to the exclusive CLIB Networking Day (CND): get to know the other members of the network and meet old as well as new cooperation partners. In 2022, the CND will be held for the fourth time and this member's only event is now a permanent fixture in the CLIB event calendar.

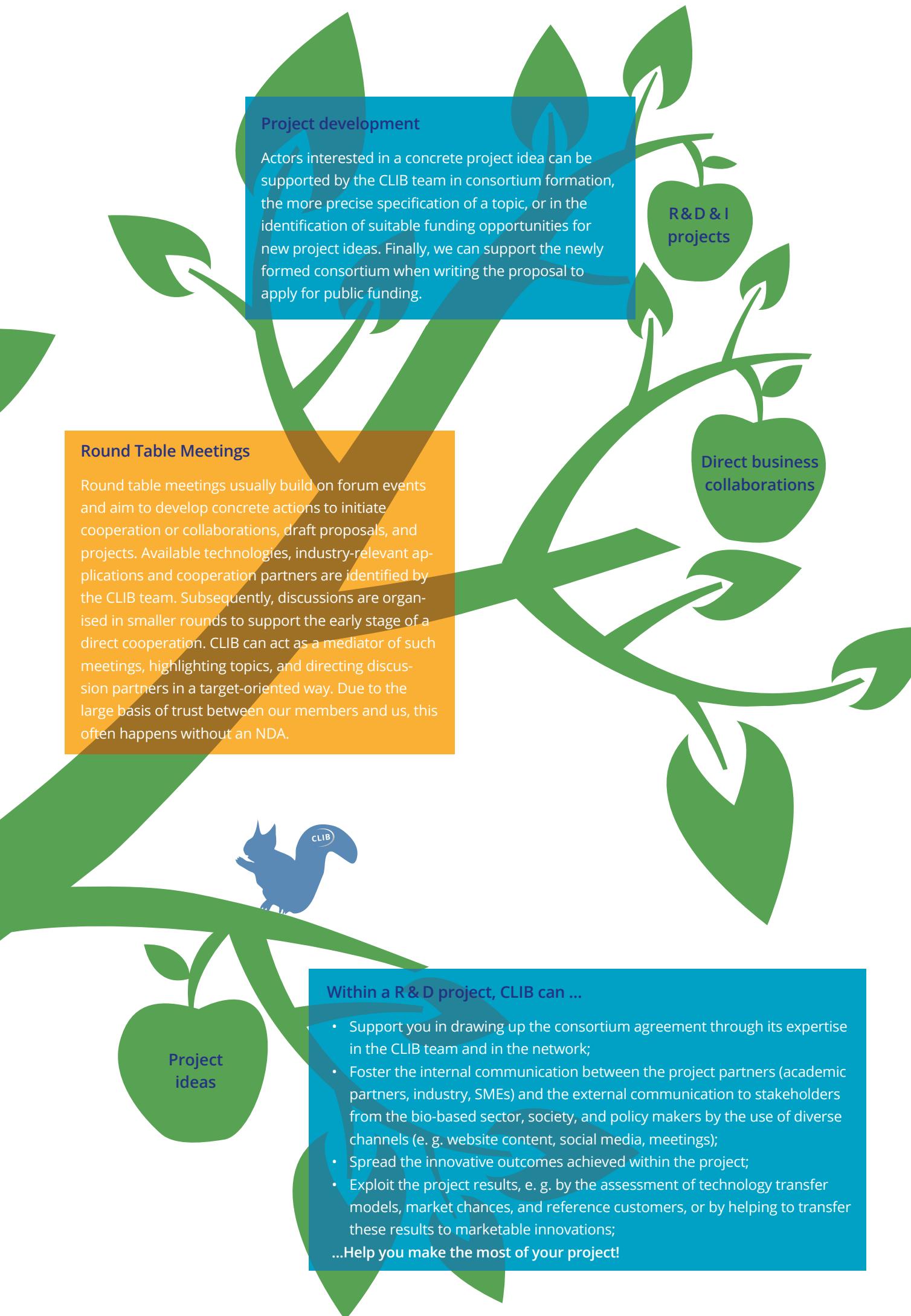
proceed to bilateral talks or result in new and promising project ideas. These can be supported in many ways by the CLIB team, finally leading to promising project proposals.

Since 2020, the CLIB team has been facing a challenge to its usual networking due to the global Corona pandemic response. We needed to develop networking formats which would work online: we quickly switched to videoconferencing tools to offer web-seminars, scouted for online collaborative tools to facilitate creativity, and adapted our event formats to the digital space. Although we miss being able to network in person, we managed to make the best out of this difficult situation and deliver value for our members. One positive effect is the closer interaction with partners wide and far. This also meant having our international members and partners connect more easily to the CLIB network.

Direct business contacts

Forum Events

This type of event has a strong focus on specific topics and offers a discussion platform that enables all participants to exchange new ideas. Forum events bring together members but also include external stakeholders, who provide an interesting addition and added value to the CLIB network. Topics cover broad fields such as food, feed, cosmetics, home care, or coatings and are discussed based on new technologies, feedstocks, or processes. More structural topics, like the support of start-up companies or education, can also be the subject of a forum. Presentations come from large companies, SMEs, or academia from the CLIB network and beyond. This ensures that at each forum the industry view, new technologies or business ideas, and also cutting-edge science are represented. Forums thus aim to cover the entire value chain, from feedstock suppliers via technology providers to chemical process industry and brand owners. Introducing cross-cutting topics makes these value-chains branch into value-networks.



Project development

Actors interested in a concrete project idea can be supported by the CLIB team in consortium formation, the more precise specification of a topic, or in the identification of suitable funding opportunities for new project ideas. Finally, we can support the newly formed consortium when writing the proposal to apply for public funding.

Round Table Meetings

Round table meetings usually build on forum events and aim to develop concrete actions to initiate cooperation or collaborations, draft proposals, and projects. Available technologies, industry-relevant applications and cooperation partners are identified by the CLIB team. Subsequently, discussions are organised in smaller rounds to support the early stage of a direct cooperation. CLIB can act as a mediator of such meetings, highlighting topics, and directing discussion partners in a target-oriented way. Due to the large basis of trust between our members and us, this often happens without an NDA.

Within a R & D project, CLIB can ...

- Support you in drawing up the consortium agreement through its expertise in the CLIB team and in the network;
 - Foster the internal communication between the project partners (academic partners, industry, SMEs) and the external communication to stakeholders from the bio-based sector, society, and policy makers by the use of diverse channels (e. g. website content, social media, meetings);
 - Spread the innovative outcomes achieved within the project;
 - Exploit the project results, e. g. by the assessment of technology transfer models, market chances, and reference customers, or by helping to transfer these results to marketable innovations;
- ...Help you make the most of your project!

Project ideas

R & D & I projects

Direct business collaborations

In Dialogue with CLIB

Throughout the year, CLIB organises large and small events to bring new topics to our member's attention, generate discussions about new technologies or developments and facilitate networking. Some of these events are part of specific project, many are open to members and non-members alike, some are invitation-only. Our members get special benefits, such as free access to the CLIB International Conference CIC and exclusive access to the CLIB Networking Day (CND). A common denominator of all our events is that we aim to include different points of view (from academia, SMEs, industry, and others) and allow time for discussions and networking.

CIC2021 Event Series

Our **CLIB International Conference CIC** is not just one of the technologically important conferences in the biotech and bioeconomy field, but also an important event for the CLIB community to meet and network. In 2021, CLIB responded to the ongoing COVID-19 restrictions by changing the usual 2-day CIC into an event series of three shorter online events, followed by one full-day, hybrid closing event in summer.

The first event expanded the alternative protein topic by looking at the challenge of "**Bringing healthy & sustainable proteins into your fridge**". How can sustainable food and feed be financed, produced and marketed? While alternative plant proteins exist and are already on the market, the large-scale production of cultured meat remains a challenge, as well as the novel food regulations for new ingredients. Interesting niche applications are specialised foods for medical use, such as phenylalanine-free protein mixes for dietary management concepts.

During the second online event, all presentations centred around how to "**Empower C1-utilisation**". Shifting from a fossil-based to a sustainable non-fossil economy will require utilising carbon from three different sources: bio-based feedstocks, recycling and using C1 feedstocks. Presenters showed strategies to use microbes to fix CO₂,

into high value chemicals, coupling electrochemical and biotechnological technologies (also for product extraction), and biological methanation.

The third session on "**How to advance lignin to scale**" focused on the recovery and valorisation of lignin on a larger scale. The economic utilization of lignin is a central building block of the future bioeconomy to produce numerous aromatic compounds in a biobased way. The session featured a flagship biorefinery which converts woody biomass into sustainable renewable feedstocks. This presentation was followed by two talks about the results of the ALIGN project regarding the pre-treatment and the catalytical fractionation of lignocellulose biomass.

The final hybrid event concluded the series under the original CIC2021 title of "**Biotechnology 2021: Advancing into a decade of sustainability**". With the announcement of support for a Bio-Scale-Up Center NRW in the amount of 30 million EUR and the signing of a MoU between IDE Trois-Rivières, Quebec, Canada and CLIB, the final CIC2021 event highlighted the topics of scaling up biotechnological processes, the use of biotechnological processes in the textile industry and closing the plastics cycle.

The topic of scaling biotechnological processes ran through a series of presentations: the challenges of successfully scaling up a process for the food industry, to various process engineering aspects required for successful scaling of biotechnological processes, to the economic perspective for a successful demonstration and commercialisation of biobased concepts. The second session of the day focused on sustainability and biotechnology in textiles production. Bio-based textiles can either replace traditional nylon fibres, or be novel materials, such as bacterial cellulose for medical applications. Textile finishing and recycling remain large fields for novel biotechnologies.

The conference was rounded out by a panel discussion on closing the loop in the plastics value chain. While en-



zymatic recycling is already feasible on an academic level and commercially active in certain applications, the less energy-intensive mechanical recycling, or different forms of chemical recycling are established or currently being implemented. Regulation must keep up with technology development to allow both access to plastic waste as a resource, and recycled materials as new feedstock.

CLIB Networking Day

Did you know that the Single Cell Lab at QIBEBT can look at the Ramanome – the metabolome of a single-cell in real time? That banana trees are monocarpic, leading to large amounts useful fibres being burnt each year? That there are literally mountains of hydrolysis lignin left unused?

If you do – you probably attended the **CLIB Networking Day 2021** (or short CND) and followed the pitches of our members.

In September 2021, our 3rd CND was held in hybrid format. Dr. Kathrin Rüggerdt of DECHEMA gave a keynote presentation, highlighting the challenges, but also the benefits of combining the best of the worlds of chemistry and biology to enable new innovations in biotechnology. Switching between on-site and on-line presentations, a quick succession of 14 pitches gave an overview of the impressive breadth of the CLIB member's activities.

The hybrid format allowed also for our international members to present their work. The examples presented ranged from valorisation of feedstocks such as wood, lignin, CO₂, or banana fibres, the production of enzymes or peptides, the development of novel process technologies, to the networking and financing of biobased innovations. Networking breaks enabled the participants at the venue to catch up, ask questions and find new collaboration partners.

The CND has become one of the most important events in our event portfolio, despite being organised for the third time only. This member-exclusive event is the

perfect occasion to not only find out about the activities of the CLIB members through the short elevator pitches, but also for meeting long-term partners, old friends, and new faces to the CLIB family. Especially our new members joining throughout the year are invited to introduce themselves to our wide and diverse network. Although networking between the on-site and online space is always a challenge, we managed to support our members in building new connections, starting new innovations, and creating sustainability in their sector.

Circular-Bio Annual Conference

The first Circular-Bio Annual Conference 2021 was joined by more than 80 participants on-line and on-site. The focus was on the availability of material flows in the cross-border region along the German-Dutch border, the development of innovative valorisation concepts, and the promotion of novel product ideas. These topics were covered in various sessions on Future Fuels, Healthy Building, Food & Feed Solutions and Utilisation of Residual Material Streams from Horticulture. Speakers from both sides of the border presented innovative approaches and discussed possible solutions for existing issues.

In the session on Food and Feed, participants heard about sugar alternatives and insects. Timo Johannes Koch from Savanna Ingredients / Pfeifer & Langen gave a comprehensive overview on scale-up challenges in the food industry. He described the challenges Savanna faced when bringing allulose, an alternative sugar, into the market. He underlined the importance of demonstrating the production process in a continuous production environment. At the same time, approval processes and application development needed to be performed before allulose can be marketed and sold as food ingredient.

Theo Verleun presented similar scale-up challenges from another market area: insects. He talked about opportunities and hurdles to incorporate insects in our food. Insect Valley Europe tries to build a network to establish a helpdesk for entrepreneurs active in this exciting



field. He emphasized the importance of developing the whole value chain from feedstock supply and storage, over larvae productions and automations systems, the pre- and post-processing, as well as regulatory aspects. Although complex issues still lay ahead, he was sure that insects, or ingredients derived from them, will become a part of our diet.

The session on "Turning healthy and sustainable - Transformations in the Building Industry" presented innovative approaches for biobased materials in the construction industry. The speakers highlighted the huge demand for climate friendly solutions in the building sector, but also underlined the manifold requirements e.g., for structural stability, fire and water resistance and longevity. Additionally, concrete examples of sustainable products were shown, such as grass fibres for insulation panels and fungi-based products that can be moulded or even 3D-printed.

"Moving forward -Innovations in Fuels" was the topic of the third session. This remains a competitive market, in which fuel properties and standards play a pivotal rule. Besides bio-LNG as e-fuel, the potential of sewage sludge as a feedstock for the production of fuels was discussed. The final session centred around the utilisation of residual material from horticulture. Fibres from residue streams can be used to produce different kinds of cardboards for example for furniture or wall coverings. In contrast, also high-value food-grade ingredients can be produced from agri-food side streams such as functional ingredients for food supplements or vegan products from cabbage leaves or onion peels.

The on-line participants gathered on the wonder networking platform, while on-site attendees continued their informal discussions on the topics of the day.

HiPerIn2.0 Forum Events – Focusing on Enzymes and Biotech

CLIB is constantly scouting the biotech and bioeconomy field for new technologies, new value chains, and new markets to inform our network and open new possibilities to cooperate and innovate for our members. At the same time, the CLIB core topics remain a source for new insights as well. As part of the HiPerIn 2.0 project, CLIB has focused on the development and production of functional enzymes with two forum events in November and December 2021.

Under the motto "**Enzymes – The Multitool of Biotechnology**" more than 130 participants spent an afternoon hearing about new technologies and discussing possible future innovations. Michael Puls from evoxx technologies presented their work on the development of robust enzymes for industrial use. He described the process of identifying and developing new enzymes using evoxx's metagenome-DNA libraries and enzyme improvement methodologies. Several real-life examples gave a good insight into the process and its applications to industrial challenges.

Jan Marienhagen, head of the Department Synthetic Cell Factories at the Forschungszentrum Jülich presented his work, which does not centre on single enzymes, but entire metabolic pathways in *Corynebacterium glutamicum*. He gave examples for strategies how to design and construct cell factories, as well as novel techniques to speed up this process.

Anne Timm from INOFEA and Emil Byström from SpinChem concluded the round of speakers with a tandem presentation on their technique to use enzymes in large scale processes. They jointly offer shielded and immobilized enzymes to be used in rotating bed reactors able to catalyse reaction in large volumes using little amounts of enzymes. The forum event closed with a short and intensive discussion on where the Multitool of Biotechnology is going to lead us in the future.



Only a few weeks later, CLIB again welcomed over 100 participants from all over Europe to the forum event “Catalysing Alliances for Greener Products”. Four EU projects, all receiving funding from the H2020 call “Enzymes for more environment-friendly consumer products” and recently started, were provided a platform to briefly present their project aim and to give a specific application example.

Gro Bjerga from NORCE (Norwegian Research Centre) introduced the OXIPRO project that aims to harness the power of oxidoreductases for greener consumer products. Marco Fraaije from the University of Groningen presented how his research in computational and structure-inspired engineering of thermostable enzymes will be applied to oxidoreductases to improve the enzymes before their efficient production by the consortium.

FuturEnzyme, a project that CLIB is also actively working in, aims at the development of innovative enzymes for the target markets detergents, textiles and cosmetics. Manuel Ferrer (CSIS) gave a broad overview of the project, followed by an example of collaboration with the industry, given by Nazanin Ansari (Schoeller Textil). Her talk presented the viewpoint of an industry customer, interested to use enzymes to improve sustainability and technical parameters of a product. This very early collaboration in the project is critical to inform the researchers about the specifications the enzymes have to meet in order to be usable in industrial applications.

As third project, EnXylaScope was introduced by Carolina Peñalva Lapuente from AITIIP Technological Centre. This project aims to unleash xylan's potential with enzymes, making this abundant biopolymer suitable to be included in a range of consumer products. Lalitha Gottumukkala from Celignis described in detail how to identify and produce enzymes for the linearisation and the targeted debranching and modification of xylan for diverse industrial applications.

Finally, the project RADICALZ was presented by Aurelio Hidalgo from the University Autónoma of Madrid. This project aims to speed-up the discovery and development of enzymes by application of AI and machine learning, as explained in more detail by Stephan Heijl from Bio-Product. In a short final discussion, the project coordinators discussed the identification of cross-sectoral fields of application and the role of AI in future R & D of innovative products.

This forum event demonstrated the power of forming clusters of R & D projects to exchange ideas and experiences as well as to build a strong network across topics, countries, and disciplines.

Outlook

In 2022, CLIB will continue to organise interesting and valuable events for our members. The CIC2022 will again open the conference year in biotech and bioeconomy as the first event of the year. The focus on technologies for a bio-industrial (r)evolution will unite all CLIB members and partners in the discussions. Circular-Bio and HiPerIn2.0 events will focus on circular bioeconomy and side streams across the Dutch-German border, and high-performance ingredients for new functionalities respectively. In our forum events, we will take up a range of topics, from CO₂ utilisation to insect biotechnology. All CLIB members are invited to join the CLIB Networking Day, as our signature member's-only event after the summer.



Framework

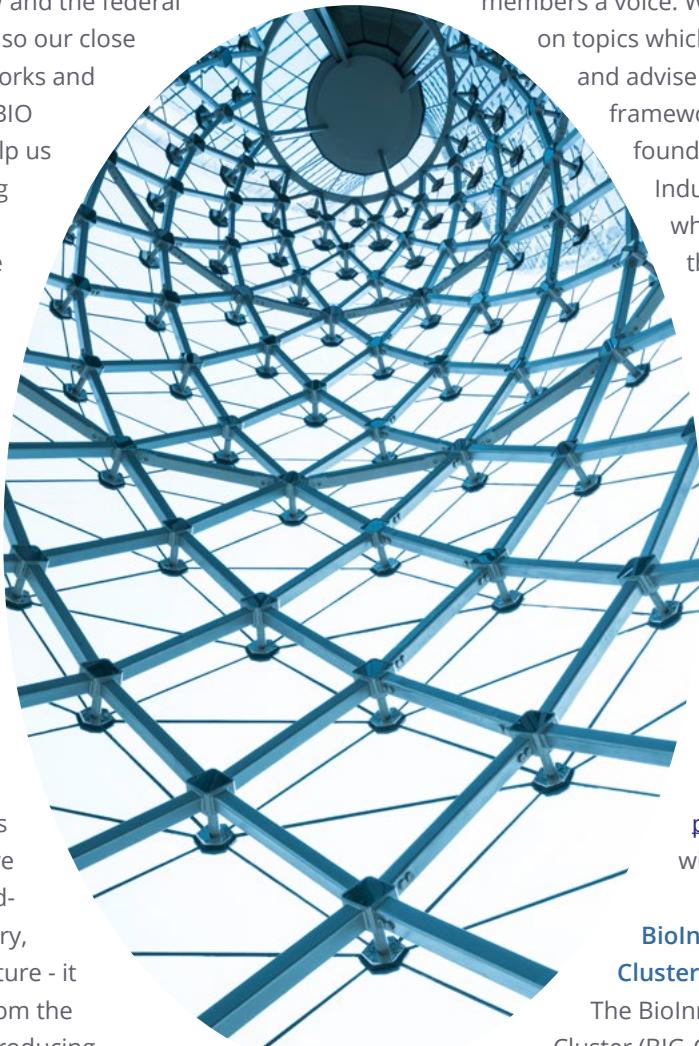
Implementation of the bioeconomy and the circular economy needs a supporting regulatory framework on regional, national, and EU level. CLIB continues to be active at all these levels to promote both the opportunities and the needs of the circular and bioeconomy. This is mainly done through our strong connections with the political stakeholders in NRW and the federal ministries in Germany. But also our close ties with other German networks and associations like DECHEMA, BIO Deutschland, or BIO.NRW help us give the bioeconomy a strong voice. Some of our projects with a regional focus, like the Dutch-German Network Circular Bioeconomy, address the municipal political level. The foundation of the circular bioeconomy, especially with regard to recycling and feedstock provision, has to be built in the cities and districts.

The ongoing structural change in the lignite mining area of NRW is both a demanding challenge as well as an enormous chance. With the collaborative work of all relevant stakeholders – academia, SMEs, industry, policy makers and infrastructure – it will result in the transition from the biggest fossil-based power producing region in Germany to a model region for sustainable production and living, based on regenerative energy and the concepts of a circular and bio-economy. CLIB as connector and translator between all these stakeholder groups is engaged in shaping this process which started in 2019 and will continue until 2038. It will see massive funding with up to 15 bn euros over the course of the next 19 years. We have already supported three proposals in this funding programme and will continue to scout for relevant topics and bring consortia together.

Challenges resulting from transforming industry sectors and climate change do not stop at regional or even national borders. Neither does CLIB: we actively enlarge our network beyond our region and beyond Germany. We are working together with partners directly across our nearest borders to the Netherlands and the Belgium region of Flanders in the long-term initiative BIG-Cluster – BioInnovation Growth mega-Cluster and in dedicated pro-

jects like the Circular-Bio INTERREG Network to connect stakeholders located in different countries but working in one industrial area to jointly develop solutions. In 3Bi we collaborate with other European clusters.

On the European level, CLIB is also present to give its members a voice. We give input to consultations on topics which matter to our members and advise on topics in the European framework programmes. We are a founding member of the Biobased Industries Consortium (BIC), which is the private partner of the Biobased Industries Joint Undertaking (BBI JU) PPP in Horizon2020, and its successor, the Circular Biobased Europe (CBE JU) in Horizon Europe. We are also active in the Vanguard Initiative “New Growth Through Smart Specialisation”, where CLIB is involved in the pilot project on bioeconomy, specifically in the demo case dealing with biogas. Being part of several Horizon2020 projects ([see page 30 – 34](#)) also helps to widen our European network.



BioInnovation Growth mega-Cluster (BIG-Cluster)

The BioInnovation Growth mega-Cluster (BIG-Cluster) is a cross-border Smart Specialisation Initiative aiming to make

Europe's industrial mega-cluster in the Flanders region of Belgium, The Netherlands, and NRW a global model in comprehensive bio-based value chains. The region has been a powerhouse of industrial innovation for decades and seeks to keep this prominent position in the future bioeconomy. The BIG-Cluster was initiated by the three cluster organisations BE-Basic (The Netherlands), Catalisti (Flanders, Belgium), and CLIB (NRW, Germany) and is backed by additional cluster organisations and networks in the three regions. Today BIG-Cluster is coordinated by Circular Biobased Delta, Catalisti and CLIB.



BIG-Cluster's purpose is to speed up the transition to the bioeconomy and circular economy in the participating regions, to identify and take advantage of critical mass and synergies in public and private R & D as well as in training and education facilities, and to build capacity. One of the long-term goals is to enable pilot and demonstration activities for the production of chemical building blocks and fuels based on alternative feedstocks sourced in the region, such as 2nd generation biomass and industrial waste gases. Early on, the BIG-Cluster decided to focus on the feedstock-to-product (F2P) value chains "Aromatics and Fine Chemicals from Woody Biomass" (Biobased Aromatics), "Chemicals from CO and CO₂" (C1 Bioconversion), and "Biomass strategies"; and the cross-sectional topics "Circular Economy Education" (Education) and "Closing the loop". In 2018, CLIB initiated three international consortia focusing on the topics Biobased Aromatics, C1 Bioconversion, and Education. The corresponding projects ALIGN, BioCONversion and CROSSBEE were funded by the German federal ministry of education and research, with international partners associated. These achieved great success during the project lifetimes and will build on their results in future projects. While there is no direct trilateral funding mechanism available for BIG-Cluster partners from the three countries, the international consortia interact and collaborate in meetings and project advisory boards.



3Bi – Brokering Bio-Based Innovation

In 2020, CLIB joined the European bioeconomy clusters IAR (France), BioVale (UK), and Circular Biobased Delta (CBB) in the 3Bi intercluster. Here, we join forces with other European clusters to reach a wider network, organise joint events, and connect our members. The events can be webinars on current topics or presentations of EU funding lines combined with networking opportunities. CLIB and the partner clusters in 3Bi benefit from each other's expertise and networks and aim to bring additional value to their respective members.

BIC

CLIB is a founding member of the Biobased Industries Consortium (BIC), a non-profit association based in Brussels. It was the private partner of the Biobased Industries Joint Undertaking (BBI JU) PPP in Horizon2020 and is the private partner of the Circular



Biobased Europe (CBE) PPP in the current Horizon Europe framework. BIC seeks to expand the partnership to include primary producers and brand owners and reach out to society in order to achieve the vision of a carbon-neutral bioeconomy, replacing fossil-based products to mitigate climate change in a circular bio-society.

By being active in BIC and CBE, we see a chance for industry to identify knowledge and technology gaps to be addressed in collaborative funded projects, to de-risk much needed investment in reaching higher technology readiness levels (TRLs) for biobased processes, and to create a critical mass in bringing the best ideas to bear on innovation in the biobased sector. This means structuring the sector and leading the way to creating a circular bioeconomy in Europe. As a cluster member, we represent several of our SMEs in BIC. We are a member of the programming core team, which we are chairing in 2021, a member of the education team, and give active advice on future strategic orientations and work programmes of the PPP.

Collaboration with Trois-Rivières, Quebec, Canada

CLIB signed a Memorandum of Understanding with the innovation and economic development agency Trois-Rivières (IDE-TR) in 2021. While the local parameters are different, both regions share a challenge of structural change and the desire to implement a bioeconomy. Together with our members, we will identify potential areas for collaboration, build connections between our networks, and identify funding opportunities. A first visit by a delegation from Trois-Rivières has already taken place and CLIB members took the chance to contact the networkers from IDE-TR.



Technology Transfer

Bridging the gaps – transferring technology from academia to industry or from SME to large enterprise – is one of the challenges taken on by CLIB each day. CLIB brings together stakeholders from academia and industry along various value networks in its structured networking process. We moderate the related exchange between academic and industrial stakeholders to improve the understanding of each other's needs and expectations. One example is to give academia an understanding of market needs, and the required specifications and performance of new products and processes. We also help industry members keep up to date with developments in basic and applied research. The ambition is to initiate R & D & I projects with defined technology development goals. Moreover, CLIB supports market-oriented technology development by selecting target products in a dedicated process and choosing the appropriate technology approaches, based on market needs. This structured networking process is also showcased [on pages 12 – 13](#).

The exploitation of research results by academic institutions is often limited due to an insufficient technology readiness level (TRL) and a lack of commercialisation strategies. Since the technical and financial risks are high, industry is often hesitant to pick up such ideas for further development. The transfer of research results into commercial applications requires tremendous financial and time efforts as well as diverse scientific and economic expertise. The extraordinary diversity of life science technologies, their areas of application, and the necessary knowledge needed to apply them further complicate technology transfer in this sector.

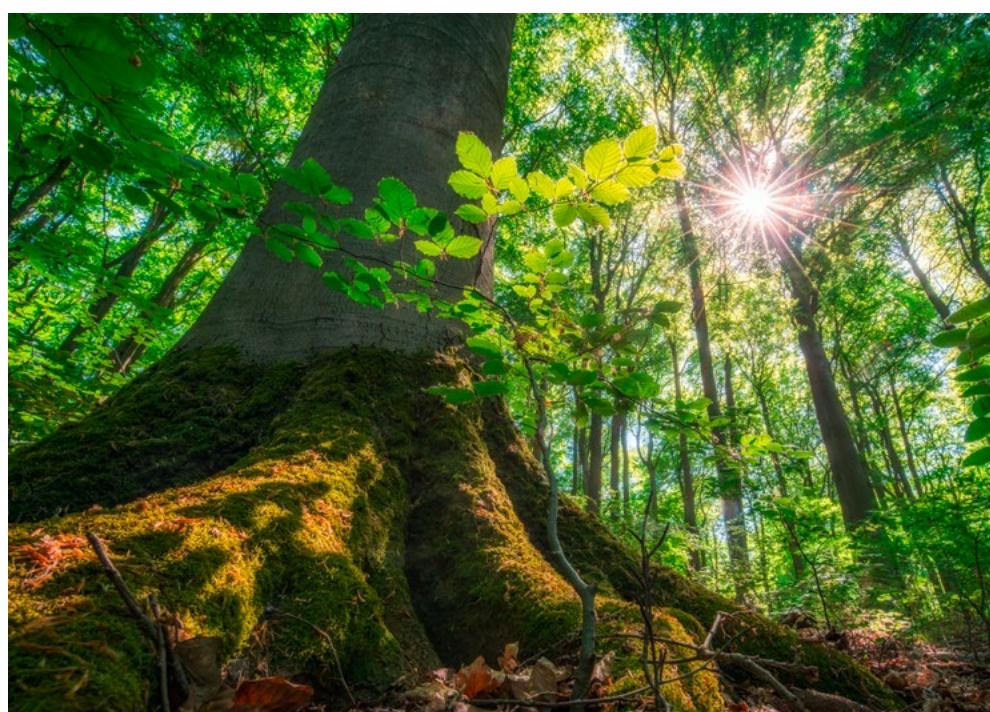
To bridge this gap and to trigger industrial interest for further development, CLIB supports technology transfer through a multifaceted approach that also involves its strong network of strategic partners.

Furthermore, the cluster creates visibility for novel technologies and young companies through presentations at its events and in its publications.

In projects involving technology transfer, CLIB can perform several kinds of analyses, depending on the cluster's involvement in the individual project and the funding available. It starts with the development of a dedicated workflow fitted to the demands of the given topic. CLIB performs value-chain analyses to identify available technology approaches, relevant stakeholders, and potential markets. Based on this evaluation, a SWOT analysis elucidates

the near-, medium-, and long-term business opportunities of the value chain in focus. As was done in BIG-Cluster, CLIB can help to select one or two technology approaches or concepts of novel value chains with the best potential for commercialisation. For these, tech-transfer strategies are then developed by evaluating the technology readiness as well as potentials and risks. In addition, CLIB can offer support when project partners are developing business models, including calculations of production costs, investments, and revenues as well as estimations of volume availabilities and market shares. We can also assist in designing IP concepts and strategies for further technology developments and strategic partnerships. We recommend and collaborate with experts from our network on several of these areas.

Novel Value Chains or Networks Catalysing the establishment of novel value chains, or rather value networks, within the circular bioeconomy is one of the major tasks of CLIB. Such value chains can form within a given industry or sector, but they are more likely to develop at the boundary of different industrial sectors. When as-yet individual branches, such as the chemical sector and the pulp and paper sector, start to converge, new value chains will form. This might happen because an enterprise seeks to forward integrate its product portfolio to gain access to later stages of the value chain or to diversify its product portfolio. Examples include agriculture or forestry enterprises starting to develop chemicals in addition to their original products for food and feed or for construction. This is one of the major opportunities of the bioeconomy: creating new business models for agriculture and forestry.



Choosing the best market to enter can be essential. Smaller, more fragmented markets are easier to penetrate by new biotechnological processes not yet developed at large scale. Smaller-scale but high-value products offer the chance to find a niche to be profitable with a new bio-based or biotechnological process, even offering business cases for pilot or demo projects. An example are high-performance ingredients for example for the cosmetics industry. They can attain a high value, but their regulatory hurdles are lower than those for pharmaceuticals or novel foods. Such specialties can also be enabling products for long-term markets of bulk chemicals and fuels.

The aforementioned developments typically emerge from market pull. Technology push can also create novel value chains. Especially in rather young ecosystems such as the bioeconomy, technological breakthroughs can be the force behind the formation of completely new services and products. For instance, the ability to utilize gaseous carbon as feedstock on a commercial scale to produce platform chemicals such as ethanol (e.g. then converted into (poly-)ethylene), opened up new value chains integrating biotechnology, chemicals, and the steel industry.

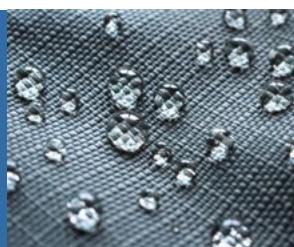
Another kind of market pull also plays an important role: the regulatory framework. This is not new, as countries across the globe have committed in the Paris Agreement of 2015 that anthropogenic global warming should be kept to less than 1.5 °C. The process towards changing industrial practice to achieve this action against climate change has been slow, but some significant developments have emerged. The vocal protests of civil society and high-profile individuals. Courts delivering verdicts that mandate political action. Weather extremes and catastrophes, made much more likely by climate change, impacting very close to home. The increasing voices from the insurance, investment, and industry sectors, emphasising that externalities must be given a price tag as well. Companies have realised the importance of their sustainability reports to attract potential investors, and are publicly pledging their commitment to climate-neutrality to increase consumer acceptance. These movements are here to stay and will in the long run lead to regulatory frameworks raising the price of carbon emissions and limiting the use of fossil-based resources.

In December 2019, the EU heads of state met in Brussels and agreed to make the union “climate neutral” by 2050. The European Green Deal aims to achieve this, by setting out a Climate Target Plan to reduce greenhouse gas emissions by 55 % by 2030, investing in research and innovation, and protecting the environment. While greenwashing remains a strategy and risks watering down the regulations and efforts to build back better, many companies are

trying to pro-actively change their processes and become part of a solution towards climate neutrality. At CLIB, we believe that biotechnology in a circular bioeconomy is an essential part towards achieving these goals.

Regulation can also play a strong role in forcing new value chains to emerge through direct interventions. The ban on BPA led to a shift in the use of additives for the plastics and coatings industry and this drive towards substances with less impact on human health and the environment continues. These regulations often come with long lead times, enabling a slow shift towards new products, but increasingly they are introduced more swiftly as with the ban on single-use plastic. CLIB aims to anticipate these regulatory effects, enable members to act on them and with its partners to advise both industry and policy on their effects.

CLIB aims to offer a radar for new developments and opportunities. In close interaction with our members from industry and academia, we analyse markets which show interesting developments, inform about political regulations, or identify technologies with a high innovation potential. Currently, CLIB focuses on the following near-term markets because they show dynamic growth rates and offer opportunities where biotechnological processes can provide advantages over chemical routes:

Personal & home care <ul style="list-style-type: none"> • Biodegradability • Cosmetics • Flavours and fragrances • Surfactants 	
Food, feed & nutrition <ul style="list-style-type: none"> • Alternative protein sources • Crop protection • Flavours and fragrances • Nutraceuticals • Supplements 	
High performance materials <ul style="list-style-type: none"> • Adhesives • Coatings • Functionalised surfaces • Packaging • Textiles (fibres) 	

In addition, process technology and education are two focus topics at CLIB because they have the potential to create further technology push for the bioeconomy. We consider bulk chemicals as well as fuels and energy to be long-term markets for biotechnology that we keep an eye on but which are not a priority in our cluster.

HiPerIn 2.0

One of the strengths of biotechnology is the conversion of functional starting materials into high-quality products. This area of high-performance ingredients ("HiPerIns") ranges from specialty chemicals through the cosmetics and food industry to the pharmaceutical sector. During the original HiPerIn project coordinated by CLIB between 2016 and 2019, essential networks and projects could be initiated in this area. However, global challenges, disruptive innovations, and changing framework conditions have made it necessary to design a revised, science-based concept to shape the next generation of bio-based high-performance ingredients: HiPerIn 2.0.



HiPerIn 2.0 expands its thematic focus to reflect the rapid change in biotechnology and includes five cross-cutting topics which are of interest to many of our stakeholders: the digitalisation of biotechnology, the renewed concept of a circular economy, the end-of-life debate, the public perception of biotechnology, and the increased regulatory requirements.

Accordingly, the project allows CLIB to link the research with appropriate cross-cutting topics at our events. Even though networking has still suffered greatly from the pandemic during the past year, the project has largely come to terms with the restrictions. HiPerIn 2.0 thus themed the first session of the CIC online series "Bringing healthy & sustainable proteins into your fridge" and the final hybrid event of the CIC2021: "Biotechnology 2021: Advancing into a decade of sustainability". Two virtual forums were hosted in November ("Enzymes – the Multitool of Biotechnology") and December ("Catalysing Alliances for Greener Products").

Another strong focus in the HiPerIn project is the support for project consortia and the identification of potential funding lines. Thereby, CLIB was able to shape the structural change process, to create several proposals with our community, and to welcome new members into our cluster.



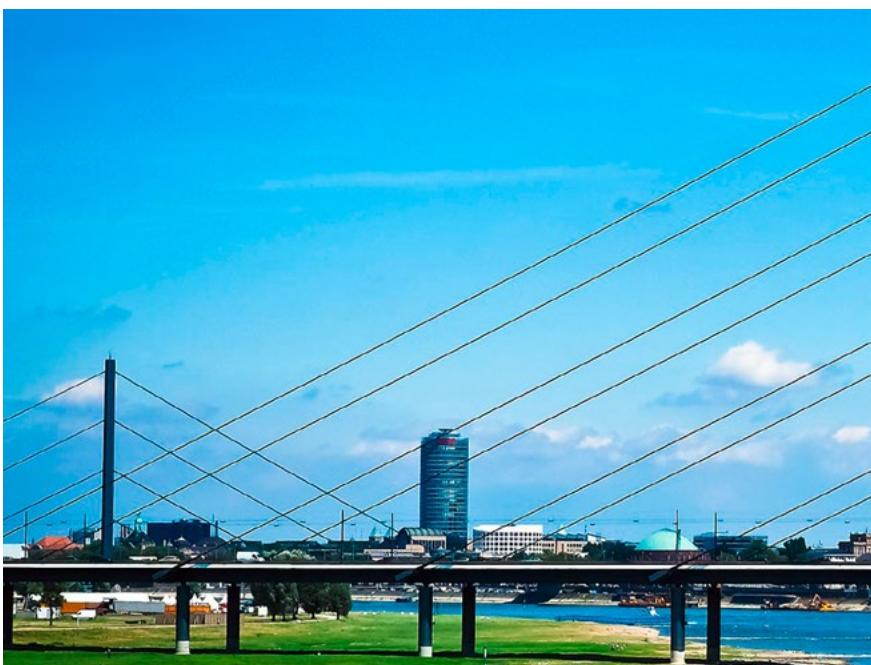
CKB

CLIB-Kompetenzzentrum
Biotechnologie

CLIB-Kompetenzzentrum Biotechnologie

Within the first HiPerIn project, CLIB developed a plan for a Competence Centre to combine the necessary experience and speed up technology transfer to get from an inspiration in basic research to an applied project and a product. The project CLIB-Competence Centre Biotechnology (CLIB-Kompetenzzentrum Biotechnologie – CKB) has been supported through the research infrastructure initiative by the German state of NRW from May 2018 to October 2021. This virtual centre was established by four academic members of CLIB: Bielefeld University, TU Dortmund University, Heinrich Heine University Düsseldorf, and the Forschungszentrum Jülich, which have a track record of long-term cooperation in several funded projects. The CKB built on the previously established separate technology platforms at the individual institutions, which were integrated into a joint virtual centre to develop biotechnological processes in a holistic approach. CLIB anchored this centre within its network and the region.

The project aimed at speeding up technology developments by integrating multiple process steps allowing for parallel process optimisation and for integrating advice from the industry at early stages of development. Following its claim "From gene and enzyme to process and product", more than 70 scientists from all four academic partners focused on the three megatrends resource efficiency, raw materials, and health. They achieved relevant results to feed the pipeline of new developments in bioeconomy in NRW. The partners are continuing to cooperate and will develop relevant technologies together to strengthen the bioeconomy in NRW.



Circular-Bio INTERREG Network

A concept for a circular bioeconomy network linking the Netherlands and NRW, including two municipalities as part of the project consortium, started in early 2020. Led by CLIB, this project involves ten organisations (two municipalities, five companies, one academic institute and two networks) working together to create novel value chains in the circular and bioeconomy in the region. It features feedstock suppliers from agriculture, forestry, waste management and the process industry to integrate materials and side streams in new regional process developments.



The project supports the creation of innovative, biobased, and sustainable product designs for the chemical industry, the energy sectors, feed and food markets, mobility/fuels, and the pharmaceutical industry. These developments require the involvement of practitioners in the various industrial sectors but also supportive framework conditions. Different types of event formats support the stakeholders in the region in the development of new, innovative, and cross-border value chains and business models in the bioeconomy sector. In addition, the project offers an innovation voucher programme for SMEs to further develop their business cases and foster their process development. It further aims to network stakeholders from agriculture, logistics, biotechnology, academia, and the processing industry, as well as municipalities to lay the foundation of a thriving circular and bioeconomy within the cross-border region.



BioCOnversion

BIG-Cluster Project BioCOnversion

In response to climate change, huge efforts have already been undertaken to reduce greenhouse gas emissions especially in the energy sector. While the fossil energy sector might be the most obvious producer of GHG emissions, also the processing industry continuously generates gaseous by-products at a constant quantity, which will not be reduced with the coming shift to renewable energy sources. Emissions generated by waste incineration will also remain unavoidable even in the long term. In a paradigm shift, these carbon-containing process gases from steel, cement or waste incineration plants should not be considered pollutants, but valuable feedstock streams. This feedstock could enable the biotechnological production of chemical building blocks currently produced via petrochemical processes, such as mid-chain carbon compounds with multiple functional groups. Producing these essential intermediates and products from process gases and side streams instead of fossil resources is a major step to establish a sustainable bioeconomy.

One of the projects coordinated by CLIB has focused on the development of a new value chain to achieve this objective. The BioCOnversion project developed a process starting with gas fermentation, in which CO-containing process gases from ThyssenKrupp Steel Europe's steel mills are converted into an intermediate product, followed by enzymatic upgrading to a plastic precursor. In a first project phase, the individual process steps were experimentally tested independently of each other. In the second project phase, the most promising approaches were combined, and an entire value chain was modelled on a laboratory scale. The process performances of the different steps were evaluated by techno-economic assessments and life cycle analysis. The project ended in October 2021. Based on its results, the activities initiated in BioCOnversion will be continued to establish a value chain in the Rhenish lignite mining area that will contribute to the economic transformation of the region.

Structural Change in Germany

The structural change in the German lignite mining areas represents an immense challenge for the actors in the affected regions in the states of Brandenburg, North Rhine-Westphalia, Saxony, and Saxony-Anhalt. According to the German Lignite Association, some 70,000 jobs in Germany are linked to the extraction and conversion of lignite into electricity.¹ If we consider the necessary restructuring of the energy infrastructure which goes hand in hand with the coal phase-out, the extent of this change, which reaches far beyond the regions mentioned, becomes apparent.

The German federal government is providing up to 40 billion euros in funding until 2038 to actively shape the structural change in an enormous opportunity to strengthen local economies. This becomes even more significant if the coal phase-out may now be completed by 2030. In this sense, the coal phase-out can provide the necessary impetus to break up established structures and create space for new, innovative, and future-oriented concepts. The reference to the German Sustainability Strategy in the "Strukturstärkungsgesetz Kohleregionen" (Structural Strengthening of Coal Regions Act) can be understood as an indication that the German government also sees the opportunity to implement more sustainable and resource-efficient economic methods.²

The overarching concepts of the bioeconomy and circular economy with their different facets are addressed in the updated Economic and Structural Programme ("Wirtschafts- und Strukturprogramm", WSP) 1.1 in the Rhenish lignite mining area, which sets the thematic framework for the structural change in this region. The vision stated in WSP 1.1 reads: "In 2038, the Rhenish mining region will be the region in Europe in which the objectives of the European Green Deal have been implemented most consistently. [...] The region operates and lives in an almost climate-neutral manner. The energy supply is secure and affordable, and it comes from renewable sources. Through intelligent specialisation, the energy-intensive industry has become a world leader in green technologies. Within a diverse economic structure, in which small and large enterprises have established new business models, the industry in the Rhenish mining region is a driver of growth for all of North Rhine-Westphalia."³ To achieve these goals, the existing linear value chains must be completely converted to circular value chains. This requires a rethinking of established procedures and the cooperation of actors throughout the entire production process.

The biologically-oriented conception of technical developments with the aim of innovative and sustainable value creation is summarised under the term "biological transformation"⁴, a change from an oil-based to a largely bio-based industry. The adoption of biological designs, principles and processes leads to highly functional manufacturing techniques and to products with novel properties that can be produced in a resource-saving manner and used in a circular economy. It necessitates the development of the associated processes, procedures, plants, and machinery to change linear to circular value chains. This biological transformation requires the integrative interaction of biotechnology and chemistry, together with computer science, mechanical and plant engineering.



This is the next and necessary step in the evolution of biotechnology: Process development needs to extend beyond going from gene and enzyme to intermediate and ingredient towards integrating the finished product and its life cycle.

1 <https://braunkohle.de/wp-content/uploads/2019/04/Braunkohle-in-Deutschland-Daten-und-Fakten-Statistikfaltblatt-deutsch.pdf>, accessed 24.08.2020

2 Investitionsgesetz Kohleregionen InvKG vom 08.08.2020

3 Wirtschafts- und Strukturprogramm für das Rheinische Zukunftsrevier 1.1, p. 8

4 Neugebauer R. (2019): Biologische Transformation. Springer Verlag, ISBN 978-3-662-58243-5

Such a holistic approach raises several questions: How can a bio-based monomer, for example, be processed? Which additives are used and are they also bio-based and / or biodegradable? Is the entire product recyclable at the end of its life cycle - and if so, under which conditions? Finding answers to these questions requires detailed knowledge across the entire process and needs to involve actors from various disciplines along the whole value chain.

The structural change will be a central element for the strategic development of CLIB and the biotech sector in the next 15 years, so we are doing our best to seize the opportunity. Over the past years, CLIB has eagerly supported and partially shaped the beginning structural change in the region. Our team members have been active on countless meetings, have brought strategic insights in various work groups and have successfully placed important aspects of the industrial biotechnology in the Economic and Structural Programme. Thanks to the cooperation of numerous actors, impressive things have been created in a short period of time – although there is still room for improvement. To bring the transformation to the affected communities as fast as possible, it is important for us to act as a mediator between the excellent academic institutions and innovative companies in the region. Only by combining the strength of both, the structural change can benefit the people already in the next years. Accordingly, we keep our eyes open for opportunities to create meaningful consortia. Of course, we are happy to support our members in word and deed if they also want to get involved in the structural change.

As our first major undertaking in this regard, CLIB is involved in Bio4MatPro, one of the upcoming projects within the structural change process in the Rhenish lignite mining area. Bio4MatPro is funded by the BMBF as one of two flagship projects in the "Modellregion Bioökonomie im Rheinischen Revier". It is coordinated by Prof. Dr. Ulrich Schwaneberg (RWTH Aachen University & DWI Leibniz Institute; Speaker) and Prof. Dr.-Ing. Thomas Bergs (RWTH Aachen University) and unites 60 project partners in a novel innovation network for the biological transformation of industries. Their expertise comprises a powerful mix of leading large companies and SMEs, a successful incubator with a planned Bio4MatPro translational research laboratory, and excellent scientists, which are linked to investor funds via a venture capital accelerator. The Bio4MatPro mission aims to generate high value products based on renewable biomass with biointegrated

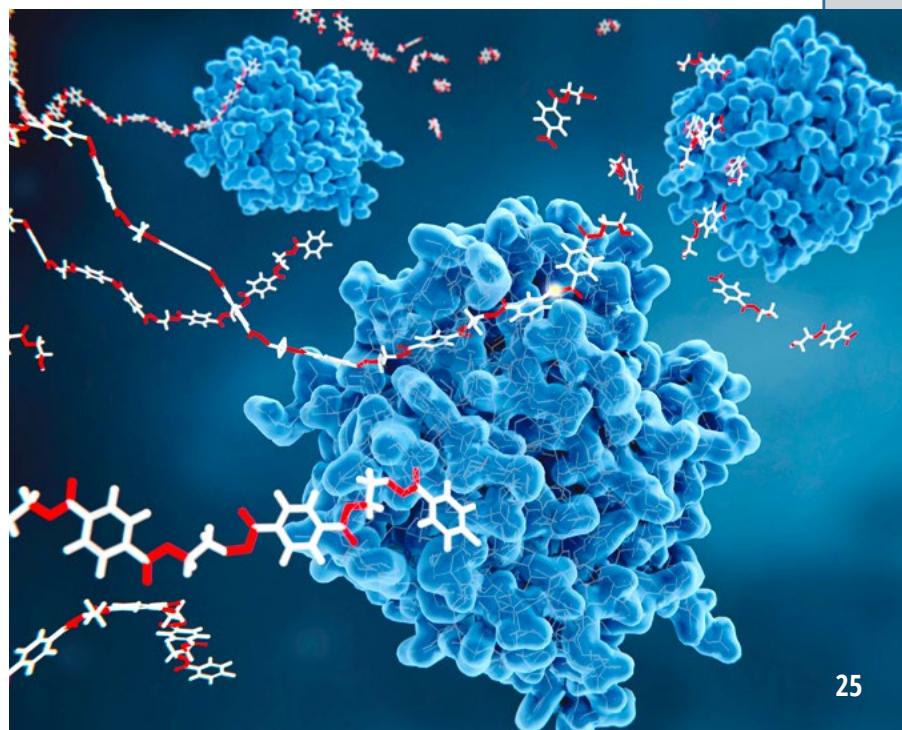
functionalities. Accordingly, this mission also requires rethinking established product processes and develop novel scalable and biocompatible production processes.

Bio4MatPro builds on several biomass related projects in the region which are based on regional renewable raw materials. The competence centre is divided into six so-called boost labs (BL), comprising 23 collaborative projects in three different thematic areas:

1. From renewable raw materials to valuable materials (BL1).
2. Future technologies (BL2 & BL3)
3. Biological transformation of application industries (BL4 – BL6).

These three areas complement each other to establish an innovation network that is unique in its form. Thereby, Bio4MatPro will create an important growth core in the Rhenish lignite mining district to bring high local added value in the structural change region.

Our vision for the region after a successful structural change sees a sustainable economic zone comprising a variety of smart agricultural production on recultivated land, production facilities based on renewable energies, biorefineries connected to existing processes, recycling plants, small-scale production facilities for high-quality ingredients, start-up incubators, and academic institutions. In such a diverse landscape, we see CLIB as the ideal accompanying designer, moderator, and catalyst, always in close exchange with the actors in the region and beyond.



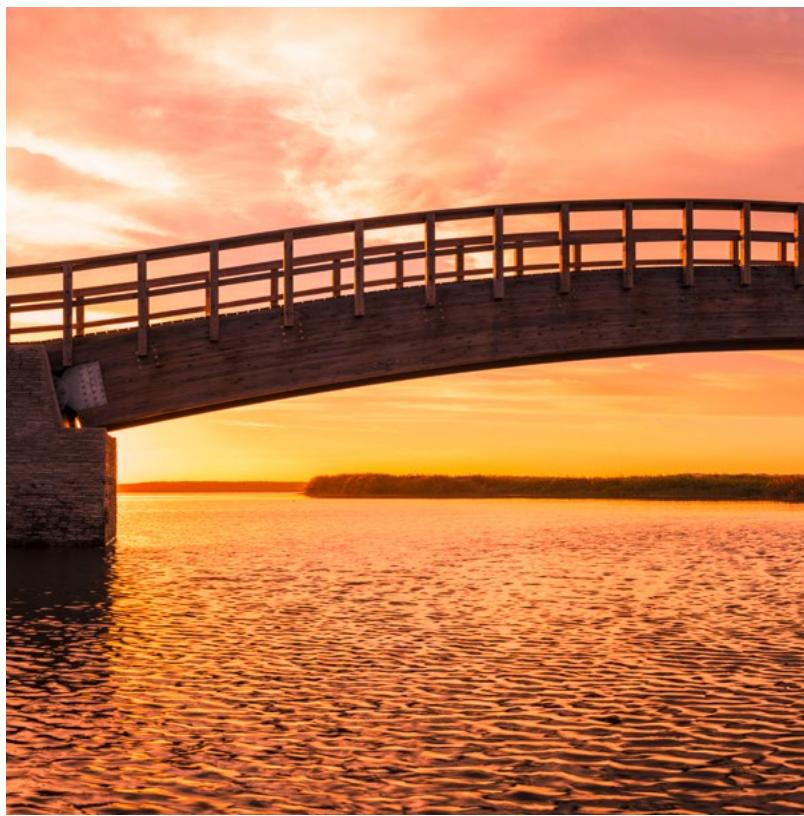
Scale-up and Demonstration

In biotechnology, the path from initial experiment to industrial process bridges many orders of magnitude. While the first trials and screenings often take place in bench-top devices at microliter scale, industrial bio-process run in fermenters of several cubic meters of solution. An increase in volume of over eight orders of magnitude is not uncommon. For clarity: this is equivalent to scaling the weight of a toy car to that of a bucket-wheel excavator. Scale-up is a major hurdle, especially for the realisation of new bioprocesses.

Apart from these scientific and technical challenges which need to be overcome, financing is also a hurdle. At the latest on the demonstration scale, large financial investments are necessary, which often exceed the possibilities of small businesses. This is one reason why larger biotechnological processes are still rare in Europe. Another reason is the lack of experience regarding important process steps for large biotechnological processes, whereas the knowledge about chemical processes is much greater, but not necessarily comparable.

To help establish biotechnology in industrial practice, CLIB focuses on supporting the market implementation of high-value, small-scale products, which are relatively easily accessible and can serve as enablers. But even for these relatively small-scale processes, universities and RTOs do not usually have the necessary equipment of the required scale to go beyond first trials and proof-of-concept. Our strategy has several steps: first, we ensure the timely involvement of the industry as potential reference and off-take consumers in research projects to integrate the industrial perspective at an early stage and to identify and develop scalable processes. A regular exchange of experience is vital to ensure projects don't "reinvent the wheel" and waste valuable time and resources. Additionally, the cluster supports the integration of combined biotechnological and chemical processes, as well as the realisation of processes in chemical parks.

CLIB has considerable expertise in projects helping SMEs and academia to access equipment for testing, for example in the CKB. In the EU-funded project MPowerBIO, we support SMEs in increasing their investment readiness level to attract financing and to cross the valley of death between a validated process in pilot scale and the commercial process. Scale-up also needs open-access pilot plants. The German state of NRW will co-finance the construction of a Bio Scale-up Center NRW that will enable biotechnological processes to be scaled up and validated in large volumes. A conceptual design project led by CLIB will help shape the basic features of this facility.



CLIB-Competence Centre Biotechnology

The CLIB-Competence Centre Biotechnology (CLIB-Kompetenzzentrum Biotechnologie – CKB) aimed at establishing an integrated infrastructure for the bioeconomy in NRW: From gene and enzyme to process and product (see chapter "Technology Transfer, [page 20 – 23](#)). The integration of all process steps upstream - fermentation – downstream performed in the project helps shortening the time from idea to market entry and thus enables a faster and more efficient upscaling of biotechnological processes.

While the funded project concluded in October 2021, the more than 20 working groups from the four academic partners, Bielefeld University, TU Dortmund University, Heinrich Heine University Düsseldorf, and the Forschungszentrum Jülich, will continue to work together to bring the novel technologies developed in the project to scale.



BIG-Cluster Project ALIGN

Aromatics represent a significant share of today's chemical building blocks used for a wide variety of applications in fields such as polymers, adhesives, coatings, resins, surfactants, antioxidants, and cosmetics. Currently, aromatic building blocks are mainly produced from fossil resources, but this BTX feedstock stream will decrease in



future. Also, the development of less toxic, natural molecules to replace toxic, synthetic ones is strongly required by consumer demand and regulations. The only large source for biobased aromatics is the abundant natural polymer lignin, which is currently only valorised in limited amounts. Conventional lignin extraction processes are often optimised towards the fractionation and purification of cellulose for pulp production, leading to a low-quality lignin. It has an undefined structure and a low degree of functionalisation and is mainly burnt for heat production. However, in an integrated, efficient biorefinery, the lignin should be converted into high-value products to optimise biomass use and revenue. To date, the production of high-quality aromatics with a high degree of functionalisation and defined structure from lignin feedstock is still a challenge.

This challenge was taken up by the ALIGN consortium, which is an example of a successful scale-up project. In ALIGN, three different extraction processes for lignocellulose were scaled-up to generate specific lignin fractions that differ in their degree of depolymerisation and functionalisation. Each of these processes leads to a high-value lignin fraction and a pure cellulose / sugar fraction.

The Organosolv process combined with the base-catalysed depolymerisation of Fraunhofer CBP leads to pure lignin oil and oligomers. In further downstream processing steps, for example via the membrane separation steps developed by VITO, the high-value lignin fraction was optimised further. The lignin-first process, established by

KU Leuven, was successfully scaled up to pilot scale by Fraunhofer CBD. In this process, high-quality phenols and pure cellulose/sugar fractions were obtained from beech wood chips. Finally, the LXP group scaled up its LX process in a demonstration plant with a biomass (dry matter) capacity of 500 t/a, which started substituting 1,500 t/a corn silage from the beginning of 2020 and has a production capacity of about 10 t lignin per year.

From these different lignin derivatives produced within the ALIGN project, a wide variety of bio-based aromatics with unique properties can be produced through enzymatic depolymerisation and specific downstream processing strategies. These bio-based molecules harbour great potential for a wide variety of applications in the aromatics sector ranging from fine chemicals to bulk products.

One of the potential high-value products is natural vanillin for food and beverages. To guarantee its classification as natural flavour and ensure the corresponding premium price, an enzymatic depolymerisation of lignin can be performed in a biotech process. In this technological development, the TU Braunschweig has already achieved initial success in establishing a corresponding enzyme cascade. The consortium also tested the use of lignin as a resin substitute for phenol and as a base for adhesives, with first promising results.

The ALIGN project managed to successfully scale-up lignocellulose extraction methods which now provide the high-value lignin fractions essential for the further development of processes leading to high-value products. ALIGN showed that scale-up projects like this are important for bringing biotechnological processes to industrial scale.

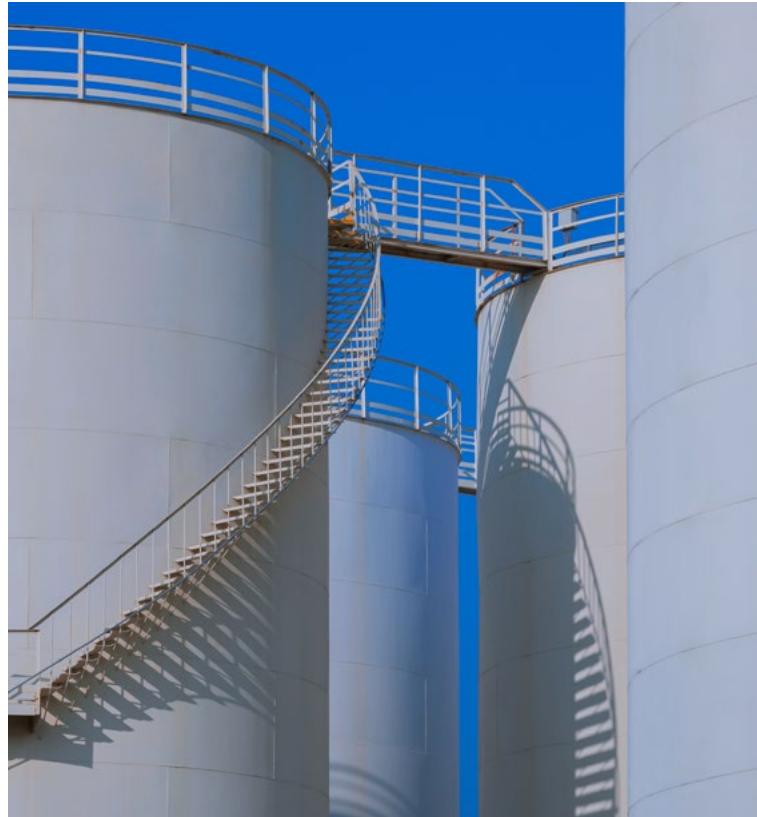


FARMYNG

The Joint Undertakings of EU with private partners, such as the Biobased Industries Joint Undertaking (BBI JU) and now the Circular Biobased Europe, CBE JU, are the only support instrument funding the up-scaling of biotechnological processes to a first commercial scale. Its flagship projects provide funding of between 12 – 20 million euros to consortia which build first-of-a-kind plants at commercial level. So far, BBI has funded 14 flagships over the last seven years, quite a few of which are being led by SMEs across Europe.

FARMÝNG, a consortium led by the French start-up ÝNSECT, aims to establish the largest global fully-automated flagship industrial plant to produce premium proteins from insects, more specifically the mealworm *Tenebrio molitor*, for animal and fish nutrition. CLIB is happy to be one of the 19 project partners, which come from eight countries and ensure that the entire value chain needed for such a scale-up is represented. These include feedstock and larvae producers, companies specialising in automation, and labs specialised in the analytics necessary to ensure the identity and good health of the beetles, but also to verify the final product specifications. The consortium also includes end-users who will utilise the final products. ÝNSECT is the SME behind the ÝnFarm™ and has grown from a start-up in 2012 to over 100 employees and 399 million USD in investment in 2021. It coordinates the project, which has 19.6 million euros of funding.

At ÝnFarm™, wide range of sustainable products from beetles will be produced: protein meal, oil, and organic fertilizer. It will demonstrate the technoeconomic viability of the first full-scale industrial plant for the production of sustainable and alternatively-sourced proteins. It will also establish new bio-based value chains from agricultural by-products to the production of fish feed and pet food products. Another targeted value chain from insect excrement (frass) to fertiliser has moved closer within reach through the approval of frass for inclusion in (organic) fertiliser. It will now be tested by a vineyard owner and on other agricultural products as well as for horticulture. CLIB will, together with the clusters IAR and WPCC, ensure the dissemination of the project's results. CLIB will also analyse how feedstock from beetles can in the long term be used in the chemical industry.



to provide training and mentoring. Through regional bootcamps and competitions, SMEs can get the chance to pitch in front of investors at the European Bioeconomy Venture Forum. In the project, CLIB is coordinating this cluster training, supports its own SME members, and organises regional events. During the regional pitching competition in 2021, the start-up Milkywaste and CLIB-member Phytowelt Green Technologies were selected as the most promising SMEs for the final European pitching event.

Bio-Scale-Up Center NRW

The Ministry of Economic Affairs, Innovation, Digitalization and Energy (MWIDE) of the state of NRW has committed itself to co-fund the construction of a Bio Scale-Up Center in NRW. This open-access facility will enable biotechnological processes to be scaled up and validated in large volume. The facility is to address a TRL range of 7-9 and thus work complementarily to existing pilot plants in Northwest Europe.

A project to design this infrastructure has been carried out by CLIB with partners from North Rhine-Westphalian industry in order to design the basic features of the facility. It was funded by the MWIDE and within the scope of this project, the needs and requirements for such a facility were analysed. The outcome of this project was an extensive report with recommendations concerning site requirements, technical design, business model, and strategic orientation of the facility. The confidential report was handed over to the Ministry in November 2021 and will inform the decision-making for the next steps expected in early 2022.



MPowerBIO

SMEs are often technology drivers but can find it difficult to attract investors, especially for risky undertakings such as scaling up novel processes. To support SMEs in the bio-based sector in increasing their investment readiness level (IRL) and attracting investors, CLIB co-wrote the proposal for the MPowerBIO project. The 10-partner strong consortium aims to provide bioeconomy clusters with the capacity to support their SME members in assessing and increasing their IRL and thus builds a sustainable expertise within European networks and clusters to support their SMEs beyond the funding period. MPowerBIO is also engaging SMEs directly in a business support programme

Fostering Biotechnology by Promoting Interdisciplinarity and Entrepreneurship

Biotechnology and bioeconomy are wide-spanning fields, intersecting multiple scientific disciplines and engineering. Additionally, the bio-based sector is ever growing, and the chemical industry needs trained staff to convert their processes to sustainable and bio-based technologies. Future bioeconomy experts will need a broad knowledge of multiple disciplines and must be able to take a holistic view of a process or technology. These competencies can only be acquired via a tailor-made education approach. CLIB is fostering such training and education by collaborating with different partners from its network.

By networking academia and students with the bio-based industry and SMEs, CLIB supports the education of young people with open minds and a wide horizon. The annual BioSC NRW PhD Day Bioeconomy, co-organised by BioSC, several graduate schools, and CLIB is only one example for events to connect students with industry experts.

In R & D & I projects on different levels CLIB offers its expertise and wide network to teach important soft skills necessary for entrepreneurship or career development.

On the European level, CLIB also serves on the education team of the Biobased Industries Consortium (BIC). It works to establish different education programmes for the bio-based industry in Europe, aiming to meet the demand for students and professionals with the right skills and competences.

The BIG-Cluster project CROSSBEE (Cross-border Bio-Economy Education), funded by the Federal Ministry of Education and Research until March 2022, fully focussed on educating students, PhD students and young professionals with specialist knowledge and a soft skill set. With a consortium of nine partners, CLIB coordinated the production of a Massive Open Online Course (MOOC) on "Biobased Products for a Sustainable (Bio)Economy", which was available for free online. Around 8,000 participants from all continents participated in the course and took the chance to learn the basics of bioeconomy from top professors from Germany and the Netherlands and get insights into case studies presented by companies directly.

Additionally, CLIB also coordinated four runs of the G-BiB, the Global Biobased Businessplan Competition, as part of CROSSBEE. Together with partners from different countries, CLIB offered students and PhD students the chance to take the adventurous journey towards their first tech start-up. Experienced mentors accompanied the teams in acquiring the soft skill set necessary for entrepreneurs. The project not only led to several successful start-ups in the biotech sector, but also educated students think outside the box and beyond their lab bench.



The 2021 winners of the G-BiB describe their journey

In October 2020, we (Alexander Setchfield and Dr. Daniel Leadbeater), two researchers from the Centre for Novel Agricultural Products (CNAP, University of York, UK) entered the G-BiB competition. It became apparent from the onset that Alex's PhD research, supervised by Prof. Neil Bruce (CNAP), had significant commercial potential - transforming inedible crop residues into feed for Black Soldier Fly Larvae (BSFL). The G-BiB came at a perfect time, and under the name 'InsBio', we attended two masterclasses hosted by BioVale and Skillfluence. These, along with invaluable mentorship from Prof. Neil Bruce and Dr. Tom North, were crucial in developing our business plan and strategy.

On 13 January 2021, we pitched at the UK semi-final and were declared the winning team. Taking onboard the judges' feedback and pivoting our business model, we then pitched InsBio's business plan at the international final on 17 February 2021, facing stiff competition from Germany's and Finland's finalists. After an intense pitch and questioning from a panel of expert judges, we were declared the international winner of G-BiB 2020!

We now look forward to a business mentoring programme by High-Tech Gründerfonds, a German venture capital investor for innovative technologies. Through this, we will prepare for a pitch later in the year with the hope of securing significant investment. InsBio soon hopes to form as a university spin-out company, whose technology will enable BSFL producers to increase production scale and gain greater security of raw material supply using sustainable novel feeds.

Overview of Current CLIB Projects

BIG-Cluster – BioInnovation Growth mega-Cluster

Funded by:	BMBF
Duration & volume:	Scoping phase (2016 – 2017), 722,000 EUR Implementation phase (2018 - 2021), 3 M EUR
Partners:	3 dedicated R & D projects with multiple partners CLIB (DE), Biobased Delta (NL), Catalisti (BE) (scoping phase) and seven additional clusters
Your contact at CLIB:	Katrin Kriebs, Dennis Herzberg
Website:	www.bigc-initiative.eu



The BioInnovation Growth Mega-Cluster (BIG-Cluster) is a cross-border “Smart Specialization Initiative” aiming to transform Europe’s industrial mega-cluster in the Flanders region of Belgium, The Netherlands, and the German state of North Rhine-Westphalia into the global leader of the bio-based economy.

Within the BMBF project, the first two years constituted a scoping phase, within which the value chains “C1 gases to chemicals” and “Aromatics from lignocellulosic biomass”, and activities for bio-based education were investigated. In 2018, three projects coordinated by CLIB and funded by the BMBF started: ALIGN, BioCOnversion, and CROSSBEE. These projects have now come to a successful end, but the BIG-Cluster initiative continues its work to support innovations in the cross-border region.

Bio4MatPro

Funded by:	SofortprogrammPLUS, BMBF
Duration & volume:	2022 – 2025, 27 M EUR
Partners:	RWTH Aachen University (DE), CLIB (DE), International Technology- and Service-Center Baesweiler (DE), ca. 50 partners from academia and industry in subprojects
Your contact at CLIB:	Tobias Klement, Dennis Herzberg



The Bio4MatPro competence centre bundles the capabilities of the research and industrial landscape in the Rhenish region and in NRW for the biological transformation of industries through the biological transformation of material science and production technology. The project combines the expertise of a powerful mix of large companies and SMEs, an established start-up centre, and excellent academic institutes and links this to investor funds via a venture capital accelerator. By founding start-ups and expanding existing business models, sustainable jobs are created in the region. This is achieved by focusing on local and renewable sources of raw materials, on companies in the region, and the binding commitment to local value creation.

The thematic focus of the Bio4MatPro competence centre is to utilise local, renewable raw materials instead of petrochemical-based feedstocks to develop the region into a resource-efficient bioeconomy model region. Today's product concepts need to be rethought to enable a future-oriented industry that is ecologically and economically sustainable. This process of “Biological Transformation” together with digitalisation represents the next major leap forward to a sustainable and circular industry. In Bio4MatPro, the application of bio-based materials, the integration of biological functionalities, and the development of scalable and biocompatible processes and machines for large-scale production will generate highly valuable products and machines to drive this transformation of industries forward.

*coordinator

Circular-Bio INTERREG Network



Funded by:	INTERREG Deutschland - Nederland
Duration & volume:	2019 – 2022, 992,000 EUR
Partners:	CLIB*, 3N Kompetenzzentrum, EE Energy Engineers, Niederrhein University of Applied Science, Stadt Krefeld, Krefeld Business, USV Agrar (all DE); Arvalis, Brightlands Campus Greenport Venlo, Gemeente Venray (all NL)
Your contact at CLIB:	Sarah Refai, Dennis Herzberg, Sabine Kortmann
Website:	www.circular-bio.com

The project has already established an active network for the circular and bioeconomy linking the Netherlands and NRW. Circular-Bio is funded by the INTERREG-programme Germany-Netherlands and supports the creation of new, innovative, and cross-border value chains and business models in the bioeconomy sector.

Raw material suppliers from agriculture, forestry, waste management and the process industry are interested in new regional processing options for their materials and side streams. Processors from the chemical industry, the energy sector, food and feed markets, mobility/fuels, and the building industry are interested in new technological processes to create innovative, biobased, and sustainable product designs. Bringing both groups together is at the centre of Circular-Bio. But also new logistics concepts, changes in framework conditions, and regulations are important factors, which are also taken up in the project. Circular-Bio offers an innovation voucher programme for SMEs to further develop their business cases and foster their process development.

ConCO₂rde



Funded by:	Horizon2020, Marie Skłodowska-Curie Actions
Duration & volume:	2021 – 2024, 2.9 M EUR
Partners:	acib GmbH*, CLIB, 15 additional partners from 5 European countries
Your contact at CLIB:	Katrin Kriebs, Sarah Refai
Website:	www.conco2rde.eu

ConCO₂rde is a European innovative training network that brings together a diverse team of chemists, synthetic biologists, enzyme technologists and process engineers. The main objective of this team is to train 11 Early Stage Researchers (ESR) in different research disciplines that together allow the conversion of CO₂ by smart autotrophic biorefineries.

The concept is based on autotrophic microorganisms that utilise renewable energy for the accumulation of biomass and, therefore, provide potential sources for future materials of our society. The network of ConCO₂rde combines chassis strain development of these autotrophic microorganisms with process engineering in order to bring biotechnological processes to the next level.

CLIB will be involved in training the 11 ESRs and integrating the project consortium into its broad C1 network.

*coordinator

CROSSBEE – Cross-border Bio-Economy Education

Funded by:	BMBF
Duration & volume:	2018 – 2022, 186,000 EUR
Partners:	b.experts GmbH, CLIB*, Ostwestfalen-Lippe University of Applied Sciences and Arts, RWTH Aachen University, SeSAM Biotech GmbH (all DE); Ghent University (BE); Delft University of Technology, Wageningen University (both NL)
Your contact at CLIB:	Katrin Kriebs, Annika Thamm
Website:	www.bigc-initiative.eu/crossbee.php



CROSSBEE tackled the challenge of combining diverse disciplines and expertise in different fields relevant for bioeconomy under the coordination of CLIB within a four-year project funded until early 2022. CROSSBEE implemented two activities in the BIG-Cluster region: within the Massive Open Online Course (MOOC) "Biobased Products for a Sustainable (Bio) economy", students from all over the world learned bioeconomy basics and discovered state-of-the-art biobased product examples. The MOOC was first published in January 2019. Within the annual student competition Global Biobased Business Plan Competition (G-BiB), student teams were individually trained in competencies and skills relevant for entrepreneurship and thus learned to think outside the scientific box.

FARMÝNG – FIAgship demonstration of industrial scale production of nutrient Resources from Mealworms to develop a bioeconomY New Generation

Funded by:	Horizon2020, BBI JU, BIC
Duration & volume:	2019 – 2023, 19.6 M EUR
Partners:	ÝNSECT* (FR), 19 project partners from across Europe, including CLIB
Your contact at CLIB:	Tatjana Schwabe-Marković, Annika Thamm
Website:	www.farmyng.eu



Increasing protein production for feed and food is a major challenge in order to keep up with the increasing global demand for meat and fish. Beetles are protein-rich and can be sustainably farmed, with a relatively light environmental footprint in terms of production and processing. The use of insect protein is already allowed in pet food and feed for aquaculture and is being approved for human consumption in the EU. The EU-funded FARMÝNG project will develop on an industrial and automated scale the breeding and transformation of *Tenebrio molitor* (mealworm) for the production of animal nutrition and fish nutrition. It will demonstrate a bio-based value chain for sustainable, safe, and premium feed products. The project aims to produce 1,500 tonnes of protein and 400 tonnes of oil per month – rates never demonstrated in the insect protein production market. CLIB is a project partner, tasked to disseminate the projects results and to support business model development.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 837750.

*coordinator

FuturEnzyme



Funded by:	Horizon2020,
Duration & volume:	2021 – 2025, 6 M EUR
Partners:	Consejo Superior de Investigaciones Científicas CSIC* (ES), 16 project partners from across Europe, including CLIB
Your contact at CLIB:	Markus Müller, Tobias Klement, Annika Thamm
Website:	www.futurezyme.eu

In FuturEnzyme, academics and industry researchers will implement new “smart” enzymes by screening and design. These can help to improve real-life consumer products to become greener, more innovative and more functional, with less impact on the environment and higher acceptance by consumers. Along the way, a high-tech platform will be designed and established to best recover, design, optimise and formulate enzymes that must satisfy the key performance indicators of the detergent, textile, and cosmetic manufacturing sectors.

CLIB is a project partner, work package leader, and co-responsible for the exploitation task force. The aim is to optimally network project partners to achieve the project’s internal aims and maximise dissemination and exploitation of project results.

This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 101000327.

HiPerIn 2.0 – Shaping the Next Generation of Bio-based High-Performance Ingredients



Funded by:	MWIDE
Duration & volume:	2020 – 2022, 600,000 EUR (realisation phase)
Partners:	CLIB*, CURE (RUB, formerly KWI Essen) as subcontractor (both DE)
Your contact at CLIB:	Tatjana Schwabe-Marković, Markus Müller, Annika Thamm
Website:	www.clib-cluster.de/en/projects

A key strength of biotechnology is the conversion of functional, bio-based raw materials to high-quality products in diverse areas including specialty chemicals, cosmetics, or the food industry. These “high performance ingredients” (HiPerIns) can thus pave the way for new technologies, new processes and ultimately a bioeconomy. In addition to new intrinsic innovations, the biotechnological sector is increasingly influenced by external factors: disruptive technologies such as digitalisation and the drive towards a circular economy are radically changing existing markets, regulatory framework conditions and consumer wishes concerning sustainability are crucial for the success of a product today.

In 2020, the realisation phase of HiPerIn 2.0 has been granted funding by the Ministry of Economic Affairs, Innovation, Digitalization and Energy of the State of North Rhine-Westphalia. With a funding volume of 600,000 euros and a funding period of three years, HiPerIn 2.0 allows CLIB to tackle the most urgent hurdles, to find the most promising product groups, and to create a lasting impact for the biotechnology scene in NRW. The cross-sectional topics digitalisation, circular (bio-) economy, regulatory frameworks, end-of-life-product design, and public perception are analysed in relation to the product and market areas of food and feed, home and personal care, coatings, adhesives, and textiles.

*coordinator

EU-IBISBA - Industrial Biotechnology Innovation and Synthetic Biology Accelerator

Funded by:	Horizon2020
Duration & volume:	2020 – 2023, 4 M EUR (Preparation Phase)
Partners:	Institut National des Sciences Appliquées – INSA* (FR), 17 other project partners from across Europe, CLIB as subcontractor to RWTH Aachen University
Your contact at CLIB:	Tobias Klement, Dennis Herzberg
Website:	www.ibisba.eu



The Industrial Biotechnology Innovation and Synthetic Biology Accelerator (EU-IBISBA) is a distributed research infrastructure aiming at supporting research in industrial biotechnology. IBISBA simplifies access to advanced multidisciplinary services that accelerate end-to-end bioprocess development and contributes to the delivery of low environmental footprint technologies for a wide variety of market sectors. To achieve this, IBISBA will provide access to first class facilities for all industrial biotechnology professionals, including academic researchers, SMEs and large companies. In the Preparation Phase (PREP-IBISBA), CLIB supports RWTH Aachen University as a subcontractor by gathering the needs and concerns of the German biotechnology scene to shape the further development of the project.

IBISBA is currently being developed in two projects: IBISBA 1.0 and PREP-IBISBA. Both receive funding from the EU's H2020 research and innovation programme and are defined by independent contractual agreements (n° 730976 and 871118) with the European Commission.

MPowerBIO

Funded by:	Horizon2020, BBI JU, BIC .
Duration & volume:	2020 – 2022, 1.5 M EUR
Partners:	Food & Bio Cluster Denmark* (DK), TechTour Global (BG), Corporacion Technologia de Andalucía (ES), Consorzio Italbiotec (IT), FoodScale Hub (RS), EIT Food (BE), Irish Bioeconomy Foundation (IE), Q-PLAN International (GR), Sustainable Innovations Europe (ES), CLIB (DE)
Your contact at CLIB:	Katrin Kriebs, Tatjana Schwabe-Marković
Website:	www.mpowerbio.eu



Many SMEs need financing or investment to bring their business idea to market. Increasing their chances in this challenging step is the aim of the EU-funded MPowerBIO project. MPowerBIO will empower clusters within the bio-based industry across Europe to offer better support for their SMEs to overcome the challenge of finding sufficient investment to get from idea to business. A Cluster Capacity Building Programme will help clusters deepen their expertise. SMEs will receive direct support through an SME Business Support Programme with concrete tools with which to improve their investment readiness level and pitching skills. Finally, MPowerBIO will connect SMEs and investors by arranging regional and international events where SMEs can pitch their business plan to get feedback and meet potential investors.

MPowerBIO is coordinated by Food & Bio Cluster Denmark and has ten partners from nine European countries.

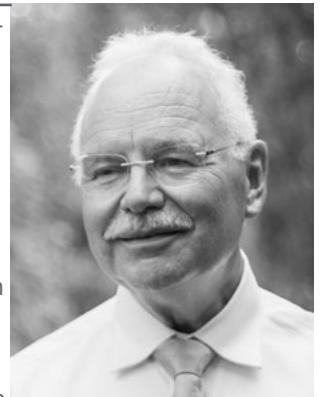
This project has received funding from the Bio-Based Industries Joint Undertaking under the European Union's Horizon 2020 research and innovation programme under grant agreement No. 887501.

*coordinator

Members of the CLIB Extended Board

Dr. Karl-Heinz Maurer – Chairman

Karl-Heinz Maurer is Chairman of the CLIB Board. In 2019, he co-founded the start-up Aachen Proteineers. From 2011 to 2019, Karl-Heinz was part of the Senior Leadership at AB Enzymes GmbH, where he held positions including Director of Business Development and Regulatory Affairs, Head of Global Business Organisation (Marketing and Sales), Director of Global Marketing, and Head of Regulatory Affairs and Special Projects. From 1986 to 2010, he worked in different positions in the Henkel organisation (including Cognis Biotechnology), starting in R & D Biotechnology, which he directed from 2000 to 2010 as Director Biotechnology (Corporate, later Laundry and Home Care division). Karl-Heinz is a biochemist and microbiologist by training and received his doctorate from the University of Tübingen in 1994. In 2007, he was one of CLIB's co-founders (in his function at Henkel at the time). He was also co-founder and Chairman of the Board of the Industrieverbund Mikrobielle Genomforschung (now Industrieverbund Weiße Biotechnologie) until 2018. In 2009, he received an honorary professorship from the University of Greifswald.



Dr. Roland Breves – Vice Chairman



Roland Breves is Head of Corporate Microbiology of Henkel AG & Co KGaA in Düsseldorf, which is a corporate function and acts for all business units, including Cosmetics, Laundry and Home Care and Adhesives. After studying chemistry and obtaining a PhD in microbiology (on chitinases from *Streptomyces*) in Hannover, he worked as a post-doc at the IPK Gatersleben on plant cell wall degrading enzymes.

After joining Henkel in 1997 (initially in COGNIS Biotechnologie GmbH), he was responsible as head of laboratory for the development and expression in *Bacillus* of detergent enzymes. In 2000, he joined the microbiology department as project leader „Smart Hygiene“. Topics were non-biocidal mechanisms against microbes and their negative impacts, e.g. malodour and biofilm formation, as well as prebiotic cosmetics. In addition to these explorative and classical microbiological topics, the department develops innovative concepts for biomaterials like adhesive bioconjugates. Roland is active in several national and international expert groups (DIN, CEN, DECHEMA, AISE).

Prof. Dr. Karl-Erich Jaeger – Vice Chairman

Karl-Erich Jaeger received a Staatsexamen in biology and chemistry and a PhD in microbiology from Ruhr-Universität Bochum in Germany. In 1995, he obtained the venia legendi for microbiology with a habilitation thesis on bacterial lipases. Karl-Erich Jaeger is co-founder and served as Chairman of the Management Board and Member of the Scientific Advisory board of the biotech company evocatal GmbH (now evoxx technologies GmbH). In 2002, Karl-Erich was appointed as Professor for Molecular Microbiology at the Department of Biology of Heinrich Heine University Düsseldorf and director of the Institute of Molecular Enzyme Technology.

In 2013, he was additionally appointed as director at the Institute of Bio- and Geosciences IBG-1: Biotechnology of the Helmholtz-Forschungszentrum Jülich. His research interests focus on bacterial enzymes and fluorescent proteins, their biochemical and structural characterization as well as their biotechnological applications. He has published about 200 peer-reviewed papers, several textbook chapters, and a textbook; he is co-inventor on about 20 patents and member of various scientific organisations, editorial and advisory boards.



Hans-Jürgen Mittelstaedt – Treasurer



After his studies of law at the Universities of Bonn and Freiburg, Hans-Jürgen Mittelstaedt worked as an attorney in Düsseldorf from 1988 to 1992. In 1992, he joined the Association of the Chemical Industry (VCI) at the department of environmental legislation. He held several positions in Frankfurt and Brussels before he became CEO of VCI NRW, the Association of the Chemical Industry in North Rhine-Westphalia. In this position, he is also CEO of BPI NRW, the Association of the Pharmaceutical Industry in North Rhine-Westphalia. Hans-Jürgen is one of the founding members of CLIB and has been holding a position in the extended board since the foundation of the cluster.

Prof. Dr. Ludo Diels



Prof. Ludo Diels, Dr. in chemistry & biotechnology, works as Professor Emeritus at the University of Antwerp, and is ex senior advisor Sustainable Chemistry for the Flemish Institute for Technological Research (VITO) in Mol, Belgium. He is the chair of the Advisory and Programming Group of Processes4Planet for A.SPIRE under the public-private-partnership, which is defining the research agenda for 10 European process industry sectors towards competitive, climate neutral, and circular production. He is strongly involved in the set-up of a bio-based economy in Flanders and Europe, and the collaboration between Europe and India on bioeconomy and water business. Ludo is member of Advisory Board of the World Bio-Economy Forum and responsible for bio-based products and also chair of the Advisory Board of the Shared Research Centre on Bio-aromatics (BIORIZON). He is founding father of the BIG-Cluster and the Vanguard Initiative on bio-aromatics. He is also working on the combination of bio- and circular economy with a strong emphasis on the use of wood and wood residues (strong focus on lignin) for integrated applications in many sectors.

Dr. Henrike Gebhardt

Henrike Gebhardt advocates the research and innovation interests of Evonik Industries AG in the European policy environment since 2015. She maintains the relationships of Evonik with European institutions and international associations such as CEFIC, SusChem, A.SPIRE and the Bio-based Industries Consortium (BIC). Henrike holds a PhD in biochemistry from the University of Cologne, an engineering degree in biotechnology from the Technical University of Berlin and studied at AgroParisTech (then Institut national agronomique Paris-Grignon), France and Technion, Israel. She began her professional career within the strategic research unit Creavis of Evonik Industries AG (then Degussa AG) in 2006. As project manager, she was in charge of the development of biotechnological processes for the production of surfactants and nutraceuticals. In 2012, she moved to the Corporate Innovation Unit of Evonik to bundle strategic and communicative aspects of the Bioeconomy and to advocate for the interests of Evonik in EuropaBio, CEFIC, EU-RRM, DIN, and CEN.



Since 2008, Claas Heise is responsible for NRW.Venture, the venture capital activities of NRW.BANK in Düsseldorf, Germany. NRW.Venture includes the management of several venture funds focused on NRW, which total more than 60 investments. He is also responsible for over 15 investments in European venture capital funds and manages fund-of-fund activities sponsoring now 13 regionally focused seed capital funds. From 2006 to 2008, Claas was partner at Innovature Capital Partners. He joined Deutsche Telekom in 1995 and held a variety of management positions including as the Managing Director for T-Venture of America from 2002-2006. He helped found TRAIAN and joined the start-up in 2000, where he led the partnership business development efforts. Claas received his PhD in physics and worked for seven years in science, including a postdoc at the Harvard & Smithsonian Center for Astrophysics. He received a Feodor-Lynen Fellowship and a NASA grant. Claas is also a graduate of NVCA's Venture Capital Institute.

Dr. Gernot Jäger

Gernot Jäger is heading the Competence Center for Biotechnology within Covestro. He joined Covestro (formerly Bayer Material Science) in 2012 and held different responsibilities in Innovation Management, Process Research, Project Portfolio Management, and the Competence Center for Catalysis. Up to now, he has contributed in various public committees including DECHEMA (Biochemical Engineering, board member), GDCh (Sustainable Chemistry, board member) and VCI (renewable resources). In addition, he is private lecturer at the RWTH Aachen university and gives lectures about the biotechnological use of alternative raw materials. Gernot studied biotechnology at RWTH Aachen University and received his PhD (summa cum laude) in biochemical engineering from the "Aachener Verfahrenstechnik" in 2012. His research areas include industrial biotechnology, pharmaceutical biotechnology, and process development/conceptual design.



Peter Kallien

Peter Kallien holds a degree in business administration and is an expert in business model development and financing of innovative companies. In 1992, he became co-founder and managing director of a consulting company, which supports physicians and pharmacists in setting up their own businesses. In 1996, he moved to the Private University of Witten/Herdecke. During his ten years as Managing Director, he was involved in the successful establishment of approximately 15 start-ups originating from the university. Together with Thomas Schwarz and Gerhard Schembecker he founded b.experts GmbH in 2013 and b.value AG in 2016, and is a member of both Management Boards. He has been operationally involved in the implementation of numerous successful start-ups. Peter was a long-time member of the supervisory boards of cardiac research GmbH in Dortmund and of bitop AG in Witten. He is currently the Chairman of the Supervisory Board of ISR Software Solutions AG.



Dr.-Ing. Frank Kensy



Frank Kensy studied bioprocess engineering at RWTH Aachen University. There, during his doctoral studies with Prof. Jochen Büchs, he developed the BioLector technology, which is now used around the globe for early bioprocess development. Frank gained his first professional experience at Rhein Biotech GmbH in Düsseldorf in the field of fermentation development for recombinant proteins. From RWTH Aachen University, he and colleagues founded m2p-labs GmbH, which he grew to a leading manufacturer of microbioreactors and led as managing director for almost 10 years. Afterwards, he advised start-ups and biotechnology companies in the field of innovation management and bioprocess development. Since 2018, he is founder and managing director of b.fab GmbH, which specializes in the utilisation of CO₂ using electrochemistry and biotechnology. Frank has 20+ years of experience in the biotech industry, leading several industry and funded R & D projects at national and European level.

Dr. Peter Welters

After his studies of biochemistry and his doctorate at the Max-Planck-Institute for Plant Breeding Research in Cologne, Peter Welters spent three years at the University of California, San Diego, and two years in Rouen, France, as a postdoc. In 1998, he founded Phytowelt GmbH and in 2002 was appointed CEO of GreenTec GmbH, a spin-off company of the MPI in Cologne. In 2006, both companies merged to form Phytowelt GreenTechnologies GmbH with Peter as CEO. The company offers contract research in the fields of agrobiotechnology and industrial biotechnology. In addition, the company developed and commercialises an enantiopure, natural, bio-fermented raspberry flavour: R-alpha-ionone. In 2018, Phytowelt received the "Most Innovative European Biotech SME Award" by EuropaBio (category agricultural biotech) and Phytowelt's BBI-JU funded project BioForever was among the TOP 20 of European Biorefinery Projects of the internet platform BiofuelsDigest. Peter is also a founding and board member of CLIB and a board member of DIB.



Prof. Dr. Volker F. Wendisch



Volker F. Wendisch holds the Chair of Genetics of Prokaryotes at the Faculty of Biology at Bielefeld University. He is Deputy Scientific Director of the university's Center for Biotechnology (CeBiTec) and speaker of its research area "Metabolic Engineering of Unicellular Systems and Bioproduction". He served as Senator of Bielefeld University, Vice-Dean of Biology from 2014-2016, and Dean of Biology 2016-2018. Volker received his diploma in biology from Cologne University. After having completed his PhD at the Institute of Biotechnology 1 of the Forschungszentrum Jülich in 1997, he worked as postdoctoral researcher at University of California, Berkeley, CA, USA. In 2004, he received the venia legendi in microbiology from HHU Düsseldorf. From 2006 – 2009, he was Professor for Metabolic Engineering at the University of Münster. His research interests concern genome-based metabolic engineering of industrially relevant microorganisms, systems and synthetic microbiology. From 2018-2021, he coordinated the multi-university ERDF.NRW- funded research infrastructure "CKB – CLIB Kompetenzzentrum Biotechnologie".

Members of the CLIB Advisory Board

Dr. Kai Baldenius

Kai Baldenius is a chemist by formation. After having received a PhD from Hamburg University, he spent a post-doc research year at The Scripps Research Institute, and then joined BASF in 1993. At BASF, Kai served in various positions in Research, Process Development, Production, Marketing & Sales. From 2009 to 2018 he led BASF's biocatalysis research group. In 2019, Kai left BASF to become an independent consultant for applied biotechnology. Baldenius Biotech Consulting offers advice to venture capital and young start-ups for best technology positioning.



Dr. Manfred Kircher

Based on more than 30 years' experience in chemical industry and bioeconomy, Manfred Kircher works on regional as well as international bioeconomy strategies. His career milestones are biotechnological research and development (Degussa AG, Germany), production (Fermas s.r.o.; Slovakia), venture capital (Burrill & Company, USA), biotechnology partnering, and branding (Evonik Industries AG, Germany) and building the bioeconomy cluster CLIB. He chairs the Advisory Board of CLIB (since 2014) and is Member of the Board of the bioeconomy association BioBall (bioeconomy in a metropolitan region; since 2019). In 2020, he has been appointed to the Advisory Board for Sustainable Bioeconomy of the State Government of Baden-Württemberg and as Chairman of the Organics Valorisation Section of the European Federation of Biotechnology (EFB). Manfred is owner of KADIB, a company consulting on important aspects of industrial bioeconomy.



Per Henrik Larsen

Per Henrik Larsen is a Chemical Engineer from the Technical University of Denmark (DTU). He has worked in biotechnology since 1982, starting his career as process engineer in the downstream production of enzymes at Novo Industry, today known as Novozymes. He worked for 24 years at Novo in various positions in production management and technology, ranging from managing fermentation, downstream and formulation departments to general site management and global strategic roles. He was in charge of building Novozymes enzyme manufacturing site in China. After leaving Novozymes he joined DSM Food Specialties for 10 years, first as site manager for their enzyme plant in France and later as global responsible for operational excellence and global manufacturing. He is today director of Operational Excellence & Global Engineering at Lallemand Bio-Ingredients. Per's experience covers large scale production of biotech products from scale-up to commercial production. He has also worked as consultant to the biotech industry.



Dr. Dr. h.c. Christian Patermann

Christian Patermann studied Law, Economics, and Languages in Germany, Switzerland, and Spain and completed his doctoral thesis in law at the University of Bonn in 1969. He entered the German public service in 1971 by joining the Federal Ministry of Science and Education. From 1974-78, he was Science Counsellor at the German Embassy in Washington D.C., USA. He returned to the Ministry of Research and Technology, to hold several positions in Germany and international organisations (ESA, ESO, and EMBL). In 1996, he joined the European Commission, DG Research and Technology, where he was Director for Environment and Sustainability, Programme Director for Biotechnology, Agriculture & Food Research (launching the Knowledge based Bioeconomy at the EC), and co-chair of the EC-US Task Force Life Sciences and Biotechnology Research. He retired in 2007 but remains active in advising on EU affairs and the bioeconomy. He was a member of the 1st German Bioeconomy Council from 2009-2012 and has been strongly involved in the Global Bioeconomy Summits in Berlin (2015, 2018, 2020). Since 2021, the annual BioSC Supervision Award, honouring young scientists for their outstanding coaching of doctoral students in the bioeconomy, is presented as the „Christian Patermann Award“.



Dr. Kathrin Rübberdt



Kathrin Rübberdt studied chemistry at the Georg-August-Universität Göttingen and the Universität Leipzig and received her PhD in Göttingen. Complementing her scientific studies, she also received an additional degree in economics at the FernUniversität Hagen. In 2001, she started her career with Accenture in strategic management consulting. In 2007, she joined AMR International Ltd. as a project manager. Since 2008, she has been working at DECHEMA Gesellschaft für Chemische Technik und Biotechnologie e.V. (Society for Chemical Engineering and Biotechnology) as Head of Communications and from 2011 also as Head of the Biotechnology Department. In July 2021, she became Head of Division "Science and Industry" at DECHEMA.

Prof. Dr. Ulrich Schwaneberg



Ulrich Schwaneberg graduated in chemistry and received his PhD in 1999, supervisor Prof. Schmid, from the University in Stuttgart. After a post-doc at Caltech in the lab of Nobel laureate Prof. Arnold, he was appointed as Professor at the Jacobs University Bremen in 2002. In 2009, he moved to RWTH Aachen University as Head of the Institute of Biotechnology and is since 2010 co-appointed to the Scientific Board of Directors at the DWI Leibniz Institute for Interactive Materials. Ulrich is on the Board of Directors of the Bioeconomy Science Center, serves as Speaker of the RWTH profile area Molecular Science & Engineering and coordinates RWTH's bioeconomy activities in the "Strukturwandel". He is a cofounder of SeSaM Biotech and Aachen Proteineers. In 2016, Ulrich received the BMBF-Forschungspreis for the next generation of bio-processes. He has published over 270 original manuscripts and is co-inventor on more than 20 patents, mostly with industry.

Dr. Willem Sederel



Willem Sederel is a chemical engineer and polymer scientist, who graduated cum laude from the University of Technology Twente in Enschede (NL). After a postdoc on biomedical materials at Case Western Reserve University in Cleveland, Ohio, he started his industrial career with Shell in Amsterdam in 1977, and then moved to General Electric Plastics where he fulfilled global leadership roles in process, product and application development and marketing. His last role before retiring from his 36-year long career in industry was Global Innovation Leader with SABIC. Willem joined Biobased Delta in 2013 as director and chairman and became president Circular Biobased Delta in 2020. Willem is also the founding father of the Green Chemistry Campus in Bergen op Zoom which opened in 2011. In 2021 he was appointed non-executive director of Synova LLC, a scale-up company which produces high value chemicals from mixed, contaminated plastic waste. Willem contributed to the transition agenda biomass and food in the Netherlands. For many years, he has been a member of the Policy Group Innovation of the Dutch Chemical Branch Organization VNCI and of the Advisory Board of Biorizon.

The Team of the CLIB Office



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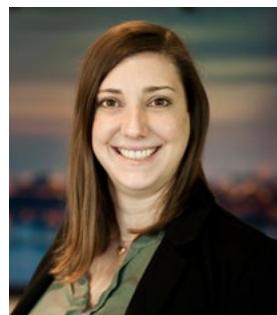
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Large Industry

[Covestro Deutschland AG](#)
[Evonik Industries AG](#)
[Henkel AG & Co. KGaA](#)
[LANXESS Deutschland AG](#)
[Uniper Kraftwerke GmbH](#)

Medium-scale Enterprises

[Axxence Aromatic GmbH](#)
[Bio Base Europe Pilot Plant BV](#)
[c-LEcta GmbH](#)
[Concord Blue Engineering GmbH](#)
[Corbion NV](#)
[Heinrich Frings GmbH & Co. KG](#)
[Jäckering Mühlen- und Nährmittelwerke GmbH](#)
[LanzaTech Inc.](#)
[Mitsui & Co. Deutschland GmbH](#)
[Neste Germany GmbH](#)
[Pfeifer & Langen GmbH & Co. KG](#)

Small-scale Enterprises

[Aachen Proteineers GmbH](#)
[Altar S.A.S.](#)
[Aminoverse B.V.](#)
[aquila biolabs GmbH](#)
[b.fab GmbH](#)
[b.value AG](#)
[biotechrabbit GmbH](#)
[bitop AG](#)
[Blucon Biotech GmbH](#)
[Carbon Minds GmbH](#)
[CO2 BioClean GmbH](#)
[Corvay GmbH](#)
[Deep Branch Biotechnology](#)
[Enzymaster Deutschland](#)
[Enzymicals AG](#)
[ERBER Enzymes GmbH](#)
[evoxx technologies GmbH](#)
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[SenseUp GmbH](#)
[Senzyme GmbH](#)
[SeSaM-Biotech GmbH](#)
[SynergyCom SOOO](#)
[Ulrich Windmöller Innovation GmbH & Co. KG](#)

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[ECBF](#)
[NRW.BANK](#)
[Prof. Dr. Detlev Riesner](#)
[Sofinnova Partners SAS](#)

Infrastructure (Business Support & Networks)

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[BioBall e. V.](#)
[BioIndustry e. V.](#)
[BioRiver - Life Science im Rheinland e. V.](#)
[BlackIP GmbH](#)
[Eder Schieschke & Partner mbB](#)
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[Schnee Research](#)
[SolarBioproducts Ruhr](#)
[Verband der Chemischen Industrie \(VCI\) NRW](#)
[YNCORIS GmbH & Co. KG](#)

Academia (Universities & Research Institutions)

[Bundesanstalt für Materialforschung und -prüfung \(BAM\)](#)
[FRC «Fundamentals of Biotechnology» of the Russian Academy of Sciences](#)
[Flemish Institute for Technological Research, VITO](#)
[Forschungszentrum Jülich GmbH](#)
[Fraunhofer IGB](#)
[Fraunhofer IME](#)
[Fraunhofer UMSICHT](#)
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[Wageningen University and Research](#)



Aachen Proteineers GmbH

Aachen Proteineers is a start-up focussing on coating solutions. We have developed a platform technology to adhere various biomolecules to a wide range of surfaces using special peptides. This technology intensifies processes, cuts cost, and achieves very high coating densities in water at room temperature. We tailor these peptides regarding application conditions, surface specificity, and binding strength through protein engineering strategies, such as directed evolution.

We are currently evaluating products for research, diagnostics, and process technology markets, and are open to discussing new applications and to exploring them in partnerships.

Arnold-Sommerfeld-Ring 2, 52499 Baesweiler

Phone: +49 157 79280363

Internet: www.aachen-proteineers.de

Founding year: 2019

Number of employees: 3



ALTAR S.A.S.

The competitiveness of Industrial Biotechnology processes is often hindered by the low performance of the microorganisms. To unlock the potential of this promising field, we must shift the paradigm and no longer adapt processes to the metabolic limitation of industrial microbial hosts, but instead adapt microorganisms to industrial requirements.

Altar develops enabling technologies for the adaptation of microbial strains to industrial requirements. Our automated fluidic platform harnesses natural selection for the adaptive evolution of microorganisms. It has successfully proven to leverage metabolic engineering and non-GMO development for a wide range of organisms (bacteria, yeasts, microalgae) in several industrial fields (food, feed, chemicals, biofuels, materials, health, cosmetics...).

5 rue Henri Desbruyeres, 91000 Evry
France

Phone: +33 688 284235

Internet: www.altar.bio

Founding year: 2017

Number of employees: 6



Aminoverse B. V.

Aminoverse solves enzyme challenges.

Founded in January 2020 by a team of entrepreneurs, scientists and investors with more than 30 years of cumulated experience in enzyme R & D, Aminoverse is the go-to enzyme R & D partner for the early innovation chain from enzyme discovery over proof-of-concept studies to purification, characterisation and evolution of enzymes.

Combining biotech wet lab services via a 150 qm BSL-1/ML-1 lab in Nuth, Netherlands with *in silico* analysis and machine learning as well as ready-to-use enzyme screening kits, Aminoverse provides cutting edge R & D in tailor-made projects meeting any budget and timeline – for both start-ups and large corporations.

Daelderweg 9, 6361HK Nuth, Netherlands

Phone: +31 4520 848 15

Internet: www.aminoverse.com

Founding year: 2020

Number of employees: 7



aquila biolabs GmbH

aquila biolabs is a German biotechnology company focusing on the development of innovative smart sensors and state-of-the-art data analytics software for bioprocessing applications.

The founding idea of the company, the Cell Growth Quantifier (CGQ), is a sensor-based technology that offers highly parallelized, non-invasive online monitoring of biomass in shake flasks, bioreactors and comparable cultivation vessels in real time. The second product line, the Liquid Injection System (LIS), is the first commercially available technology that allows for programmable feeding of liquids in shake flasks and enables fed-batch experiments in shake flasks for instance.

In 2021, aquila biolabs was acquired by Scientific Bioprocessing (SBI), a US-based developer of optical sensors for non-invasive real-time monitoring of cell culture systems. The joint mission is to take the guesswork out of bioprocessing.

Arnold-Sommerfeld-Ring 2, 52499 Baesweiler

Phone: +49 163 2922615

Internet: www.aquila-biolabs.de

Founding year: 2017

Number of employees: 20

UNLOCK NEW BIOCATALYSIS

- Oxyfunctionalization -

30 ENZYMES 24 wildtypes + 6 mutants
VERSATILE broad substrate scope



Available up to kg scale



Free of third-party IP

SOLVE ENZYME CHALLENGES

- Enzyme services -

- FIND enzyme discovery and scouting
- TEST application testing, feasibility studies
- DESIGN data-directed evolution
- MAKE enzyme QC, labscale production

150 m² ML-1 biolab located in Nuth, NL



Accelerate your enzyme innovation project with our

Enzyme products and kits

- Ready-to-use enzymes
- Proof-of-concept studies
- Up to commercial scale

CRO services

- Discovery of enzymes
- Enzyme feasibility studies
- Enzyme mutant library generation
- Enzyme engineering by Directed Evolution and machine learning





Tackenweide 28, 46446 Emmerich

Phone: +49 2822 685610

Internet: www.axxence.com

Founding year: 1976

Number of employees: 100

Axxence Aromatic GmbH

Axxence Aromatic was founded in 1986 and is a privately held company with its head office in Emmerich, Germany. Over the years our focus has been the dedication to be one of the most reliable and innovative sources within our prime field of expertise: NATURAL AROMA INGREDIENTS for the flavour & fragrance industry worldwide.

By strategic investments in R & D of both novel natural ingredients and new manufacturing processes, we constantly strive to expand the use of our products in existing and new applications as well as markets.

Axxence has around 100 employees. Sales offices and warehousing are present in Germany, France, USA and Japan. Manufacturing and R & D facilities are located in the Slovak Republic.



Gottfried-Hagen-Straße 60-62, 51105 Köln

Phone: +49-221-56092741

Internet: www.bfab.bio

Founding year: 2018

Number of employees: 6

b.fab GmbH

b.fab is specialized in the efficient conversion of CO₂ and renewable energy into biotechnological value chains. CO₂ and water are abundantly available and are therefore our starting point to build a sustainable circular bioeconomy. We use formate as our central mediator to bind and store CO₂ and H₂ (made from water) in liquid form. Our bioprocesses start with the feedstock formate and we use Synthetic Biology to design specific pathways and to convert formate into value-added chemicals. Our platform is built on anaerobic and aerobic microbial production hosts to provide flexibility in the process design and adaptation to specific product requirements.

b.fab offers formatothropic strains, bioprocesses and technology licences.



Otto-Hahn-Straße 15, 44227 Dortmund

Phone: +49 231-79300196

Internet: www.b-value.de

Founding year: 2016

Number of employees: 5

b.value AG

As one of the first German early-stage venture capital providers for industrial biotechnology, life sciences, chemistry, and advanced materials, b.value AG seeks to fully deploy the economic potential of bio-based technologies in common interest of founders and investors. The b.value AG invests in start-ups mainly in the seed stage in the D-A-CH region, acquiring majority and minority interests in almost all cases together with other co-investors.

The b.value team is characterised by an exceptional scientific and technological specialization. The management team has >40 years of experience in the establishment, management, and development of technology companies and biotechnology innovations. Besides this, the portfolio companies benefit from the unique "Company Building" approach and the broad b.value network.



Universitätsstr. 27, 33615 Bielefeld

Phone: +49 521 106 8760

Internet: www.cebitec.uni-bielefeld.de

Founding year: 1998

Number of members: 179

Bielefeld University - Center for Biotechnology (CeBiTec)

CeBiTec is one of the largest faculty-spanning central academic institutions at Bielefeld University. Its purpose is to bundle the biotechnological activities and research projects at the university, to foster cross-linking of research approaches and technologies from different research fields, and to develop innovative projects within its two main research areas 'Large Scale Genomics and Big Data Bioinformatics' and 'Metabolic Engineering of Unicellular Systems and Bioproduction'.

The availability of comprehensive technological infrastructure as being provided by CeBiTec's Technology Platforms is crucial for a successful scientific work.

Furthermore, the CeBiTec considers itself as a central communication platform and a 'think tank' of the university with respect to initiatives and activities with a dedicated biotechnological perspective.

Bio Base Europe Pilot Plant

Bio Base Europe Pilot Plant is an open innovation pilot and demonstration facility for process development, scale-up and custom manufacturing of biobased products and processes from lab to multi ton scale. We combine technologies (biomass pretreatment, biocatalysis, green chemistry, (gas)fermentation, biorefining and downstream purification) for advanced manufacturing of biobased products utilising a wide and flexible spectrum of modular unit operations. As such, our team of highly trained and experienced engineers and bioprocess technicians facilitates the translation of your biobased laboratory processes into viable industrial processes.

From 2013 to 2019, Bio Base Europe Pilot Plant successfully conducted 322 bilateral (private) projects with 124 different small, medium and large sized companies. On top of these private/bilateral projects, Bio Base Europe Pilot Plant has been involved in more than 50 public project consortia.



**Bio Base Europe
Pilot Plant**

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Phone: +32 9 335 70 01
Internet: www.bbeu.org/pilotplant
Founding year: 2008
Number of employees: 109

BCNP Consultants GmbH

BCNP Consultants GmbH is specialized in the industries biotech, chemistry, nanotech and pharma (BCNP). The three divisions of BCNP Consultants are:

BCNP strategy

On basis of our business analyses (market and competitor analysis, technology comparisons) you are able to design and sharpen your business model, to write the business case and to identify new M&A targets.

BCNP connect

On the basis of our vivid business networks in the life sciences industry we bring you together with relevant people in order to support you in filling your customer pipeline.

European Chemistry Partnering

Since 2017 innovators – from chemistry to bio-economy, from engineering to digitization - have been meeting twice a year: In February at the European Chemistry Partnering and in September at the ECP Summer Summit.



**BCNP
Consultants**

Varrentrappstr. 40-42, 60486 Frankfurt am Main
Phone: +49 69 15 32 25 678
Internet: www.bcnpc.com
Founding year: 2002

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Bioökonomie im Ballungsraum e.V. c/o
Provadis School of International Management
and Technology AG Industriepark Höchst,
Gebäude B835, 65926 Frankfurt am Main
Phone: +49 69 305-28145
Internet: www.bioekonomie-metropolregion.de
Founding year: 2019

BioBall e. V.

The aim of the Innovation Space Bioeconomy in the Metropolitan Area - BioBall is to promote the material use of biogenic residual and waste materials - under the special conditions of the densely populated and industrialised Frankfurt Rhine-Main metropolitan region.

The BioBall Innovation Space intensifies the direct exchange between private and municipal business, science and politics throughout Germany, initiates new project ideas and promotes innovative research and development projects to establish a sustainable, bio-based economy. This not only helps to close raw material cycles and reduce greenhouse gas emissions, but also to leverage untapped economic potential.

BioIndustry

Otto-Hahn-Str. 15, 44227 Dortmund
Branch office: c/o Bio-Security Management
GmbH, Siemensstraße 14, 59199 Bönen
Phone: +49 238 3919-224
Internet: www.bioindustry.de
Founding year: 2000
Number of employees: 2

BioIndustry e. V.

BioIndustry e. V. is a regional life science cluster of companies, research and training institutes, technology centers, biotechnological service providers and public business development organizations. BioIndustry has been committed to strong interdisciplinary networking between science and companies, especially in the Ruhr area, but also in eastern Westphalia. The focus of its activities are the promotion and support of biotechnology in science, research and development, and in the application and implementation of novel biotechnological processes.

By actively supporting the transfer of ideas to the market, BioIndustry helps to generate novel product and process-innovations in the region.



Merowingerplatz 1a, 40225 Düsseldorf
Phone: +49 211 3160610
Internet: www.bioriver.de
Founding year: 2004
Number of employees: <10

BioRiver - Life Science im Rheinland e. V.

BioRiver - Joining forces for Life Sciences & Biotechnology

Founded in 2004, BioRiver – Life Science im Rheinland e.V. is fully committed to representing the Life Sciences sector in the bioregion Rhineland as an independent industry organization. The essential aims of BioRiver are to build a strong network within the biotech sector, to improve the political and economic conditions as well as to market the bioregion Rhineland and its members. Thanks to the strong profiles of the partners in the network, it has been possible to initiate various collaboration projects and gain direct access to experts in both business and academia.



Volmerstr. 9, 12489 Berlin
Phone: +49 30 55578210
Internet: www.biotechrabbit.com
Founding year: 2011
Number of employees: 45

biotechrabbit GmbH

biotechrabbit GmbH was founded in 2011 in Henningsdorf; already 4 years later, in 2015, a second research and production site was opened in Berlin/Adlershof. Biotechrabbit is a team of top class scientists, experienced managers and business developers who are determined to offer highest quality products and services for diagnostic companies and life science research. We value the relationships with our partners and customers and are driven to exceed current limitations with flexibility, innovation and highly customized solutions to match specific requirements.

Biotechrabbit's offering includes enzymes for molecular diagnostics, antibody generation and production, high-capacity protein fermentation, lyophilization for diagnostic test kits and pharma, highly parallel, cell-free protein synthesis, mRNA for therapeutics, site-directed amino acid incorporation for labeling or cancer biotherapeutics, and a full molecular biology products catalog.

Our way of doing business combines the passion and pure curiosity of excellent researchers with the agile spirit of true entrepreneurs.

BIOTECHNOLOGY APPLICATIONS

for Sustainability and Bioeconomy



Our activities include:

- Joint stands at exhibitions and fairs
- Information and networking events
- Cooperation with CLIB on different topics and projects

9 – 10 NOV 2022



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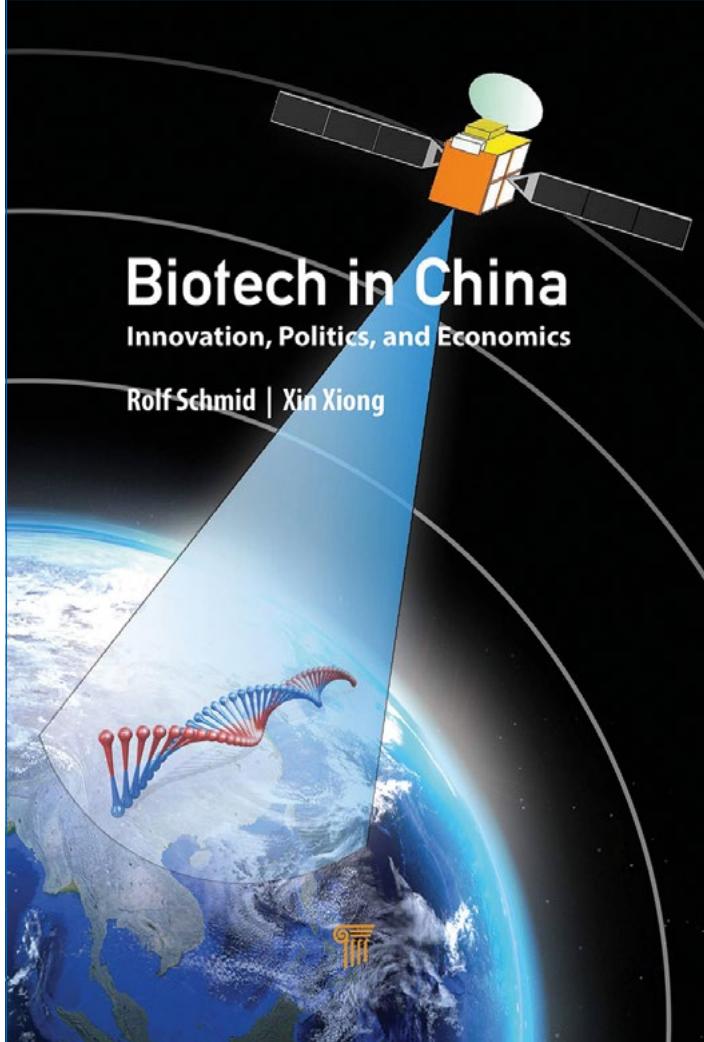


BIO.NRW.eco is a focus area of the umbrella organisation **BIO.NRW**

BIO.NRW is your first contact point in NRW for all areas of Biotechnology

BIO.NRW is supported by the Federal State North Rhine-Westphalia





Bio 4 Business

China, during its 14th 5 years planning period (“145”, 2021-2025), will take next steps towards a low-carbon “digital civilization” and invest heavily into many bio-digital technologies such as synthetic biology, AI-based imaging and modelling, telemedicine and genomic medicine, robot-supported agriculture and food production, and environmental biotech.

The team of Bio4Business has documented these developments and their major drivers in a monograph “**Biotech in China**”, Jenny Stanford Publishing July 2021, 320 pages, ISBN 978-981-4877-53-4 (hardcover) and ISBN 978-1-003-13193-9 (eBook), with chapters on

- politics, economics, infrastructure and China’s science and education system
- healthcare and (bio)medicine
- biotech in agriculture and fermented food
- industrial biotech and “smart cells”
- environmental biotech and biodiversity

The book contains a 13-page index and hundreds of citations and URLs.

bitop

Extremolytes for Life

Stockumer Str. 28, 58453 Witten

Phone: + 49 2302 914400

Internet: www.bitop.de
www.ectoin.net

Founding year: 1993

Number of employees: 37

bitop AG

bitop AG is a biotechnology company focused on products based on extremolytes, a group of natural protective molecules responsible for the stress resistance of extremophilic microorganisms. bitop develops and employs fermentative and biocatalytic bioprocesses for extremolyte production.

The company offers innovative medical devices based on the extremolyte Ectoin® in the areas of allergy, dermatology, respiratory diseases, and dry epithelia with scientifically confirmed efficacy and tolerability. Furthermore, bitop offers extremolyte products like Ectoin®, Glycoin®, and 28Extremoin® as cosmetic active ingredients as well as hydroxyectoin as biostabilizer for diagnostics and life sciences.

Black IP

In den Baumäckern 5a, 76865 Insheim

Phone: +49 6341 93 55 442

Fax: +49 6341 987 568

Internet: www.black-ip.de

Founding year: 2016

Number of employees: 5

BlackIP GmbH

The main focus of the consulting company BlackIP GmbH is on intellectual property. BlackIP is building bridges between stakeholders ‘speaking different languages’: developers, scientists, and engineers, and includes expertise on intellectual property rights. The company offers support in the organisation/re-organisation of internal patent systems and training for employees, monitors technology fields with respect to patent-relevant activities of competitors, conducts research and analyses, and offers the service of an external patent department.

BlackIP supports clients throughout the whole process, starting with the early development phase, then monitoring intellectual property processes together with the client’s attorneys and experienced attorneys from BlackIPs network, and ending with the exploitation of these rights.

BluCon Biotech GmbH

Plastics from Nature for Nature®

BluCon Biotech is developing a unique technology by which L-lactic acid can be produced from non-food feedstocks like straw or wood by direct fermentation with BluCon's proprietary extremophilic production bacteria. The business purpose is to allow the bioplastic polylactic acid (PLA) to be produced on a sustainable basis and commercially competitive to fossil fuel based plastics.

BluCon Biotech collaborates with a network of expert groups and companies, at academia and in the industry, for efficient and rapid launch of its technology. BluCon is welcoming further collaborations regarding conversion of all kinds of feedstock to value added fermentation products, as well as collaborations with the purpose of PLA production.



Next bioplastics.

Nattermannallee 1, 50829 Köln

Phone: +49 221 93338860

Internet: www.blucon-biotech.com

Founding year: 2017

Number of employees: 21

Bundesanstalt für Materialforschung und -prüfung (BAM)

The Federal Institute for Materials Research and Testing (BAM) is a research facility under the authority of the Ministry of Economics and Technology. Its competences are to improve safety and reliability in chemical and materials technologies through research, testing, analysis, and information.

The division Biodeterioration and Reference Organisms performs research and development in the fields of

i) materials protection against biological deterioration

ii) biotechnology with bacteria.

We are especially interested in biotechnology and molecular biology of bacteria from extreme environments. Our expertise in molecular biology with extremophiles comprises a wide range of technologies to manipulate metabolic pathways with the goal to improve productivity of strains currently used in industry.



Unter den Eichen 87, 12205 Berlin

Phone: +49 3081041410

Fax: +49 3081041417

Internet: www.bam.de

Number of employees: 1660

Capricorn Partners NV

Capricorn Partners is an independent manager of venture & growth capital and quoted equity funds, with a focus on innovative companies who use technology as a competitive advantage. We invest mainly into the relevant range of innovative digital, clean and health technologies that have a positive impact on the world.

Inspired by the Chinese economy in innovative sectors, we manage a growth capital fund with a two-way Europe-China focus.



De Jonge St. Jacob, Lei 19/1, 3000 Leuven
Belgium

Phone: +32 16 28 41 00

Internet: www.capricorn.be

Founding year: 1993

Number of employees: 26

Carbon Minds GmbH

Carbon Minds is a data analytics startup. We use our proprietary digital model of the global chemicals and plastics industry to offer our clients unprecedented levels of transparency about environmental impacts in global supply chains.

We bring down the cost of reaching climate targets by providing market intelligence that enables our clients to reduce their environmental impacts in the most cost-efficient way possible through the choice of suppliers. Our data covers thousands of suppliers, accounting for more than 80 % of the global greenhouse gas emissions due to chemicals and plastics production.

In addition to providing data, Carbon Minds builds digital twins of complex integrated production sites and uses novel optimization approaches to identify cost-efficient transition pathways.



Eupener Str. 165, 50933 Köln

Phone: +49 1573 7975079

Internet: www.carbon-minds.com

Founding year: 2019

Number of employees: 13



c-LEcta GmbH

c-LEcta is a leading industrial biotechnology company, using best-in-class biotechnologies to efficiently provide customized enzymes and microbial strains to industrial applications. Scientific excellence is combined with in-depth commercial and regulatory know-how to bring innovative and competitive bioprocessed products into scale. Besides our in-house project and product pipeline we have a strong focus on strategic cooperation with industrial partners.

Moreover, c-LEcta is an established enzyme supplier, manufacturing unique, quality-controlled enzyme products on large technical scale.

Perlickstr. 5, 04103 Leipzig

Phone: +49 341 355 214 0

Internet: www.c-lecta.com/

Mail: contact@c-LEcta.com

Founding year: 2004

Number of employees: 100



Friedrichstr. 15A, 61476 Kronberg

Phone: +49 174 4657708

Internet: www.co2bioclean.com

Founding year: 2019

CO2BioClean GmbH

CO2BioClean prevents the release of industrial CO₂ emissions by capturing them before their release into the atmosphere. The CO₂ is transformed into 100% biodegradable biopolymer (PHA) via an efficient fermentation process. Making use of this polymer, a versatile set of items ranging from textile fibres, packaging items, and interior design can be produced. The fermentation process used to produce the biodegradable polymers allows to tune the properties of the PHA such as aesthetics and mechanical properties, ranging from rigid to flexible, soft-touch and adhesive. This way, we can address requirements of complex end use applications.



Königsallee 6-8, 40212 Düsseldorf

Phone: +49 211 320364

Internet: www.concordblue.de

Founding year: 1997

Number of employees: 160

Concord Blue Engineering GmbH

Concord Blue is a waste management company that transforms nearly any form of local waste into a variety of clean, renewable fuels. Concord Blue has developed a revolutionary closed-loop system that efficiently and cost-effectively produces the highest quality sustainable energy with virtually no pollutants. Unlike other available waste-to-energy processes, Concord Blue's unique technology benefits the environment, fulfilling all international, EPA and European regulations for renewable energy and air emissions.



Arkelsedijk 46, 4206 AC Gorinchem
The Netherlands

Phone: +31 183 695695

Internet: www.corbion.com

Founding year: 2013

Number of employees: 2,000

Corbion NV

Corbion is the global market leader in lactic acid, lactic acid derivatives, and a leading company in emulsifiers, functional enzyme blends, minerals, vitamins and algae ingredients.

We develop sustainable ingredient solutions to improve the quality of life for people today and for future generations. For over 100 years, we have been uncompromising in our commitment to safety, quality and performance. Drawing on our deep application and product knowledge, we work side-by-side with customers to make our cutting edge technologies work for them.

At Corbion, we live our brand promise "Keep creating", through our science, clear understanding of the markets we serve, and of course through our creative people.

Corbion's strategy and every aspect of our operations are built around advancing sustainability and applying high ethical standards, whether this relates to the management of our global supply chain, responsible procurement of our raw materials, or the safety and wellbeing of our people.

Corvay GmbH

Corvay provides consulting and project management services to multinational, medium and small enterprises. Corvay builds and helps building businesses. Some examples: biotech cluster BioRegioN in Lower Saxony, Vakzine Projekt Management, advising Direvo and later building and managing BluCon Biotech Cologne. Recently we established Corvay Bioproducts, Leuna, developing bioproduction processes. Our trade company Corvay Specialty Chemicals is selling long chain aliphatic diacids and specialty enzymes to the chemical industry, and vitamin D3 to the food and feed industries; we are interested in expanding our specialty portfolio.

Corvay's value for you:

- i. high performance proven over 20 years,
- ii. operational expertise and international management experience
- iii. efficient business network.



Sophienstr. 6, 30159 Hannover

Phone: +49 511 449895-0

Internet: www.corvay.de

Founding year: 2002

Number of employees: <10

Covestro Deutschland AG

Covestro is a world-leading supplier of high-tech polymer materials: innovative, sustainable, and diverse.

We are serving key industries (such as automotive, construction, and electro/electronics) around the globe with technologically leading processes. Our products and application solutions are used in many areas of modern life.

In line with our vision "We will be fully circular" we are on the way to a circular economy. Alternative raw materials (such as biomass, CO₂, plastic waste) and alternative production technologies (e.g. via biotechnology) are the basis for various new innovative products and production processes.

With approximately 17,200 employees Covestro posted sales of 12.4 billion euros in 2019.

It has some 30 major production sites worldwide that operate in a safe, efficient and ecofriendly way. The product range includes the high-performance polymer polycarbonate and precursors for polyurethanes that are used to produce foam.



Kaiser-Wilhelm-Allee 60, 51373 Leverkusen

Phone: +49 214 6009 2000

Internet: www.covestro.com

Founding year: 2015

Number of employees: 17,200

Deep Branch Biotechnology Ltd.

Deep Branch Biotechnology are a UK-based start-up that produce single cell protein for animal feed. The company utilises carbon dioxide as a feedstock for their proprietary gas fermentation process, producing high-quality protein for aquafeed and monogastric animals.



D6 Thane Road, NG90 6BH, Nottingham
United Kingdom

Internet: www.deepbranchbio.com

Founding year: 2018

Number of employees: 10

TU Dortmund University - Department of Biochemical and Chemical Engineering (BCI)

The Department of Biochemical and Chemical Engineering (BCI) in Dortmund is one of the largest and most successful departments of its kind in Europe. It is active in all areas of biochemical and chemical engineering. The strength of the department is its multidisciplinarity, linking various research areas, e.g. thermodynamics, technical (bio) chemistry, biotechnology and process engineering, thus covering all stages of (bio) process and (bio)catalyst development.

BCI has been an active partner in many CLIB-related projects (Graduate and Technology Clusters as well as the Kompetenzzentrum Biotechnologie CKB). The overall aim of the research is the design and optimization of safe, environmentally friendly and sustainable processes and products for the chemical, pharmaceutical, and related industries.



Emil Figge Str. 66, 44227 Dortmund

Phone: +49 231 755 5950

Internet: www.bci.tu-dortmund.de

Founding year: 1969

Number of employees: >200

Advanced courses in Industrial Biotechnology

www.biotechdelft.com



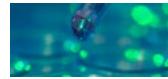
Biocatalysis and Protein Engineering

Course board: Ulf Hanefeld, Frank Hollmann, Caroline Paul, Adrie Straathof



Bioprocess Design

Course board: Sef Heijnen, Henk Noorman, Ruud Weusthuys



Downstream Processing

Course board: Marcel Ottens, Luuk van der Wielen



Integrated Multi-Omics approaches for Improvement of Industrial Microbes

Course board: Jean-Marc Daran, Walter van Gulik, Aljoscha Wahl



Environmental Biotechnology

Course board: Robbert Kleerebezem, Mark van Loosdrecht, Cristian Picioreanu, David Weissbrodt



Microbial Physiology and Fermentation Technology

Course board: Sef Heijnen, Han de Winde



Modelling and Computation in Biotechnology

Course board: Cees Haringa, Henk Noorman, Cristian Picioreanu, Adrie Straathof

Go to www.biotechdelft.com to see the full program



TU Delft



Postbus 5, 2600 AA Delft
The Netherlands

Phone: +31 152789111

Internet: www.tudelft.nl

Founding year: 1842

Number of employees: 6050

Delft University of Technology contributes to solving global challenges by educating new generations of socially responsible engineers and expanding the frontiers of the engineering science. In CLIB, TU Delft is represented by the Department of Biotechnology.

Research in the Department of Biotechnology is unique in addressing all relevant levels of organization in biotechnological processes: discovery, characterization, and engineering of enzymes as molecular catalysts; physiology, systems biology and engineering of microbial cells and cellular networks; ecophysiology of microbial populations; design and integration of unit operations in industrial and environmental bioprocesses and analysis of socio-economic impact. These research activities are supported by state-of-the-art laboratory facilities and infrastructure.



Godesberger Hof 2, 53173 Bonn

Phone: +49 170 220 9067

Internet: www.ecbf.vc

Founding year: 2019

Number of employees: 10

The European Circular Bioeconomy Fund GmbH (ECBF)

ECBF is the first venture fund exclusively dedicated to investing in growth-stage companies in the European bioeconomy, including the circular bioeconomy. The fund aims to make sustainable investments in our future and drive the shift from a fossil-based to a bio-based economy, backing up businesses with high potential for innovation, favourable returns, and sustainable impact. By identifying the most promising investment targets and syndicating with private and public investors, ECBF brings Europe's circular technologies and bio-products to market.

As a growth-stage venture capital fund, ECBF offers both project financing and typical venture capital investments to the EU-27 and 16-HORIZON 2020 associated countries. Established in Luxembourg, ECBF is managed by Hauck & Aufhäuser Funds Services S.A. (AIFM) and advised by the experienced investment team of ECBF Management GmbH. It relies on robust networks to catalyze sustainable innovations and fuel business growth.

Eder Schieschke & Partner mbB

The chemical department of the intellectual property law firm Eder Schieschke & Partner mbB has specialized in representing clients in the field of organic chemistry, biochemistry and biotechnology before the European Patent Office, the German Patent and Trademark Office, the German Patent Court and the European Intellectual Property Organization in all areas of intellectual property law.

Amongst obtaining patent rights, utility model rights and trademark rights Eder Schieschke & Partner mbB's expertise is also directed to license agreements, preparation of invalidity, infringement and freedom-to-operate studies, as well as German employee law.

As a member of CLIB, Eder Schieschke & Partner mbB is supporting the Cluster with the realization of IP coaching seminars for start-ups and SMEs.

EDER | SCHIESCHKE | PARTNER

Patentanwälte • European Patent, Trademark and Design Attorneys

Elisabethstr. 34, 80796 München

Phone: +49 89 278 148-0

Fax: +49 89 278 148-50

Internet: www.eder-ip.de

evoxx technologies GmbH

evoxx technologies GmbH, a German industrial biotechnology company, is focussed on the development and production of industrial enzymes and biocatalytic processes. As European subsidiary of the global enzyme manufacturer Advanced Enzyme Technologies Ltd., a comprehensive product portfolio of enzymatic solutions for human nutrition, animal nutrition, bio-processing, and pharma industries is offered.

Product development is based on the proprietary technology platform covering the whole value chain from early enzyme and process development via scale-up and technology transfer to industrial scale production. evoxx's industrial partners and customers not only benefit from the long-term experience of our interdisciplinary team but also from our unique metagenomics libraries, enzyme engineering and development skills, tech transfer experience, and large scale enzyme production capabilities. Depending on the requirements, we can work in bacterial or fungal expression systems. Our comprehensive technology platform is also used to develop and produce tailored carbohydrates, mainly for food industry. evoxx is located on the Creative Campus in Monheim am Rhein, Germany.

evoXX

Alfred-Nobel-Str. 10, 40789 Monheim am Rhein

Phone: +49 2173 4099-40

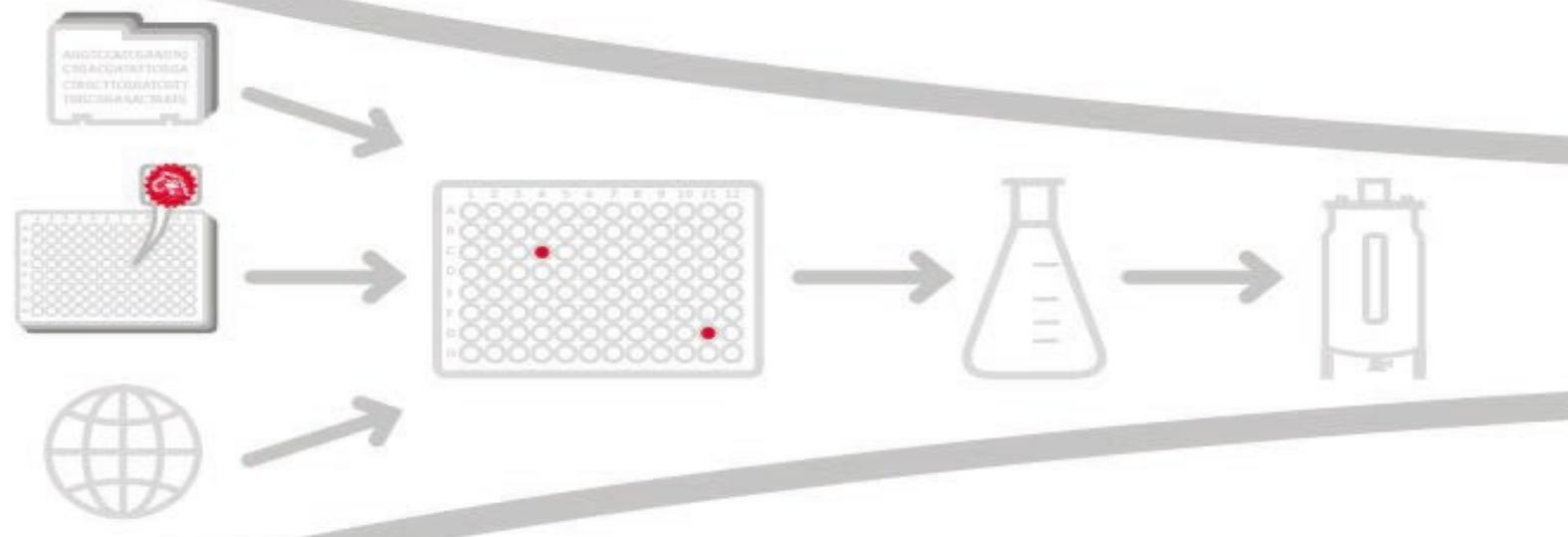
Internet: www.evoxx.com

Founding year: 2006

Number of employees: 40

We develop and produce your enzyme

evoXX



www.evoxx.com

Grow your success on our experience

WE MOBILIZE CAPITAL FOR TRANSFORMATION



European Circular
Bioeconomy Fund



Transform our future with us!

Innovative technology is the key to shifting from a fossil-based to a bio-based circular economy, crucial for achieving the European climate targets.

As a venture capital fund, our primary goal is to invest in scale-up companies with high potential for excellence on a pan-European or global scale - delivering both impact and financial returns at the highest level.

Our entire experience in venture capital and our investment scope spanning the circular economy and bioeconomy is focused on this purpose.

Supported by:



Investors:



www.ecbf.vc

Eindhoven University of Technology

Eindhoven University of Technology (TU/e) is a research university, founded in 1956, specializing in engineering science & technology. The Department of Chemical Engineering and Chemistry aspires to be an academic institution for education and research in chemical science and engineering of the highest international standard. The aim is to generate and to develop technology and scientific knowledge relevant for the long-term needs of society.

Scientific curiosity and the use of newly generated knowledge are the main driving forces behind the continuing enhancement of our expertise in (electro-)chemical reactor engineering, multiscale & multiphase modelling, process intensification, membrane processes and heterogeneous catalysis



Groene Loper 5, 5612AE Eindhoven,
The Netherlands
Phone: +31 402479111
Internet: www.tue.nl
Founding year: 1956
Number of employees: 3239

Enzymaster Deutschland GmbH

Enzymaster provides a one-stop solution for the development and commercialization of innovative and sustainable enzyme catalysis technologies. With our proprietary BioEngine® platform and long-term experience, we offer R & D services combined with establishment of complete technology transfer packages, and manufacturing collaborations to fine chemical, pharmaceutical, and other industries.

Our portfolio includes enzyme panel screening, smart enzyme engineering, process development, enzyme preparation by fermentation, and biocatalytic manufacturing.

Enzymaster Deutschland GmbH, a subsidiary of Enzymaster (Ningbo) Bio-Engineering Co. Ltd., represents your partner in the international market for enzyme applications and products manufactured by biocatalytic processes.

Green Magic Happens Here!



Green magic happens here

Neusser Str. 39, 40219 Düsseldorf
Phone: +49 211 15821610
Internet: www.enzymaster.de
Founding year: 2018
Number of employees: 6

Enzymicals AG

We are an experienced partner for industrial biocatalysis from mg to ton-scale with more than a decade of experience. Enzymicals' experts offer their recognized expertise in the use of enzymatic processes for complex chemical synthesis, from initial catalyst-lead finding to process optimization and pre-scale up. Combining many years of experience in biotechnology with state-of-the art facilities, our company has success stories with many partners from diverse industries speeding up their developments.

Our core working principles are high quality R & D, professionalism and customer satisfaction. By this we add value with tailor made enzymes, customized chemicals and individual process solutions and contribute to a more sustainable industry with greener and safer processes.



Walther-Rathenau-Straße 49a, 17489 Greifswald
Phone: +49 3834 515470
Internet: www.enzymicals.com
Founding year: 2009
Number of employees: 20

ERBER Enzymes GmbH

ERBER Enzymes is a spin-off company of EFB, ERBER Future Business GmbH, ERBER Group's in-house incubator.

ERBER Enzymes GmbH is headquartered in Dortmund, Germany, and with our focus on microbiological and enzymatic solutions we address selected food and feed markets.

According to our customers' needs, we develop suitable specialty enzymes or microbial strains in close cooperation with our sister companies at ERBER Group or in direct cooperation with leading market participants. In line with the core competencies within the group, we focus on food and feed safety; however, we also walk new paths in markets ERBER Group has not yet addressed.



Otto-Hahn-Str. 15, 44227 Dortmund
Phone: +49 231 9865 2845
Internet: www.erber-group.net
Founding year: 2018
Number of employees: 8



As builders of the future, we work all day to make your daily life better. **By thinking beyond chemistry.**

Whether it's biotechnology, physics or materials science – we connect disciplines, areas of expertise and perspectives to create sustainable solutions that add value in partnership with our customers. That means we play a leading role in our markets as well as in driving our industry's development. We are passionate about giving our customers' products outstanding properties. And that answers the question of why we exist: to make people's lives better day in, day out. **Leading beyond chemistry to improve life, today and tomorrow.**

www.evonik.com

 **EVONIK**
Leading Beyond Chemistry

Evonik Industries AG

Evonik is one of the world's leading specialty chemicals companies.

We may not manufacture tires, mattresses, medications, or animal feeds, but Evonik is part of all of those products – and many more. While we often contribute only small amounts of material, those contributions are precisely what make the difference. That's because Evonik products make tires fuel-efficient, mattresses more elastic, medications more effective, and animal feeds healthier. That's what specialty chemicals are all about. And when it comes to specialty chemicals, we're among the best in the world.

Evonik is one of the world leaders in specialty chemicals. The company is active in more than 100 countries around the world and generated sales of €12.2 billion and an operating profit (adjusted EBITDA) of €1.9 billion in 2020. Evonik goes far beyond chemistry to create innovative, profitable and sustainable solutions for customers. More than 33,000 employees work together for a common purpose: We want to improve life, today and tomorrow.



Rellinghauser Str. 1-11, 45128 Essen

Phone: +49 201 177 01

Internet: <https://corporate.evonik.com>

Founding year: 2007

Number of employees: 33,000

Federal State Institution «Federal Research Centre «Fundamentals of Biotechnology» of the Russian Academy of Sciences»

The Russian Academy of Sciences was founded by merging the A.N. Bach Institute of Biochemistry RAS (INBI RAS), the S.N. Winogradsky Institute of Microbiology RAS and the Centre «Bioengineering» RAS.

The Research Centre of Biotechnology RAS carries out basic and applied research in the fields of biochemistry and biotechnology, microbiology, genomics, bioengineering and genetic engineering, biocatalysis, system and structural biology, biogeotechnologies, bioremediation, agrobiotechnologies, food quality and safety.

The Centre is the key member of the Russian Technology Platform «Bioindustry and Bioresources-BioTech2030». The Russian National Contact Point on Biotechnology, three core facilities, an accredited testing laboratory, and an experimental greenhouse are operating at the Centre.



FEDERAL RESEARCH CENTRE
«FUNDAMENTALS OF
BIOTECHNOLOGY»
OF THE RUSSIAN ACADEMY
OF SCIENCES

Leninsky prospect, 33, Bld. 2, Moscow,
119071, Russian Federation

Phone: +7 495 9545283

Internet: <http://www.fbras.ru/en/>

Founding year: 2014

Number of employees: 500

Flemish Institute for Technological Research, VITO

Within the "Sustainable Chemistry" research theme, VITO focuses on new value chains from renewable and circular resources - like CO₂ and biomass - and on process transformation. Key is the integration of conversion with separation processes to improve overall efficiency and sustainability. In this domain VITO has unique expertise and equipment in membrane-assisted intensification of enzymatic and fermentation processes, complemented with membrane development.

VITO develops efficient Carbon Capture and Utilization technologies and has acquired a high pressure fermentor with extensive online process monitoring and control and high operational flexibility. It constitutes a unique high-tech research platform for fundamental and applied gas fermentation studies to the benefit of researchers and companies. In addition to direct C1 gas bioconversions, VITO also investigates hybrid approaches, combining for instance electrochemical reduction of CO₂ into methanol with methanol fermentation.



Boeretang 200, 2400 Mol
Belgium

Internet: www.vito.be

Founding year: 1990

Number of employees: 947

Forschungszentrum Jülich GmbH - IBG-1: Biotechnology

IBG-1: Biotechnology is a leading institute in the field of microbial biotechnology and biocatalysis. Multipurpose microbial production platforms (e.g. *C. glutamicum*, *P. putida*) are used for the production of industrially, nutritionally or pharmaceutically relevant products (bulk / fine chemicals, natural products, enzymes/proteins) from renewable carbon sources. Methods of synthetic biology are used for establishing novel concepts in strain development and engineering of metabolic pathways. Moreover, multi-step enzyme cascades for cell-free biosynthesis are developed.

Process development is based on lab automation systems combined with extensive digitalization. IBG-1 runs an extensive "omics" platform (sequencing, proteomics, metabolomics and fluxomics) for strain characterization and a single-cell analysis lab. Microbial cultivation facilities range from microfluidic devices over parallelized mini bioreactor systems up to pilot plant scale. Lab investigations are tightly integrated with mathematical modelling, data analysis, experimental design and process optimization.



Wilhelm-Johnen-Straße, 52425 Jülich

Phone: +49 2461 61 3294 (Prof. Bott)

3118 (Prof. Wiechert)

Internet: <http://www.fz-juelich.de/ibg/ibg-1>

Founding year: 1977

Number of employees: 120

WE DESIGN AND BUILD YOUR BIOPROCESS PLANT IN LABORATORY, PILOT AND PRODUCTION SCALE



Heinrich Frings GmbH & Co. KG
Boschstrasse 32, 53359 Rheinbach

Tel.: +49 (0)22 26 89 29-400
Fax: +49 (0)22 26 89 29-401

marketing@frings.com
www.frings.com



Heinrich Frings GmbH & Co. KG

Boschstr. 32, 53359 Rheinbach
Phone: +49 2226 8929-400
Internet: www.frings.com
Founding year: 1878
Number of employees: 70

FRINGS

The company Heinrich Frings GmbH & Co. KG is a worldwide supplier of machines, equipment and components for process technology in the industry sectors food, biotechnology, and the chemical industry, as well as environmental technology with special focus on fermenters and bioreactors.

FRINGS not only supplies customized systems for each application, but also offers assistance and consulting services. FRINGS has extensive know how and experience concerning process optimization and product development. For downstream processing FRINGS delivers membrane filtration systems (crossflow filtration) for many different industrial sectors.



Padualaan 8 Kruytgebouw 4 Noord,
3584CH Utrecht, The Netherlands

Phone: +31 0880666194
Internet: www.ginkgobioworks.com
Founding Year: 2015
Number of employees: 21

Ginkgo Bioworks Netherlands B. V.

Ginkgo Bioworks is a biotech company from the United States founded in 2009 by scientists from MIT.

Ginkgo is building a platform to enable customers to program cells as easily as we can program computers. The company's platform is enabling biotechnology applications across diverse markets, from food and agriculture to industrial chemicals to pharmaceuticals.

On July 1 2021, Ginkgo Bioworks acquired Dutch DNA Biotech, adding a fungal engineering platform to its portfolio. Dutch DNA Biotech continues its activities under the name Ginkgo Bioworks Netherlands and keeps its focus on development of fungal strains and fermentation processes for the production of proteins.

Fraunhofer IGB

The Fraunhofer Institute for Interfacial Engineering and Biotechnology IGB develops and optimizes processes and products for health, sustainable chemistry, and environment. In the field of industrial biotechnology we focus on establishing, optimizing and scaling up processes that take place with the help of enzymes or microorganisms. For example, hydrolases and oxidoreductases as well as a wide variety of bacteria, fungi and yeasts are used for this purpose.

In some cases, the desired conversion also becomes possible through combination with chemical transformation processes. In the development of the conversion processes under laboratory conditions and the optimization of the biocatalysts themselves, the focus is already on scaling up the processes and processing the products. At the Fraunhofer Center for Chemical-Biotechnological Processes CBP, the Leuna branch of the institute, infrastructure and pilot plants are available to scale up processes to production-relevant dimensions.



Fraunhofer
IGB

Nobelstr. 12, 70569 Stuttgart

Phone: +49 711 970 4167

Internet: www.igb.fraunhofer.de

Founding year: 1953

Number of employees: 368

Fraunhofer IME

The Fraunhofer Institute for Molecular Biology and Applied Ecology IME conducts research in the field of applied life sciences from a molecular level to entire ecosystems. By strategic orientation along the value chain, the Fraunhofer IME follows the mission to take innovative products closer towards the market, to develop enabling technologies, and provide scientific services to partners from academic institutions and industry.

In the area of industrial biotechnology, the Fraunhofer IME offers research in the field of directed evolution, classical strain improvement, metabolic pathway engineering, and fermentation. Besides scientific expertise, we possess state-of-the-art facilities for high-throughput screening, enzyme production & purification, fermentation process development, and protein crystallization and modelling.



Fraunhofer
IME

Forckenbeckstr. 6, 52074 Aachen

Phone: +49 241 6085 0

Internet: www.ime.fraunhofer.de

Founding year: 1959

Number of employees: approx. 600,
incl. at international locations

Fraunhofer UMSICHT

Fraunhofer UMSICHT is a pioneer for a sustainable world. With our research in the areas of climate-neutral energy systems, resource-efficient processes and circular products, we make concrete contributions to achieving the 17 Sustainable Development Goals (SDGs) of the United Nations.

We develop innovative, industrially feasible technologies, products and services for the circular economy and bring them to application with all our strength. The focus is on the balance of economically successful, socially equitable and sustainable developments. As one of 75 institutes and research facilities of the Fraunhofer-Gesellschaft, the leading organization for applied research in Europe, we are part of a worldwide network and promote international cooperation.



Fraunhofer
UMSICHT

Osterfelder Str. 3, 46047 Oberhausen

Phone: +49 208 8598 0

Internet: www.umsicht.fraunhofer.de

Founding year: 1990

Number of employees: 577 (473 in Oberhausen
and Willich, 104 in Sulzbach-Rosenberg)

Fraunhofer WKI

The Fraunhofer Institut für Holzforschung, Wilhelm-Klauditz-Institut (WKI) works as closely and as application-oriented with the companies of the wood and furniture industries and the supplier industry as it does with the construction industry, the chemical industry and the automotive industry. Virtually all procedures and materials, which result from the research activities of the Institute, are used industrially.

WKI has extensive competence in the areas of intermediates preparation from biosourced raw materials and polymer synthesis. The focus was laid on the modification of vegetable oils, saccharides, utilising building blocks generated by industrial biotechnology, and the utilisation of lignin for various applications for generating coatings, adhesives, sealants and elastomers.

WKI stands for R&D along the value chain, starting with monomers to end-use applications.



Fraunhofer
WKI

Bienroder Weg 54 E, 38108 Braunschweig

Phone: +49 531 2155 329

Internet: www.wki.fraunhofer.de

Founding year: 1946

Number of employees: 175



Böhlerstr. 1, 40667 Meerbusch
Phone: +49 151 52451698
Internet: www.gec-europe.de
Founding year: 2021
Number of employees: 6

Global Entrepreneurship Centre powered by Flow gGmbH

Based at Areal Böhler in Meerbusch, the Global Entrepreneurship Centre (GEC) is the first structure of its kind to address the scaling challenges of promising SusTechs - deep-tech start-ups with a clear sustainability and climate protection focus - from all over the world.

Launched in 2021, the GEC will initially support up to 20 start-ups per year in the sectors of building & living, textiles, mobility and agriculture & nutrition with access to venture capital, business development and advisory services and lab capacity.

The GEC is funded by the Rhenish region's "SofortprogrammPlus" initiative and the Rhine County of Neuss. In the long term it will be funded by its own resources. Up to 3,000 new jobs will be created by 2030 through the relocation of innovative companies taking part in the GEC programmes to the region.



Forschungszentrum Jülich GmbH,
Wilhelm-Johnen-Straße, 52428 Jülich
Phone: +49 2461 61 3716
Internet: www.iet.uni-duesseldorf.de
Founding year: 1986
Number of employees: 40

Heinrich Heine University Düsseldorf - Institute of Molecular Enzyme Technology (IMET)

The Institute of Molecular Enzyme Technology (IMET) of Heinrich Heine University Düsseldorf is located on campus of the Forschungszentrum Jülich as part of the Institute of Bio- and Geosciences IBG-1: Biotechnology which holds a leading position nationally and internationally in the field of basic research and biotechnological applications of microorganisms.

The IMET is directed by Prof. Dr. Karl-Erich Jaeger and currently employs about 40 people. Four groups cover the scientific topics "Bacterial Enzymology" (Dr. Filip Kovacic), "Bacterial Photobiotechnology" (Dr. Thomas Drepper), "Molecular Biophotonics" (Dr. Ulrich Krauss), and "Natural Product Biosynthesis" (Dr. Anita Loeschke/Dr. Stephan Thies).



Marker Allee 76-78, 59063 Hamm
Phone: +49 2381-8789-115
Internet: www.hshl.de
Founding year: 2009
Number of employees: 410

Hochschule Hamm-Lippstadt

Founded in 2009, the Hamm-Lippstadt University of Applied Sciences has developed rapidly, currently counting 5,600 students in 14 Bachelor and 10 Master degree programs. The focus is on the students, professional and individual development is supported by practice-oriented teaching which is oriented towards the needs of the changing society and the dynamic working environment.

Mentoring between scientific and practical experts, research marketing and reporting, founding, inventions and industrial property rights, promotion of cooperations between science, companies, and institutions are the main tasks. With cooperative doctoral studies, the HSHL offers the opportunity for a further scientific qualification in research projects for qualified graduates of Master degree programs.



Henkelstr. 67, 40589 Düsseldorf
Phone: +49 211 797 0
Internet: www.henkel.com
Founding year: 1876
Number of employees: 53,000

Henkel AG & Co. KGaA

Henkel operates globally with a well-balanced and diversified portfolio. The company holds leading positions with its three business units - Laundry & Home Care, Beauty Care and Adhesives - in both industrial and consumer businesses thanks to strong brands, innovations and technologies.

Founded in 1876, Henkel looks back on more than 140 years of success. The DAX-30 company has its headquarters in Düsseldorf, Germany. Henkel employs more than 53,000 people worldwide, over 80 percent of whom work outside of Germany. In 2020, Henkel reported sales of 19.3 billion euros and an operating profit of 2.6 billion euros (adjusted for one-time gains/charges and restructuring charges). As a recognized leader in sustainability, Henkel holds top positions in many international indices and rankings.

Holiferm Ltd.

Holiferm uses natural fermentation to produce environmentally friendly and economically viable alternatives to petrochemical-derived ingredients. Using our team's wealth of experience in biotechnology and process engineering, alongside our patented integrated gravity separation technology, we develop processes with massive boosts in productivity and cost efficiency versus conventional batch fermentation.

Our biosurfactants have already been adopted by various environmentally conscious distributors and formulators, and we are scaling up our production to the kiloton scale with the construction of a new manufacturing plant. Furthermore, we are actively developing fermentation processes for other suitable molecules, ultimately aiming to make the world less reliant on fossil fuels.



Greenheys Building, 61 Pencroft Way
M15 6JJ Manchester
United Kingdom

Phone: +44 7467 547 979
Internet: www.holiferm.com
Founding Year: 2018
Number of employees: 20

Industrial Biotechnology Innovation Centre

The Industrial Biotechnology Innovation Centre's (IBioIC) role, as a specialist in the Industrial Biotechnology (IB) sector, is to stimulate the growth of the IB sector in Scotland to £900 million by 2025. IBioIC connects industry, academia and government, and facilitates collaborations, provides scale-up capabilities, creates networks, and develops skills.

IBioIC supports transition into IB by helping companies to understand the benefits and opportunities, overcome any barriers and to make sure our members are in touch with the right people to guide them through the technology and its consequent translation and implementation in their business.



121 George Street, Glasgow G1 1RD
United Kingdom
Phone: +44 141 548 3192
Internet: www.IBiolC.com

IP Services

The international protection of Intellectual Property (IP) is of great importance for successful collaboration and commercialization. The successful protection of biotechnological inventions e.g. representing one part of a complete value chain requests a sound experimental set-up from the initial idea to patent filing. IP Services assists throughout the process of translating ideas into valuable Intellectual Property Rights. Based on a 17 year experience in a biotech company working as project manager and IP manager in the field of recombinant expression in yeast, I started my own business in 2005.

The objective is to represent the interface between a company and a law firm and providing any IP service needed by small or mid-sized biotech companies on a cost efficient basis and independent of the company's location.

The service comprises assessing the value of a company's technologies, collaboration with R & D, IP searches, definition of patent filing strategy, analysis and maintenance of IP portfolio, patent application processing, cooperation with law firms, preparation for due diligence (M&A processes), IP administration, cost control, and IP training.



Unter Linden 35, 50859 Köln
Phone: +49 221 790 077 30
Internet: www.weydemann.net
Founding year: 2005
Number of employees: 1

Jäckering Mühlen- und Nährmittelwerke GmbH

The Jäckering group of companies has developed over 100 years (foundation 1910) into a group of various activities reaching from wheat starch production to machinery business and by-product recycling in the PVC industry with its main production site in the harbour of Hamm in Germany.

Just recently an 85 Mio. € investment was executed by Jäckering in its mill and wheat-based biorefinery with an increase of its raw material input from 300,000 tons to 600,000 tons of wheat. The signs point to growth and expansion, with an important pillar in the biotechnological production of e.g. biobased plastics, organic acids as well as microbial astaxanthin and protein using the existing side-streams as substrates.

Research is already carried out together with leading universities and institutes. The research & development centre onsite is readily available and offers facilities for bioprocess development and up-scaling of up-stream-, down-stream- and fermentation processes from shaking flask over 10L and 300L up to 1500L.

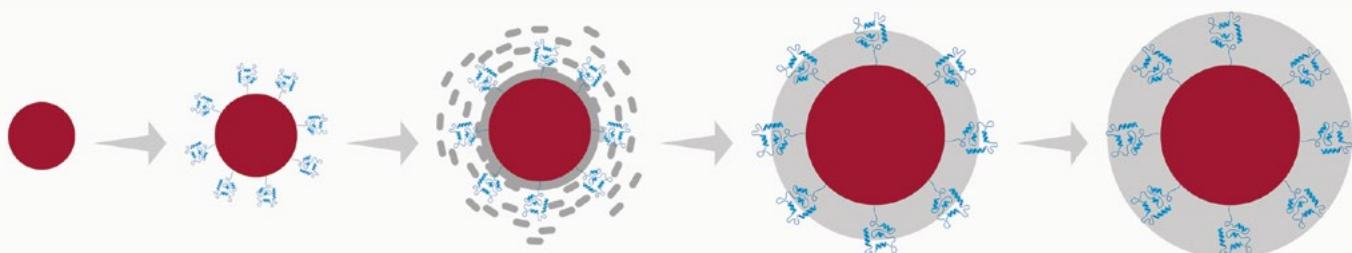
Approval for usage of GMO (S1) for research is possible.



Vorsterhauser Weg 46, 59067 Hamm
Phone: +49 2381 4220
Internet: www.jaeckering.de
Founding year: 1910
Number of employees: 100



Enzymes are capable of amazing catalytical tasks but they are limited by their nature. INOFEA's enzzen® technology challenges these limits by strengthening enzymes and allowing them to stand industrial conditions like high temperature or extreme pH. Furthermore, through a fine tuning of the enzzen® shield even the catalytical properties of the enzymes can be enhanced, i.e. favoring the affinity with substrates, increasing enantioselectivity and stability in solvents.



INOFEA AG

INOFEA was created to meet a critical need of the industry: to make enzymes more stable, re-usable and suitable for continuous processes.

We immobilize enzymes and protect them with a tailor-made shield, making them easy to use in biocatalysis, bioanalysis (diagnostics), and as active ingredients. INOFEA's technology allows enzymes to be recycled by about 20 times and makes them significantly more stable (10-fold improvement). Our technology allows a reduction of raw materials needed for synthesis, a reduction of energy consumption during the production process and a reduction of waste and solvents in biocatalytic processes.

We supply to customers who are among the top players in their industry, namely Pharma, Food, Crop Protection, Specialty & Fine Chemicals and Consumer Care.



Hofackerstr. 40b, 4132 Muttenz Switzerland
Phone: +41 76 4050743
Internet: www.inofea.com
Founding year: 2014
Number of employees: 6

KADIB - Kircher Advice in Bioeconomy

KADIB offers comprehensive expertise in Industrial Bioeconomy. We provide consultancy in positioning profitable chemical and energy value chains in your Political, Economical, Societal, Technological, Legislative and Ecological (PESTLE) environment. KADIB provides advice and moderates decision-making:

- Analysing the Bioeconomy Potential
- Designing strategic Bioeconomy Concepts
- Implementing Bioeconomy Strategies
- Focusing on Markets, Technologies and Business Opportunities
- For Industries, Research Institutes, Governmental Agencies

KADIB works through its unique network of senior experts. KADIB is a member of CLIB (Cluster Industrial Biotechnology) and BioBall (Bioeconomy in Metropolitan Regions).



Kurhessenstr. 63, 60431 Frankfurt am Main
Phone: +49 69 95104772
Internet: www.kadib.de
Founding year: 2014
Number of employees: 1

TH Köln - University of Applied Sciences

The TH Köln - University of Technology, Arts, Sciences offers students and scientists from Germany and abroad an inspirational study and research environment in the social, cultural, engineering, and natural sciences. Currently there are more than 24,000 students from about 120 countries enrolled in over 90 bachelor's and master's programs of 11 interdisciplinary faculties.

Climate change and scarce resources are some of the major challenges mankind will be facing in the coming decades. The faculty of Applied Natural Sciences at Campus Leverkusen engages itself in chemical and biotechnological research projects to address these 'great challenges' and actively contributes to the advancement of science and economy.

**Technology
Arts Sciences
TH Köln**

Gustav-Heinemann-Ufer 54, 50968 Köln
Phone: +49 221 8275-3051
Internet: www.th-koeln.de
Founding year: 1973
Number of employees: 1700

Kuhner Shaker GmbH

The Kuhner Shaker GmbH distributes shaking machines and application technologies for shaken bioreactor systems. Moreover, we produce and develop innovative feeding technologies for microtiter plates, shake flasks and spin tube bioreactors. The product portfolio covers bench top shakers, industrial shaking machines for GMP environments as well as the feeding technologies FeedPlate, FeedBead and FeedTube.

Kuhner Shaker is driven by a personal and trustful contact to our customers. Based on a long-term experience and our expert knowledge regarding shaken bioreactors we are capable to offer individual and custom-made solutions. As a partner of the science, we actively contribute to academic research projects.



Kaiserstr. 100, 52134 Herzogenrath
Phone: +49 2407 554 88 22
Internet: www.kuhner.com, www.feedingtechnology.com
Founding year: 2015
Number of employees: 10



Kennedyplatz 1, 50569 Köln
 Phone: +49 221 8885 0
 Internet: www.lanxess.com
 Founding year: 2004
 Number of employees: 14,900

LANXESS Deutschland GmbH

LANXESS - at the heart of the chemical industry

LANXESS is a leading speciality chemicals company based in Cologne. With around 14,900 employees in 33 countries, we are an established company on the global market. Our primary expertise lies in producing, developing and marketing chemical intermediates, additives, specialty chemicals, and plastics, with annual sales of EUR 6.1 billion (2020).

Sustainability and responsibility are key factors behind our successful business operations. They help us become an even more efficient and competitive company while also supporting social goals such as protecting the environment. Our products also play a role in this, providing sustainable solutions in key areas such as electric mobility.

Our aim is for the company to be carbon neutral by 2040. We also demonstrate this by supporting initiatives such as Responsible Care® and the Carbon Disclosure Project and being listed in the Dow Jones Sustainability Index World & Europe and FTSE4Good.



8045 Lamon Avenue, Skokie, 60077 IL USA
 Phone: +1 847 324 2400
 Internet: www.lanzatech.com
 Founding year: 2005
 Number of employees: 120

LanzaTech Inc.

Founded in 2005, LanzaTech has developed a fully integrated gas to liquid technology platform that produces fuels and chemicals from gas resources. The potential feedstock ranges from industrial waste gases (steel mills, refineries and phosphorous plants) to biomass syngas (MSW, organic industrial waste, and agricultural waste); as well as biogas.

LanzaTech employs a strong technical team based in the USA, China and Europe and has a rapidly growing patent portfolio. With agreements now in place across a variety of sectors internationally, including steel, aviation, refining and chemicals, LanzaTech's technology is being scaled to commercial production.



Hafenstrasse 24, 49565 Bramsche
 Phone: +49 5461 93030
 Internet: <https://leibergmbh.de/en/>
 Founding year: 1954
 Number of employees: 198

Leiber GmbH

Leiber refines the food side stream "Brewers' Spent Yeast" into innovative and nutritional products for the fields Life Science, Food and Animal Nutrition. We are a reliable partner for the brewing industry and bridging the gap between food industry and technology-driven markets like the biotechnology industry.

The Life Science division is dedicated to functional nutritional solutions for applications in Biotechnology, Nutraceuticals, Agriscience. Our Brewers' Yeast extracts are perfect for the fermentation industry. They improve the fermentation rate of a wide range of microorganisms, such as bacteria, fungi, algae and numerous other production organisms, because they are an important source of assimilable nitrogen and also contain B vitamins, minerals and other nutrients.



Harburger Schloßstraße 6-12, 21079 Hamburg
 Phone: +49 40 428784295
 Internet: www.lignopure.de
 Founding year: 2019
 Number of employees: 4

LignoPure GmbH

LignoPure is a pioneer in helping materials science and life science companies revolutionize their portfolio with tailor-made, sustainable product solutions. For this purpose, LignoPure uses the raw material lignin, which is as good as unknown, but actually the second most abundant biopolymer in the world!

We offer lignin-based solutions for your product ideas. LignoPure is a spinoff of the Hamburg University of Technology – a multidisciplinary team with expertise in process engineering, product development & business administration.

From its versatile biorefinery network, LignoPure can source suitable lignins and process them specifically for the customer's application. In addition, LignoPure offers tailor-made development services to the processing customer.

LXP Group GmbH

LXP is a tech company, active in the field of industrial biotechnology. The objective of the company is the development, marketing and licensing of technical solutions for the economic and ecological processing of plant residues on the basis of closed carbon and mineral cycles. Our mission is to maximize the ecological and economic efficiency of biotechnological processes.

The core technology is based on a patent protected pre-treatment process called LX-Process. This process provides alternative/2G-carbohydrates-/sugars and is easy to integrate into biotechnological processes. It allows the conversion of virtually all carbohydrates of lignocellulosic non-food materials to chemicals or biofuels. Additionally, sulphur free lignin is obtained.



Rheinstr.3, 14513 Teltow

Phone: +49 3337 / 3774140

Internet: www.lxp-group.com

Founding year: 2009

Number of employees: <10

Mitsui & Co. Deutschland GmbH

Mitsui & Co. Deutschland GmbH is a subsidiary of Mitsui & Co., Ltd., one of the most diversified and comprehensive trading, investment and service enterprises which covers a wide range of industries: Metals, Machinery & Infrastructure, Chemicals, Nutrition & Agriculture, Energy, Lifestyle, and Innovation & Corporate Development.

We currently comprise 130 sites in 63 countries/regions and a network of more than 500 affiliates, employing approximately 45,000 talented people worldwide. In every arena, Mitsui & Co. provides high added value services and solutions that truly reflect our customers' needs. Our job is to imagine new businesses and bring them to life. Creating new value for this era and innovating for the next.



Herzogstr. 15, 40217 Düsseldorf

Phone: +49 211 9386418

Internet: www.mitsui.com/de

Founding year: 1954

Number of employees: 179

mk2 Biotechnologies GmbH

mk2 Biotechnologies develops, produces and investigates peptides at highest purity and quality standards using a revolutionary scalable synthesis technology. We are able to synthesize any kind of authentic peptide, regardless of its physical or chemical properties.



mk2 Biotechnologies

Fallstr. 9, 81369 München

Phone: +49 160 7770 880

Internet: www.mk2.bio

Founding year: 2020

Number of employees: 12

Neste Germany GmbH

Neste (NESTE, Nasdaq Helsinki) creates solutions for combating climate change and accelerating a shift to a circular economy. We refine waste, residues and innovative raw materials into renewable fuels and sustainable feedstock for plastics and other materials.

We are the world's leading producer of renewable diesel and sustainable aviation fuel, developing chemical recycling to combat the plastic waste challenge. We aim at helping customers to reduce greenhouse gas emissions with our renewable and circular solutions by at least 20 million tons annually by 2030. As a technologically advanced refiner of high-quality oil products with a commitment to reach carbon-neutral production by 2035, we are also introducing renewable and recycled raw materials such as waste plastic as refinery raw materials.

We have consistently been included in the Dow Jones Sustainability Indices and the Global 100 list of the world's most sustainable companies. In 2020, Neste's revenue stood at EUR 11.8 billion, with 94 % of the company's comparable operating profit coming from renewable products.



Fürstenwall 172, 40217 Düsseldorf

Internet: www.neste.com

Founding year: 1948

Number of employees: 4,800



International Conference on CELLULOSE FIBRES 2022



2 - 3 February 2022

Hybrid Event

Cologne (Germany)

cellulose-fibres.eu



Conference on CO₂-based Fuels & Chemicals **2022**



23 - 24 March 2022

Hybrid Event

Cologne (Germany)

co2-chemistry.eu



RENEWABLE MATERIALS CONFERENCE 2022



10 - 12 May 2022

Hybrid Event

Cologne (Germany)

renewable-materials.eu

RENEWABLE CARBON NEWS

More than 28,000 news on
bio-based and CO₂-based materials
and recycling



renewable-carbon.eu/news



Industriestr. 300, 50354 Hürth

Phone: +49 2233 4814 40

Internet: www.nova-institute.eu

Founding year: 1994

Number of employees: 46

nova-Institut GmbH

nova-Institut is a private and independent research institute, founded in 1994. nova offers research and consultancy with a focus on the transition of the chemical and material industry to renewable carbon.

What are future challenges, environmental benefits and successful strategies to substitute fossil carbon with biomass, direct CO₂ utilisation and recycling? What are the most promising concepts and applications? We offer our unique understanding to support the transition of your business into a climate neutral future.

Our subjects include feedstock, technologies and markets, economy and policy, sustainability, communication and strategy development. The nova team consists of more than 40 employees.



Kavalleriestr. 22, 40213 Düsseldorf
Friedrichstr. 1, 48145 Münster

Phone: +49 211 91741 - 4800

Internet: www.nrbank.de

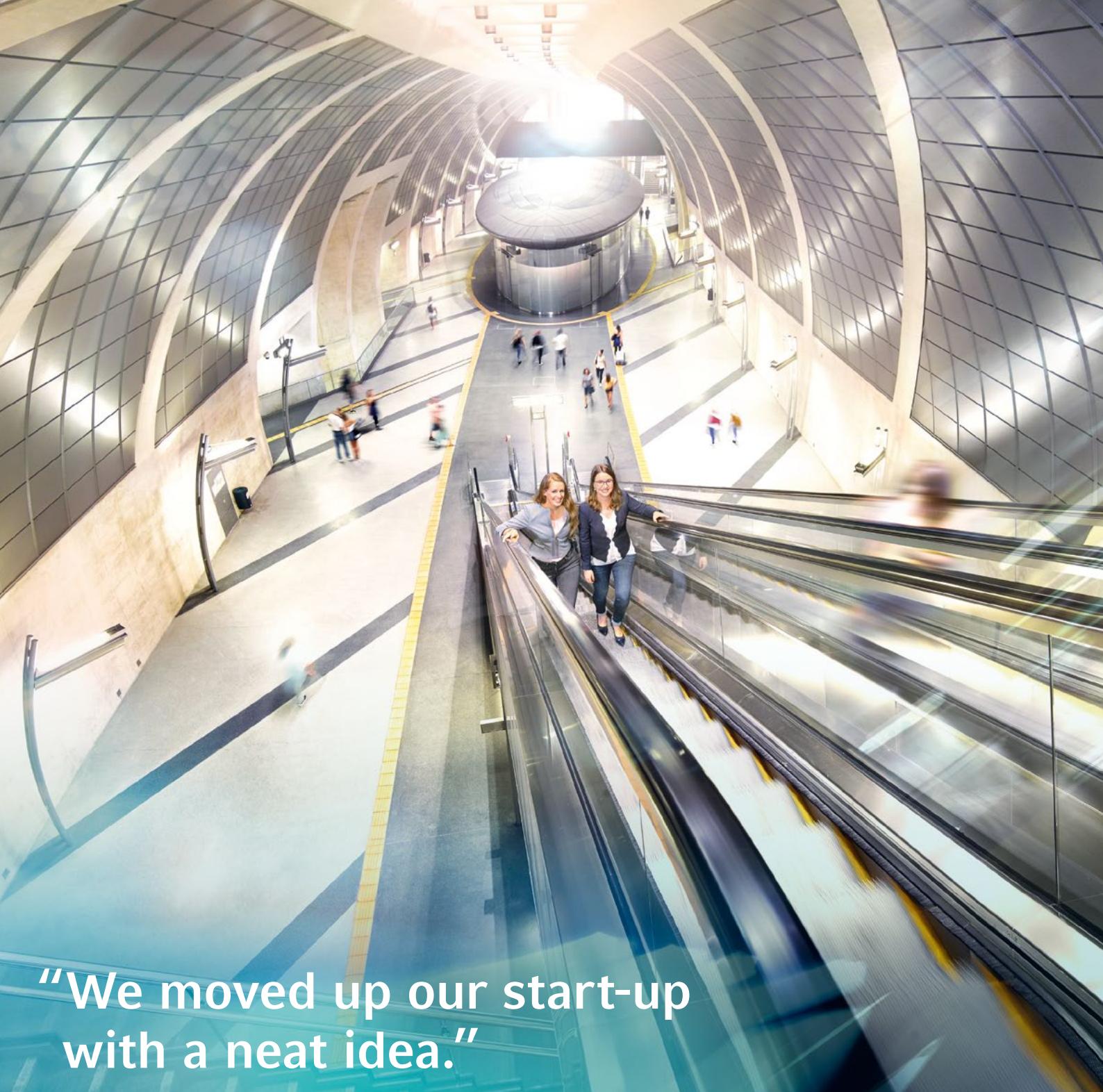
Founding year: 2002

Number of employees: 1,474

NRW.BANK

NRW.BANK is the promotional bank of North Rhine-Westphalia. NRW.BANK essentially orients its equity products on the business life cycle. With NRW.SeedCap it doubles initial investments of Business Angels in innovative start-ups. In addition, NRW.BANK supports start-up financing through its involvement in regionally based early-stage funds. Young, innovative and often technology-oriented companies are supported via "NRW.Venture".

Within the "win NRW.BANK Business Angels Initiative" private investors support young entrepreneurs with capital and know-how. And the "NRW.BANK.Venture Center" is a specialist advisory unit for business founders from universities and research institutions as well as innovative start-ups.



**“We moved up our start-up
with a neat idea.”**

**We promote what's moving
North Rhine-Westphalia.**

Tanja Zirnstein and Katharina Obladen, founders of UVIS, disinfect escalator handrails with UVC light. The start-up benefits from the NRW.BANK's early stage financing, which supports entrepreneurs in North Rhine-Westphalia with a wide range of promotional tools. Moreover, the state's promotional bank acts as an intermediary between companies and business angels, making them the ideal partner for private investors in search of new business opportunities.





Hochschule Niederrhein

University of Applied Sciences

Reinarzstr. 49, 47805, Krefeld

Phone: +49 2151 822 4047

Internet: www.hs-niederrhein.de

Founding year: 1971

Number of employees: 880

Niederrhein University of Applied Sciences

The Hochschule Niederrhein is one of the largest and top-performing universities for applied sciences in Germany. We are a renowned educational and research institution. With ten faculties, 245 professors, more than 14,000 students, we are an important contact for companies from the region for research and transfer.

Our activities in CLIB include Molecular and Industrial Biotechnology, Sustainable Organic Chemistry (Faculty of Chemistry, Institute ILOC), Applied Mycology, Microbiology, Food Biotechnology (Faculty of Food, Nutrition and Hospitality Sciences, Competence Centers CCMB, KAMU), Sustainable Textiles (Faculty of Textile and Clothing Technology, Institute FTB), as well as Logistics and IT (Faculty of Industrial Engineering, Institute GEMIT).



The Novo Nordisk Foundation
Center for Biosustainability

Kemitorvet 220, 2800 Lyngby
Denmark

Phone: +45 45 25 80 00

Internet: www.biosustain.dtu.dk/english

Founding year: 2011

Number of employees: 253

Novo Nordisk Foundation Center for Biosustainability

Why not use the smallest factories to make the biggest possible amounts of high-value chemicals and pharmaceuticals – biosustainably? The Novo Nordisk Foundation Center for Biosustainability is doing exactly this by developing new technologies for engineering microbes, turning them into cell factories, which are designed for efficient production of a specific compound in a commercially competitive way. The Center is part of a cluster of research centers that aim at attracting the world's best researchers, and thereby creating the basis for an internationally oriented and innovative research environment of the highest quality to benefit society.



Pfeifer & Langen

Aachenerstr. 1042a, 50858 Köln
Research Facility: Dürener Str. 40, 50189 Eisdorf
Phone: +49 221 4980 0
Internet: www.pfeifer-langen.com
Founding year: 1870
Number of employees: 2,300

Pfeifer & Langen GmbH & Co. KG

Pfeifer & Langen operates five sugar factories in Germany. Sugar beets grown by farmers are processed to white sugar and the by-products sugar beet pulp and molasses. These products and intermediate products such as thick juice can be used as carbohydrate sources for biotechnological processes.

Pfeifer & Langen supplies sugar and sugar specialities for the food industry and the consumers. The production process of Pfeifer & Langen starts when the sugar beet seed is sold to the farmers and ends when the sugar is placed on the grocery shelves. We are looking for opportunities to use our expertise in the process chain beginning with agriculture and ending in the food retail trade for new processes and products connected with biotechnology. Even though we offer deep knowledge in the development of enzymatic processes and enzyme production.

Pfeifer & Langen is with its affiliated company Savanna Ingredients GmbH active on the field of production and sales natural functional carbohydrates.



Head Office Kölumer Weg 33, 41334 Nettetal
R & D Facilities : Stöckheimer Weg 1, 50829 Köln
Phone: +49 2162 77859
Internet: www.phytowelt.com
Founding year: 1998
Number of employees: 24

Phytowelt GreenTechnologies GmbH

Phytowelt GreenTechnologies is an experienced SME performing R & D services and production in green and industrial biotech. Our knowhow in plant tissue culture and process engineering assists our clients in plant breeding or in the utilisation of secondary metabolites and enzymes for industrial use. Thus we enable the production of valuable molecules within plants via key technologies like protoplast fusion or gen editing, or outside of plants in microbes, via fermentation or bio-catalysis. Our approach to combine plant and industrial biotechnology maximizes synergies and promotes sustainable development in the F&F, pharmaceutical or agricultural industry. Such technologies are developed in our state-of-the-art fermentation which is also available to external customers for pilot projects.

PROvendis GmbH

PROvendis acts as a professional service provider in the entire field of IP management for more than 40 universities and extra-university research institutions as well as for companies and start-ups.

We provide an exclusive access to licensable inventions of approx. 30,000 scientists from the areas of medicine, natural sciences and engineering.

Our Life Sciences Team consists of experienced innovation managers with professional expertise in the fields of biology, chemistry, medicine and pharma. They identify suitable partners, negotiate license agreements and promote long-term research collaborations..



Schlossstr. 11-15, 45468 Mülheim an der Ruhr

Phone: +49 208 94105 0

Internet: www.provendis.info

Founding year: 2001

Number of employees: 41

Qingdao Institute of Bioenergy and Bioprocess Technology Chinese Academy of Sciences

The Qingdao Institute of Bioenergy and Bioprocess Technology (QIBEBT), Chinese Academy of Sciences is one of China's primary national research institutions for renewable energy and green materials, focusing mainly on research and development of the resources, technologies, products and processes for bio-based energy and materials.

QIBEBT currently has a staff of 800, 470 of whom are full-time employees and 330 are graduate students. The institute offers PhD, Master and Postdoctoral programs in biology, chemical engineering and technology, and material science and engineering.

The institute attaches high importance to promoting international cooperation and has more than 170 global partners including Boeing, Shell, P & G and Total.



No.189 Songling Road, Laoshan District,

Qingdao, 266101, P.R.China

Phone: +86 532 80662640

Internet: <http://english.qibebt.cas.cn>

Founding year: 2009

Number of employees: 470

Saint-Hyacinthe Technopole

Saint-Hyacinthe Technopole manages economic development on the city of Saint-Hyacinthe's territory. Its mission is to attract new industrial and commercial businesses, as well as promote and develop tourism. One of the Technopole's main tasks is to attract potential investors to the Maskoutan region. It works closely with investors to help get their projects set up in our area and ensure their success. It also manages and develops the technology park, the City of Agri-Food, Veterinary and Agri-Environmental Biotechnology. The Technopole is in charge of managing and selling lots in the industrial parks. The Technopole also helps established businesses in the city centre with their development projects, namely by securing financing packages and guiding them.



1000 Dessaulles, J2S 8W1 Saint-Hyacinthe, Quebec, Canada

Phone: +450 774 9000

Internet: www.st-hyacinthetechnopole.com

Founding year: 2003

Number of employees: 14

Scheele Wetzel Patentanwälte Partnerschaftsgesellschaft mbB

We Protect Your Intellectual Property

Scheele Wetzel is a boutique IP law firm offering services in all areas of German and European patent, trademark and design law. Our clients range from large enterprises, small and medium sized businesses, universities, institutions to private inventors.

The firm is a cooperation partner of US based law firm RatnerPrestia PC with offices in Philadelphia, Washington and Wilmington. The attorneys at Scheele Wetzel have been shareholders of RatnerPrestia and thus have a strong personal and professional relationship to the firm, which allows them to solve client's needs in European law as well as US law on short notice. By combining our patent attorney services and technical expertise in engineering and natural sciences, we effectively support our clients in obtaining, defending and enforcing their intellectual property rights.

The firm is located directly beneath the European Patent Office in the heart of Munich.



INTELLECTUAL PROPERTY

Bayerstr. 83, 80335 München

Phone: +49 89 125012162

Internet: www.swp.legal

Founding year: 2021

Number of employees: 3

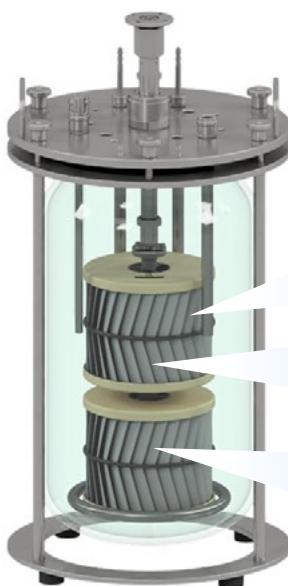


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RWTH Aachen - Institute of Biotechnology

Prof. Schwaneberg's research group at RWTH Aachen University is a world leader in protein engineering using guided evolution and rational design. Projects range from basic research to understand structure-function relationships to method development for guided evolution and optimization of biocatalysts for sustainable production from renewable resources, including enzymes for the synthesis of pharmaceuticals, detergents and agricultural chemicals.

Prof. Schwaneberg is spokesperson of the profile area Molecular Science & Engineering of RWTH Aachen University, director of the competence center Bio4MatPro, member of the Centers for Molecular Transformation and Circular Economy, co-initiator of the Center Smart Industrial Agriculture and aims with his team to advance bioeconomy and the biological transformation of industries within a sustainable circular economy.



RWTH Aachen University, Institute of Biotechnology, Worringerweg 3
52074 Aachen

Phone: +49 241 80 24170
Internet: www.biotec.rwth-aachen.de
Founding year: 2008
Number of employees: 52

Schnee Research

Schnee Research sees itself as a mediator between financial markets (e.g. investors) and small to mid-sized companies in different areas (e.g. biotech, chemical industry). Having worked for some years as analyst in the financial industry (independent research house, and rating agency), I now keep strong ties to the chemical industry from my background as a trained chemist (Dipl.-Chem.) and to biotech from my thesis work. My business activities in the area of white biotechnology are focused on evaluation and scouting. I focus on the analysis and evaluation of privately owned as well as listed biotech companies or their development projects.

I was contracted as independent specialist by an investment bank to consult and assist a white biotechnology company in obtaining funding. Schnee Research offers two different services directly or via its cooperation partners faireseach (pure-play financial research) and Breslin. As a consequence, Schnee Research can span an investment bank's value chain with its entire network. The services of Schnee Research are closer to the money market than to production.



P. O. Box 1104, 63461 Maintal
Phone: +49 6181 9455 262
Founding year: 2002
Number of employees: 1

SCION - New Zealand Forest Research Institute Limited

Scion is a New Zealand Crown Research Institute that specialises in research, science and technology development for the forestry and wood-derived materials: tree improvement, wood-related bioenergy, industrial biotechnology and high-value manufacturing. Scion is developing biorefinery processes to create new green chemicals and biopolymers from renewable resources, with a focus on lignocellulosic biomass: soft wood.

We develop microbial and enzyme-based processes that can be used by industrial partners for the production of valued compounds, enzymes and other biological products.

Scion is New Zealand's centre of expertise in bioplastic research and development: production and manufacturing of biopolymers as plastics, adhesives, coatings, foams, pulp/packaging, and fibre-composites.



49 Sala Street, 3010 Rotorua,
New Zealand
Phone: +64 7 343 5899
Internet: www.scionresearch.com
Founding year: 1947
Number of employees: 300

SenseUp GmbH

SenseUp develops and optimizes microbial strains for industrial amino acid production. Using its revolutionary metabolite-sensor based screening technology, SenseUp offers strains with superior productivity, massive IP-generation and short development times. The SenseUp-Technology is currently adapted to non-GM compatible natural evolution, enabling unique optimization of probiotic microorganisms in near future.

As a spin-off from Forschungszentrum Jülich, SenseUp combines decades of experience in microbial strain-development with novel disruptive technologies.



c/o Campus Forschungszentrum,
Wilhelm-Johnen-Straße, 52428 Jülich
Phone: +49 2461 61 5529
Internet: www.senseup.de
Founding year: 2015
Number of employees: 10



Gierichsstr. 6, 53840 Troisdorf

Phone: +49 2241 2715 2000

Internet: www.senzyme.de

Founding year: 2000

Number of employees: 45

Senzyme GmbH

Senzyme GmbH is innovatively operating in biotechnology and develops and produces technical enzymes and other additives for applications in bioenergy, biorefinement, as well as in the food and feed industries.

The company has long and substantial experience in the cultivation of fungi using solid-state fermentation as the preferred method. Senzyme GmbH maintains a quality management system and guarantees the effectiveness and quality of all its processes and products. The company always welcomes cooperations with scientific institutions and other companies.



Quality Enzyme Solutions

Forckenbeckstr. 50, 52074 Aachen

Phone: +49 241 938 569 79

Internet: www.sesam-biotech.com

Founding year: 2008

SeSaM-Biotech GmbH

As an 'all-in-one' protein engineering service provider, SeSaM-Biotech improves industrial enzymes for various industry sectors like the chemical, dish&fabric, feed and food sector.

Our expertise covers a range of enzymes including amylases, lipases, esterases, cellulases, glucose oxidases, laccases, monooxygenases, phytases, proteases, pectinases, polymerases and isomerases which we already have improved towards e.g. higher activity, thermal resistance or many other characteristics. With our cutting-edge technologies for mutagenesis (e.g. SeSaM-Technology, OmniChange), computational modelling of enzymes, and individually adapted screening assays we follow our vision:

To provide our clients with 'Quality Enzyme Solutions' to make their products eco-friendlier, more cost effective and more valuable.



Westring 303, 44629 Herne

Phone: +49 2323 956 5863

Internet: www.solarbioproducts.com

Founding year: 1965

Number of employees: 20

SolarBioproducts Ruhr c/o Wirtschaftsförderungsgesellschaft Herne mbH

SolarBioproducts Ruhr was founded by the business development agency Herne in cooperation with the Photobiotechnology group (Ruhr-University Bochum). SolarBioproducts Ruhr aims to intensify research projects, develop innovative ideas and bring together different fields of study.

We offer outstanding experience in the field of green biotechnology, including in-depth knowledge of biocatalysts from photosynthetic microorganisms. Our team is interested in collaborations across a broad range of fields. Our experience in gene expression and genetic manipulation is applicable in the field of renewable energy, but also for bioeconomical alternatives for industrial applications like the use of microorganisms as chassis for the production of chemical compounds or high-value products.



Rumyantseva 7, 220034 Minsk

Belarus

Phone: +375(2340)3-56-56

Internet: <https://synergysorb.ru/en>

Founding year: 2011

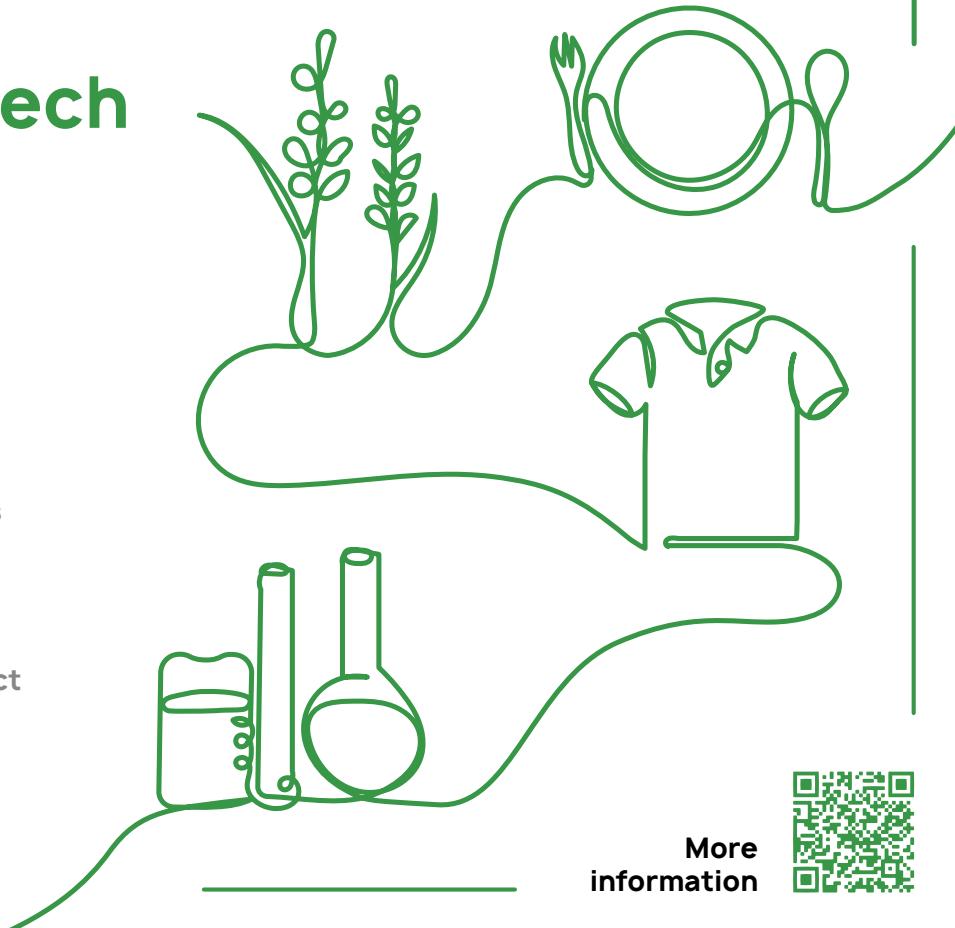
Number of employees: 88

SynergyCom SOOO

SynergyCom SOOO is focused on sustainable and cost-effective hydrolysis lignin valorization. SynergyCom SOOO produces lignin-based chemicals for various industries, including oil and gas, environmental, construction, agricultural, mining, and several others. Businesses across many industries are beginning to see benefits in utilizing intrinsic advantages of SynergyCom's hydrolysis lignin in its purified form as well as in its chemically modified forms enriched with high concentration of functional groups. SynergyCom SOOO pays a lot of attention to research and innovation aimed at creating environmentally friendly technologies and new lignin-based products.

industrial biotech strategy

- Invests early stage (Seed, Series A & B)
- Targets sustainable bio-based solutions
- Focuses on the **food, agriculture, materials, and chemicals** sectors
- Harnesses 10+ years of investing in industrial biotech
- Emphasizes environmental impact
- Partners with visionary entrepreneurs



More information



Sofinnova Partners

Sofinnova Partners is a leading European venture capital firm specialized in Life Sciences, with a focus on healthcare and industrial biotechnology. Based in Paris, London and Milan, the firm brings together a team of over 40 professionals from all over the world. The firm focuses on paradigm-shifting technologies alongside visionary entrepreneurs. Sofinnova Partners invests across the Life Sciences value chain as a lead or cornerstone investor, from very early-stage opportunities to late-stage/public companies. It has backed 500 companies over 50 years, creating market leaders around the globe.

Today, Sofinnova Partners has over €2 billion under management. For more information, visit: www.sofinnovapartners.com

Sofinnova partners

7-11 Boulevard Haussmann 75009, Paris
France
Phone: +33 1 76 23 41 00
Internet: www.sofinnovapartners.com
Founding year: 1972
Number of employees: 45

Ulrich Windmöller Innovation GmbH & Co. KG

UWI is a young, high-innovative company for research and development of new technologies and processes in the field of chemical and biocatalytic modification of vegetable oils. These oils which are used as bio-based raw materials in the production of polyurethanes (PU) can replace a large amount of the crude oil-based polyols. The start-up, founded by Ulrich Windmöller in 2018, is working on this project in the new, well-equipped laboratory with motivated employees at Detmold with the aim of supplying Windmöller GmbH - a cooperation partner - with tailor-made polyols based on local vegetable oils. These polyols are used as building blocks to produce floor coverings and underlays made of PU.



Ottenheide 60, 33758 Schloss-Holte Stukenbrock
Phone: +49 5237 609100
Internet: www.uw-innovation.de
Founding year: 2018
Number of employees: 4



Holzstr. 6, 40221 Düsseldorf

Phone: +49 211 7327 0

Internet: www.uniper.energy

Founding year: 2016

Number of employees: 12,000

Uniper Kraftwerke GmbH

Uniper is a leading international energy company, has around 12,000 employees, and operates in more than 40 countries. The company plans for its power generation business in Europe to be carbon-neutral by 2035. Uniper's roughly 35 GW of installed generation capacity make it one of the world's largest electricity producers. The company's core activities include power generation in Europe and Russia as well as global energy trading and a broad gas portfolio, which makes Uniper one of Europe's leading gas companies. Uniper sold more than 220 bcm of gas in 2020. In addition, Uniper is a reliable partner for communities, municipal utilities, and industrial enterprises for planning and implementing innovative, lower-carbon solutions on their decarbonization journey. Uniper is a hydrogen pioneer, is active worldwide along the entire hydrogen value chain, and is conducting projects to make hydrogen a mainstay of the energy supply.

The company is based in Düsseldorf and is currently Germany's third-largest publicly listed energy supply company. Together with its main shareholder Fortum, Uniper is also Europe's third-largest producer of zero-carbon energy.



Völklinger Str. 4, 40219 Düsseldorf

Phone: +49 211 67931 43

Internet: <http://nrw.vci.de>

Founding year: 1945

Number of employees: 6

Verband der Chemischen Industrie e. V. – NRW

The "Verband der Chemischen Industrie e. V. NRW" (the Chemical Industry Association in North Rhine-Westphalia) represents the politico-economic interests of more than 500 NRW chemical companies and NRW subsidiaries of foreign enterprises in contacts with politicians, public authorities, other industries, the world of science, and the media.

VCI NRW represents about 30 % of the entire German chemical industry, an industry that realised sales of € 50 billion in 2018 and employed some 110,000 staff. A main focus of the last years was the interlinking of industry and science especially in the area of biotechnology. The association's policies are shaped by a presidential council which works in an honorary capacity and the VCI NRW executive management.



Droevedaalsesteeg 4, 6708 PB Wageningen
The Netherlands

Phone: +31 317 480100

Internet: www.wageningenur.nl

Number of employees: 8,254

Wageningen University and Research

To explore the potential of nature to improve the quality of life.

Wageningen University and Research is a joint venture between the Wageningen University, which focuses on education and fundamental research, and Wageningen Research which conducts applied research directly for industry. In CLIB, the WUR is represented by five academic chair groups - Bioprocess Engineering, Microbiology, Systems and Synthetic Biology, Environmental Technology and Biobased Commodity Chemistry - and by the applied research centre Food & Biobased Research (WFBR)

The groups study microbial processes intra-cellular, cellular, inter-cellular, reactor, and environmental scale with a strong link to the chemical industry. The generated knowledge at the University is translated into application, by WFBR, for production and biorefinery of pharmaceuticals, healthy food ingredients, bulk chemicals, and biofuels.



Industriestr. 300, 50354 Huerth (Cologne)

Phone: +49 2233 48 6343

Internet: www.yncoris.com

Founding year: 1997

Number of employees: 1,160

YNCORIS GmbH & Co. KG

YNCORIS places particular emphasis on the engineering of individual plants - from process development and conceptual design to basic and detailed engineering, regardless of whether we just carry out sub-services or take over the general planning for every stage. YNCORIS does not supply one-size-fits-all solutions. Instead, we adopt a flexible approach and gear ourselves towards the specific requirements of the current project stage - step-by-step. Thanks to a broad range of diverse engineering fields and an extensive selection of methods, we can guarantee the highest degree of flexibility with regard to content.

The Chemiepark Knapsack near Cologne in Germany also offers companies a scale-up platform and access to know-how for bio-based production and integration into existing value chains. The innovative capacity of the Chemiepark Knapsack, solid infrastructure, plug&play services, as well as less bureaucracy and red tape all offer huge benefits for your company to commercialize your product.

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Qingdao, 266101

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119071 Moscow

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