



12 voices on the future of life science

– a report from Heja Framtiden



Human development for all

The future of mankind rests in the hands of life science. In this report, we get to know some of the profiles and driving spirits who in various ways strive for health and development.

WHEN I WAS commissioned to compile a report for STUNS Life Science, it felt equally honorable and frightening. How do you approach a subject that is outside the immediate scope of your knowledge?

It took a while before I found the answer: I had to approach it the same way as I always do – with curiosity and a systems perspective.

Since 2017 I have met and interviewed almost 250 futurists, researchers, industry experts, and entrepreneurs in the podcast Heja Framtiden – and probably at least as many in my work as a freelance writer and editor.

For some reason, I have always felt extra intrigued having conversations about issues concerning the healthcare of the future. There is something fundamentally exciting in the overthrow of old systems, that can uniquely manifest itself in how we view human development. Of course, it can feel like many processes are sluggish, but at the same time: in some fields, the development is extremely fast. The future of mankind is deeply linked to developments in life science, even though few people have insight into the work behind the scenes.

Some basic findings

♦ *Technology* is taking huge strides forward, in large part because more and more people are embracing an interdisciplinary approach. The materials sciences are connected with 3D printing, which hooks into the explosion of biodata, which promotes diagnostics and artificial intelligence, which supports the healthcare profession and enables an increased degree of self-monitoring and strengthens the preventive paradigm. Convergence is happening on a rapid scale.

♦ *Funding does exist*, but in Sweden, it is difficult to reach the really deep pockets for investments. Here, too, a combination of government support, business angels, venture capital, and credits will be the way forward. As of now, this is often a slow row but there are great opportunities for efficiency gains. And as more and

more people get convinced that the big winners of the future will be found within biotech, life science, and medical technology, the interest and expertise of investors will most likely increase in these fields as well.

♦ *Skills* are in short supply, but the pandemic's digitalization leap has at the same time made it possible – and necessary – to create new networks and collaborations across national borders. This is how work will need to be organized in the future. With this said, Uppsala can continue to work on strengthening its brand as an equally dynamic and peaceful place for research, leisure, education, and work.

♦ More *regulations* are on the way, while the opportunities for exciting research and new business models increase in step with the inevitable data explosion in both society and healthcare. In other words, further discussions are needed at both the regional level and in the EU's decision-making bodies to create a science-friendly environment.

Merging the spider webs

This report – or maybe we should call it a “magazine” since that's my background – has meant a way of working that is familiar to me. I place myself in the middle and try to navigate around how the ecosystem develops. After talking with key people on the inside, I spice it up with people and insights that come from the periphery of the spider web (or from completely different webs). Maybe it is right there, in the unexpected meeting, that the solutions and success stories of tomorrow begin to take shape?

You have certainly already encountered some of the interviewees and the topics they discuss. But I can guarantee that there are others that you have yet to learn about.

Anyways, I hope that this content will inspire you and invite you to new contacts, tests, or collaborations. This philosophy is also the basis for why STUNS exists: to get smart people to cooperate across their organizational boundaries. Then we can go as far as we like. We may not know exactly where we are going, but we go there together. Human development is not a zero-sum game.

Enjoy the reading!



Christian von Essen

Heja Framtiden
2021-06-29



This is how Sweden will take a stronger position in life science

What is required to promote Sweden's strengths in life science in order to take a clearer global position? Jenni Nordborg, the government's coordinator for the life science strategy, has a lot of challenges and opportunities ahead of her.

IN 2018, AFTER 10 years at Vinnova (Sweden's innovation agency), Jenni Nordborg took on the role as coordinator for the Swedish government's life science issues. The following year, a new national life science strategy was launched, and she got the opportunity to start up an office that reaches across various ministries at the Government Offices.

Her assignment is to implement the national strategy in collaboration with the many players within the life science industry. In total, there are 30 clear objectives in fields where the government sees both opportunities and challenges for the Swedish industry. With 40,000 employees and 10 percent worth of Sweden's export, it is an important task.

– It is clear that there have been major structural changes during the last 20 years, and now there is a need

for special efforts to maintain the importance and the value of the sector in our country, she says.

Nordborg believes that the situation became extra acute almost ten years ago when Astra Zeneca down-scaled parts of its Swedish operations at the same time as St Jude Medical – with the pacemaker in its portfolio – left the country.

– This development shed light on the question: either we work hard towards increasing investments in Sweden, or we will fall behind. But it requires a holistic approach. All countries compete for this industry, both in terms of jobs and revenue to the public treasury.

The potential of precision medicine

Jenni Nordborg is convinced that an important way forward is to invest more in precision medicine and

individualized treatments for cancer and other illnesses. These are often expensive drugs but if they work as a curative treatment, they can provide enormous societal benefits.

– Sometimes the investment and the profit do not end up in the same place, but we must dare to invest in Sweden. We need to strengthen access to health data and become better at clinical trials.

With a more preventive model of health care, Jenni Nordborg admits that the life science industry is faced with a dilemma: what is our role if we no longer need to treat diseases as often?

– I believe that the life science players need to collaborate with other parties and invest in new business models. Better health and economic growth must go hand in hand.



Both talent and funding are important keys to the development of Sweden's life science sector.

A NATIONAL STRATEGY FOR LIFE SCIENCE

The government has prioritized eight areas that are judged to be particularly important. Under these, 30 objectives are gathered.

1. Structures for collaboration
2. Utilization of health and care data for research and innovation
3. Responsible, safe, and ethical policy development
4. Integration of research and innovation in healthcare
5. Welfare technology for increased independence, participation, and health
6. Research and infrastructure
7. Skills supply, talent attraction, and lifelong learning
8. International attractiveness and fields in which competitiveness changes

The entire strategy can be downloaded as a pdf at [Regeringen.se](https://www.regeringen.se)

New skills are needed

The fact that both funding and talent are required – not infrequently to attract each other – can seem like a catch-22. But Jenni Nordborg sees that one gives the other.

– If we move from a biological to a more data-driven development, new types of expertise will most likely be required. Therefore, attracting talents – including through labor immigration – is one of the key issues in the government's strategy.

What opportunities are there to coordinate health data more effectively in Sweden?

– 30 years ago, we were early adopters with e-journals. Digitalization

started, but data management halted. I believe that the regional divisions have made the work much more difficult and that we need to approach this issue on a national level. We need a new start as well as a national gathering of forces.

Why is the data collection so sensitive?

– Our health data is as sensitive as talking about finances, and there is still some stigma around, for example, mental illness and venereal diseases. But coordinating health data does not have to be about collecting personal data, but rather about understanding patterns and being able to build personas. Today, we do not take

advantage of all the possibilities with synthetic data.

As we look ahead to 2030, Jenni Nordborg sees good opportunities for life science in Sweden, including a deeper knowledge of genetics, and AI as decision support for early detection and finding the right treatments.

– I'm optimistic. In ten years, we have taken important steps in Sweden to organize around both diagnostics and treatment, so that we can use precision medicine. We will also have a secure, robust system for using the existing health data. There will probably be a long list of data-driven innovations, and I hope we talk about completely different things by 2030. ●

NOTED



Myocardial infarction – in seven years?

Researchers at Örebro University have discovered a new biomarker that can determine the risk of a future heart attack in smokers and people with high blood pressure. It is the inflammatory marker IL-6 which, according to studies on 300 people having suffered a heart attack,

has shown elevated levels in comparison with an equally large control group. In some individuals, the increase occurred as early as seven years before the heart attack struck. The researchers hope that this finding will help significantly more people to change their lifestyle in good time and to measure the effects of this change. *Source: Warp News*



Ceramics and connectivity

Materials research is advancing, sometimes with unexpected results.

Professor Håkan Engqvist has started several companies that can contribute with small revolutions in different fields. Now he is calling for more funding and expertise in the innovation system.

HÅKAN ENGQVIST WAS instrumental in the start-up of Ångström Material Academy (ÅMA) at Uppsala University's UU innovation. The goal was to enable a stronger collaboration – in true “MIT spirit” – between the university and the Swedish research community. Today, he runs his own research department in materials science.

In recent years, Håkan Engqvist has increasingly focused on how ceramic materials can be used in the human body.

– Doctors and dentists use many different types of materials, the most common being plastics and metals. But ceramics have been a promising material for a long time – especially in dentistry, where function and aesthetics interact. After all, our teeth are ceramic from the beginning. Ceramics can be made biocompatible and even antibacterial, which are very beneficial properties as we see an

increasing demand for safe materials, without the risk of secondary infections.

Tailored skull

The company Psilox has developed a toothpaste for sensitive gums, but it is perhaps OssDsign that has attracted the most attention. OssDsign 3D prints ceramic implants for patients who have suffered severe head injuries or defects. First, a CT 3D X-ray is performed, and the information is sent to CAD engineers who produce a unique implant. The product is then printed, sterilized and packaged, and sent to the hospital before surgery.

Håkan sees a bright future for 3D-printed implants in different parts of the body but emphasizes that it is always a trade-off.

– You can theoretically print an artificial leg – but is it better, simpler, and more cost-effective? It is not at all obvious that it will be better to print

everything. For head injuries, however, this process is excellent.

Invigorating bone glue and cast intoxication

At the moment, Håkan Engqvist and a group of researchers are working on a new type of bone glue.

– It is very difficult to patch an elbow with screws and threads, but there are no adhesives that are safe, effective, and approved. We use calcium phosphate and phosphoserine – a common ingredient in sports drinks. It is still a long way to approval, but I think we have a very good product here.

A completely different innovation that has been incorporated is called Emplicure, which can be seen as an insurance against drug abuse. The need for such a product stems from the opioid crisis in the United States.

– It is a big problem that addicts quite easily can extract opioids

from many types of drugs. There are instructional videos online on how to smoke, chew, make tea, and everything else imaginable. There can be quite a lot of active substances in a patch that is made to last for 72 hours, so they must become safer to use.

The solution was found in cement.

– We cast a type of concrete for the drug. Then we put the drug in small grains of sand that we pour into the product. This makes it hard to crush them to quickly get the effect of the drug.

Commercial balancing act

Håkan Engqvist has long worked in different parts of the innovation system in Uppsala and sees how the various parts of it constantly interplay to move forward.

– I get energized when there is a need to fill and a goal to work towards – regardless of whether it is at a societal level or in communication. Within my field, it often coincides. And when you get a good team together, you can work quickly.

Is there still skepticism around commercializing research?

– Partially. And one must beware of conflicts of interest. On the other hand, I am an engineer – I need a denominator to find the driving force in the work I do.

He rather believes that entrepreneurship must be implemented in academia more naturally.

– Many people struggle with their career paths within the academy, but for some reason, entrepreneurship is not part of that chain. For example, I'm incredibly proud of OssDsign and what we do for our patients, but it gives me no advantage in academia. I believe that there also needs to be incentives academically, for example in the form of merit, if you have an entrepreneurial background. Otherwise, there is a risk of hindering the utilization part of the research.

What is your view on the future of life science in Uppsala? What more is needed for the ecosystem to thrive?



OssDsign 3D prints custom ceramic implants.

– If you want to start more new companies, it is obvious that more access to people is needed. Finding the right people and putting together a commercial team is still quite difficult.

Are issues with funding another threshold?

– Yes, Sweden is still a bit too small-scale in terms of funding. It is easy to start up, with the help of, for example, Almi, the government's business development agency. If you have enough ambition, there are good opportunities to get started. But then you have to hire and develop – and in life science, it usually takes a long time before you become profitable. There is too little money in the system. In other words, ideas and infrastructure are not the problems, but there is a lack of both the right people and money. With an increased influx of skills, money follows – and the other way around.

What future development do you see in this sector?

– Individualization and monitoring are important concepts. A modern car is hugely connected, and in the future, our bodies will be connected as well. It is obviously a good thing if an implant can communicate, since then you will immediately know if there is an inflammation or infection in progress. And I think that development is going to start in the

mouth. With artificial teeth, you can implement sensors that enable you to build exciting new applications using the cloud and big data.

What kind of solutions are we talking about?

– As an indicator of how good the environment is, you could measure the pH value with an implant and send a signal to an app. We could have sensors in our mouths to analyze food intake. The hip joint can warn you if you have sat for too long, or signal if you have gained a lot of weight. I think we have all the know-how to achieve this, but it requires interdisciplinary expertise. I know my narrow field, but it must be connected to a systemized thinking. I think that Sweden and Uppsala could be great at this. With funding and skills, the stars will align for someone.

Is the preventive approach difficult to apply to the pharmaceutical industry?

– In Germany, a lot is invested in these issues. But right now, many companies benefit from continuing as they do today. We must jointly create good cases that can be scaled up. Does the life science system want to be involved in preventing diabetes or should we just continue to treat it? The whole community benefits from preventive care, and we will see new winners in the future. But it has to start somewhere. 📍



The fight to prevent diabetes

Sana Alajmovic got tired of the reactive way of looking at diabetes. She founded Sigrid Therapeutics, which develops SiPore15[®], a silicon-based oral solution for blood sugar reduction. The company has now reached an agreement for large-scale production.

AS THE WORLD becomes wealthier, our lifestyle-related diseases are also soaring and diabetes is now one of the fastest-growing public diseases. According to IDF Atlas from 2019, more than 463 million people – 1 in 11 adults between the ages of 20-79 – live with the disease.

The good news is that diabetes can be avoided through relatively simple behavioral and lifestyle changes, while prediabetes markers are becoming increasingly accessible and measurable.

Sigrid Therapeutics' mission is to offer the market an over-the-counter drug called SiPore15[®], which can also be prescribed to patients before the disease has developed. Sana Alajmovic visited Heja Framtiden podcast in November 2019. Just over a year later, Sigrid Therapeutics reached a production agreement.

– We have scaled up our production together with one of the world's largest silicon suppliers, which has been difficult during the global

shutdown. Also, this type of product is not scaled linearly – when we have done tests and analyses at the molecular level, it does not mean that it works in the same way in the production of thousands of tons in special silicon furnaces. Therefore, this process has taken an extra long time.

80 million in funding

To date, Sigrid Therapeutics has raised SEK 80 million through Almi Invest, private business angels, and a San Francisco-based venture capital company. But Sana Alajmovic believes that there is a lack of funding in the Swedish ecosystem.

– It is good that there is a lot of research, strong universities, and competent consultants. Uppsala University also has one of the world's best incubators for startups. But we need more investors – many companies go to the stock market far too early because they cannot find funding.

She is looking for venture capital funds that are brave enough to enter

a market with high risk and long lead times, but where the upside can be large in the long run.

– It's different in the tech world, where you can scale up to a valuation of a billion SEK in just a couple of years. In life science, there are long development cycles and we cannot suddenly change our business model in the same way as a tech company.

In 2021, the last capital round will be put in place before Sigrid Therapeutics can take the next step in development.

– The phase we now are entering will be the biggest milestone for the company so far, she says.

Prevention is the way forward

Sana Alajmovic welcomes the digital development that can contribute to a more preventive health care system, but points out that the level of awareness must be raised throughout society.

– We need a broader approach to diabetes, and with digital aids, pa-

tients today can get help and support with everything that affects their health in some way. We also know that just changing your diet is not enough, as many people fail to do so in a sustainable way.

Sigrid Therapeutics is thus aiming to be included as a natural complement in primary care. When I go to my healthcare provider and it appears that I am at risk of developing type 2 diabetes, the doctor can prescribe a change in diet and exercise, and supplement with Sigrid's product SiPore15®, consisting of gentle silicon.

– We need to push the information about the disease forward and pick up the common warning signs, such as overweight, sedentary, fatigue, thirst, and frequent urination. There is a need for greater awareness of diabetes throughout society. The campaigns against smoking have led to an important change in behavior, and I believe that we should treat diabetes in the same way. ○



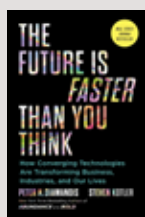
“We need a broader approach to diabetes, and with digital aids, patients today can get help and support with everything that affects their health in any way.”

SANA ALAJMOVIC

READING TIP

The Future Is Faster Than You Think

Peter Diamandis & Steven Kotler



Silicon Valley profiles Diamandis and Kotler are incurable technology optimists and have previously written books like

Abundance and Bold together. The Future Is Faster Than You Think came out just before the pandemic broke out, possibly causing it to lose some of its momentum.

But their theories about the exponential development of new technologies are still relevant. The really exciting effect lies in its convergence of different technological leaps. In the chapter The Future of Healthcare, the authors highlight the

possibilities that unfold with the combination of sensors, 3D printing, AI, robotics, gene editing, and quantum computers.

As a result, two major paradigm shifts are emerging. Firstly, that we are moving from reactive to proactive health care; and secondly the management of the data flood, where the global tech giants are expected to take big steps into the health sector.

The Six D's of exponential organizations

Diamandis and Kotler often return to their theory of “The Six D's” which characterizes technological development:

1. Digitized. Digitalization enables exponential development in accordance with Moore's law.

2. Deceptive. The initial growth curve after digitalization is often moderate and can be misleading. But a doubling of 0.1 to 0.2 is also a doubling and can be the prelude to a so-called warp curve.

3. Disruptive. As digital development picks up, operations become significantly more efficient and fast-growing, which has the potential to overthrow traditional industries.

4. Demonetized. As technology becomes cheaper with free copies, costs quickly disappear in the upscaling process. Producing an app that is downloaded ten times costs as much as one that is downloaded a million times.

5. Dematerialized. The need for clumsy gadgets decreases as the functions move into our smartphones. Without material and production costs, new services can scale quickly.

6. Democratized. With digitalization and lower costs, technology previously reserved for the global elite can suddenly reach people all around the world, regardless of income levels.



“We need an ecosystem for startups in digital biology”

Chip implants have in a short time gone from a fun way to open the gym door to being able to measure vital parameters in real-time. Entrepreneur and biohacker Hannes Sapiens Sjöblad believes that we are facing a paradigm shift when it comes to accessing biometric data.

HANNES SAPIENS SJÖBLAD is primarily known for his involvement in the biohacking movement. A notable part of this has been the work with implants – rice grain-sized NFC (Near Field Communication) chips that are inserted into the skin between the thumb and forefinger.

The areas of use have so far been exciting but limited. NFC technology has made it possible to open digital locks, show the ticket at the train, and upload some member cards.

But now, it is time for the next generation of implants. Hannes runs the company Druptive Subdermals, which recently completed an extensive study of biometric implants in collaboration with researchers at Karolinska hospital.

– A chip that can capture data in the body is a real game-changer. The vision ahead is for users to be able to measure and share biometric data in real-time – but it will require that the data is available in all contexts. Therefore, the measuring tool must be integrated with the body.

Making way for AI care

With an automated flow of sharable data, digital and personalized care can be taken to the next level.

– When I talk to a doctor, I should be able to share statistics about my vital parameters. Eventually, artificial intelligence can analyze my data flow and make predictions, since the algorithm can proactively see the pattern. The system captures warning signals

in good time and we can work preventively. By calibrating the implants to the individual user, they enable personalized care for real.

Hannes Sapiens Sjöblad believes that the tools we use for collecting personal biometric data today, such as bracelets and rings, will soon belong to a bygone era.

– You can compare it with aviation. The propeller plane was good – until the jet engine arrived. Wearables are clever and we have learned a lot from using them, but the user experience is too complicated for most people. We need to get rid of friction to measure and share data. If you instead have the sensor function inside the body you do not need to make an active decision to

measure. But the reading itself can be a choice.

One issue with the tsunami of collected data is, of course, how the information is to be managed and stored in a way that is secure and privacy-proof. In the wake of this, a new industry is emerging around aggregated health data.

– We are seeing more and more examples of these types of services right now. They are often located in Switzerland, where they have the world's strongest privacy laws. They are foundations or cooperatives, rather than traditional tech companies.

One example is Healthbank.coop, where users can collect all their health data from a variety of sources. It is also organized as a cooperative so that users of the service can vote and collectively decide on how the data should be used.

– It will be a distribution of data instead of capital. I think they have a very interesting model for the future since we have a hard time trusting the American or Chinese tech giants. Just as with money, it is about building trust and confidence.

Time to turn the system around

Hannes has on several occasions pointed at how the Covid-19 pandemic can accelerate the transition to a more preventive care system.

– I'm convinced of that. Distance consulting is now the norm, it's a behavior that has changed very quickly. In addition, door-to-door testing systems can also grow in other types of diagnostics. If you are ill, the worst thing you can do is go out on the town and sit in a waiting room with other sick people. It is much smarter with home care, that the care staff comes to you when needed. We also see new types of health centers that are open on evenings and weekends. I think this is a paradigm shift that we have just seen the beginning of. But continuously collecting data is a prerequisite for many other solutions.

You are also an advocate of collecting more genetic data. How could that benefit the life science industry, as well as caregivers and patients?

– There are different reasons why people take genetic tests. Most often it is about curiosity, that they want to learn about their heritage and family ties. However, a few percent of the population carry genetic variations that correlate with certain serious diseases, so discovering these as early as possible can be downright life-saving.


But according to Hannes Sapiens Sjöblad, the biggest societal benefit of genetic testing in the future is pharmacogenomics – learning about genes and their effect on different drugs.

– Society has not caught up on this, but the knowledge is increasing. Everything from ordinary headache tablets to specific cancer medicines have different effects on different people, depending on their genome. We need to start matching prescription drugs with genes, and that practice should ideally be performed routinely in pharmacies.

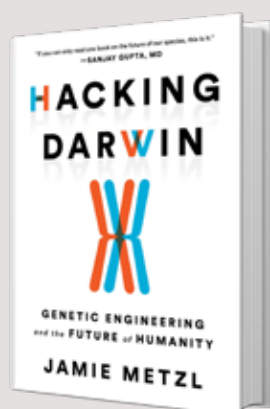
As an example, he mentions Estonia, where the Estonian Genome Project has been running since the year 2000 and has mapped the genome of 10 percent of the population.

– We can and should do that here as well.

What would you like to see more of within the Swedish life science system?

– I think that Sweden should build an ecosystem for startups in digital biology. We need to look at biology as information technology. How can we take advantage of the skills that exist and build a powerful ecosystem? Today, there is extensive research in life science and some successful companies, but we need breadth and rapid innovation cycles, just as we have in gaming, fintech, and digital services. We have to get a thousand flowers to bloom, and for that to happen, we need the startup culture. We must dare to fail and test our way forward more quickly. We must create that cultural soil. 

READING TIP



Hacking Darwin

Jamie Metzl

If CRISPR and genetic modification increase at the same exponential rate as many other new technologies – where will the world be in a few decades?

Jamie Metzl extrapolates today's reality into future scenarios that offer the reader a lot of interesting questions. If you can already choose between a sick and a

healthy embryo, why should you not soon be able to choose between brown and blue eyes, or between physical and creative conditions?

Scientific advances could even make it possible to produce countless new generations of embryos in the lab in a short time, with more and more desired – and fewer unwanted – properties. What is the limit for what we can do in the future and what consequences can it have?



Collaboration for a 3D-printed future

In the early days, 3D printing was mostly about plastic details and spare parts. But how can the 3D printer revolutionize the life science industry? That is what The Additive Manufacturing for Life Sciences Competence Centre is going to find out.

ADDITIVE MANUFACTURING

(AM) is another word for 3D printing and clearly illustrates what it's all about: adding material until a product is finished, instead of starting from a large amount of raw material and discarding what is left over. This lets you manufacture with precision and resource efficiency, two aspects that are highly interesting for both the industry and for drug development.

The new competence centre in Uppsala has equal parts funding from Vinnova, academia, and the business community, and collaborates with companies in needs-driven research projects. Cecilia Persson, professor of applied materials science, is Director of the center.

– We want to take a broad approach in the field. It's not just about the

products themselves, but we also look at regulatory aspects. How do you CE mark something that is only produced in one copy? And who is responsible for what is created when there are different people behind the levers?

New technology in rapid development

At the centre, there will be constant monitoring the emergence of new 3D printers, as well as new types of materials and applications that can be useful for the development of medical technology.

Cecilia Persson highlights four concrete uses for additive manufacturing in that context.

1. 3D-printed implants.
2. For medicines or delivery by other

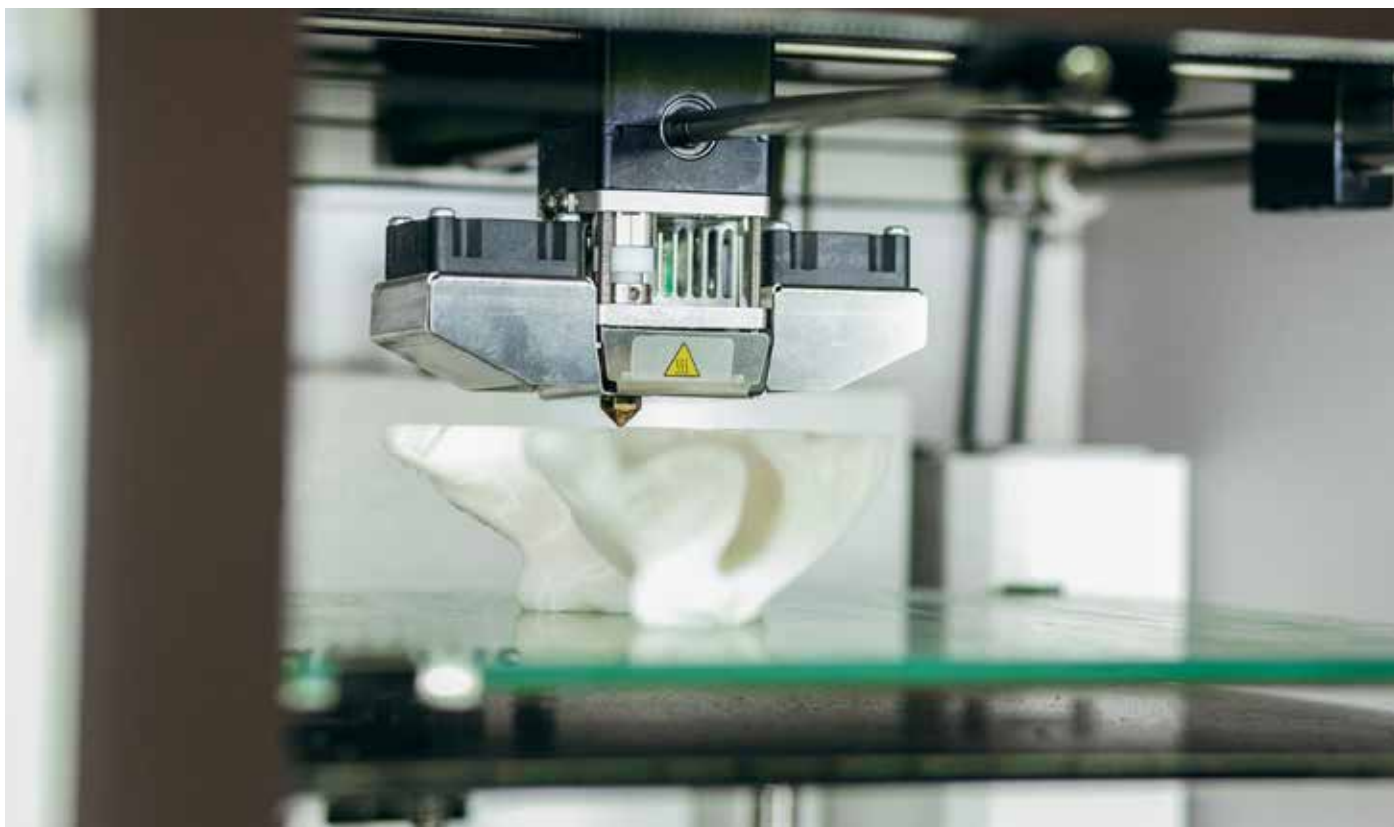
active substances, such as printing bacteriostatic materials, or into components for vaccine development equipment.

3. Print with cells, including organ-like objects on which early tests can be performed. One vision in the field is to be able to print organs for transplantation in the future.

4. Dosage of drugs, for example, exact doses of medicine for children.

The initiative will run for five years, but Cecilia Persson hopes for an extension after that time has expired.

– We will develop the field by contributing to the supply of skills for engineers, researchers, and employees at the companies in this field. There is a two-year master's program today at Uppsala University, but we notice that many companies want to be involved and enhance the level of



Prostheses and implants are important parts of 3D printing, but now comes a plethora of other uses.

“... the methods trigger innovation because you learn to think differently.” CECILIA PERSSON

competence further together with our partners.

In addition to the competence issue, high costs are a major threshold for 3D printing to really take off. Therefore, one of the center's main tasks is to make the technology available so that more people have an opportunity to try it out.

– There must be a payment model and a way to share the costs. Among other things, we will ensure that researchers and companies can rent equipment at Uppsala University to conduct specific projects. Today, some machines are very expensive while others can be built on their own. Our doctoral students have, for example, used 3D printing to print a component to the printer itself. The methods trigger innovation because you learn to think differently.

In the future, she hopes that 3D printing will find its way to hospitals, among other things to be able to create tailored implants. Cecilia Persson



By collaborating and sharing resources, additive manufacturing can get to more people faster.

is also looking forward to a more general development in the field.

– Above all, we can expect a lot of new types of materials with new properties. The most fun is finding materials that work inside the body or than can adapt to missing tissue. I very much hope for further developments in bioprinting, but perhaps mainly to be able to perform more accurate early evaluations of materials and drugs instead of having to use complete biological systems. ●

ABOUT THE COMPETENCE CENTER:

Additive Manufacturing for Life Sciences is a Competence Centre at Uppsala University that brings together many of the country's leading experts in additive manufacturing. The total budget for 2020-2024 is SEK 100 million.

The partner network includes 23 members:

Uppsala University, Royal Institute of Technology, Swedish University of Agricultural Sciences, Universitat Politècnica de Catalunya, Association For The Advancement Of Tissue Engineering And Cell-Based Technologies & Therapies (A4TEC), RISE, Swerim, Läkemedelsverket, Uppsala Region, Yrkeshögskolan Sandviken, Additive Composite Uppsala, AddNorth, Cellink, Disruptive Materials Operations AB, Erasteel Kloster AB, Exmet AB, OssDsign AB, Cytiva, Graphmatec, VBN Components, ÅF Industry, Kanthal, and Akademiska sjukhuset.



Should aging be classified as a disease?

In the future, aging will be viewed as a disease that can be cured (or at least slowed down) with the right type of medication. This is a theory that is increasingly emerging in longevity circles. Victor Björk became obsessed with the idea a long time ago and is now helping innovative companies to grow.

WHEN I FIRST contacted Victor Björk in 2019, it was because I realized that the view of aging had changed. In the fields of transhumanism and biohacking, the new truth was increasingly pronounced: aging is a disease, so why is not more research being done on how we can cure it?

Victor Björk studied molecular biology in Uppsala and became increasingly interested in how senescent cells play a role in the aging process. He traveled to Italy to meet the world's oldest living person, received some attention, and became involved in more and more forums for research on aging and life extension – popularized in the term 'longevity'. It is safe to say that he became obsessed with this topic.

Lifestyle choices are not enough

Personally, I had not fully understood the breadth of the scientific and medical research in this field. I was

still of the opinion that a long life was only defined by lifestyle factors such as diet, exercise, finding meaning, and a social context, which we learned through the studies of the so-called 'blue zones' that are found in certain parts of the world. Today, we have deeper insights into, for example, biohacking and periodic fasting.

When we met in the podcast studio in 2019, Victor Björk admitted that these were important parameters. But he went a step further.

– Lifestyle is absolutely important if you want to live to 90, or even 120. But somewhere there seems to be a limit. If you want to live even longer, medication is needed.

Shortly afterward, he left Uppsala to pursue his dream in San Francisco and New York, where most of the research and development around solutions to aging are being done – eagerly fueled by the IT billionaires'

capital (and perhaps their growing death anxiety). He worked with companies such as Bio-Age and Ichor Therapeutics to develop drugs for slowing down aging.

– I have worked in many different parts of the field. Among other things, I have looked at senescent cells and lipofuscin, a substance that accumulates in cells that do not divide. You could say it's like a biochemical goo that takes over cell function. Lipofuscin is common in old people, among other things linked to the yellow spot in the eye. One of my previous employers in San Francisco recently raised 90 million USD for their drugs to go to clinical trials. They work with hypoxia-induced factors that trigger the body to repair itself.

Two popular anti-aging drugs

There are mainly two substances on the market, which according to

early studies on mice are considered to be able to slow down aging. Metformin is perhaps the most well-known.

– Metformin is a medicine to treat type 2 diabetes, but it has been shown that those who eat it also have a lower incidence of cancer and cardiovascular disease. The advantage is that it has been given to diabetic patients for many years, so it is possible to study. I believe that we should carry out that type of study in Sweden, and I have written about this to the Swedish National Board of Health and Welfare. I take Metformin in myself since anyone can buy it in Southern Europe. In Sweden, you have to persuade your doctor to get it prescribed.

The other substance that often appears in longevity discussions is Rapamycin, an immunosuppressant given to patients with organ transplants, for example.

– There are no data on the effect of rapamycin on aging in humans, but there are a lot of studies on mice that show that it has a clear life-prolonging effect.

A major hurdle, says Victor Björk, is that credible studies cannot be done on humans as long as aging in itself is not classified as a disease.

– Researchers in this field must take detours and claim that they are studying effects on osteoarthritis or similar. I would say that many scientists now have started to understand this field – but not very many legislators.

Funding on the way

Today, Victor Björk lives in Brussels, close to both decision-makers within the EU and HEALES – The Healthy Life Extension Society – which organizes one of the largest longevity conferences in the world.

Victor sits on HEALES' board and works for a venture capital company, where his task is to find new exciting longevity startups that may need capital injections.

– The number of startups is steadily increasing, and this is now an industry that exists as an actual field. 20 years ago, there were no techniques to cure aging but now there is data to start from. A low-hanging fruit is senescent cells, which lie in the body as debris and do not participate in the functions of the body. If you eliminate them from mice, you can increase their lifespan. It is one of the hottest parts of rejuvenation technology right now. We will see major breakthroughs.

What type of companies are you going to invest in?

– I am looking for small, underestimated companies at an early stage, with a technology that makes them unique. The problem is that when an area becomes popular, you get many competitors with similar purposes. This causes some fields to be neglected. There are also many good companies with applications for aging research, but which do not work with aging as a single focus.

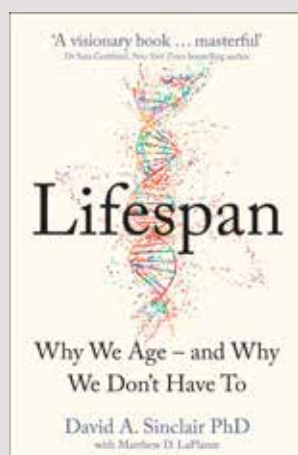
You are connected with some of the world's key players in the field. What do you see as the next step in longevity?

– On the horizon is technology to be able to reprogram cells so that they become younger. Probably by injecting for better functionality.

What could Sweden do to take a position in this field?

– Many labs have interesting technologies, but they need to be more visible. I believe in creating a research community specifically around aging. That way we could get collaborations and technology transfers between clinics and labs, as well as more startups and spin-offs from the universities. ●

READING TIP



Lifespan – We We Age – And Why We Don't Have to *David A. Sinclair & Matthew D. LaPlante, 2019*

David Sinclair has been researching at Harvard Medical School since 1999 and has over the years increasingly questioned the necessity of the decomposition of the human body. He contradicts the notion that it would be something “natural” with the simple statement that basically nothing in our modern society can be determined as “natural”. On the contrary, it is “natural” to fight diseases – including aging.

His own work on aging has a lot to do with information – he calls it The Informa-

tion Theory of Aging. But it is not about the genome's “digital” information, but rather about epigenetics – the “analog” information that tells our cells what they should be and what tasks they have. Over time, analog information deteriorates, causing the cells to lose their identity. Like a scratched CD record.

In *Lifespan*, Sinclair leads the reader through a large part of the research that is going on in the field. According to him, we can live a healthy and happy life even at the age of 120. And it is not a matter of living a long life just for the sake of it – with diseases such as diabetes, dementia, and fragility as constant companions. It's about adding more healthy years to our lives.



AI can support in every step

Artificial intelligence can be used in all parts of the pharmaceutical chain. That is the opinion of Christian Guttman, global AI manager at the technology software company TietoEvy.

CHRISTIAN GUTTMANN was the global head of AI at Tieto, which since our podcast conversation in early 2019 has partnered with Evry to form the twice as large organization TietoEvy, with 24,000 employees. Guttman is also active in two other roles – partly as a member of the Nordic AI Institute, partly at the Karolinska hospital where he supervises doctoral students in their research assignments.

He notes that it is the capital-strong American market that controls investments in AI for the pharmaceutical sector.

– Many people are now looking at digital platforms that can increase the availability of their medicines, among other things by promoting the interaction between doctors, patients, and pharmaceutical companies, Guttman says.

Increased availability with AI

As the regulations regarding patient communication are extremely strict, artificial intelligence is being developed to increase the prescribing of certain drugs. But Christian Guttman does not believe that it is

necessarily a question of working in a legal and ethical gray area.

– It is rather a more advanced way of increasing accessibility. For example, you can get detailed information about what treatments other similar patients have received and how they have experienced it. This comes with great value since AI can analyze which drugs a patient is taking, as well as how well they work and interact. PatientsLikeMe is a good example of such a platform.

The goal is to build more services where updated research information can result in advice based on the latest scientific articles. The fact that both patients and care providers are becoming more educated is a great benefit, says Christian Guttman, and adds that AI in healthcare has more areas of use than one might first think.

– AI is already present in every step of the drug process. It is being used in diagnostics, molecular analysis and to create new types of antibiotics with time savings of several years. Researchers who test manually in wet labs may be able to do 30-40 analyses a week. With AI and a

database, you can test hundreds of millions of molecules and work much faster. Others use algorithms to produce representative experimental groups so that clinical trials can be carried out more quickly.

Amy books appointments

In addition, there is of course the possibility of having an AI create new, tailor-made medicines.

– We still have strict legislation that requires evidence in the form of clinical studies. But since AI quickly can perform a patient analysis of genes and microbiome, it is possible to see if there are patterns in a dataset.

Christian Guttman also practices what he preaches. When I send him an email with an interview proposal, it is his virtual assistant Amy who answers and sends a link to his calendar for booking the appointment.

– It works quite well. She can also make transcripts from my Teams meetings and summarize the action points that apply. It's fun to test AI in a real-life situation to see this development up close. ●



Immunotherapy with the US in sight

Evelina Vågesjö's research in immunophysiology at Uppsala University led her to found Ilya Pharma. The company is now developing the next generation of immunotherapy to heal wounds in both the skin and the gastrointestinal tract.

IT ALL STARTED when Evelina Vågesjö, Mia Phillipson, and Stefan Roos collaborated in an interdisciplinary research project and found new functions in immune cells that could be developed to affect their behavior. The trio chose to commercialize their innovation, and the step from research to development has gone fast.

In short, Ilya Pharma's solution is about letting lactic acid bacteria produce the human therapeutic protein that heals wounds much faster. Through clinical trials and systematic experiments in animals, successful results have been achieved. Now a first product is being developed for the treatment of severe skin wounds.

– One area of application will be for diabetic patients with chronic wounds on their feet or legs. It is a common problem, but difficult to address. It can also be used for the treatment of wounds during surgery, especially in

diabetics because they suffer an extra high risk of serious wound complications, says Evelina Vågesjö.

She has always had great faith in her innovation. Ilya Pharma has just received its first patents approved in the EU and the USA. The first patent application was filed as early as 2014.

– We have five other patents in other markets, but approvals in the EU and the US were a real milestone for us. Now we can continue to build a broader portfolio while protecting our upcoming strategic projects.

What has the time in Uppsala looked like from a development perspective?

– We have used all parts of the innovation system, which has been particularly important for the patent process. I was involved in several other projects as a researcher, but it was very scientific. I wanted to work

with something that could benefit people and then patent protection is necessary.

Through UU Innovation, she received advice and help with applications and strategy. One important piece of advice was to build a platform to show that the technology works with different types of bacterial strains. Through a grant from a fund in the Swedish bank Handelsbanken, the company was able to pay for the first patent application. Evelina herself has participated in Uppsala Innovation Centre's training program for researchers who want to commercialize their research results.

– When we received a good response to the first patent application, we set up the company. Then we received 30 million SEK in EU grants from Horizon 2020, now known as the EIC Accelerator. That allowed us to work really fast, and we went

from animal experiments to clinical trials in only sixteen months. The large contributions have also helped us to raise additional venture capital, as well as to recruit sharp people to the company. Today we have a team working from six different countries.

What about the future? Evelina Vågesjö sees a big boom in cell and gene therapy.

– 90 percent of all companies in this field have been started after 2016, so it is a megatrend in the industry. In Europe, over 300 private investment rounds have been conducted and many of these innovations are now entering the clinical phase. Cell and gene therapy are changing the pharmaceutical industry in the same way biological drugs did 15 years ago. In five years, so-called microbiome drugs will also be common in clinical trials. It is very exciting.

Why are the big pharmaceutical companies not present in this market?

– Out of the 20 largest big pharma companies, only one has an in-house

program for cell and gene therapy products. The innovations come from small and medium-sized companies that are often formed around a specific product or technology. It is no longer uncommon for a company – especially not within cell and gene therapy – to take a drug candidate all the way to market approval. Half of all new approvals from the FDA and EMA are granted to a company that gets its first product approval. I think we are addressing the medical needs that the classic drugs have failed to address.

Are acquisitions an option for the larger players?

– It all depends on which therapy fields and skills you are looking for. The difference is that it is not always possible to build a generic process for this type of drug – the development must come from science, while both regulatory and investment assessment are more on a case-by-case basis. Since cell and gene therapy are more disruptive, it is often difficult to compare directly with traditional drug candidates.

“90 percent of all companies in this field have been started after 2016, so it is a megatrend in the industry.”

EVELINA VÅGESJÖ

What is your time horizon for the future?

– We plan to submit our first product for wound treatment for market approval in 2024, which is super-fast compared to many other projects. But it is still a long time and some risks remain until then. We will start with the US and the FDA since we see that Europe is a more fragmented market for our type of product. EMA has done a great job of harmonizing, but there is still some way to go – in some countries you can suddenly be placed in the agricultural category, and the processing can just as easily take two months as two years. In the United States, it is one process, one authority, and one market. 

PODCAST TIPS



Exponential Wisdom

Friends Peter Diamandis and Dan Sullivan run this short and dense podcast where they delve into exponential technologies and the entrepreneurs and researchers that create the future.

Peter Diamandis is a well-known Silicon Valley profile. He has, among other things, founded the innovation catalyst X Prize Foundation and the educational platform Singularity University, and authored a handful of books about the enormous opportunities that technological development can contribute in the future. Today, he runs several cutting-edge companies

and invests in tomorrow's visionaries. Dan Sullivan is a leadership expert and runs the company Strategic Coach. He is constantly working on new books and has, among other things, published the short but interesting *My Plan For Living To 156*, which is basically about us being able to get significantly more out of life by changing our mindset about death, aging, and retirement (we should ignore the latter completely, he says).

With Sullivan's older age (he is approaching 80) and his more humanist approach to development, the conversations become curious as Diamandis is in direct contact with some of the world's most interesting companies and technologies.

Together, they look at the education, healthcare, aging research, and business development of the future.



Health Tech

The Seattle-based media house GeekWire runs a handful of podcasts to complement its news reporting – including the future exploration *2025: Tomorrow, Today*. The Health Tech podcast addresses issues related to future care and health, including topics as pandemic control, AI, vaccine, and genetic modification.



Sweden's new AI hub enters the stage

The Swedish AI sector is starting to pick up speed, and the strategic hub AI Sweden is in full swing with its work. Now, the first sharp implementations in healthcare are also here.

AI SWEDEN IS based in Lindholmen Science Park in Gothenburg. A name change (from AI Innovation of Sweden) took place in the autumn of 2020, which at the same time meant a significant broadening of the work field. With funding from Vinnova, AI Sweden now has over 100 partners.

Henrik Ahlén has a long background as a consultant in digital care and e-health, and he has often expressed frustration that the healthcare sector has not progressed faster in digitalization issues. As newly appointed AI Change Agent Healthcare at AI Sweden, he gets the opportunity to work with healthcare issues at the absolute forefront of tech development.

At the moment, he is busy with the project Information-Driven Care and Health, where he surveys the leading players in Sweden, in order to spread

good examples further. Partners in the project include Swedish regions, hospitals, universities, municipalities, as well as large and small companies. Among the regions is Region Halland, which contributes with exciting AI applications from its operations, says Henrik Ahlén.

– Halland is at the forefront of AI. They have implemented the technology in clinical care and have succeeded in resolving certain legal issues. Among other things, they have developed algorithms that measure a patient's care costs throughout the system, so that a basis for decisions can be obtained and help with optimizing processes. It is very useful for many caregivers.

To predict how long a patient lives after their emergency visit, mortality predictions have also been developed at hospital emergency departments.

Together with AI Sweden, Halland's AI model for this will be packaged together with The Karolinska University Hospital to see how the findings can be scaled up nationally.

Decentralized AI unties regulatory knots

One challenge for artificial intelligence in healthcare is that large amounts of patient data are needed. This data is often collected at a single hospital or region and can usually not be shared with other regions for legal reasons.

One solution to the problem with disseminated data and patient integrity is called Edge AI. AI Sweden has built a testbed in Gothenburg called Edge Lab, where it is possible to work with the technology.

– Machine learning usually requires you to upload large amounts of data



By allowing the algorithms to analyze patient data locally, tough regulations can be evaded

to a common server where the algorithms can work. With Edge AI, you can instead send out AI algorithms to the local data sources to run calculations and analyses on-site.

Then the insights from the locally trained AI models – not the data – can be transferred to the central database without risking any patient data. This also heavily reduces the amount of data that is shared, which reduces costs. This procedure is still at an early stage so it needs to be tested. But it has great potential, and not just in the healthcare sector, says Henrik Ahlén.

Are you more hopeful about the future of health care now that you see what is happening behind the scenes?

– Yes, because now I am in an environment where we focus on the

opportunities and want to contribute to the distribution of good ideas. Of course, we also have lawyers on site who keep track of the legal obstacles that arise. AI is not a technology in the first place, but a transformation of business development. Therefore, the issue must be raised in the management teams, and we run specialized podcasts and training on the topic “AI for CxOs”.

Henrik Ahlén points out that healthcare processes are largely about logistics, which makes it excellent for optimization with the help of machine learning and AI.

– Everything that can be streamlined, automated, or quality enhanced benefits from AI. It’s a lot about raising the utilization rate of the available

“Everything that can be streamlined, automated, or improved in quality benefits from AI. It’s a lot about raising the utilization rate of the available resources, and the healthcare sector has a lot to learn from other industries.”

HENRIK AHLÉN

resources, and the healthcare sector has a lot to learn from other industries. The ten largest companies on the US stock market are heavily involved in AI, regardless of whether it is Amazon in e-commerce or mobility companies that develop self-driving vehicles. ●

REPORT



AI för bättre hälsa (AI for better health)

Magnus Österberg and Lars Lindsköld

In 2020, Swelife released a report on the opportunities and challenges that exist for AI in the life sciences. Magnus Österberg and Lars Lindsköld map the AI implemen-

tation in Swedish healthcare and within the life science system at large.

Several exciting examples and initiatives are presented – both from a Swedish and an international perspective – at the same time as thresholds in data management and regulations are identified and analyzed. **Swelife.se**



“We will contribute to Uppsala’s luminosity”

The new centre formation SweDeliver is developing a multi-disciplinary cluster around drug supply in Uppsala. The aim is to produce research that benefits society.

RESEARCH AND DEVELOPMENT

around new types of drugs is one of Uppsala’s great strengths. But how do you make sure that the patient really gets the right amount of medicine, to the right place in the body, at the right time? Enter SweDeliver – a new research collaboration with co-funding from Vinnova, Uppsala University, and the business community.

The term “drug delivery science” is used most frequently. Research on tablets, creams, and syringes does not always receive as much attention as the development of new drug substances or a new vaccine, but it is probably as important from a patient perspective.

At least, that is the opinion of centre director Christel Bergström, vice dean and professor at the Department of Pharmacy at Uppsala University. She is very hopeful about the possibility of making a difference in the ecosystem.

– The step from drug development in laboratories to clinical research is long and passes what is often described as the “valley of death” where many projects fail. This is where drug delivery comes in as an increasingly important part. We see that the demand for skills in this field will only continue to increase in the future.

In other words, research on drug delivery is about bridging the gap between drug development and the patients’ everyday lives. In the end, it is often a matter of the patient being able to administer their medicine on their own, regardless of whether it involves injections, inhalations, tablets, or patches with microneedles.

At the horizon, there is also a connection to monitoring systems and a holistic perspective where drug delivery is linked with diagnostics and treatment. Christel Bergström mentions both theranostics and

nanomedicine as possible solutions where an accurate supply of the drug substance becomes vital.

– For research to create real benefits for society, we must work multi-disciplinary and in close collaboration with other actors in this sector. There is often an invisible boundary between medical and technological research that we hope to break.

Broad collaboration that benefits everyone

SweDeliver will promote collaboration between many different players from both academia and the corporate sector, and so far about twenty researchers have been through the academic system. Christel Bergström is happy to highlight Uppsala’s unique position as a life science hub.

– We have ten minutes walking distance between pharmacologists, clinical competence, technology development, and authorities such as the Swedish Medical Products

“To attract a skilled workforce, we must be able to offer both exciting career opportunities and international school” **CHRISTEL BERGSTRÖM**

Agency. It is a fantastically broad and strong competence gathered in a small area. We are good at using it, but not always as good at communicating our strengths to the outside world.

Communication is connected with the supply of skills, she says. Recruitment processes and visa issues need to proceed faster to build a more attractive and robust system for attracting talent to Uppsala and Sweden.

– At SweDeliver, we want to contribute to Uppsala’s luminosity in life science. Together with other key players, we must look at the supply of skills from a longer perspective. How can we present Uppsala as an exciting region to live and work in? To attract a skilled workforce, we must be able to offer both exciting career opportunities and international schools, says Christel Bergström. ●



Christel Bergström, centre director for SweDeliver in Uppsala.

SWEDELIVER

Is “a world-leading research centre focusing on new strategies for parenteral, oral and pulmonary drug delivery.”

15 Scandinavian pharmaceutical and biotechnology companies are affiliated as industry partners. 18 doctoral students and post-doctoral students are affiliated with SweDeliver.

uu.se/forskning/swedeliver

LISTENING TIPS

Dr. Blood and the artificial heart

Ina Laura Perkins (aka “Dr. Blood”) visited episode 198 of Heja Framtiden podcast as research manager for Realheart, a Stockholm-based company that develops artificial hearts. Since then, she has become CEO of the company and will now ensure that successful animal experiments can be safely translated into tests on real people. The idea is that in the future Realheart’s hearts will be available in hospitals around the world when heart failure patients need transplantation. The potential is huge.

Life science at Clubhouse

Clubhouse is the social platform for conversations that took the world and Sweden by storm during the first months of 2021. Just like all platforms that grow quickly, there is a lot of content you can happily dismiss, but you will also find deeply

interesting and engaging conversations between some of the world’s sharpest brains. And the life science sector is highly represented.

Here are 12 clubs to follow to take part in the latest in the industry:

- MedTech 24/7 Lobby
- Swedish Life Science
- Uppsala Life
- Life Science
- Medtech
- Hälso och sjukvården 2030
- Future of Health (Care)
- Immunotherapy Forum
- Vision Ehälsa 2025
- AI For Life Sciences
- Fråga en spetspatient
- Warp Institute



Ina Laura Perkins aka “Dr. Blood”.



Clubhouse: hyped but educational.



Early detection of skin cancer using AI

Simon Grant is the CEO of medtech company SciBase, which develops medical instruments for detecting malignant melanoma and other types of skin diseases with the help of machine learning and artificial intelligence.

What's happening at SciBase and what does the future hold for you?

– We have launched new applications for non-melanoma skin cancer and skin barrier in Europe. At the same time, the solution for early detection of melanoma is beginning to take hold in the United States. We have also released the latest version of our platform Nevisense Go, a pen that uses neural networks to perform diagnostics. In 2020 we have examined 25,000 patients in Germany, where we have for the first time become profitable in a local market. In 2020, we also received a procedure code from the American Medical Association and we have recently submitted our first application for reimbursement compensation in Florida. This is a significant milestone for the company.



SciBase analysis pen provides great time savings.

– Analyzing the skin barrier is an interesting technology, and can be used for everything from eczema or food allergies in infants to outbreaks of skin conditions in adults. The technology is used by both researchers and industry partners,

to develop new areas of use and clinical products.

– Our future is divided into two parts. First and foremost, it's about sales and profitability through increased use of our skin cancer tools in Europe and the USA. Then it's about



SciBase's technology can be used for detection of skin cancer and other skin conditions.

developing AI algorithms for clinical applications in our product Nevisense Go. This platform is smaller, cheaper and simpler than previous versions, and enables us to expand to all our customer groups – GPs, pharmacies, and patients.

How do you view the possibilities for preventive care from a Swedish perspective?

– I am thinking of two main things:

we need to focus more on larger and long-term studies to show that preventive care is possible to implement effectively and with improved results. This requires time and focus, and it is not the sexiest field of research at the moment. Then we have to make sure that the financial incentives are in place for researchers, doctors, clinics, and patients so that preventive care becomes something that is sought after. Just because it looks like the "right

thing to do" does not mean that it will happen by itself.

What opportunities are there for AI in the life science and medtech sector?

– Both I and SciBase have been "all in" on AI for the past 10 years. Things have gotten better, but there is still a lot to do. AI will eventually become a key tool for most companies in life science and medtech – from design to clinical data analysis and algorithms for many different products. The great difficulty is to determine when it will happen. Once companies have overcome the first implementation threshold, AI offers strength and flexibility that will make it invaluable. How long it takes depends on a couple of key factors: the availability of simple AI development tools, and whether companies understand how AI can coexist with the increasingly tough regulations of healthcare. 📌

Listen to a longer interview (in Swedish) with Simon Grant in *Heja Framtiden* podcast episode 182.

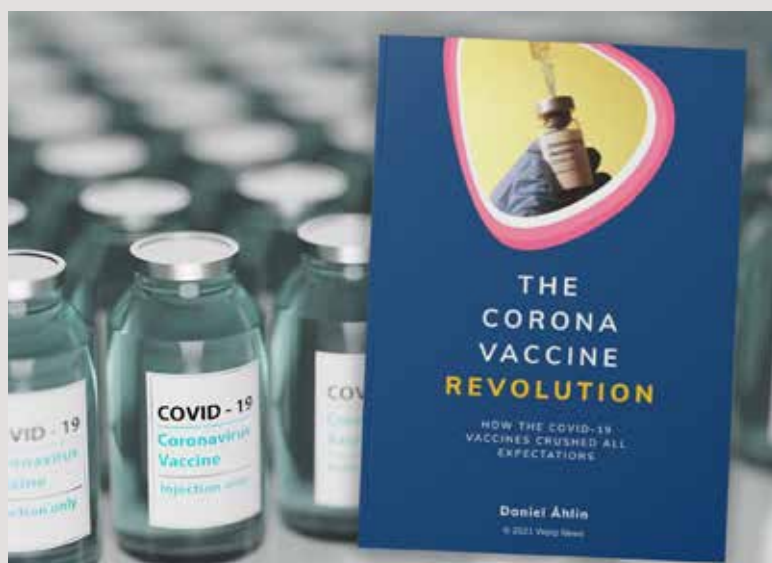
READING TIP

How could we get vaccines so fast?

In the e-book *The Corona Vaccine Revolution – How the Covid-19 vaccines crushed all expectations*, freelance journalist Daniel Åhlin explains how the development of the vaccines against Covid-19 took place at a speed that puzzled most assessors.

By going back to official statements from the pandemic's first trembling months, an interesting picture is painted – there were very few experts who dared to be optimistic that a vaccine could be developed in as little as 12-18 months. In reality, as we all know, it happened much faster. The pessimists were wrong.

Åhlin states that this astonishing achievement could take place thanks to global cooperation, strong funding, and a platform of existing basic research. The success bodes well for future challenges.



The e-book can be downloaded from warpnews.se for Premium supporters

Warp Institute is a foundation that works to "make the future come faster". Through a global community and the media house Warp News, it helps to spread optimistic news about progress and the future.



Hello there

Björn Lindh,
investor, and advisor in
Uppsala's growing food
tech sector

What is Uppsala's status in food tech development?

– Uppsala has extremely good conditions for building a food tech cluster with the world's third highest-ranked agricultural university SLU as a base. Uppsala has world-leading research, many conscious graduates who dream of entrepreneurship as a way to improve the world, a dynamic startup scene (as good as Stockholm per capita), good government support through UIC (which is the world's 4th ranked university incubator), access to venture capital in Stockholm, a new fine business park for food tech (Green Innovation Park), and a strong biotech sector to draw expertise from..

What possible interactions can you see with the life science sector? How could the two fields collaborate more?

– Today, improper diets and a system error in food production are the world's most common cause of death, through diseases such as obesity, cardiovascular disease, diabetes, a large proportion of cancer, and Covid-19 (where obesity has been a critical factor in many who have died). This is one of the main

problems that food tech is trying to solve. The megatrend in life science is preventive medicine, and the solution – if you detect risk factors early – is in 80-90 percent of cases a change in diet. A lot of food tech solutions are based on biotechnology – cell-based meat, for example – so technical competence is an important area.

What is your most important prospect in this field?

– In 2020 food tech sailed up as the hottest of all technology sectors, since four megatrends take place simultaneously:

1. The Greta effect has made people aware of the need to act quickly for the sake of the climate. Food choice is what can affect the climate the most, and new protein sources are one of the hottest fields of science right now.
2. The epidemic of our time is obesity, which leads to premature death in sequelae such as cardiovascular disease, cancer, diabetes, and Covid-19. By 2030, we will see a shift towards high-fiber, unprocessed foods with high nutritional value and low effects on blood sugar levels.
3. Automation takes place quickly in all parts of the food chain.
4. The way food is delivered is rapidly changing.

Sweden and Uppsala have a fantastic opportunity to understand these trends early and pave way for the unicorns of the 2020s in this field – and perhaps even become the EU's new food country. This opportunity must be seized. ●

Björn suggests 8 hot Uppsala companies in food tech

1. Optima Planta

Resource-optimized aeroponic growing systems for vegetables with a franchising model for very fast scaling up. At the moment they have two franchisees and by 2022 they are forecasting a rapid expansion.
Optimaplanta.com

2. Havredals

Oat-based dairy products. They have big ambitions and sales have already picked up speed. The products are healthy and the raw materials are grown in Sweden.
Havredals.se

3. NitroCapt

An entirely new chemical process for carbon-neutral fertilizer production (which accounts for two percent of the world's carbon dioxide emissions). Giant case if they succeed! The first customer may be signed as early as next year.

4. Grönovation

Vertical cultivation systems that have picked up good international investors. Initially working with medicinal plants, as well as herbs under the Deliplant brand.
Gronovation.se

5. Sciins

One of the world's first breeding farm for insects for food production (the market for insects for food is estimated to reach USD 8 billion by 2030). The founders are two world-leading and award-winning professors from SLU.
Sciins.com

6. Vollo

Peer-to-peer home food delivery by phone or website from ALL stores. Extremely scalable business model and many smart solutions in this seemingly simple service. There are probably few companies in this industry that have an equally long-term business model.
Vollo.se

7. Drupps

Makes water out of air. Has, among others, Coca-Cola in Saudi Arabia as a customer. They secure their water supply in the factory through Drupps' technology – a container on the roof that delivers 100 percent clean water.
Drupps.com

8. FoodNest

A social network for cooking. At the moment, they are perhaps the food tech company with the greatest potential in Uppsala. They can influence thousands of followers by pushing for healthy and sustainable recipes.
Foodnestapp.com



“The future depends on collaborations”

Individualized medicine is the future, but the road there is fraught with high costs and heavy research. One key is increased collaboration in the ecosystem. That is the opinion of Björn Arvidsson, managing director at STUNS Life Science.

UPPSALA HAS A unique position as a research hub – with short distances between universities, pharmaceutical companies, and decision-makers, there is an excellent breeding ground for collaboration and trust. At least, that thesis is the starting point for Björn Arvidsson’s work with STUNS Life Science, which was previously called Uppsala Bio.

Björn is a doctor of analytical chemistry and worked on developing new methods for determining the content of substances in the body. After a similar assignment at the Swedish Armed Forces Research Institute in Umeå, he started working with policy issues at a diagnostics company. He then built a Swedish department for policy development at one of the world’s largest pharmaceutical companies, before his accumulated experience led him to his dream job as managing director at STUNS Life Science.

Digitalization helps

Björn Arvidsson defines life science as “the ability to understand and strengthen the standard of living”, which includes drug development, medical technology, and diagnostics, as well as materials research and food development.

– At the same time, the digital transformation means that borders get blurred, which opens up new types of collaborations. When everything is connected, we get an increased resolution of the knowledge we need to conduct further research and development.

He sees great potential in a still accelerating digitalization of the life science sector.

– Historically, it has been difficult to aggregate information. Now we can see correlations between different types of research that can be used as a basis for decision-making in both healthcare, the pharmaceutical industry, and the public sector. By

increasing the precision, we can do more things right today than we did yesterday. Digital formats allow you to quickly find new candidates, create faster feedback loops, and get information on the use of medical equipment. The goal is for us to be treated as the individuals we are, not as the group we belong to. To get there, you have to constantly analyze and adjust.

A capital-intensive industry

Life science entrepreneurs are often frustrated over the lack of funding in Sweden. But Björn Arvidsson points out that the industry actually does receive a lot of money.

– We see quite large investments in health tech, but it is also an incredibly capital-intensive and risky industry – developing a completely new drug can cost up to 20 billion SEK. Development costs are also doubling every nine years, while the more tailored applications are targeting smaller and smaller populations.

In that perspective, says Björn Arvidsson, it is not surprising that it is difficult to take a drug all the way from the first idea to industrialization and mass market in a small country like Sweden.

– I think we should focus on the strengths we have and take advantage of the parts of the value chain that we are good at. We can not suddenly decide for the Swedish football league to become the best in the world. However, we can make sure that we produce individual players who can advance internationally. And I believe that collaborations are the way forward.

Prevention with higher resolution

When it comes to the development of a more preventive care system, Björn Arvidsson is equally hopeful and cautious. He describes the current situation as a sector with “low insight inertia and high maneuver inertia”.

– As we now start collecting more and more data from sensors, we can get a higher resolution and thus an earlier detection. At the same time, we still have a reactive funding model, which makes it difficult for organizations to find funding for the preventive approach. Analyzing DNA is a growing trend, and it generates a lot of information you can act on. But the health care sector does not have the answers yet. I’m optimistic, and I think it will happen.

But revolutions often come from the side.

Who has access to the data?

At the same time, it is extremely difficult to find balance in the regulations that surround health and health care. The research must be developed while personal integrity must be safeguarded.

– It is interesting that today, our health data is stored in so many places, but in the healthcare system, there is only information about our diseases. Through the mobile face recognition, one could potentially analyze hundreds of high-resolution images every day to determine how I feel, based on various vital parameters. It could revolutionize the work on mental illness. In the future, I think that health care needs access to more of this type of data in order to make the right decisions. Of course, we must have further discussions about how our data may be used, and by whom.

People’s relationship with the global tech giants is currently strained, and trust has been damaged in many places. In the same way, the increased rollout of AI services will build on a lot of trust, says Björn Arvidsson.

– The more data points we can collect, the more powerful AI we can create. If my doctor can get an increasingly better and faster decision support, that would, in the long run, benefit society as a whole. I believe

that the boundaries between sick and healthy will be blurred, as well as the separation between reactive and proactive care interventions. In addition, more tests and more data can mean increased complexity, as synergetic diseases can be detected, resulting in new challenges. The main question is what we should do with all the information?

Vaccine development through collaboration

During the pandemic, STUNS Life Science has closely followed the development of vaccines for Covid-19, and it is becoming increasingly clear that the scientific collaboration during the crisis has been quite impressive.

– Life science has been the answer to the medical challenge during the pandemic, and we see that when there is a “sense of urgency” it is possible to quickly find new solutions together. It should also be added that society has been a good customer, and innovation procurements of this kind will hopefully become more common. Then it becomes even more important to establish understanding, collaboration, and trust. Life science is already a Swedish branch of strength, and if we continue to break silos, the future looks very bright. ●

Listen to a longer interview (in Swedish) with Björn Arvidsson in *Heja Framtiden* podcast episode 213.

NOTED

Will cervical cancer soon be a thing of the past

At The Karolinska Institute, researchers have trained an AI to recognize the pre-stages of cervical cancer based on images of cell samples. A quick initial analysis can thus be performed with mobile microscopes at a distance, without having to take the detour via the lab. The first study was conducted on 740 Kenyan women, and now the work continues.



The future megamicroscope

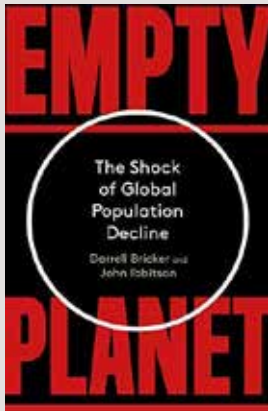
By combining the techniques of light-field microscopy and light-sheet microscopy – and let an AI analyze the images – researchers at the European research institute EMBL have succeeded in creating 3D images in a much faster and more high-resolution way than before.

AI creates synthetic proteins

A collaborative project between Chalmers, Vilnius University Life Sciences Centre, and the biotech company Biomatters Designs has found a way to create synthetic proteins. By allowing artificial intelligence using generative deep learning to study existing proteins, it is possible to obtain synthetic results that are similar to organic ones. When do you know you have succeeded? Well, when one part of the AI no longer can see the difference between existing proteins and the ones the other part of the AI has created.

Source: *Warp News*

READING TIPS



Empty Planet: The Shock of Global Population Decline

Darrell Bricker & John Ibbittson

It is a long-established truth that we are facing an unsustainable population explosion. In *Empty Planet*, the authors show that the opposite is happening: in all probability, the earth's population will peak as early as the middle of this century, and then decrease. The reasons are many, but it boils down to one simple fact: people are having fewer and fewer children. Many of the underlying factors are positive, such as women's education, access to health, care, and contraception, less religiosity, better living conditions, and increased urbanization. But it also places completely new demands on tomorrow's societies, where fewer and fewer people of working age need to pay for more and more old people. This is an eye-opening and fascinating read about a future dilemma that few people know about.

NOTED



Ditt framtida jag (Your future self) Sara Öhrvall

The business profile Sara Öhrvall has always been interested in the interaction between man and machine. Therefore, she has spent several years of her free time writing what would become the book *Your future self*. The subtitle says a lot about what it contains: How new technology is revolutionizing humans and making us stronger, smarter, and friendlier.

Sara Öhrvall draws a broad and interesting picture of how we can use the possibilities of technology in different ways in the future, and she has tested many of

the new products and services that are emerging in different parts of the world. These can be digital assistants analyzing our mood, clothes that prevent back problems, AI solutions that recommend how to communicate with a specific person, or sensors that measure stress and sweating. The book also raises important issues concerning ethics and data integrity, but the basic attitude is that this development will lead to very positive effects at both the individual and societal levels.

Also listen to an interview (in Swedish) with Sara Öhrvall in *Heja Framtiden* podcast episode 180.

PODCAST

Conversations about digital tissue samples

In the podcast *Digitalisamtal* (Digital Conversations), freelance journalist Anders Thoresson dives into the digital development of society every week through conversations with interesting guests and experts.

Listen in particular to episode 240, which is guested by Bengt Persson, professor of bioinformatics at Uppsala University and director of National Bioinformatics Infrastructure Sweden (NBIS), which helps researchers navigate

among the analysis techniques available for their work. He is also involved in the six-year EU project *Big Picture*, which aims to promote developments in digital pathology to improve diagnostics in Europe. Uppsala and Linköping University are two of many partners.

In Sweden, storage infrastructure is now being developed for this type of images, so that international research teams – and distributed algorithms – can easily access relevant data.

Digitalisamtal.se

Time for less salt and sugar in Swedish food

The government has asked Livsmedelsverket (Sweden's National Food Administration) and the food industry to investigate how to reduce the proportion of salt in Swedish foods and reduce the sugar content in foods for children and young people. A third mission is to increase

knowledge among the population to help them reduce their intake of "energy-dense and nutrient-poor foods".

Read an interview with Åsa Brugård Konde, nutritionist at Livsmedelsverket and project manager for the government assignment, at **framtidenshallbara.se**

THIS REPORT HAS BEEN PRODUCED BY HEJA FRAMTIDEN
ON BEHALF OF STUNS LIFE SCIENCE

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