Pressemitteilung

Fraunhofer-Institut für Zuverlässigkeit und Mikrointegration IZM

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01.04.2025 http://idw-online.de/de/news849951

Buntes aus der Wissenschaft, Forschungsprojekte Elektrotechnik, Umwelt / Ökologie überregional



Measuring environmental damage with the help of insects

Spring brings back the subtle hum of insect life, yet research indicates a troubling decline: studies conducted in Germany have described more than 75% decline in insect biomass over 27 years. However, insects are one of the most powerful environmental indicators on the planet, providing real-time insights into ecosystem health and climate shifts. To address this issue, Collette Wasielewski and Tom Cox founded SPAIA. They are collaborating with scientists and advisors from Start-A-Factory at Fraunhofer IZM to create an open-source system designed to gather global insect data and make it accessible to everyone who needs it.

Hi Collette and Tom. Before we talk about your startup, maybe we can take a step back and you can tell us about your background first. Where do you come from? What did you do before and why did you take a step into the startup business?

Collette: My background is in design, and before moving to Berlin, I worked for many years as an Executive Creative Director in the brand and advertising world. But over time, I became disillusioned - selling sugary drinks to teens and credit cards to families who didn't need more debt just didn't sit well anymore. For the past three years, I've been part of the Berlin startup scene, bridging the gap between brand, marketing and product. Alongside that, I've always had a deep love for small creatures - especially insects and the animals that eat them - toads, lizards, hedgehogs and birds. Growing up in South Africa, I watched them slowly disappear. I wanted to understand why - and when I looked, I found that research on this was surprisingly scarce. That's where the idea for SPAIA started to form, and that's also where Tom comes in.

Tom: I'm a creative technologist with a background that spans everything from sales to digital experience design and advertising - I once made beatboxing Coke cans - to building integrated systems and now applied AI platforms. Across all of it, one belief has stayed constant: that technology can connect us more closely with the physical world, not just the digital one. About 11 years ago, I started working with "Wildbiene + Partner", developing software to help manage wild bee populations. That project was a turning point for me. It opened my eyes to just how little we actually know about the insects that pollinate our food, maintain our ecosystems, and quietly keep the planet running. What I found was both fascinating and alarming: the data just wasn't there. Not even for bees - arguably the most popular insects we talk about. That realization kicked off a much deeper journey into the world of insects and the invisible roles they play. It also sparked a question: if insects are nature's real-time health vitals, why aren't we listening? That's the question SPAIA was born to answer.

With SPAIA you're decoding this 'invisible' environmental intelligence - turning nature's pulse into a new dataset for sustainable environmental management. Can you explain how you've set your vision to a mission and decided to make a business out of it?

Collette: A turning point for us was a study, that came out of Germany, the Hallmann et al-Study , published in 2017. It described a 75% decline in insect mass over the last 27 years. And of course the press got hold of this and proclaimed the insect apocalypse. Looking at the numbers, and realizing this very limited data was coming from conservation areas, we knew that to begin to address the problem we needed a fuller picture. We needed more insect data from more places. Furthermore, we realized that this was not a problem that two people alone could solve. We needed to create a business to make it sustainable and at the same time gather like-minded people around us, researchers, citizen scientists and

other businesses. That is what we wanted to create in creating SPAIA. Not just a business, but a movement. Tom: Our very first prototype was a very simple device to try and detect movement in front of a wild bee nest to see when activity started. This got us thinking about insects in motion, beyond just analyzing still images. And questioning whether we can understand insect populations better from their movement and activity.

Collette: At the same time we thought, wouldn't it be interesting to figure out what the conditions are where there are a lot of insects versus very few insects. The Hallmann-Study was one long term study done in Germany. There are very few other long-term studies looking at generalized insects and their biomass. Currently, we simply can't tell how many insects there are on the planet or what conditions they need. Especially in places like the global south, where we are from, which are some of the most biodiverse places on Earth. We have no data.

Ok, we've understood your passion now. But why is this critical for industry and What do insects have to do with biodiversity?

Collette: Insects make up between 60 – 80 % of all known animal species on the planet. They are the foundation of healthy ecosystems and directly impact key sectors like agriculture, forestry, ESG-driven land regeneration, and even areas like renewable energy, water management, and, of course, they can be devastating disease vectors. However, despite this, we still lack real-time, high-quality big insect data needed to inform proactive decision-making. It's crazy, but the study of insect populations is still largely being done the same way we did it 100 years ago. It's limited by species-specific data collection and labor-intensive field research - people in fields with nets and clipboards. This narrow approach, has made it nearly impossible to capture the bigger picture of insect-driven ecosystem change at scale. When it comes to Biodiversity, this is a buzzword at the moment. But interviewing a lot of people we found out that it is not a term that is widely understood. We spend a lot of time and money on conserving rare species like pandas and rhinos. But a lot of the more common species are actually more important when it comes to functioning ecosystems, these species are what others rely on as a food source or contribute to pollination and soil health for plant growth. There are populations of insects, that, if we lose them at this stage, we'll see ecosystems collapse.

Tom: Biodiversity loss isn't just an environmental issue - it's a financial one. When pollinators vanish, crops fail. When forests die, supply chains break. According to the Norges Bank, which manages the world's largest sovereign wealth fund, only 32% of their 9000+ global companies meet basic expectations for biodiversity risk management. A 32% score means nature risk is still invisible to most corporates - and that's a serious blind spot. It's not just ESG or tree-hugging - it's about supply chain resilience, regulatory risk, and, simply put, the ability to carry on doing business. If you're not tracking this risk, you're not managing your business - you're gambling.

But how does this all work? What`s the technology behind this and how do you work together with Fraunhofer IZM, and especially Start-a-Factory in this?

Collette: SPAIA is building the first scalable global insect data network, integrating low-cost hardware and AI-powered software to generate real-time insect activity and biomass intelligence at an unprecedented scale. Our system captures insect activity and

SPAIA is creating a simple, scalable way to understand the world through insects.

We're building a global network of smart insect monitors that track insect activity and local environmental conditions in real time. Our low-cost hardware and AI-powered platform help land managers, businesses, and their communities see what's happening on the ground - whether it's early signs of recovering ecosystem health or sudden environmental changes in the wrong direction. The system combines sensor data, smart recognition, as well as input from local users to turn raw insect activity into clear, useful insights - like maps, trends, photos, and recommendations for action. It's a tool for anyone managing land - starting with ecologists and ESG teams - to help manage biodiversity proactively, track progress, and make better decisions, backed by real data.

Tom: The devices we have pilots right now use a camera and we've been using pure algorithmic image analysis. The reason we are at Fraunhofer IZM and in Start-A-Factory is, because we've been testing 60 GHz Radar and seeing what size of insect we can detect with radar. We had devices outside in Zürich for about three months during summer last year, this year we will get devices out to capture the summer season. Some of the devices go out for a week, others are going there to stay. Why? Because one of the problems with environmental reporting at the moment is that reporting windows are short when you are working with field ecologists. One bad weather day can completely skew your results. Together with the MotionLab Berlin community, we've built the first 25 devices for our next batch of pilot projects. Our

next step is to build a fleet of 100 devices, that we can deploy all at the same time to gather hi-resolution comparative data from various different land-use cases.

What SPAIA Achieved So Far:

🛛 Vision-based monitor: Successfully detecting insect activity in real-world conditions.

² First pilot deployments: Vision-based insect detection and microclimatic correlation in active testing.

© Fraunhofer collaboration: Radar-based insect detection validation in lab tests, now preparing for field deployment and extended testing with alternative sensors.

Demonstration Community-driven scaling: Open-source DIY monitor handbook (v1) launched, engaging the maker and DIY tech community for feedback and iteration.

Second Wave of Four Pilot Deployments Secured: Expanding to land regeneration and urban biodiversity monitoring projects, working closely with ecologists specializing in spatial interaction to refine our data models and approach, further validating broader industry applications.

Collette: Together with the radar experts of Fraunhofer IZM we conducted a study into the feasibility of detecting insects with radar. We've also had valuable discussions with the experts from the sustainability department who shared insights on expanding our application areas and connected us with some of our new pilot partners. Most importantly Ulf Oestermann and Alexandra Rydz – the team behind Start-A-Factory: They have given us so much advice and support, based on their deep understanding of the hardware industry which is so much more complex than software. There's a reason they call it 'hard tech', because it's hard!

Tom: I think the experience of the engineers is phenomenal. If you look at the radar team: you need deep experience before you can get those results. It would take us hundreds of hours and tens of thousands of Euros to get the equipment and go through the trial and error ourselves.

Why did you build your startup in Germany? Aren't there more insects in other places of the world? Collette: From a research perspective, Germany has incredible institutions looking at biodiversity and species interaction ecology. It also has some of the top biodiversity programs for researchers in Europe. Not to mention that Germany is already quite advanced in terms of the insect protection laws. In many other countries from a business perspective, the legislation is not as advanced as it is in the EU, in terms of sustainability concerns, biodiversity and so much more. So, all in all: Germany for us felt like a good fit. And having world-class institutes like Fraunhofer IZM to collaborate with or ecosystems like MotionLab Berlin, all of these were really attractive to us, as well. The hard-tech-startup scene in Berlin is full of potential.

We're also very happy to have you here and working on you to spread the message from Germany to the whole world. But how long do you plan to stay here at Fraunhofer IZM and what are the next steps? Collette: The first iteration with the experts from the Fraunhofer IZM as part of the feasibility study has been

collette: The first iteration with the experts from the Fraunhofer IZM as part of the feasibility study has been successfully completed and we were able to validate the radar as a sensing solution. We're in the process of applying for various further research and development grants, many of them in partnership with Fraunhofer IZM and Start-A-Factory.

Tom: We are very passionately open source. And very happy to share what we are doing and publish the work, and look for collaboration and cooperation. I think our next step, which we are really excited about, is getting real insects into the labs of Fraunhofer IZM and verifying that we can get the same results. Outside of that we got the deployment coming up this week, where we're installing at Moawald in Moabit, together with an organization called Kiezwald, that develop tiny forests. We're installing with them to monitor their urban forest to determine what the effects are. And finally opening up the software to our community to actually come on and see results in the fields. Every device gets it's own page on our website where you can login and determine, is there an insect or not? We will use this data to improve our algorithms. So, there are a lot of plans and no end.

wissenschaftliche Ansprechpartner:

Collette Wasielewski & Tom Cox l https://www.spaia.earth/



Originalpublikation:

https://www.izm.fraunhofer.de/en/news_events/tech_news/spaia.html

URL zur Pressemitteilung: https://www.start-a-factory.com/



First prototypes of SPAIA in the field. Collette Wasielewski SPAIA

idw - Informationsdienst Wissenschaft Nachrichten, Termine, Experten



Collette Wasielewski and Tom Cox are working on Real-Time Environmental Intelligence Powered by Insects. Claudia Brall Fraunhofer IZM