

Collaborating to simplify sophisticated experimentation: the Antha and dragonfly® discovery partnership

In today's fast-paced drug discovery environment, pharmaceutical assay development groups need to handle an ever-increasing volume and complexity of assays.

Yet, many teams find themselves without additional resource to meet these growing demands. In this context, Design of Experiments (DoE) is a promising strategy with the potential to improve efficiency and outcomes. However, the transformative possibilities of DoE have, until now, been limited by an array of technical challenges. A recent product development collaboration brings together the innovative liquid-handling power of SPT Labtech's dragonfly discovery hardware and the flexible planning and data structuring capabilities of Synthace's Antha software. The partnership provides assay development groups with a toolkit to more effectively harness the potential of DoE and realise new levels of efficiency.

In this article, SPT Labtech's Product Manager Anne Hammerstein, and Synthace's Chief Scientific Officer Markus Gershater discuss the origins of the partnership, the customer problems that it solves, and the impact they hope the joint capabilities will have on the drug discovery landscape.



Markus Gershater

Chief Scientific Officer
and Co-founder, Synthace



Anne Hammerstein

Product Manager,
SPT Labtech



01 Can you tell us about your products and how they help customers?

Markus Gershater (MG):

Synthace's Antha software automates lab processes and the processing of the data that is generated by these experiments. Historically, automated processes have been programmed inflexibly, often requiring users to have coding expertise. By contrast, Antha provides flexible methods of designing automation execution and dynamically structuring the data outputs. In the past, scientists usually relied on unwieldy Excel spreadsheets to manage their data, spending hours manually cutting and pasting. Antha smooths out the experimental process from initial planning and hardware programming to subsequent data analysis.

Anne Hammerstein (AH):

The dragonfly discovery is a low-volume liquid handling platform that reduces assay development time and improves assay robustness in screening. Assay development scientists love the convenience of the instrument's ten independent liquid channels and the use of disposable syringes that minimise maintenance and cleaning. Importantly, it's an instrument that a scientist can walk up to and use since it requires no prior calibration or special programming skills.

02 How was your partnership initiated?

MG: We were discussing Antha's capabilities for flexible planning and programming of high-dimensional and sophisticated DoE approaches with a large biopharmaceutical company based on the West Coast of the USA. This customer had seen the capabilities of the dragonfly discovery and recognised the combined potential of our technologies. They suggested we should get in touch with SPT Labtech to discuss a collaboration.

It's noteworthy that, while SPT Labtech and Synthace are close geographic neighbours in the UK, we were brought together by our mutual contact in San Francisco!

AH: We became aware of this customer-led interest in implementing Synthace's Antha solution in tandem with the dragonfly discovery. Once we started working with the Synthace team to scope the project and do initial trial runs, we quickly saw the value of a combined approach. The fact that our two organisations share a strong ethos of customer care and innovation has enabled the partnership to come together very quickly.

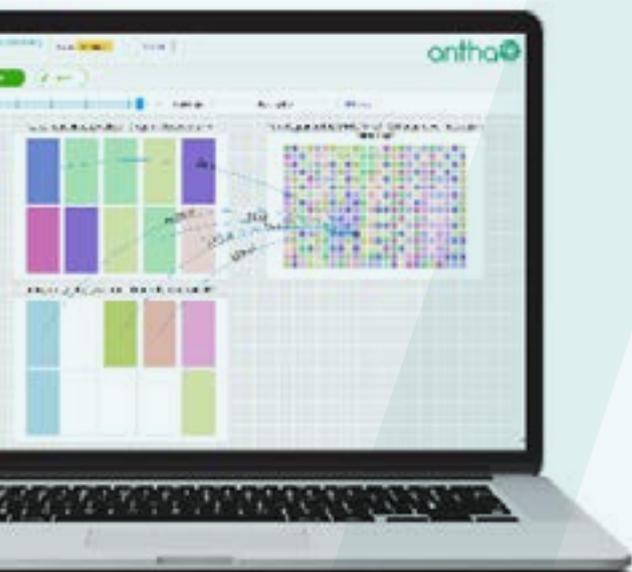
03 What appealed about working together, and what were your goals for the partnership?

MG: At a high level, we knew that we wanted to work with SPT Labtech as an organisation. Not only does SPT Labtech have exceptional standards of engineering, but they also share our commitment to practical innovation that is capable of making real, rapid changes.

From a technical standpoint, we could see that dragonfly discovery is substantially superior for the kind of experiments that are needed to address biological complexity. Because of this, we were confident that combining our technologies would result in a compelling, synergistic capability. Once we started working on a few ambitious initial experiments in the Synthace lab, our team was blown away by the gains in speed and accuracy achieved using Antha and the dragonfly discovery together.

As a company, Synthace has always aimed to help biologists do the sophisticated experiments necessary to address biological complexity. We could see immediately with this partnership the possibility of achieving these aims and executing these complex experiments for which the dragonfly discovery is vastly better suited than conventional pipetting robots.

AH: From our side, we knew that dragonfly discovery is a powerful instrument that can handle a great deal of complexity in dispensing. Nevertheless, we recognised the need to provide customers with a superior data handling solution that could work with our hardware and allow researchers to move away from working with the burdensome manual 'cut-and-paste' processes in Excel that Markus has described. However, we hadn't developed a firm picture of what the solution could look like in practice. By harnessing Antha's planning and data structuring expertise with our liquid-handling capability, we knew that we could jointly enable assay development teams to work at a completely different level than would be possible with either product alone. We aimed to provide a complete package to our customers that would allow them to move away from burdensome and error-prone manual steps, automate more effectively, and benefit from new efficiencies within their workflows.



04 What barriers have prevented progress in this area in the past?

MG: We founded Synthace to do precisely these kinds of biological experiments. We didn't begin as a software company, so we've tried a range of alternative methods and done both DoE and data processing by hand. These manual approaches made it very difficult to execute and interpret these experiments, so we sought to automate. From there, we created the Antha software. It's interesting to look back now and reflect on how our organisation might have developed if we had had access to the type of dispensing technology that dragonfly discovery now provides.

AH: DoE is not a new concept. While the approach has vast potential, until now, technical hurdles have made it very difficult to implement beyond initial proof-of-concept studies. Historically, there hasn't been a single product that could overcome the hardware and data limitations that our partnership is now able to address. The combined flexibility, speed, and robustness of our solution represents a genuine turning point.

05 What is the value to your customers of overcoming these barriers?

MG: The value goes beyond efficiency towards a more exceptional ability to identify new, promising candidates or conversely reduce the false-positive rate. The capability enables research groups to determine more accurately which potential drug is likely to be helpful for a particular disease by systematically optimising a specific assay. As we move to more sophisticated assays that look at cell-based systems as opposed to individual proteins, we can achieve more accurate insights and help to reduce the failure rate within pharma as a whole. Incremental advances, such as those provided by our collaboration, can address some of the most fundamental challenges within the pharmaceutical industry today.

AH: Assay development tends to be used early on in the drug discovery process. Once we have a promising biological model, we need to screen vast libraries often comprising more than a million compounds to find a 'hit' that elicits a response. Ultimately, these candidates may progress into the clinic and even become an approved drug to treat that particular disease. To screen this volume of compounds effectively, you need robust assays that conform to specific standards. Since this is generally a 'one-shot' opportunity, (there are typically no replicas in High Throughput Screening), you need to ensure that your assays are as robust and as predictive as they can be to guard against false-positives or false-negatives. When you are screening this volume of compounds even a small difference in your percentage hit rate can have a significant impact on your downstream work. As we have discussed, assays are evolving to become more complex. By optimising using our technologies, we can generate more predictive data to accelerate the time to pre-clinical and clinical stages of development.

06 What fresh perspectives did you gain from working together?

MG: We've been grappling with problems of a multi-disciplinary nature since we founded Synthace in 2011. Within our organisation, we have a lot of biologists and software engineers, so naturally, we tend to focus on how better software can help biologists in the lab. I didn't initially expect a piece of hardware to have the dramatic impact on our core objectives that it has done. The experience highlights that we need to apply a combination of biology, software, hardware, and mathematics to advance the drug discovery field.

AH: While it's common to look at a problem from your own organisation's perspective, science doesn't just require one particular toolkit; it's a multi-disciplinary field. Nowadays it's common to have bench scientists working alongside data scientists and statisticians. It was refreshing to see our partnership facilitate multi-disciplinary product development by bringing different experts together from their respective fields.

07 In a nutshell, what key benefit does the partnership deliver to customers?

MG: Our partnership supports customers with a dramatically more capable tool that enables them to execute sophisticated experiments and drive forward innovation.

AH: Our customers now have a complete package that unites both the hardware and software requirements to enable complex DoE.



08 What impact would you like to see your work together have on pharmaceutical development?

MG: I'd like to see assay development teams enabled to routinely run sophisticated high throughput optimisation experiments and solve problems that have historically been untenable. My hope for our work is that we empower scientists to create more sophisticated assays and increasingly predictive screens to accelerate and, importantly, de-risk drug discovery. Looking beyond drug discovery, in any setting where there is a high level of biological complexity, our joint offering will have a lot of power.

AH: In screening, we often think about a single target that's hit by a single drug candidate. However, this way of thinking often doesn't translate to biologically complex processes. By equipping scientists with the tools to bring more difficult assays into the drug discovery pipeline and work on more physiologically relevant models, we will enhance our ability to develop drugs in complex disease areas.

The laboratory environment is poised for dramatic change in the coming years through increased automation and the use of sophisticated software. This partnership between SPT Labtech and Synthace is a powerful illustration of the kind of transformation that can be achieved when scientists from across disciplines come together to solve the industry's tough challenges.



[Sign up to listen to a recording of our joint webinar \(Dec 2019\) and hear more of the practical insights and story behind the partnership and outcomes.](#)