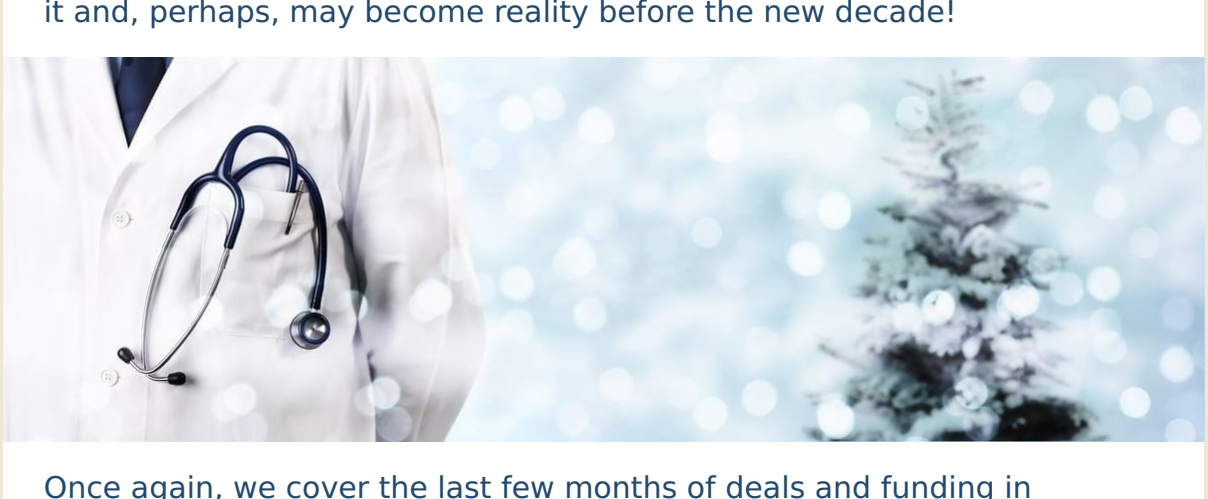
The Technology Partnership

inside:diagnostics

Dec 2023: Issue 5

Welcome to the 5th inside:diagnostics of 2023 – with updates and insight about the diagnostics industry from TTP. I'm Dr Giles Sanders, Head of Diagnostics at TTP.
Welcome to our final issue of what has been an interesting 2023. As we move into the Holiday Season and in keeping with numbers found in traditional Christmas songs, I thought I would share my 12 Holiday Season Hopes of Diagnostics as we move into 2024. I also have a dream for the new year – maybe it can be all of our resolutions to communicate it and, perhaps, may become reality before the new decade!



Once again, we cover the last few months of deals and funding in diagnostics and related arenas. We can hope that the recent large deals in the proteomic space of Somalogic and Olink may help reinvigorate the whole life science and diagnostics funding market. The Oxford Nanopore Technologies and Biomerieux funding agreement is certainly interesting, and we can imagine looks to move nanopore enabled sequencing ever closer to regulated diagnostic instrumentation and application.

Sharing our insight

12 Holiday Season Hopes of Diagnostics – and one dream for the new year …

This list covers some of my hopes for the industry in the coming year – be these areas of technical focus or funding considerations. It is certainly not comprehensive, but I hope you enjoy and agree with many if not all our hopes and dreams. We expect to cover some of these in more detail next year.

1. **The end of the Covid hangover**
   As we all are painfully aware, 2023 has seen challenges as the impact of Covid on the diagnostic market has continued to be visible. Innovative companies that overstretched themselves in delivering Covid test platforms have had to restructure, sell and some have, sadly, gone out of business. Concurrently, we have seen (not unsurprisingly) lower year-on-year revenue for multinationals as sales of Covid testing materials and tests reduced. So, despite underlying growth in diagnostics, we have seen continued belt-tightening to reduce overheads.

2. **Continued strong underlying growth in diagnostics**
   Despite the hangover, diagnostics continues to be fundamentally a strong and growing market. Once you remove Covid from company finances, almost all major diagnostic companies are recording revenue growth of around and over 10%. I really hope that we have come out of the last few years appreciating the opportunities in diagnostics and that growth will continue and help drive innovations in the market.

3. **Clarity on the regulation of Lab Developed Tests**
   Lab Developed Tests (LDT) have the spotlight of the FDA on them every few years – and the spotlight is shining very brightly right now with expectations that the FDA will implement changes in 2024. In Europe IVDR regulations have made a major impact recently – not all for the good of innovation in the industry. Looking forward, many may agree that there needs to be a level of regulatory oversight in the LDT space, but conversely it is an area that fosters novel markets and approaches in diagnostics. Therefore, whatever the FDA chooses to do, it needs to listen carefully to the industry and strike a balance that does not deprive us of future innovations.

4. **Greater focus on women's health in diagnostics**
   According to Nature, only 0.5% of neuroscience studies look at women's health, and not for want of more participants. Hormonal transitions over a woman's life are poorly understood. Nearly half of respondents to the "Women's health – let's talk about it" survey (2021) wanted the DHSC to prioritise menopause for the Women's Health Strategy for England. This area has had little investigation for something that has an impact on so many. Conditions such as endometriosis can go undiagnosed for years – often dismissed as something else, with the only surefire diagnosis through a laparoscopy. In women's health, diagnostics could play a huge role in reducing relentless GP appointments and creating minimally invasive strategies going forward. It is important for the industry to consider these areas and others; for too long women's health diagnostics have almost exclusively focused on pregnancy and fertility.

5. **A return of industry and government funding to address antimicrobial resistance (AMR)**
   Rapid antibiotic susceptibility testing is now a real worldwide need https://www.ttp.com/insights/the-antimicrobial-susceptibility-testing-conundrum/. We are approaching a cliff edge, and diagnostics that help us give people the right drug at the right time, instead of broad-spectrum antibiotics, will push that cliff edge out by a welcome few years. AMR is a key risk to human health with estimates that deaths will be more than those from cancer by 2030. Diagnostics has a huge role to play in addressing this need and ensuring people get the right antibiotics, spotting resistant strains early, enabling action and being a line of defence to protect the population.

6. **New and more diagnostic tools for neurological health**
   The last years have seen, for the first time in well over a decade, new pharmaceuticals for Alzheimer's (many enabled by the technologies developed for ultrasensitive protein detection) and there is a growing pipeline in drugs for neurodegenerative diseases. This will help drive innovation in diagnosis and stratification and ideally help lead to a virtuous circle of both pharmaceutical and diagnostic innovations in years to come. Beyond neurodegeneration, we are starting to see tests for mental health emerging through recent biomarker discoveries; it will be good to see more of these too.

7. **Seizing opportunities to improve the environmental impact of diagnostics**
   All industries need to consider their footprint in the world. There is no doubt that aspects of diagnostics can appear wasteful (such as disposable tips and plates in central labs and plastic casings around LFTs). Clearly, much of this is required for performance, but we should nevertheless consider further how to maintain performance whilst reducing use of fossil fuel derived materials. My colleague Elena Boland recently wrote a blog outlining seven ideas for doing so in the distributed diagnostic area: https://www.ttp.com/insights/reduce-the-environmental-impact-of-point-of-care-diagnostics/

8. **Further growth in applications of cf-DNA enabled diagnostics and prognostics**
   The last few years have seen a lot of activity in using cf-DNA, in particular, in oncology – both diagnosis and monitoring and we've seen major companies such as Grail, Guardant, Delfi and many others emerge in the last decade. More broadly though, cf-DNA is an exciting non-invasive marker. Not only can foetal cDNA be detected in maternal blood, but cf-DNA can also be used as a marker of DNA damage. This means it can be used as a monitoring tool for chronic conditions such as kidney or liver disease, among others.
   There is no doubt too that the FDA's decisions regarding LDTs may have a major impact on this space, as will the conclusion of what happens to Grail following the likely demerger from Illumina. Recent years have seen huge innovation in diagnostics using cf-DNA (for example, Karius is exploring the use of cf-bacterial DNA in blood) and over-regulation may slow down progress.

9. **Sequencing finds fertile diagnostic ground beyond oncology**
   As the overall costs fall, we should see a rise in the use of sequencing as a tool to inform diagnosis and treatment in a clinical setting. In November, the UK Biobank unveiled whole genome sequencing data from half a million participants. This data will provide an invaluable resource for those studying (and in time, diagnosing and treating) complex multigenic disorders and rare diseases. There's also a clear case and developing further technologies and applications for sequencing in pandemic preparedness, sepsis and AMR. Beyond those noted above, it will be interesting to see what further clinical applications become commonplace as costs of sequencing reduces further.

10. **Evolution in pathology practices to allow tissue-based diagnostics to move into the 21st century**
    As TTP discussed previously https://www.ttp.com/insights/translating-spatial-biology-into-tissue-diagnostics-with-inventive-technology/, while tissue diagnostics is used almost universally for solid tumour cancer detection and monitoring, the physical technology in use – digital pathology aside –has not advanced significantly over recent decades. A growing number of new and existing companies have led a big push in digital pathology (DP) and the use of AI in assisting pathologists analyse tissue sections. The implementation of DP in healthcare facilities though is still relatively low and faces challenges for its uptake.   Beyond DP there is huge opportunity to improve workflows in sectioning, processing (be this antibody retrieval, staining or hybridisation) and general data handling to prove a far simpler, faster and more consistent workflow. Some may even say we should move away from FFPE in general practice, as new approaches will improve genomic data – however, this may be another dream.

11. **Long-term vision and funding for diagnostic innovation – from both VC and governments**
    Developing regulated diagnostics typically takes longer than the typical timescales of many venture firms. There just isn't a "minimum viable product" in diagnostics. Your first regulated products will (barring small tweaks) be your product for years. It needs to be right to be effective and successful. Conversely, unlike biotech, it is rare for exits to occur before there are marketed products that have been through clinical trials. Thus, long-term investment and vision is indispensable.

12. **A continued focus bringing diagnostics - one step closer to the patient**
    Before Covid, some might have said that point-of-care diagnostics has delivered more hype than products over the last few decades. But during the pandemic, we have seen point-of-care in extremis at the home and there is no doubt that consumer expectations of turnaround times for diagnostics have started to change. However, "point-of-care" is, in my opinion, too narrow a description of the opportunity, and in order to improve diagnostics for all **one step closer to the patient** is key. This could include:

    - tools to enable sequencing in smaller hospitals
    - pharmacies and care homes could offer a menu of tests to consumers in a near automated manner
    - you may take and receive the results of a PCR test in the 10 minutes your physician has to see you
    - it will include point-of-care and at home testing (perhaps even with wearable phlebotomy)

    All of this should (but not exclusively) lead to less stress and better outcomes for patients. It should possibly also see some of the smaller hospitals receive more of the reimbursement to further help their patients. It should also focus on the right diagnostics at the right place – not everything should be point-of-care or **one step closer**, sometimes, if not often, large centralised facilities should be the point of call. However, pragmatically we should look for the opportunities to improve the patients' lives (in all ways – be this providing an answer and reducing stress, to providing a diagnostic ring of defence around a population) and deliver diagnostics one step closer – deskilling but providing the same lab quality of results and, ideally, not adding hugely to the cost.

And one dream

1. **Appreciation for the value of diagnostics in the healthcare continuum**
   What good diagnosis can enable has huge value – in both healthcare and in the more general economy. Diagnostics should be a first line of defence – not only against pandemics but spreading of any disease. Informed healthcare with the integration of epidemiological data can enable action and hopefully avoid spread. Good diagnosis can drive the correct healthcare pathway and pharmaceutical action – such as a cardiac test to enable someone to go home, a test to help choose the right antibiotic for a UTI or a test to stratify to the correct oncology treatment. In all these cases and many more, diagnostics saves healthcare huge amounts of money. We in the industry know this enormous value, but it often feels that diagnostics has to fight for every penny from those that we enable to save hundreds and thousands of dollars. It is a dream, but it would be wonderful if the coming years saw more and more people, governments and healthcare providers really seeing the value of diagnostics.

Diagnostics deal flow

M&A

The fourth quarter of 2023 has seen just three deals. The first deal is Thermo Fishers' acquisition of Olink for US$ 3.1 billion. The second Somalogic and Standard BioTools announced they have signed a definitive agreement to merge their companies. The merged companies will be known as Standard BioTools and be worth over US$ 1 billion. The third was Oxford Nanopore Technologies' recent acquisition of Northern Nanopore Instruments, a Canadian biotechnology startup. No financial details of the deal were disclosed.

Since we reported in the last issue of the newsletter on the Danaher–Abcam acquisition Danaher has announced they have now completed their US$ 5.7 billion acquisition after finally overcoming initial opposition from Jonathan Milner (Abcam Founder) who said Danaher undervalued the company.

- **Thermo Fisher Scientific** recently announced they are to acquire Olink in a deal worth US$ 3.1 billion. The transaction is expected to be completed by mid-2024, subject to closing conditions, applicable regulatory approvals, and completion of the tender offer. Thermo Fisher expects to fund the acquisition using cash on hand and debt financing. Upon completion, Olink will become part of Thermo Fisher's Life Sciences Solutions segment.

- **Somalogic** and **Standard BioTools** announced they have signed a definitive agreement to merge their companies. The merged companies will be worth over US$ 1 billion. After the close of the transaction Standard BioTools shareholders will own about 43% of the combined company, and Somalogic shareholders will own about 57%. The combined company will trade as Standard BioTools.

- **Oxford Nanopore Technologies** recently announced the acquisition of Northern Nanopore Instruments, a Canadian biotechnology startup with unique expertise in an innovative solid-state nanopore fabrication technology. No financial details of the deal were disclosed. The acquisition is reported to expand Oxford Nanopore's longer-term technology pipeline by enhancing its solid-state nanopore expertise and patent portfolio.

Other acquisitions:

- **4D Lifetec** announced they have sold a 20% stake to Xlife Sciences for U$ 25.9 million. The Zurich (CH) based business has developed early cancer detection technology, which uses a novel biomarker called DDS — or DNA damage sensitivity — to quantify DNA fragmentation in blood. The investment means 4D Lifetec will gain access to AI digital health software Xlife developed specifically for the company.

VC Funding

The fourth quarter of 2023 saw more than US$ 580 million in VC funding flow into in-vitro diagnostic companies – this is higher than the US$ 97 million of funding committed in Q3 2023. Early-stage companies received more than US$ 328 million in funding, compared to US$ 32 million last quarter, and late-stage companies received US$ 80 million in funding, compared to only US$ 50 million last quarter. In addition, US$ 169 million of VC funding was committed without mention of a specific funding round; higher than last quarter which saw more than US$ 5.6 million in funding. This also included two corporate funding rounds for Oxford Nanopore Technologies who received US$ 85 million in strategic investment from BioMérieux, and ThinkCyte who received US$ 24 million from Toyoda Gosei and several Japanese investment companies.

Seed funding:

- **IQ Biozoom** has announced they have raised US$ 6.5 million in Seed funding. The company, based in Podkarpackie (PL), is focused on developing non-invasive, pain-free saliva-based glucose monitoring that replaces finger-prick testing for people with diabetes. The core innovation is their use of thin-film transistors embedded with the enzymes that initiate an electrochemical reaction which transforms the biochemical reactions into an electrical signal proportional to the glucose concentration.

- **Spear Bio** has recently announced "tens of millions" in Seed funding round. Based in Woburn Mass. (US), Spear Bio is developing and commercialising ultra-sensitive digital immunoassay platform, that has a wash-free workflow that can be easily automated with microfluidics or liquid handlers, runs on ubiquitous qPCR instruments, and does not require high-affinity antibodies to achieve high sensitivity.

Early-stage funding (Series A – Series B):

- **Harbinger Health** announces they have raised US$ 140 million in Series B financing round. The Cambridge Mass. (US) based company combines advances in artificial intelligence with proprietary insights into the biology of the beginnings of cancer to identify cancer before it is visible or symptomatic with the aim of developing low-cost, multi-cancer blood tests. The new funds will be used to support further technology development, clinical studies, expand its data science and commercial teams. The company expects to launch its first product — a laboratory developed test for detection of early-stage cancer — in 2025.

- **Universal DX** announced the close of a US$ 70 million Series B funding round. The Madrid (ES) / Cambridge, Mass. (US) based company also took the opportunity to announce they have signed a commercial agreement with Quest Diagnostics. Quest plans to perform and provide clinical laboratory services to providers and patients in the US based on Universal DX's colorectal cancer screening blood test, will be dependent on premarket approval of the test in the US.

- **VedaBio** announced the closing of a US$ 40 million Series A round. The San Diego (US) based business is developing a proprietary method called CRISPR cascade to detect nucleic acids in a sample in approximately one minute at room temperature without the need for target amplification.

- **Genome Insight** has announced they have closed a US$ 23 million Series B-2 financing round. The San Diego (US) based company said in a statement they plan to use the funds to support their goal of bringing whole-genome-based precision diagnostics into routine clinical care.

- **Aqtual** recently announced they have raised US$ 16 million in Series A financing. The Hayward, Calif., (US) based business focuses on developing a cell-free DNA (cfDNA) analysis platform to develop blood-based assays to help select effective treatments for chronic diseases and cancer, starting with rheumatoid arthritis. The company plans to use the funds to further develop their cfDNA platform.

- **Inito** has announced they have raised US$ 6 million in Series A funding round. The Palo Alto (US) based business is developing fertility monitor technology that measures four specific hormones on a single test strip.

- **Jana Care** raises US$ 6 million in Series B funding. The Boston, Mass., (US) business is developing a novel-connected blood diagnostic device.

Late-stage funding (Series C – Series F):

- **Cytovale** recently announced they have raised US$ 84 million in a Series C funding round. The San Francisco (US) based business is focused on commercialising their microfluidic deformability cytometry technology. The company intends to use the funding to expand the commercialisation of their 10-minute sepsis test.

Venture funding (Unknown series):

- **Precede Biosciences** recently emerged from stealth mode and announced they have received US$ 57 million in funding since their inception. The Boston Mass. (US) based company is focusing on developing genomic liquid biopsy technologies aiming to be used to explain a patient's biological state at any given time from 1mL of plasma.

- **Day Zero Diagnostics** recently announced they have closed a US$ 16 million funding round. The Boston, Mass. (US) based business is focused on developing a sequencing-based diagnostic that can identify a comprehensive range of bacterial and fungal pathogens and determine their antimicrobial susceptibility in less than 8 hours.

- **Senzo** recently raised an additional US$ 1.8 million in financing. Based in London (UK)/Pennsylvania (US) Senzo is developing a 10-minute/low-cost amplified lateral flow test with the same accuracy as a laboratory PCR test. The funds will help advance the company's mission to bring high-quality affordable tests into the home.

Corporate

- **Oxford Nanopore Technologies** has announced BioMérieux has made a strategic investment of GBP £70 million (US$ 85 million) into the company. According to the announcement the partnership and investment, the two companies intend to leverage Oxford Nanopore's nanopore-based in-vitro diagnostics (IVD) solution and BioMérieux's IVD expertise in R&D, regulatory, medical and market access. As part of the transaction, the two companies will establish an IVD Advisory Board to advance nanopore technology into routine clinical use.

- **ThinkCyte** has announced they have raised US$ 24 million in a corporate funding round. Based in Tokyo (JP)/ Redwood City, Calif. (US), ThinkCyte is a biotechnology company – and has developed an AI-based, dual-mode fluorescence and morphometric cell sorting platform called VisionSort. This funding will be used to expand ThinkCyte's production capabilities for VisionSort and accelerate sales efforts, with a focus on North America, Europe, and Asia.

Research funding

During the fourth quarter of 2023 there were six notable research funding awards above US$ 1 million. In total US$ 38 million in researching funding was committed to five diagnostics companies, and one major research institution – three based in the United States, two based in the UK and one based in Switzerland.

- **Octave Bioscience** has received a US$ 10 million grant from The Michael J Fox Foundation for Parkinson's Research. The grant will be used for discovery, development, and validation of a custom protein biomarker panel to measure Parkinson's disease activity and progression in the clinic.

- **FIND** recently announced they have been granted a US$ 10 million extension from the UK Department of Health and Social Care' Global AMR Innovation Fund. It will be used in support of FIND's three-pronged strategy to prevent AMR emergence and halt its development. This requires development and use of rapid diagnostic tests and digital tools tailored for AMR that can be available when and where people first access health services (i.e. in primary care and community settings) – particularly for common infections that may or may not require antibiotics, such as respiratory infections and sexually transmitted infections.

- **Co-Diagnostics** has been awarded US$ 9 million over 24 months from the Bill & Melinda Gates Foundation for research to make affordable and accessible point-of-care diagnostics for tuberculosis that will help eliminate the disease worldwide.

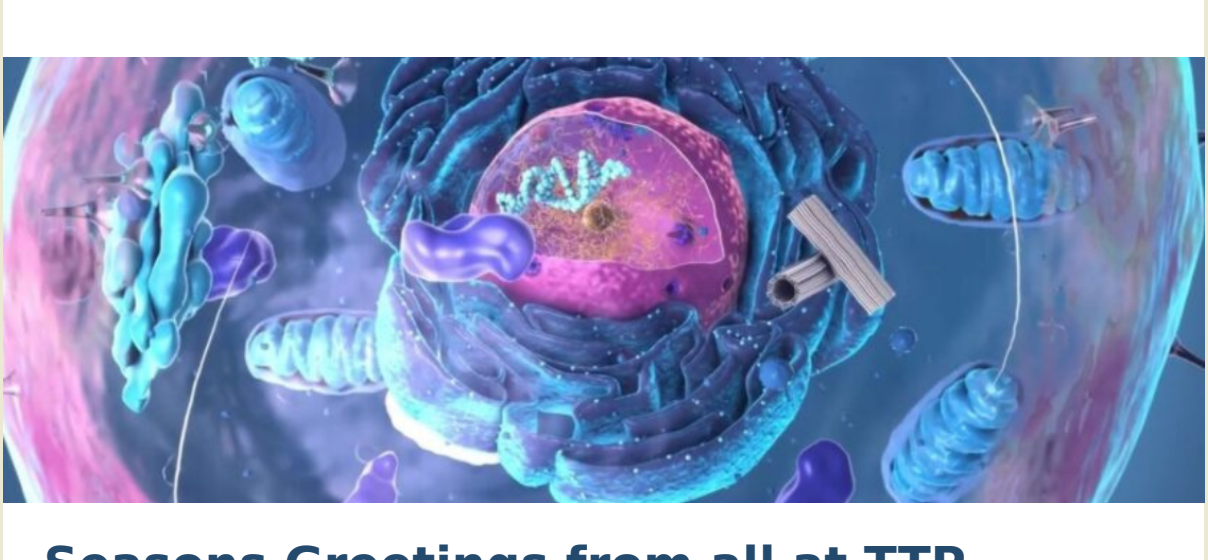
- **Quantigen** has recently been awarded US$ 5.4 million over 26 months from the Bill & Melinda Gates Foundation for research to further develop tongue swabs as an alternative method for TB specimen collection testing that is simpler and cheaper to use.

- **Flexotronics** (a Sapphiros company) have been awarded US$ 2.1 million from Bill & Melinda gates Foundation to develop a high-volume Malaria Rapid Diagnostic test for the detection of histidine-rich protein II (HRP-II) antigen and pLDH of malaria in human whole blood to aid in the diagnosis of malaria infection in LMICs.

- **Sapphiros** has been awarded US$ 1.5 million from the Bill & Melinda Gates Foundation for research to establish pathways for rapid diagnostic development and scaling of manufacturing to meet health needs and demand within areas experiencing high burdens due to infectious diseases in low- and middle-income countries.

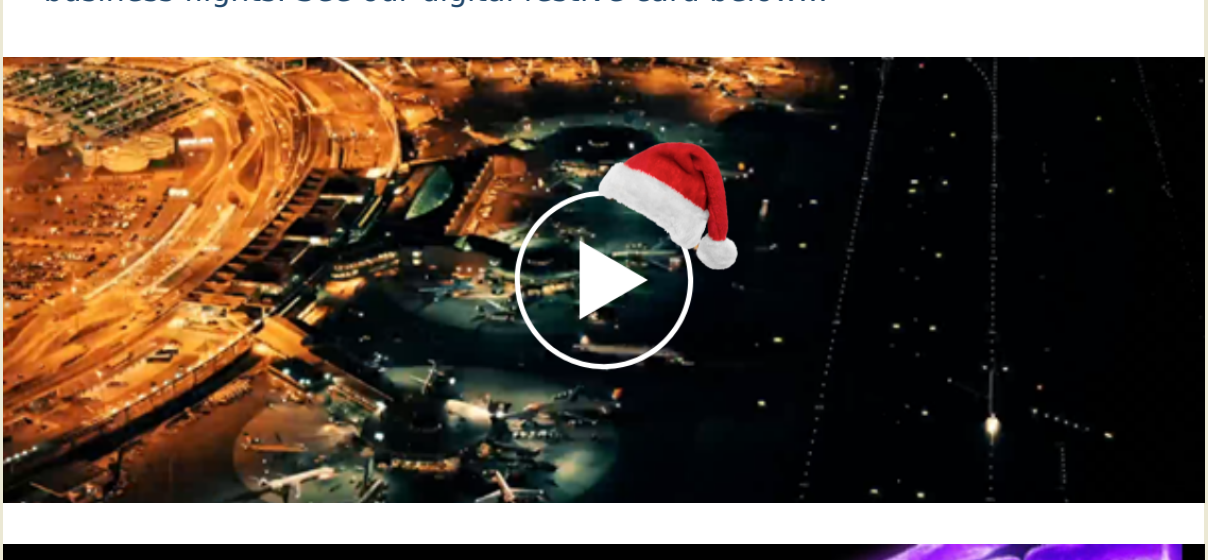
TTP News

At TTP, the teams developing tools for life science research and diagnostics collaborate and discuss regularly – often today's tool will be enabling tomorrow's diagnostics. One particular area where we can see this is that of multi-omics; in one of our latest insight documents Lauren Laing our Omics team Leader discusses some of the challenges and opportunities in this space



Seasons Greetings from all at TTP

Our festive message this year celebrates our partnership with Tradewater to remove harmful greenhouse gases from the atmosphere to offset our business flights. See our digital festive card below…



Jobs at TTP

Do keep an eye on TTP vacancies; some of our initiatives will be looking for capable people in the new year!

Dates for your diary

ECCMID 2024: 27-30 April 2024

Fira Gran Via (North Access), Barcelona, Spain
https://www.eccmid.org

ADLM (formally AACC) 2024: July 28–August 1

McCormick Place Convention Center, Chicago, IL
https://meeting.aacc.org/2024

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