

AGILE LEADERS

Insights from the Agile Leaders
Life Sciences and Healthcare Workshop Series



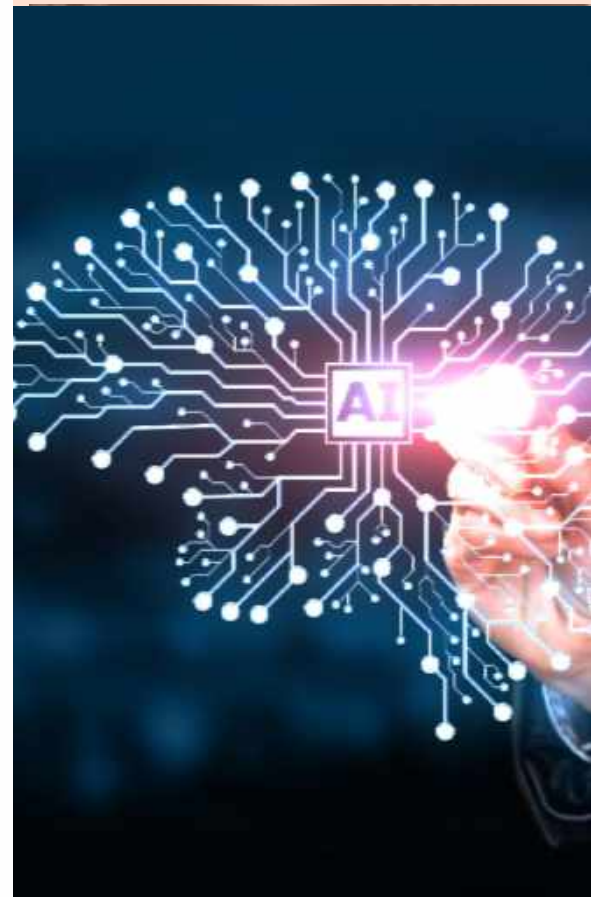
WHAT'S INSIDE

AI will disrupt the life sciences and healthcare industries. Fact or Fiction?

What are the Agile Leaders Creative Disruption Workshops

Written by Graham Combe and Dr. Samantha Cheung

The Agile Leaders Creative Disruption Workshops are for leaders, and aspiring leaders, of life sciences and healthcare organizations engaged in innovation. It is a type of "self-help" group of thought-leadership professionals focused on creatively disrupting the old methods of innovation in healthcare and life sciences. The Agile Leaders Workshop allows these people to engage in a creative and trusted environment with like-minded peers, to explore ideas under Chatham House Rules.





More about this content, and Chatham House Rules.

**The Agile Leaders
Creative Disruption
Workshops are
moderated by Prof
Tony Sedgwick**



This thought-leadership write up is an aggregation of the discussions from a few Agile Leaders Creative Disruption Workshops that Graham Combe and Prof Tony Sedgwick hosted in Oxford and London, UK. The Workshops were moderated by Prof Tony Sedgwick, and written up by Dr. Samantha Cheung and Graham Combe. A list of the Agile Leaders who participated in these Workshops are highlighted towards the end of this feature.

According to Chatham House, the place where international policymakers come together to advance policy, 'When a meeting, or part thereof, is held under the Chatham House Rule, participants are free to use the information received, but neither the identity nor the affiliation of the speaker(s), nor that of any other participant, may be revealed.' In alignment with that rule, this summary of the latest Agile Leaders discussion will adhere to covering the themes and views that emerged during the meeting without attributing specific statement to any of the attendees.



""Is AI a magic box that will fix everything?" No. AI is not a disruptor in itself, it's an enabler.



What is AI, and how is it being applied to life sciences and healthcare?

Is it a "magic box" that will fix everything? No. AI is not a disruptor in itself; it is an enabler. The disruption is understanding the problem that needs to be solved, and AI / ML is just a tool. It is in software's toolbox which is now made available through the cloud by supercomputers such as Google's Deep Mind or IBM Watson etc.

Has AI has become the new immuno-oncology? – everyone is doing it – AI is real, like Immuno-Oncology, however like Immuno-Oncology, and the .com boom, there is a lot of hype and people jumping on the bandwagon. The challenge for Pharma and investors, as usual, is finding the "wheat from the chaff."

Machine learning vs bioinformatics, which is it? Bioinformatics, automation, drug design have leveraged computing for many years, the big difference now is the computing power available, and it is "sexier" terminology to call it AI. By using the term AI, it's more likely to get you a meeting with an investor.

Where are you going to do AI? AI / ML can be used anywhere if there is enough data. Patterns, trends, identity can be established and reliable assumptions, made through computerized visual representations, or machine problem-solving.

And what is AI going to be in the next round? Will it be like military swarming? Swarm intelligence is a part of AI. Having got its name how bees collectively work together in an unbiased way to find areas with the best source of pollen. Swarm Intelligence is the thinking together in systems, as a brain of brains. This is a reason why people use "networking maps" when describing their use of AI to find an "intelligent" solution – using collective groups of information to determine the "best" solution.



"Take Images and use AI to visualize, to recognize patterns."

Below is an image of a mammogram, for example, where AI has been proven to be more accurate at identifying tumors than cancer practitioners looking at images manually.



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There are three different levels of AI:

1) The mechanized approach to computer science, the step by step automation, making processes quicker through higher computing power – this is the low hanging fruit. Seamlessly connecting the professional to bespoke information, usually visualized, that enables them to do their job better. This is most achievable.

2) Take images and use AI to visualize, to recognize patterns.

Radiomics, e.g. use MRI scans to identify biological patterns. The image connected to the biological link. There is an explosion of companies utilizing this Technology to diagnose disease better and diagnose the disease earlier. Examples include breast cancer, Melanoma, Lung Cancer, Brain Images to detect the likelihood of Stroke and Dementia, and Heart Images to detect heart disease. Often these diagnoses are more accurate than a human practitioner. People in the best position to leverage this are those that have access and authority to use hospitals clinical data. Electronic Hospital Records (EHR), Telemedicine, Peer-Reviewed Publishing are other areas where AI / ML is being applied. This is very achievable.



""They are using multi-omics systems to make a decision. This is where people are claiming AI can be used in drug discovery."



How real is AI in Drug Discovery? Where else can AI be used?

3) Data from many patients, etc. and make decisions by a machine that humans may not necessarily secure.

They are using multi-omics systems to make a decision. This is the area where people are claiming AI can be used in drug discovery to find new targets or to go from target to lead. The Holy Grail! How real is this?

Related article to how AI is successfully used in Drug Discovery. The best published example to date that AI can accelerate the drug discovery process:- Novel Drug Candidate Designed, Synthesized and Validated in 46 Days Using AI
<https://www.technologynetworks.com/drug-discovery/news/novel-drug-candidate-designed-synthesized-and-validated-in-46-days-using-ai-323600>

Original Reference:
Zhavoronkov, et al. Deep learning enables rapid identification of potent DDR1 kinase inhibitors.

Nature Biotechnology.

Other uses:

- Clinical trials
- Process Automation
- Biopartnering
- Diagnostics
- Personalised Medicine

How do we get to a common language between different scientists? It is thought one of the biggest challenges is getting scientists, who have worked a certain way for many years, to understand the benefits of how AI / ML can be used to streamline and speed up their work. A suggestion was made that finding common terminology for scientists and software engineers could be one of the solutions.



"how can AI be used to facilitate this biotech-pharma partnering process?"



The Big Pharma and Biotech Paradigm:

It is known that Big Pharma sometimes tries to mimic smaller, more efficient emerging biotechs to improve their internal R&D processes. One of the main differences is recognized as the culture, where the emerging biotech's employees are happier taking on risk. In contrast, many of those in big Pharma are satisfied with the security of a regular income, with no risk. Of course, Big Pharma is better resourced and has deeper pockets. For many years it has "outsourced" early-stage research and development to biotech and universities, and then partnered or acquired an asset when a product or Technology has matured. They come in when the more expensive costs associated with more significant trials and in-depth knowledge to get the product approved. Once a product is approved the pharma companies then use their established networks to distribute and sell these products. The more mature the biotech asset, the more financial reward it will generally get, in this risk-sharing "outsourcing" model with Pharma. Some have even argued that in the future Big Pharma eventually just become regulation, marketing and distribution companies?

A question was asked, how can AI be used to facilitate this biotech-pharma partnering process??

- What data should be used?
- Who do they need to connect with?
- How does it all fit together?
- How do we use this AI/data now to help future blockbusters vs current drugs?

More questions were then asked about the Future of Drug Discovery Wet Labs.

In 30 years, what will labs look like? What is genuinely disruptive vs enabling? How do we take data and visualize that data? How do we translate data into a visually compelling way?

How will AI affect jobs in the future? AI won't replace, e.g. radiologists/doctors, but it may replace the radiologists/doctors that don't use AI in the future

What is the role of our Teaching Institutions and Universities in this rapidly changing the digital world? How should universities and teaching institutes prepare students for AI and future employability? Are there differences in the way academics vs non-academics are thinking? What is the best way to foster creativity in our changing world?



"The Biotech and Pharma industries need to be bold, and stop using the excuse it is the science and regulation that is slowing down tech innovations."



Questions were asked about Company Recruitment.

What are different skills required within life science companies that embrace tech? How does one integrate the cultures from the tech and life sciences? Do the leaders of these companies need to be polymaths? How many Bill Gates are there on this planet?

Interested in the impact AI has on the industry as a whole?

What skills do we need? Will we need? You will need to hire some people who are very knowledgeable in the tech skills that you are looking to leverage. Many life science companies now have a CTO, and many have their own teams of coders. Most companies already have an IT function, this function now needs to be part of the overall company strategy, so hiring thought-leaders in this function is now necessary.

Can we simply outsource the tech function? Like any organisation, focus on what you are good at. Life Science companies are never going to be tech companies and there are lots of good consulting and developing resources out there to meet your tech requirements.

The big tech firms are moving into the life science space, as they can see how slow the life sciences and healthcare industries are moving, and the size of the opportunity to disrupt. However they won't become drug developers, in the same way life science companies won't become tech companies.

Do Tech Companies understand huge differences in technology that can disrupt everything but the drug discovery and drug manufacturing?

The Biotech and Pharma industries need to be bold, and stop using the excuse it is the science and regulation that is slowing down tech innovations. With such a great history of collaboration, pharma needs to partner with tech to enable their work, rather than let them be the disruptors. For this reason I see that outsourcing tech solutions, and partnering, will be a big part of the Life Sciences and Healthcare organisations strategy going forward. With outsourcing (most often) the life science company gets to keep any IP that is generated, whilst partnering / sharing the revenues.

What does the industry need to prosper in this new world successfully?

It was thought that we need to nurture and create new Ecosystems. This is where emerging companies that are agile enough to innovate can focus on their most robust skill sets. There are clear lines of communication. A commonality in language. Enabling those that are willing to move better, faster, cheaper. Everybody needs to understand what each of the pieces of the Ecosystem need. Can AI be applied to achieve a unique system of this type?



""Is there more profit to be made, and a better outcome for patients and payers, by using AI?"



Can creatively be replaced by AI?

Not currently in life sciences and healthcare – it is only as good as the algorithms being created and data being inputted. It can identify gaps, but not necessarily identify new areas.

Where do life science companies sit in the value chain?

Many companies are marketing themselves as being full service. How do they differentiate themselves from the competition? Can they? Are big companies in life sciences trying to be innovation ecosystems? Yes, there are great documented examples where big Pharma is trying this, like the Stevenage BioCatalyst at GSK's main EU research campus, and the AZ BioVenture Hub in Gothenburg Sweden, and JLABS Beerse, Belgium – for example.

How are these Big Pharma Ecosystems engaging with AI and Tech solutions?

Can a new type of tech-enabled Life Sciences Ecosystem be much more than what is currently offered??

What is the measure of success of AI in Healthcare? What is better, in a capitalist world, is who makes the most profit. In the healthcare world, it is also about the best outcome for the patient.

Is there more profit to be made, and a better outcome for patients and payers, by using AI?

Better profit is made through efficiencies; better patient and payer engagement and outcomes. Can AI help us do this better? Can we reduce TOX testing through AI, for example? Or better patient stratification? Getting the right drugs to the right patient, faster and more efficiently. Can an AI-driven Ecosystem also help Start-Ups to fail faster and earlier? To reduce capital costs, and the innovative team focused on their next idea? By applying the process to innovative start-ups, can this help with the stigma often found in Europe, that its' not okay to fail? Rather than the US mentality of fail quick, and move on – until you have a product that succeeds. How do we disrupt a drug's cycle?

How can we deliver new and better drugs quicker?

Is big Pharma in the best position to form new Ecosystems? Could this be an opportunity for the NHS or the ASHNS? Are the UK Catapults already doing this? Catapults – hugely valuable to develop these high concentrations of knowledge (and share for a consultancy fee). Also Accelerators like Panacea Innovation, RebelBIO and Start Codon, working with the ASHNS, could play a huge part here. AI could help by driving the process, assisting the patients, and payers, to put pressure on, and be more supportive of, the drug and healthcare development process.



"Why has Pharma got the resources but not the courage?"



Why has Pharma got the resources but not the courage?

Is a culture shift needed in Pharma?

Banking has changed hugely in the past decade, with a shift from high street to mobile and especially with the rise of companies such as Monzo. Airbnb has also been hugely disruptive to where we stay when travelling? Skyscanner is disruptive the way we book flights. Ocado has been disruptive in the way we order supermarket food. The most prominent example is Amazon which has disrupted how we shop online and shop in general. Why are they successful, they start with the Why? They identify the problem first and then develop a solution. In the case of Monzo, Ocado, Skyscanner, Amazon, they have all focused on the customer experience first and foremost? Can Life Sciences and Healthcare do the same? In certain parts of healthcare, there has been a success like with the Babylon TeleMedicine solution, and the Zesty patient booking app, for example. Can the same be done in drug discovery and development? Biotechs can pivot to a new area/target, but Pharma cannot, e.g. change from a neuro target to an oncology target if the drug shows more promise in the latter area. For this reason, it is likely that the biotechs will lead the way in the digital revolution.

The idea of Data Philanthropy (not a new concept).

Data is continuously being collected, e.g. through our phones, smartwatches, Fitbits, etc., but who is using this data and to what end? Also, there is a considerable amount of hospital data, particularly in the NHS. Who should own this data? There is a school of thought that an individual should be the person that owns their data, particularly hospital data. Maybe with the NHS, these should be shared ownership – so the state and the patient equally benefit? More likely, the state will decide to cash in to help with their spiraling healthcare liability costs. Sharing data – many are happy to share their data if they think it could help others, but who is going to pay for this? There is value in this data. Could we treat data in the same way people donate organs when they die, but instead while they are living? An opt-in system?

Data philanthropy – “describes a form of collaboration in which private sector companies share data for public benefit.” A term that was introduced at WEF in Davos, in 2011.;

<https://www.unglobalpulse.org/data-a-philanthropy-where-are-we-now>
Do people need to take control of their own health? Can AI help you gain control of your health and your health data? How do we motivate people to take control of their health? People want to reach 10,000 steps a day ever since someone said it was the recommended daily goal.



""AI is just a tool. Like the story of the microscope, is the story of AI any different?"



Is AI just a metaphor for extraordinary change?

There are so many unsolved questions, which AI is provoking new leadership and thought. Is AI making us think about the future more? We have had the data for so many years, but AI is provoking new questions. AI is just a tool. Like the story of the microscope, is the story of AI any different?

Everyone, irrespective of their role, will be impacted by AI, certainly in terms of efficiency. You / we are an extension of machine learning. The common thread – creating an ecosystem driven by innovation so that people can try new things without being afraid to fail will be crucial e.g. Silicon Valley. Many people in Pharma are comfortable, not thinking of disruption. High up, there is a will to innovate, but less drive further down. Is regulation in healthcare is a constraining factor? But does lack of technology uptake come down to limited thinking or negative group think? In 1992, the Agile concept was created in the software industry. The opposite of agile is a waterfall, which in Pharma is the workflow process.

Agile = anti-process

Is science stopping agility by having experiments that need to reach the end before a conclusion is made? Can it be Agile? What steps can we implement to make science more Agile?

How do we make people more agile? The concept of “Sprints” in IT were introduced. Can scientists do 2-week sprints, for example? Is there value in having a stand up at the start of the day, to get people to be/feel more connected?

It can work, depending on the circumstances. For example, 15 minute daily stand-ups to discuss:-

- What happened yesterday?
- Did you get the expected outcome?
- What are you doing today?
- What is your expected outcome today?

Agile and AI, do they work together? Are they the opposite? AI recognizes patterns; agile is a discipline. The tech industry has had much success using Agile teams. The proof is in the pudding! Is Technology driving us closer, or further apart?

Is there a critical size where an organization can no longer be agile? Is the C-suite the active unit that senses and responds to the environment and then we add on the delivery unit? In a way, biotech C-suites are the Agilist.

Biotechs can be agile because of their size. Can large Pharma? There is a gap between C-suite and the next level down. Department heads Agile and agility are different – agile creates the environment for which people demonstrate agility, which is a culture.



"Is AI just a fad? No. It's like the ".com" boom. There is a lot of hot air, and show boating, and there will be many failed AI concepts. However, AI has been proven useful in many scenarios, so it will be with us for many years to come, just like the internet"



Are computers and tech driving people to be close again? The opposite is happening. I.e. face-to-face meetings cannot be replaced by teleconferencing and emails. We have too many ways to communicate now, without having a real conversation it is difficult to know whether you've been heard. Need a critical mass of positivism, which will build inertia.

Would it be better to design a human-based on data to help drug discovery? Is a human digital twin possible? The film industry has been using Digital Twins for many years, but there are no whole Digital Twin systems for healthcare or life sciences yet. There are a few examples of a "Digital Twin Heart" that have been made, so you would conclude that in time it will be possible to create a digital human twin for medical use.

Is AI just a fad? No. It's like the .com boom. There is a lot of hot air, and show boating, and there will be many failed AI concepts. However, AI has been proven useful in many scenarios, so it will be with us for many years to come, just like the internet.

- AI can be used for patient prediction of availability for clinical trials? I know of a case with a CRO client. They have reduced the time to create a proposal from 2 months to 20 days using AI patient enrollment prediction.
- AI is also being used in Clinical Trial Software systems to predict potential adverse risks, for example.

In healthcare, is AI only currently able to mine data (informatics?) Not able to say, for example, we are looking in the wrong places for curing dementia?

How do we make people feel safe to improve processes?

- Trust containers give people space to fail in groups
- Toastmasters and Agile Leaders meet-ups encourage innovation

How will AI change academia? How do we increase employability?

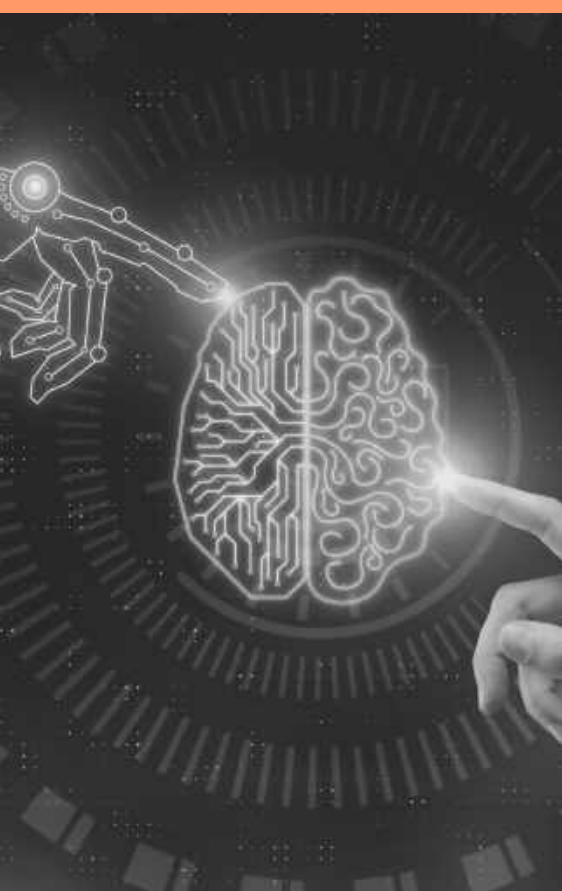
- Could there be a time where people will change from being "T-shaped" people to 'broken comb'-people, where they will have multiple talents and be able to be a biologist and mathematician better? <http://leftfoot.com.au/blog/t-shaped-people-and-broken-combs>

Will AI facilitate cross-functional organizations?

Do we need to create new Ecosystems to take full advantage of AI in life sciences and healthcare?



"AI is proving to be very powerful in learning when the rules are simple....."



Conclusions

by Graham Combe

AI and tech are transforming areas of drug discovery, development and healthcare –

Change is coming about through techniques that have existed for years, like informatics and automation, but much hasn't changed in that computers and AI aren't intelligent, yet.

It was discussed that in drug discovery, the scientist won't be replaced, or be bettered at drug discovery by computers, because computers will never have intuition, perception and emotional intelligence of a human scientist. Many innovations are made through serendipity – can AI accelerate this? Much of the work being done which people are calling AI is Machine Learning (ML), rather than some form of intelligence. However, in simple tasks with not many rules and clear outcomes, AI can perform better than humans. For example, when AI beat Gary Kasparov at Chess around 20 years ago by IBM's Deep Blue. More recently, the world champion at the South Korean game GO was beaten by Google's Alpha GO. Here "AI" did perform better than a human could. In 2017 the Google Alpha Zero learned the game of Chess in 4 hours, then beat the then world champion chess program Stockfish 8, in a 100 game match up. It won or drew, all 100 games.

AI is proving to be very powerful in learning when the rules are simple, but the life scientists I have met say you have good reason to be skeptical when it comes to "AI" understanding of complex biological systems.

One area some of the big pharma's are currently looking at is, can AI help us understand how a protein folds? If you have ideas around this, please let me know. We can then all make a lot of money, and of course more importantly, get better treatments to patients, faster! This is where the industry is at, so question any claims that are more complex. Also question anyone that claims AI can produce better answers using their system, but they don't know how the AI got the answer. In my humble opinion, if you can't explain how an answer is reached, then it's most probably BS!

There has been a lot of success with using AI / ML in using images for diagnostics, partly in my view because images are non-corrupted sources of data, and the personal data input is minimal, and no corrupt data. Often AI is predicting disease, like in breast cancer mammograms, or early onset of lung cancer from lung images, or Melanoma from skin and mole images.



Below is a picture of a Quantum Computer from the Watson Research Laboratories in Yorktown Heights, New York, USA.



Conclusion Continued..

For example, here is news information of a prototype app

from SkinCareAI, created by our sponsor DataArt, that detects Melanoma through a SmartPhone..

<https://www.medicaldevice-network.com/news/dataart-launches-skincareai-app>

The saying "AI is only as good as the data it reads" rings true, and the same can be said of the algorithm that it follows. So the question is still out there, will AI disrupt more complicated fields like drug discovery? One thing everybody agreed with was that AI is getting everybody to think hard how they currently do things, and whether it can be improved. This is a really good thing, whether true AI is a fallacy or not!!

Also, with the introduction of Quantum Computers that will be over 10,000 times as powerful as today's Super Computers, then much more will be able to be achieved. The power of AI is also directly correlated to the power of the computer that drives it.

Recommended reading list by participants:

- The Geography of Genius – Eric Weiner
- Sprint – test big problems and test new ideas in just five days – by Jake Knapp
- Irrational Exuberance – Robert Shiller
- The Illustrated Man – Ray Bradbury

Recommended people to lookup by participants

David McCandless, programmer and visualize – the beauty of data visualization

Simon Sinek – Start with Why
Bret Victor – Visualization (of science)



t h a n k y o u

Participants & Thank Yous

A special thanks go to our participants of the Agile Leaders

Creative Workshops where the majority of this insight was taken:-

Joann Rhodes, Director of Strategy and Operations at the MSD Discovery Innovation Centre.

Dr. Olga Kubassova, CEO, Image Analysis Group (IAG),

Dr. Michael Stein, CEO, Valo Therapeutics

Dr Musaddiq Khan, Director, Clinical Operations, Eli Lilly

Dr. Enca Martin-Rendon, Director of Strategy & Technology, Oxitec Ltd.

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The main author is Graham Combe, the organizer of Agile Leaders and Biotech Buddies. Graham Combe of BioSell is a leading PR, Marketing and Event Solutions Consultant for the Life Science Innovation sector. If you have any questions about this report you can contact Graham using the e-mail graham@biosell.co.uk

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Royds Withy King:

Royds Withy King are a leading law practice with a dedicated team for the life science sector lead by Claus Andersen. For more information about their life sciences practice go to <https://www.roydswithyking.com/sectors/life-sciences>.



TESTIMONIALS



"I've found the Agile Leadership events extremely useful. As well as being very valuable networking opportunities, I've found that the discussions have exposed me to new ways of thinking about the most common problems we face in biotech and there's always wide range of experience around the table. Tony manages to engender an atmosphere of cooperation-and, crucially, the meetings are also fun!"

Ross Breckenridge, CEO, Arjuna Therapeutics

"It was a joy to attend the Agile meeting the other day. It was unusual to have such a relaxed and unpressured conversation in which ideas and thoughts could simply float up and exist, even if some of them will only exist in that room for that time."

John Hodgson, Previously Editor-at-Large Nature Biotechnology and Managing Editor of Scrip magazine

THE ORGANISERS



Prof Tony Sedgwick

Life Science Strategy and "Big Picture Advisor."

Agile Leaders is facilitated by Prof Tony Sedgwick, the self professed www.ThoughtDisruptor.com. Tony has an esteemed career in life sciences in academia and in business, he is a trained pathologist. His accolades include once being the Global Head of Clinical Trials at Roche AG, and he has also been CEO of four life science companies, as well as having many positions within the academic community. He is also an actively training psychologist which is helping him develop his "Agile" community group development passion.



THE ORGANISERS



Graham Combe

BioSell, Helping R&D Business Leaders with PR, Marketing and Event Solutions.

Graham is an experienced relationship & business development professional with a demonstrated history of working in publishing, marketing and events within the life sciences and science led industries. Skilled in publishing, marketing & event management, Graham has a deep understanding of the life science industries in the space before market approval and commercialization. He is a strong business development professional and marketing strategy consultant with a BSc (Hons) in Chemistry from University College London.

Graham Combe (right below) with Mike Ward, Editor-in-Chief, Informa Group, Pharma Intelligence Division. We share a love of flowery shirts.

