# SCOTTISH MORTGAGE – ANNUAL GENERAL MEETING

27 June 2019

*All investment strategies have the potential for profit and loss, your or your clients' capital may be at risk.*

**Fiona McBain:** Good afternoon ladies and gentlemen and a very warm welcome to the annual general meeting of Scottish Mortgage Investment Trust. And a special welcome to all for what for us is a new venue. It's obviously a different seating configuration so that we can all see each other more easily and there's also better hearing functionality so hopefully those are good things.

Some of you may have noticed on the way in that this venue also has cameras. But please don't be camera shy when it comes to asking questions because they're only here not to film any of us but to film our two star presenters that are coming on later on.

So I would like to first introduce your board to you. Biographies are in the annual reporting account so I will spare their blushes and just give headlines. I'm Fiona McBain. I'm the chair of this board and I'm in a minority of two along with Mr. Dowley because he and I are now the only non-professors on this board.

So that's an element of diversity that we bring. Justin is a former international investment banker CA and a very experienced company director and he chairs our audit committee. Next to him, second on my right, is Professor John Kay, who's a renowned economist and academic and commentator and he's our senior independent director.

Next to him continuing the professor theme as I referenced earlier is Professor Subacchi, who's an international economist specialising in global monetary policy. And finally, last but not least is Professor Patrick Maxwell who's the Head of School of clinical medicine at Cambridge University and has special expertise in biotechnology, which as you'll know features in our portfolio.

So, we are supported here today as ever by the aforementioned managers on whom the cameras will be trained shortly. Our colleagues from teams across Baillie Gifford are external auditors, brokers and other advisors. So there's a great pool of people here to address any questions that you may have later in the proceedings.

**James Anderson:** Thank you all very much for coming. We do genuinely appreciate your interest and that's even more so given that A) many of you are coming back for more and B) the weather is so nice outside that I hasten to add that I fear that you would be better off enjoying the sunshine than listening to me but perhaps Tom will change that. Lastly before talking, I would just like to emphasise that both Tom and I are immensely grateful for what the board does and thinks and helps with. I think they are a real demonstration of how having an independent board can actually help greatly and I'd just like to offer my thanks to Fiona and her colleagues for that.

In thinking about what we do, I think we need to be very clear without being tempted by arrogance about it, that we believe that we have differences from the way most people invest. I listen to so many investment presentations which is not clear why you should believe the people talking have any advantage in their views. We can all have views about things but why should they matter? Now as many of you will be aware, we've tried particularly over the last 15 years to emphasis three parts of our differentiation.

Firstly, that we are absolutely long term. That's something a lot of fund managers like saying but they don't provide much proof of statement but we think that whether you observed our turnover or asked companies they would agree with that about us. We are genuinely long-term and as I'll come onto, that opens up many opportunities that wouldn't otherwise exist.

Secondly, we have to try and control things that we can control. We don't know what the future will turn out to be. We don't know whether our perceptions will turn out to be helpful but we can control costs. And that is really important to us. We think in the compounding of returns people often underestimate it and I think that the investment industry still needs badly to look at itself from that point of view.

And I just stress that this is absolutely an ongoing commitment and if we're lucky enough to continue to grow and be successful that we would absolutely be in favour of further moves in that direction. Lastly, and I say this with a certain degree of poignancy given various of the commentaries going on from parliamentary select committees to the governor of the Bank of England, we don't believe that safety resides in being like the index.

We actually believe even less looking forward over the next ten years whether owning large lumbering companies will be a help to you. So we proudly say we are very unlike the index and probably hope that that gets even more so in the years ahead.

But we can't stand still. And I genuinely believe that we aren't standing still and I genuinely believe that we're making improvements but that's of course for you and the markets to judge over the course of time. The first point, which I may not have realised when I thought about what was relevant to say here, I may not have realised it might be so publicity oriented at the moment given news flow from other people. But we think that we are in the midst of being able to develop a presence in global, absolutely global, venture capital that is probably, I'll go further than the slide, probably rather than arguably unique. We know of nobody else who is offering access to world-class, dynamic, inspirational, founder-driven companies moulding the future in the way that we are and certainly they are not doing it, and I really want to stress this, at the cost that we are offering.

Frankly if we go to Silicon Valley or China and we say that we're folding this to an overall cost basis of under 0.4 per cent, people look at us with bemusement and ask us what we're hiding. Where's the carry? But we are able to give you access to the same set of companies that the great venture capitalists of Silicon Valley and the like who have created so much value over the past 10 to 15 years do. Of course we need to keep trying to prove that we're taking the right decisions about which ones to own but our access is there and that's been a surprise of unbelievably delightful proportions to both Tom and myself over the last five years and the way it's expanded. And I go back again, the cost of this matters and we're democratising and making it cheap. But beneath those structural issues, both the historic ones and those that we think are rapidly evolving, we've had some tensions about the workings of markets which matters a great deal to us. I often think that people ask me ask too much about what we're doing and what we're owning at the moment rather than why we do this and a big part of the why which I may have said in years past but only becomes more true is that the greatest opportunity for us and the greatest delight is that we're having increasing success at being the most stupid people in the rooms in which we operate.

That's the way we try and learn and try and earn your confidence. We can only do all this if we get access to brilliant people, brilliant companies, but above all to a different set of academics and a different set of information. Now Fiona's already pointed out that 60 per cent of the board are professors but we do talk to other professors in the world at large and more and more so. One of the most important points for us is that we think the information, which most people in the stock market use to make judgements, is frankly not very helpful at all. And again, this is a topic I've touched on before but I think it's worth stressing. If somebody could tell me what the Federal Reserve was going to decide to do at every meeting for the next year or what was going to happen about Brexit, I would still be no more wiser in terms of what doing in the stock market. These are completely unpredictable relationships which far too many people, thousands upon thousands of people have an opinion for which mine is not going to better than theirs. But if we go and look out at what people are saying in great companies with great academics about the underlying process of change and try and understand where that dramatically underestimated process takes us in the long run rather than guessing what's in the next year. We think that that is both hugely important, highly probable to be true, and has a direct impact in our portfolio. But it doesn't suit the impatient of stock markets. So we focus on what has been the rate of improvement in technologies such as those aided by Moore's law but more and more that's moving out into a world that is ever more important, ever more destructive for the pace of change in such outlets as healthcare and genomics or battery technologies and solar power.

So we think that very often we can look at information that is much, much more valuable to us than what commonly we're talking about. I think we're approaching, which is a big improvement, about halfway through this process in putting those decent sources of information, those deeply valuable sources of insight into our portfolio. Now that's risen quite a lot. I think we've made a reasonable amount of progress from what I thought was about a third of the way 12 months ago. One specific that I'd like at this stage to mention, although we're not talking about it that much, I think it's critical given this is an annual event to mention, that we are about in probably the autumn to open a fairly large-scale office in Shanghai. We've done a lot of work of trying to understand from a far what's gone on in Silicon Valley in particular over the last decade and more, but we don't think that from Edinburgh and without people really embedded in the system that we can do that to the same extent in China. So led by my colleagues Linda Yueh and John McDougall that will be a major task and operation for us and I have to say I'm sure it's not pre-empting questions but it may be giving a hint at the direction of answer, I think it is ever more important in the world of trade wars and tweets that we do try and understand what is going on in China. There's a terrible danger of the agenda being set by Western capital markets and Western politicians which does not help us one iota. So that's going to be a major preoccupation for all of us over the next 12 months and if it's only Tom speaking to you next year it might be because I'm in China rather than anything else.

But having said that it's how we think that matters the most to us and why we think it, let's talk a bit about what we think. This is a picture not of an ex-director of Scottish Mortgage but of Ben Graham the father, as Warren Buffett never ceases to remind us, of value investing or as Mr. Buffett would put it, the only type of investing out there. It's very clear that Mr. Graham would not approve a word of what I'm saying. But I think that shows the dangers of our investing landscape. At one level we don't acknowledge the big structural changes which are emphasised in a few minutes. At another level I think it shows the extent to which far too high a percentage of the industry is just preoccupied with believing what they are told either in the textbooks or as mediated by the CFA.

And one of the intriguing things for us is that there is really very little convincing, serious backing of the contentions behind growth with a capital G investing. The only good book on growth investing common stocks and uncommon profits was written the year I was born so you can tell it's a very long time ago and the world has changed since then.

So what's changed? Well Ben Graham won't take you through the details of his hundreds of pages but he basically believed that the only thing that mattered in investing was following cycles of companies going a little bit up and a little bit down and if they got through a recession you should own them.

But behind that was a thesis that said it's impossible for any company at scale to grow by more than 10 per cent per annum. But that's not what's been happening in the last 35 years and my contention would be that the two pictures on this slide sum up why this is.

Many of you will recognise the top one as being a young Bill Gates and my contention would be the day Microsoft went public or we realised the implications of it the investing world changed acutely. And the second one less known would be a gentleman, another professor, Professor Brian Arthur principally of the Santa Fe Institute who tried to interpret this world. So what in both practical and philosophical terms did they talk about that should make us as investors pause and rethink? Well, when Microsoft went public that notion of 10 per cent per annum growth for a large company, it's been completely blown out of the water. And that's despite it being run by one of the worst business leaders in the world in the shape of Steve Bulmer for at least a decade. Since Microsoft went public in the mid-1980s its earnings have compounded at 24 per cent per annum. It shows little sign given its recent reinterpretation of changing particularly. It'll be down but not that much down.

Now, I've previously had a discussion with the various board members about the greatest long-term record ever. I've recently been spending a lot of time in Amsterdam and I've come to the conclusion it's not quite because the Dutch East India company had the first capitalist company of all time had a total return of mid-30s percent for its first 48 years of existence. But it's pretty good. It's well above that Ben Graham talks about and we know plenty of other companies from Amazon to Tencent have exceeded this at scale in recent years. So why? How can this happen? How can it be so different from what we've taught?

Well Brian Arthur would say that he wrote about this first in the mid-1990s that it's about increasing returns to scale. That historically the marginal productivity and profitability of companies declined as they get bigger. But we all know that if you produce software and you have a decent scale network that that's not the truth of the matter.

The extra customer both costs very little and creates a great deal of value and longevity at the same time. And I think the notion that that is becoming a bigger and bigger percentage of the companies we see, we evaluate and inspire us is absolutely the truth of the matter. To bring it up to date as Marc Andreessen the venture capitalist puts it, software is eating the world and that we don't think is going away.

But it's also, and we have talked about this one before so I won't go into detail, it's also about our understanding of the distribution returns in capital markets and as I say I won't belabour it except for the basic concision here, which is that since 1926 out of over 24,000 companies just 90 of them have created half the excess value in the US stock market. Our task is to find the extremes. It's not to own a bit of everything as economic conditions create. It's about finding these companies and I'll leave Tom to talk about it in detail what we do there. By the by, we've now seen data on how this applies internationally and it's even more extreme. Frankly in many markets you shouldn't own companies at all but where you should it's dominated by one or two companies not even close to 90.

This is where our material gets difficult. Though once companies start growing and then attain that increasing return to scale that Brian Arthur describes and Microsoft embodies, at the start it's a lot more difficult of that and of course it's important to us to try and own companies fairly early in this stage. If nothing else to get to know them better so we can make our holdings larger as their triumph becomes inevitable.

Because the start of all this is usually a complete mess to be frank. It's luck rather than skill. And the two pictures I have here I hope in different ways encompass that. So first time we used this slide I said to our invaluable assistant Catharine why is there a balloon there? And she had to remind me that the reason there is a hot air balloon is because on the occasion that Bill Gates was first in negotiations to sign a landmark contract with IBM he said you know I'm not sure we're the best people to do this for you.

And he introduced them to another gentleman who didn't like IBM at all. He didn't like white ties. I mean, sorry, white shirts and whatever colour ties. And he just found their formality and hierarchy endlessly tiring so on the day he was meant to meet them he went up in a hot air balloon which was his hobby. Hot air balloon floated off in an unexpected direction so he missed the meeting with IBM. So Bill Gates who was there merely to introduce them said well we'll have a go at doing it ourselves. That long history of Microsoft has now come off that complete accident at the start as well as Gates not actually knowing which direction he wanted to go.

The other one is a more extreme one. A more ancient and less connected with stock markets but does show I think how fund managers incline to treat a certainty is very often the proof of accidents. This is a picture of Annie Oakley as in Annie, get your gun, who used, at the end of her performance in the Buffalo Bill Wild West show, to offer to anybody in the audience, just like you today, that she would shoot a cigar out of their mouth to bring the show to an end. Usually, as you'd guess, nobody volunteered. So you know I suppose the equivalent is I would ask Linda or whoever to come up now because you just demand it that one of your colleagues did this instead. But the very last night of one her tours she and Buffalo Bill were in Berlin and to celebrate going back and to start their trek back to America, she and Buffalo Bill had been out for a few drinks before. So she was a bit hesitant as to whether to offer this trick in the evening. But she decided carried away by the success and applause she was getting that she would do so. And to her horror, a large gentleman, I'm not here referring to this audience at all. A large gentleman leapt out of the front row and said 'I will do it'.

Now, by all accounts there are several her hand began to shake a little bit, but she succeeded in the task. Why am I telling you this? Because the gentleman, the large gentleman who leapt out of his seat was the Kaiser. Now I'm going to sort of semi-train this story as my friends put it. There are lots of histories of the First World War and the subsequent events of the 20th century but I know not one of them that denies that the personality of the Kaiser made a very extreme difference to sudden events. So I think we need to take awareness that actually although we think there are definable trends that the world is a lot less certain that we think and we are prisoners of this. And I think any fund manager who tells you anything with great confidence ought to be aware of these accidents of history much more than they are.

Getting to the end of my bit, I promise. What's the result of all this? That we have concentration of returns. That we have a process at the start that's very lucky or path dependent as people would say. But that after that companies get more and more powerful. More and more attractive to investors. I think it is that you need to replace the Ben Graham, Warren Buffett mantra and I'm conscious that sounds wildly over self-confident but we think you need to replace that by not thinking about downside but about upside. It's extreme outcomes that matter in this business.

And I think actually that is formidably well put and philosophised by Jeff Bezos. Not in practicalities so much as in philosophy. Now Warren Buffett's rule one is don't lose money and rule two is don't forget rule one. But that's not actually right because if you are giving up multiple upside then you're not giving yourself availability of the real potential of equity investment. So I much prefer and I take incredibly seriously the Bezos line on this which is that in America, as you'll know, just about every analogy is sporting in general and baseball in particular to which his take in a shareholder letter was, you hit a grand slam in baseball you only score four runs. And I know enough to know that's true. If you hit a grand slam in business you make at least 1,000 times your return. That 1,000 times and giving yourself the opportunity to earn those 1,000 times matters a lot more than Buffett's rule one or two and I think that's a sign of just how much the economics of the world has changed in the last 35 years or roughly since I've been doing this.

The last point and this is really a transitional one is to come back to what I was saying about unquoted companies. Tom will talk about some of them in a bit more detail. But we find and again this was a point which I would emphasis to come back again to the beginning the board have been hugely helpful about. We gradually became aware that companies were going public much, much later on.

We're very happy. We've all very happy to talk about why that might be so but it's absolutely so. Now if we are to give our shareholders access to the real opportunities arising to those companies where actually returns are beginning to increase to scale, then we need to give ourselves the opportunity to know these companies and to understand them and to invest in them where appropriate.

So I would emphasise as a closing sentence that if you don't do this you are not giving clients access to the greatest opportunities there are. We would see at the moment well over half of the companies that we see as new opportunities coming in this unquoted form. And I think that's something that we all need to think about and all need to provide democratic, low cost access to and that we shouldn't be put off by headlines and the like from that incredibly serious task. This is what providing proper capital in the long-term in a supportive manner to companies is about and if we don't have that, I'm sorry our economies are most unlikely to grow. This is a really important part of it. At which for even more significant ideas, Tom.

**Tom Slater (TS):** Thank you, James. So I'm going to use my slot to talk about Scottish Mortgage's investment portfolio. What I'm not going to do though is compare our investments to the broader stock market. I'm not going to talk about our sector weightings. Our country weightings. Not just because I think they're irrelevant, because I actually think they're deeply unhelpful to us. They diminish our ability to perform the clearly defined aim of long-term capital growth on your behalf. So why do I say that? Why are they unhelpful? I think many if not most of the large companies that make up our stock market indices are the product of past success. Established ways of working. Cash flows earned by having a strong grip on underlying markets in which the company operates. We think many of those positions are unsustainable. We think that the future looks very different from the past. There will be no reversion to the mean for these companies.

Why? Because our world is changing rapidly and I don't believe that is because of progress in the broadly defined area of technology. Technology has been progressing ever since the invention of the wheel. Instead I think it is the ubiquity of mobile devices and the internet that is deepening our connection into a global network. And networks behave in complex ways. They change our opportunities. They change our expectations. Ultimately they change our behaviour. And this change is having an increasingly profound effect in our economy. The impact isn't uniform. Different industries move at different speeds. But the breadth and scope of this change continues to increase.

Now academic work on complex networks throws up some interesting results and I find them useful to keep in mind when thinking about potential investments. First of all, approaches that work for complicated problems don't work for networks. Networks can't be reduced to systems and processes and rules. Hierarchical institutions can be effective in solving complicated problems like operating a supply chain or broadcasting media content but they're ill-equipped to deal with networks of supplier and consumers interacting, evolving at breakneck speed. Secondly complex networks have no equilibrium state. The system is always changing. So when your customers, your suppliers, your competitors, your regulators, your users are all connected to one another in countless ways, you can't have a fixed model of the world. Instead you have to adapt and use your position in the network to your advantage.

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Flexibility is crucial. As is clearly creating value for your customers rather than just extracting a toll based on your market position. So having shared that mental model I want to dive in and talk about how this is reflected in the portfolio and I wanted to start with retail but specifically food retail.

Retail is arguably the first industry to feel the full impact of internet-enabled business models. It's hardly an insight to suggest that Amazon is transforming the Western retail landscape at increasing scale or that Alibaba is the infrastructure layer for retail in China. What I want to focus on is how limited today's offering is. And when you think about that it's perhaps best captured by considering food retail. On its own grocery is an enormous category. So half a trillion dollars in the US alone. But the online penetration of that market is extremely modest. Bizarrely the UK has just about the highest penetration of online grocery of anywhere in the world. Although one might suggest that the idea of people driving vans from your local store is hardly revolutionary either in its efficiency or in its concept.

Even five years ago you might well have said that the food industry was going to be one of the last to be digitised. But it's currently one of the most interesting parts of the market. So as Amazon is seeking to grow its share of wallet in its customer base, grocery is clearly a top priority. They see it as a market in which there has just been very little radical thinking for a very long time but the frequency of purchase, the scale, make it very attractive for a technology-led entrant. Customers want a combination of physical stores, click and collect, online delivery. So this is a battle which is likely to consume capital.

It's likely to take a long time and that of course is the type of competition that Amazon revels in. So in tying together its online pantry service, click and collect, it's estate of whole food stores predominantly in the US it sees a bigger opportunity. But they themselves would enthusiastically acknowledge that they need to get to a totally different level of inventory control, picking capability, if this is to be a big growth driver for them if you look out over the next decade.

But you can see in this industry that advanced networks are making possible some incredible experiences. So if you go to one of the 11 Amazon Go stores in Seattle or San Francisco you can scan your mobile device as you walk into the shop and from then on you can just walk around, pick up items off the shelves, and walk out. So you don't need to scan the items, you don't need to queue at a till, there's no check out, it's just cameras and machine intelligence. So a meaningful improvement on the customer experience of going to a store. Meanwhile if you go to an Alibaba Hema supermarket in China you'll find them serving physical customers on the ground floor whilst food for online orders is being whisked on conveyor belts across the ceiling to an army of online delivery agents waiting to take it to customers. And the key to achieving either of these formats is having data on the customers. Understanding what people want. Who they are. And that's something that traditional retail just doesn't have any experience in. Meanwhile the progress that's been made by some of our food ordering and delivery companies such as Meituan, the middle company on the slide, Delivery Hero, Grub Hub. May lead to some other structural changes in the market.

So ordering from an online network of vendors is easier for consumers. The range of product that's available has improved and as costs continue to decline, as delivery times continue to shorten, the market is growing. But what we're also seeing is the emergence of completely new business models. So dark kitchens, these are operations on light industrial parks. They have no counters. They have no covers and instead they're building their business. Their marketing. Their distribution is all through these online networks. Meituan's best customers order 21 meals a week. And that type of behaviour is changing China's physical infrastructure. So apartments are being built with smaller and smaller kitchens. In some instances, no kitchens. But apartment blocks are being built with the infrastructure to accommodate arrivals from Meituan's half-million strong force of delivery drivers.

So the combination of changing habits and some of these local monopolies is creating some great opportunities in the food industry. The next area I wanted to touch on is media. Now I mentioned at the start the broadcasting content to a large audience is a complicated problem and traditional media companies were created to solve that complicated problem. They've made a lot of money out of it. However, today we're consuming a growing proportion of our media on a network of connected devices and a result of that is the traditional model of media companies is fracturing. So the powerhouse of the cable television industry is ESPN. The sports network. ESPN peaked with about 100 million subscribers. That happened back in 2011. Since 2011, ESPN's subscriber base has declined by about 14 per cent. Disney's purchase of 21st Century Fox last year, Comcast's purchase of Sky Broadcasting here in the UK, I think are illustrations of the pressure that's been created by that declining audience.

Now since peak ESPN, Netflix has grown from 25 million subscribers to 137 million today. Its spending is close to double that of the traditional media company. The largest, traditional media companies on content. And customers are voting with their eyeballs. So two or three weeks ago Netflix released its latest original film, Murder Mystery. That film attracted viewership from 39 million accounts in its first three days. So to give you some context that is more than double the number of people who will go to see a film in the US, any film in the US over the next week.

And with the industry in that time of flux you can understand why this is another area that is a priority for Amazon. It spent just under $5 billion on original content last year. It signed some impressive producers and directors from Netflix like NBC to head its studio business. And what you have to remember here is that Amazon is a data-driven business. So the motivation for spending this $5 billion is what they see in the behaviour of their customers. When a Prime member watches their first piece of free content through Prime Video they become a much more committed Prime member. Their renewal rates improve. And that comes back to a business model advantage that Amazon has that it doesn't have to monetise all its products directly. Instead it can invest in media content and use that to sell more shoes. And so in a way we've become familiar elsewhere. There's not actually much competition at the audience level. All the competition between Netflix and Amazon for example is the competition for talent.

Now the transition in music is even more advanced. A few years ago you were probably still fumbling around with CDs, their cracked cases. Or if you were very modern you would be paying iTunes 99p to buy a song that you wanted to hear on your first generation iPod. And it was farfetched to think that you might actually be able to get instant access to all the music in the world. But now there are 217 million people who can make that claim courtesy of Spotify and the type of distribution at this scale just hasn't existed before. But the company has so much more to go for. Remember there are over three billion smartphone users in the world so they have a tiny fraction of the potential audience. And as their scale increases they have the ability to dictate terms to the rest of the industry. It can easily add other services. It will likely become a major marketing channel for creative artists over the coming years. And to link that back to one of the topics James was touching on, there is no cost to them to do that.

Elsewhere within our media holdings, Facebook is working hard to rebuild the damage done by the Cambridge Analytica scandal. It has its work cut out in the face of a hostile traditional media industry but we are seeing a return to growth and profits. Gaming continues to grow. It's now bigger than the music industry and the video industry combined here in the UK. However, our principle holding in this area the Chinese company Tencent is caught up in government dissatisfaction with the direction of the gaming industry in China and its impact on Chinese youth. So the hiatus on game approvals there is causing some short-term difficulties. Now whilst the big internet platforms like Facebook and Alphabet are not as prominent in the portfolio as they were a couple of years ago, it doesn't mean we're any less enthusiastic about the power of these platform business models and the growth opportunities they address. So whilst the impact of networks on retail and the media has been apparent for some time now, there are other big areas where the changes are much more nascent and they're arguably more important. So the first one I was going to touch on is healthcare.

There have been some massive change over the past ten years to a data driven world and our expectation as consumers has really changed. But our healthcare institutions have shown massive inertia. It's still difficult to get prompt answers in a way we've come to expect elsewhere. And it's against this backdrop that we've been looking for healthcare companies that can drive that type of shift. By far the most important are our holding and sequencing companies, Illumina and Grail. Illumina's equipment is used for the vast majority of the world's gene sequencing. It marked its $20^{th}$ anniversary of founding this year. You can see on the chart the rapid explosion in data that this technology combined with rapid cost declines has created.

The company's mission remains the same as it has in the past but we are entering a new phase. The first part was about refining the technology. Serving the research markets. And its success has transformed how research is being done. Instead of starting with a research hypothesis and collecting a little bit of data to test it, in this new paradigm you measure everything and then run computational experiments on this data. The next phase is about unlocking clinical and that's something that's happening increasingly rapidly. So a million individuals have now had their genome's sequences but we're still at the stage where only 1 per cent of those diagnosed with cancer have their disease sequenced. Earlier this year the government announced that all children in England diagnosed with cancer will qualify for whole genome sequencing. A couple of weeks ago it expanded that to all children with undiagnosed illness who are admitted to intensive care. And meanwhile the clinical data that we're getting from Illumina's unlisted progeny Grail suggests that its quest for an early stage pan-cancer diagnostic test is showing considerable promise. It's happening much faster than they had anticipated.

Roche bought our holding in Flatiron last year which was aggregating oncology data but we do have other unlisted holdings such as Tempus Labs, which is building a cancer mutation dataset through its testing business. The picture on the right-hand side of the slide shows the launch of one of Zipline's drones. Now this is a company which is making big strides in the use of autonomous network connected aircraft to improve medical logistics in sub-Saharan Africa.

Drones have been a technology that's been searching for a use case but I think in this Zipline may have found it. Their aircraft launched navigate interface with air traffic control, circumnavigate bad weather to deliver blood supplies and other essential medicines and they can do that rapidly to the point of need which allows you to take significant costs out of the supply chain. And as the technology improves, the costs continue to fall. We think the number of applications of this should grow exponentially.

Now whilst we invest in a number of companies that are using biology to improve our health, a more recent development in the portfolio is our investment in companies that are using biology for other purposes. So consider the clothing industry. Our clothes are either made from synthetic fibres so nylon, polyester, spandex. Or they're made from natural fibres; cotton, wool, silk. Natural fibres are perceived as higher quality but synthetic fibres are much easier to work with for manufacturers. You can engineer them for the required qualities; strength, elasticity. But producing fibres with synthetic biology allows you to carry out that type of precise engineering of the properties without sacrificing the perception of quality.

So Bolt Threads are producing spider silk at volumes and costs which are facilitating commercial applications. This is currently being deployed in the luxury sector. As costs continue to fall I think we'll see this increasingly in mainstream products. I think they'll be able to engineer other desirable properties into products that aren't available today. So you know, think silk that you can put in the washing machine. Indigo Agriculture are using similar techniques to identify and engineer microbes that promote healthy and rapid crop growth. So it's not just a parallel. It's deploying this technology across a whole range of industries.

But perhaps the most visible application of what I've been talking about isn't in healthcare or in bioengineering but it's in the automotive sector. Our cars today are pretty much like mobile phones were ten years ago. Mostly they aren't connected to the internet. Mostly they don't have smart operating systems. They have limited awareness of their environment but that's about to change dramatically. So companies like Tesla or Chinese competitor Neo are pushing the market away from internal combustion engines. In places like California or China that are at the forefront of these trends, we already see that electric vehicles are making about 10 per cent of the new vehicles sales mix. Progress on autonomy also rapid. Google Alphabet is already operating commercial taxis on the public roads with no human driver or supervisor. That fleet is small but it's expanding exponentially. Tesla's fleet of vehicles is already very large and the vehicles that are selling today have the hardware that's required to operate autonomously in the future.

It's an open question though whether we will own our cars in the future. Will they sit idle for most of the time and there are huge efficiency gains to be had by increasing driving utilisation. And that's an inefficiency which is being addressed by our holding in Lyft, which allows people to reliably and cheaply summon transport. Now if they're able to remove the human driver from that equation then costs will come down rapidly and it could make this a very economically attractive alternative to car ownership.

I'm going to finish my session by getting right to the sharp end of our portfolio. To the holdings which are new where our conviction is nascent. Where the evidence of success is yet to come. Where the hypothesis is yet to harden. Now these holdings are small. Individually they're immaterial to the outcome at this point but I do think they give you some hints about the direction we're going in.

So on the left-hand side of the slide Space X probably requires the least introduction. This is a private company which is making commercial space applications feasible through a massive reduction in the cost of transport. Principally through the use of reutilisation of equipment.

In the centre you have Affirm which is harnessing the vast amounts of data that exist online to make instant credit decisions for consumers making purchases from websites. Point of sale finance has been dominated by providers who want to exploit customers. Exploit their position to charge higher interest rates. By underwriting effectively a firm is able to offer fair, transparent pricing and that drives customer satisfaction and in turn higher utilisation.

On the right you have ByteDance. Most of you I think have come across Facebook by now but I'm afraid the average age of the audience dictates that you won't have come across TikTok. Won't all have come across TikTok. Sorry, Fiona. An audience of teenagers however would know exactly what I'm talking about. This is the social network for sharing video content and it's where the younger generation now goes to socialise since their parents and grandparents are on Facebook. And it's particularly interesting because it looks like the first Chinese media company which is going to break out of the sinosphere and become a global business.

So summarising all of this, the changing nature of our economy creates enormous challenges but it also creates many new opportunities. We can't assume that businesses that have persisted for a long time will have a right to exist in this future. We can't start with today's companies and markets or today's stock market index. Instead we have to look for the entrepreneurs and businesses that are building this future and where we find them, whether they're private or public, we're going to be long-term and patient shareholders on your behalf.

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The specific risks associated with the funds include:

The Trust invests in overseas securities, changes in the rates of exchange may also cause the value of your investment (and any income it may pay) to go down or up.

Market values for securities which have become difficult to trade may not be readily available, and there can be no assurance that any value assigned to such securities will accurately reflect the price the Trust might receive upon their sale.

The Trust invests in emerging markets where difficulties in dealing, settlement and custody could arise, resulting in a negative impact on the value of your investment.

Scottish Mortgage can borrow money to make further investments (sometimes known as ‘gearing’ or ‘leverage’). The risk is that when this money is repaid by the Trust, the value of the investments may not be enough to cover the borrowing and interest costs, and the Trust will make a loss. If the Trust's investments fall in value, any borrowings will increase the amount of this loss.

The Trust has a significant exposure to unlisted investments. The Trust’s risk could be increased as these assets may be more difficult to buy or sell, so changes in their prices may be greater.

The Trust can make use of derivatives. The use of derivatives may impact on its performance.

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