

December 14, 2017

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## IP Group (IPO LN)

Price	£ 1.47
Rating	<b>SELL</b>
Price Target	<b>£ 0.80</b>
Market Cap (mln)	£1,559.4
Avg. Volume	650,471

IP Group (IPO LN) last share price in pence (blue, LHS) and volume (green, mln shares)



Source: Bloomberg 12 December 2017

## IP Group (IPO LN) One for the Bankers

- ▶ **Disaster waiting to happen**  
IP Group has hurried to diversify risk from its biggest asset, Oxford Nanopore, a company that cannot make its technology work but whose valuation has been bloated by successive rounds of investment. Now, facing cash shortages, the company looks to be on the precipice of a major devaluation if not failure. That single company could drag down IPO's price by 20%.
- ▶ **Screwy book values**  
IP Group is an accounting game more than a company and has an atrocious track record of delivering bankable returns.
- ▶ **Can't help themselves**  
Private investors in IP Group share a collusive interest creating high paper values for tech concept companies that generally fail.
- ▶ **SELL**  
We think the company is worth half its posted value at best.

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IP Group is really good at persuading its shareholders to invest in the portfolio companies

### Playing the DIY Valuation Game

Only children believe that, when a stage magician taps an empty box with a wand and opens the box to let a dove fly out, he has created life. Yet the market believes that IP Group (IPO LN, IPZYF OTCMKTS), fresh off a merger with Touchstone Innovations (IVO LN), has done just that. The reality is that IP Group is just a black box with no transformative power, and its valuation of £1.50 per share is inflated by around 50%. Right now, the company faces the threat of a sharp devaluation of its principal asset. We believe the merger was to avoid the collapse of IP Group when its key portfolio company, Nanopore, is significantly written down or closed.

This grab bag of a company derives all its revenue from paper-only gains in more than 200 portfolio companies as well as from the smaller venture funds all jumbled inside, and yet never manages to make cash gains.

What has kept IP Group alive since it listed in 2006 are valuation-inflating infusions of cash in the portfolio companies by funds that are also investors in the listed parent. These funds share a perverse incentive to overpay in order to boost the valuation they can book. Portfolio company valuations are magnified on the books of the parent and from there to the funds that own IPO. That creates a deeply embedded conflict of interest for investors that incentivizes them to embrace write-ups and avoid write-downs no matter what the market is telling them.

“IP Group is really good at persuading its shareholders to invest in the portfolio companies,” said a former member of the executive team in a phone interview with J Capital. “They all want valuations to rise.” No one has an interest in a down round or write-offs, and write-offs should be common at a company working at the seed stage of new technologies. Both institutional holders and management are rewarded based on increases in the book valuations rather than from cash returns.

IPO and its pyramid of investees are worth a small fraction of the traded price, which has recently swollen to £1.59 billion after merging with Touchstone, itself a controversial and failed experiment with a similar business model. The group’s very existence relies upon a continuing flow of capital into questionable technology companies.

The key investor behind each level of funding is the British fund manager Neil Woodford. Woodford had a stellar record as a large-cap investor but has been heavily criticized, including by the Financial Times,<sup>1</sup> for his bio-

<sup>1</sup>See “Neil Woodford loses glow as recent fund performance stutters,” April 28, 2017: <https://www.ft.com/content/d3793830-29ba-11e7-9ec8-168383da43b7>

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tech frolics. “It has become very high profile for Woodford to invest in your company,” said the former executive. Woodford is under intense pressure this year, as his funds have seen £1 billion in redemptions following poor performance.<sup>2</sup>

The crown jewel and largest part of IP Group’s portfolio is a DNA sequencing company whose technology, after a decade of commercialization efforts, has failed to generate material sales. The company, Oxford Nanopore, is valued on paper at £1,250.3 million but in our view is actually worthless and running out of money. Nanopore may already be looking for a new round of equity and could need an emergency cash infusion as early as January, if the 2017 burn rate matches what it was in 2016. Since 2009, Nanopore has generated 54% of the IP Group’s “revenue” by booking most of the group’s fair-value gains. Now, that valuation game may finally be ending: Nanopore is burning so much cash that we think it could fail early next year. That failure would catalyze a significant drop in NAV and cause losses for shareholders as well as a re-rating of the stock--something IP Group has flagged on page 40 of its 2016 Annual Report.

The potential for imminent failure of Nanopore may have been a key motivation behind IPO’s recent hostile takeover of Touchstone. The merger diluted Nanopore to 18% of combined company NAV and therefore will soften the impact on managerial bonuses of any write-down in Nanopore’s value.

The rest of the portfolio comprises a motley basket of tech ideas, some plausible and some downright silly but generating negative returns for IP Group. The group also manages venture capital funds for fees, but those funds, says a former member of the IP Group management team whom we interviewed by phone, do very poorly. Like IP Group itself, managed funds North East Technology Fund and IP Venture Funds I and II have yet to see lucrative exits. “There’s an agency challenge,” said the former manager. IP Group also pours capital into university tech-transfer platforms like Oxford Sciences Innovation and Cambridge Innovation Capital for no visible benefit (unless you care about gratitude by university science departments).

IP Group has not had a single home run. The total of proceeds from disposals since 2008 is £40.9 million, and that compares with a total of £346.3 million invested in portfolio companies in the same period (including the acquisition of Fusion, an investment platform). Other gains are paper-only, with little prospect of being realized in cash.

<sup>2</sup>See “Neil Woodford: Will Investors Keep the Faith?” by Clair Barrett and Kate Beioley, Financial Times, December 1, 2017: <https://www.ft.com/content/c6ef0f16-d51f-11e7-a303-9060cb1e5f44>

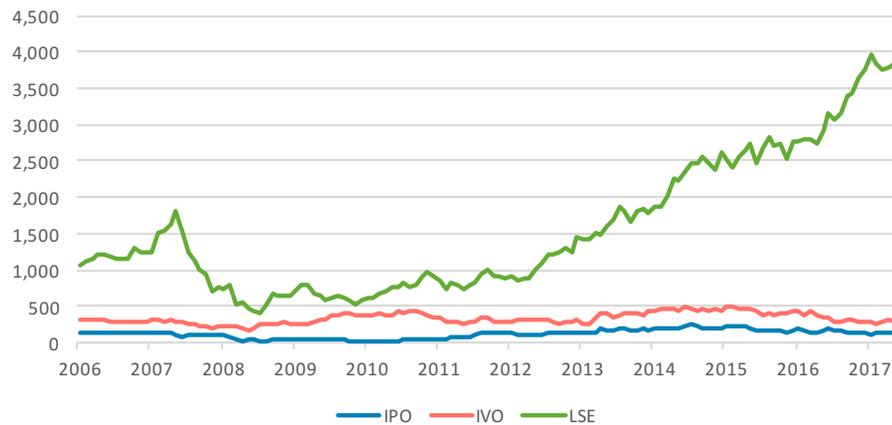
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IPO and IVO themselves, whose share prices track NAV, have also been poor investments. IVO has seen a 5% decline in its share price since its listing on AIM in 2006, and since that time, IPO has gained 17%. The LSE over the same period returned 275%.

**Table 1. IPO and IVO Share Prices (in pence) against the LSE Average**



Source: Bloomberg

In our opinion, IP Group's profits are an accounting fiction and could quickly evaporate. We value Nanopore, currently 18% of portfolio value, at zero. The rest of the portfolio is too opaque for accurate evaluation, but external analysis like this groundbreaking Kauffman Foundation report has determined that 75% of venture capital funds render zero gains at termination and only three in 100 funds beat public market gains. IP Group had ample time to prove that it is among the three, and it has failed to do so. We assume there is salvage value in IP Group's portfolio holdings but that most of the companies will fold. We therefore assign a 50% discount to the portfolio assets ex-Nanopore. That leaves us with a target price of £0.80, a 47% discount to the stock's price on December 13. The short-term catalyst for re-rating will likely be a write-down in the value of Oxford Nanopore.

We discovered IP Group as a candidate for further evaluation by screening listed fund managers that have not achieved cash realization from exits. Forensic accounting analysis revealed valuation-inflating infusions of cash in the portfolio companies a small group of investors. Because Oxford Nanopore is such an outsized portion of the IP Group portfolio, we focused our primary research on that company, speaking with scientists we located through blogs and Twitter accounts and contacting Nanopore customers and former employees of the company for color on the product and prospects for future sales. Interviews were largely conducted by telephone and

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via email. IP Group products and services are highly technical and scientific in nature. We had four scientists with relevant knowledge review critical sections of the report at various stages of drafting.

We have contacted IP Group to discuss issues raised in our research and the company was unable to coordinate a time for a telephone conference. Company management is generally open and helpful.

### How the Nanopore Technology Works

In the early days, Nanopore’s process seemed to eliminate the requirement that strands of DNA be tagged with dyes or other markers to make it easier to “see” the nucleotides that make up the DNA. Bulky and expensive equipment, typically using lasers, is needed to read these dye-terminators. Nanopore measures electrical impulses that occur as strands of DNA pass through a tiny biological hole called a nanopore. That should make sequencing fast, cheap, and easy to do. DNA blocks part of the protein pore while it transits. Nanopore applies an electric current and measures the change created by this blocking to identify specific nucleobases. This is something like blocking water coming out of a tap and using the direction of the water to identify the object that blocked the tap. A semiconductor or “ASIC” specially designed to “read” the electric current is installed in the Nanopore device to record the electric “squiggles.” Those squiggles are sent to a powerful computer that runs machine-learning algorithms to translate the squiggles back to DNA sequences.

The process sounded good, but Oxford Nanopore couldn’t solve the technical problems. A former Oxford Nanopore scientist told us that the nanopores are unstable, need refrigeration, and have a shelf life of a relatively brief eight weeks. The sequencing is error-prone. The algorithms the technical team wrote to interpret data have to be updated all the time, but they are embedded in hardware, so the sequencers in the market have glitches that can’t easily be fixed. Nanopore has failed to cooperate with the scientific community, so no one writes compatible software to make the Nanopore technology more useful. “Nanopore has a very bad relationship with the scientific community,” said a scientist who was formerly employed by Nanopore. “I wondered why, and then I realized that Nanopore is not paid by customers; it’s paid by investors. Maybe that is why they close the doors to the scientific community.”

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Nanopore has not figured out how to make its sequencing cheap

### Pore Man's Technology

Oxford Nanopore is the principal driver of IPO's valuation: IP Group's 19.7% stake in Oxford Nanopore is valued at £246.3 million, or 18% of the total portfolio. We believe this company will eventually go to zero; as soon as January, its value could be written down. That is because Nanopore is burning around £5 million each month, based on its financial statements and the comments of insiders, and the company had £64 million in the bank at the end of 2016 despite having raised £100 million in December 2016.

Oxford Nanopore had a breakthrough about 15 years ago. The problem is that the company never figured out how to commercialize the technology, and now it has been surpassed.

Critically, Nanopore has not figured out how to make its sequencing cheap. Although the smallest of the Nanopore devices sells for just \$1,000, the cost of getting data out of it, according to a former data scientist who worked three years for Oxford Nanopore, is roughly 100x that of sequenc-

**Table 2. Technology Comparison**

	PacBio		Oxford Nanopore		Illumina		
Instrument Name	RS II	Sequel	MinION	GridION X5 Starter Pack	PromethION	MiSeq	NovaSeq
Average read length (kilobytes)	10-15	10-15	up to 900			up to 600	
Error rate	10-15%	10-15%	5-15%	5-15%		<1%	
Output (gigabytes)	0.5-1	5-10	~5	10-20		15	167
# of reads	50,000	500,000	up to 1 million	3-5 million		25 million	3-10 bln
Instrument price/ access fee (USD)	\$750,000	\$350,000	\$1,000	\$49,955	\$135,000	\$125,000	\$850,000
Run price	\$400	\$850	\$500-900	\$475	~\$1,000	\$750	
Cost per genome sequenced	\$3,000		\$90,000			\$1,000	

Sources: Bhagyashree Birla/Genohub<sup>3</sup>, Oxford Nanopore, Illumina, Genome Web, Quora, J Capital

<sup>3</sup>Genohub is a useful source of comparative information for sequencing technologies.

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ing by the industry leader, Illumina (ILMN US), or \$1,000 per microbe versus \$1,000 for at least 100 microbes by an Illumina device. Much of that cost is hidden until the customer acquires a device, because it's the cost of calculating results. The genomics expert Shawn Baker, writing on [Quora](#), estimates that sequencing a genome on a MinION costs about \$90,000. This compares with \$1,000 for sequencing a genome on an Illumina device. Independent estimates for sequencing on a device from competitor Pacific Biosciences (PACB US) suggest a cost of \$3,000 for a genome. Since the human genome was successfully mapped in 2003, sequencing has fallen in price by nearly five orders of magnitude—far faster than the price of semiconductors. In a world where companies like 23andme will provide gene testing to consumers for as little as \$130 per sample, the Oxford Nanopore proposition looks very outdated.

Nanopore was formed as a spin-out from the University of Oxford in 2005, with seed funding from IP Group, by a team of three: the renowned chemist Professor Hagan Bayley, Gordon Sanghera, a scientist who had spent most of his career at the diabetes diagnostics company Medisense, and Spike Willcocks, a biochemist. Although the men are by all reports talented scientists, Nanopore staff we spoke with believe that management are terrible custodians of shareholder value and have created a siloed company in which researchers do not talk to development team, and no one dares challenge management.

It turns out that scientists do not necessarily know how to build businesses. Former middle management interviewed by phone told us that Nanopore managers are “failed” as academics and yet lack managerial expertise. Research is conducted without regard for commercial value. Different departments are asked not to communicate. Certain researchers control specific technologies, putting the company at risk of losing the technology if those people leave, and no one can challenge executives.

“There’s a very significant waste of resources internally, like duplicated posts,” said a former technical employee.

### The Hype

Faced with these problems early on, Nanopore management doubled down: they took the nanopore research idea and made it into science fiction. The executives have been promoting a vision of Oxford Nanopore devices in every shirt pocket, allowing citizen-scientists to sequence microbes as they walk through subway stations and airports or drink a glass of water.

In 2012, CEO Gordon Sanghera [claimed that](#) Nanopore would be sequenc-

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## Portability is a myth.

ing the human genome in 15 minutes by the next year. The company said the technology would allow computation on a smart phone. In 2012, Sanghera [said that](#) Nanopore’s GridION and MinION devices—neither of which yet existed--were “poised to deliver a completely new range of benefits to researchers and clinicians.” The MinION was not available until 2015 and the GridION came on the market in March this year. Neither device--both of which have been sold in very limited numbers and appear to be plagued with problems--is remotely capable of sequencing the human genome in 15 minutes.

In an April 2016 [article](#) in The Atlantic, CTO Clive Brown talked about how Nanopore would enable an “internet of living things”:

“What if you can track every beef burger? What is it, where did it come from, and what’s growing on it?” he asks. “What if every package that goes through an airport had a swab taken off it? Or the air supply in a hospital? We have interest from plant breeders who want to track what’s happening to their crops. I spoke to someone in the defense industry who wanted to detect pathogens in real-time on the London Underground.”

The company promoted the idea of this brave new world through their “London Calling” annual conference and heavy promotions of an experiment in a young scientist went to Africa to look for the Ebola virus with a MinION device. The Atlantic in 2015 wrote admiringly of the Ebola episode, and analysts bought the idea. But these promotions were half-truths at best. In reality, according to several DNA scientists, Nanopore field sequencing requires a mobile lab with refrigeration and uplinks for massive data streams. It would be cheaper and more effective to transport blood samples to labs. Said one scientist who formerly worked for Nanopore, in a phone interview, “Portability is a myth.”

“The citizen scientist is really far off,” said DNA scientist Keith Robison, who writes a blog called Omics! Omics!<sup>4</sup> Robison says that, despite claims to simplicity, Oxford Nanopore’s technology requires sample preparation that is very difficult without scientific training.

“If you want to do directed testing for Zika, Ebola, or whatever, you can quickly generate a dipstick test that will be cheaper,” says Robison. “If you

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<sup>4</sup>Robison has a blog on DNA science at <http://omicsomics.blogspot.com/2016/10/genia-publishes-polymerase-to-pore.html>.

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**A Nanopore flow cell for the MinION.** | Photo from Science Practice <http://www.science-practice.com/blog/2016/04/22/minion-burn-in/>

know what you're looking for, there are simpler strategies.”

Finally, Nanopore's reads are fatally error-prone—5-15%, according to DNA scientist Dr. Bhagyashree Birla as well as an article in Nature that appeared in June 2016.<sup>5</sup> PacBio has roughly the same amount of errors on the first read-through. But PacBio sequencing can be repeated over and over until errors are very low, while Nanopore sequencing cannot. For one thing, Nanopore's errors are not random, so the same error is often introduced if the sequencing is repeated. That is a fatal flaw.

### Over-promise and Under-deliver

Nanopore's principal product is a handheld sequencer called the MinION, announced in 2012 but first made commercially available in May 2015. In January 2014, Nanopore announced that the early access program for the MinION was “heavily oversubscribed,”<sup>6</sup> but the MinION saw less than £1 million in revenue in 2015.

The MinION contains just one flow cell. A flow cell is a single-use cartridge containing the nanopore, an ASIC, a plastic casing, and the other components of the sequencing reaction. Nanopore gives away the MinION

<sup>5</sup>“Coming of Age: Ten Years of Next-Generation Sequencing Technologies,” by Sara Goodwin, John D. McPherson, and W. Richard McCombie

<sup>6</sup><https://markets.ft.com/data/announce/full?dockey=1323-11844425-40L6V9IS5TIDD529N-L7EMETUTL>. The announcement is still available on the Financial Times website but has been removed from Nanopore's site.

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The CTO announces products that don't exist and before we know if they're possible

for free with a consumable “starter pack” that costs \$1,000. It’s a “razor-razor blade” idea, based on the idea that the company will develop a wide base of installed devices and then sell lots of consumable kits. But the computational requirements and the unreliability of the technology make that impossible. Indeed, Nanopore’s low sales have not supported the idea that customers will buy lots of consumables.

The only other product that has actually launched is the GridION X5, a desktop device that processes up to five MinION flow cells. This was launched in March 2017. People in the sequencing community say that Nanopore launched the GridION to access the institutional market, since the MinION has failed to boost sales.

Behind the GridION launch is an underlying problem that Nanopore would prefer investors not dwell on: its long-promised PromethION device is so plagued with technical problems that it may never launch at all. A former Nanopore employee told us that the PromethION may not be possible. “They can’t fit enough computing power in the box,” he said. The Nanopore process is just too data-intensive.

The PromethION is a benchtop device that is intended to process 48 flow cells. It was originally promised for 2015. In 2014, the company [was soliciting](#) \$135,000 “early access fees” from buyers of the PromethION. In July 2015, Nanopore again [offered](#) an early access fee of \$24,000 and a deposit of \$75,000. But in 2016, deferred income was only £1.4 million, less than half the level of 2015, and in late 2017, the machine has still not launched.

Robison believes the PromethION and the GridION represent throwing in the towel on the “citizen scientist.” In November 2016, Robison wrote a [blog post](#) entitled, “Is the PromethION a Strategic Error?” Having failed to sell a lot of MinION devices, the company is trying to capture the institutional market.

Other products remain theoretical. The VolTRAX is supposed to simplify and automate sample preparation but it is in development and a former employee of the company does not expect that the technical problems associated with the VolTRAX will be overcome. The SmidgION is a mobile phone sequencer [announced in May 2016](#) but also in development.

This comment on the blog Homolog sums up the consensus of many online comments:

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Chinese buyers we spoke with said they were disappointed and did not plan to buy again.

“One person says the CTO announces products that don’t exist and before we know if they’re possible (usually they’re not and so we waste months and millions). Is ‘Prometheon’ one such product?”<sup>7</sup>

The shift toward large, institutional analyzers and away from the hand-held versions betrays a fundamental flaw in the MinION idea. The vision of Stanley-and-Livingston-style researchers slashing through underbrush with MinIONS in the pockets of their bush jackets was a potent story for selling the potential of the company, but practicalities have overcome it.

“Commercialization is a complete failure,” said a former employee in a phone interview. “The marketing and product strategy are completely dysfunctional.”

### Nanopore China

After a decade without revenue, Nanopore showed some progress in 2016 and has sold several of the newest Nanopore devices, the GridION, in the Chinese market in 2017. The company announced that it has appointed a distributor in China, Shanghai NanodigmBio. But every one of the six Chinese GridION and MinION buyers we spoke with said they were disappointed and did not plan to buy again. These companies had made their purchases because the device seemed to offer “long” gene sequencing for a fraction of the price of PacBio devices, which most of them own. The buyers said the Nanopore sequencers are error-prone and deliver much less data than promised.

An employee of one of the three Chinese buyers Nanopore [recently announced](#) confirmed that the company had purchased three sequencers from Oxford Nanopore, but “We’re not very satisfied with the results. We definitely will not buy more,” he said. “Their technology is not very mature... We spent all this money, but we achieved about 10% of the expected results.” He added, “We think about 80% of what company management says is bull.”

A second said that his company had chosen the MinION for its low price and advantages in long sequencing. “But we weren’t very satisfied with the results. Their management says the device can process several megabytes but we only got to 30 kilobytes, 1,000 times worse than reported. . . . Now we’re mostly using PacBio—their stuff is much more reliable and mature.”

<sup>7</sup><http://homolog.us/blogs/blog/2016/02/13/our-agbt16-forecast-oxford-nanopore-will-go-out-of-business-by-2017/>

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The third customer, Bioscikin, is a subsidiary of Sincere Pharmaceutical and an investor in Oxford Nanopore's most recent, 100 million round.<sup>8</sup> Sincere Pharmaceutical is also intimately linked with the lead investor in Nanopore's 2016 round, GT Healthcare. Bioscikin employees did not comment on the quality of Nanopore equipment.

A genetics institute in Beijing conducted a detailed comparison of existing technologies for long sequencing. One of the researchers said that Nanopore's reads are the longest but that the institute chose to buy PacBio equipment. A management employee of a key partner to Nanopore in a phone interview said [our translation], "The cost for Nanopore reads is very high; basically it's very hard to make commercial. Even though the machine isn't that expensive, the materials are, because you need to do a lot of tests."

Quite a few companies in China use PacBio technology, the interviewee said. The list price is about four times as high as that for Nanopore, but using Nanopore is in the end more expensive. Every one of the organizations interviewed preferred Illumina technology.

### Competitors

Nanopore's valuation compares negatively with comparables in public markets. Pacific Biosciences has only \$346 million in market cap despite \$91 million in 2016 sales. PacBio's is the most widely used long-read platform, called single-molecule real-time sequencing or SMRT. But, despite revenue growth, PacBio can't earn an operating profit, and the stock price hasn't gone anywhere for a long time.

Nevertheless, PacBio gets better reviews from users. The key is that PacBio opens itself to the research community and encourages complementary software, while Oxford Nanopore is inimical to scientists.

Illumina is the market leader in sequencing and specializes in "synthetic" long-read sequencing. That is, instead of reading a long strand of DNA, Illumina's technology marks short strands and assembles them in a computer based on the tags or "barcodes." This synthetic assembly allows the researcher to see larger structures and may displace long-read technolo-

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<sup>8</sup>See the list of investments on the Bioscikin website: <http://www.bioscikin.com/tzjj/tzjj.asp> and the reference to Bioscikin as a subsidiary of Sincere here: [http://bcic.biocentury.com/companies/sincere\\_pharmaceutical\\_group](http://bcic.biocentury.com/companies/sincere_pharmaceutical_group). This article in iFeng Media also discussed the Bioscikin relationship: <http://wemedia.ifeng.com/20872149/wemedia.shtml>

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gies like PacBio's and Nanopore's.

Illumina, a profitable company with \$2.4 billion in revenue, is valued at 30x earnings. Investors sensibly recognize that DNA sequencing is falling in price at the fastest rate yet seen for a technology.

Short-read sequencers tend to be faster, more reliable, and cheaper. Long-read sequencers see more complexity and can be better for "de novo" sequencing of unknown organisms, if phasing of DNA structures is relevant. Short-read technologies probably have an edge in diagnostic applications and long reads in research applications. Illumina is the industry giant in short-read sequencing and PacBio in long reads.

### Driving the valuation

The importance of Nanopore to IP Group's accounting profits can hardly be overstated. Revenue in this company consists almost entirely of fair-value gains from successive investment rounds. Since Nanopore has been particularly successful raising money, it has delivered on fair-value gains and carried IP Group's NAV increase each year. From 2009 until June 2017, changes in Oxford Nanopore's fair value comprised 65% of IP Group's total gains and 54% of IP Group's total revenue. In the years 2012-2016, Oxford Nanopore's changes in fair value were 69% of IP Group's total changes in fair value, or 59% of IP Group's total revenue.

Oxford Nanopore's fair value gains comprised 65% of IP Group's total gains since 2009

**Table 3. Oxford Nanopore's Fair Value Movement (mln £)**

Period	Nanopore BOP	Nanopore Investment	Nanopore Fair Value Movement	Nanopore EOP
Jan '09 - Dec. '09	£19.50	£-	£3.20	£22.70
Jan '10 - Dec. '10	£22.70	£0.70	£2.20	£25.60
Jan '11 - Dec. '11	£25.60	£1.40	£6.40	£33.40
Jan '12 - Dec. '12	£33.40	£6.70	£26.40	£66.50
Jan '13 - Dec. '13	£66.50	£4.50	£33.30	£104.30
Jan '14 - Dec. '14	£104.30	£6.00	£18.00	£128.30
Jan '15 - Dec. '15	£128.30	£14.30	£50.40	£193.00
Jan '16 - Dec. '16	£193.00	£19.50	£33.80	£246.30
Jan '17 - June '17	£246.30	£-	£-	£246.30
<b>Total (Jan '09 - June '17)</b>		<b>£53.10</b>	<b>£173.70</b>	

Source: Company reports

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**Table 4. Nanopore's Contribution to IP Group Revenue and Fair Value Gain**

Period	Nanopore Fair Value Movement	IP Group Total Fair Value Movement for Period	IP Group Total Revenue
Jan '09 - Dec. '09	£3.20	-£1.40	-£0.80
Jan '10 - Dec. '10	£2.20	£4.00	£7.00
Jan '11 - Dec. '11	£6.40	£0.90	£5.90
Jan '12 - Dec. '12	£26.40	£38.00	£52.50
Jan '13 - Dec. '13	£33.30	£82.40	£85.40
Jan '14 - Dec. '14	£18.00	£20.70	£28.40
Jan '15 - Dec. '15	£50.40	£86.40	£98.30
Jan '16 - Dec. '16	£33.80	£7.00	£7.60
Jan '17 - June '17	£-	£28.50	£34.50
<b>Total (Jan '09 - June '17)</b>	<b>£173.70</b>	<b>£266.50</b>	<b>£318.80</b>
<b>Oxford Nanopore as % of IP Group's Total FV Movement and Revenue:</b>		65%	54%

Source: Company reports

All of these paper gains rely on up-rounds driven by the same small group of investors. Since 2008, Nanopore has raised £407.34 million. Excepting the London-based fund Odey and a mysterious Chinese fund called GT Healthcare, all funding participants are also investors in IP Group and others of its investees. They are IP Group, Invesco—Neil Woodford's former employer—Lansdowne, a London fund typically co-invests with Invesco and Woodford, and of course, Woodford Investments. We are in no way accusing Woodford or other funds of wrongdoing but simply pointing out that it would be very hard for a manager invested in many layers of this company to disentangle the narrow interest of fund investors from the broader interests of IP Group shareholders.

"They don't have a successful product and they have unlimited money," said a former member of the IP Group management team who has worked with Nanopore. "Every year they say they will float [on public markets] and every year they don't, because they would have to show revenue and they can't do that."

### illumina relationship

In 2009, Illumina partnered with Nanopore, providing \$18 mln in development capital and promises of another round should Nanopore reach development targets that were not publicly delineated. At the end of the first half of

**Table 5. Oxford Nanopore Investment Rounds**

Date	Offering Price	Capital Raised (mln GBP)	Post-Money Valuation (mln GBP)	Premium to Prior Round	Investors
January-09	£6.68	£11.80	£85.00		Illumina (18 Mln USD)
February-10	£7.31	£17.40	£110.00	29%	Illumina, Lansdowne, IP Group, Invesco Perpetual, new unidentified U.S. investors
April-11	£9.14	£25.00	£163.00	48%	Lansdowne, Invesco, IP Group
March-12	£16.39	£31.60	£323.00	98%	Unknown
October-13	£24.60	£40.00	£525.00	63%	Odey, IP Venture Fund, IP Group
August-14	£28.75	£35.00	£649.00	24%	Woodford, IP Group
July-15	£40.00	£70.00	£973.00	50%	IP Group
December-16	£46.50	£100.00	£1,250.00	28%	IP Group, GT Healthcare

Source: IP Group Annual Reports, Crunchbase

2013, the companies ended their cooperation when Nanopore apparently began looking for paths to commercialize its technology without Illumina. Ross Muken, an ISI analyst, wrote at the time that the break-up would not affect Illumina's share price, saying that the fracturing of the Illumina and Oxford's relationship would not affect Illumina's share price since most investors had heavily discounted the success rate of Oxford Nanopore.

"We continue to view Oxford as an intriguing company with a compelling technology. However, the technical complications of nanopore-based sequencing make the commercial feasibility of the products highly uncertain," he wrote.

**Legal challenges**

Oxford Nanopore was sued for patent infringement by [Illumina](#), which claimed exclusive rights to Oxford Nanopore's particular type of biological nanopore. Oxford Nanopore settled the lawsuit in August 2016 and resolved to use a different nanopore on which Illumina does not have a patent.

In March this year, [PacBio filed a complaint against Nanopore](#), claiming infringement of a sequencing technique. PacBio has a patent on the double-read process, which lets you check results by simultaneously reading both strands of DNA. This action has not been resolved. PacBio won an action against Nanopore in late 2016 that effectively barred Nanopore from selling the GridION in the United States. However, in March this year, Nanopore’s CTO Clive Brown said that, in May, the GridION X5 kits would no longer use the technology in dispute.<sup>9</sup> There has been no further announcement.

**IPO’s Other Concept Companies**

Nanopore is the most outsized of IP Group’s poor bets. The rest of the portfolio holds little of near-term commercial promise, and there have been no highly remunerative exits to date.

IP Group’s gains rely entirely on fair-value gain from Nanopore. The company has invested £341.9 million since 2008 in its portfolio companies and realized a cash gain of £40.9 million. The 10-year fair-value gain is £564 million, but the record shows those gains will not be realized. Besides, nearly all of the gain derives from Nanopore, which is a ticking bomb.

**Table 6. Portfolio Disposals**

Period	Disposals
2008	£-
2009	£1.2
2010	£2.2
2011	£1.4
2012	£6.3
2013	£5.8
2014	£7.9
2015	£0.8
2016	£15.3
H1 2017	£-
<b>Total</b>	<b>£40.9</b>

Source: Annual Reports, Note 14

Touchstone is no better. In total, from its listing through the 2017 Interim report, Touchstone invested £372.4 million in portfolio companies and realized £51 million in cash. The portfolio total fair value gains have totaled £88.7 million. Its portfolio companies collectively raised £1.7 billion over the same period. That amounts to an average annual gain of 4% on the portfolio investment on a straight-average basis—should the fair value gains be realized. That 4% does not take into account the roughly £80 million sunk into Touchstone the parent company. Touchstone has a cumulative £455.7 million over 10 years under its belt in proceeds from financing.

<sup>9</sup><http://www.frontlinegenomics.com/news/10618/oxford-nanopore-launch-gridion-opening-up-nanopore-sequencing-as-a-service/>

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Touchstone and IP Group portfolio companies are small and speculative start-ups based on technology that has no proven commercial application and sometimes has already proven a failure.

The problem, according to a longtime executive of IP Group interviewed by telephone, is that IP goes into very small companies at an early stage of development, and these companies have minuscule chances of success. The investor needs to be ready to cut them loose when they don't meet targets. IP Group, this former executive said, is really good at persuading its shareholders to invest in the portfolio companies. But they all want valuations to rise, and no one has an interest in a failure that would decrease NAV.

"If you can get into a traditional PE, that's better than IP Group," said the executive. "Realizing cash income is the main thing for VCs."

In general, Touchstone and IP Group portfolio companies are small and speculative start-ups based on technology that has no proven commercial application and sometimes has already proven a failure. A few examples of portfolio companies:

- ▶ Circassia, a public company that wants to vaccinate people against their cats, but whose share price has fallen by 75% since its vaccination failed miserably at trials in June 2016.
- ▶ First Light, a company in the discredited technology of cold fusion.
- ▶ Veryan, which is developing a new device for stenting coronary arteries. But [trials](#) thus far have not shown efficacy for stenting.
- ▶ OxSyBio, one of the companies that, like Nanopore, emerged from the Oxford University laboratory of chemist Hagan Bayley. The team has never successfully commercialized a research idea.
- ▶ Genomics plc is a genomics company whose main purpose seems to be to create a market for Oxford Nanopore—a company we think is a zero. In IP Group's annual report, the company explains that Genomics "was the first to sequence Multiple Human Genomes using hand-held Nanopore technology." The company generated a book gain of £4.9 million in the first half of 2017 for IP Group.
- ▶ Cell Medica, a company that has been much more successful raising money--£77 million so far, from Touchstone, Woodford, and Invesco—than in developing its proposed immunotherapy for cancer.
- ▶ Ultrahaptics: A technology designed to enhance virtual reality with a sense of touch. The company is struggling to find use cases for its technology and has been promoting in-air dashboard controls in automobiles.
- ▶ Nexeon, a lithium-ion battery company, since 2004 has been exploring silicon anodes. IVO invested an additional £30 million last year. The competition in l-ion batteries is intense.
- ▶ Salunda: Offers devices to monitor machinery at the poles or in very high altitudes.

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The takeover of Touchstone was to dilute the effect of a potential Nanopore write-down

- ▶ Pulmocide: Developing inhaled treatment for a virus called *Aspergillus Fumigatus* that affects the lungs, starting clinical trials.
- ▶ Progenteq: developing a cartilage-replacement therapy for knee injuries. The company was founded in 2010 and has been trying to develop a commercial product since then.
- ▶ Mobilion Systems: Licensing SLIM (Structures for Lossless Ion Manipulation, a platform technology for conducting ion mobility separations, for biological applications.

IP Group's 38.9%-owned in-video advertising portfolio company Mirriad Advertising plc is set to list on AIM before Christmas and is being valued at £63 million. That would bring IP Group's fair value to £24.5 million, up from the carrying value of £13.4 million reported at the 2017 Interim. Excluding Oxford Nanopore, this gain of £11.1 million would rank among the highest fair-value gains for IP Group historically but, depending on other results in H2 2017, would fail to make up for the poor gains in 2016, when IP Group invested £33.8 million and realized a deflation in fair value, posting net gains of only £7 million.

### Trying to Make Two Stones Float

We think the driver behind the November 1 hostile takeover of Touchstone was to dilute the effect of a potential Nanopore write-down. This view is corroborated by a former member of the management team who knows both companies very well. IP Group "had too much commitment to Nanopore," he said. The merger "solves their biotech problem. . . If Nanopore was to blow up, it would have a huge effect on IP Group."

The Touchstone merger does not create shareholder value but does help management preserve their bonuses under the current incentive scheme. With Nanopore comprising such a high proportion of IP Group's NAV, a write-down would almost negate any chance of management receiving compensation under the LTIP for at least three years. Under the LTIP scheme, management is evaluated based on "Total Share Returns" (share price performance relative to the FTSE 250) as well as growth in "hard NAV"—NAV minus goodwill and intangibles. Since the share price of IP Group (and other listed PE groups) typically mirrors NAV, these performance metrics are closely linked.

In order to qualify for compensation under the LTIP, management is required to grow hard NAV by a minimum threshold of 8% per annum over a consecutive three-year period. A substantial write-down of Nanopore would lower management's odds of achieving this threshold. Because performance is measured on a three-year basis, a write-down in 2017 would impact compensation in the following three years. It is worth noting that, for the financial year

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2016, neither TSR nor hard NAV performance met the minimum threshold under the LTIP. Hard NAV was tracking at 6% annual growth versus the 8% minimum hurdle. A write-down in Nanopore would only make the 8% target even more elusive.

Management owns very few shares in IP Group. The largest portion of potential compensation for executive directors of IP Group comes from the LTIP. The CEO, for instance, can earn up to 300% of his base salary under the LTIP but only 100% of his base under the annual incentive scheme (AIS). Management compensation under the LTIP has increased in recent years – in 2015 for instance, the maximum payout for CEO and other executive directors were previously capped at 100% of base.

### Table 7. Executive Director Compensation

Bad Debts / Accounts Receivable	Maximum Reward under LTIP	Maximum Reward under AIS
CEO	3x base	1x base
Other Executive Directors	2x base	1x base

As managers of a larger company, IP Group executives will also likely find justification to increase their base salaries post acquisition. Given that compensation is based on

### Table 8. CEO Base Salary (£ 000's)

2014	261
2015	300
2016	345
2017	400

Source: Annual Reports

“size and complexity” of the underlying business, our best guess is that salaries go up.

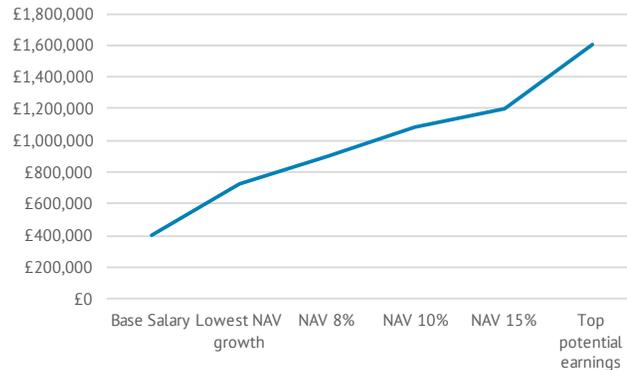
### Table 9. Executive Director Compensation under IP Group's LTIP: Vesting Matrix

TSR pa				
15%	60%	75%	90%	100%
10%	30%	45%	60%	90%
8%	15%	30%	45%	75%
>8%	0%	15%	30%	60%
	<8%	8%	10%	15%
	<b>Growth in NAV pa</b>			

Source: 2016 Annual Report

Here is what Alan Aubrey’s compensation will look like should NAV meet the target:

**Table 10. CEO Potential 2017 Bonus**



Source: 2016 Annual Report, J Capital

The business reality is that merging the two companies is like tying two stones together and expecting them to float. Once the portfolio companies are unstrung and evaluated on their merits, there is very little to like about either IPO or Touchstone. Both Touchstone and IPO Group have diluted shareholders and invested their money for lackluster returns. Prior to the merger, IPO’s NAV per share had seen 343% dilution since the 2006 IPO.

**Table 11. Nanopore Dilution**

<b>Adjusted for share split</b>	<b>139,345,464</b>
<b>Ordinary shares after IPO</b>	<b>40,638,910</b>
<b>NAV per share dilution</b>	<b>343%</b>

Please find a detailed list of share issues, prices, and equity raises [here](#). Source: IP Group Annual Reports

**How IP companies perform**

Funds like this just don’t work. Study after study has demonstrated that around 90% of venture capital funds make low returns. The CFO of one private equity company in the U.S. commented, “VC as a sector delivers very poor returns...we say it is not an asset class.” The Kaufman Foundation in Kansas City [reviewed](#) its own historical performance with its \$250 million VC fund and its \$1.83 billion endowment fund and concluded that “Returns data is very clear: it doesn’t make sense to invest in anything but a tiny group of ten or twenty top-performing VC funds.” IP Group, and its new merger partner, Touchstone, are not among those top performers.

Companies that invest in early-stage development of technologies out of uni

versities are not at all unusual and generally perform very poorly. Xperi Corporation (XPER US, down 48% since inception) creates and licenses audio, imaging, semiconductor packaging, and interconnect technologies. Trading at 2.4x book value, the company has a negative 8.8% return on assets. GSV Capital Corp. (GSCV US, down 57% since inception), investments in venture capital-backed companies. Firsthand Technology Value Fund Inc. (SVVC US, down 69% since inception) invests in early-stage technology companies, mostly in cleantech. The list goes on. In fact, among tech-focused listed VC funds, none has performed well.

**Table 12. Listed Tech-Focused VC Funds**

Name	Ticker	Start date	Share Price Historical Return
<b>3i Group</b>	III	15-Jan-99	1.75%
<b>Allied Minds</b>	ALM	27-Jun-14	-14.46%
<b>Arix Bioscience plc</b>	ARIX	20-Feb-17	-16.22%
<b>Firhand Technology Value Fund</b>	SVVC	29-Apr-11	-68.90%
<b>Frontier IP Group</b>	FIPP	10-Feb-11	-3.70%
<b>GSV Capital Corp.</b>	GSVC	6-May-11	-55.60%
<b>JZ Capital Partners</b>	JZCP	20-Jan-99	-31.53%
<b>Touchstone Innovations</b>	IVO	10-Aug-06	-19.35%

Source: Google Finance

**Echo chamber: the Woodford Funds**

The most prominent investor in IP Group and many of its portfolio companies, Neil Woodford, has taken aggressive positions in small biotech names, including highly publicized failures like Circassia and Northwest Biotherapeutics, a company focused on developing a vaccine for brain cancer. Woodford’s funds are invested not only in IP Group but in portfolio companies Oxford Nanopore, 4D pharma, Horizon, hVivo, Ultrahaptics, and many smaller companies as well as in some of the investment funds IP Group owns.

The Woodford funds’ involvement in IPO portfolio companies at the seed and private equity level as well as in the listed company create an unavoidable conflict of interest and positive feedback loop on the valuation, which ultimately is being determined by a small number of investors. When, for example, Nanopore’s “value” in 2016 jumped 39%, from £899 million to £1.25 billion, the Woodford funds were able to record a nearly 28% return and IP Group booked £7 million in revenue from the fair-value gain of its holding, a full 92% of the group’s revenue in 2016.

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### Performance Contribution of IP Group Holdings to Patient Capital Trust H1 2017 (companies marked in red are also Invesco holdings)

Stock	Stock return (%)	Average position size (%)	Contribution (%)
<b>Prothena</b>	59.23	15	6.34
<b>Oxford Nanopore</b>	27.88	6.73	1.85
<b>Immunocore</b>	40.33	5.81	2.31
<b>Purplebricks</b>	221.48	5.52	8.31
<b>Theravance Biopharma</b>	81.25	4.9	2.99
<b>Mereo Biopharma</b>	1.16	4.14	0.06
<b>Proton Partners International</b>	15	4.07	0.63
<b>Oxford Sciences Innovation</b>	20	3.21	0.65
<b>4D Pharma</b>	-71.31	2.68	-2.74
<b>Allied Minds</b>	-54.33	2.64	-1.82
<b>Ilex</b>	4.39	2.57	0.11
<b>Malin</b>	-17.97	2.5	-0.73
<b>Kymab</b>	--	2.32	1.05
<b>Atom Bank</b>	15	2.19	0.3
<b>Touchstone Innovations</b>	-36.24	2.01	-1
<b>Gigaclear</b>	20.37	1.91	0.49
<b>Verseon</b>	-10.41	1.91	-0.21
<b>Industrial Heat</b>	--	1.87	-1.34
<b>Horizon Discovery</b>	47.16	1.71	0.77
<b>IP Group</b>	-5.21	1.67	-0.05

In the Woodford Equity Income Fund portfolio, Oxford Nanopore is the 26th-ranked contributor to fund performance out of 156 holdings at the end of the first half of this year.

The leader of Oxford Nanopore's £100 mln raise last December was a little-known fund based in Hong Kong and Nanjing called GT Healthcare (coincidentally, a name shared by an Invesco fund that ran from 1997 to 2005). Seek-

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**Position Size of Oxford Nanopore in “Patient Fund” by date**

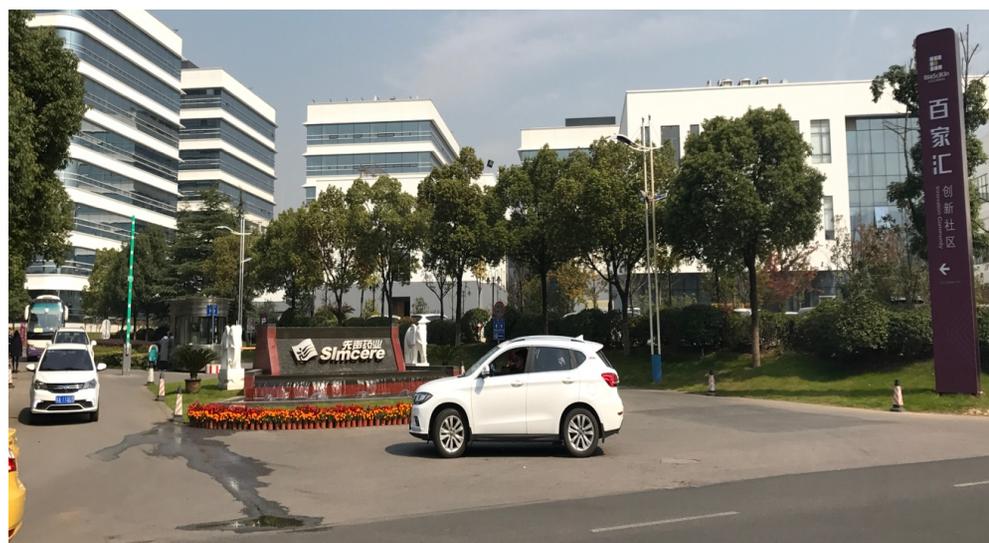
June 2017	8.64%
Dec. 2016	7.69%
June 2016	4.7%
Dec. 2015	4.2% (cost and value of investment at year end was £34.4 Mln)
June 2015	No holding disclosed

Source: Woodford Funds

ing Alpha [described](#) GT Healthcare as a pan-Asia fund with a focus on China:

Oxford Nanopore’s “fund-raising was led by a new investor, the pan-Asian fund GT Healthcare, which has a particular focus on China. The round also included existing investors Woodford Investment Management and IP Group.”

In fact, GT Healthcare looks very much like a British fund transplanted to Asia. In addition to Nanopore, it reports investing in Immunocore, Jupiter Diagnostics, and Organox, all British companies, and RareCyte, based in Seattle, with no reported Asian operations.<sup>10</sup> Of the investees, Immunocore is also a Woodford investee and Organox is another Oxford University company. That leads us to suspect that GT Healthcare may be another in the cluster of related-party funds that are helping pump up Nanopore’s value—but we have no evidence that that thesis is true.



The main gate of the Simcere compound in Nanjing where GT Healthcare has its address. We could find no GT Healthcare office. | Photo by J Capital November 1, 2017

<sup>10</sup>[http://go4venture.com/wp-content/uploads/2017/02/2016\\_12\\_Go4VentureBulletin-2.pdf](http://go4venture.com/wp-content/uploads/2017/02/2016_12_Go4VentureBulletin-2.pdf)

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GT has little presence in China. The company cohabits with Simcere, a pharmaceutical company formerly listed in the U.S. and privatized in December 2013 and of which GT Healthcare's managing partner, Alan Au, was a director. Simcere Pharma is named on the GT Healthcare website as a "cooperator" and is a buyer of Nanopore devices in China.

### Summary

Like other listed IP companies, IP Group has been a terrible investment. Even the meager returns the group has realized have been essentially invented by agreement among the clubby group of investors in British university IP. At private equity funds, partners whose investments don't achieve exits are forced out. At IP Group, the unnatural body just keeps walking.

Oxford Nanopore's last raise, which concluded in December 2016, assigned a valuation to Nanopore far in excess of much larger competitors with proven products. It is hard to imagine how the company could raise more money at the same valuation. If there is a raise, it will likely be on distressed terms. A loan from the parent would prolong Nanopore's life, but not for long.

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