

## *Analytica...*

*by Mark Fihn*

I'm a bit nervous about associating my name with the word "Analytica" due to the demise of the now-defunct and politically divisive company Cambridge Analytica, but I like the translation from the Latin. Basically "Analytica" is an old Latin way of saying "what we know now". As with all topics, the display industry has many analysts that do their best to predict the future – trying to divine market trends, the role of emerging technologies, the strengths of incumbent technologies, judging the trade-offs between basic science, economic realities, and the constant vagaries of political manipulation.

Newly, on a monthly basis, *Fihn Analytica* will take a quick look at something topical that lies within the vortex of science, economics, and politics in the displays industry – offering up a commentary that intends to be both intellectually challenging and culturally entertaining.

I've been publishing the Veritas et Visus newsletters since January 2005. Never a price increase – only more and more, and better and better, information and insights... Many in the industry think the VeV business is limited to journalism – but actually, the newsletters are just a way for me to keep up with the rapidly changing and fascinatingly diverse developments that take place in the industry. The core of my business is related to translating almost one-third of century of industry experience to people interested in getting strategy and "analytics" about the displays industry. My goal is, and always has been, to delight my customers with timely relevant information that allows them to make solid decisions for the future.

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## On Wisconsin...

### AKA, “The eighth wonder of the world”

by Mark Fihn

*On, Wisconsin! On, Wisconsin! Plunge right through that line!  
Run the ball right down the field, a touchdown sure this time.  
On, Wisconsin! On, Wisconsin! Fight on for her fame,  
Fight! Fellows! Fight! fight, fight, we'll win this game.  
On, Wisconsin! On, Wisconsin! Stand up, Badgers sing!  
'Forward' is our driving spirit loyal voices ring.  
On, Wisconsin! On, Wisconsin! Raise her glowing flame!  
Stand, fellows, let us now salute her name!*

I grew up in Minnesota, and to this day, I remain a loyal fan of the Golden Gophers – the moniker for those who attend the University of Minnesota. (Great in ice hockey; but it usually takes an amazingly loyal fan to cheer them on in any other sport)... As a kid, the fight song of the Badgers – the rivals from neighboring Wisconsin – was a form of sorcery, something to be despised. (And even now, almost a half-century later, that fight song not only seems a bit demonic, but it’s not even a very good bit of “poetry”...

Anyway, predicting the future is a fool’s game, as there are just too many variables to really have a solid understanding of what will happen. I am personally convinced that the very, very best predictive models are based on luck and serendipity as much as on actual knowledge and perceptive analysis. And, of course, the market analysts (in any field) focus only on when serendipity intervened to later prove them right, and to ignore the times when their prognostications missed the mark...

I suppose there are cycles and trends that sometimes help analysts find some reasonable level of accuracy, but 50/50, from my perspective, is a pretty good result. And note that the biggest problem with making predictions about the future is a matter of timing. It’s one thing to imagine what the future will look like, it’s another to actually identify when the future will take place...

There will likely be many industry analysts (amazing to me) that may still disagree with me, but one important prediction about the future, believed by many, had to do with “plans” to build an LCD fab in Wisconsin. Donald Trump made it a big part of his braggadocio about bringing high-paying jobs to the United States, claiming that this new fab was solely a result of his being elected President – going so far as to claim it would be “the eighth wonder of the world”. Former Wisconsin Governor, Scott Walker, wagered much of his future in politics on making this “deal with Foxconn” a reality. Former Speaker of the House, Paul Ryan from Wisconsin, bragged regularly about this new factory – to be built in his home Congressional District.

Well, from my perspective, one of the easiest predictions that could reasonably be made in recent years about the displays industry was that this Wisconsin fab would never happen...

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Indeed, during the past 2 years, I've written many times why this Wisconsin LCD fab was unlikely, I've made public presentations on the topic, and I've been unhesitant in expressing my fact-based opinions to a broad landscape of industry professionals who really, really wanted to believe the United States would have a state-of-the-art LCD fab.

OK, a minor part of my skepticism was related to my life-long antipathy about that damn "On Wisconsin" rivalry with my home-state of Minnesota. But more practically, my skepticism was based on the "deal" itself. In my mind, there was simply no sensible way this fab to be built. Huge tax concessions from the State of Wisconsin – untenable by any sensible financial analysis; amazing boasts from the Trump folks about job creation and revenue opportunities; a complete lack of credibility from Wisconsin politicians – Walker and Ryan – that simply sold the taxpayers of Wisconsin an absolutely unbelievable set of promises from Terry Gou and the FoxConn group.

Well, yesterday (January 30, 2019), Foxconn spokespeople advised what was already obvious to most serious industry observers – that the fab is unlikely to happen. From my perspective, there are three fundamental reasons this outcome was so easily predictable:

- The fab just didn't make sense financially. The enormous pledges made by the State of Wisconsin, just made zero sense, particularly since the claims about job growth really seemed exaggerated.
- The fab also made little sense politically – a series of highly-partisan Trump-led claims led by a man that cannot be recognized as anything but serial liar, and bolstered by Walker/Ryan and their unquestionably dubious politically-motivated claims. Betting on the political promises of "leaders" with a recognized history of failed business endeavors, is a poor bet, at best...
- And finally, the fab made little sense based on the interests of Foxconn. OK, an amazingly one-sided deal favoring Foxconn, the support of the President of the United States, and a bunch of money from successful Foxconn operations, and it was imaginable that this deal might actually happen. But here's the reality, unlike the cons of Trump, Terry Gou, CEO at Foxconn, is a brilliant businessman, who is flamboyant in his promises, but quick to cut his losses. Unlike Trump, bankruptcy is not a viable option. Lies upon lies, Trump and Gou share that trait, but Trump is simply no match for Gou when it comes to making deals.

This "deal" never stood a chance. Commentary from today's announcement from Foxconn:

- "...the global market environment that existed when the project was first announced has changed," Foxconn said in a statement. "As our plans are driven by those of our customers, this has necessitated the adjustment of plans for all projects, including Wisconsin."
- Foxconn said that it still aims to create 13,000 jobs in the state but did not respond to questions about the nature of the positions, when they would arrive and what precisely inspired the shift.
- "In Wisconsin, we're not building a factory," Louis Woo, special assistant to Foxconn CEO Terry Gou, told Reuters. "You can't use a factory to view our Wisconsin investment."
- Rep. Mark Pocan, D-Wis., who asked the U.S. Government Accountability Office in November to investigate the Foxconn deal and other enormous state subsidy packages, said Wisconsin has already poured cash into new roads, campus construction and paying families who lived on the tentative factory site to move. He declined to name a figure.
- Woo told reporters the firm wasn't sure how to proceed in Wisconsin, citing the high cost of assembling TV screens in the United States. Labor costs are steep, he told Reuters in the report. "In terms of TV, we have no place in the U.S.," Woo said. "We can't compete."
- The comments reflect a sharp reversal in a plan Walker and state officials had said would transform Wisconsin into a technology hub like Silicon Valley.

- Foxconn didn't hire enough workers in 2018 to claim the sweeteners, closing the year with 178 full-time employees in the state, according to a letter the company sent state officials. That's 82 positions shy of the minimum requirement.
- Foxconn has a history of retracting its hiring announcements. The company grabbed headlines in 2013 when it unveiled plans to invest \$30 million and generate 300 jobs at a new high-tech factory in central Pennsylvania. The state's governor applauded the news, and economists predicted Foxconn would lead a local manufacturing revival. But after the spotlight faded, Foxconn dropped its plans in the state.
- Wisconsin's nonpartisan Legislative Fiscal Bureau forecast the move wouldn't bring profits to the state until 2042.
- Walker lost his race in November to Democrat Tony Evers, who has slammed the Foxconn deal as a “Hail Mary pass on the part of the governor.”
- Wisconsin's offer of economic sweeteners to Foxconn was unprecedented in scale, analysts say. The bundle of financial incentives was larger than what New York, Virginia and Tennessee collectively pledged to Amazon to win its new offices, a *Washington Post* comparison of the two development projects showed, (except the Amazon deal is likely to actually increase employment as advertised)...

As an effort to “validate” that my opinions about the Wisconsin fab are not newly formed reactions to yesterday's news, here are the primary articles I wrote in Veritas et Visus newsletters in the past months:

## *Foxconn to build an LCD fab in Wisconsin – maybe...*

*by Mark Fihn – August 22, 2017, Display Standard newsletter*

This is now “old news”, but just in case you've spent the past few weeks preparing for the solar eclipse that tantalized the US today – to the exclusion of all other science/technology news – Foxconn Technology Group recently announced they would invest \$10 billion to build a LCD fab in Wisconsin that could employ up to 13,000 workers and draw up to \$3 billion in subsidies from state taxpayers.

As with my fellow analysts related to the display industry, I will agree that this is exciting news – about which I won't go into many details (in part because not many details have been announced yet). Unlike most of my fellow analysts, I am VERY SKEPTICAL that this fab will ever be built. Here's why I'm skeptical:

- Much of the hype about this announcement is being led by the Trump White House and its endless propaganda about job creation in the United States. From my perspective, as with virtually everything championed thus far by Trump – it's not real. Just a play to what some voters want to hear...
- Terry Gou, head of Foxconn, is an experienced negotiator in the electronics industry. Donald Trump and Wisconsin politicians have no such expertise. If such a factory is going to actually be built – the subsidies and concessions have just begun – playing on the political imperatives of the American negotiators. Gou has no compelling incentive to build this plant in the US – while Trump, Ryan, and Walker have heavy political reasons to concede during ongoing negotiations.
- There are no details – such as exactly where the factory will be built in Wisconsin. At the moment, it's just an announcement, not an actual deal.
- \$3 billion is a lot of money in tax subsidies to be borne by the taxpayers of Wisconsin. It's not clear that the citizens of Wisconsin are going to agree...

- The only way that a fab in Wisconsin makes sense is if numerous downstream suppliers to Foxconn also make substantial investments adjacent to the Wisconsin LCD fab. One must presume that these additional facilities will require tax subsidies to be borne by Wisconsin taxpayers. One must understand that 13,000 new jobs will simply not happen based on the fab alone – it must include many downstream suppliers.
- Part of the announced deal suggests that Foxconn would pay no corporate taxes on profits from sales. I'm not sure, but I suspect other corporations operating in Wisconsin may have some negotiations they would like to begin, making it even more difficult for Wisconsin voters to accept the tremendous expense of the subsidies. This entire discussion of \$3 billion in subsidies is a very, very slippery slope that I cannot imagine will withstand political (or economic) realities.
- Building an LCD fab for large-area panels requires some customers to buy those panels. Since there are currently zero TV manufacturers in the US, not only will there need to be investments in the display industry – but also in the consumer electronics industry. The nearest TV assembly facility to Wisconsin is in Mexico – but shipping LCD modules to Mexico would virtually eliminate any logistics advantages gained by avoiding trans-Pacific shipping.
- The most likely customer for Foxconn panels would be Sharp – a recognizable brand affiliated with Foxconn's LCD investment. Unfortunately, the Sharp brand is currently owned by the Chinese company Hisense – who has rejected offers from Foxconn for two years now to buy back the branding rights. Even if Foxconn can regain control of Sharp's branding, for a fab to have a single customer is very, very risky...
- Making an LCD does not require very many workers. Making a TV, however, is much more labor-intensive, (or alternatively, would require some significant investments in robotics). It's not clear how US labor rates will enable competitive production of large-screen TVs.
- It's worth remembering that Sharp's current LCD manufacturing capability in Japan is underutilized. Until the existing fabs move to full-production, fully competitive with similar fabs in South Korea, Taiwan, and China, it is not clear to me how expanding production into the US is economically sensible.
- Foxconn has a history of making big announcements about factory expansions, but then failing to follow-through.
  - In November 2013, Pennsylvania Governor Tom Corbett announced that Foxconn planned to invest \$30 million in a “high-end technology manufacturing facility” with 500 jobs. The company has a small research operation in Harrisburg, Pa., but the factory was never built.
  - Similarly, the *Washington Post* reported in March that Foxconn has spoken of making major investments in India, Vietnam, and Brazil, but with results that have not matched the original announcements.
- Key to the politics of this investment is going to be large-scale job growth. Current claims are that such an investment from Foxconn will add 13,000 jobs. Personally, I doubt that, and in fact Terry Gou has publicly stated that the initial expectation is only 3,000 jobs.
- High-paying jobs in the LCD industry are related to advanced technology in science and manufacturing know-how. Sadly, such knowledge is largely non-existent in the United States. Only a tiny handful of universities in the US have programs related to display technologies – none of which are specifically related to large-area TFT LCDs. Translated – at least for many years – most skilled labor to support such a fab will be imported from Asia.

- One of the talking points during the hype-phase of the announcement has been that such a fab will enable technological leadership to return to the United States, a so-called “5G+8K” realm. Personally, although I think such technological development is inevitable, for the US to lead will require some enormous investments in infrastructure. Until the politicians begin to discuss ways of enabling 5G and 8K across the United States, I’m doubtful. As such, I suspect that if Foxconn moves ahead with a fab in Wisconsin, the output will be relegated to producing lagging edge LCDs, not leading edge solutions.
- In my opinion, the only way an LCD fab in Wisconsin will make economic sense is if the Trump administration enables tariff protections that will disadvantage TVs manufactured overseas. This might happen – but at the tremendous expense of the US consumer. I doubt that a trade war with Asian electronic manufacturers will assure the long-term viability of a TFT LCD investment in Wisconsin.
- Lastly, I return to my first concern – that of Donald Trump. It seems increasingly unlikely that Trump will be President in 2020 – about the time this factory would come on-line. Given the current political climate, a savvy businessman like Terry Gou is unlikely to proceed.

Just my prediction... As much as I’d love to see LCD manufacturing in the United States, I believe that such production must make financial sense. Politics isn’t going to Trump economics on this one... Maybe...

## *Foxconn fab in Wisconsin – unlikely to happen...*

*by Mark Fihn, June 30, 2018, Display Standard newsletter*

There may be no bigger advocate for the development of a US-based display industry than me. I’ve studied the topic at great length, consulted numerous companies and industry groups about such developments, and I’ve continuously concluded that aside from some materials companies, manufacturing/test equipment companies, and perhaps manufacturers for a few specialty markets, the US will almost certainly be a consumer of displays, and not a primary manufacturer.

So, it’s been with great interest that I’ve been watching carefully the developments associated with Hon Hai’s proposed LCD fab in southeastern Wisconsin. A big part of me really wants the fab to be built, but perhaps because I have several tax-paying friends in Wisconsin, I hope it will not be built. If it’s built, it will likely fail. And not only will Wisconsin taxpayer’s have footed a huge up-front bill, but they will end up wasting more money trying to salvage a poor decision. The reasons the Foxconn is a poor decision are manifold across a range of inter-related technological, economic, and political factors:

### **Technological factors:**

- Operating an LCD fab requires a considerable amount of know-how. For the most part, such expertise does not exist in the United States. For a considerable amount of time, a significant majority of the talent required to operate the Wisconsin fab will be filled by expatriates from Asia.
- There are many components that the LCD manufacturer must rely upon. Virtually all of these components are currently manufactured in Asia. While some components could certainly be newly manufactured in the U.S., that requires some substantial investments.
  - A Gen 10.5 fab, as was originally promised by Foxconn for the fab in Wisconsin, essentially requires a co-located facility to produce the mother glass. While the State of Wisconsin was able to put up some \$4.5 billion in concessions for Taiwan-based Foxconn, they were unwilling to provide additional financial incentives to help reduce the \$1 billion needed by New York-based Corning to co-locate at the facility. As such, in part, just days before the Trump-celebrated ground-breaking ceremonies, Foxconn announced that the new fab would be a Gen 6 instead of a Gen 10.5 fab. Supposedly, the mother glass

for the Gen 6 fab will be trucked from a Corning facility in Harrodsburg, Kentucky – about a 7 hour drive.

- I am unaware of a single co-located component manufacturing facility planned for Wisconsin, which means that virtually 100% of the material will be need to be imported – most of it from overseas.
- There is a significant amount of science involved in the development of LCDs – which requires ongoing research and development in order to stay at the leading edge. Asian countries, where LCDs are currently manufactured, have all invested heavily in developing academic and national research centers that are focused on the development of displays. The US, by comparison, is academically weak when it comes to training display engineers. Same argument when it comes to encouraging research and development.

#### **Economic factors:**

- Some display industry analysts have calculated that since the first LCDs were created some 50 years ago, that the industry has operated in the red. Sure, the most efficient companies, in the most optimal years for LCD production, have shown profitability, but overall, the industry has not made money. This fact does not bode well for any business operation.
  - In those countries with advanced LCD manufacturing, (Japan, South Korea, Taiwan, and Japan), each nation has gone through a very painful start-up period – one that was heavily reliant on a national focus on LCD production capabilities – that involved a massive cooperation between industry, government, and academia. In all four nation’s the decisions to move forward were made to support the interests of the nation – and were not made based on the profitability of the actual corporation manufacturing the LCDs.
  - This “national interest” includes such things as enhancing science education, promoting the production of the end-use products that utilize displays, (TV, PCs, mobile phones), promoting the production of LCD components and manufacturing equipment.
  - Foxconn’s Wisconsin fab does not really do anything to assure a cost-effective supply chain, from component production to final sales of consumer products. Without an entire ecosystem, it will be a huge challenge for Foxconn to produce competitively priced products. Although the State of Wisconsin is hopeful such an ecosystem will be developed, it truly needs to be part of a national effort that subsidizes the industry, national-level R&D, and academic development.
- The Foxconn investment has been widely touted as bringing a \$10 billion investment, along with 13,000 new jobs to Wisconsin. And for a Gen 10.5 fab, the \$10 billion investment probably understates the actual costs. (I’m not sure of the creative math used to suggest that facility would create 13,000 jobs, as LCD fabs are not labor intensive), but perhaps it also includes new local gas station employment... But now that Foxconn has shifted to a Gen 6 fab, that’s only perhaps a \$3 billion investment, (but probably closer to \$2 billion). It’s a lagging edge facility – not a leading edge facility. It might actually require a few more workers, as material handling becomes a more complex factor when smaller-sized panels are targeted at specialty and niche markets.
- *Louis Woo, special assistant to Foxconn chairman Terry Gou, recently advised that Foxconn still intends to create 13,000 jobs and invest \$10 billion in Wisconsin. “We would never change that,” he said. “That’s our commitment to the government, that’s our commitment to the state of Wisconsin. It’s just the nature of the technology, what kind of technology we are bringing in, what kind of product we will produce, that will continue to change.”*
- *The State of Wisconsin is providing an incentive package of about \$3 billion and local incentives and infrastructure improvement costs for the Foxconn project total another \$1.5 billion. One wonders how much of this \$4.5 billion Wisconsin is still on the hook for given Foxconn’s drastic reduction in fabrication capabilities.*
- One of the most important factors associated with any successful manufacturing operation is the assurance of a strong customer base.

- Aside from some very minor niche market companies, there is only one small TV assembly facility in the United States – Element, which is located in Winnsboro, South Carolina. Although their relatively small output proudly boasts, “assembled in the USA”, the level of assembly is so minor that the TVs still say “Made in China”. And of the 24 TVs Element currently lists on its website, only 5 are assembled in the US, of which 3 are at 1280x720; 2 at 1920x1080 – hardly the sort of leading edge products currently demanded by today’s consumers.
- Beyond Element, the next closest TV assembly house is in Mexico. Not exactly an economically sensible supply chain...
- That said, Foxconn apparently intends to assemble TVs in the US – which would certainly provide an output for the facility. But Foxconn is not a brand name – and developing a brand presence is an enormous undertaking. Although Foxconn owns a controlling interest in Japan’s Sharp Corporation, the rights to the Sharp brand for TVs in the US belong to China’s TV manufacturer Hisense until 2020.
- It has been pointed out that Hon Hai companies now control about 14% of Vizio, a well-known brand name in the US. So maybe that’s a reasonable outlet for a Wisconsin fab. For the next couple of years, perhaps, we will have a Taiwan company using Asian components, assembling TVs in Wisconsin that still say “Made in China”. It’s important to note that TV assembly in Wisconsin at a Foxconn facility will not achieve anywhere close to a \$10 billion investment or job creation of 13,000 employees.
- There is a possibility that Foxconn will further degrade their production plans – this time from a Gen 6 fab to a simpler module assembly operation. This would mean that Foxconn would buy TFT cells from Asian suppliers and then assemble the final modules in Wisconsin. Foxconn already does this in Asia, and from my perspective, a module assembly operation makes much more sense than an entire LCD fab.
- *Foxconn’s contract with the State of Wisconsin requires the company to have at least 260 full-time employees at the end of the year to receive any tax credits and 1,040 to receive the maximum \$9.5 million in credits available this year. The actual credits the company will receive are equal to 17 percent of its qualifying payroll for the year.*
  - *To date, there are reportedly about 100 Foxconn employees in Wisconsin, a significant portion of which are not US citizens.*
  - *The 17 percent credits that Foxconn hopes to get from Wisconsin will still translate to higher overall labor costs than in Asia. Not only are wages uniformly lower in Asia (particularly at executive levels), but Asian companies are not burdened by the cost of providing healthcare insurance – currently a cost to US corporations that is about 20% of total labor costs. In other words, Wisconsin’s incentives don’t even cover company-sponsored healthcare costs.*

#### **Political factors:**

- When Foxconn was planning to build a gen 10.5 fab focused on manufacturing high-end TVs, there were some good arguments that could be used to support this project, (not very many – but it does at least make sense to focus at the high-end of the product food chain). Today, the only real reason for building a Gen 6 fab in Wisconsin is purely political. The problem with politics is that things can change very, very quickly.
  - Paul Ryan, Speaker of the House of Representatives, who coincidentally is from the Congressional District in which this new fab will supposedly be built, is not running for re-election – and although unlikely, the District could conceivably shift parties in the November elections.
  - Wisconsin Governor, Scott Walker, is likely to win re-election, but recent special elections in Wisconsin point to some huge shifts in the State’s political alliances. It is entirely possible that Democrats will flip Wisconsin’s governorship, and perhaps the entire Wisconsin political make-up.
  - Although President Trump is being challenged on many fronts, he is not up for election in 2018. Both the House and less-so, the Senate, are vulnerable to a “Blue Wave”, in which case Trump’s policies will be challenged intensely in 2019 and 2020. And never mind discussions about impeachment, it’s entirely

possible that after the 2020 election, any Trump efforts to prop up Foxconn will be reversed. Making major investments in an environment filled with Trump-level political uncertainty is not a good bet.

- Without a broad range of technological expertise and without a sensible economic plan, the only reason to make multi-billion dollar investments with very low returns is if there are political reasons to do so. As such, Trump's tariff "policies" come into play. It is possible to "protect" Foxconn's investment via tariffs – if you simply ignore the enormous negative consequences to other industries and to consumer prices.
  - Keep in mind that Trump's tariffs are widely unpopular even within his own political party.
  - Also keep in mind that Trump's tariff actions are extra-legal – his right to impose tariffs is strictly limited to "national defense" related factors. It will be difficult to protect a Taiwanese company manufacturing TV screens based on claims of national security.
  - And don't forget that tariff-based retaliation will not be difficult... What to do if China imposes massive retaliatory tariffs on rare metals mined mostly in China that are necessary to produce LCDs?

This article could go on and on. But I'll stop here. As state at the beginning of the article I hope I'm wrong. But I don't think I am... The Foxconn fab, even when downgraded to Gen 6, is unlikely to happen. Then again, the folks at Foxconn are savvy investors, and perhaps they are counting on US bankruptcy laws to bail them out.

## *Walker walks - Gou goes...*

*by Mark Fihn, November 14, 2018, Display Standard newsletter*

The prospect of building an LCD fab in the United States dimmed considerably with the ouster of Wisconsin Governor, Scott Walker, at the mid-term elections last week. Although numerous political factors contributed to Walker's loss, it cannot be denied that one of the stated concerns from Wisconsin voters was Walker's advocacy of billions of taxpayer dollars to supplement Foxconn's "investment" in an LCD fab in southeastern Wisconsin.

Let me be clear, I continue to believe that Foxconn's selection of Wisconsin for location of a new LCD fab was unlikely to ever come to fruition. I believe that the entire exercise was little more than political fluff orchestrated by President Donald Trump, (who urgently needed some technological job-growth claim to gain his 2016 Presidential election), by Terry Gou, CEO at Hon Hai., who has a long history of committing to big investments that fail to come to fruition, and the Wisconsin duo of Scott Walker/Paul Ryan – GOP leaders who desperately needed something, anything, to indicate they were actually serving their constituency. My opinions about this unlikely group of opportunistic allies:

- Donald Trump sought nothing more than to gain political favor by aligning with Foxconn with "promises" of substantial job growth in the United States... Problem is – the claimed number of new job resulting from the fab (13,000) was absurdly high, and the costs to the taxpayers of Wisconsin were very substantial (about \$3 billion) was simply not justifiable. Moreover, it's not really clear that Mr. Trump ever really understood what Foxconn was planning to build, as his discussions seemed to always mention Apple and iPhones which not a likely candidate for output from a fab in Wisconsin.
- I regard Terry Gou to be a brilliant businessman, who is certainly comfortable negotiating, and gaining the upper hand, with US politicians. As with all negotiations, especially from Asia, a signed contract is nothing more than an opening position for the next round of negotiations. The Wisconsin deal with Foxconn is mostly a moving target, that if enacted would mire Wisconsin taxpayers in an increasingly troublesome pit of quicksand. Well-played, Foxconn... But at some point, those played – opt out.
- If it weren't for Wisconsin's deal with Foxconn to build a TFT LCD fab, I'm convinced that Scott Walker would have been re-elected to again be Governor. One of the big issues that sealed Scott Walker's loss, which I've verified with numerous friends from Wisconsin, is related to the fiscal irresponsibility associated with Walker's giveaway to Foxconn, at the expense of the Wisconsin

taxpayer. And although he did not run for an additional term, it's no coincidence that Speaker of the House, Paul Ryan, resides in the Congressional District in which the Foxconn fab was to be built...

The headline to this article suggests that "Walker walks". That's not quite accurate – as he lost an election that he wanted to win. So Scott Walker's departure from the political scene was not voluntary.

And the headline reads, "Goh goes". I'm not entirely sure that Foxconn will abandon their plans to build a TFT LCD fab in Wisconsin, but under the current political climate, it seems very unlikely a fab will be built. Maybe Foxconn will build a TV assembly facility. Less likely, but possible, is that they will build an LCD module assembly facility. I personally doubt Foxconn will assemble TVs or LCD modules in Wisconsin, but if they do, that's great – but nowhere near the investment/employment projected by Trump/Walker/Ryan.

In most places in the world, if a corporation wants something done, a government official is paid money "under-the-table" to help facilitate commerce, (aka "bribery"). In the United States, corporations are enriched by government officials using taxpayer funds in order to facilitate commerce. In the US, such a flow of money is considered to be "good business". Sometimes, the difference between "good business" and "bribery" is a fine line. In my opinion, whether funds flow from corporation to government official, or the other way around, it's not good business. As such, perhaps it's a good thing that Walker walks and Goh goes...



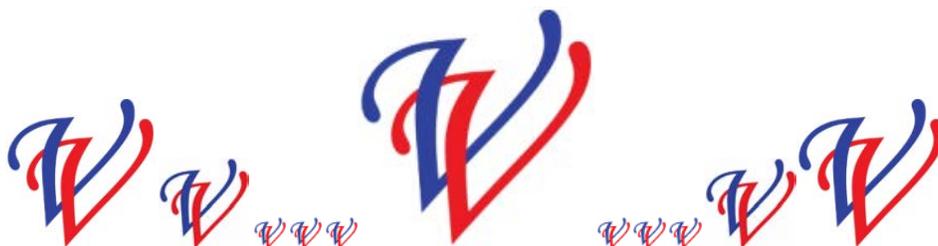
Look folks, just like Trump's Wall along the US/Mexican border, this LCD fab in Wisconsin is something that could reliably be predicted to NOT happen. No matter how much you rely on Fox News – that particular source of "information" is not related to Foxconn, but is similarly subject to considerable skepticism... Partisan politics is almost never a barometer by which we should measure sound business practice – and this Wisconsin fab – like the "On Wisconsin" was never much more than a poorly written fight song...

The Wisconsin LCD fab will almost assuredly not be built. Beyond some rabid Trump supporters and some very, very gullible individuals with more "faith" than sound financial analysis, it takes a real stretch of common sense to justify this politically motivated project...

Kudos to Foxconn for playing along for so long... Condolences to those who pretended this "deal" actually made sense.

Oh, and by the way, this article is still nothing but my best effort to "predict the future". So, there's still a possibility that I might be wrong. (After all, I also predicted that there was no way the people of the United States would ever elect the man who currently resides in the White House)...

Regardless, I still shudder a bit whenever I hear, "On Wisconsin"... But I am quite relieved that the good people of Wisconsin will not be carrying the tax burden associated with this questionable political boondoggle.



## *Things that last...*

As a part of the monthly transmission of Fihn Analytica, I feel compelled to share words of inspiration that struck me as significant in recent days. These uplifting words may not have anything to do with the display industry – except for their overall importance to us all as human beings!

### **What you scatter** (author unknown)

I was at the corner grocery store buying some early potatoes... I noticed a small boy, delicate of bone and feature, ragged but clean, hungrily appraising a basket of freshly picked green peas. I paid for my potatoes but was also drawn to the display of fresh green peas. I am a pushover for creamed peas and new potatoes. Pondering the peas, I couldn't help overhearing the conversation between Mr. Miller (the store owner) and the ragged boy next to me.

"Hello Barry, how are you today?"

"H' lo, Mr. Miller. Fine, thank ya. Jus' admirin' them peas. They sure look good."

"They are good, Barry. How's your Ma?"

"Fine. Gittin' stronger alla' time."

"Good. Anything I can help you with?"

"No, Sir. Jus' admirin' them peas."

"Would you like to take some home?" asked Mr. Miller.

"No, Sir. Got nuthin' to pay for 'em with."

"Well, what have you to trade me for some of those peas?"

"All I got's my prize marble here."

"Is that right? Let me see it," said Mr. Miller.

"Here 'tis. She's a dandy."

"I can see that. Hmmm, only thing is this one is blue and I sort of go for red. Do you have a red one like this at home?" the store owner asked.

"Not zackley but almost."

"Tell you what. Take this sack of peas home with you and next trip this way let me look at that red marble." Mr. Miller told the boy.

"Sure will. Thanks Mr. Miller."

Mrs. Miller, who had been standing nearby, came over to help me. With a smile she said, "There are two other boys like him in our community, all three are in very poor circumstances. Jim just loves to bargain with them for peas, apples, tomatoes, or whatever. When they come back with their red marbles, and they always do, he decides he doesn't like red after all and he sends them home with a bag of produce for a green marble or an orange one, when they come on their next trip to the store."

I left the store smiling to myself, impressed with this man. A short time later I moved to Colorado, but I never forgot the story of this man, the boys, and their bartering for marbles.

Several years went by, each more rapid than the previous one. Just recently I had occasion to visit some old friends in that Idaho community and while I was there learned that Mr. Miller had died. They were having his visitation that evening and knowing my friends wanted to go, I agreed to accompany them. Upon arrival at the mortuary we fell into line to meet the relatives of the deceased and to offer whatever words of comfort we could. Ahead of us in

line were three young men. One was in an army uniform and the other two wore nice haircuts, dark suits and white shirts... all very professional looking. They approached Mrs. Miller, standing composed and smiling by her husband's casket. Each of the young men hugged her, kissed her on the cheek, spoke briefly with her and moved on to the casket. Her misty light blue eyes followed them as, one by one; each young man stopped briefly and placed his own warm hand over the cold pale hand in the casket. Each left the mortuary awkwardly, wiping his eyes. Our turn came to meet Mrs. Miller. I told her who I was and reminded her of the story from those many years ago and what she had told me about her husband's bartering for marbles.

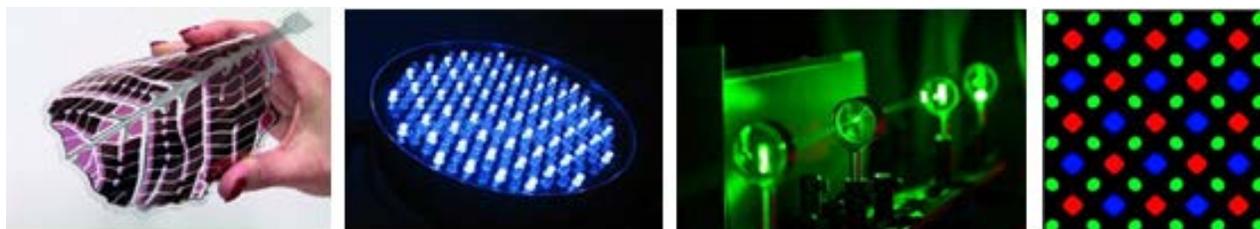
With her eyes glistening, she took my hand and led me to the casket. "Those three young men who just left were the boys I told you about. They just told me how they appreciated the things Jim 'traded' them. Now, at last, when Jim could not change his mind about color or size... they came to pay their 'debt'. "We've never had a great deal of the wealth of this world," she confided, "but right now, Jim would consider himself the richest man in Idaho..." With loving gentleness she lifted the lifeless fingers of her deceased husband. Resting underneath were three exquisitely shined red marbles.



# Forty Favorites

Veritas et Visus

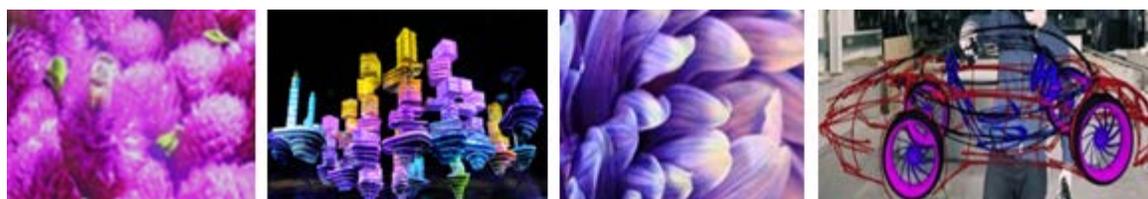
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Volume 11: December 31, 2016 – 106 pages



Volume 12: June 13, 2017 – 98 pages



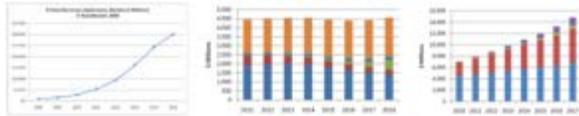
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# MultiView

*Veritas et Visus*



**Jon Peddie, #21**



**Lawrence Gasman, #22**



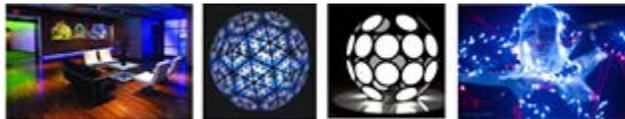
**Mark Fihn, #23**



**Neil Schneider, #24**



**Andy Marken, #25**



**Jutta Rasp, #26**



**Peter Harrop, #27**



**Parting Shot, #28**



**Mark Fihn, #29**



**Keith Baker, #30**



**Chris Williams, #31**



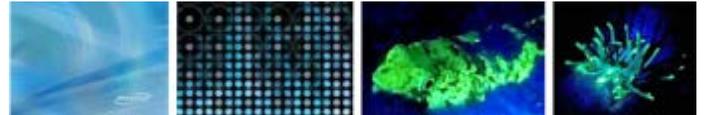
**Jin Kim, #32**



**Mark Fihn, #33**



**Ray Soneira, #34**



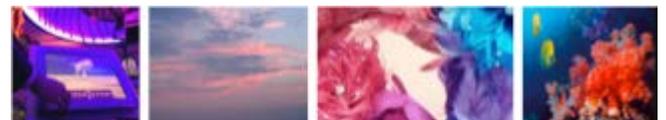
**Conrad Blickenstorfer, #35**



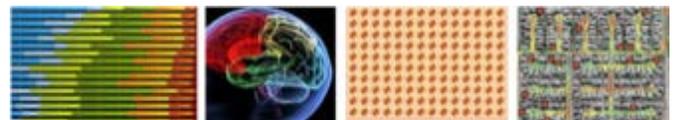
**Andy Updegrave, #36**



**Kathleen Maher, #37**



**Bruce Berkoff, #38**



**Andy Marken, #39**



**Jeff Yurek, #40**

# Program



# electronicdisplays

## Conference

February 27 - 28, 2019 | Nuremberg, Germany

### Wednesday, February 27, 2019

#### Keynote-Session: Trends & Technologies

09:50 - 10:00	Opening of the electronic displays Conference 2019	Prof. Dr. Karlheinz Blankenbach, Pforzheim University of Applied Science
10:00 - 10:25	From one Solution (CRT) to Competing FPD Technologies	Bob Rakas, MEKO
10:25 - 10:50	What next for displays? Politics, tariffs and escaping the commodity trap	Paul Gray, IHS Technology
10:50 - 11:15	OLED Market and Technology Development	Robert O'Brien, Display Supply Chain Consultants
11:15 - 11:40	Quantum Dot Pixel Color Converter, a potential solution for LCD, OLED and micro-LED	Edgar Böhm, Merck
11:40 - 12:00	Scenarios for the future of MicroLED displays (and other WCG displays)	Ian Hendy, Hendy Consulting
12:00 - 13:15	Author Interviews (20 min.) & Lunch & Posters	

#### Session 1: Touch Technologies & Integration

13:15 - 13:35	Capacitive Touchscreen Technology for Industrial and Automotive Applications	Chris Ard, Touchnetix
13:35 - 13:55	A Novel PCap Sensing Technology for Electronic Touch Displays	Dr. Gerald Morrison, SigmaSense
13:55 - 14:15	The challenge of specific touch controller programming	Stephan Meyer-Loges, Garz & Fricke
14:15 - 14:35	Touch and Display Integration for automotive HMI	Petr Shepelev, Synaptics
14:35 - 14:55	Free Shape Bonding with LOCA - Process & Material	Donald Schaffner, Felix Veltan, Dexerials Europe
14:55 - 15:35	Author Interviews & Coffee & Posters	

#### Session 2: Display Measurements

Potential of selected basic homogeneity and mura quality metrics for evaluation of black mura	Tanja Thiele, TechnoTeam Bildverarbeitung
Understanding Imaging System Specifications for Pixel-Level Measurement of Displays	Doug Kreyser, Radiant Vision Systems
Pixel by Pixel: Localizing Display Texts	Christian Weh, Across Systems
Characterization of NIR light sources for 3D Imaging using new Fourier optics viewing angle instrument	Dr. Pierre Boher, ELDIM
Smart Measurement of Glass Panels	Wolfram Froehlich, Hexagon Manufacturing Intelligence

#### Session 3: Future Automotive Displays & Optimizations

15:35 - 15:55	Future display technologies for automotive applications	Dr. Amin Wagner-Gentner, BMW Group
15:55 - 16:15	Local Dimming with Functional Safety for Automotive Displays	Szu-Kang Hsien, Maxim Integrated
16:15 - 16:35	ISELED - A revolutionary Approach to Ambient Lighting and Display Matrix Backlight in Automotive Applications	Thomas Rothhaupt, Inova Semiconductors
16:35 - 16:55	Advanced Direct-Lit Light Panel Technology for Automotive Displays	Dr. Ulf Meiners, Nichia Chemical Europe
16:55 - 17:15	Author Interviews & Posters	

#### Session 4: Displays Systems & HMI

HMIs: System aspects and component integration	Patrick von Unold, Data Modul
The 'ideal' Display Interface?	Rudolf Sosnowsky, HY-LINE Computer Components
Production Embedded UIs: What is Your Test Team Missing?	Jonny Slumpff, Alta
Interactive Display Systems - Functions, Key Features and Components for Future Trends	Milos Cvitanovic, VIA optronics

### Thursday, February 28, 2019

#### Session 5: Automotive Functional Safety & Testing

09:00 - 09:20	How to secure the image content on Automotive displays (Cluster, HUD and CID)?	Manfred Wittmer, Epson Europe Electronics
09:20 - 09:40	Automotive Mirror-Replacement with Displays - Requirements and Test Procedures according to ISO 16505 and UN ECE R.46	Prof. Dr. Anastis Terzis, University of Applied Sciences Ufm
09:40 - 10:00	Leading Edge Cyberphysical EOL Testsystems for Automotive Displays	Herbert Pichlik, SYSTEC
10:00 - 10:40	Author Interviews & Coffee & Posters	

#### Session 6: Display Optimizations by Functional Films

Functional Films for Displays Application	Dr. Nizamidin Jappar, Kimoto Tech
Functional Film, Introduction of Nano Buckling Sheet	Misato Yamanaka, Sokai
Evaluation of easy-to-clean coatings - beyond contact angle measurement	Dr. Thomas Oberbiller, COTEC

#### Session 7: Automotive HUDs

10:40 - 11:00	Power efficiency advantages of TI DLP(R) technology for augmented reality head-up displays	Ross Schneider, Texas Instruments
11:00 - 11:20	Holographic Information Display (HID)/ Interactive three-dimensional holographic information display	Peter Brandt, Opel
11:20 - 11:40	A driving simulator study investigating the effects of digital mirror failures on visual and driving behaviour, and mental workload	Dr. Sanna Pampel, University of Nottingham
11:40 - 13:00	Author Interviews (20 min.) & Lunch & Posters	

#### Session 8: HDR Displays & Evaluation

Advanced picture quality evaluation by measurements and visual testing	Roland Seibt, Video magazine
HDR for TVs and monitors: More remarkable than high resolutions?	Ulrike Kuhlmann, c't magazin
The race toward Rec2020 and HDR1 - OLED vs. LC display technology	Dr. Michael Becker, Instrument Systems

#### Keynote-Session: Micro-OLEDs

13:00 - 13:25	Micro-LED: challenges and opportunities	Dr. Jean-Jacques Drolet, Osram Opto Semiconductors
13:25 - 13:50	Micro-LED driving the third wave of technology revolution of information display	Prof. Dr. Qun Yan, Fuzhou University/SID China

#### Session 9: Automotive Displays: Evaluation & Surfaces

13:55 - 14:15	Next Generation Display Supplier Management	Sascha Zagorac, Visteon Electronics Germany
14:15 - 14:35	The future of Smart Glass in Automotive	Dr. Martin Hainfellner, Dr. Francisco J. Veredas, Shadvision
14:35 - 14:55	Plastic cover lens with multi optical surfaces for Automotive display	Takashi Kihara, DNP
14:55 - 15:15	Author Interviews & Coffee & Posters	

#### Session 10: E-Signage Displays

Digital Out Of Home - Behind the scenes of digitalization	Michael Schmid, Ströber SE
From Sunlight to Moonlight - An LCD with superior image quality for all lighting environments	Dr. Nathan Smith, Sharp Laboratories of Europe
Quality Aspects from MicroLED, COB-LED to SMD-LED	Dr. Steffen Hergert, Hergert Consulting

#### Session 11: New Technologies & Applications

15:15 - 15:35	Highly Efficient Deep Blue TADF Emitter Materials For OLED Displays	Thomas Baumann, Cynora
15:35 - 15:55	Smart windows for architecture and automotive applications: addressing the rising demand for switchable glass through innovative solutions	Dr. Graziano Archetti, Merck
15:55 - 16:15	Respirator with integrated data glasses for indoor navigation	Prof. Rigo Herold, Westsächsische Hochschule Zwickau
16:15 - 16:45	Wrap-Up, Summary & Author Interviews	

More information: [www.electronic-displays.de](http://www.electronic-displays.de)

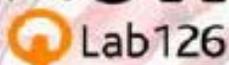


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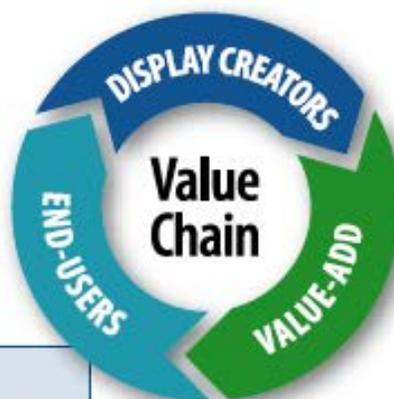


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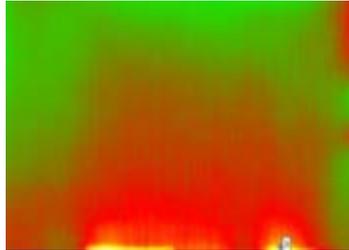
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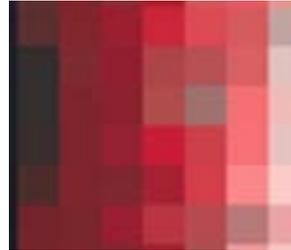
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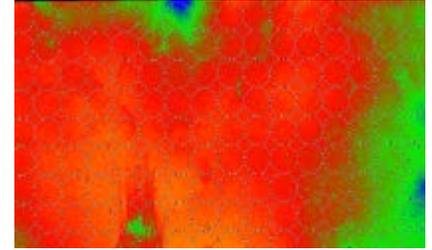
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**Display-related standards news:** intoPIX, IDC, Strategy Analytics, Futuresource Consulting, Gartner/ABI Research, Lenovo/CLEARink, Juniper Research, Phoenix Model Market, Sinclair/SK Telecom, 8K Association, VESA, AWM Smart Shelf, Strategy Analytics, Citi Research, Sponchiado/Davis, ICDM, Nielsen, DisplayLink, HDMI, Sony, FCC, ams, ABI Research, Microsoft, MIPI Alliance, Consumentenbond, YouTube, CES, IHS Markit, Faraday Technology, CerebrEX, TrendForce, Gartner, Audi, DisplayLink/Targus, Parks Associates, Digital Cinema Initiative, and Salk Institute

**AVI '18**, May 29-June 1, 2018, Castiglione della Pescaia, Italy; Papers from DIBRIS - University of Genoa/Durham University, LMU Munich

**I3D '18**, May 15–18, 2018, Montreal, Quebec; Papers from National Chiao Tung University, and Chinese Academy of Science/University of Houston/Zhengzhou University

**Display Week 2018**, May 22-24, 2018, Los Angeles, California; Papers from Pforzheim University/MSCTechnologies/August Faller, Kyung Hee University, Asahi Glass, Semiconductor Energy Laboratory, LG Display(x2), Nanomatch GmbH/Karlsruhe Institute of Technology, Kookmin University/Korea Research Institute of Standards and Science/Hanyang University/LG Display, Visteon, XTRONIC/Daimler, University of Edinburgh/STMicroelectronics, Chinese Academy of Science, Sciences, Lumileds, Brunel University, and Shanghai Jiao Tong University

**Image Sensors and Imaging Systems 2018**, January 28- February 2, 2018, Burlingame, California; Papers from Shizuoka University, Tohoku University, Simon Fraser University/University of Massachusetts, Melexis/Vrije Universiteit Brussel, ON Semiconductor/Friedrich-Alexander-Universität, University Grenoble Alpes/IMT-Atlantique, Aphesa SPRL, Forza Silicon/Intersil, Delft University of Technology/Harvest Imaging, and BAE Systems/Université de Toulouse/CNES

**Green electronics round-up** by *Keith Baker*; Target, Stone Castle Recycling, NYC Electronics, PowerWatch 2, Tetronics International, Istituto Italiano di Tecnologia in Pontedera, MIT, and Blocket/Chalmers Industriteknik/Closing the Loop/European Environmental Bureau/iFixit/Elgiganten/EI-kretsen/Inrego/IVL Svenska Miljöinstitutet/Lenovo/Recipo/TCO Development

**Display metrology news;** Datacolor partners with Color Solutions International to ams Westboro Photonics Radiant Vision Systems Massachusetts Institute of Technology

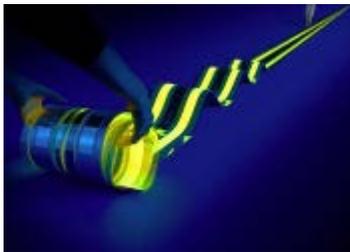
**ATSC 3.0 Announcements at CES 2019** by *Aldo Cugini*

**To enjoy great content, it's all about delivery** by *Andy Marken*

**Why ruggedness testing matters** by *Conrad H. Blickenstorfer*

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**ISS '18**, November 25-28, 2018, Tokyo, Japan; Papers from University of Hawaii at Manoa, Meiji University, Indian Institute of Technology-Guwahati, and Meiji University

**UIST '18**, October 14-17, 2018, Berlin, Germany; Papers from Carnegie Mellon University/ETH Zurich, University of Applied Sciences Upper Austria/Johannes Kepler University, Université Grenoble Alpes, Bauhaus-Universität Weimar, Inria/Univ. Paris-Sud & CNRS (LRI)/Université Paris-Saclay

**ISWC '18**, October 8-12, 2018, Singapore; Papers from MIT Media Lab, Ulm University, University of Lapland, University of Minnesota, and State University of New York

**UbiComp**, October 8-12, 2018, Singapore; Papers from Robert Bosch, University of California Davis, University of Auckland, Carnegie Mellon University/University of Illinois at Urbana-Champaign, Microsoft Research/Porsche/Ludwig-Maximilians-Universität/Northumbria University/Oxford University, Northwestern University, University of Minnesota, Utrecht University/University of Lapland

**Display Week 2018**, May 22-24, 2018, Los Angeles, California; Papers from Seoul National University, Silvaco Europe/CENIMAT, I3N, FCT-UNL, BOE Technology Group, TNO/Holst Centre/IMEC/Chungwha Picture Tubes, Hong Kong University of Science and Technology, Hitachi Chemical/Yamagata University, Chonbuk National University/Dong-A University, Kyung Hee University/Corning Research & Development Corporation/Korea University/SUN MOON University, Korea University/Samsung Display/SUN MOON University, KITECH, Korea University/SUN MOON University, Chinese Academy of Sciences, and Hongik University

**IDTechEx Europe**, April 11-12, 2018, Berlin, Germany; Presentations from Applied Materials Italia, Agfa Gevaert, Blue Spark Technologies, Ceradrop, Fraunhofer IISB, BreathDX, GE Healthcare, CIC energigune, CeNTI, Armor, and CPI

**LOPEC**, March 13-15, 2018, Munich, Germany; Presentations from Fraunhofer IVV, Cambridge University, National Research Council Canada, Karlsruhe Institute of Technology, Eurecat Technology Centre, Technische Universität Chemnitz, Nanomatch, Fraunhofer FEP, Dongguk University

**PIQO pocket projector moves towards production** by *Arthur Berman*

**What educators think about flexible displays** by *Len Scrogan*

**Stretchable and conformable electronics: Materials, components, products** by *James Hayward*

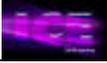
**The global RFID industry / World firsts in Printed Electronics in 2018** by *Raghu Das*

**Last Word: Roll up! roll up! roll up! The future of displays is here! Or is it?** by *Chris Williams*

**Display Industry Calendar**

# Display Industry Calendar

A much more complete version of this calendar is located at: [http://www.veritasetvisus.com/industry\\_calendar.htm](http://www.veritasetvisus.com/industry_calendar.htm). Please notify [mark@veritasetvisus.com](mailto:mark@veritasetvisus.com) to have your future events included in the listing.

<i>February 2019</i>			
February 2-5	Imersa Summit	Columbus, Ohio	
February 2-7	Photonics West 2019	San Francisco, California	
February 5-7	ICE Totally Gaming	London, England	
February 5-8	Integrated Systems Europe	Amsterdam, Netherlands	
February 6-8	3D & Virtual Reality Expo	Kyoto, Japan	
February 11-15	Hollywood Post Alliance 2019 Tech Retreat	Palm Desert, California	
February 16-21	Medical Imaging	San Diego, California	
February 18-21	FLEX	Monterey, California	
February 22-24	Sound & Vision 2019	Bristol, England	
February 24-28	Advances in Computer-Human Interactions	Athens, Greece	
February 26-28	Broadcast Video Expo	London, England	
February 27	DSCC Japan Seminar	Tokyo, Japan	
February 27-28	Electronic Displays Conference 2019	Nuremberg, Germany	
February 27 - March 1	Strategies in Light	Las Vegas, Nevada	
February 27 - March 1	PV Expo 2019	Tokyo, Japan	
<i>March 2019</i>			
March 6-7	OLED Korea Conference	Seoul, Korea	
March 6-8	Smart Materials	Rome, Italy	
March 11-12	Augmented Human Conference	Reims Champagne-Ardenne, France	
March 11-13	DVB World	Dublin, Ireland	
March 12-13	Wearable Technology Show	London, England	
March 13-14	Image Sensors Europe	London, England	
March 17-20	Intelligent User Interfaces	Los Angeles, California	
March 17-20	Tangible, Embedded, and embodied Interaction	Tempe, Arizona	

March 18-22	Game Developers Conference	San Francisco, California	
March 19-21	Phosphor Global Summit	San Diego, California	
March 19-21	Quantum Dots	San Diego, California	
March 19-21	LOPE-C -- Large Area, Organic and Printed Electronics Convention	Munich, Germany	
March 20-22	FPD China	Shanghai, China	
March 20-24	LAVAL Virtual	Laval, France	
March 23-26	International Sign Expo	Las Vegas, Nevada	
March 23-27	IEEE VR	Osaka, Japan	
March 26-29	Digital Signage Expo	Las Vegas, Nevada	
<i>April 2019</i>			
April 1-4	Cinemacon	Las Vegas, Nevada	
April 2-4	Sign UK/Digital Signage Showcase	Birmingham, England	
April 2-4	TecnoMultimedia Infocomm Brasil	Sao Paulo, Brazil	
April 6-11	NAB 2019	Las Vegas, Nevada	
April 8-11	MIPTV	Cannes, France	
April 9-10	Image Sensors Automotive	Berlin, Germany	
April 9-11	2019 China VR&AR Fair and Summit	Guangzhou, China	
April 10-11	Printed Electronics Europe	Berlin, Germany	
April 10-12	Infocomm China	Beijing, China	
April 14-18	SPIE Defense, Security, and Sensing	Baltimore, Maryland	
April 16-19	2019 Measurement Science Conference	Anaheim, California	
April 30 - May 3	International Conference on Animation, Effects, Games, and Digital Media	Stuttgart, Germany	
<i>May 2019</i>			
May 4-9	CHI 2019	Glasgow, Scotland	
May 5-7	Functional Printing, Process and Products Conference	Itasca, Illinois	
May 6-10	Eurographics	Genova, Italy	
May 7-9	SEMICON Southeast Asia	Kuala Lumpur, Malaysia	
May 8-10	Photonics Festival: OPTO Taiwan, SOLAR, LED Lighting, Optics	Taipei, Taiwan	

May 12-17	SID International Symposium	San Jose, California	
May 13-15	SID Display Week Business Track	San Jose, California	
May 14-16	AutoSens USA	Detroit, Michigan	
May 14-17	Archiving 2019	Lisbon, Portugal	
May 14-17	European Sign Expo	Munich, Germany	
May 20-23	Embedded Vision Summit	Santa Clara, California	
May 21-23	Immersive Hollywood	Los Angeles, California	
May 28-31	Graphics Interface 2019	Kingston, Ontario	
May 28 - June 1	Computex 2019	Taipei, Taiwan	
May 29-31	Augmented World Expo	Santa Clara, California	
May 31 - June 3	Symposium on Interactive 3D Graphics and Games	Montreal, Quebec	
<i>June 2019</i>			
June 3-7	Collaborative Conference on Materials Research 2019	Seoul, Korea	
June 5-7	Interactive Experiences for Television and Online Video	Manchester, England	
June 8-14	InfoComm '19	Orlando, Florida	
June 11-13	E3 Media and Business Summit	Los Angeles, California	
June 11-13	CES Asia	Shanghai, China	
June 12-13	AR & VR World	London, England	
June 12-14	World Congress of Advanced Materials	Jinan, China	
June 12-14	International Symposium on Pervasive Displays	Palermo, Italy	
June 12-15	Interaction Design and Children	Boise, Idaho	
June 17-19	Nanotech Conference & Expo	Boston, Massachusetts	
June 17-20	CineEurope	Barcelona, Spain	
June 18-21	Symposium on Engineering Interactive Computing Systems	Valencia, Spain	
June 19-21	WEAR: Smart Fabrics, Wearable Technology	Seattle, Washington	
June 19-23	Digital Holography and Three Dimensional Imaging	Bordeaux, France	
June 23-28	Designing Interactive Systems	San Diego, California	

June 24-28	CeBIT 2019	Hannover, Germany	
June 25-27	Sensors Expo & Conference	San Jose, California	
June 25-27	OLED Expo 2019	Seoul, Korea	
June 25-27	LED Expo 2019	Seoul, Korea	
June 26-28	C-Touch & Display Shanghai	Shanghai, China	
June 26-28	SIIM 2019	Denver, Colorado	
<i>July 2019</i>			
July 1-4	International Symposium on Flexible Organic Electronics	Thessaloniki, Greece	
July 3-5	NAB Show Shanghai	Shanghai, China	
July 9-11	Intersolar North America	San Francisco, California	
July 9-11	Semicon West 2019	San Francisco, California	
July 9-12	IEEE World Haptic Conference	Tokyo, Japan	
July 18-19	International Conference on Organic Electronics	Paris, France	
July 26-31	HCI International	Orlando, Florida	
July 30 - August 5	National Stereoscopic Association Convention	Akron, Ohio	



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# MultiView



► *Mark Fihn*, volume 54: 121 articles, 225 pages, December 2017

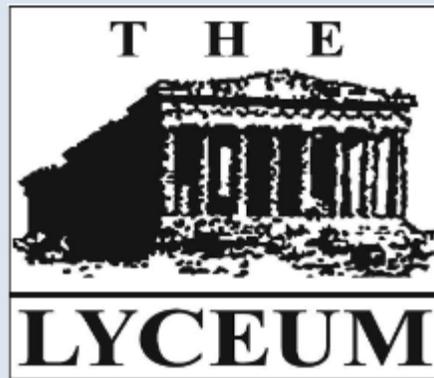


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## Monthly Display Conference Summary



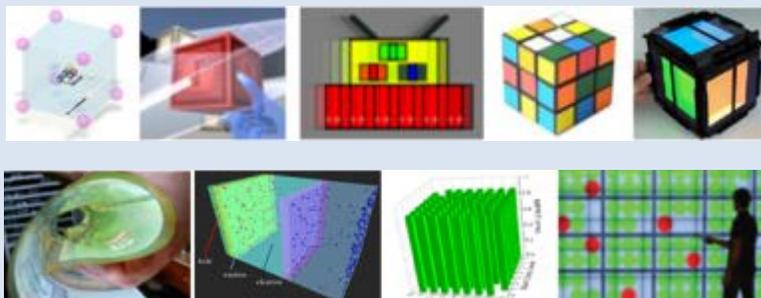
We are introducing a new title to our offering of newsletters. *Lyceum Veritas* can roughly be translated, from the Latin, to “Truthful Discussions”, although it should be noted that the original Lyceum was the location where Aristotle taught in Athens.

ly·ce·um \ lī-'sē-əm , 'lī-sē- \ *noun*

- 1: a hall for public lectures or discussions
- 2: an association providing public lectures, concerts, and entertainments

Both of those definitions represent our intention with this new effort – as we share the post-conference outputs from some of the many display-related events we have covered in our most recently published editions of our core newsletters about the display industry. We are excerpting the conference sections from each of the *Flexible Substrate*, *Display Standard*, *3rd Dimension*, *High Resolution*, and *Touch Panel* newsletters published each month. We’ll add a few additional bits related to upcoming events – and each edition will include a lead article that is not published elsewhere.

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# Omnibus Veritas

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## Monthly Display News Compendium



For the first time in several years, we are introducing a new title to our offering of newsletters. *Omnibus Veritas* can roughly be translated, from the Latin, to “All the Truth”, which is undoubtedly a self-contradictory and exaggerated title, but I was more focused on linking to two relevant definitions of the word “Omnibus”:

om·ni·bus 'ämno,bəs/ *noun*

1. A volume containing several novels or other items previously published separately.
2. Of, relating to, or providing for many things at once.

Both of those definitions are direct hits on our intention with this new effort – as we’re simply taking portions of our most recently published editions of our core newsletters about the display industry. We are excerpting the news sections and the lead articles from each of the *Flexible Substrate*, *Display Standard*, *3rd Dimension*, *High Resolution*, and *Touch Panel* newsletters published each month. We’ll add a few additional bits related to upcoming events – and each edition will include a lead article that is not published elsewhere.

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## Display-Industry Newsletters

