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Youth and Technology on the Rise

In our industry, the sheer number of new technologies in development will change not only what our industry builds but how we build it. And the youth coming up behind us are perfectly willing to make use of these new technologies. It's not a brave new world; it is a courageous new world. Apparently, no one told these young people that it couldn't be done.

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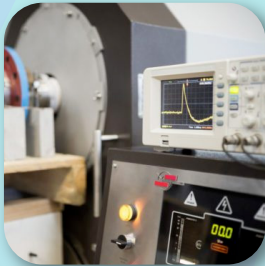
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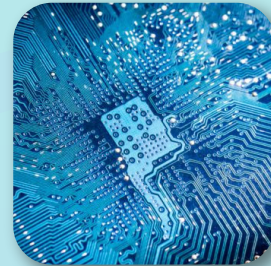
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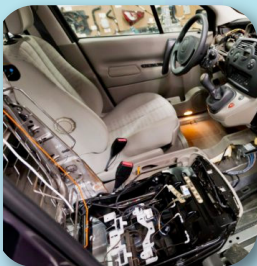
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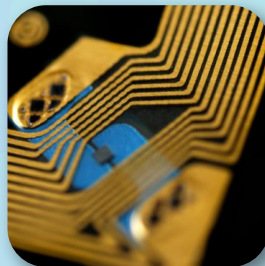
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They Don't Know It Can't Be Done

Nolan's Notes
by Nolan Johnson, I-CONNECT007

The old saying is that youth is wasted on the young. I'm not so sure that saying is even true. Find a young person who has a passion and a purpose, and suddenly the impossible is overcome. Regular readers will notice that there have been many stories in our magazines recently, showcasing young and early-career engineers and designers. The same themes kept coming up, including during October, November, and January—almost every month, we've showcased a young engineer somewhere in our magazines. Examples include Project Libre and IPC's STEM Student Outreach Program *(Real Time with… IPC APEX EXPO 2019 Show & Tell Magazine)*, just to name a couple. And we expect to see more of this in the coming years.

Moreover, we've been following the dialogue in the industry on how to bring more students into electronics manufacturing. I refer you to our "The Next Generation: Who Will Fill Your Shoes?" issue of *Design007 Magazine* from July 2018. IPC, SMTA, NextFlex, SEMI, and IEEE all have some type of educational engagement program to expose students to modern manufacturing as early as middle school.

So, here we are in April 2019, and we're continuing that discussion by bringing you a taste of who will be filling your shoes, and what they'll be bringing with them.

Young people succeed because they don't know it can't be done. We are now far enough into this new millennium that college populations are flipping from 20th-century babies to 21st-century kids. The youth and young professionals today see digital models as an innate way to interact with the analog world. Millennials see the world differently, which isn't bad; it's simply different. From today forward, if you are hiring entry-level positions in manu-

facturing, you will be hiring truly digital thinkers, and those positions will not be the same as starter jobs were back in the 20th century.

Further, young technology takes time to be fully adopted. While we've become increasingly accustomed to new technology gaining critical mass adoption in years instead of generations, it often still takes a combination of events coming together to make adopting the new technology more valuable than simply leaving things the same. Corning's Gorilla Glass is an example. Corning developed an ion-exchange technology for strengthening glass back in the early 1960s. The chemically-strengthened glass found some specialty use in the 1990s—some 30-plus years later—but it broke out as a mainstream product in 2005 thanks to the iPhone.

The dynamic is so common as to be a truism—people tend to criticize new ideas. Revolutionary thinking is met with disdain from the entrenched status quo. We all resist change and new thinking, some more than others. In our industry, the sheer number of new technologies in development will change not only what our industry builds but how we build it. And the youth coming up behind us are perfectly willing to make use of these new technologies. It's not a brave new world; it is a courageous new world. Apparently, no one told these young people that it couldn't be done.

Our issue launches on a ballistic trajectory with coverage of the IEEE Rising Stars Conference. I spent a weekend at the conference and brought back a pair of interviews with conference organizers. Matt Smith leads us off. He started as a student attendee, and just a few years later, he's wrapping up a stint as event committee chair. We follow with an insightful talk with Mike Andrews, the elder statesman and founder of the conference.

Next, columnist Eric Camden ponders the impact of "tribal knowledge" in the evolution from design concept to production in his aptly-titled "These Darn Kids/Back In My Day."

Speaking of kids, our next piece takes us back to Rising Stars. In this article, I share perspectives from conference attendees. Following

right behind is Barry Matties' conversation with Jeffrey Diament, a young engineer (and Princeton graduate) developing new sensors at startup Instrumems. If you think the youth of today aren't focused, motivated, and career-oriented, then you need to talk to these young people; they'll change your mind.

Craig Reiselt, CEO at Octane Open Concepts, discusses Octane's innovative tools for CM floor optimization. Octane straddles both of our themes this month in that the products demonstrate a shift toward new manufacturing technology. Also, Craig's development team is young, fresh out of school, and unhampered in their thinking about how to solve problems.

Turning our attention to emerging technologies, we bring you two interviews on battery and sensor technology currently under development with help from the Nano and Advanced Materials Institute (NAMI) based out of Hong Kong. Tracy Liu and David Yeung discuss their work and the forthcoming rollout of their products.

We're also delighted to premiere a brand-new column! Mike Fiorilla from Manncorp Inc. kicks it off with "When Is It the Right Time To Automate?" Look for insights on equipment from Mike monthly in *SMT007 Magazine.*

Closing the latch on this issue is Vic Markarian from Cadence Systems. I caught up with Vic at CES in Las Vegas in January and learned why Cadence maintains a presence at a consumer electronics show.

I hope you enjoy the insights and energy from these young people and the new technologies that tend to come along with them. The I-Connect007 team had a delightful time bringing these stories to print. If you have feedback, suggestions, or would like to submit a story of your own, please contact us at editorial@iconnect007.com. SMT007

Nolan Johnson is managing editor of *SMT007 Magazine.* Nolan brings 30 years of career experience focused almost entirely on electronics design and manufacturing. To contact Johnson, click here.

From Participant to Volunteer to Leader:
Matt Smith
on the IEEE Rising Stars Conference

Feature Interview by Nolan Johnson
I-CONNECT007

Matt Smith

Matt Smith is one of the volunteer organizers for the IEEE Rising Stars Conference. As if that's not enough, Matt also is an example of the impact this program can have on a young professional. In this interview, Matt provides an overview of the programs and what the conference strives to create for the attendees.

Nolan Johnson: Can you start by telling us about yourself, and how you're affiliated with the IEEE Rising Stars Conference?

Matt Smith: I've been a member of the IEEE for six years. I started in 2013 volunteering at my university student branch. The first time I became involved with Rising Stars was as a participant in 2014, which was held at the Riviera Hotel and Casino in Las Vegas, Nevada. It was the first Rising Stars Conference and was quite a bit different than what we have today. There weren't as many attendees, and not nearly as many speakers. The tracks were a little bit different; we've learned a lot over the years, so the program has evolved.

When I attended the first Rising Stars Conference, I was inspired by what I learned and all of the networking that I was able to do. I made new friends and met contacts that made the beginning of my career in engineering a reality. I wanted to give back, so I spoke with the organizers and offered to volunteer. I volunteered for a year as a regular volunteer, then I was asked if I'd be interested in serving as vice chair. I said yes. Last year, I chaired the conference; this year, I'm co-chairing to help support our efforts, and it has taken off.

Johnson: Clearly this is something you're passionate about.

Smith: Absolutely. Every year, I feel compelled to give back after everything I've gained from my involvement with the Rising Stars Conference. I can never seem to even the score.

Johnson: That's usually when it's working right.

Smith: For some background, it has been four or five years since the first IEEE Rising Stars Conference. Before I came to the Rising Stars Conference, I was working on my engineering degree online because there was no local university in Montana where I'm from; there

Matt Smith performing his master of ceremonies duties at the IEEE Rising Stars Conference in Las Vegas.

weren't a lot of opportunities. I applied to the one or two places available. They said they weren't hiring, so I started asking, "How can I market myself?" I received an e-notice when I joined the IEEE that there was an opportunity to do just that. I came to the conference and met the conference organizer, Mike Andrews, who helped set me on the path for success professionally and through volunteering for the IEEE.

In the junior year of my degree program, I thought, "I need to start getting some real experience," I asked Mike if he knew anywhere I should apply. Mike made a recommendation to reach out to a contact in Arizona. I reached out to him when I happened to be in Arizona for a vacation, and they said, "Come down for an interview." I actually got the job through networking.

If it wasn't for the Rising Stars Conference and applying what I learned there, I don't think I would be where I'm at today in my current job. It has been amazing how much of a difference the conference has made on my life and enabled me to progress and succeed. By applying what I've learned at Rising Stars Conference, I was also nominated and selected for employee of the quarter. I attribute a lot of that to what I learned at the conference.

Johnson: There are approximately 350 students and young professionals in the conference right now experiencing their own version of that same story.

Smith: Yes, and one of the big things for me being in Montana, which is pretty low income, I couldn't afford to fly to these types of events. So, when I learned I could volunteer and get funding to come to this event and support it, it really empowered me. I would encourage anybody that can't afford it or thinks it's not possible, just reach out to us. Let us know that you want to help and what you're passionate about, and we'll try to make it happen.

Johnson: If we can pivot a little bit, who should come to the Rising Stars Conference? Who are you targeting?

Smith: The conference is aimed at young engineers studying for an engineering or computer science degree, or anyone in a position related to technology. We also have humanitarian efforts and professional tracks to develop skill sets. Thus, it applies to anyone looking to better themselves technically or professionally, which includes students and young professionals. Typically, the conference is ideal for people with less than approximately 15 years of experience, but we do have topics that are broad and apply to all demographics. I think it appeals to pretty much anyone, but our target audience is college students and young professionals.

Johnson: I know this from my personal experience and from talking to others who have earned a technical degree: nothing in my college curriculum required me to learn how to be a professional. It seems like there are a lot of those skills built into the Rising Stars Conference. How did that come to be?

Smith: We recognized a need for what the students had to understand and how they were going to market themselves, generate their personal brand, and interact with other people. To realize that, you must network with other

people and appeal to them so that they want to network with you; it goes both ways. We took off with that idea and have had several speakers that felt very passionate about it as well. We've created networking sessions where people can practice. They can go to a networking session, learn how to do it, and immediately go and network with other people and apply what they've learned.

Committee members and attendees at the IEEE Rising Stars Conference.

Johnson: As an older-than-average adult at this venue, I've been the recipient of some of that practice, as a matter of fact.

Smith: That's good to hear.

Johnson: Some students are consciously choosing to step out of their comfort zone. You can see the thought process: "I don't know you, and you're older than me, so I'm going to talk to you" (laughs).

Smith: That's good. It's working!

Johnson: You have some high-powered speakers here too. Already this morning, a VP of research from Western Digital spoke, and multiple high-end folks who have work on Titan missile systems in their backgrounds— even more have presenters are aerospace. How did you get them to speak?

Smith: Essentially, we apply the techniques we teach everyone else. We go through our networks and reach out to people that we've met in the past. We might not necessarily know them directly, but we know someone who knows them through a second or third party. We'll reach out to them and say, "I'm putting together this conference. This is what our goal is. Do you think you could get me some time with them?" Usually, it works, so we put our own advice to use. We design the program from the perspective of, "If I was an attendee and wanted to go to a conference to better myself from a professional perspective or a skill set, what topics would we cover? What would make me excited and enthusiastic about going to this conference?"

We ask our own volunteers and gather feedback from the surveys that we have. With that knowledge, we handpick every speaker. We personally invite them and work with them throughout the year to figure out what their topic is going to be, what they're passionate about. We aim to make sure that everything blends together to create a nice balance between the professional and technical aspects in a way that students can pick and choose between the four tracks that best apply to what they want to learn about and what they're trying to do in their life.

Johnson: You also have quite a number of sponsors for this event. How do you involve your sponsors?

Smith: Whether it's hosting a workshop, collecting resumes, setting up interviews, or having some influence in the conference, we work hard to empower our sponsors. We want our attendees to interact with them. Sponsors have even held keynote slots in the past. We listen to our sponsors and accommodate them as much as possible. If it weren't for sponsors, we wouldn't have a sustainable event, so it's very important to us to illustrate the value of sponsorship.

However, we haven't had as much industry

engagement as I would like to see. I would have expected leading companies that need top-tier talent to express more interest because all of our attendees are handpicked by their sections. It's a good opportunity for sponsors to get the best of the best in the IEEE.

Johnson: You said student attendees are handpicked from their areas. What do you mean by that?

Smith: How that works is there's a certain level of representation from each IEEE demographic. Regional is the most overarching, then areas within the region and sections within each area. Each has access to funding, and they can use that funding to say, "I want to sponsor or fund this student to attend this conference because they have been a standout volunteer." Maybe they're running workshops, involved in their

community, or helping other IEEE members, so those types of people are usually the ones that IEEE chooses to send to the conference through the section, area, or region. Attendees also fund themselves to come to the conference, but the majority who are funded from within the IEEE and come to this conference are top tier in their section, area, or region.

Johnson: Is that where a lot of the sponsorship goes—helping fund those handpicked people?

Smith: The majority of the sponsorship funding goes towards offsetting the cost for our attendees, which might include paying down the bill for the venue or food. It may also go towards funding travel or lodging costs. Our goal is to lower the price for the overall conference attendee so more people can attend the event. It's up to the section, area, or region to pick who they choose to fund to come to the conference. We do fund some of our own volunteers. Usually, the top five or ten people who have contributed the most to the conference over the year get funding from us directly as a conference committee.

Johnson: So, anybody who wants to get involved should follow up with the Rising Stars Conference committee to talk about sponsorship opportunities.

Smith: I would highly recommend it.

Johnson: Where does the committee see the Rising Stars Conference going in the next three to five years?

Smith: We want to continue to expand but it's more challenging every year. We will continue to recognize new problems and opportunities and we want to capitalize on them as much as we can through partnering with industry. I'd like to see more of that and get more input
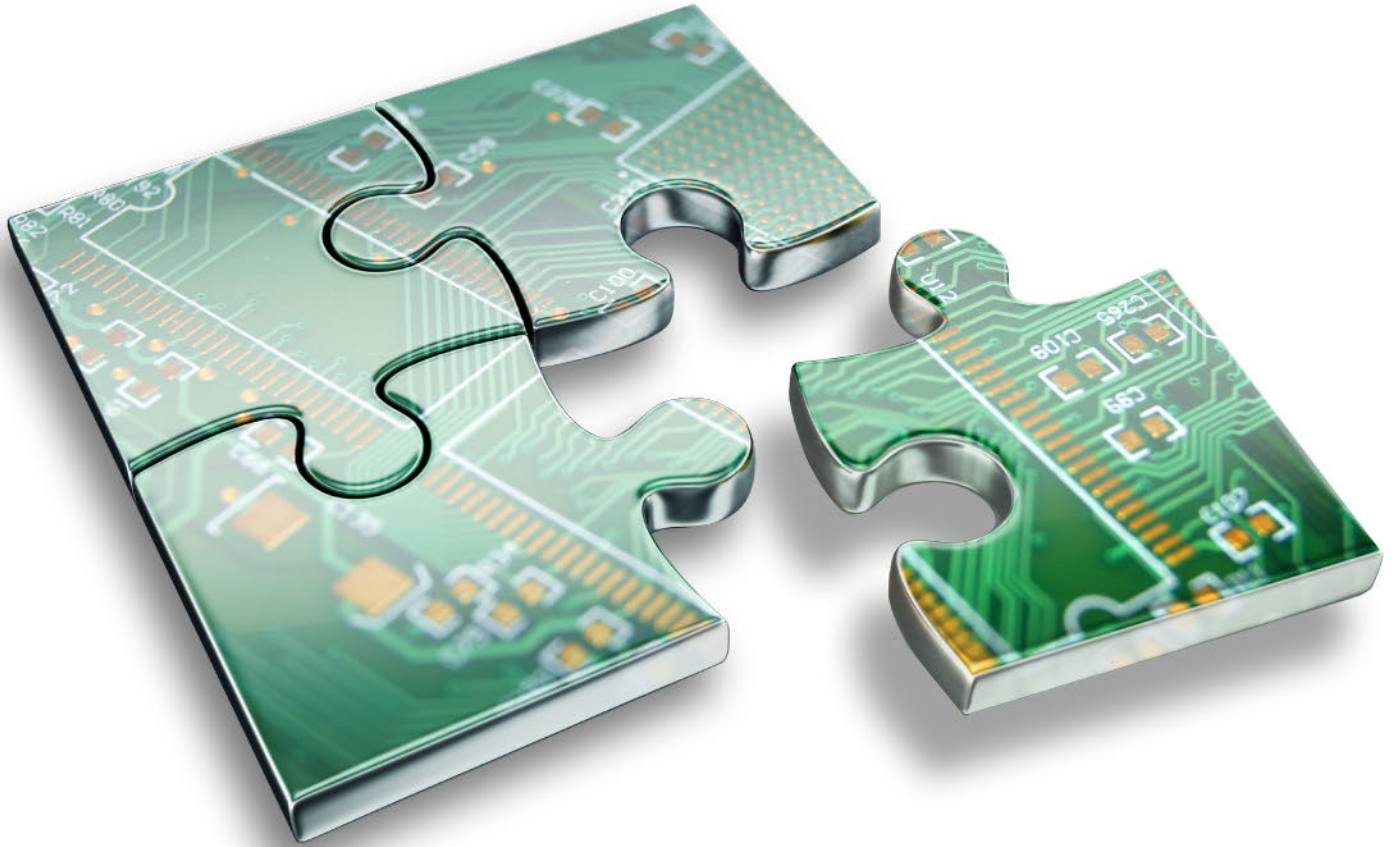
from our attendees about what they would like to see in the future. We need more volunteers to help plan and execute the conference to maintain this momentum.

Our team works with IEEE booth staff to give our attendees the opportunity to volunteer at the Consumer Electronics Show (CES), which typically follows the conference within a couple days. It has been very popular, and we've received a lot of positive feedback regarding the partnership and experience at CES. I wouldn't be surprised to see something collaborative evolve that involves CES in a way that we haven't yet seen.

I think we'll also see more variety in the conference agenda regarding professional and technical tracks as we continue to evolve. These topics change, so what we presented back at the first Rising Stars Conference may not be applicable today. We have to stay on top of the latest trends. Our last panel was called "The Next Big Thing," which talked about upcoming technologies. That is one of our big topics every year; we look to see what's trending, what's disruptive, and how we can embrace the change to enhance technology for the benefit of humanity. We're always looking for what that might be. I see that continuing for as long as I can imagine.

Johnson: Companies in this space that are actively looking to develop new talent with unique perspectives and the latest training and education should be involved here.

Smith: Yes, I firmly believe that.

Johnson: Thank you, Matt. This has been great.

Smith: Thank you, Nolan. SMT007

Photonics Breakthrough: Device That Shakes Light

Researchers at Yale University have developed a device that combines mechanical vibration and optical fields to control light particles better. The device has demonstrated an efficient on-chip shaping of photons enabled by nanomechanics driven at microwave frequencies. Led by Hong Tang–the Llewellyn West Jones, Jr. Professor of Electrical Engineering, Applied Physics, and Physics–the results of their work are published in *Nature Photonics.*

Currently, the most common technique for manipulating photon frequency is with nonlinear optical effects where a strong laser essentially acts as a pump, controlling the color and pulse shape of a signal photon. However, the effect is weak, so the process requires a very strong laser, which creates noise.

To break these limits, the Yale researchers created a device that consists of a series of waveguides. Light and microwave frequencies are sent through the device, and the light wends its way through alternating suspended and clamped waveguides on a single chip. This creates a positive and negative effect, corresponding to the microwave frequency. The light spirals in each of the waveguides to prolong the interaction and maximize efficiency.

Mechanical vibrations modulate the optical phase in each suspended waveguide spiral. This accumulates to generate what's known as deep phase modulation. Previously, the Tang lab had created a single waveguide device. With this new device, the alternating positive and negative waveguides dramatically boost efficiency. (Source: Yale University)
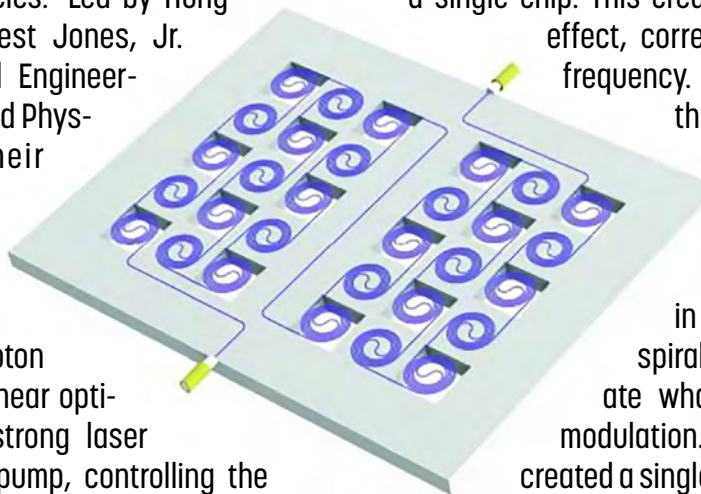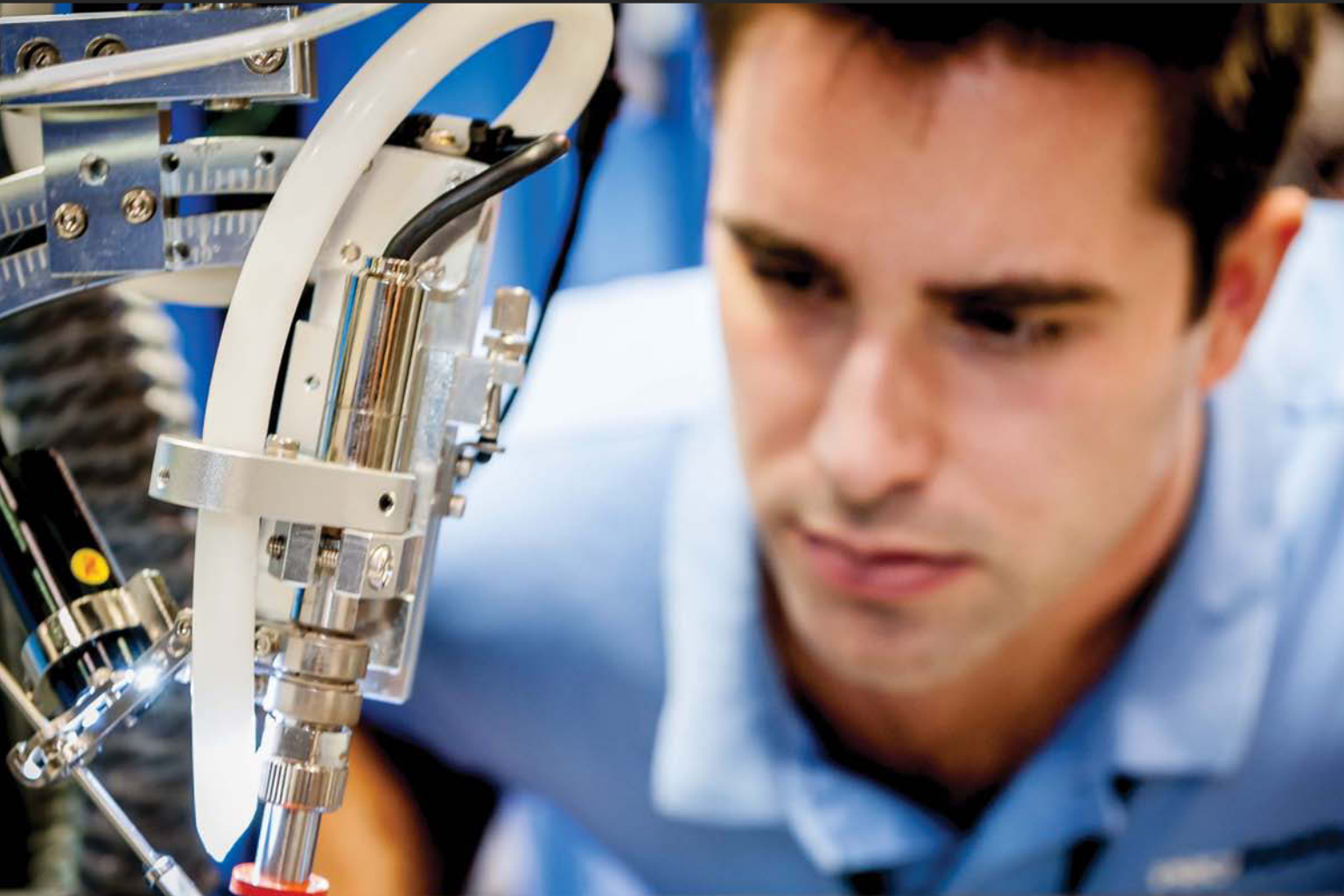
IEEE Rising Stars Conference Founder:
Empowering Young Professionals

Feature Interview by Nolan Johnson
I-CONNECT007

Held each year in Las Vegas on the weekend preceding CES, the IEEE Rising Stars Conference is rapidly establishing itself as a model program for developing leadership, networking, and aptitude in navigating an organizational structure in technical students and young professionals. I spent the weekend observing the program and realizing the amount of vision and development that went into crafting this conference. Then, I turned to Michael Andrews to help explain it all. Andrews is an IEEE Senior Life member, serial entrepreneur, and founder of the IEEE Rising Stars Conference.

Nolan Johnson: How are you affiliated with IEEE Rising Stars Conference?

Mike Andrews: Well, I was actually the creator of the conference. When I was the director-elect for IEEE Region 6, I had this idea for a student and young professionals' event. The idea behind the conference was to provide young people an opportunity to develop an appreciation of emerging technologies, and to be provided with professional tools that would greatly influence their future success. The conference was designed for the attendees to meet key influencers and thought leaders in fields of interest. The conference would also provide them with professional growth opportunities and encourage them to move into leadership positions—that is, provide them with the confidence and abilities to professionally "fly." We tried for a long time to find a location, secure a venue, get a date for a conference, etc., which was a crazy task.

The challenge was that if you looked at the different university schedules, there are various educational systems including quarters, trimesters, and semesters. Some schools even go through the summer, so we could never come up with a consistent date or time. Finally, I ended up taking the bull by the horns. I said, "Here's the conference we're going to put together, and here's where and when it's going to be." My successor, Tom Coughlin, and I were on the phone, talking about our frustrations about not being able to get a conference scheduled after working at it for a long time and trying to make all of the necessary considerations. So, we discussed our audience—young professionals—what we want them to do and developed a program that

Mike Andrews

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A student work session at IEEE Rising Stars.

I had in mind, which was a combination of professional and technical features.

One conversation led to another, and we said, "There's CES in Las Vegas." At the time, Tom was hosting the Storage Visions Conference, and I thought, "If we have a conference and there's a professional and technical portion of it, the attendees would gather some working knowledge of areas in technology and information about how to communicate and network with other people successfully." Skills such as what do you do after shake hands and introduce yourself to someone?

Since Storage Visions was on January 10 and CES was on January 12, I said, "Why don't we do a conference on January 8 that provides our attendees with all of these tools and exposure?" Tom responded, "Let's invite them to attend Storage Visions at no cost. They could go to some of the sessions." Our goal was that the Rising Stars attendees would have an opportunity to meet the technical professionals. Storage Visions included engineers who were very technical people, and they would have an opportunity to exchange technical ideas.

It's part of the bridge. When you go to CES, most of the show is primarily sales professionals and technical professionals. There are a lot of different products, so we focused Rising Stars on young professional, providing them tools, exposure to technology, and interpersonal skills. We wanted young people to interact with technical professionals as well as sales groups, including the product piece of it. And it wowed people. Rising Stars, Storage Vision, and CES was a great combination to offer.

Johnson: You wanted to cover all of those phases that a technical engineering professional would need to navigate anyway.

Andrews: Absolutely. That's where the inception of the bridge came from. We were looking for a good name, so when I came up with the Rising Stars name, it was one of those low-and-behold moments; the vision came. I created the logo for it. If you look closely on the t-shirts, you can see the Franklin kite inside the stars.

Johnson: By golly. I see it now.

Andrews: And what was funny about that is when I designed it, we printed t-shirts with it, and the IEEE Brand Experience Department said no initially. But the first time I wore it to a board meeting and explained the logo and

conference, everybody fell in love with it; it was something different. It was a complete departure for IEEE, and it worked. Tom has since relocated Storage Visions because of facility and timing issues. However, there are a number of our Rising Stars attendees that go to CES and some of them work in the IEEE booth at CES.

Johnson: I've run into a couple who have asked if I was staying for CES and if I would stop by the booth.

Andrews: As I said, it's interesting, and the idea behind this all was to provide an experience for young professionals that would get them as excited about our industry as we were when we were young. It makes you think about where we were and the influencers we had. This year, we added a Connections Panel on the first evening. At a previous conference, I had a conversation with a guest panelist where we started talking our connections, how important they were, and how we wish we had access to more. The result was the creation of the Connections Panel. Do you remember James Burke and the book Connections as well as the TV series on PBS a million years ago?

Johnson: I loved it.

Andrews: Me too. I met him a couple of times and had great conversations with him. One of this year's panel members is a friend and

Students attending the IEEE Rising Stars Conference learned a number of professional skills from industry veterans and staffing recruiters.

colleague. We get together about once a month for breakfast or lunch, and we invariably find out something about each other that we didn't know before. The last time we met, I found out that he had worked with Stephen Hawking while Stephen was at Stanford, and that he had spent time at the labs in New Mexico doing plasma research. I had also been at the labs regarding plasma issue eons ago. You never know what connections will influence your career.

I also talked with Daniel Schweiker this afternoon after he had finished his presentation about the same idea about the various unexpected twists and turns your career can take. It's like when you see a fork in the road during your career; your career will have multiple forks, and you won't know where it's

Mike Andrews kicking off the 2019 IEEE Rising Stars Conference at the Tropicana Hotel in Las Vegas.

The Cybersecurity workshop at IEEE Rising Stars was led by Chris Humphreys. Find our interview with Humphreys in the March 2019 issue of *SMT007 Magazine*.

going to take you, but you keep following your intellectual nose.

That all being said, this event gives young professionals an opportunity to see different things, and there's probably a fork that they hadn't expected here. The last two students that I spoke with were getting ready to graduate this spring or summer, and they came up to thank me. One said that something he saw had struck a chord, and the second one wanted to meet me because he thought I was pretty unapproachable until they heard me speak. They liked that I did unrehearsed, spur-of-the-moment introductions around the room during the last session; they thought that was great. I've talked with many of the attendees that had the same kind of reaction to the topics presented and to the speakers. We made a difference in the lives of these young professionals.

Johnson: That's fantastic.

Andrews: It's interesting that many of our attendees have never participated in this kind of conference.

Johnson: Right. It's the first one for many of them.

Andrews: It's not only the first one, but it's unlike any other conference they will attend. Most conferences include a presentation of academic papers. At that kind of conference,

a paper presentation might attract a dozen people if you're lucky and have brought friends and family. At this conference, all four of the concurrent sessions were well attended. Every time I looked in one of the breakout rooms where we had seating for 85–90 attendees, they were consistently full and all had good audiences and great participation.

So, why do we do this conference? It's because of what the speakers have to share, and the response from the audience being phenomenally interested in what they have to say, how they say it, and how they interact. It's an interesting dynamic to watch, and it makes a difference.

Johnson: Being here for the first time myself, I think you're on to something. You've structured something here where you're showing an audience who has largely never been to a conference how to go to a conference.

Andrews: There are a lot of layers in this. We have our keynote speaker on the closing day, and that session was on "The Next Big Thing." That's by design because what we want the last panel to deal with what is in the immediate horizon, not what's going to happen in five to 10 years. We want to hear about what's going to happen in the next two to three years, and how we can be prepared for it. If I'm a young professional or in school and looking toward graduation, what tools do I need to have in my quiver to make me employable or

position myself well enough to be in demand? Or if I'm in early career, what might the next steps be? Ultimately, we would like to close the conference with an outbound challenge that is actionable by each attendee.

Johnson: A couple of minutes ago, you mentioned having that moment where you find a fork in the road and have to make a choice that will influence where you decide to go with your career; that seems to happen a lot, but that's qualitative. It's hard to measure, but some of what you're doing also seems to be pretty measurable. You also mentioned gathering metrics about how attending the conference changes their professional behavior.

Andrews: I was curious because, at some point, you have nights when you ask, "Why am I doing this?" Sometimes, you're not sure if it matters, so we do surveys asking about what parts of the conference the attendees like or dislike, etc. It gives us an understanding of their level of satisfaction. We're pleased with the outcomes, and like any other good engineer, we always find something wrong with it, and work on tweaking and improving it.

I also contacted IEEE Member Services and asked them to contact the 400–500 who had attended Rising Stars over the past four years because I wanted to know what they're doing now. Are they still involved with IEEE as members? And the number was exceptionally high.

Johnson: Validatingly high (laughs).

Andrews: Yes. The retention rate within IEEE of the individuals who attended Rising Stars is 85–90%. If you talk with any other engineering society, including IEEE, and ask, "What's your retention rate for 20–24-year-olds?" They'll look at you and say, "Typically, 20–30%, and depending on conditions, maybe 40%." We're seeing high enthusiasm and return attendance. If we could generate other conferences or continue to expand Rising Stars, that would be a win. It's an unusual conference because it doesn't follow the typical conference pattern. We invite senior-level industry executives to present real-world applications of technology. Funding for the conference is a challenge. We want to keep the registration cost as low as possible for attendees, bearing in mind that they're young professionals and may not have the discretionary funds available to attend the conference.

Another significant aspect of the conference is corporate outreach, sponsorship, and involvement. We ask all of the companies that

the speakers associate with if they are willing to provide some level of financial support to the conference. Corporate outreach and soliciting sponsors is a learning process for all of the young professionals. When we started the conference, the organizing committee was a mix of experienced professionals and young professionals. Tom and I were the program drivers. Over the years, we have morphed the committee to be driven by the young professionals. I am still actively working on the committee. We try to make sure that the young professionals do the majority of the work. I still communicate with all of the speakers and companies. This year, I had one of the young professionals make some corporate contacts and sponsor requests. We secured the speaker, and now, that contact is warm sales call for financial support.

Johnson: A very warm sales call, indeed.

Andrews: Make it happen. We didn't secure many corporate sponsors as we wanted, and that's okay. Next year, I will work with the committee members to do a little bit more. They need to become comfortable making direct contact with decision makers. The committee is more confident in talking to decision makers and putting together proposals; now, it's a matter of executing and taking it one more step. Every year, we use a very purposeful growth and improvement process. We have a group of young professionals building this conference and working hard on it as volunteers.

Johnson: Did they start as attendees?

Andrews: Yes. At one point or another, they all attended the conference.

Johnson: That's a great next step by getting involved in leadership. They can come to the conference and learn, and then they can apply what they've learned at the conference for the conference.

Andrews: What's funny is the last two people I

One of the numerous panel discussions at the IEEE Rising Stars Conference. L to R: Mario Milicevic, moderator; Lay Guo (Lam Research); Kathy Murphy (management consultant); Ravender Bhojwani (Amazon.com); and Sanna Gaspard (Rubitection Inc.).

talked with were from San Diego and were so excited after attending the conference. When I told them, "If you're interested, here's how we put together the program. We get your feedback. You tell us what kind of topics you're interested in and what kind of speakers and companies you'd like to see; we try to refine that a bit, and then pursue that." We actively pursue anybody that we think makes any sense to be here. My phone calls are to the C-suite. If you look out here, we have CEOs, company presidents, and directors—not only engineers.

Johnson: You have a VP of R&D, for example.

Andrews: We have good, solid folks out there. And when I spend time with the speakers, I tell them who their audience is and what to expect; all of the little things so that there are no surprises. You've seen how our speakers and the audience interact; it's dynamic, and we're pleased and proud of exactly what happens here. There are a lot of moving parts, and it looks a little chaotic sometimes, but that's the nature of the beast, and if you're in the young professional arena, you expect it. You and I will run at the door and make it through, a young professional might run at the door and hit it. If they do, they will get up and run at it again until they get through it.
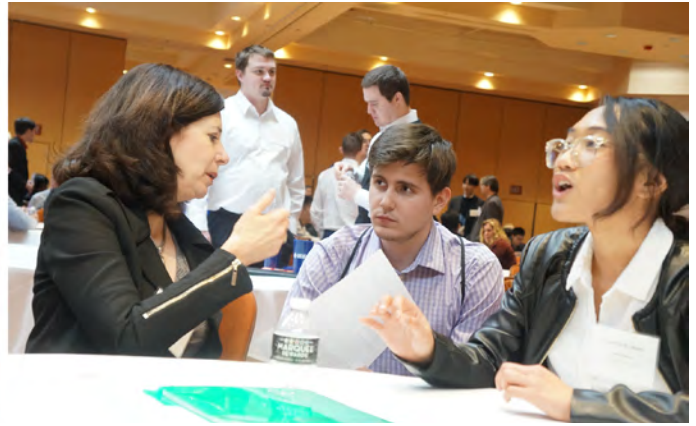
Industry executives take an active role in mentoring students throughout the conference.

As a more experienced person, sometimes, you give guidance; other times, you have to learn to shut your mouth and let the young professionals work through the challenges, which is an exciting metamorphosis. We've watched many young professionals grow considerably over the past few years. They take the leadership on very well and seriously; it's fun. We do one new thing every year. If you understand IEEE conferences, and almost any conference, you have to build a surplus in it. Last year, they built in the surplus, but forgot to include the complimentary registration fee for the speakers. If you're comping attendance, there's a cost, and you have to build that cost into your budget development process because it's going to drive ultimately what you have to charge for the registration fee. This year, they have accounted for that and are on track for a higher profit.

Johnson: There are multiple layers of opportunity to mentor, teach, and bring somebody new into something that gives them a very capable job skill, such as project management.

Andrews: Absolutely, and the little things make all the difference. There are huge screens in the big room. But if you had been here early yesterday morning, you would have seen a 12x14-foot screen in there, which is the same size as the other breakout rooms. When I walked into the room with the young professionals, they said, "Those screens are small." I responded, "Well, we made the decision to cut back because you

were saving a few hundred dollars, but you forgot the audience experience." It was an uh-oh moment, so we went back to the big screens almost immediately. Again, it's one of those teachable moments that we, as teachers and mentors, love the opportunity to be able to do. It's all about creating the opportunity to grow their leadership capabilities and aspirations.

Johnson: I used to talk to my kids about how a situation was an opportunity to fail safely. Do this to succeed, but if you fail, it's going to be safe as opposed to having it be a project that is on the profit and loss statement for your employer. That's awesome. I get the sense that some of the other IEEE Regions are studying this conference and determining how they can bring into their territory.

Andrews: Yes, because this conference has been successful; we've had to work at it, and it isn't an easy thing to do. It's like any other great conference; we have weekly meetings and teleconferences that start in February. They took a few holidays off, but we have processes that we're happy to share. This conference is repeatable and valuable. And we'll never forget the lessons learned after organizing the first conference. We had two parallel tracks with some keynote speakers, but overall, we had about 42 speakers, so it was busy. It kept us working, but we launched it, and it gave us some confidence to make it happen.

What's important now is growth. More and more attendees are figuring out ways to fund
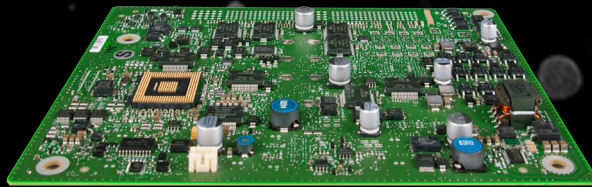
it themselves without any IEEE support. Some of them are getting small funding, such as $100 from their local section. Others are hosting fundraisers or getting funding from their schools and employers. If you were going to a conference, you would talk to your professor or employer, and they usually say, "That's a great professional development activity. We'll pick up the tab for it." We haven't gotten to the 100% level, but we're going to work at it over the upcoming year.

During the opening welcome session, Ramesh Nair pointed out that the 2019 event was the biggest Rising Stars Conference we have ever had. We had attendees from all six U.S. Regions, Canada (Region 7), and Asia-Pacific (Region 10). One of the moderators was also from Australia. Ramesh further expressed his pride in the organization and execution of the conference. He said, "I am most proud of the fact that Rising Stars is a 100% volunteer-driven conference. Everything from planning the conference to executing it is entirely done by volunteers." On the PowerPoint slide, Ramesh even had the phrase "100% volunteer-driven conference" in bold. Our volunteers sandwich in what they do with their work, which goes back to being a leader in their profession and seeking ways to do things that they wouldn't normally do.

Johnson: What's the committee's vision for getting sponsorship to help to grow the conference?

Andrews: To get corporate sponsors, we do serious outreach. Getting corporate support is critical, and to do so, you must understand what the company believes is important and what you believe to be important; if those two things match, you often find a supportive partner and sponsor. It doesn't make any difference if it's $1,000 or $10,000, support flows based on common values to the employer, company, and conference.

There are two main benefits to becoming a sponsor of Rising Stars. First, sponsors get the opportunity to touch the top talent in the country. An IEEE member is always a cut above the average professional; they've taken their career to another level that the average engineer doesn't. Second, sponsors get an opportunity to meet other decision makers. It's an opportunity for companies to get to know each other on a different level, and for young professionals to find out more about your company and what you do.

This year, I asked the companies and speakers to provide a two-minute video that highlights what their company does, what they do for a living and if there were any special projects in the works—something to warm the audience a little bit. The idea behind that was the company had the opportunity to share their story with the audience and to have it broadcast on various channels, such as social media, into the world. We also could connect the company more deeply with the attendees and the conference.
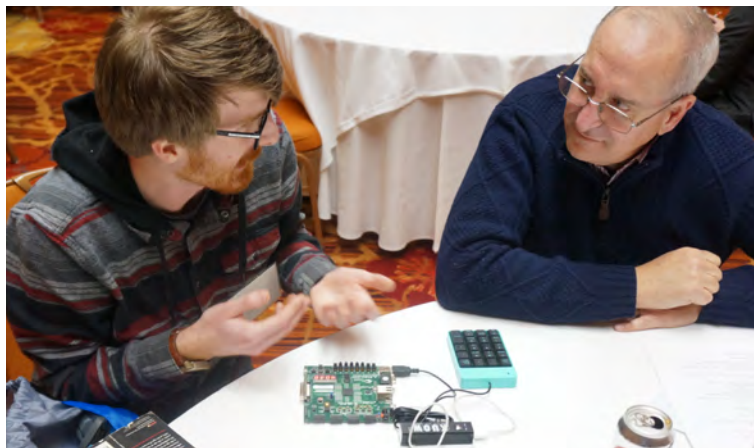
We have not really pushed corporate sponsorship, but I think next year, I would like to do that a little more intentionally. I want to say, "We have great value here and a common interest. Your company is interested in hiring and finding top, innovative talent, and the talent at the conference is seeking organizations and technology that they didn't realize existed or they may not have seen in a book." When an attendee sees the presentations about what the company has done and is planning to do, it provides exposure to forks in the road—different available opportunities and pathways.

Student hardware sometimes came out of the backpack for discussions with conference mentors.

Johnson: Every one of them has potential.

Andrews: Definitely, whether that's something the company deals with on a tactical or strategic level. Instead of dealing with the marketing or HR department, you talk with the engineering teams that understand the importance of it. As the conference evolves, I would love to see engineering departments and technical staff from various companies send their employees. The conference is an opportunity for that employee to grow professionally.

Somebody asked me a long time ago, "Why do you bother attending conferences or meetings?" The simple answer is, "I'm searching for one new idea." I don't know where it's going to come from, but is that one idea worth $500? Absolutely. It's one idea that I can put into action that gains me $5,000; I bet that you can't make money any better or faster way. The return on the investment are huge. I'm looking forward to having opportunities to chat with companies as well as the young people on our volunteer committee, such as Ramesh and others around the table, and those who are coming up and we don't know yet.

It's interesting to watch the growth in their attitudes and abilities over the course of the year. We had one very shy person who had never worked on a conference or had any level of responsibility. He not only stepped up, but I had a chance to chat with his university VP who wrote him a note. The young man didn't know why she sent him because the VP said, "I understand you're doing things with IEEE at this conference. Let us know if you need anything," which knocked his socks off. He only went up from there. If you're making that kind of an impact, whether it's working on the conference or watching a speaker excite an entire audience or young professionals feeling empowered, it's worth it.

I am involved with many other community and STEM activities ranging from the Salvation Army to the Future City Competition. Sometimes, people asked me, "Why do you do all of that?" I do it because when I go to a party or stand in front of an audience, I don't have to talk about the weather, sports, or politics; I can talk about the difference that somebody made in my life because of something that I did. What happens to you at this conference is the difference that you make. When somebody walks up to you and says, "I was excited to hear you speak and to have a chance to sit next to you and talk to you because I didn't realize..." fill in the blank. Then, it all matters. It's all about making an impact.

Johnson: That's what it's all about. I've certainly been excited to be here.

Andrews: And you're always welcome.

Johnson: Thank you. SMT007

These Darn Kids/Back in My Day

Quest for Reliability
Feature Column by Eric Camden, FORESITE INC.

This month's topic is focused on youth, both in terms of humans and technologies. I think these two topics go together since they rely on each other to a large degree. The latter has more than likely shaped or even invented by the former. Regarding reliability and what we have seen here in the failure analysis lab, youth in the industry have played a large role.

In the all too well-known story, company X employs several people that make a nice salary, and everything is going well, but when dollars become scarce, they begin to look where they can save some money to get out of the red and back in the black. One way to do this is to look at the employees making the highest salaries and determine if they can live without that position or hire a younger person with a comparable education to plug in that slot. This can be done in many cases, but that is only on face value.

We've seen many times that when you save the salary number, you end up losing more than that in lost experience and tribal knowl-edge. Tribal knowledge is as important if not more than any formal education can possibly give you. This type of knowledge is based on years and years of hands-on experience with the exact equipment being used to build a specific assembly, or other product, which is irreplaceable.

For instance, we work with many major CMs around the world, and we see that we end up working with a lot of the same companies within the same divisions but with different engineers. We will work with engineer A on a specific problem, and a few years later, we are working on the exact same issues because the higher salaried engineer was cut to save a few bucks, and when they left, they took all of that experience with them.

If engineer A knew about a specific tweak to a piece of equipment when the results were less than anticipated, the new engineer had no idea where to look for this information because most tribal knowledge isn't printed in an oper-ator's manual or reference guide. This is espe-

cially true when using older equipment that has developed its own personality over time; and when I say personality, I mean like your old TV with rabbit ears that you had to smack on the side like you were The Fonz to get it working again. Since this month's topic is the youth in the industry, I will ask the younger readers to use their Google machines and look up rabbit ears and The Fonz.

Now, the new engineer will go through their own learning curve to see what tribal knowledge was missing from their education. It will take time to learn this information. And while the education is in process, there is a real risk of producing product that is questionable in terms of reliability.

Having said all that, emerging technologies can help overcome the loss of tribal knowledge. Saying the words "emerging technologies" in the electronics industry is painting with a very broad brush, but in relation to reliability, I am looking at new equipment and material technology. New factory initiatives, such as CFX, that connect machines to the business are proving to be invaluable at reducing time to market and lowering cost in some instances by streamlining processes.

Newer monitoring systems on assembly equipment that can email or text a quality group when something is going out of tolerance is a big leg up on needing the experience to see when things are going awry. Wash chemistry companies have new technology that will monitor the percentage of saponifier in a wash tank and inject the right amount to bring it back up to the proper percentage. This is one of the most important parameters of a wash process because if you are running your wash at a lower concentration, the overall cleanliness will be impacted and increase the risk of electrical leakage or electrochemical migration. Newer monitoring systems certainly won't solve every issue that can lead to a quarantine situation, but they certainly help reduce the risk.

Emerging technologies in testing and analysis are also a key component when it comes to reliability. There have been many changes in the approach to cleanliness that include rejecting "the way we've always done it." In its place, the industry is accepting that we need to look at better ways to determine how clean is clean enough based on the products being built today with far more advanced and miniaturized component technology.
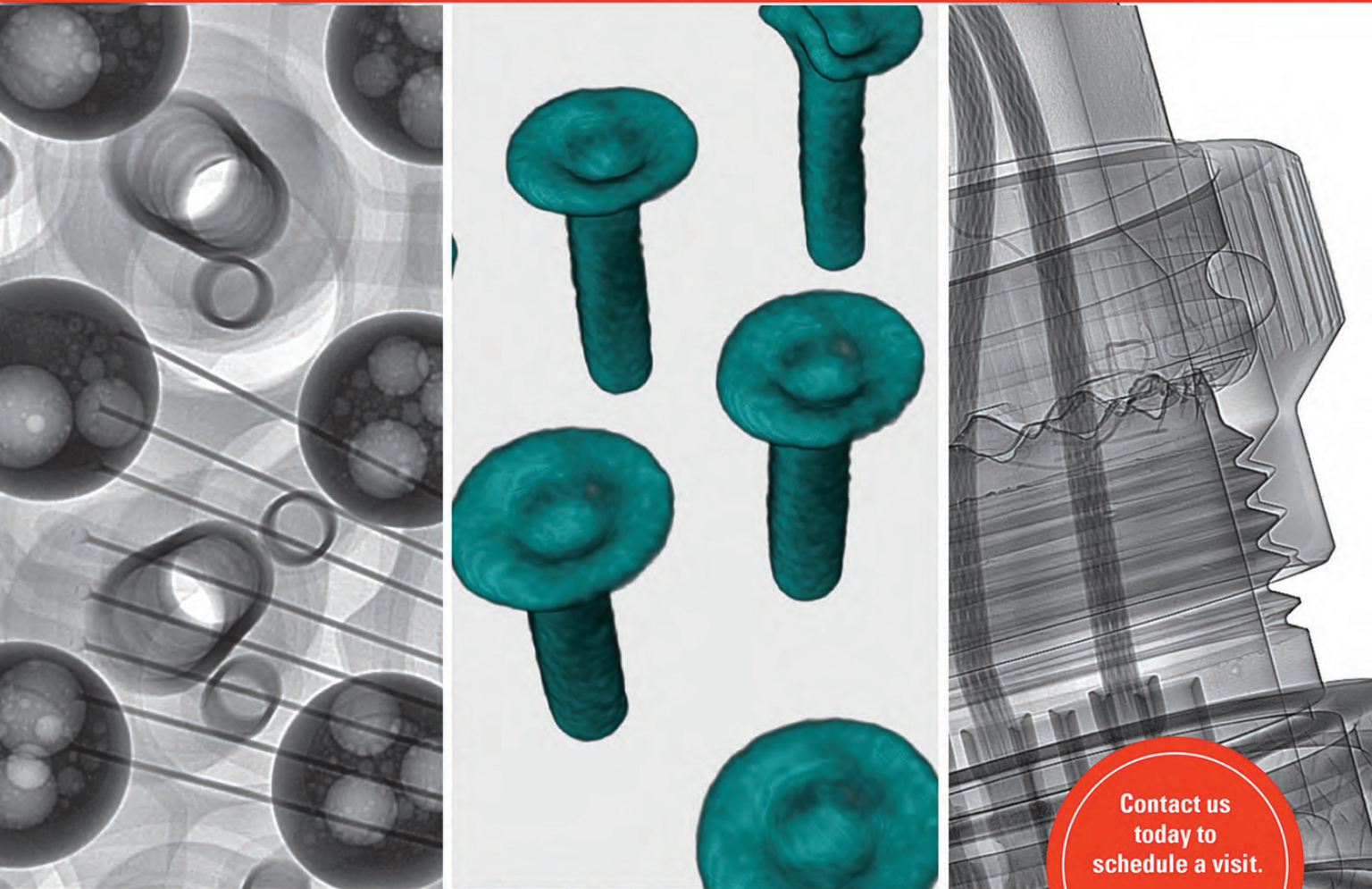
One company has introduced a real-time SIR tester that uses test coupons built with the final assembly material set to give you an indication of the effect elevated heat and humidity will have on your product. Shameless plug alert, there is also a real-time extraction tool that can measure the conductivity of residue at a specific location. Being able to separate unique soldering processes is important when troubleshooting or monitoring an assembly process. Tests like these allow the CM to see if the way they are processing the materials is acceptable or if the process needs to be optimized. Also, these tests are most often done off-site and can take a couple of weeks to complete and see the results. Being able to immediately react and adjust assembly parameters will become more commonplace over time, but for now, it is more of a sign of commitment to reliability as part of an overall philosophy of cleanliness. This approach will definitely make your company more attractive to prospective customers.

Young people coming into the industry will bring a different approach to manufacturing than engineer A did, and that is a good thing. It's like watching the differences between any average middle school child using a computer today and myself using one in 1995. That middle school student has been raised with new technology, and it's largely second nature to them. Youth in the industry and emerging technologies won't change the fact we need that tribal knowledge, but from where I sit, it will shorten that learning curve and increase reliability. And Fonzie thinks that is perfectamundo. **SMT007**

Eric Camden is a lead investigator at Foresite Inc. To read past columns or contact Camden, click here.

Rising Stars at Rising Stars

Feature Interviews by Nolan Johnson
I-CONNECT007

Elsewhere in this issue, we've discussed the IEEE Rising Stars Conference, its origins, and the scheduled training and events. One key takeaway was the pace of the event: fast, high-energy, and whirling—just as you'd expect from young people somewhere in the transition from teenager to adult. If their individual excitement about attending was like a photon of light energy, then over the course of the weekend, those photons aligned and collimated just as they would inside a laser chamber, resulting in a unified power and energy in the conference as everyone fell into phase with each other.

That's what ended up happening with an ad hoc panel interview I put together toward the end of the event. I had intended to sit down at a table in the main ballroom with seven students to hear their perspectives on Rising Stars, but that isn't exactly how it played out.

Nolan Johnson: I'm here at the IEEE Rising Stars Conference, sitting around a table with a group of attendees to get some feedback on their experiences. First, could you each tell me where you go to school and what you're studying, and if you're not in school, what you're doing?

Justus Engstrom: I go to the New Mexico Institute of Mining and Technology, and I'm studying electrical engineering.

Joe Sandoval: I study electrical engineering at California Polytechnic State University in San Luis Obispo, California.

Anthony Salazar: I go to New Mexico Tech and am studying electrical engineering.

Eric Bressinger: I'm studying electrical engineering and music at Santa Clara University.

Stone Wilkes: I'm also at New Mexico Tech studying electrical engineering.

Simon Gebrai: I'm studying electrical engineering at Santa Clara University.

Gregorio Valdivia: I'm actually a young professional. I'm a technical specialist with the Federal Emergency Management Agency, which is a public assistance division.

Nolan: How did you find out about Rising Stars, and what were your objectives when you came to this conference?

Justus: I heard about this through our local professional IEEE chapter when they recom-

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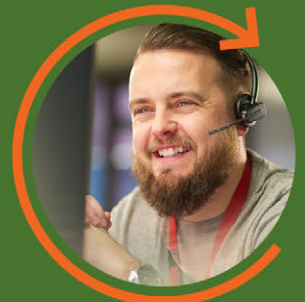
mended it to us. My goal is personal and professional development through networking workshops and other educational materials.

Anthony: I heard about this through our IEEE chapter too. Some seniors had gone to this conference, and I thought it would be a cool one to attend. I'm really hoping to get networking connections from people in the industry that I could talk to later in life.

Eric: I heard about this through my school's IEEE chapter, and I came to learn about emerging technologies.

Stone: I learned about Rising Stars through my local IEEE Chapter, and I came here for networking, professional development, and staying up to date with new technologies.

Simon: I learned about it through the IEEE president at my local chapter.

Gregorio: My objective is to find a third speaker for a committee event…

Justus Engstrom

Eric Bressinger

Stone Wilkes

Unfortunately, this is as far as we got with the conversation before another activity was announced and the group politely scattered. Gregorio, the young professional now working for the U.S. government, was unable to finish his thought. While I had been hoping for more details on their individual experiences, it was very clear that each one of these students was fully immersed in the conference agenda. They all had other things to learn and master— no time for a reporter!

However, the group did come back together for a short while, and we talked as much as time allowed.

As we regrouped, I had Anthony, Stone, Simon, and Gregorio in the conversation.

Nolan: Picking up where we left off, did you achieve your objective here this weekend? And what's something that you're going to take immediately back to implement at your school or workplace?

Anthony: I definitely achieved what I wanted to do. I was looking for networking contacts and people to talk to, and it was amazing to meet all of the people here. I talked to someone named Lorenzo, and he gave me his contact information. He said even if it wasn't immediate, I could still contact him in two or three years when I'm ready to get into radar engineering, which is what I was looking for; I hope that will come to fruition in the future and help me out. I also want to bring back a lot of the knowledge I gained from the workshops. They had radar and 5G people to talk with, which is something that we don't necessarily talk about at my school; I think that's something I can translate to other students that weren't able to make it to this conference.

Stone: I achieved my objective this weekend too. I learned a lot about new technologies that I can continue to research. In the future, I can explore these technologies when I look into various companies where I might want to work at or different research opportunities for academics.

Simon: I would say I achieved my goal, which was trying to learn from the workshops and find a few networking opportunities as well. I learned a lot from the resume workshop and learned some interview tips, which I think I'm going to use very soon.

Nolan: And what can you take back to campus right away?

Simon: We networked with one of the blockchain presenters. From that, we're going to set up a blockchain night at our school and have a speaker from one of the panels come to the campus in Santa Clara to do a presentation with IEEE, so that's what we're going to take back.

Nolan: Awesome. How about you, Gregorio? You were interrupted last time.

Gregorio: My goal was to find a speaker. Our group is a local committee for metropolitan Los Angeles. We submitted a proposal for two speakers; I was trying to find a third speaker, and I did, so I was also able to make contacts. I'm also trying to grow my professional network.

Simon Gebrai

Gregorio Valdivia

To wrap-up, I asked three questions. First, I asked who would recommend Rising Stars to other students and young professionals? Everybody raised their hands. Second, when I asked who was coming back next year, nearly the whole group planned on it. Third, when I asked if it was worth their time, it was a resounding, "Yes."

As this conversation ended, I had an opportunity to have a similar conversation with two other attending students, Steven Lukow and Shane Heau.

Nolan: First, can you tell me your names and what you're studying in school?

Steven Lukow: I'm a senior studying electrical engineering at New Mexico Tech.

Shane Heau: I'm a freshman at New Mexico Tech, and my major is technical communications.

Nolan: What objectives did you wanted to accomplish coming to this conference?

Steven: My main objective was to learn better team-building skills. This year, we're doing our senior design project, and I'm the project manager. I wanted to learn about any skills, tips, or tricks about how to better manage a team, bring in new perspectives, and make sure we get the project done better and finish on time.

Nolan: And do you feel like you achieved that?

Steven: I did. There were a lot of seminars here on topics. Personally, I'd probably be more interested in neural network development and that sort of thing, but the team-building sessions were even better for my specific goal to learn those skills, so I definitely got that.

Nolan: What can you take back to campus right away?

Steven: One thing that was mentioned involved the stages of team building: forming, storming, norming, and performing. I feel like we're kind of at the norming stage, but I really want to push us into the performing stage to get a lot of good results from our group.

Nolan: How about you, Shane?

Shane: For my major, we have to have a depth of stuff on top of just technical communications, and I'm interested in the electrical engineering field. But I also wanted to see what was out there—some of the possibilities—learn how to be a team leader in the future. I feel like I achieved that through the talks that I attended; one was on safety and low radar in microwaves, which was very interesting. I have an interest in earth science, so that was neat for me.

Steven Lukow and Shane Heau.

Nolan: Shane, you've just attended this conference and learned some skills. Now, you have three-and-a-half years in front of you at school to apply this. What's the first thing you're going to apply?

Shane: I'll probably explore what New Mexico Tech has to offer regarding classes, labs, and research projects. I want to see what technical experiences professors might have to offer.

Nolan: So, attending Rising Stars helped you understand how to get a more crystallized view of what to do as you pursue your degree.

Shane: Yes.

—◄●►—

Steven and Shane both reported that they plan to attend the conference again. These two brought some interesting perspectives because it showed that young attendees don't need to be a senior or above to find value in educational programs and conferences. In addition, Steven's concentration on soft skills, such as leadership, was just another example that learning professional soft skills was a common theme.

As afternoon turned to evening, I was able to continue the discussion one-on-one with Joe Sandoval from the original interview group. Joe was attending Rising Stars for the first time as a Cal Poly student. The program was slowing down as the dinner buffet was being set up, which allowed us to complete our conversation more thoughtfully. It's no surprise that soft skills popped up as a topic of conversation here too.

Nolan: What were you looking to take away from this conference?

Joe: At my student branch, what we often have a hard time conveying to our members is the benefit of being a member of a large organization like IEEE. So, I was looking to get an idea of exactly what being a member of the national branch had to offer. And, boy, did I find it!

Nolan: Fantastic. What are some of the things that will leave you better prepared or more knowledgeable than you were before?

Joe: For one, something that we've always told our members but I've never really had experience with is the kind and number of connections you can make here. For example, I talked with Iris Bombelyn from Golden Seeds. Not only is she working with one of the startups at Cal Poly, but she also has a valuable breadth of experience she has gathered from working

Iris Bombelyn, conference speaker and mentor, consults with a student attendee during one of the many workshops throughout the weekend.

in the aerospace industry and with defense contractors, which are areas I've been trying to look into for quite some time.

I was able to ask Iris a lot of questions about leadership and the industry. During her talk, "Failure to Succeed," I also asked her how to handle problems with leadership while working with teams on big projects. I can take the information I gained from those interactions back

Joe Sandoval

to the student branch. Now, when I members are thinking about whether or not to renew their membership, I can say "With an IEEE membership, you gain access to these kinds of industry professionals."

Also, there are all of these sections and sides of IEEE. We have a couple of branch sections at Cal Poly. But since I've been here, I've talked to Cal Poly members from five or six different societies that I hadn't even heard of TEMS, for instance, dedicated to management at IEEE.

Nolan: What's one thing from this conference that will be immediately applicable for you when you go back to campus?

Joe: I'm a member of the student government at my university. When I go back, I'll represent a whole bunch of students—about 6,000 students from Cal Poly's College of Engineering. I'll be able to take back what I learned in my conversation with Iris, for instance, as well as some of the conversations I had during breakout meetings. For example, there was a talk on ethics in large organizations. After listening to the speaker, I'm better able to take that and practice it in my role in student government. Now, as far as my student branch goes, I can go back and tell the other members what it's like to be at a conference, which is a major benefit for electrical engineering.

In addition, I can share that there are numerous students at IEEE from different universities who also want to connect. We've been working on building bigger, stronger relationships with the University of California, San Diego, for instance. There's even the potential to collaborate with other IEEE members, such as putting together a hackathon.

Nolan: That's a great idea. You're touching on the realization that when the IEEE talks about this as your tribe, and your tribe is much larger than your school; it's national and international.

Joe: Exactly.

With that, Joe was off to participate in the rest of the program. As the conference wound down and moved into the Sunday morning panel discussion on "The Next Big Thing," and the group photo, it was very clear that the students and the industry leaders alike had made connections and started professional relationships that everyone could leverage in the future. After talking to the IEEE Rising Stars Conference Founder Michael Andrews about the vision and mission for this event, this all means that the 2019 edition of the conference achieved its key objectives. **SMT007**

Dan Schweiker presents on driving decisions through relational and rule-based ethics.

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The human body is an extremely complex "electrical (neurological) system", with companies continuing their quest to understand and improve capability as related to neural interface, basically connecting the human body directly into computers! There is no question, capabilities in smart phone/watch technologies connected to the internet erases any doubt of the potential to connect people to computers.

With the brain being the human equivalent of the "MicroProcessor", semiconductor companies such as IBM, Intel, MicroChip and MicroSemi have been well aware of potential for connectivity. Others have taken knowledge of neural interface to help humans manage their internal electrical systems, including Medtronic, Philips and Abbott, with a range of pacemakers, defibrillators and neural therapies.

Expanding the potential scope of linking the brain to computers and to the internet has attracted the likes of Amazon, Apple, Facebook, Google, MicroSoft, Neuralink and others, adding to the list that already includes J&J, G.E., T.I., Stryker, and Edwards. MicroProcessors and other ASIC Chips, coupled with MEMS and Sensors, are now seen as the "next-big-thing" over the next 5 years looking at the Internet-of-Things (IoT).

This event will bring together experts to cover topics such as:

- Forecasting and Analytics
- MEMS, Sensors and Integrated Circuits
- Implantable Devices and Neural Interface
- Medical Robotics, Equipment, and Prosthetics
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BAE Systems has upgraded its EW systems for the global fleet of fifth-generation F-35 Lightning II fighter aircraft.

Benchmark Electronics Appoints Jeff Benck as President and CEO ▶

Benchmark Electronics Inc.'s board of directors has appointed Jeff Benck as president and CEO.

ANU Research Set to Shake-up Space Missions ▶

A new study from the Australian National University (ANU) has found a number of 2D materials that can not only withstand being sent into space but could potentially thrive in the harsh conditions.

RTW IPC APEX EXPO 2019: Five-year Standard Committee Collaboration on JS-001 ▶

David Hillman from Collins Aerospace and IPC's Teresa Rowe speak with Editor Dan Feinberg about how a seemingly simple question resulted in years of committee work to develop the JS-001 standard on the use of conformal coatings and avoiding tin whiskers.

High-powered Fuel Cell Boosts Electric-powered Submersibles, Drones ▶

A team of engineers in the McKelvey School of Engineering at Washington University in St. Louis has developed a high-power fuel cell that could power a variety of transportation modes—including unmanned underwater vehicles, drones and eventually electric aircraft—at a significantly lower cost.

NASA Looks to the Future, Seeks Next Level Visionary Aerospace Concepts ▶

NASA is looking for trailblazing ideas that could one day change what's possible in space. The NASA Innovative Advanced Concepts (NIAC) program is seeking Phase II proposals for the continuation of Phase I research studies.

Zentech Hosts UMBC Advanced Manufacturing Graduates ▶

Zentech Manufacturing recently hosted twenty-four graduating seniors from the University of Maryland Baltimore Campus (UMBC) at its Baltimore headquarters location.

Collins Elbit Vision Systems Marks F-35 Helmet Mounted Display System Delivery Milestone ▶

Collins Elbit Vision Systems (CEVS) recently celebrated the 1,000th delivery milestone of the F-35 Helmet Mounted Display (HMD) System.

2020 Army Budget Begins 'Dramatic Shift' ▶

An Army budget drill that identified $30 billion in savings was partly about finding money for future modernization, according to Undersecretary of the Army Ryan D. McCarthy during a breakfast hosted by the Association of the U.S. Army's Institute of Land Warfare.

Cicor Strengthens Testing Capabilities at Radeberg Facility ▶

In January 2019, the Cicor site in Radeberg acquired a new pull and shear tester for mechanical testing of the strength of electronic packaging superstructures.

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NIST/Matt Turpin interview

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A Young Engineer's
Perspective

Feature Interview by Barry Matties
I-CONNECT007

At the recent FLEX Tech show, I spoke with Jeffrey Diament, a recent Princeton University graduate and an engineering associate from sensor manufacturer Instrumems, about the company's nanowire sensing platform that can measure velocity, temperature, and humidity. Since this is Jeffrey's first career job out of college, he discussed his experience on the hardware and manufacturing side of things and offers advice to other young professionals.

Barry Matties: First, can you tell us a little bit about your company?

Jeffrey Diament: Instrumems was born out of revolutionary nanowire technology that was originally invented in Princeton University. The nanowires were first used to study very high Reynolds-number turbulence in a way that no other sensors could; they were invented to be the state-of-the-art, highest performance velocity and temperature sensors. Along the way, we discovered that they had some other measurement capabilities, such as measuring humidity, detecting bubbles in microfluidic flows, and even measuring underwater acoustic waves for use in sonar systems. Instrumems was founded to commercialize all aspects of this nanowire technology.

Matties: How long has Instrumems been in existence?

Diament: We raised seed money about two years ago, so we're still pretty young.

Matties: How many people are in your company?

Diament: We're made up of a combination of full-time employees and contractors, including three core full-timers and 10 employees overall.

Matties: And what's your position?

Diament: I split my time between mechanical engineering and business development work.

Jeffrey Diament

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Matties: You're at the FLEX Tech show for your business development strategy. Can you talk about that?

Diament: The core of the technology is nanowire sensing capability. As I mentioned, we are discovering more and more capabilities of it as we go along. One of the things we're trying to do is narrow down our market space. Being a sensors company, we have the advantage and disadvantage of having a broad range of applications, including anything from aerospace to natural gas, microfluidics, and e-cigarettes; systems in all of these sectors can use our sensors. Right now, we're in the stage of finding what the most profitable ventures for us to pursue and develop specific solutions for are; once we hone in on those market segments, we're going to focus our efforts there in the coming years.

Matties: Profit is one measure. What markets are you most interested in with profit aside?

Diament: For us, high-volume markets are attractive. One of the ways we see our sensor being useful is as a cheap, high-performance sensor—the MEMS production process we've pioneered allows it to be produced in high volume at a low cost to bring high-fidelity fluid sensing to a variety of markets.

Matties: What type of fluids? Is it any particular fluids?

Diament: Our sensors were originally invented to work in airflow specifically, but we've extended our capabilities to most non-corrosive gases as well as liquids. Sensor performance in different fluids is an active area of R&D right now. We're seeing a lot of promising results, especially in microfluidics where the small scale necessitates a very low-footprint sensor, such as our nanowires.

Matties: You mentioned vaping is a big market too?

Diament: It's a large, growing market. It's also an ideal application for our nanowires because the device is highly dependent on the sensor. The e-cigarette/vape needs to be able to accurately measure the strength of the user's inhale to deliver the correct amount of power to the heater and create the most satisfying user experience.

Matties: More isn't always better.

Diament: Exactly.

Matties: Have you encountered any opportunities while being here?

Diament: Yes, there have been a few interesting opportunities I've run into. One involved a MEMS fabricator located in the Netherlands, which is currently producing organ-on-a-chip products. The company has flow sensors embedded into this module, but they're not meeting the required accuracy specifications. That's somewhere we can see our nanowires adding value—on-chip integration of our nanowire flow sensors to bring more accurate sensing to these organ-on-a-chip modules.

Instrumems sensors are small enough to be used in a wide variety of new applications.

Matties: Why did you choose to work for Instrumems?

Diament: The opportunity arose when I was finishing my undergraduate senior thesis. I worked with nanowire flow sensors to integrate them on a small UAV for real-time control in windy environments, so I had a history of working with the technology. The professor who served as my advisor is one of the co-founders of Instrumems, and he presented the opportunity to me. It was an attractive offer because although I was looking at bigger, more established aerospace companies, I didn't want to feel like I was getting boxed in. Even if I had some upward mobility within one of these giant companies, it still wasn't as much my vibe to work for a larger corporation.

I like the small size of Instrumems because I get to do both technical work, such as running tests in our makeshift wind tunnel, and I also get to come to conferences like these to network with people. It's really dynamic, and I feel a lot of personal meaning in the work that I'm doing because I can immediately see the impact it has on the company; it doesn't get lost in the machinery of a larger corporation.

Matties: And this is your first career job coming out of college?

Diament: Exactly. I've done internships before, but this is the first full-time position.

Matties: Do you expect to be with this company for years to come?

Diament: Hopefully. That's one of the advantages of getting in at the ground floor is being able to grow with the company.

Matties: How is the company performing so far? Has it met the expectations or goals?

Diament: We're quickly meeting the early technical milestones that we set out for ourselves. Obviously, we still have work to do because there is still a gap that needs to be filled

A closer look at the construction of the Instrumems sensor assembly.

between university sensors and commercial sensors, but we're making strong progress.

Matties: As we look around this room, you might be the youngest person here, which is one of the topics that we talk about often in our industry.

Diament: I've noticed that.

Matties: Tell me about that experience because others must see the world differently than you. What do you run into?

Diament: For me, it has actually been kind of nice. It's almost liberating in a way being so young because I feel like everyone sees me as a naïve kid fresh out of college who doesn't know much. And that gives me the freedom to ask a bunch of questions and learn from people who are much more experienced than me.

Matties: They may see some of that, but I would also say that they are glad to see it. Because when you look around, you're one of the few young people here, but you're in a room full of manufacturing, which isn't necessarily a glamorous job in the world right now. That's why
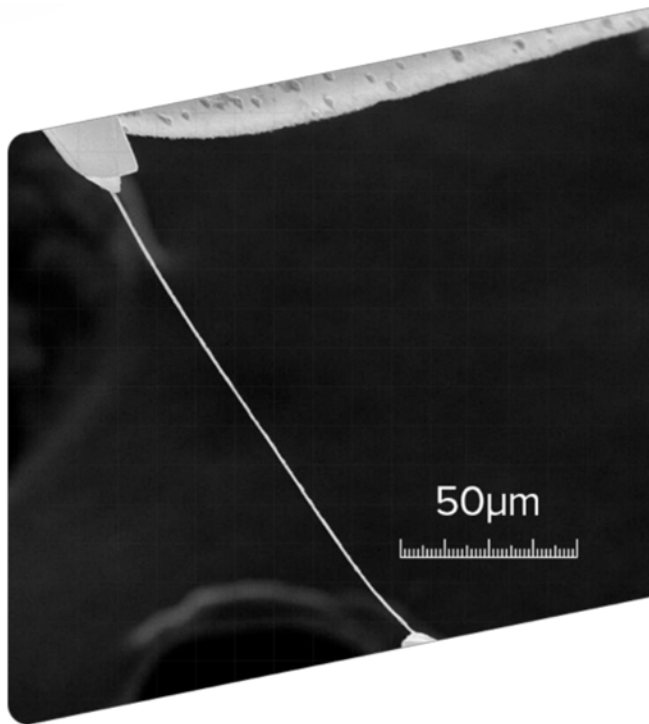
Close-up detail of the nanowire in the Instrumems sensor.

I was curious about your career path and why you're here.

Diament: I see Instrumems as a way to access a whole range of different technologies. What makes being at a sensor company exciting is that I can get my hands in a bunch of different exciting fields.

Matties: You're not being limited to old people (laughs).

Diament: (Laughing) I didn't say that but…

Matties: You can go where they are smoking vapes.

Diament: (Laughing) Nah, that definitely isn't where I like to go.

Matties: Well, this is great that you're out doing this. What advice would you give to other young people in the industry?

Diament: I'd say Instrumems is an exciting place to work in terms of hardware. A lot of my peers tended more toward the software path, which can seem to be more glamorous at this stage, but I think hardware is a cool place to be. I like having a tangible product that I can see, work with, and develop through to completion. I would say don't "dis" hardware because it can also be exciting.

Matties: Indeed. When you looked at your career, what or who influenced you the most?

Diament: I've had a series of mentors, and the most influential has been this professor who helped co-found Instrumems and served as my advisor for my senior thesis. He taught me a lot of lessons about fluid mechanics but also larger life lessons about how to work hard but still enjoy things. Another major reason I took this job was that it was on the West Coast and I am a big surfer. I've been dying to get to the Santa Cruz waves my whole life, so this has been a great avenue to do that as well.

Matties: Is there anything that we haven't talked about that you'd like to share with the industry?

Diament: I think getting our message out there that this nanowire technology is a huge platform, and we see it as analogous to how piezo materials came onto the market a few decades ago. At first, piezo materials were simply substances that stretched and compressed; now, they are used as a whole range of sensors and can infer a whole breadth of measurement quantities, and that's how we see our nanowire technology. It started with measuring air velocity, and we realized it could do temperature, humidity, and liquid flows. We anticipate uncovering a bunch of other applications during the later stages of our development process.

Matties: As the manufacturing environment changes around the world to smart factories and Industry 4.0, sensors become the foundation. Without sensors, you don't have the data. With your sensor, I would think that there are opportunities everywhere you look for tech-
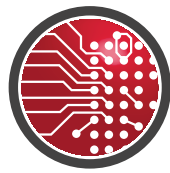
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nology in manufacturing. What about managing the software side of it? When you capture the data, are you capturing in your software or is that going into a third-party?

Diament: We've explored different possibilities based on the end application. For more consumer-grade products, we often see that the manufacturer is interested in doing the processing on their own microprocessor. So, we'll just provide them with the front-end drive circuitry and the condition signal from our sensor. Other times, we do the post-processing onboard our microprocessor.

One interesting opportunity that we've come across is because our sensors are so fast, they produce a huge amount of data that can be leveraged effectively as input to machine-learning algorithms. An interesting application we came across is using the sensors for security in homes and buildings. Because they're so sensitive to low airflows, you can almost recognize unique airflow profiles of either a door opening or a person passing by; thus, you could use these sensors as a visual alternative to see the moving world through airflow profiles.

Matties: That's very cool; sounds like spy stuff.

Diament: Yes, sir!

Matties: Since many companies are trying to become 4.0, there's a lot of legacy equipment in the marketplace that is not equipped with all of these sensors. In this industry, it's a lot of wet processing equipment with fluids, chemicals, acids, etc. Is there an opportunity for you to work with an OEM and come up with a retrofit kit that they could then sell?

Diament: That's one of the advantages of our current stage is being small enough to work with OEMs and develop application-specific solutions versus a larger, more established sensor company that provides standardized off-the-shelf components, which can be hard to integrate. At Instrumems, we all come from strong fluid mechanic backgrounds, so we like to get to know the application and figure out ways to smartly package our sensors not to obstruct flow; we want to get the most accurate measurements possible.

Matties: Thanks so much for spending time with us today, Jeffrey.

Diament: Of course. Thank you. **SMT007**

Top 20 List of European-owned EMS Providers

Rank	Company	Country
1	Zollner	Germany
2	Asteelfash	France
3	VIDEOTON	Hungary
4	Enics	Switzerland
5	Scanfil	Finland
6	Neways	Netherlands
7	ALL CIRCUITS	France
8	éolane	France
9	GPV*	Denmark
10	LACROIX Electronics	France
11	Kitron*	Norway
12	Fideltronik	Poland
13	BMK Group	Germany
14	Melecs	Austria
15	TQ-Group	Germany
16	Elemaster*	Italy
17	TT Electronics*	United Kingdom
18	HANZA*	Sweden
19	Leesys	Germany
20	Cicor	Switzerland

The German Zollner Group remained the leading European EMS provider based on global revenues with estimated sales of €1.25 billion in 2017, according to the Reed Electronics Research. Meanwhile, despite lower sales from its European operations, primarily in Germany, Asteelflash remained second with the Hungarian company Videoton, third.

The top five all reported revenues over Euro 500 million in 2017 with the Dutch company Neways becoming the sixth European company to achieve this in 2018.

Acquisitions continue to have an impact on the ranking. The most notable in 2018 was the acquisition of of Swiss company CCS Holdings by GPV. As a result, the Danish company has moved into the Top 10 with pro-forma revenues in 2017 of €344 million.

Kitron, Elemaster, TT Electronics, and HANZA have also completed targeted acquisitions in 2018/2019, and it is expected that further acquisitions will take place over the next two to three years as companies look to strengthen their operations in both Europe and globally. (Source: Reed Electronics Research)
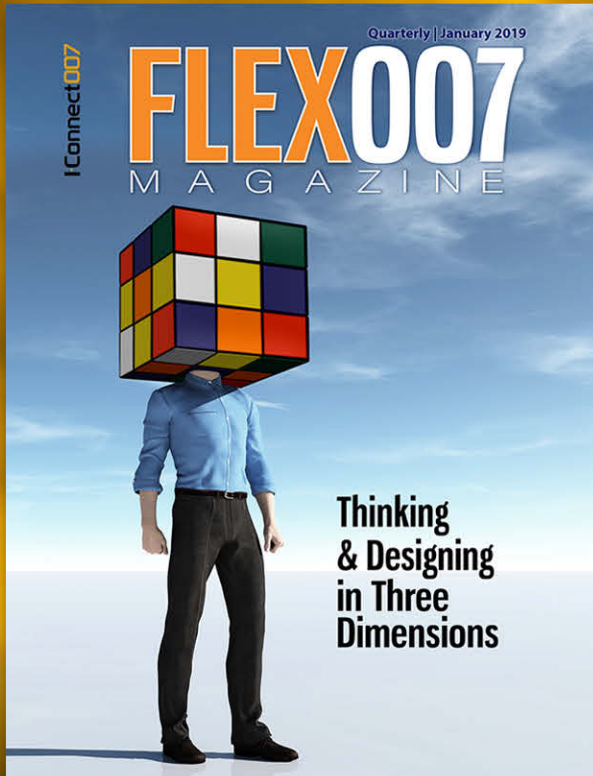
Supplier Highlights

Aculon on Technology Developments and Partnership with Henkel ▶

Aculon CEO Edward Hughes and Pete Starkey discuss surface modification technologies based on nanochemistry. Of particular interest to electronics technologists are recent developments in waterproofing treatments for assemblies, and how Aculon's strategic partnership with Henkel opens up new opportunities.

IPC's John Mitchell: Electronics Industry Backs USMCA Coalition ▶

Representing the views of more than 2,500 U.S. companies engaged in the global electronics industry, and their nearly one million workers, IPC—Association Connecting Electronics Industries, is joining the new USMCA Coalition, which is being launched in Washington by the U.S. Chamber of Commerce.

MIRTEC Discusses Automation, CFX, and Sales Success ▶

MIRTEC President Brian D'Amico speaks with Dan Beaulieu about automation, the Connected Factory Exchange (CFX) standard, and their banner year last year. He speaks about Industry 4.0, automating the inspection process, and collecting more data to help refine the manufacturing process.

iNEMI on Next-generation Soldering ▶

Grace O'Malley, VP of technical operations at iNEMI, and Nolan Johnson discuss the next-generation soldering buzz session workshop hosted by iNEMI at IPC APEX EXPO 2019 and the upcoming bi-annual technology roadmap that will be released this spring.

Thermaltronics Discusses New Soldering Robot ▶

Michael Gouldsmith, director of Thermaltronics, speaks with Dan Feinberg about their new TMT-9800S robotic soldering unit, and about an inline robotic soldering system—the next stage of their product development—scheduled to be released in the middle of the year.

Indium Launches Die-Level Bonding Solder Composite ▶

Indium Corp. has launched InFORMS ESM02, a reinforced matrixed solder composite specifically designed to produce consistent bondline thickness for die-level attach applications.

Zero Defects International Relocates to Larger Facility ▶

Zero Defects International is moving to a new location with greater space to handle additional products and services. This facility is also in Silicon Valley and is near the current site on O'Toole Way in San Jose.

ASMPT Achieved Record Year in 2018 ▶

In 2018, ASMPT's SMT Solutions Segment did exceptionally well, achieving new records in billing, booking and segment profit consecutively for the past two years. Revenue grew by 19.1% to $1.03 billion, contributing 41.1% to the group's revenue.

Advanced 3D Solder Paste Inspection Technology ▶

Olivier Pirou, managing director of Vi TECHNOLOGY, provides Joe Fjelstad with an overview of their advanced 3D solder paste inspection technology, featuring the ability to make corrections in real time. And he talks about their efforts in strengthening their inspection systems.

Craig Reiselt

Octane Open Concept Solution: Innovative Analytics and Floor-control Software

Interview by Nolan Johnson
I-CONNECT007

I met Craig Reiselt, CEO of Octane Open Concept, on the show floor at IPC APEX EXPO 2019. Octane Open Concept targets the contract manufacturer and is well along in the development process for a pair of software tools designed to optimize assembly and testing results tracking on the manufacturing floor. These tools use real-time data collection from an MES or local testers and displays pictorial representations of failures, interestingly enough. While not necessarily taking advantage of all that Industry 4.0 has to offer yet, Octane's products illustrate the type of innovative solutions that are possible when merging enterprise-wide data, machine-to-machine communications, and artificial intelligence. In this conversation captured after the show, Craig and I discuss the company and the products and opportunities in front of Octane.

Nolan Johnson: Can you tell us about your company Octane Open Concept?

Craig Reiselt: I am the CEO and founder, and I also have a small part in sales; the rest of the team takes care of all of the technical aspects of the company. Octane Open Concept was an idea that started from a personal need for my other job as a director at a contract manufacturer. We needed some tools to enhance our productivity, and that's how this came about—strictly to enhance what I was doing at Dynalab.
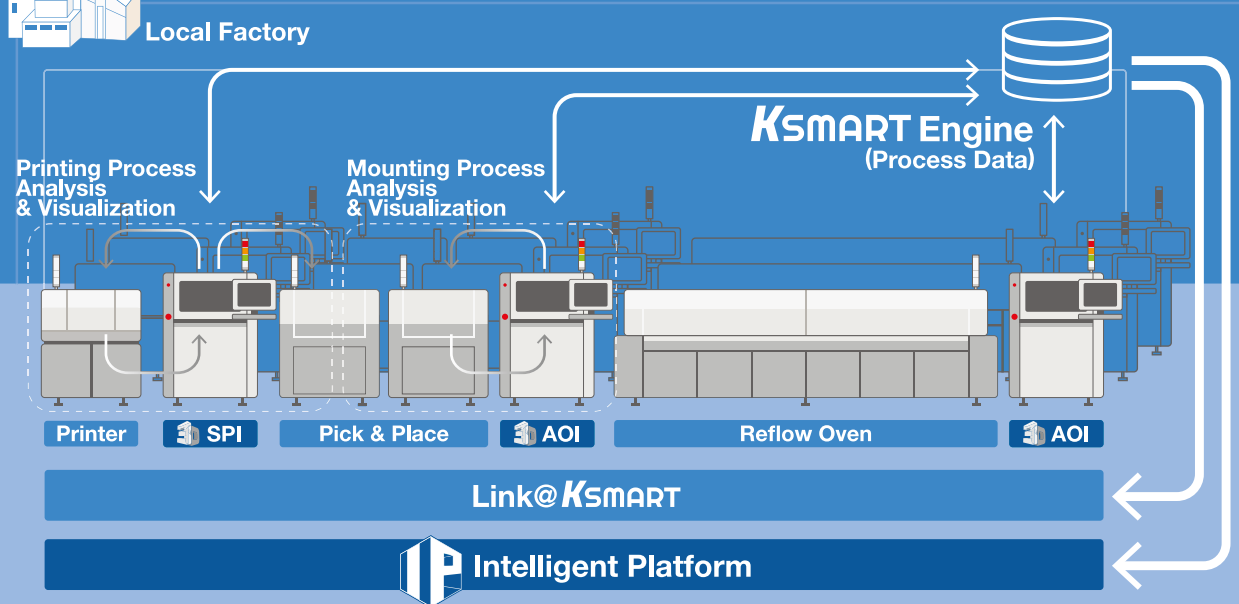
Johnson: Are there a lot of on-the-job challenges?

Reiselt: Yes. And as this started to evolve and other people and peers from other companies saw it, they were quickly interested in wanting to have it for themselves, so I thought, "Why not make retirement come a little closer if that's possible, or a lot further away if we don't succeed—whichever the case may be?"

Johnson: You had to take the risk.

Reiselt: Absolutely.

Johnson: Octane Open Concept delivers on what sort of vision and mission for the industry?

Reiselt: We're bridging the gap for the MES segment of the industry. So, the original concept behind Octane was a product called Heatwave. What we did was simplify the process of fighting through hours and hours of data that is typically end-of-shift or next-day reporting and display it real time on the production floor. All the MES companies have phenomenal tools to dig deep into this data, but none of them can tell you what's happening right now on your production floor. And if you can't solve what's happening at a given second on your production floor, you can't stop things from going to repair.

Heatwave was designed to take all of that data and make it real time instead of putting it in pie charts, graphs, spreadsheets, etc. It's a pictorial image of your circuit board as it goes down the line. So, if you have a defect on U1 at the screen printer, SPI, AOI, ICT, functional test, or where ever it may be in your process, as soon as it's recorded to the MES, it's populated and colorized on the monitors out on the floor.

Johnson: Did you demonstrate this software at IPC APEX EXPO 2019?

Reiselt: Yes. We were with CTI in their booth, and they had an integrated line with Omron, so we piggy-backed up on top of the AOI system, and as defects were reported by the AOI, we displayed them for everyone to see.

Johnson: Is your software limited to just those suppliers, or are you more open than that?

Reiselt: We're completely open, as our name suggests. If you're reporting a failure, it doesn't matter how you're reporting it; we will get it into a format that will allow it to be shown in a pictorial format. We can integrate with any of the AOIs, MESs, etc.; it doesn't matter.

Johnson: What sort of a protocol or communication are you using underneath the software to achieve that integration?

Reiselt: We can use a direct call to the database—an API—import a CSV, or anything that the different manufacturers use as an output.

Johnson: Is this something that needs to be running on CFX or Hermes, for example?

Reiselt: No.
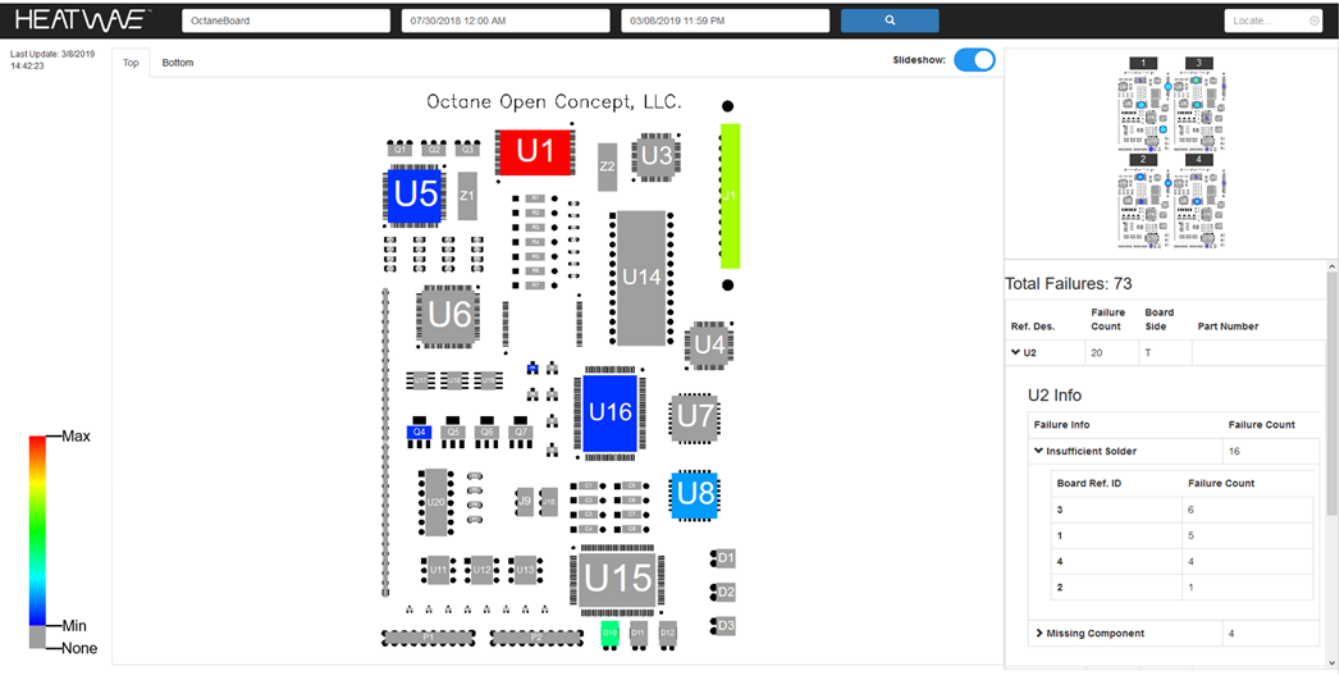
Octane Open Solutions' Heatwave application flags assembly trouble spots based on real-time tester results data.

Johnson: Can you make use of CFX and Hermes right now, and do they support your technical roadmap?

Reiselt: For Heatwave, CFX, Hermes, all of the different communications don't play a vital role for us simply because we must have the failure data in reference designator format. But for our other product, Flexline, which is slide-line documentation, they play a role and allow us to change and launch exactly what we need as the boards arrive.

Johnson: Talk to me a little bit about that product as well. How does it all play together?

Reiselt: Flexline runs off of the same software engine as Heatwave. It's a pictorial representation of your board. As many people know, when doing slide-line documentation, it's great; you do it one time, and it's out there. But the challenge from the manufacturing floor is if engineering sets the slide line up for six people and only five people showed up, the documentation is no longer valid. So, what the industry has done for years is take the parts from the person that's not here and redistribute them, but the documentation doesn't change. Flexline sets it up for the optimum six stations, for example, and if only five people show up, you only log in five people; it automatically redistributes all of the parts based on the rules that were put in by engineering and changes all of the documentation in less than one second.

Johnson: It was pretty impressive to watch on the show floor. Flexline is some of the most interesting resource leveling implementation I've ever seen.

Reiselt: Thank you. We'll pass that along to the development team. They will be very happy to hear that.

Johnson: Can we talk just a little bit about where you see this sort of software going? How do you plan, for example, to utilize CFX or Hermes as a communication platform for new and better things? What do you see in the future for Octane?

Reiselt: We're still a pretty new company. The ideas have been around for a while, but the working products have not been; Heatwave is less than three months old, and Flexline is three weeks old. For the next year or two, we plan on perfecting those. We have some beta sites set up and quotations out for a few people as of today, which was very exciting for us. Also, we currently use it in our own factory.

> # The ideas have been around for a while, but the working products have not been; Heatwave is less than three months old, and Flexline is three weeks old.

CFX, Hermes, and all of the standardization makes everyone play together better. I can't think of a better way to bring the whole industry together. Think of all the vendors at IPC APEX EXPO. Right now, if you want to have a Panasonic surface-mount line, an Ersa wave solder, a Heller oven, etc., getting them all to communicate takes a whole development team to put that together. And switching over and getting everybody on a standard format really brings it to where we can get the data and make it useful for everybody in real time.

Johnson: One of the things I've heard often at IPC APEX EXPO was that these two protocols create a lot of data. And the question is, "What exactly to do with all that data?" I heard multiple conversations about integrating the data upward to the enterprise level—going up to the management suite, not down to the manufacturing floor. You seem to be a little contrarian in that regard.
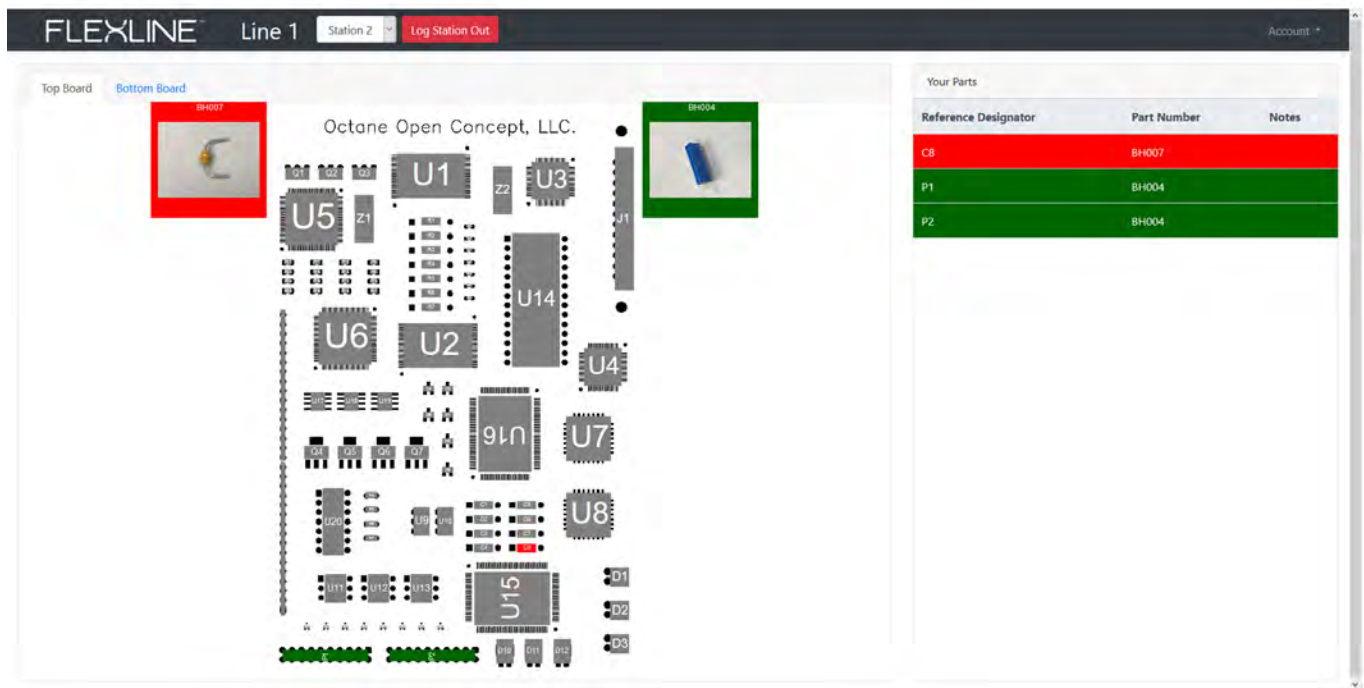
Flexline from Octane Open Solutions integrates work instructions and real-time labor resource-leveling capabilities. Here, you can see assembly instructions.

Reiselt: Absolutely, because I live on the manufacturing floor? I also have the same responsibilities as the rest of the management team, but by the time you push it all the way up and put it in reports, it's not in real time; it's all past tense. Therefore, the only thing that you can do is try and predict how that's going to happen again and put measures in place to keep it from happening.

Those are all great things and things that need to be done, but what you missed out on was that whole shift where you were building 2,000 boards, for instance, and you sent 200 to repair because of this problem. When you come back to the most simplistic approach, which is what Heatwave does, that takes you right back to the beginning, and instead of sending 200 to repair, maybe you only sent 83. What's the cost of 117 boards that don't go to repair? Think about it; that involves $15 an hour for an associate here in the U.S. at a minimum. If they have an MES or anything else, you have several minutes just to scan a board, document it, and look it over. Multiply that by 117, and that's what you saved in one shift.

Johnson: That can be huge.

Reiselt: It doesn't take long to get the payback.

Johnson: I don't know whether you heard at the show at all, but automotive is generating a lot of discussion about how manufacturing reliability needs to increase dramatically. The automotive segment says that they need a field failure rate that's about two orders of magnitude less than the current field failure rates for cellphones. How do you see your solution affecting that?

Reiselt: Well, we can play in that from early detection and to trying to eliminate escapes because we're giving that data to the production floor immediately. If you put a 60-inch monitor out on the floor and have Heatwave up on it, every person down to the person sweeping the floor can see it; they could see when it changes and when there's a new defect, so communication is key right down to the lowest level. And with the failures, I think it's going to take collaboration between the manufactur-

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ers and the designers on the front end, and a lot more DFM.

We see a lot of people who say, "This is how I'm designing it, and this is what it is. You need to build it, and you need to build it right." But it doesn't always work out that way. Being able to collect this data in real time and early on in the process during prototypes and get that back to the designers so that they can maybe make some better choices or small changes will increase the longevity of the product is critical.

Johnson: Is getting that information back to the designers so that they can incrementally improve yields something you're currently looking to do with your software?

Reiselt: No, our software wasn't designed for reporting DFM back to the designers. Remember, we take the information from an MES or collect it from a few pieces of test equipment and display it in a picture. We can supplement the DFM reporting from the MES with a screenshot of the assembly highlighting problem areas, so ours is more of a first-line defense.

> ## We can supplement the DFM reporting from the MES with a screenshot of the assembly highlighting problem areas, so ours is more of a first-line defense.

Johnson: That makes sense.

Reiselt: Again, the companies that are doing the MESs, such as Aegis, Cogiscan, and Panasonic, are collecting so much data and they have great tools to dive deep into some amazing analytics. That market is taken and covered, and that's not where we're trying to go. We're

trying to address the very beginning by keeping the failures from happening as soon as they're detected.

Johnson: So, you play well with the MES tools.

Reiselt: Correct. There's no competition between us and an MES. We need the MES to collect the data; we're simply putting it into a real-time picture. Then, when you get that report at the end of the shift or the following day, you can take a deeper dive and say, "Oh, this is how that happened, and this is what we're going to do to prevent it in the future." You can use our tool to ensure that it stops almost immediately on the floor.

Johnson: Obviously, there is a need for this for anybody working on a manufacturing floor. And you're out there addressing this need pretty creatively. You mentioned you're working with beta testers through the rest of the year. Do you care to share when you think you're going to release these as products?

Reiselt: For Heatwave, we think the beta testing should be complete by April and available for full production; Flexline will probably be fairly close behind. We're using it at the manufacturing site where I work, so we want to make sure that we work out any compatibility issues before release.

Johnson: Congratulations on all of that.

Reiselt: Thank you.

Johnson: You certainly answered all of the questions I had. Is there anything else that you want to cover?

Reiselt: We're a veteran-owned organization with over 30 years of manufacturing experience in electronics and are committed to creating simple and intuitive solutions.

Johnson: Thanks again, Craig.

Reiselt: Thank you. **SMT007**

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[1] Source: TechValidate survey of 609 users of IPC. Published: Jan. 5, 2018 TVID: C96-ADC-FD2.

[2] Source: TechValidate survey of 303 users of IPC. Sample comprises Large Enterprise, Medium Enterprise, S&P 500, Global 500, Fortune 500, and Small Business electronics industry organizations. Published: Jan. 9, 2018 TVID: BDB-191-596.

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Electronics Industry News and Market Highlights

Additive Manufacturing Leaps from Prototype to Production ▶

According to a new report published by ABI Research, additive manufacturing will produce more than $360 billion worth of parts and end products each year and nearly $2 trillion in sum by the end of the next decade.

Personal Computing Device Shipments to Drop 3.3% in 2019 ▶

Unit shipments for the worldwide personal computing devices market, comprised of traditional PCs and tablets, are expected to decline 3.3% in 2019, according to a new forecast from the International Data Corp. (IDC) Worldwide Quarterly Personal Computing Device Tracker.

Canalys Expects Fewer than 2 Million Foldable Smartphones Will Ship in 2019 ▶

Foldable phones have arrived, in the shape of the Samsung Galaxy Fold and Huawei Mate X, and more vendors will soon follow with their own takes on foldable displays—but 2019 will not be the year that foldable phones go mainstream.

Egyptian Mobile Phone Market Shows Signs of Recovery ▶

Egypt's mobile phone market saw shipments totaling 14.4 million units in 2018, according to the latest insights from International Data Corp. (IDC).

Automotive Semiconductor Market to Reach $77B by 2027 ▶

The global automotive semiconductor market accounted to $34.89 billion in 2017 and is expected to grow at a CAGR of 8.3% during the forecast period 2018–2027 to reach $76.93 billion by 2027.

MEA Personal Computing Devices Market Down 5% in 4Q18 ▶

The Middle East and Africa (MEA) personal computing devices market declined by 5% year on year in Q4 2018, according to the latest insights from International Data Corp. (IDC).

Semiconductor Equipment Market to Grow at CAGR of 7% From 2018–2026 ▶

According to Coherent Market Insights, the global semiconductor equipment market is projected to exhibit an impressive CAGR of 7.2% over the forecast period (2018-2026).

Intel Expected to Recapture Top Semiconductor Supplier Ranking in 2019 ▶

Although Intel Corp.'s semiconductor sales are forecast to be relatively flat in 2019, the company is poised to regain the top semiconductor supplier ranking this year—a position it held from 1993 through 2016.

Smartphone Shipments Expected to Drop in 2019 ▶

Worldwide smartphone volumes are forecast to fall by 0.8% in 2019 with volumes dipping to 1.39 billion. However, the smartphone market will begin to pick up momentum this year with year-over-year growth of 2.3% expected in the second half of the year.

Green Regulations Driving Growth of Lithium-ion Batteries▶

The global lithium-ion battery market is expected to reach $93.1 billion by 2025 while registering a robust CAGR of 17% as well, according to data compiled by Grand View Research.
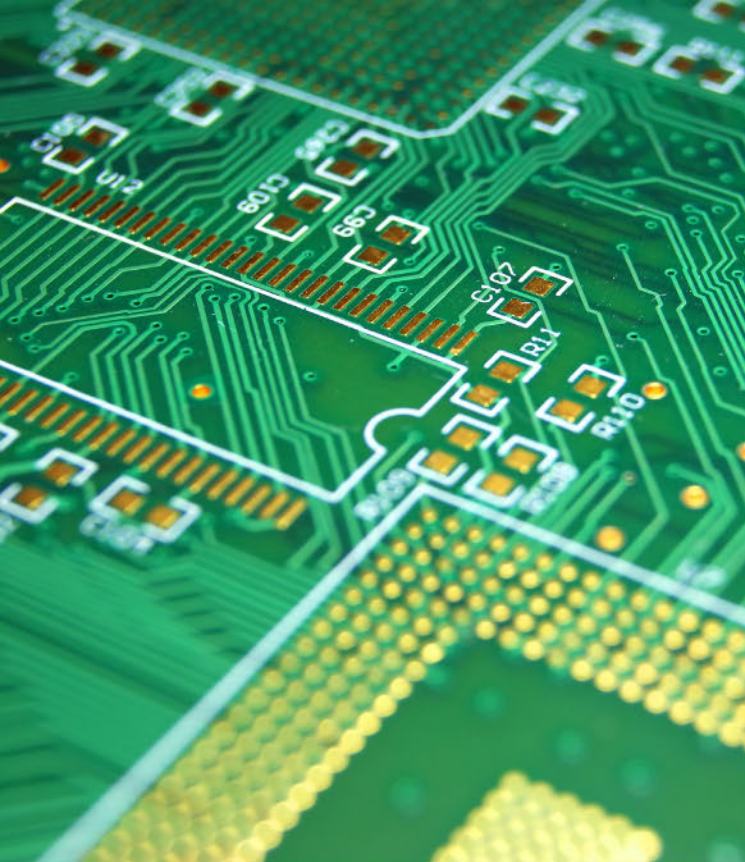
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Innovative Battery and Pressure Sensor Technologies

Feature Interview by Nolan Johnson
I-CONNECT007

Tracy Liu is the director of R&D of the Nano and Advanced Materials Institute (NAMI) in Hong Kong. At CES 2019, Liu discussed a number of battery and pressure sensor technologies being developed by the NAMI for licensing. A few technologies in particular also received CES Innovation Awards.

Nolan Johnson: Tracy, as the director of R&D for the NAMI in Hong Kong, you came to CES 2019 with some award-winning technologies and applications. Can you tell me a little bit about what you're doing?
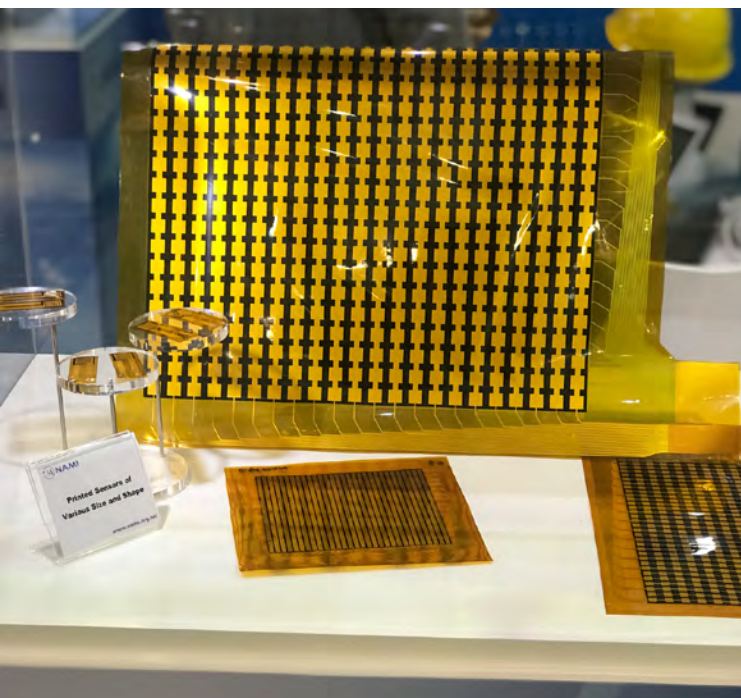
Traci Liu's battery sensors can be manufactured on a variety of flex substrates, and in a number of sizes and densities.

Tracy Liu: At the NAMI, we do market-driven applied research, unlike what the university is doing, which is fundamental research. This year, we brought five technologies to showcase at CES. The first one is the printed primary battery. The key point is that we print all of the components of these batteries from the current collector to the electrolytes, electrode materials, and the whole package. This is a cost-effective and high-performance, paper-like battery. The key point is that this battery can offer a very high current output, which can support some very advanced IoT communication functions.

Johnson: So, at the risk of showing my ignorance, what are you printing the battery on?

Liu: We printed the battery on plastic substrates such as PET (polyethylene terephthalate), PI (polyimide), or anything that was plastic or flexible—even on a piece of paper.

Johnson: Very interesting. Is it printable on older technologies like FR-4?

Liu: It is. The battery can be printed on the substrate such as FR-4. However, the amazing point is that we can make the battery very flexible, so a flexible substrate should be more suitable for our batteries.

Johnson: That's very interesting and useful technology on any substrate.

Liu: Even on woven fabric or clothes.

Johnson: Is this something that is ready for the market now?

Liu: We are working with our industry partners to apply this battery into things such as safety patches. We put it in an IoT device, which is integrated with a vibration sensor. When there is a vibration, or a person falls, it can detect it, send a message to the cloud, and people will know the person has fallen down.

Johnson: Running off of this battery?

Liu: Correct.

Johnson: How do you recharge it?

Liu: This is a primary battery, so it's disposable. It is very low-cost and made with zinc and manganese. It can be fabricated under ambient environment, unlike a lithium-ion battery. Lithium-ion batteries are rechargeable but the fabrication of lithium-ion battery needs an inner-gas environment.

Johnson: What are your next steps for bringing this battery to market?

Liu: We are working with different industries to apply this kind of battery for different applications. For example, we will develop a micro-current system for the facial mask to enhance the active-agent delivery to our skin to improve penetration. For IoT devices, we are developing different applications such as asset tracking. There are a lot of applications.

Johnson: Since you're showing this technology at CES, you're obviously looking to make the U.S., North America, and the world aware of your technology. Do you have representation in the U.S? If someone wants to specify this battery for their product, is there someone to work within the U.S. or do they come to you directly in Hong Kong?

Tracy Liu

Liu: The NAMI is a government-funded research institute, and we work with some companies in Hong Kong to commercialize the technology; some of our industrial partners have connections with U.S. companies. We also welcome collaboration with industries in other countries for commercialization of the technologies through licensing.

Johnson: Did I see that this particular technology received a CES Innovation Award?

Liu: It did.

Johnson: That says a lot right there. Let's talk about your other technologies.

Liu: The other one is also very interesting. This time, we brought three battery-related technologies. The next one I would like to introduce is a fast charge battery for the applications such as earphone and wearable devices with wireless charging functions. This battery has a very compact size and high energy density. It can pass industry safety standards and nail penetration. Further, it can be fully charged within 15 minutes and is wirelessly rechargeable. That's another technology that received an award.

Johnson: On the Qi standard?

Liu: Yes. The last one I would like to highlight is another technology where we printed the lithium-ion battery directly on the flexible PCB (FPCB). During this project, we worked with a famous Hong Kong FPCB company named Compass. They are one of the largest FPCB manufacturers in the world and want to make FPCB cell self-powered. It's the same as a primary battery; most of the battery component are printed directly on the FPCB.

Johnson: In this parti-cular application, you're demonstrating a fairly large piece of flexible PCB material with printing on it.

Liu: This is a printed pressure sensor mapping system. The whole device is very thin and flexible, and integrated with our battery. There are other pressure sensors in the market, but not of this kind. The pressure sensor has a long history, but most of them are using rigid semiconductor or ceramic bases. If you want to realize a mapping system, for example, you want a 100 by 100 pixels—which means 10,000 pixels—you need 10,000 sensors. That is not cost effective, and you need a complex driver and circuit design. With our technology, we print all of the materials on a piece of plastic. With this sensor, you just need three layers—electrode, pressure-sensitive materials, and another layer of the electrode. We print it by using this technology.

Johnson: You're printing in a matrix.

Liu: Yes, like a matrix. Each compact point is a pixel. If you want 100 or 10,000 pixels, you can just change the printing screen. You can get 10,000 pixels in one go. So that's an amazing point of this technology.

Johnson: By using a fairly simple material in a fairly simple manufacturing process—just three layers—you can create a highly customizable sensor bed.

Liu: It can be large or small. You can have more or less pixel points and print it in different shapes. It can be used in your shoe pad, a wheelchair, and even for kid's gait monitoring.

Johnson: These types of sensor applications tie in very nicely to the emerging IoT transition
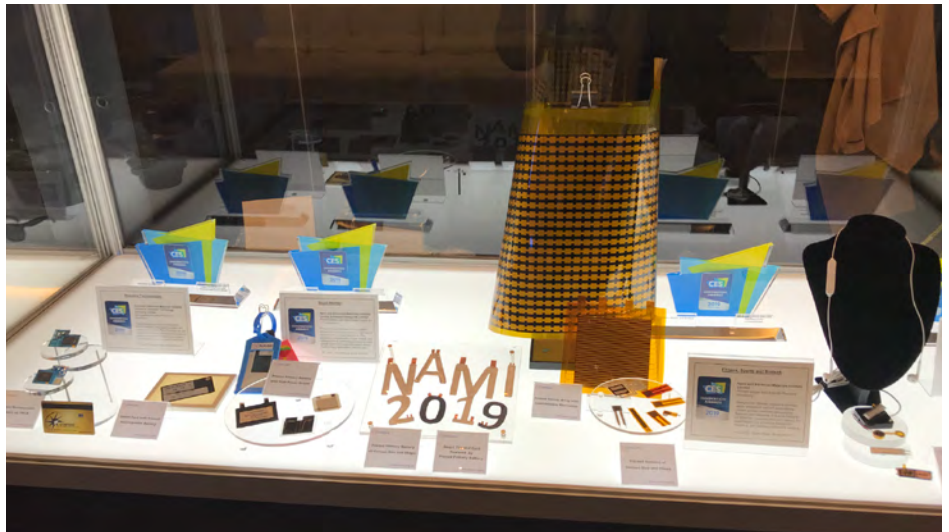
Printable batteries in a variety of configurations. Liu points out that these batteries are versatile enough to be applied to paper or textiles.

going on. You're providing input devices to track things such as the mobility of an elderly person?

Liu: Yes, or even to track if your posture is correct as you're sitting here.

Johnson: Right, so it's very flexible in a lot of different ways. Is this also a technology that you are planning to take to market?

Liu: We are looking into different industries such as wheelchair companies or smart robotics. I cannot disclose more at this moment.

Johnson: Is this technology something that the NAMI is looking to manufacture or are you licensing the technology?

Liu: We're licensing the technology. The NAMI is government-funded, non-profit institute. We offer solutions and technology transfer, and we are very happy to work with industries from all over the world to apply our technology to products from various industries.

Johnson: Thank you, Tracy.

Liu: Thank you. **SMT007**

When Is It the Right Time to Automate?

The Mannifest
by Mike Fiorilla, MANNCORP INC.

If your PCB company is growing, you'll eventually encounter the inconvenient question of, "How can I increase my production to keep up with rising demand while keeping my operating costs reasonable?" Once you're there, you'll inevitably start seeing steps in your production process that you can automate to save yourself time, money, and headache. While it can be tempting to go all-in and convert your entire production process to a fully automated assembly line, it may be more advantageous to start with low-volume assembly and convert more gradually.

In any case, when you find that the demand for your product is starting to outstrip the number of units you can feasibly produce in a month, it's time to consider your automation options.

Depending on your production requirements, a prototyping line could be the right solution for you. A low-volume SMT workcell solution is often the first step towards a fully automated inline production facility in the future. The increase in production over an on-site manual assembly will let you keep up with increasing demand from your customers without an egregious investment of capital or floor space. If you currently source your assembled boards overseas, a low-volume line may not meet your current production demands, that would likely require an upgrade to a more substantial line. However, a small line could provide you with a fast, reliable prototyping solution and a way to better produce small runs without the hassle of involving an outside production source.

These lines aren't the be-all, end-all of SMT production, but they can be a great, convenient option for on-site prototyping as well as R&D work, and can also work for companies that have small production requirements that they need to meet.

One of the downsides of a transition to this type of line is that it may not increase your production as much as you'd like, and it may even be seen as a temporary stopgap measure before an upgrade to a full inline solution. While a small prototyping line has advantages of its own, if you currently source your boards from an outside producer and are looking to bring your assembly in house, you may wish to consider a fully automated production line.

Transitioning to a fully automated inline solution is bound to vastly increase your production abilities. While this type of conversion is the ideal solution for businesses looking to bring their production from an outside source to in-house, it can also be the right upgrade for businesses transitioning from manual production or low-volume workcell lines, depending on their industry and unique situation.

> ## Transitioning to a fully automated inline solution is bound to vastly increase your production abilities.

In the event that you're looking to step up to mid-range production, or you're attempting to bring mid-range PCB assembly in-house from an outside contractor, you should look toward inline automatic solutions. Something to keep in mind is if you're transitioning from hand assembly to completely automated production, it's important to ensure that you have the commensurate demand for your new production capabilities, as your overhead is about to get a significant upgrade as well.

Before a fully inline conversion, you'll need to take into account your software, facility, and personnel requirements to keep that line up and running so that you can meet your production standards. Hurdles you could face include reworking the layout of your facility, dedicat-

ing time to equipment training and evaluation, and increasing your staff to keep up with the increased complexity of your operation. Be sure you're fully aware of the specifications of the products you're looking to purchase, the specifications of the products you're building, and that your machines fall in line with your intended production capacity.

There is some good news in terms of financing, however. If you're thinking that a complete inline solution might work for you, but you're worried about the up-front cost or the overall expense of running it, there are a number of options that you can explore as long as you do your due diligence. For one, banks are more likely to approve loans and other lines of credit for purchasing a physical property. Also, many states offer financial opportunities that could help you defer your costs. In terms of machinery that will generate jobs for business and stimulate the economy, you even have more leverage when pursuing incentives from state and local governments that can offset your capital cost. Make sure to research the options available to you fully before deciding how you'd like to proceed with a line.

The question of whether your facility could benefit from a conversion to a small-scale SMT workcell or fully automated SMT line is a heavy one to consider. It's important not to let the excitement of a possible increase in production and sales get the better of you when making the decision to automate. Keep in mind the increased overhead and the ongoing costs associated with new personnel that may offset your new production capabilities. Take the time to research the capabilities of any line you may be looking into as well as the personnel and training requirements to get the line started. Even with the initial investment of time and money, converting to an automated line could be the right choice to take your assembly capabilities to the next level. **SMT007**
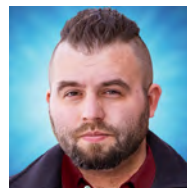
Mike Fiorilla is a writer at Manncorp Inc. debuting his first column in this month's issue. Look forward to more insights from Mike in future magazines.

Lionrock
Delivers Foldable, Bendable, Industrial-grade Battery Technology

Interview by Nolan Johnson
I-CONNECT007

David Leung dicusses Hong Kong-based Lionrock's foldable battery technology at CES in Las Vegas.

David Yeung, co-founder and CEO of Lionrock Batteries, discusses previous projects—including smartwatch straps—and his collaboration with the Nano and Advanced Materials Institute (NAMI) in Hong Kong on wearable, flexible battery technology at CES 2019.

Nolan Johnson: I'm here with David Yeung from Lionrock Batteries at the South Plaza tent at CES 2019 in Las Vegas. David, could you tell us a little bit about you and what your company does?

David Yeung: I have been in the wearable industries for a few years. Before this project, I ran a smartwatch strap project attempting to include some functions and battery power within the flexible watchstrap part itself. During that course, I discovered flexible battery background technology being developed by the NAMI. I have engaged with them on research and development to refine the flexible battery. The project concluded in 2016, and then we started Lionrock Batteries in 2017 to commercialize this technology, which I think was amazing.

Johnson: Where is Lionrock located?

Yeung: Hong Kong, as is the NAMI.

Johnson: Can you tell me a little bit about this battery technology?

Yeung: It is a nanofiber structure battery, which is very reliable, durable, and highly porous; thus, you practically avoid the battery from being short-circuited. If we deform it, fold it, or cut it, the battery remains safe. That's a main feature of the battery. It's so safe that we can make it deformed and bendable, so it's a flexible battery.

Johnson: What are the specifications for this battery?

Yeung: It can charge and recharge 1,000 times with very high energy of retention.

Johnson: And you have a couple of examples of that battery here in front of us where the battery is embedded in a plastic rubber watchband like you would use for a smartwatch. If I
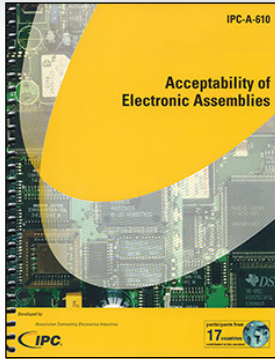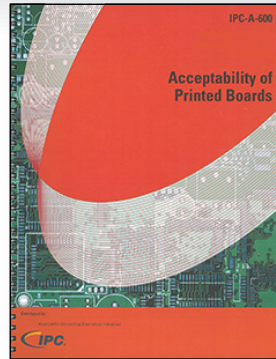
have this battery built into my watch band—I can feel it all the way down the band—how much charge do I get out of it and add lifetime to my watch?

Yeung: You are looking at one section of the watch strap, but watch straps have two sections. Each section has approximately 80–100 mAh (miliamp-hours). If they are both wrapped with a battery, that's around 180 mAh. To give you an indication, I believe an Apple iWatch battery is about 200+ mAh. If you have this watch strap integrated into an Apple Watch, it can run from one to two days now to three to four days, which is nearly double the capacity.

Johnson: Or for the same battery life, you could move the batteries into the band and free up room inside the case for additional function.
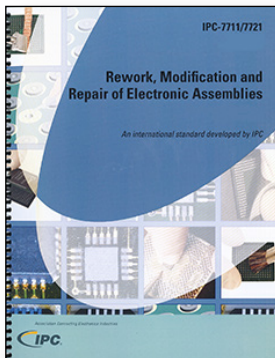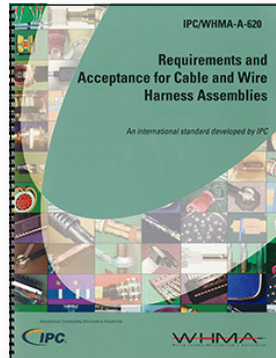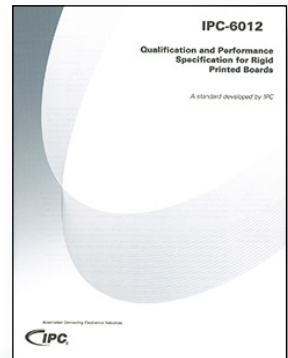
Yeung: Yes, which is quite a lot. And by the way, for each smartwatch, typically it has about 50% of the watch body compartment contributed to the battery. So, if you can place the battery outside the watch, the watch can probably be half the size.

Johnson: Or you could go that direction and make a smaller watch, which makes a lot of sense. What other cases are envisioned for this battery technology?

Yeung: Oh, there are a lot. For wearables, whatever you put on the body should be a light, ergonomic, and curvy. We can put this battery on a blouse or a smart insole to track activity and pressure of the body when you exercise. There are many applications for clothing, on headphones, etc., so it's a quite limitless application.

Johnson: Are you seeing a lot of interest here at CES for this product, and is this commercially available today?

Yeung: It is commercially available. We had the production ready in Hong Kong starting last year. Now, we are making samples for various interested parties to try and see. Because this technology is so new, no one would place a big order right now. Instead, everyone picks samples and tries them out. We also offer low-cost customization of the battery, so for whoever wants to try it, we could give them the compact battery that suits them. We expect more and more inquiries in the coming few months. Then, we expect mass production to start later this year.

Johnson: As I'm thinking about other applications such as pet collars, heated clothing, powered wallets, or even a smart insole for your shoe or watch band, I wonder about the lifetime of the battery. At some point with the battery embedded in the watch band, if it needs to be swapped out for a new battery, what are some of the challenges and how do you solve them?

Yeung: The battery has lithium-ion chemistry, but it is more efficient than typical lithium-

ion batteries because of this nanofiber structure inside. The deterioration of the battery composition is slower than a typical battery. We run charge-discharge cycles up to 1,000 times, and the battery still retains well above 60% of the capacity, which is the limit to the lifetime of a lithium battery. Most batteries that you can see in the industry is about 500 times, so we're nearly double.

Johnson: Not only are you potentially getting a longer charge out of the battery but then you can go through more charge cycles for the overall lifetime of the battery, which pretty much removes the concern. If someone has an Apple watch, for example, using one battery until the watch is ready to be replaced with an upgraded mode, this battery provides even more than that. Battery replacement could be basically not a problem for the typical lifetime of a product.

Yeung: That's right.

Johnson: What other features can we expect from your batteries?

Yeung: This is very safe; it's cut and punctured. There's no fire or explosion because it's a safe structure. On top of being bendable, safety is another main feature.

Johnson: If it gets cut or punctured like that

by accident, does that limit or end the functionality of battery?

Yeung: Of course, if you damage the battery, then the electrolyte inside will oxidize and slowly deteriorate. But right away, it can still maintain a voltage that drives the battery running. Another beauty of this battery is that it uses the same lithium-ion chemistry, delivering the same voltage at 3.8 volts. There's no need to change to any electronics or the design of any wearable technology device; just plug it in, and it's usable.

Johnson: That makes it very easy.

Yeung: Yes, there's no friction for the industry to adopt this technology at all.

Johnson: The only changes to incorporate your battery technology are going to be mechanical changes.

Yeung: And the product design. They need an innovative design to accommodate that.

Johnson: Again, when do you think you're going to be ready to go into the market with this?

Yeung: We're going to market and are ready to ramp up whenever there is an increase in demand. Then, we get to order more machines, set up a line, and move to mass production accordingly. So, we're waiting and ready for that, which should come within the next 12 months.

Johnson: Thank you so much, David. This is a very interesting emerging technology. I'm looking forward to sharing this with our readers.

Yeung: Thanks, Nolan. **SMT007**

Cadence Design Systems Takes Their Tensilica Product to the CES Show Floor

Feature Interview by Nolan Johnson
I-CONNECT007

While roaming the aisles of CES, I happened across a suite hosted by Cadence Design Systems. It wasn't a booth—just a quiet presence behind walls with demonstration hardware inside. The Cadence staff was friendly and welcoming, and it didn't take long before I was talking with Vic Markarian—senior group director for worldwide IP licensing and sales—about why Cadence was at CES.

Nolan Johnson: Vic Markarian, we're talking about why Cadence is here at CES. Other CAD tool companies don't see this show as being of value, and yet you're here.

Vic Markarian: Our presence at CES is to represent Cadence's Tensilica product line, which Cadence acquired back in 2013. Tensilica develops a processor IP technology, which is very unique in the industry. Unlike other processor technology, which involves fixed-configuration cores, we developed a technol-

ogy that allows our customers to configure the processor and extend the instruction set with their own custom instructions and interfaces.

With our technology, one can create application-specific processors, including everything from a small state machine to a programmable engine, high-end DSP, or even an application-specific programmable function inside their SOC. The reason we are here at CES is that many of our customers who utilize our technology are showcasing their latest, most advanced products at the show, including items displayed here from Huawei to LG phones and many other devices on the floor.

In 2017, our customers shipped over five billion cores, and I think that number will be closer to 10 billion cores in 2018. And the volumes continue to ramp up as the adoption of our technology accelerates with leading companies that you see exhibiting here at CES. If you walk around the show, you'll see tons of Tensilica-based products that have been shipped, introduced, and/or targeted for introduction.

Vic Markarian

Johnson: And you have some new developments and configurations where you're starting to get into some verticals.

Markarian: We've always done verticals, but we're expanding now. We started with audio as a vertical, and that has been very successful; it has so dominated the audio space that we have become the de facto standard for audio DSP IP. We also have our HiFi product line doing audio. Then, we came out with our ConnX DSPs, which provide a full range of communication DSP solutions from a dual MAC to a 64 MAC implementation. A few years ago, we introduced our Vision DSPs, which provide IP solutions for imaging and vision applications, and has seen huge adoption in the market.

Further, we have a vertical product line called Fusion. The Fusion family is a scalable range of general-purpose DSPs designed with flexible options to give designers the ability to optimize the DSP specifically for a customer's application needs. From having ultra-low power to a small footprint, being compute-intensive, and having high-performance processing, the Tensilica Fusion DSPs are perfect for many of the advanced applications we see today such as

IoT, automotive, mobile, wearables, consumer electronics, and so much more.

Recently, we expanded into the AI space with the announcement of our DNA100 technology, which has generated a tremendous amount of interest and excitement in the market. The great thing about all of the processor technologies we offer (including the vertical solutions) is that these processors can be further configured and extended with custom instructions and interfaces. It really becomes a powerful architectural option and a differentiator for our customers.

Johnson: This seems very powerful and configurable on the hardware side of things. When it comes to putting together an instruction set, you have some tools that are very powerful as well.

Markarian: Yes, and that's an excellent point. It's not difficult to add instructions in a processor; all you do is add hardware. The real value we offer is the ability to match the software to the hardware you just configured. As you're creating and configuring these processors and adding your instructions, we provide a process where you have a user interface, go through, and you click on boxes to do the configuration and choose the architectural features that you want. You can then add your own instructions and interfaces as well as define your own memory subsystem and interrupt structure. You're really basically defining what your

SMTA

2019 Educational Calendar

CONFERENCES

Electronics in Harsh
Environments Conference
April 2-4, 2019
Amsterdam, Netherlands

eSMART Factory
Conference
June 20-21, 2019
Dearborn, MI, USA

SMTA International Electronics
Manufacturing Conference & Expo
September 22-26, 2019
Rosemont, IL, USA

Medical Electronics
Symposium
May 21-22, 2019
Cleveland, OH, USA

Symposium on Counterfeit
Parts & Materials
June 25-27, 2019
College Park, MD, USA

International Wafer-Level
Packaging Conference
October 22-24, 2019
San Jose, CA, USA

Pan Pacific
Microelectronics Symposium
February 10-13, 2020
The Big Island of Hawaii

International Conference for
Electronics Enabling Technologies
June 4-6, 2019
Markham, ON, Canada

Advanced Process &
Materials Conference
September 3-5, 2019
Eastern Europe

Additive Manufacturing:
PCB Scale to IC Scale
October 24-25, 2019
San Jose, CA, USA

CERTIFICATION

SMT Processes
June 18-20, 2019
Mequon, WI, USA

SMT Processes
TBA, 2019
Guadalajara, Mexico

SMT Processes
September 24-26, 2019
Rosemont, IL, USA

SMT Processes
TBA, 2019
Dallas, TX, USA

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processor needs to be for its specific function and task.

Once you've defined the processor, you click a button in our tools and the "processor specification" is submitted to our encrypted server. In about 30 minutes, we deliver not only the RTL for the custom defined processor but also the compiler, debugger, linker, and instruction set simulator. The entire toolset reflects the processor that a user just defined; that's really the hard part. There are customers who configure and add instructions to their processors, but the problem is that now they require a team of engineers and developers to debug and verify the design as well as develop the complete toolset to match the processor they just created. With our technology, it is all automated and done for you in minutes.

Our proven technology has been around for over 20 years. The fact that there are billions of our cores shipping each year shows that it's proven. What really happens is the Tensilica processor technology becomes an architectural tool. Now, when customers are doing an SOC, rather than just saying, "I need to drop in a controller or DSP," they start thinking, "I'm going to take this controller or DSP as my starting point, and I can further define architectural features to align with my application requirements. Maybe I can take some of my RTL, move it into the processor, and make it a programmable implementation." Not only that, but you start reducing the verification require-

ments as the processor is pre-verified. In addition, if you find an issue post-silicon, the more programmable you make the device, the more likely you won't have to respin the design; instead, you'll be able to address any issues in firmware. As you can see, it's a very powerful option for SoC designers.

Johnson: That certainly is! Clearly, that is why you're here at CES. You're occupying a place in the supply chain where a lot of the other exhibitors present are using your technology.

Markarian: Absolutely.

Johnson: Do you find that the show has the right kind of people for you to talk to?

Markarian: Absolutely. While we work with engineering teams in the implementation and use of our technology, we are also engaged with architects, marketing people, and other functional areas as each has an opportunity to leverage our technology within their discipline. We provide very strategic technology for our customers. CES gives us the opportunity to meet with our customers and partners in an environment where they are showcasing their products. It's a place where promise, potential, execution, and success come together We get to share in the success of our customers as they introduce next-generation products to the market as well as explore long-term strategic opportunities. This is a great show for us.

Johnson: Thanks for your time, Vic. It has been very informative.

Markarian: No problem, Nolan. It was great to meet you. **SMT007**

2019 Programs

NORTH AMERICA

CONFERENCES

May 14–16
Baltimore (Hanover), MD
IPC High Reliability Forum

June 3
Boston, MA
ITI & IPC Conference on Emerging & Critical Environmental Product Requirements

June 5
Chicago, IL
ITI & IPC Conference on Emerging & Critical Environmental Product Requirements

June 7
San Jose, CA
ITI & IPC Conference on Emerging & Critical Environmental Product Requirements

June 15–20
Raleigh, NC
IPC SummerCom featuring Panelpalooza

September 11
Philadelphia, PA
IPC E-Textiles 2019

November 5-7
Minneapolis, MN
IPC Electronics Materials Forum 2019

MEETINGS

May 21–22
Washington, D.C.
IPC IMPACT Washington, D.C.

June 15–20
Raleigh, NC
IPC SummerCom: IPC Committee Meetings

WORKSHOPS

April 29
Anaheim, CA
Export Control Compliance: Training Workshop and Regulatory Update

May 1
Rosemont, IL
Export Control Compliance: Training Workshop and Regulatory Update

May 3
Sterling, VA
Export Control Compliance: Training Workshop and Regulatory Update

WEBINARS

April 30
Production of Electronics Hardware with the Assistance of IPC Standards – Part 1

May 7
Production of Electronics Hardware with the Assistance of IPC Standards – Part 2

IPC TECH ED

Apri 2
King of Prussia, PA
Process and Acceptability Requirements: Utilizing J-STD-001 and IPC-A-610 Together

May 7
Milwaukee, WI (in conjunction with Electrical Wire Processing Technology Expo)
The Evolution of IPC's Cable & Harness Documents — IPC-D-620, IPC/WHMA-A-620 and IPC–HDBK–620

September 10
Huntsville, AL
Process and Acceptability Requirements: Utilizing J-STD-001 and IPC-A-610 Together

November 12
Raleigh, NC (in conjunction with PCB Carolina)
Design for Excellence: Design for Manufacturing, Design for Reliability, Design for Assembly and More

December 3
Anaheim, CA
Process and Acceptability Requirements: Utilizing J-STD-001 and IPC-A-610 Together

EUROPE

May 6–7
Nuremberg, Germany
IPC Tech Ed – Process and Acceptability Requirements: Utilizing J-STD-001 and IPC-A-610 Together

May 8–9
Nuremberg, Germany
PERM Meeting

June 5–6
Budapest, Hungary
i4.0 Connect Forum-Europe

September 23–24
Prague, Czech Republic
IPC Wire Innovation Conference

September 26
Paris, France
IPC Transportation Electronics Reliability Council Annual Meeting (ITERC)

November
Brussels, Belgium
IPC IMPACT Europe

November 11–12
Munich, Germany
IPC E–Textiles Symposium

ASIA

June 25
Suzhou, Greater China
IPC WorksAsia Automotive Electronics Forum

September 3
Beijing, Greater China
IPC WorksAsia Aerospace & Aviation Forum

WISDOM WEDNESDAY WEBINARS — Exclusive for Members

April 3	April 17	June 26	August 21	October 16	December 18
May 8	May 22	July 17	September 18	November 20	

Editor's Picks from SMT007.com

1 RTW IPC APEX EXPO 2019: Standards Updates—IPC-7093 & IPC-7530 ▶

Ray Prasad, IPC Hall of Famer and chairman for multiple committees, gives Joe Fjelstad an update on two IPC standards: IPC-7093 on bottom-termination components (BTCs), and IPC-7530 progress with reflow characterization. He also addresses no-clean flux and its challenges.

Ray Prasad

2 ITL Inks Five-year Contract with OrganOx ▶

OrganOx has signed a five-year manufacturing contract with ITL Group for their portable, performance-critical medical device metra—a normothermic perfusion system that operates by supplying a donated liver with oxygenated blood, anti-clotting drugs, and assorted nutrients, while keeping the organ at a stable temperature (37°C).

3 Flex Recognized with Five 2019 Manufacturing Leadership Awards ▶

Flex has been named a winner of five 2019 Manufacturing Leadership Awards for its outstanding achievement in four categories: sustainability leadership, supply chain leadership, enterprise integration, and technology leadership and next-generation leadership.

MANUFACTURING LEADERSHIP AWARDS
NATIONAL ASSOCIATION OF MANUFACTURERS
WINNER 2019

4 Global Statistical Programs for IPC Members Now Open for 2019 ▶

IPC's statistical programs for the global electronics manufacturing services (EMS), assembly equipment and solder industries are now open to new participants for 2019.

Year-on-Year EMS Sales and Order Growth Rates in North America

5 Punching Out! Why Sell to a Private Equity Group? ▶

One category of buyers that is often overlooked is private equity groups. PCB/PCBA owners either think that their company would not be of interest to a non-strategic buy, or they have a negative impression of financial buyers. Here are six reasons why companies should consider selling to a private equity group.
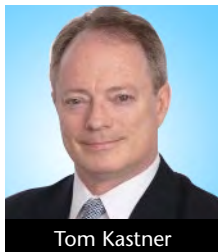
Tom Kastner

6 Valuetronics Posts 3% Net Profit Growth in Q3 FY2019 ▶

EMS firm Valu-etronics Holdings Ltd has reported a net profit of HK$59.7 million for the three months ended on December 31, 2018 (Q3 FY2019), by 2.6% compared to the same period in the previous year.

7 ALL Circuits to Inaugurate New Design Facility ▶

On April 2, ALL Circuits will inaugurate their new design office at the Electronic Technocampus in Angers, a couple of hours southwest of Paris, France.

8 SMTC Reports 55% Revenue Growth in 2018 ▶

EMS firm SMTC Corp. has posted a revenue of $216.1 million in 2018, up by 55.2% compared to $139.2 million in 2017, with $23.5 million attributable to the November 2018 acquisition of MC Assembly.

9 Techstreet Partners With IPC to Offer Electronics Manufacturing Standards ▶

Techstreet and IPC have formed a partnership to offer electronics manufacturing standards through the Techstreet Enterprise subscription service.
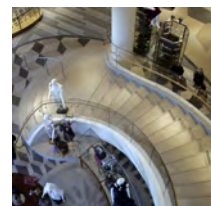
10 Dorigo Systems Included in Vancouver's List of Top 100 Manufacturers ▶

For the second year running, Pillon Holdings—the corporate parent company that encompasses Dorigo Systems and Enigma Interconnect—has been included in Business in Vancouver's annual ranking of the city's 100 top manufacturers.

For the latest news and information, visit SMT007.com. Subscribe to our newsletters or premium content at my I-Connect007.

Career Opportunities

APCT, Printed Circuit Board Solutions: Opportunities Await

APCT, a leading manufacturer of printed circuit boards, has experienced rapid growth over the past year and has multiple opportunities for highly skilled individuals looking to join a progressive and growing company. APCT is always eager to speak with professionals who understand the value of hard work, quality craftsmanship, and being part of a culture that not only serves the customer but one another.

APCT currently has opportunities in Santa Clara, CA; Orange County, CA; Anaheim, CA; Wallingford, CT; and Austin TX. Positions available range from manufacturing to quality control, sales, and finance.

We invite you to read about APCT at APCT.com and encourage you to understand our core values of passion, commitment, and trust. If you can embrace these principles and what they entail, then you may be a great match to join our team! Peruse the opportunities by clicking the link below.

Thank you, and we look forward to hearing from you soon.

apply now

Technical Service Engineer (PCB Process Engineer)
Plano, Texas

PRIMARY FUNCTION:
To provide expert technical advice on production and engineering issues in the application of solder mask and other Taiyo products.

ESSENTIAL DUTIES:
- Troubleshoot customer problems
- Conduct technical audits
- Advise and consult on product evaluations
- Conduct technical presentations
- Frequent travel to customer facilities (travel required, up to 50% of the time)
- Write trip/audit reports
- Coordinate travel arrangements to realize significant transportation savings
- Respond to and write email messages
- Write monthly reports
- Prepare agendas for customers, detailing goals and objectives
- Must comply with all OSHA and company workplace safety requirements at all times

OTHER DUTIES:
- Other duties as assigned from time to time

REQUIRED EDUCATION/EXPERIENCE:
- College degree preferred with solid knowledge of chemistry
- 10 years of technical work experience in the printed circuit board (PCB) industry
- Computer knowledge
- Good interpersonal relationship skills

WORKING CONDITIONS:
- Occasional weekend or overtime work

apply now

Career Opportunities

Career Opportunities

Koh Young America

Vision and Machine Learning R&D Engineer
Atlanta, GA or San Diego, CA

At Koh Young, we are focused on developing the future and continue to bolster our newly established R&D center near San Diego, California, with top talent focused on vision engineering and machine learning for electronics and medical applications. Currently, we are collaborating with top medical universities and hospitals across the U.S., Korea, and Japan to develop innovative neurosurgical robotic systems. With core technologies developed in-house, we expect to deliver neurosurgical breakthroughs.

The role will develop practical, scalable 3D machine learning solutions to solve complex challenges that detect, recognize, classify, and track medical imagery. Additional focus on the design, implementation, and deployment of full-stack computer vision and machine learning solutions.

The ideal candidates will hold a master's (doctorate preferred) in computer science or electrical engineering with at least three years of relevant experience. We desire a strong understanding of machine learning and computer vision algorithm application within embedded systems, plus significant vision expertise in multiview geometry, 3D vision, SFM/SAM, and activity recognition.

Koh Young is the leading 3D measurement-based inspection solutions provider. We perform quality control and process optimization across a growing set of industries including electronics, final assembly, semiconductors, and most recently, medical imagery.

Join the 3D inspection leader as we expand. Forward your resume to Michelle.Hayes@KohYoung.com.

apply now

THERMAL SYSTEMS

Service Engineer Reflow Soldering Systems (m/f)

To strengthen our service team at Rehm Thermal Systems llc. in Roswell, Georgia, we are seeking candidates to fill the position of Service Engineer— Reflow Soldering Systems.

Your area of responsibility:
- Installation of Rehm reflow soldering systems at the customers' site
- Maintenance and repair work as well as technical service for our customers in the USA and Mexico
- Execution of machine training

Your profile:
- Completed education studies as an engineer in the field of electrical engineering/mechatronics or comparable education (m/f)
- Basic and specialist knowledge in the field of electronics and electrical engineering/ mechatronics
- High willingness to travel and have flexible employment
- Service-oriented and like to work independently

We offer:
- Performance-oriented, attractive compensation
- Comprehensive training
- A safe workplace in one successful group of companies
- Self-responsibility and leeway

Please send application documents online to Natalie Werner at n.werner@rehm-group.com.

apply now

Career Opportunities

MacDermid Alpha
ELECTRONICS SOLUTIONS

Technical Service Rep
Waterbury, CT

Do you have what it takes? MacDermid Alpha Electronics Solutions is a leading supplier of specialty chemicals, providing application-specific solutions and unsurpassed technical support.

The position of the Technical Service Rep will be responsible for day-to-day support for fabricators using MacDermid Alpha's chemical products. The position requires a proactive self-starter that can work closely and independently with customers, the sales group and management to ensure that customer expectations and company interests are served.

- Have a thorough understanding of the overall PCB business, and specifics in wet processing areas.
- Prepare action plans for identification of root cause of customer process issues.
- Provide feedback to management regarding performance.
- Create and conduct customer technical presentations.
- Develop technical strategy for customers.
- Possess the ability to calm difficult situations with customers, initiate a step-by-step plan, and involve other technical help quickly to find resolution.

Hiring Profile
- Bachelor's Degree or 5-7 years' job related experience.
- Strong understanding of chemistry and chemical interaction within PCB manufacturing.
- Excellent written and oral communication skills.
- Strong track record of navigating technically through complex organizations.
- Extensive experience in all aspects of Customer Relationship Management.
- Willingness to travel.

apply now

LIMATA

Service Engineer USA

Limata GmbH, a provider of direct imaging system solutions for the global PCB manufacturing industry and adjacent markets, is looking for qualified candidates to fulfill the role of service engineer in the United States.

Duties:
- Assemble, install, service, and maintain our products
- Inspect the unit towards operating conditions
- Solve technical problems on-site
- Resolve problems with our customers and technical department
- Ability to support our customers in all technical questions

Qualifications:
- Proven experience in microelectronics is preferred
- Willingness to travel
- Strong verbal and written communication skills

To be part of our team, please click below and send your resume to karriere@limata.de.

apply now

Career Opportunities

Manncorp™

SMT Operator
Huntingdon Valley, PA

Manncorp, a leader in the electronics assembly industry, is looking for a technician to operate our new in-house SMT LED assembly lines.

Duties and Responsibilities:
- Set up and operate automated SMT assembly equipment
- Prepare component kits for manufacturing
- Perform visual inspection of SMT assembly
- Participate in directing the expansion and further development of our SMT capabilities

Requirements and Qualifications:
- Prior experience with SMT equipment, or equivalent technical degree preferred
- Basic computer knowledge
- Proven strong mechanical and electrical troubleshooting skills
- Experience programming machinery or demonstrated willingness to learn
- Positive self-starter attitude with a good work ethic
- Ability to work with minimal supervision

We Offer:
- Paid training period
- Health and dental insurance
- Retirement fund matching
- Continuing training

apply now

Manncorp™

SMT Field Technician
Huntingdon Valley, PA

Manncorp, a leader in the electronics assembly industry, is looking for an additional SMT Field Technician to join our existing East Coast team and install and support our wide array of SMT equipment.

Duties and Responsibilities:
- Manage on-site equipment installation and customer training
- Provide post-installation service and support, including troubleshooting and diagnosing technical problems by phone, email, or on-site visit
- Assist with demonstrations of equipment to potential customers
- Build and maintain positive relationships with customers
- Participate in the ongoing development and improvement of both our machines and the customer experience we offer

Requirements and Qualifications:
- Prior experience with SMT equipment, or equivalent technical degree
- Proven strong mechanical and electrical troubleshooting skills
- Proficiency in reading and verifying electrical, pneumatic, and mechanical schematics/drawings
- Travel and overnight stays
- Ability to arrange and schedule service trips

We Offer:
- Health and dental insurance
- Retirement fund matching
- Continuing training as the industry develops

apply now

Career Opportunities

Technical Support Engineer, Germany

We are looking for a technical support engineer to join our team at our German facility in Kirchheimbolanden. The successful candidate will assist potential and current customers in appreciating the benefits of using and optimizing the use of Ventec materials in their PCB manufacturing processes, enhance customer loyalty and satisfaction, spread the use of Ventec materials, and grow sales. The technical support engineer will provide a two-way channel of technical communication between Ventec's production facilities and U.K./European customers.

Skills and abilities required for the role:
- Scientific and technical educational background
- Experience in the PCB industry in engineering and/or manufacturing
- Strong communications skills (German and English) with the ability to write full technical reports for group or customer distribution
- Ability to work in an organized, proactive, and enthusiastic way
- Ability to work well both in a team as well as an individual
- Good user knowledge of common Microsoft Office programs
- A full driving license is essential
- Willingness to travel regularly throughout Europe and occasionally to Asia

We offer:
- Excellent salary and benefits commensurate with experience

This is a fantastic opportunity to become part of a successful brand and leading team with excellent benefits.

Please forward your resume to
applytoventec@ventec-europe.com

apply now

Sales Personnel, Japan

The Gardien Group is looking to expand the sales team in Tokyo, Japan, and seeking highly motivated team players with a positive attitude. Prior experience in the PCB industry is an advantage but not necessary for the right candidate.

The role involves working closely with the customer to identify their needs and deliver the right solution. The candidate should be able to offer a high level of customer satisfaction to ensure ongoing sales.

Training will be provided along with a competitive benefits package, excellent growth opportunities, and periodic bonuses.

Interested candidates, please contact us at careers.jp@gardien.com with your resume.

Kindly note only shortlisted candidates will be notified.

apply now

Career Opportunities

Sales Representatives (Specific Territories)

Escondido-based printed circuit fabricator U.S. Circuit is looking to hire sales representatives in the following territories:

- Florida
- Denver
- Washington
- Los Angeles

Experience:
- Candidates must have previous PCB sales experience.

Compensation:
- 7% commission

Contact Mike Fariba for more information.

mfariba@uscircuit.com
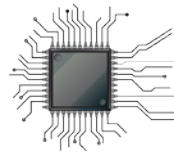
Multiple Positions Available

Want to work for a fast-growing company? MivaTek Global may be the place for your next career move. 2018 has brought significant growth, increasing sales and revenue. And, we are just getting started! To support the current customer base and fuel further expansion, we are looking for bright and talented people who are energized by hard work in a supportive and flexible environment.

Open Positions:
- Technical Service Technicians
- Regional Sales Representatives
- Regional Leader for Asia Sales and Support

Proven experience in either PCB or Microelectronics and willingness to travel required for all positions.

More About Us
MivaTek Global is a distributor of manufacturing equipment with an emphasis of Miva Technologies' Direct Imager, Mask Writer, Flatbed Photoplotter imaging systems and Mach3 Labs X-Ray Drills. We currently have 45 installations in the Americas. Expansion into Asia during 2018 has led to machine installations in China, Singapore, Korea, and India.

To be part of our team, send your resume to n.hogan@kupertek.com for consideration of current and future opportunities.

Career Opportunities

Career Opportunities

Events Calendar

Hannover Fair ▶
April 1–5, 2019
Hannover, Germany

MicroTech 2019 ▶
April 4, 2019
Cambridge, U.K.

NEPCON China 2019 ▶
April 24–26, 2019
Shanghi, China

Del Mar Electronics Show ▶
May 1–2, 2019
Del Mar, California, USA

SMTconnect 2019 Technology ▶
May 7–9, 2019
Nuremberg, Germany

Medical Electronics Symposium 2019 ▶
May 21–22, 2019
Elyria, Ohio, U.S.

Industry 4.0—Smart Factory ▶
May 29, 2019
The Israel Trade Fairs Center, Tel Aviv

PCB Pavilion @ LCD EXPO Thailand ▶
June 27–29, 2019
Bangkok, Thailand

Additional Event Calendars

Coming Soon to *SMT007 Magazine:*

MAY: **How Assemblers Can Help Their Customers**
We survey a cross-section of the Contract Manufacturer market to uncover the tips, tricks and techniques that make the supply chain sing for the customer.

JUNE: **Everything Starts With Design**
A look at the powerful impact that the design phase has on the rest of the manufacturing processes downstream.

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