

2019 YEARBOOK

POWERING THE FUTURE



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Our 2019 yearbook invites you to look back and reflect on a memorable year for Intel.

2019 kicked off with the announcement of our new chief executive, Bob Swan. It was followed by a stream of notable news: product announcements, technology breakthroughs, new customers and partnerships, and important moves to evolve Intel's culture as the company entered its sixth decade.

It's a privilege to tell the Intel story in all its complexity and humanity. Looking through these pages, the breadth and depth of what we've achieved in 12 months is substantial, as is the strong foundation we've built for even greater impact in the future.

I hope you enjoy this colorful look at what's possible when more than 100,000 individuals from every corner of the globe unite to change the world – through technologies that make a positive difference to our customers, to society, and to people's lives.

— Claire Dixon, Chief Communications Officer

NEW CEO. EVOLVING CULTURE. EXPANDED AMBITIONS.

2019 was an important year in Intel's transformation, with a new chief executive officer, ambitious business priorities, an aspirational culture evolution, and a farewell to Focal. Bob Swan spelled out for Wall Street and employees our top priorities: accelerating growth, improving execution and deploying capital for attractive returns. From the data center to 5G to the edge, including investments in artificial intelligence, in the cloud, and in leading-edge manufacturing, "the opportunity is massive," he said. Underpinning an internal culture shift is a focus on increasing truth and transparency, being customer obsessed and fearless, and having a One Intel mindset, with inclusion running through everything. We reached an important milestone in our journey to become a more inclusive workplace when we achieved global gender pay equity. Another big symbol of our evolving culture: replacing Focal, our iconic, love-it-or-hate-it performance management system, with Insights. This new approach rewards results, how they're achieved, and continuous learning.



Displaying a customer-obsessed culture, the Intel leadership team visits with leaders of Quanta, one of Intel's longest-tenured and largest customers, in Taiwan. During their visit, CEO Bob Swan and other leaders also gathered Intel employees for open forums and conversations.



Bob Swan is named CEO in January. He is the seventh CEO in Intel's 51-year history.

MORE DATA. MORE STORAGE. MORE PROCESSING.

Intel's transformation from primarily a maker of PC chips to a solutions provider helping customers move, store and process data reached a tipping point in 2019. It was jump-started with the Data-Centric Innovation Day in April, a formidable portfolio launch that saw customers like cloud giants Amazon and Microsoft turning to 2nd Gen Intel® Xeon® processors for built-in artificial intelligence, and Google and SAP touting Intel's revolutionary Optane™ DC persistent memory. By 2019's third quarter, data-centric revenue had risen to a record 50% of Intel's total, and the Internet of Things Group had achieved its first \$1 billion quarter. "We are pursuing the largest opportunity in Intel's history," said Navin Shenoy when he announced the creation of the Data Platforms Group, realigned to "execute with excellence at a larger scale and quickly adapt to the constantly changing market." And as part of our commitment to security, Intel proactively identified, mitigated, and disclosed vulnerabilities in our products, working with external researchers to do the same.

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Data Platforms Group leader Navin Shenoy (left) greets CEO Bob Swan at the kickoff to Intel's Data-Centric Innovation Day in April.



The Intel Xeon Family is introduced in April as part of a portfolio of data-centric tools to help Intel's customers extract more value from their data.



Intel leaders display new tools to help our customers manage the proliferation of data-rich workloads during Intel's Data-Centric Innovation Day in April.

The Intel Mask Operation team builds the masks used as the templates to print circuitry onto a silicon wafer. To create a mask, engineers use computerized drawings that are the blueprints for Intel processors and their billions of transistors. In Santa Clara, California, engineer Linda-Thiet Q Nguyen inspects a mask.

INNOVATION FOR THE PC USER EXPERIENCE

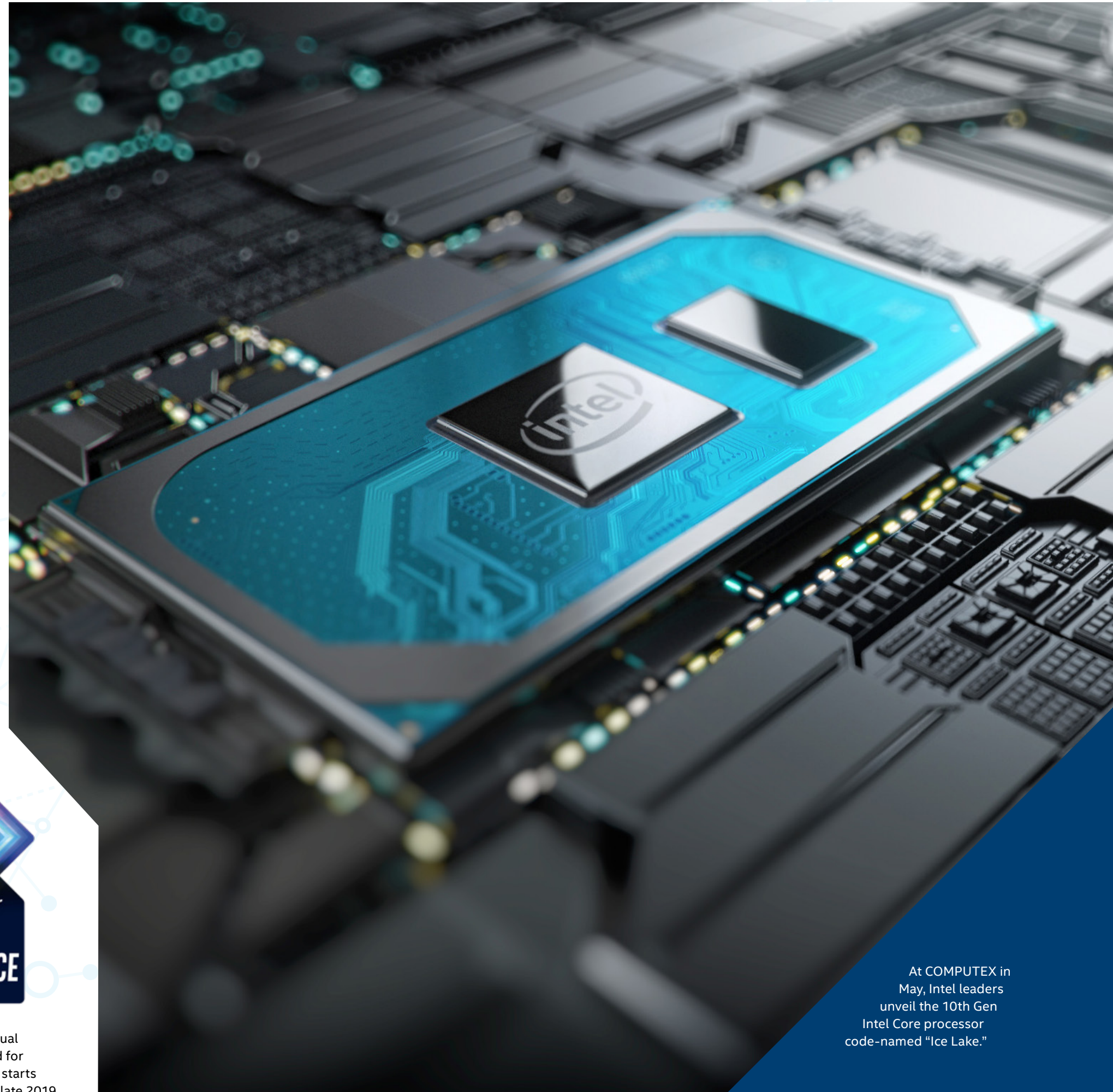
In 1975, Intel helped bring the first personal computer to a broader population with the Intel 8080 CPU. Ever since, the company has been instrumental in making personal computing more powerful and useful. In 2019, we launched a multiyear innovation program to take a new class of laptops that addresses the way people use and are limited by their devices. The first “Project Athena” designs were verified for performance on-the-go with responsiveness, real-world battery life and ultra-fast Wi-Fi 6 and Thunderbolt connectivity. We also boosted mobile PC performance with the launch of 10th Gen Intel® Core™ processors, highlighted by our first volume 10nm mobile processor — code-named “Ice Lake” — with built-in artificial intelligence and double the graphics capabilities^{1,2}. Intel also elevated the gaming experience with a concept laptop called “Honeycomb Glacier,” offering unique dual screens and musclebook performance to inspire new OEM devices, and the i9-9900KS processor, the world’s best desktop gaming processor^{1,3}.



Gregory Bryant, Intel senior vice president, displays an “Ice Lake” system-on-chip with 10nm technology at CES 2019 in January.



The “Project Athena” visual identifier — “Engineered for Mobile Performance” — starts appearing on laptops in late 2019.



At COMPUTEX in May, Intel leaders unveil the 10th Gen Intel Core processor code-named “Ice Lake.”



SELF-DRIVING CARS HIT THE ROAD

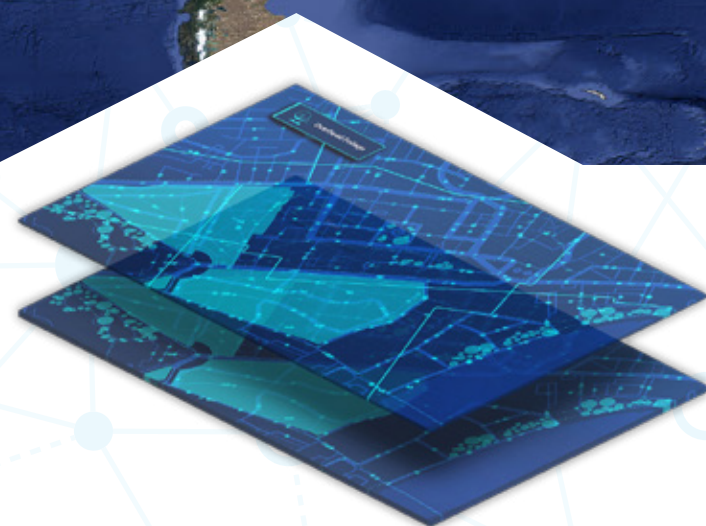
Mobileye, an Intel company, showed how it is making the science fiction of self-driving cars a reality. In November, after analysts at Mobileye's inaugural Investor Summit learned of the company's ambitions to map the world, unleash autonomous robotaxis, and save lives with driver-assistance systems, they piled into test cars to experience urban self-driving firsthand on Jerusalem's challenging streets. Using only camera sensors, the vehicles deftly dodged traffic and smoothly yielded to pedestrians.

Mobileye's unique method to build high-definition maps — ones usable by autonomous vehicles — made considerable inroads with governments that use that data for more than just self-driving cars. Ordnance Survey, Britain's mapping organization, used Mobileye cameras to map road infrastructure, such as signs and lamps, and proved the value of these maps for city planners over existing systems. The map-gathering tech improves safety, too. Barcelona, Spain, equipped 400 of its vehicles with Mobileye, mapping 45,000 kilometers daily and, in the first two months of the project, detecting 240,000 pedestrians and 37,000 cyclists. In the United States, the Michigan government will run a pilot program to retrofit existing state and city fleets with Mobileye to help avoid collisions, improve road safety, reduce collision-related costs, gain insight into local collision hotspots, and prepare the state for autonomous vehicles.



One of Mobileye's camera-only autonomous cars deftly drives on busy urban streets and successfully navigates on and off highways in Jerusalem.

More than 300,000,000 kilometers of roads are covered worldwide so far using Mobileye's high-definition mapping technology. That is equal to the distance from the Earth to the sun and back.



Information on roadside infrastructure harvested by Mobileye-equipped vehicles is layered with external data, allowing city leaders to improve safety and efficiency.

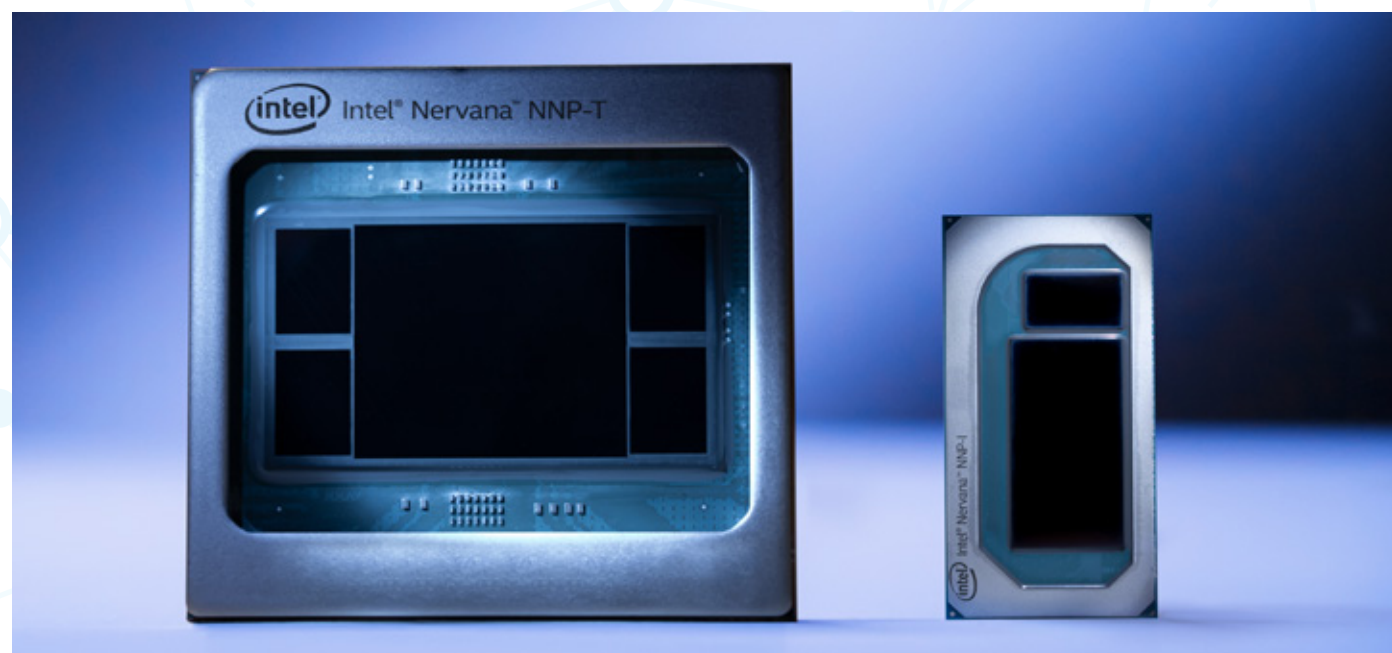


A Mobileye autonomous vehicle gathers data, recognizing surrounding objects as it maneuvers through traffic in Jerusalem.

AI UNLOCKS THE POWER OF DATA

Intel's efforts to infuse artificial intelligence (AI) everywhere kicked into high gear in 2019. Intel's AI-related revenues rose to roughly \$3.5 billion, as customers embraced the world's only CPUs with built-in AI to make better predictions and decisions with data. Intel also introduced chips built specifically for AI, the Intel® Nervana™ Neural Network Processors, with early adopters Baidu and Facebook. Thousands of customers turned to Intel's expanding suite of AI programming tools, including Keemotion to help college basketball coaches make smarter adjustments during practices and games, and GE to diagnose hospital patients with more speed and precision.

Intel's Anna Bethke holds the inside of the TrailGuard AI anti-poaching camera system during a demonstration in the mountains south of Monterey, Calif. The Intel Movidius Myriad 2 chip in the camera uses artificial intelligence to identify potential poachers.



In November, Intel introduces Intel Nervana Neural Network Processors (from left) for training (NNP-T1000) and inference (NNP-I1000). The processors are designed to accelerate artificial intelligence system development and deployment from cloud to edge.

HELPING CUSTOMERS PUSH BOUNDARIES

Intel leaders challenged employees in 2019 to be more customer obsessed so that we can play what CEO Bob Swan called a bigger role in our customers' success. That focus resulted in innovative products and new partnerships across our business. Reducing food waste using blockchain technology. Using artificial intelligence to bridge severe spinal injuries and protect animals from poachers. Working with e-commerce giant Rakuten to build an all-new 5G mobile network that will enable people to view, connect, and share content faster than ever. Providing health technology company Cerner the Intel Optane tools to process records more efficiently, boosting overall patient care. Helping mortgage lenders use artificial intelligence to expand home ownership. Partnering with the English Premier League to provide fans with immersive highlights using Intel 360-degree True View technology. Working alongside companies like Netflix to deliver the latest technology to power data centers.



Queenena Chang, of Lenovo, displays the company's first "Ice Lake" client laptop.



CEO Bob Swan meets with Rakuten CEO Mickey Mikitani in August in Yokohama, Japan, where Rakuten Mobile announced plans to build an end-to-end cloud-native, 5G-ready mobile network.



In partnership with Arsenal FC, Liverpool FC and Manchester City, Intel delivers immersive experiences via Intel True View to the teams' fans worldwide.



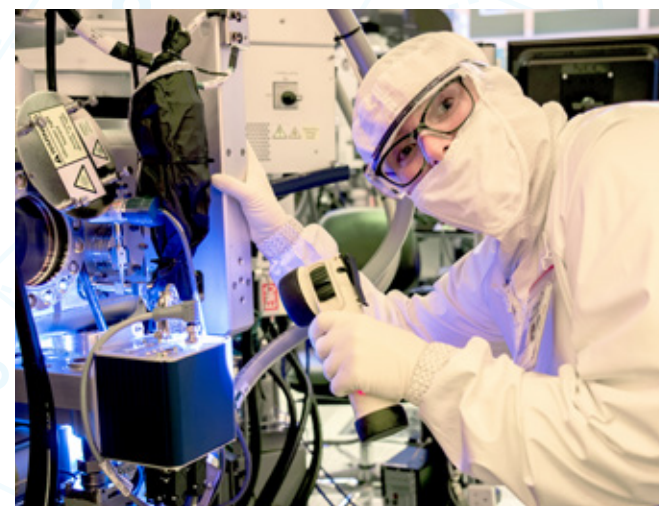
Intel's Ninette Vaz holds two Intel Connected Logistic Platform smart tags before they are placed into blueberry pallets to track shipments at Curry & Co., an Oregon-based fruit distributor.

MORE SUPPLY TO MEET STRONG DEMAND

2019 marked a year of solid progress to overcome manufacturing challenges, including 10nm delays and 14nm supply constraints. Intel boosted capital expenditures, increased the use of foundries, and saw teams in Intel factories worldwide work tirelessly to meet customer demand. Our 10nm “Ice Lake” PC chips and Intel® Agilex™ FPGAs began shipping in high volume. Our 7nm progress remained on track, 5nm development began, and we recommitted to a two-year Moore’s Law cadence of making our computer chips smaller, their circuits faster, and their costs lower. In July, we unveiled innovative new packaging technologies based on two groundbreaking inventions to give chip architects unprecedented flexibility: embedded multi-die interconnect bridge, or EMIB (connecting chips side by side), and Foveros (stacking chips).



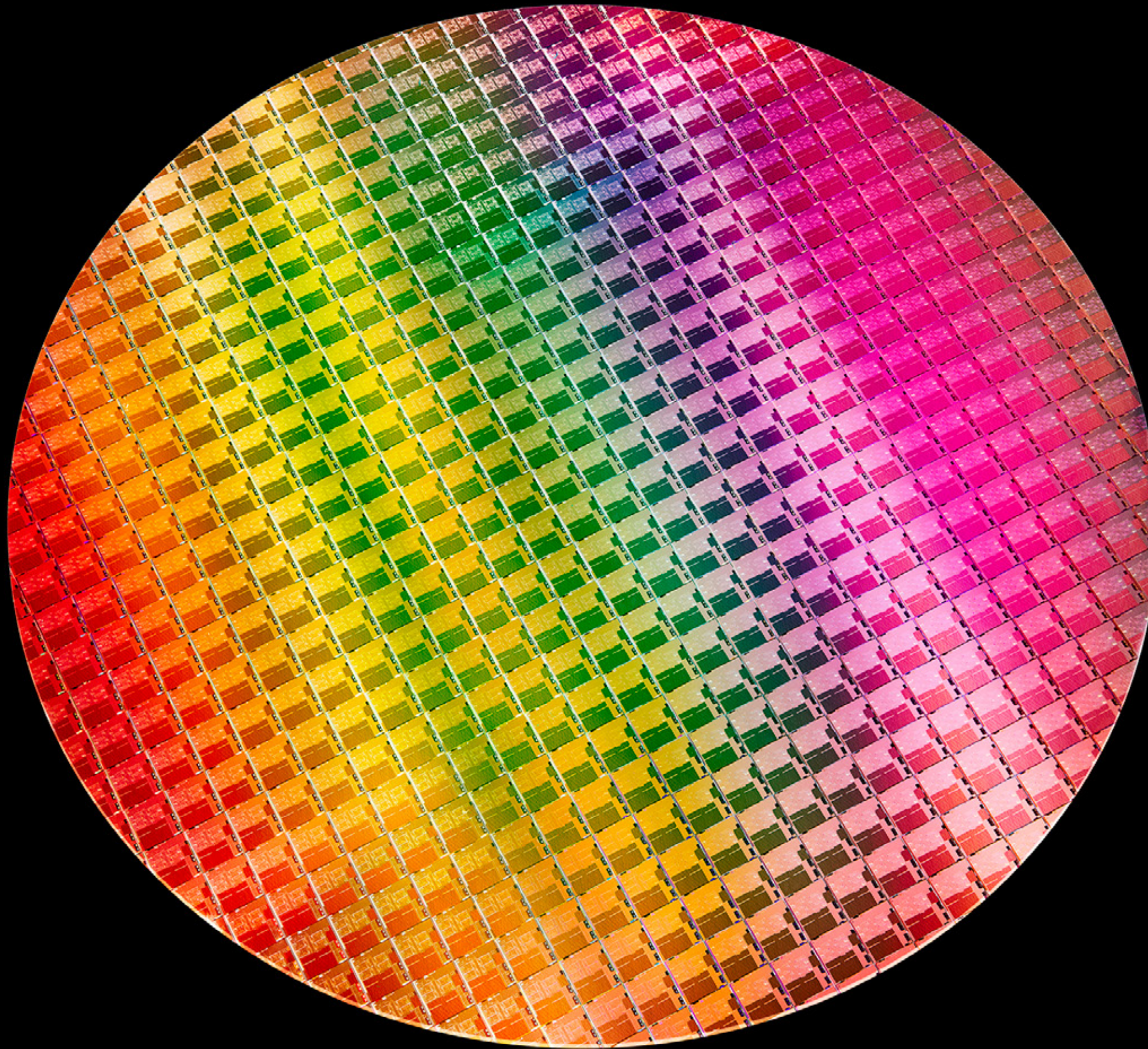
Manufacturing technicians gather inside Intel Vietnam's assembly and test factory, the company's largest at more than 570,000 square feet.



Eimear Leonard works as a manufacturing technician in Ireland's Fab 24.



At Arizona's advanced packaging facility, engineers Gang Duan (left) and Yosuke Kanaoka work with specialized tools on Intel's embedded multi-die interconnect bridge (EMIB) technology.



10th Gen Intel mobile processors, shown on a wafer, have up to 4 cores and 8 threads, up to 4.1 GHz max turbo frequency and up to 1.1 GHz graphics frequency.

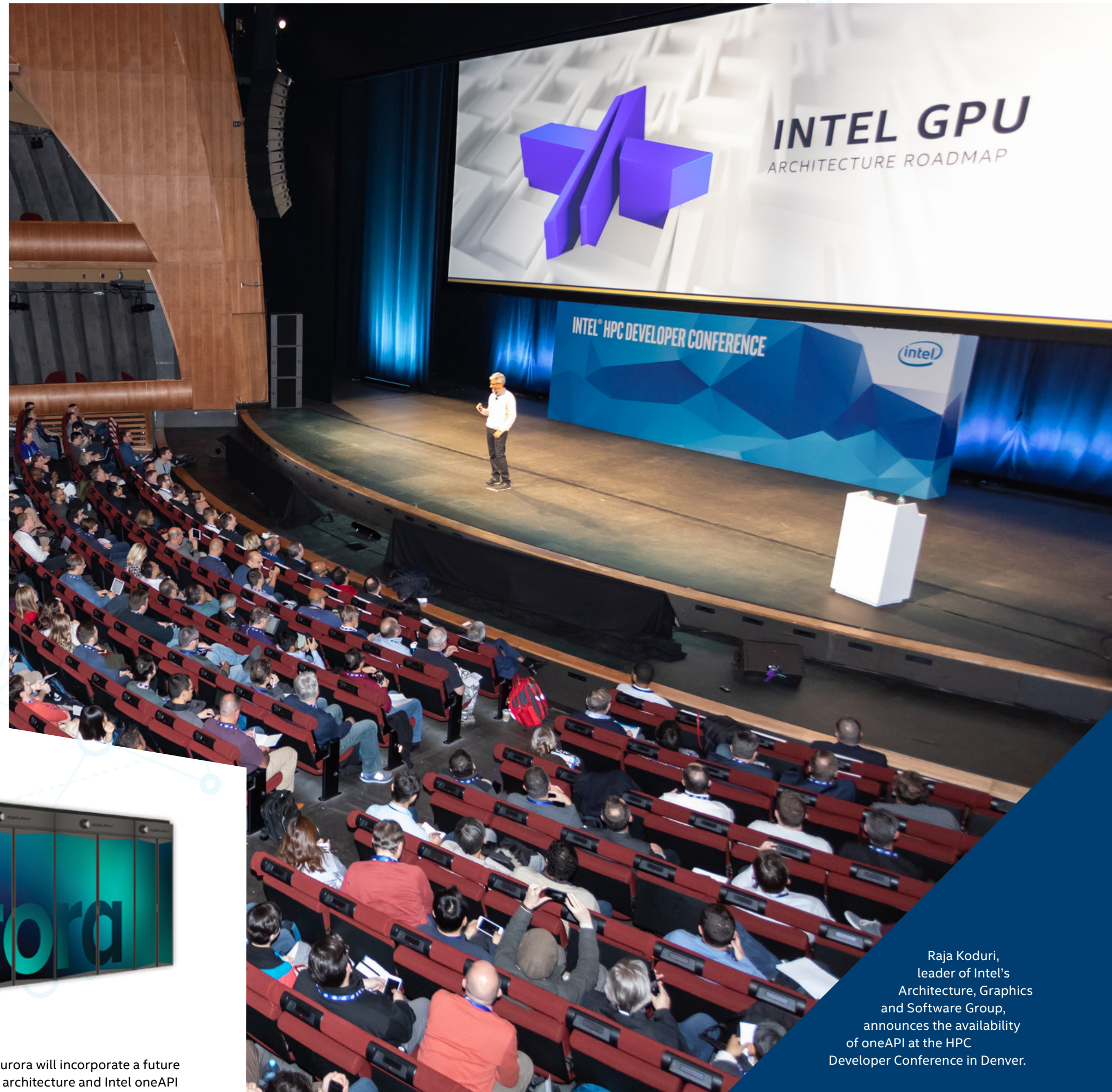
NEXT-GEN HARDWARE AND SOFTWARE TO UNLOCK IT

Intel Xeon processors are the brains powering 94% of the world's top supercomputers today. For tomorrow's supercomputers, Intel expects to help deliver "Aurora" in 2021, the first U.S. exascale supercomputer (capable of at least one quintillion calculations per second), with next-generation "Sapphire Rapids" Intel Xeon processors and "Ponte Vecchio" GPUs for high-performance computing. Software's role is ever-more critical in unlocking the power of hardware. In November, Intel launched oneAPI — the product of millions of engineering hours — as a new programming model that will simplify the work of application developers across diverse hardware architectures. We also kicked off an open oneAPI industry initiative, with 30 leading companies and research organizations supporting this new programming model.

oneAPI



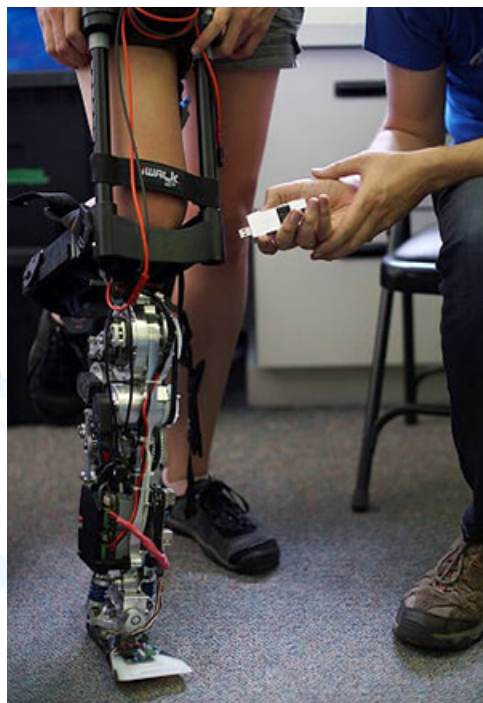
Intel will deliver the Aurora supercomputer to Argonne National Laboratory in 2021. Aurora will incorporate a future Intel Xeon Scalable processor, Intel Optane DC Persistent memory, Intel's Xe compute architecture and Intel oneAPI programming framework. (Credit: Argonne National Laboratory)



Raja Koduri,
leader of Intel's
Architecture, Graphics
and Software Group,
announces the availability
of oneAPI at the HPC
Developer Conference in Denver.

TECH'S FUTURE: INVENTING AND INVESTING

Intel remained focused on inventing the future of technology. Whether it was quantum computing chips to solve problems today's supercomputers can't or exploring how to mimic the human brain in silicon, Intel's engineers and scientists defined the cutting edge of computing. Looking to bolster future growth, Intel acquired Habana Labs for its strong portfolio of AI tools; Ineda Systems for its graphics expertise; Omnitek to strengthen FPGA video and vision offerings; Barefoot Networks to accelerate delivery of Ethernet-based fabrics; and the Smart Edge software platform from Pivot Technology Solutions to speed development of the edge computing market. Through research, investments, and more, Intel continually aimed to create world-changing technologies that enrich lives.

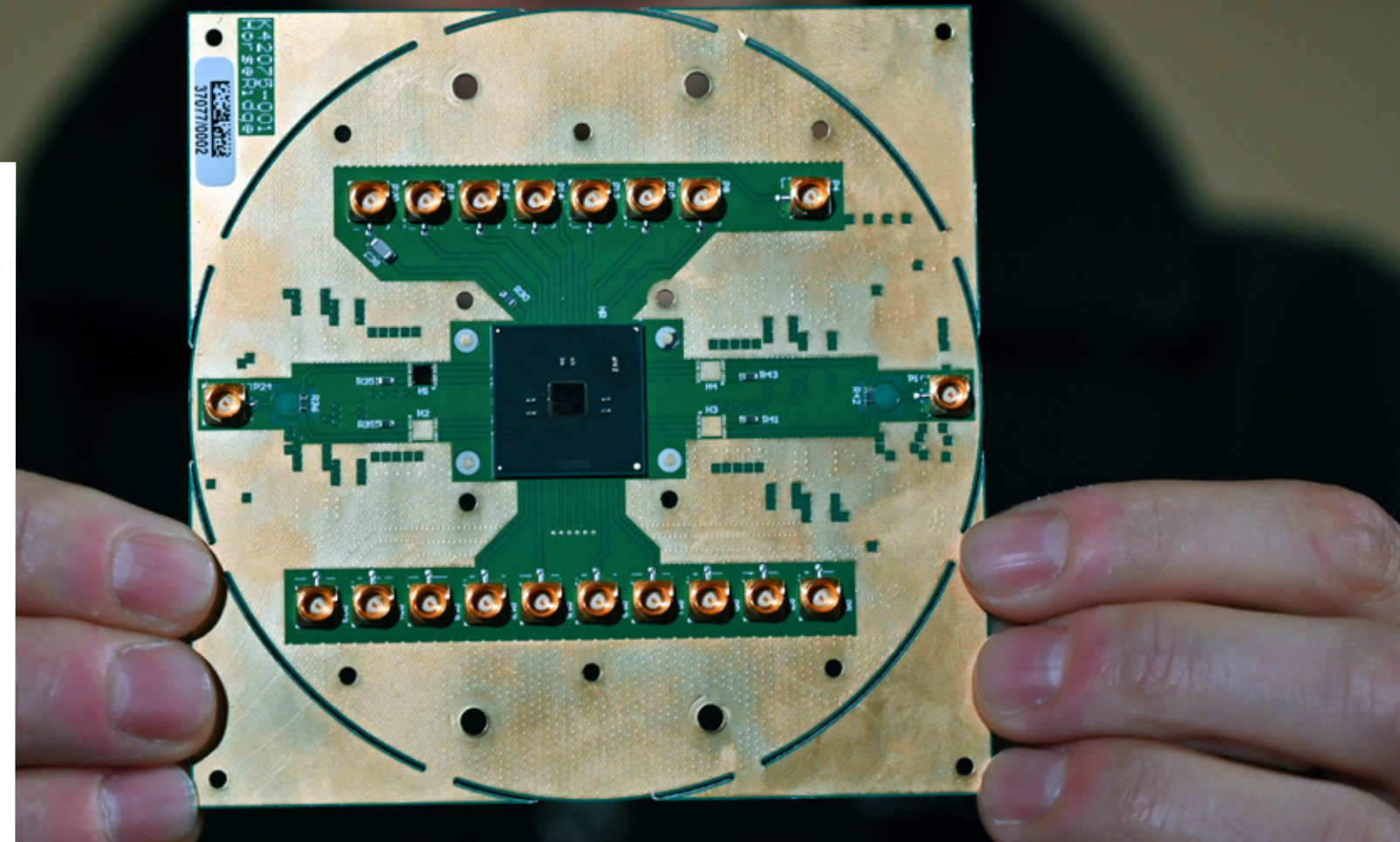


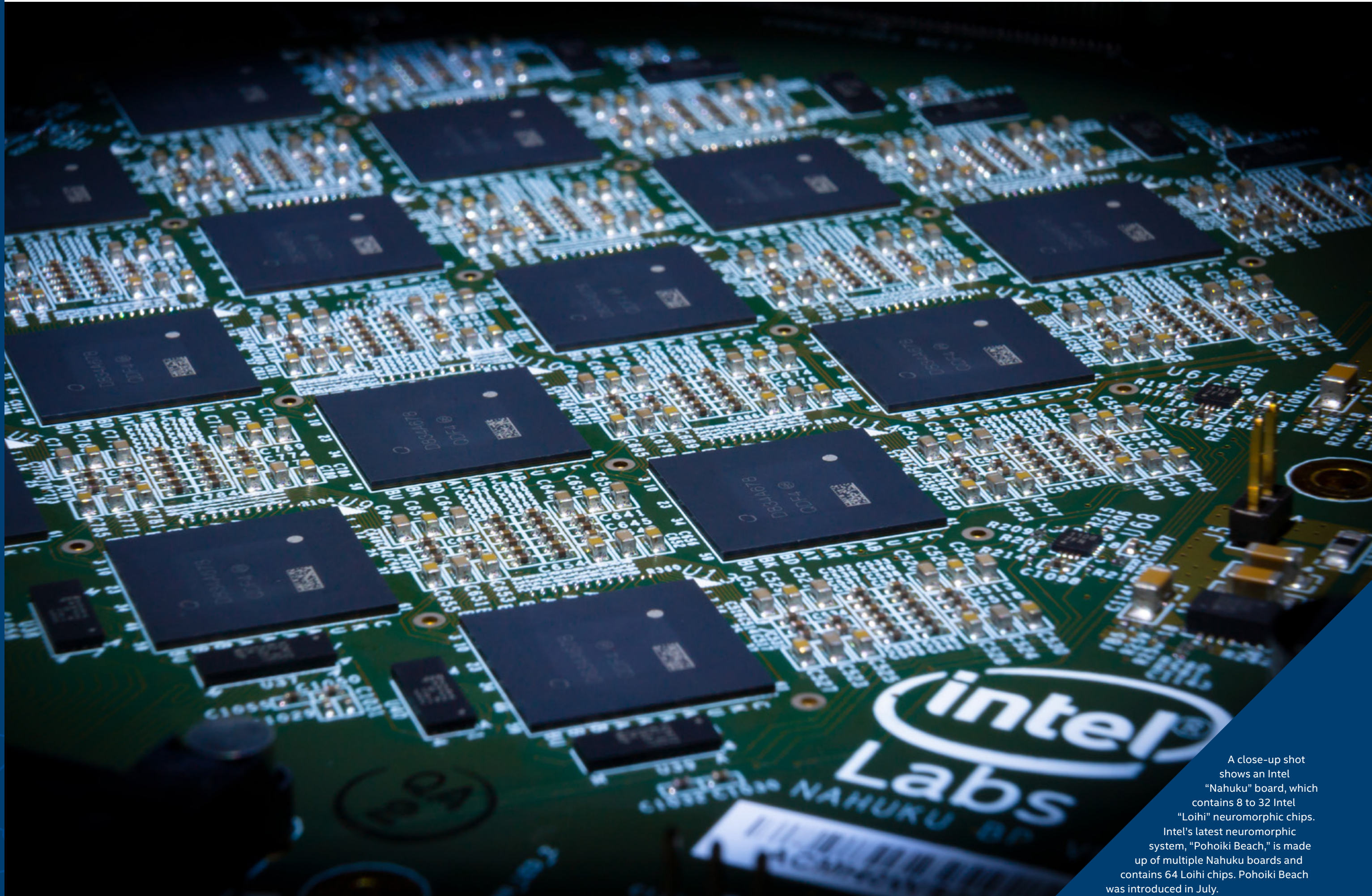
Rachel Gehlhar of Caltech's AMBER Lab and Terry Stewart of Canada's National Research Council control the experimental AMPRO3 prosthetic leg. Embedded with Intel's "Kapoho Bay" "Loihi" device, the leg helps its owner adapt to unforeseen motion disturbances.



Nick McKeown, co-founder, chief scientist and chairman of Barefoot Networks; Navin Shenoy, Intel executive vice president and general manager of the Data Platforms Group; Bob Swan, Intel CEO; and Craig Barratt, CEO of Barefoot Networks; stand outside Barefoot Networks' headquarters in June.

Principal engineer Stefano Pellerano holds a printed circuit board that contains an integrated circuit (code-named "Horse Ridge") built on Intel's 22nm FinFET Low Power Technology used for quantum computing research.





A close-up shot shows an Intel "Nahuku" board, which contains 8 to 32 Intel "Loihi" neuromorphic chips. Intel's latest neuromorphic system, "Pohoiki Beach," is made up of multiple Nahuku boards and contains 64 Loihi chips. Pohoiki Beach was introduced in July.

REINFORCING THE NATURE OF MOORE'S LAW

Reports of Moore's Law's end aren't just exaggerated, they're flat out wrong. "Moore's Law is relentless." Those are the messages Silicon Engineering Group leader Jim Keller delivered to more than 100 software developers in San Francisco at Silicon100. At the first-of-its-kind event, technical leaders shared Intel's clear path to continue Moore's Law, which predicted the inexorable improvement and increase in integrated circuit technology. Intel Chief Technology Officer Mike Mayberry said, "Moore's Law is not a law of nature; it is an expectation of continued innovation." He shared Intel's latest innovations in architecture, materials, and scaling with a simple message: "Moore's Law only ends when we run out of ideas." And, he promised, we still have plenty of ideas.



Chief Technology Officer Mike Mayberry speaks in June at Silicon100 in San Francisco. The event was devoted to discussing the future of Moore's Law.



Intel engineers lead technical demonstrations at Silicon100. The event offered visitors the chance to hear directly from the people creating the technology.



Silicon Engineering Group leader Jim Keller offers an introduction to microprocessor architecture to a group of software developers in June at Silicon100 in San Francisco.

BUILDING FOR THE SMARTER FUTURE

Factory expansions, new high-tech buildings and millions invested in startups fueled Intel's readiness for the future. Arizona's Fab 42 was outfitted with more than a thousand wafer tools to launch our next-generation 10nm manufacturing process. Construction continued on factory additions in Oregon, Israel, and Ireland. In Petah Tikva, Israel, Intel unveiled the "smartest building in the world," boasting 14,000 sensors to do everything from flagging open conference rooms to conserving water. In Jerusalem, Mobileye CEO Amnon Shashua and Israeli Prime Minister Benjamin Netanyahu laid the cornerstone for Mobileye's global development center — the largest real estate investment in that nation's history. And Intel Capital announced its largest round of venture fund investments: \$117 million in 14 technology startups, many focused on artificial intelligence.



Mobileye CEO Amnon Shashua (left) and Israeli Prime Minister Benjamin Netanyahu break ground in August on a new global development center in Jerusalem.



Leaders from 14 tech startups join Intel Capital President Wendell Brooks at the 19th annual Intel Capital Global Summit in April.



An aerial view shows Arizona's Fab 42, one of the world's most advanced factories.

Sources

1. Software and workloads used in performance tests may have been optimized for performance only on Intel microprocessors. Performance tests, such as SYSmark and MobileMark, are measured using specific computer systems, components, software, operations and functions. Any change to any of those factors may cause the results to vary. You should consult other information and performance tests to assist you in fully evaluating your contemplated purchase, including the performance of that product when combined with other products.
2. Approx. 2x Ice Lake Graphics Performance: Workload: 3DMark11 v 1.0.132. Intel PreProduction ICL U4+2 15W Configuration (Assumptions);, Processor: Intel® Core™ i7 (ICL-U 4+2) PL1=15W TDP, 4C8T, Memory: 2x8GB LPDDR4-3733 2Rx8, Storage: Intel® 760p m.2 PCIe NVMe SSD with AHCI Microsoft driver, Display Resolution: 3840×2160 eDP Panel 12.5", OS: Windows* 10 RS5-17763.316, Graphics driver: PROD-H-RELEASES_ICL-PV-2019-04-09-1006832. Vs config – Intel PreProduction WHL U4+2 15W Configuration (Measured), Processor: Intel® Core™ i7-8565U (WHL-U4+2) PL1=15W TDP, 4C8T, Turbo up to 4.6 GHz, Memory: 2x8GB DDR4-2400 2Rx8, Storage: Intel® 760p m.2 PCIe NVMe SSD with AHCI Microsoft driver, Display Resolution: 3840×2160 eDP Panel 12.5", OS: Windows* 10 RS4-17134.112., Graphics driver: 100.6195. Measured by Intel as of April 2019.
3. As measured by in-game benchmark mode performance (score or frames per second) where available, or frames per second where benchmark mode is unavailable. PC Gaming Processors Compared: 9th Gen Intel® Core™ i9-9900KS, 9th Gen Intel® Core™ i9-9900K, Intel® Core™ i9-9980XE Extreme Edition, Intel® Core™ i9-9960X X-series, Intel® Core™ i9-9940X X-series, AMD Ryzen™ 9 3900X, AMD Ryzen™ 7 3800X, AMD Ryzen™ 7 3700X, AMD Ryzen™ 5 3600X, and AMD Ryzen™ 7 2700X. Prices of compared products may differ. Configurations: Graphics: Nvidia GeForce RTX 2080 Ti, Memory: 2x8GB DDR4 or 4x4GB DDR4 (2666, 2933 or 3200 per highest speed of the corresponding processor), Storage: Intel Optane SSD 900P, OS Windows 10 Pro 1903 v175 19H1(RS6). Results: 9th Gen Intel® Core™ i9-9900KS scored better on the majority of the 20+ game titles tested. Intel® Core™ i9-9900KS is a special edition of Intel® Core™ i9-9900K, with even better performance.



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