Consumer Electronics
CES 2019

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SMTA
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CES 2019 – The Buzz

5G, AI, voice assistant, and privacy were major buzz words

Amazon Alexa and Google Assistant compatibility has become standard

Many mobile phone releases delayed until Mobile World Congress in Barcelona

Consumer medical electronics surge

8K displays everywhere while 8K content still lags
Headlines
8k Displays

Sony and Samsung releasing 65, 75, and 82" models

TCL and Roku Collaboration

Large 8k LCDs and 55" 4k OLED technology refined

8k content created either via AI upscaling or specialized cameras

Sharp’s 8k consumer camera 8k TV with Hisense

LG 8k OLED TV

Samsung releasing 65, 75, and 82” models
Sharp Electronics Addresses Lack of 8K Content

Sharp suggests that consumers should use an 8K camera to create content (photos) that can be viewed on an 8K TV.

Sharp’s 80” TV and all cell phones use IGZO.
Other Display Highlights

• LG
  – Roll-up display

• Samsung
  – MicroLED display shrunk to 75”

• Vizio
  – Extreme TV brightness (2,900 nit)

• HP
  – Quantum dot on glass display

• HP/Dell/Lenovo
  – OLED laptop screens
  – Reappearance

• HP/Dell/Lenovo
  – 4K near eye displays
  – Working with LG
5G Dominance
Qualcomm battles Intel

Partnerships, displays, and novel technology are all fighting for attention
Small Cells Must Appear Everywhere (Re-Allocated Radio Waves Travel Much Shorter Distances)

- Train station small cell
- City-block small cells
- Main Base Station
- Small cells on streetlights
- Small cells on telephone poles
- Small cells near businesses
- Small cells for deep city blind spots
5G Equipment

Samsung and Intel demonstrate 5G infrastructure equipment
Applications and Demonstrations
Intel 5G Holographic Demonstration on Tactile Augmented Reality

Qualcomm streams 4K video over 5G

Intel’s 5G display enables VR capability
(Bill M. passing items to drone)

5G smartphone was kept under a glass case (Samsung)
Gaming and Virtual Reality
Personal Autonomous Shuttles Everywhere

Bosch

Denso

Mercedes

ZF

Continental

Trolley

Simpler and cheaper solution for repeatable urban routes?
Bell Nexus Quadcopter

Bell helicopter debuts full-size transport drone in their second CES appearance

Capable of carrying four passengers, this prototype is a major step toward Uber’s goal of rolling out an on-demand air service by 2023
Automotive Lighting
- Smart Helmets, Smart Lighting Therapy

OSRAM partnered with Tesla for lighting
Industrial Automation

AI OMRON
autonomous ping-pong
and pick and place

John Deere
Autonomous tractors

Automation capable of wowing consumers at Ping-Pong has tremendous potential in industrial automation
BreadBot – The Robot Breadmaker

The BreadBot is a bread-making machine that mixes, kneads, bakes, and cools bread without human intervention.

- The BreadBot can produce 10 loaves per hour (235 loaves per day).
- There are more than 70 sensors to control water temperature, mixer speed, loaf height, crust browning.

Ingredients in

Bread out

The BreadBot is a bread-making machine that mixes, kneads, bakes, and cools bread without human intervention.
Significance

TV and cell phone developments incremental but showcase future technologies

Massive infrastructure investment ongoing, 5G is definitely coming but debatably not “here”

48V, SiC chips, and transition to “high rel” alloys. Automation and are a force to be reckoned with
Normalization
Consumer Medical

Consumer Electronics

Clinical Equipment

Source: IBM Institute for Business Value.
Skip the Doctor - At Home Tests

1. Test your vision
2. Measure your pupil distance
3. Receive refraction results
4. Order eyeglasses with a click

Skip the Optometrist

Skip the Radiologist

Ultrasound-on-chip technology replaces the traditional piezo transducer with a single silicon chip

Avoid unnecessary trips to the ER by checking for broken bones at home
Electronics VS Opioids

Quell is a class II FDA registered device approved for use during sleep.

Nerve bundles in the calf are electrically stimulated, sending signals to release endorphins in the brain triggering pain relief.

Motorola Smart Safe for Opioids

- Wi-Fi Internet connected
- Remote open from anywhere
- Smartphone alerts when tampered

PCBs are manufactured in the northeast.

Warehouse scanner access.
Major Medical Implantable Companies Make First Appearance at CES 2019

Nerve and brain stimulators

40’ x 40’ booth shared among medical implantable competitors
Abbott bought Apple’s last 67,000 discontinued iPods as controllers as they are more secure than phone apps.

Electrical impulses treat neural pathology in the auditory cortex and also treat chronic pain using spinal cord stimulation (SCS) devices.

Vercise deep Brain stimulator is approved by the FDA to treat Parkinson's disease.

Spectra Wavewriter is an implantable spinal stimulator that can treat chronic pain.
Medical Implantables (2)

Nevro manufactures brain/spine stimulators at 10,000 Hz - a higher frequency than competitors’ devices.

Medtronic rep’s personal collection of defibrillators, pacemakers, and PillCams demonstrate top-tier medical miniaturization.

Devices are built all over the world by many different contract manufacturers.
Smart Pet Products

- **Smart pet robot playmate**
- **Facial recognition pet food dispenser**
- **Moving water cat bowl**
- **Smart treat dispenser**

Take a break from work to play with your dog via smartphone-controlled robot.
Electronics in the Pet Supply Market

2018 Statistics on pet spending

Sterilize your Pet in this $600 Doggy Spa
Value Added Electronics

Smart Fitness and Smart Hygiene

JAXJOX Kettlebell counts reps, shares workouts with your friends and electronically adds or remove internally concealed weights.

Heating element 110 °F

Gillette adds heated blades to razors for that “Hot Towel Shave” effect.
Smart Bathrooms Find Purpose
- Airport Maintenance

- Concourse B – Restroom B29, replace towel #5
- Concourse A – Restroom A14, stall #4, use up 314% - Maintenance required!

Smart bathrooms alert custodial staff when maintenance is needed
Household IoT
Bob – The Countertop Dishwasher

“Bob” the mini dishwasher, cleans and dries the daily dishes of two people in 20 minutes with 3 liters of water

Smart home products have become believable! And everything is connected to Amazon or Google – integration and security an ongoing concern.
Significance

- **Consumer Medical**: Capability/testing vs pricing. Wearables are low temp linked and battery dependent.
- **Traditional Medical**: Growing market. Fine pitch and high reliability challenges increasing.
- **IoT**: Increasing applications and tied to low cost, low power, and security concerns.
Consumer Electronics... and Beyond

48V

What 48-volt can do:
- Catalyst e-heater
- Steering e-assist
- Heating ventilation and AC blower
- Cooling fan
- Coolant pump
- AC compressor
- Windshield heater
- Heated seats
- Chassis control
- Engine and transmission pumps

Source: Motor Magazine
Thank you for your Attention
Implications

• Artificial intelligence (AI) becomes mainstream
• Highways become much safer
• The concept of healthcare changes radically
• All of this IoT (Internet of Things) stuff finally works
• We get security figured out
Gartner Hype Cycle

Emerging Technologies, 2019

- Biochips
- AI PaaS
- Edge Analytics
- Autonomous Driving Level 5
- Low-Earth-Orbit Satellite Systems
- Edge AI
- Explainable AI
- Personalization
- Knowledge Graphs
- Synthetic Data
- Light Cargo Delivery Drones
- Transfer Learning
- Flying Autonomous Vehicles
- Augmented Intelligence
- Nanoscale 3D Printing
- Decentralized Autonomous Organization
- Generative Adversarial Networks
- Decentralized Web
- AI Cloud
- Biotech - Cultured or Artificial Tissue
- Graph Analytics
- Next-Generation Memory
- 3D Sensing Cameras
- Emotion AI
- DigitalOps
- Adaptive ML
- Immersive Workspaces
- Autonomous Driving Level 4

Time

- Plateau will be reached
  - less than 2 years
  - 2 to 5 years
  - 5 to 10 years
  - more than 10 years
  - obsolete before plateau

As of August 2019
Indium Topics of Interest

• Quantum Computing
• Server centers
• VCSEL
• 48V vehicles
• Liquid metal – flexible electronics
• Display thin film transistors
Quantum Hardware

• Cloud Computing

• Quantum Computing
Healthcare 2.0
Drone Golf Cart