Automotive Sensor Venture and M&A activity
An overview of recent deals, trends, and developments

June 14th 2017
Important Disclosure

The Information and opinions in this report have been prepared by Woodside Capital Partners International, LLC, and its affiliate, Woodside Capital Securities, LLC (collectively, “Woodside”). All information supplied or obtained from this report is for informational purposes only and should not be considered investment advice or guidance, an offer of or a solicitation of an offer to buy or sell a security, or a recommendation or an endorsement by Woodside Capital Securities, LLC, Woodside Capital Partners International, LLC and Woodside Capital Partners UK, LLP of any security. Further information on any of the securities mentioned in this report may be obtained from our offices. Other than disclosures relating to Woodside Capital Securities, LLC the information herein is based on sources we believe to be reliable but is not guaranteed by us and does not purport to be a complete statement or summary of the available data. Any opinions expressed herein are statements of our judgment on this date and are subject to change without notice. Periodic updates may be provided on companies/industries based on company specific developments or announcements, market conditions or any other publicly available information.

Important Disclosures:

Woodside Capital Securities, LLC is not a market maker in any securities mentioned in this report.

Woodside Capital Securities, LLC and their officers and employees may from time to time acquire, hold, or sell a position in the securities mentioned in this report. Woodside Capital Securities, LLC compensates individuals for activities and services intended to benefit the firm’s investor clients. Compensation determinations for individuals, including the author(s) of this report, are based on a variety of factors, and may include the overall profitability of the firm and the revenues derived from all sources, including revenues from investment banking.

Woodside Capital Securities, LLC is a registered broker-dealer and member of FINRA (www.finra.org) and SIPC (www.sipc.org).

Woodside Capital Securities, LLC is an affiliate of Woodside Capital Partners International, LLC and Woodside Capital Partners UK, LLP.

One or more private companies in this report have confidentially retained Woodside Capital Securities, LLC, Woodside Capital Partners International, LLC or Woodside Capital Partners UK, LLP as an advisor. In addition, in the future Woodside may seek to offer investment banking services to, and collect fees from, any of the companies featured in this report.

Third Party Disclosures:

Any analyst opinions, ratings, and public company reports included in this report are provided by third-parties unaffiliated with Woodside Capital Securities, LLC, Woodside Capital Partners International, LLC and Woodside Capital Partners UK, LLP. Woodside Capital Securities, LLC, Woodside Capital Partners International, LLC and Woodside Capital Partners UK, LLP makes no guarantees that information supplied is accurate, complete, updated or timely, and does not provide any warranties regarding results obtained from its use.
Automotive Sensing Systems - Market Map

Vision
- Camera Outward
  - AEROSTAR
  - ASAP
  - ADVANCE
  - itseez
  - Moblieye
  - SENS
  - SENSORS
  - Valeo

LiDAR
- AEC
- ALTRAX
- BOSCH
- DENSO
- FUTURO
- OCULAR
- PIONEER
- RIEGL
- SICK
- STROBE
- Velodyne

Radar
- AEC
- ALTRAX
- BOSCH
- DENSO
- FUTURO
- OCULAR
- PIONEER
- RIEGL
- SICK
- STROBE

V2X
- Azuga
- Cohda
- DANLW
- LEAR
- LEONIS
- SAYARI
- TTTech
- VENIAM

AI / Sensor Fusion
- AMOTIVE
- Ambarella
- ARGO AI
- comma.ai
- drive.ai
- Elektrobit
- nuTonomy
- PEARL
- Zededa

Semis & Components
- ARM
- ARM
- BMW
- Bosch
- Cypress
- Freescale
- Intel
- Infineon
- LG
- Mitsubishi
- NVIDIA
- NVIDIA
- NXP
- Qualcomm
- Renesas
- Sony
- Texas Instruments
- TSMC
- Toshiba
- Xilinx
Competitive Landscape

Suppliers
- Lens set vendors
  - LARGAN
  - Sunex
  - Panasonic
  - SEKONIX
  - GSEO
  - MLL
  - LG Innotek
  - Calin
  - Umicore

- Sensor vendors
  - On Semiconductor
  - Omnivision
  - STI
  - Melexis
  - Panasonic
  - Sony

- Data & Power Management
  - NXP
  - Fujitsu Ten
  - Mobileye
  - STI
  - Renesas
  - Toshiba
  - Qualcomm
  - Atera
  - ARM
  - Intel
  - Xilinx

New Entrants
- Four Nations
- Chrono Cam
- InVisage
- BrightWay Vision
- Quanergy
- Infineon
- PMD
- SoftKinetic

Automotive Camera Makers
- Panasonic
- Sony
- Fujitsu
- Valeo
- LG Innotek
- Magna
- MCNex
- SeikoNix
- Calin
- Film

Substitute Technologies
- Car as a service
  - Uber
  - Didi
  - Google

Buyers
- Automotive brands
  - Volvo
  - VW
  - Toyota
  - BMW
  - Audi
  - Tesla
  - Ford
  - GM
  - Nissan
  - Hyundai

- Tier One – Tier Two
  - Bosch
  - Delphi
  - Magna
  - Continental
  - Denso
  - Valeo

Yole Development, 2017
Sensor Modules Market Value for ADAS (US$B)

Yole Development, 2017
Auto Tech Annual Global Financing History
2012 – 2017 YTD (5/19/2017)
Automotive Sensing Private Placements by Region (Last 3 Years)

- **US and Canada**
  - Deals: 41
  - $1.79 billion

- **Europe**
  - Deals: 10
  - $49 million

- **Middle East**
  - Deals: 8
  - $484.4 million

- **Asia (Asia and Oceania)**
  - Deals: 4
  - $21.1 million

*Source: Capital IQ*
Semiconductor Revenue by ADAS Application

$1.8B - $2.0B

$4.6B - $5.3B

Venture Investment by Sector: 2012-2017

By Deal Volume (65 Transactions):
- Automotive AI/Control Software: 33%
- Automotive LiDAR: 16%
- Automotive Radar: 6%
- Automotive V2X: 23%
- Automotive Vision: 22%

By Dollars Invested ($2.3 B):
- Automotive AI/Control Software: 56%
- Automotive LiDAR: 14%
- Automotive Radar: 0%
- Automotive Vision: 20%
- Automotive V2X: 10%

Source: CapitalIQ
# Most Active Venture Investors

<table>
<thead>
<tr>
<th>Venture Firms</th>
<th>Company</th>
</tr>
</thead>
</table>
| **Accel**                | 1. Blue Vision Labs  
                            | 2. DeepMap  
                            | 3. Pearl          |
| **ANDREESEN HOROWITZ**   | 1. Comma.ai  
                            | 2. DeepMap  
                            | 3. Local Motion   |
| **BESSEMER VENTURE PARTNERS** | 1. Deepscale  
                            | 2. Oryx Vision  
                            | 3. Otonomo        |
| **DRAPER NEXUS**         | 1. AIMOTIVE  
                            | 2. Nauto          |
| **MANIV MOBILITY**       | 1. Autotalks  
                            | 2. Drive.AI  
                            | 3. Nexar  
                            | 4. Oryx Vision    |
| **PLUG AND PLAY**        | 1. Caruma Technologies  
                            | 2. CloudCar  
                            | 3. Driveway Software  
                            | 4. Nauto          |

Source: CapitalIQ, Crunchbase, Firm Websites
# Most Active Corporate Investors

<table>
<thead>
<tr>
<th>Strategic Investor</th>
<th>Company</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BMW</strong></td>
<td>Nauto</td>
</tr>
<tr>
<td></td>
<td>RideCell</td>
</tr>
<tr>
<td></td>
<td>Stratim</td>
</tr>
<tr>
<td></td>
<td>Zendrive</td>
</tr>
<tr>
<td><strong>Delphi</strong></td>
<td>Quanergy</td>
</tr>
<tr>
<td><strong>DiDi</strong></td>
<td>99 Taxis</td>
</tr>
<tr>
<td></td>
<td>Lyft</td>
</tr>
<tr>
<td><strong>Qualcomm Ventures</strong></td>
<td>Brain Corp</td>
</tr>
<tr>
<td></td>
<td>Cruise Automation</td>
</tr>
<tr>
<td></td>
<td>iOnRoad</td>
</tr>
<tr>
<td></td>
<td>Swift Navigation</td>
</tr>
<tr>
<td><strong>Bosch</strong></td>
<td>AIMOTIVE (formerly AdasWorks)</td>
</tr>
<tr>
<td></td>
<td>Chronocam</td>
</tr>
<tr>
<td></td>
<td>TetraVue</td>
</tr>
<tr>
<td><strong>Samsung</strong></td>
<td>Autotalks</td>
</tr>
<tr>
<td></td>
<td>CarVi</td>
</tr>
<tr>
<td></td>
<td>NuTonomy</td>
</tr>
<tr>
<td></td>
<td>Quanergy Systems</td>
</tr>
</tbody>
</table>

Source: CapitalIQ, Crunchbase, Firm Websites
# Private Automotive LiDAR Companies to Watch

<table>
<thead>
<tr>
<th>Company</th>
<th>Description</th>
<th>Capital Raised</th>
<th>Last Round</th>
<th>Investors</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>blackmore</strong></td>
<td>Develops frequency-modulated wave lidar imaging and supporting analytic tools</td>
<td>$3.5 M</td>
<td>Dec. 2016</td>
<td>Millennium Technology Ventures, NEXT Frontier Ventures</td>
</tr>
<tr>
<td><strong>INNOVIZ TECHNOLOGIES</strong></td>
<td>Develops smart 3D sensing, sensor fusion, and mapping/localization for autonomous driving</td>
<td>$9.0 M</td>
<td>Aug. 2016</td>
<td>Amiti Ventures, Delek Group, Magma Venture Partners, Vertex Ventures</td>
</tr>
<tr>
<td><strong>LeddarTech</strong></td>
<td>Develops LED detection and ranging solutions for recognition and distance measurement apps</td>
<td>$16.0 M</td>
<td>Nov. 2014</td>
<td>Access Capital, BDC Venture Capital, Go Capital, GO Capital Fund</td>
</tr>
<tr>
<td><strong>LUMINAR</strong></td>
<td>Produces advanced sensor technologies for the autonomous vehicle industry</td>
<td>$36.0 M</td>
<td>Apr. 2017</td>
<td>1517 Fund, Canvas Ventures, GVA Capital</td>
</tr>
<tr>
<td><strong>Phantom Intelligence</strong></td>
<td>Phantom Intelligence develops an innovative LiDAR technology that has the capacity to reduce the occurrence of collisions</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td><strong>Private Automotive LiDAR Companies to Watch</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Crunchbase, Company Websites

---

**Phantom Intelligence** offers Geiger-mode (APD) cameras for three-dimensional laser radar imaging (LiDAR imaging) | Capital Raised: NA | Last Round: NA | Investors: NA
Private Automotive LiDAR Companies to Watch

**Quanergy**
LiDAR sensors and software that capture and process real-time 3D mapping data
Capital Raised: $135.3 M
Investors: Daimler, Delphi Automotive, Rising Tide, Samsung Ventures

**SensL**
Leading provider of low light detection solutions
Capital Raised: $2.1 M
Last Round: Jan. 2011
Investors: Horizons AIB Seed Capital Fund, Delta Partners, Enterprise Ireland

**Tetravue**
Provides 3D and optics Time of Flight (TOF) technology solutions.
Capital Raised: $10.0 M
Last Round: Feb. 2017
Investors: Foxconn Technology, Nautilus Venture Partners, Robert Bosch, Samsung

**TriLumina**
Developing semiconductor laser solutions for ADAS and autonomous driving systems
Capital Raised: $36.4 M
Last Round: May. 2017
Investors: Caterpillar Ventures, Cottonwood Tech. Fund, Stage 1 Ventures

**Velodyne**
Leading developer, manufacturer and supplier of real-time LiDAR sensor technology
Capital Raised: $150.0 M
Investors: Baidu, Ford Motor Company

Source: Crunchbase, Company Websites
### Private Automotive RADAR Companies to Watch

<table>
<thead>
<tr>
<th>Company</th>
<th>Industry Description</th>
<th>Capital Raised</th>
<th>Last Round</th>
<th>Investors</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Arbe Robotics</strong></td>
<td>Industry’s first ever SAR (Synthetic Aperture Radar) that provides automotive with real time full 4D mapping</td>
<td>$2.5 M</td>
<td>Apr. 2017</td>
<td>iAngels</td>
</tr>
<tr>
<td><strong>InnoSenT</strong></td>
<td>Produces radar sensors for national and international B2B customers</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td><strong>Oculii</strong></td>
<td>Specializes in 4D radar design and fusion</td>
<td>$3.4 M</td>
<td>Jan. 2015</td>
<td>Comet Labs, Decent Capital, F50, LeBox Capital, Legend Star, Qihoo 360</td>
</tr>
<tr>
<td><strong>Omniradar</strong></td>
<td>Develops unique sensing solutions based on millimeter wave radar</td>
<td>$3.4 M</td>
<td>Aug. 2014</td>
<td>Orlaco, Rijksdienst Voor Ondernemend</td>
</tr>
<tr>
<td><strong>Silicon Radar</strong></td>
<td>Designs and delivers millimetre wave integrated circuits for sensor applications and wireless communication</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td><strong>Smartmicro</strong></td>
<td>A specialist in Radar technology for the automotive industry</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
</tbody>
</table>

Source: Crunchbase, Company Websites
Private Automotive Vision Companies to Watch

**Affectiva**
- Pioneer in emotion recognition technology, bringing emotional AI to the digital world
- Capital Raised: $33.7M
- Last Round: May 2016
- Investors: Fenox Venture Capital, Horizons Ventures, KPCB, Myrian Capital

**AMOTIVE**
- Develops affordable artificial intelligence-based software for self-driving cars
- Capital Raised: $9.2 M
- Investors: Day One Capital Fund Management, Draper, Inventure, NVIDIA

**Chronocam**
- Bio-inspired computer vision solutions for autonomous navigation and connected tech
- Capital Raised: $18.3 M
- Investors: 360 Capital Partners, CEA Investissement, iBionext Growth Fund

**DEEPSCALE**
- Develops perceptual systems for semi-autonomous and autonomous vehicles
- Capital Raised: $3.5 M
- Last Round: Mar. 2017
- Investors: Autotech Ventures, Bessemer Venture Partners, Greylock Partners

**Oryx**
- Designs video and geometry processing integrated circuits for capture and projection
- Capital Raised: $21.2 M
- Last Round: Feb. 2017
- Investors: Harris and Harris Group, Mindset Ventures, Panasonic

**Oryx**
- Develops solid state depth vision solutions for autonomous vehicles
- Capital Raised: $17 M
- Investors: Bessemer Venture Partners, ManivMobility, Trucks Venture Capital

Source: Crunchbase, Company Websites
Private Automotive V2X Companies to Watch

**Autotalks**
- A smart car company specializing in V2V communications in autonomous driving
- Capital Raised: $30.0 M
- Last Round: Mar. 2017
- Investors: Delek Motors, Mitsui Global Investment, Samsung Catalyst Fund

**CohdaWireless**
- Connected vehicle solutions for public safety, outdoor, and automotive wireless systems
- Capital Raised: $1.8 M
- Last Round: Jan. 2006
- Investors: Epicorp, M-Group, SciVentures Investments

**Commsignia**
- Develops, manufactures, and distributes V2V and V2X communication technologies
- Capital Raised: NA
- Last Round: Dec 2016
- Investors: Credo Ventures, Day One Capital Fund, PortfoLion, Traction Tribe

**Azuga**
- Designs and develops GPS vehicle tracking and road usage charging solutions
- Capital Raised: NA
- Last Round: NA
- Investors: NA

**Savari**
- Develops and sells vehicle communication software and hardware (Mobility & Transport Solutions)
- Capital Raised: $8 M
- Investors: Delta Electronics, SAIC Capital

Source: Crunchbase, Company Websites
Develops autonomous vehicle technology

**Capital Raised:** $1.0 B  
**Last Round:** Feb. 2017  
**Investors:** Ford Motor Company

Creates autonomous car kits with features such as lane-keeping and emergency braking

**Capital Raised:** $3.1 M  
**Last Round:** Apr. 2016  
**Investors:** Andreessen Horowitz and Techhammer

Engages in designing and creating AI software for autonomous vehicles and self driven cars

**Capital Raised:** $12.0 M  
**Last Round:** Mar. 2017  
**Investors:** Maniv Mobility, Northern Light Venture Capital, Oriza Ventures

System Software that offers AI powered connected camera network and smart cloud

**Capital Raised:** $14.5 M  
**Last Round:** Oct. 2016  
**Investors:** Allianz Ventures, BMW I-Ventures, Draper Nexus Ventures

Develops robotics based self-driven software for automobiles

**Capital Raised:** NA  
**Last Round:** NA  
**Investors:** NA

Invents software for self-driving vehicles and autonomous mobile robots

**Capital Raised:** $19.6 M  
**Last Round:** May 2016  
**Investors:** EDB Investments, Fontinalis Partners, Highland Capital Partners,

Source: Crunchbase, Company Websites
Private AI/Control software for Autonomous Drive

**PEarl Automotive**
Manufactures aftermarket parts that enable users to have modern features on older cars
- Capital Raised: NA
- Last Round: NA
- Investors: NA

**sfara.**
Advances mobile safety technology through the raw processing power of smartphones
- Capital Raised: $9.74 M
- Investors: Cultivation Capital, Lerer Hippeau Ventures, Verizon Ventures

**Varden Labs**
Builds self-driving vehicles
- Capital Raised: $120 K
- Investors: FundersClub, Maven Ventures, SV Angel, Y Combinator

Source: Crunchbase, Company Websites
M&A Activity by Sector: 2012-2017

By Deal Volume (37) Transactions
- Automotive AI/Control Software: 35%
- Automotive Radar: 11%
- Automotive LiDAR: 5%
- Automotive Vision: 16%
- Automotive V2X: 33%

By Dollars Spent ($25.2 B)
- Automotive AI/Control Software: 22%
- Automotive Radar: 0%
- Automotive LiDAR: 0%
- Automotive V2X: 16%
- Automotive Vision: 62%

Source: CapitalIQ
Top Public Company Acquirers

<table>
<thead>
<tr>
<th>Strategic Buyers</th>
<th>Company</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Advanced Scientific Concepts</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>Elektrobit</td>
<td>$668.2 M</td>
</tr>
<tr>
<td>1</td>
<td>Argo</td>
<td>NA</td>
</tr>
<tr>
<td>2</td>
<td>SAIPS</td>
<td>NA</td>
</tr>
<tr>
<td>1</td>
<td>Cruise Automation</td>
<td>$1.0 B</td>
</tr>
<tr>
<td>1</td>
<td>iOnRoad</td>
<td>$0.8 M</td>
</tr>
<tr>
<td>2</td>
<td>Symphony Teleca</td>
<td>$780.0 M</td>
</tr>
<tr>
<td>3</td>
<td>TowerSec</td>
<td>$75.8 M</td>
</tr>
<tr>
<td>1</td>
<td>Itseez</td>
<td>NA</td>
</tr>
<tr>
<td>2</td>
<td>Mobileye</td>
<td>$15.3 B</td>
</tr>
<tr>
<td>1</td>
<td>deCarta</td>
<td>NA</td>
</tr>
<tr>
<td>2</td>
<td>Geometric Intelligence</td>
<td>NA</td>
</tr>
<tr>
<td>3</td>
<td>Otto</td>
<td>$680.0 M</td>
</tr>
<tr>
<td>1</td>
<td>Fleetmatics</td>
<td>$2.4B</td>
</tr>
<tr>
<td>2</td>
<td>Telogis</td>
<td>NA</td>
</tr>
</tbody>
</table>

Source: CapitalIQ, Crunchbase
Automotive Sensing M&A by Region (Last 3 Years)

**US and Canada**
- Local: 13 deals, $4.84 billion
- Inbound: 5 deals, $3.92 billion
- Outbound: 5 deals, $15.43 billion

**Europe**
- Local: 8 deals, $698.7 million
- Inbound: 4 deals, $347.0 million
- Outbound: 4 deals, $3.0 billion

**Middle East**
- Inbound: 3 deals, $15.4 billion

**Asia (Asia and Oceania)**
- Local: 4 deals, $13.4 million
- Outbound: 3 deals, $1.24 billion

Source: Capital IQ
## Notable Recent Acquisitions

### Selected ADAS, Autonomous Vehicle, V2V/V2X Transactions

<table>
<thead>
<tr>
<th>Company</th>
<th>Location</th>
<th>Date</th>
<th>Amount</th>
<th>Additional Information</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Intel</strong></td>
<td>Santa Clara, CA</td>
<td>March 2017</td>
<td>$15.3 B</td>
<td>Jerusalem</td>
</tr>
<tr>
<td><strong>DENSO</strong></td>
<td>Kariya, Japan</td>
<td>September 2016</td>
<td></td>
<td>Kobe, Japan</td>
</tr>
<tr>
<td><strong>verizon</strong></td>
<td>New York, NY</td>
<td>August 2016</td>
<td>$2.4 B</td>
<td>Waltham, MA</td>
</tr>
<tr>
<td><strong>GM</strong></td>
<td>Detroit, MI</td>
<td>March 2016</td>
<td>$1.0 B</td>
<td>San Francisco, CA</td>
</tr>
<tr>
<td><strong>GT CR</strong></td>
<td>Chicago, IL</td>
<td>February 2016</td>
<td>$500.0 M</td>
<td>San Diego, CA</td>
</tr>
<tr>
<td><strong>DAIMLER</strong></td>
<td>Ingolstadt, Germany</td>
<td>July 2015</td>
<td>$3.0 B</td>
<td>Munich, Germany, Stuttgart, Germany</td>
</tr>
<tr>
<td><strong>Elektrobit</strong></td>
<td>Hanover, Germany</td>
<td>May 2015</td>
<td>$668.2 M</td>
<td>Helsinki, Finland</td>
</tr>
</tbody>
</table>

*Source: CapitalIQ*
Opportunities & Threats for New Companies

Opportunities

✓ ADAS and AI are HOT!
✓ OEMs and Tier1s are actively investing
✓ Software (AI, simulation, sensor fusion) and novel sensors (radar, LIDAR)
✓ Security software to protect ECU against cyber attacks
✓ Automotive safety technologies likely to remain a robust growth market
✓ Strategic M&A multiples being paid by corporate acquirers

Threats

✗ Unclear business model for software-only companies
✗ Venture funding challenging for hardware companies
✗ Automotive market and regulatory environment = long lead times to revenue
✗ OEMs and Tier1s are competing across entire supply chain
✗ Need to stay out of the way of Intel, NVIDIA, NXP, Google, Apple,....
Automotive Market Disruption

OEMs
- Audi
- BMW
- Honda
- Ford
- Mercedes-Benz
- Toyota
- Volvo

Tier 1s
- Autoliv
- Continental
- Denso
- Panasonic
- Valeo

Artificial Intelligence
- Preferred Networks
- AMotive
- Drive.ai
- Five AI

Processors
- ARM
- Intel
- NVIDIA
- NXP
- Qualcomm
- Xilinx

Sensors
- Omnivision
- ON Semiconductor
- Chronocam

Vision Sensors
- Sony
- Samsung

Mmwave and LiDAR
- Quanergy
- Velodyne
Thank you!

Rudy@woodsidecap.com