Keeping up with the Jetsons — A Panel Discussion of Autonomous Vehicles and Real Estate Development
Welcome and Introductions

Desmond D. Connall, Jr.
Ballard Spahr

Panelists

Henry Fonvielle
Rappaport

Revathi Greenwood
Cushman & Wakefield

Scott Plank
War Horse Cities

Neal Walters
Ballard Spahr
Autonomous Vehicle Basics

How: The Technology

FUTURISTIC FEATURES? NOT ANYMORE!

1. RADAR
   Accident-prevention systems trigger alerts when they sense something in a car’s forward path.

2. LIDAR
   A rooftop ranging system comprised of 44 lasers giving a 360-degree view of the road that is accurate to within 2 centimeters.

3. STEREO VISION
   This technology uses a camera pair to build a real-time 3D image of the road ahead, spotting hazards like pedestrians and animals.

4. LANE GUIDANCE
   Cameras mounted behind the rear-view mirror compensate lane markings, vetting the contrast between the road surface and borderlines.

5. GPS
   GPS is accurate to within 1.5 meters, with 99 percent accuracy by compounding vehicle, weather, and terrain data like red lights, stop signs, and construction zones.

6. INFRARED CAMERA
   Two infrared headlamps extend your vision of objects without blinding other drivers. The signature of the infrared beam is detected by a camera which displays an image on the dashboard.

7. WHEEL ENCODER

Helps Build the Nation November 8, 2017
What: From Human to Machine Driving Levels

<table>
<thead>
<tr>
<th>Human</th>
<th>Machine</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LEVEL 0</strong></td>
<td><strong>LEVEL 5</strong></td>
</tr>
<tr>
<td>No Active Assistance System</td>
<td>No Driver</td>
</tr>
<tr>
<td><strong>LEVEL 1</strong></td>
<td><strong>LEVEL 4</strong></td>
</tr>
<tr>
<td>Longitudinal or Transverse Guide</td>
<td>No Take Over Request</td>
</tr>
<tr>
<td>Hands On</td>
<td>Hands Off</td>
</tr>
<tr>
<td>Eyes On</td>
<td>Eyes Off</td>
</tr>
<tr>
<td><strong>LEVEL 2</strong></td>
<td><strong>LEVEL 3</strong></td>
</tr>
<tr>
<td>Traffic Control</td>
<td>Awareness for Take Over</td>
</tr>
<tr>
<td>Longitudinal and Transverse Guide</td>
<td>Take Over Request</td>
</tr>
<tr>
<td>Hands Temp Off</td>
<td>Hands Off</td>
</tr>
<tr>
<td>Eyes Temp Off</td>
<td>Eyes Off</td>
</tr>
<tr>
<td><strong>LEVEL 6</strong></td>
<td></td>
</tr>
<tr>
<td>Autobahn (SAE)</td>
<td></td>
</tr>
<tr>
<td>City (Ride Sharing)</td>
<td></td>
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</tbody>
</table>

When: Industry Timing Estimates

Self-driving cars are on their way

<table>
<thead>
<tr>
<th>SAE class</th>
<th>Year</th>
<th>Availability of self-driving cars</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 2</td>
<td>2016</td>
<td>Available today e.g. Tesla 'Autopilot'</td>
</tr>
<tr>
<td>3 to 5</td>
<td>2018</td>
<td>TESLA</td>
</tr>
<tr>
<td></td>
<td>2020</td>
<td>HYUNDAI</td>
</tr>
</tbody>
</table>

Total autonomous test miles driven so far**

- Tesla (SAE class 2): 130m
- Google (SAE class 3): 1.9m

275m miles are required to prove a self-driving vehicle is at least as safe as a human

* Levels 1 und 2 are assistance systems only. From level 3, the vehicle constantly monitors traffic.
* From level 4, driver intervention is not required even in an emergency.
* ** To June (Tesla) / August 2016 (Google)

Sources: LSP Digital research, manufacturer information, SAE, RAND
Connected Cars: V2V and V2I

- No more traffic signals? Rule Making has been proposed to regulate the wireless communication of vehicle to vehicle, and vehicle to infrastructure, including roads, bridges and traffic signs.

Perspective: How Will Transportation Be Provided?

- Ride sharing will likely be the primary future mode of transportation.
- Automotive companies may ultimately only sell vehicles to single sources, in partnership with ride-sharing tech and rental car companies.
- If individuals still own a vehicle, it’ll likely be only one, and loaning it to a fleet may result in substantial cost savings.
- For all you UCC fans, the “Point of Sale” will become the “Point of Use”
### Who? Consumer Demographics Impacted

<table>
<thead>
<tr>
<th>Demographic</th>
<th>Population</th>
<th>Percentage of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digital Natives (0–14 years)</td>
<td>49 million</td>
<td>16%</td>
</tr>
<tr>
<td>Gen Now (15–34 years)</td>
<td>84 million</td>
<td>28%</td>
</tr>
<tr>
<td>Gen X (35–44 years)</td>
<td>43 million</td>
<td>14%</td>
</tr>
<tr>
<td>Baby Boomers (45–65 years)</td>
<td>80 million</td>
<td>26%</td>
</tr>
<tr>
<td>Older Adults (66+ years)</td>
<td>47 million</td>
<td>16%</td>
</tr>
</tbody>
</table>

### Who? Commercial Transport Impacted

![Diagram showing the impact of urban consolidation centers on commercial transport](image)
AVs Impact on Real Estate

- Fewer vehicles operate more often and don’t need to be parked.
- Conventional parking lots and spaces disappear, yielding to fleet centers.
- Roads shrink, creating increased real estate development opportunities.

Curb Side

BEFORE
Roadway: 80%
Green Space: 0%

AFTER
Roadway: 20%
Green Space: 42%
Parking

**Before Parking Reduction**

- **Building**: BC-6000 sq ft
- **Parking**: 375 spaces (35,100 sq ft)

**After Parking Reduction**

- **Building**: BC-6000 sq ft (35,100 sq ft)
- **Parking**: 357 spaces (32,400 sq ft)
- **Openings**: 4,100 sq ft
- **Assuming 1,200 FAD per year after noise barriers, 55,750 sq ft (1,421 spaces)
- **Total FAD**: 62,500

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November 8, 2017
ON THE ROAD
NOVEMBER, 2017

REVATHI GREENWOOD, AMERICAS HEAD OF RESEARCH

Three Pre Conditions

Safety  Latency  Widespread adoption
WHAT DRIVES ADOPTION?

- **Ride-hailing**
  - 21% usage in major cities
  - Parking (37%), Drinking (33%)
    - Vehicle ownership
    - Public transit use 6%
    - Vehicle Miles Travelled
  - Cost matters
  - No driver = No costs?
  - 65+ : 4%, Millennials : 36%

Source: U.S. UC Davis, Institute of Transportation Studies, October 2017
Long-haul freight, logistics, storage and online retail.

Limited increase in urban sprawl. Explosion in data centers & cybersecurity.

Parking in prime inner city real estate reclaimed.

Car ownership shifts to “pay-per-mile.” Entire economy remapped.

Lag in real estate impact

2017 - 2020: Technology Development

- Limited to backup system. Requires licensed driver with full legal responsibility. Safety concerns.

2020 - 2030: Partial Driver Substitution

- Requirements for legally responsible operator likely to be relaxed. Driver can multi-task.

2030+: Complete Self-Driving

- Vehicle can maneuver and self-park. Driver retains ability to intervene in emergency or system failure.

2030+: Widespread Penetration

- Completely self-driven. Driver control over car is limited or none.

WHY IS THE FUTURE ALWAYS DYSTOPIAN?

AV CAR TIMELINE

Why is the future always dystopian?
INNOVATION AND JOBS

Source: IPUMS-USA, University Of Minnesota

PLANNING WITH UNCERTAINTY

A decade to prepare

Infrastructure capacity (5G, Physical)

Uneven adoption
Follow on Twitter @RevuGreenwood
Keeping up with the Jetsons — A Panel Discussion of Autonomous Vehicles and Real Estate Development

Thank you for your time!

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Moderator – Desmond D. Connall, Jr.

Des Connall is a commercial real estate lawyer with more than 35 years of experience and serves as Team Leader of Ballard Spahr's Leasing Team. He concentrates his practice on complex real estate transactions, with an emphasis on development and leasing. He has particular proficiency with office and retail leasing matters and transactions involving mixed-use projects. Des has worked on many of the most significant mixed-use developments in the Washington, D.C., region. Des’ clients include real estate developers, investors, owners, landlords, anchor tenants, and other businesses. In addition to his real estate practice, Des serves as outside general counsel to a nonprofit organization.

Panelist – Henry Fonvielle

Henry Fonvielle is President of Rappaport. He oversees leasing of all shopping centers in the Rappaport portfolio and third-party brokerage, which includes Landlord and Tenant representation. His vast experience spans different retail types, including urban, mixed-use, neighborhood, lifestyle and power centers. He is also involved with design and construction of new shopping centers, expansions and renovations of existing centers, as well as the planning of mixed-use projects.

Henry joined Rappaport as Executive Vice President in 2005 and served in this capacity until he was named President in 2012. Under his leadership, Rappaport’s leasing and brokerage portfolio has increased from 35 to more than 150 properties, while still maintaining close-knit relationships within the firm and with clients.

Henry has more than 20 years experience in commercial real estate. At Charles E. Smith Commercial Realty he served as Senior Vice President and as the Department Head for the Retail Division. Projects completed under Henry’s direction include: 1140 Connecticut Avenue, 1666 K Street, Crystal City Redevelopment, Fairfax Square Luxury Retail, Bristow Center and the largest power center inside the Capital Beltway – Potomac Yard Center.
Panelist – Revathi Greenwood

Revathi Greenwood is the Americas Head of Research for Cushman & Wakefield with overall responsibility for the research platform within the Americas region. She provides leadership to hundreds of professionals who are focused on producing predictive, timely and interpretative analysis on the latest real estate trends. A well-established thought leader, Revathi has 22 years of experience in the CRE industry, advising on properties valued at more than $15 billion for various clients. She brings significant consulting and corporate finance experience as well as strong global exposure across Europe and Asia.

Revathi started her career in India and later moved to London where she worked for four years at Citigroup’s European Investment Banking Division. After working as a Director of Corporate Finance for KPMG in London from 2003 to 2012, she moved to the U.S., where she most recently held the position of Americas Head of Investment Research at CBRE.

Revathi holds an MBA from the Indian Institute of Management Ahmedabad, and a Master of Philosophy from the University of Cambridge.

Panelist – Scott Plank

Scott Plank founded War Horse in 2010 to pursue his passion in exploring how built environments can magnify our lives and relationships. War Horse develops a diverse range of projects, including entertainment venues and a portfolio and pipeline of over 850 apartments, 80,000 square feet of office, 150,000 square feet of retail and philanthropic public service programs driven by this philosophy. Scott began pursuing his love and curiosity for cities by studying Urban Planning at the University of Maryland, years of world traveling, and eventually financing thousands of multi-family homes at Freddie Mac from 1995 to 2000. As his brother, Kevin Plank, began selling Under Armour t-shirts in 1996, Scott joined in 2000, also dedicating himself to Making All Athletes Better. It was at Under Armour where Scott learned that a place is more than just a jumble of bricks. Our buildings are as important to our personal and professional mission as a computer or a sewing machine. He learned that customers and teammates need inspiring environments: playing fields, gyms, stores, and offices. By 2010, Scott’s leadership across the organization was broad and impactful; being responsible for half of the company’s then 7,000 employees, a robust retail platform of 100 stores, 2 million SF of real estate, ecommerce, expansion into China, and a third of the company’s revenue, and half of its profits.
Neal Walters is the Practice Group Leader for Ballard Spahr's Product Liability and Mass Tort Group and a member of the firm's Manufacturing and Retail Industry Groups. Neal focuses his practice on defending product companies in litigation and counseling them on emerging risk management and regulatory issues. For over 20 years, he has regularly represented automotive companies in complex litigation, including the rare feat of having tried two different automotive class actions to successful jury verdicts.

As a compliment to litigation, Neal reviews and develops product warnings and product owner's manuals to help companies mitigate risk. During the past 3 years, he has frequently counseled and lectured on the legal issues arising from the development of autonomous vehicles, including cyber security issues.