

## Austin Shim

At a certain point in life, everyone faces limitations brought on by aging, injuries and illnesses. As a healthy, tennis and lacrosse playing teenager, this reality should be the furthest thing from my mind. But with happy memories of once active grandparents, who are now mostly homebound, this is harder to ignore. Although difficult to imagine now, with growth and adoption of autonomous mobility, robotics and wearable technologies, today's limitations will not define tomorrow's possibilities.

Without dependable access to mobility, the simplest activities most of us take for granted become difficult undertakings. For my grandparents, even grocery shopping now requires the help of other people, usually my parents. But as autonomous mobility expands, going out to shop whenever and wherever anybody wants will be one of many freedoms people like them take back. Riders will be free from the worries of driving in bad weather, in unfamiliar places and among unpredictable drivers. While Naval research in this field is appropriately directed toward missions at sea, the goals are similar--to decrease human involvement while still safely and effectively carrying-out operations. And because the Navy sees a future with fewer on-board sailors and more dangers at sea, autonomous vessels will help prepare it for this changing reality. Whether at sea or on land, autonomous mobility is coming. When it comes, homebound seniors and ship cramped sailors will increasingly be reminders of a bygone era.

Beyond autonomous mobility, fast developments in robotics, wearables and composite materials will continue to push the boundaries of what is possible as well.

Out of necessity, the Navy is a natural leader in robotic innovations. Continuous progress of this technology has successfully led to robotic substitution for human presence in many dangerous situations. Bomb detection and disposal, search and rescue, reconnaissance, firefighting and undersea vessel repair are only a few scenarios. In practice, robotic actions have become the only realistic options in certain circumstances. They include search and rescue efforts when the only choices are either robotic deployments or abandoning operations made impossible by extreme conditions. At the mass consumption level, there is explosive research growth in housekeeping robotics. Still elusive, like the search for the "Holy Grail", when they do come, even Luddites will embrace full service home cleaning robots, freeing young and old alike from one of life's never-ending and soul-sucking toils.

Particular requirements of the Navy have also made it a pioneer in innovative wearable and material technologies. Wearable powered exoskeletons are excellent examples of this and the real world application of "form following function". With built-in "smart" sensors that drive motor components to support mechanical functions, exoskeletons play an important role in helping restore partial bodily movements to people with certain physical disabilities. To improve work setting efficiency, there is also growing interest in exoskeletons used as manpower multipliers, including in warehouses and for firefighting. Promising advancements are not limited to rehabilitation and work connected wearables and materials. Approaching next level healthcare, epidermal electronics wearables continuously monitor and collect real-time physiologic data, providing more meaningful information with fewer in-person doctor visits. With temperature controlling properties, adaptive fabrics improve safety for sports and leisure activities, especially during extreme weather conditions. Like these innovations, technologies are increasingly rising to meet the needs of a more inclusive society.

Most optimistically, because technologies are overcoming the challenges of today, for tomorrow's seniors and sailors, it is full speed ahead!

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