March 10, 2021

Dear Colleagues in the Year 2042,

When you read this, it will have been 25 years since our wonderful Lab celebrated its 75th birthday! Four years after that, we decided to publish this issue of the *APL Technical Digest* to give you our sense of what the Lab might have achieved when we celebrated its centennial. As director, I have the good fortune of being able to write the introductory message to this special issue. I hope to give you some insight into how our generation reflected on the past and planned for the future, and perhaps provide you with some food for thought as your generation envisions the Lab's bicentennial in 2142.

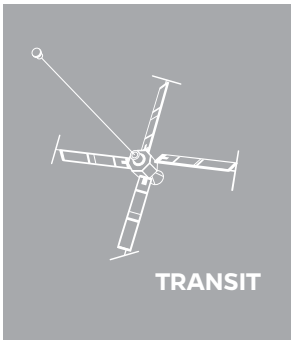
Critical contributions to critical challenges is the foundation that has held constant for APL since its founding on March 10, 1942. This is our core purpose. You may call it something else or use different language to express it, but we believe that it will have been as foundational to your being as it has been to ours. It is the reason we exist and why close to 8,000 great staff members come to work each day.

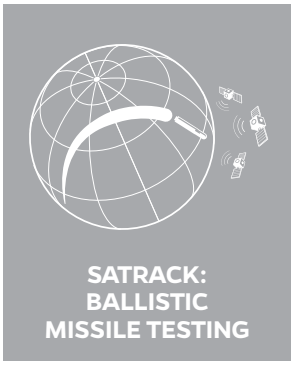
As you are well aware, APL has made thousands of critical contributions throughout its history to ensure the security and well-being of our great nation. There also have been once-per-decade contributions that have transformed the world. These are our *defining innovations*. While APL can determine a critical contribution, society must weigh in to determine whether a contribution rises to the level of a defining innovation. By 2021, we had nine and we likely are getting close to identifying the tenth. Illustrated along the edges of this letter, they include the development of the proximity fuze that changed the course of World War II, the creation of satellite navigation which served as the precursor to GPS, the development of defense technologies that transformed military operations, and the creation of radically new ways to explore space. In 2042, we expect that you will have identified at least a couple more.

As we approached our 75th birthday, we took the opportunity to look ahead to the Lab's centennial, just as we would expect that you are looking ahead now. With our core purpose as bedrock, we thought about you in 2042 and developed our *Centennial Vision*, which is shown on the inside back cover of this issue.

In addition to our core purpose, we identified the underlying core values of our organization. The first is *unquestionable integrity*. It is essential to APL's role as a trusted agent. And in the context of that value, we fully embrace *trusted service to our nation*. It underpins essentially all of the work that we do. Our *world-class expertise* is also key. While we cherish individual knowledge and skill, it is the collective expertise of our teams that distinguishes the Lab. With great teams, we have the opportunity to pursue and realize *game-changing impact*. Our critical contributions and defining innovations all have been focused on having that level of impact. Finally, we value *a highly collaborative, fulfilling (even fun!) environment*. The pure joy of innovation has kept our Lab vibrant and exciting. We hope that you are having as much fun in 2042 as we have had in the years leading up to 2021. As with our core purpose, you may call these core values something else, but it is my hope that they feel very familiar to you. After all, both our core purpose and our core values are intended to transcend time and capture the essence of our institution.

With clear purpose and values as a foundation, we set a goal that would guide us for 25 years to our centennial. Given an organization as complex and diverse as APL, this was a daunting task. But you will recall that of our thousands of contributions, only a couple of handfuls rose to the level of defining innovations. That insight became the basis for what we would seek to achieve: *create defining innovations that ensure our nation's preeminence in the 21st century*. This is our big hairy audacious goal (BHAG). BHAG was a term of art when we created our





SATRACK: BALLISTIC MISSILE TESTING

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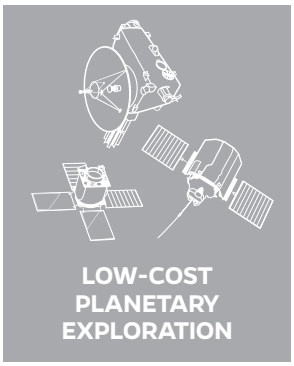

LOW-COST PLANETARY EXPLORATION

Centennial Vision. It gave us a challenging target and set a standard of excellence to which we could aspire. It changed the way we viewed our work, the way we invested, and how we set intermediate and short-term objectives. We allocated resources for high-risk activities with the potential for high payoff, and we required each of our dozen mission areas to establish initiatives in pursuit of game-changing technologies.

But having a BHAG was not enough. We asked ourselves what the world would look like if we achieved our goal. This is captured in the vivid description of our Centennial Vision. Each of the statements in that description of our anticipated future world (and your present world) changed our perspective. The description provided us with a basis for strategic focus elements and execution priorities that drove us year after year. It is what is driving us across generations toward 2042 to provide you with the Lab you have. You will have to determine how prescient we might have been.

We expect that in 2042 APL will indeed be a treasured national resource that is providing uniquely novel solutions, even when others have given up and believe that no solution is possible. Citing just a few examples, we anticipate that the Lab will have played a key role in developing and defending against hypersonic weapons and systems, will have ensured that the nation has retained undersea dominance, will have visited several other worlds in our solar system and perhaps be on the way to other parts of our galaxy, and will have provided deep cyber resilience despite underlying component and subsystem vulnerabilities. We also expect that APL will have contributed deeply in new areas. As I write this, we are applying the expertise that we have developed during the past few years in biology and health to help the nation in its fight against the COVID-19 pandemic. I expect you will have built on this expertise significantly to improve the lives and safety of people throughout the world. I also hope that some of our nascent efforts in new areas such as climate change will have borne fruit.

Of course, these achievements require a culture of experimentation and balanced risk-taking that the nation can depend on, even when others might be pursuing more commercially appealing opportunities. Building on enduring initiatives, we expect that the staff in 2042 will be exceptional, as is the staff in 2021, and will reflect the diversity of our nation. With all the exciting work that we have done as a renowned technology hub, it is not surprising that the Lab will have been such a magnet for great talent. I also am hopeful that many of your organizational and thought leaders are here today in 2021 and will have played key roles in creating your defining innovations! And we are fortunate to be part of Johns Hopkins University. We are serving as close partners with many JHU divisions in 2021, and we are confident that you will have built on that in 2042.

I could go on, but there are great articles for you to peruse in the rest of this issue and I do not want to keep you from them. I truly hope that we have positioned the Lab in 2042 to be bold, do great things, and make the world a better place!

With deep respect and best wishes from 2021,

Ralph