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## GUEST EDITOR'S INTRODUCTION

Since its inception, APL has fostered an understanding of the propagation of electromagnetic waves as an element in the design, testing, and evaluation of electronic systems. APL has a rich heritage in the development of radar, communications, navigation, and tracking systems, all of which rely on the behavior of electromagnetic waves in the atmosphere.

This issue of the *Johns Hopkins APL Technical Digest* is the first of two theme issues that highlight several current electromagnetic propagation investigations at APL. The articles not only illustrate the breadth of such investigations at APL, but also the focused application of the results to bona fide systems through theory, models, experiments, and analysis. It is a pleasure also to note interdepartmental participation, another APL tradition.

Often, detailed evaluation of electronic systems performance requires that several effects, such as refraction, diffraction, absorption, and surface boundary phenomena, be understood in integrated fashion. The article by Thomas reviews the attenuation of infrared and millimeter-wavelength radiation in the troposphere from water vapor absorption and reports on the comparison of the APL model with laboratory data. Missile flight through the atmosphere creates a peculiar propagation environment for infrared and optical sensors. Tropf et al. report on optical refraction and window shock interactions in hypersonic optical guidance.

The assessment of candidate strategic communications leads Lunnen to report on experiments for extremely-low-frequency and very-low-frequency propagation from an ionosphere heated by high-frequency radio waves.

Microwave propagation through the highly refractive atmosphere is a dynamic process that depends in part on the space and time evolution of vertical refractive gradients. Schemm et al. demonstrate that the APL planetary boundary layer model can be used in conjunction with APL's EMPE (Electromagnetic Parabolic Equation) propagation loss code to predict radar coverage variations. Dockery and Konstanzer discuss EMPE improvements for antenna patterns and monopulse radar performance

with validating experimental data. Rowland and Babin describe helicopter-based and rocket-launched meteorological measurement systems that provide the basic information for the determination of atmospheric refractive index vertical profiles during propagation experiments. Skura reports on the worldwide occurrence of anomalous refraction and propagation and illustrates how troposcatter communications can be affected adversely.

We note that recent issues of the *Digest* have also reported on other propagation-related investigations for Transit Doppler navigation,<sup>1</sup> missile guidance,<sup>2</sup> extremely-low-frequency oceanographic propagation,<sup>3</sup> anomalous microwave propagation,<sup>4</sup> strategic communications performance,<sup>5</sup> rain attenuation effects on earth/satellite communications,<sup>6</sup> high-latitude ionospheric probing,<sup>7</sup> applications of scattering theory,<sup>8</sup> and the fear of radiation effects on biological tissue.<sup>9</sup> The next electromagnetic propagation theme issue will continue to report on current APL work on topics such as land-mobile satellite communications, microwave-ducted sea clutter, millimeter-wave ocean evaporation duct propagation, and radar backscatter from ocean internal waves.

## REFERENCES

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