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GUEST EDITOR'S INTRODUCTION

In *A Scandal in Bohemia* by Sir Arthur Conan Doyle, we read:

> *Watson.* This is indeed a mystery, what do you imagine it means?
>
> *Holmes.* I have no data yet. It is a capital mistake to theorize before one has data. Insensibly one begins to twist facts to suit theories, instead of theories to suit facts.

This issue of the *Johns Hopkins APL Technical Digest*, with theme articles on Electromagnetic Propagation, is the companion to the October–December 1987 issue. Sherlock Holmes would have appreciated APL's style of understanding complex propagation issues by means of the interplay of field test data and theoretical development.

Goldhirsh and Vogel describe several propagation tests on the effects of trees and terrain on land-mobile-to-satellite civilian communications systems; they discuss signal attenuation by trees and multipath fading caused by terrain. Meyrick et al. describe corrections required to compensate for ionospheric refractive effects on radio-frequency transmissions in the SATRACK missile tracking system. In a two-frequency satellite and pseudosatellite system, data from one frequency are used to calculate the basic range and range-rate information, while the second frequency is used for correction.

Three articles discuss the effects of anomalous propagation, particularly ducting, on microwave and millimeter-wave propagation in the lower troposphere. Ko et al. present results of the comparison of APL's predictive EMPE (Electromagnetic Parabolic Equation) code with a variety of field test data for surface- and elevated-duct features and with results from other theoretical models. Lee et al. introduce two valuable methods for describing radar surface clutter under surface ducting conditions. The dynamic range of the clutter amplitude is estimated by combining surface reflectivity with ray incidence angle, surface topography, and nonstandard propagation loss. A mechanism for determining mean Doppler shift and Doppler spread in rough-sea-state clutter under surface ducting conditions is also described. Boyles and Dozier introduce a coupled-mode model for predicting ducted electromagnetic wave propagation over the rough ocean surface at millimeter-wave frequencies. Progress is reported; the model is compared with results obtained using EMPE and with a case study at 35 GHz, both under ocean-surface-duct conditions.

High-latitude high-frequency propagation is the subject of two articles. Baker and Greenwald describe experiments conducted in 1985 and 1986 at APL's high-frequency radar system in Goose Bay, Labrador, to measure signals received from a transmitter in Thule, Greenland. They show that high-latitude ionospheric tilt can significantly alter high-frequency communications channels because of variations in the maximum usable frequency, propagation time delay, vertical angle of arrival, and the Doppler shift. Greenwald et al. report on measurements taken in 1987 after improvements were made on the Goose Bay radar. They describe the importance of ionospheric tilts and latitudinally confined electron density, which affect the localization of backscatter returns.