Guest Editorial

Ocean Optics

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Photo-optical technology has exceptionally varied uses in the sea ranging from imaging to communications and remote sensing. The optical region has many inherent advantages which will insure its continued application in ocean-related tasks. Optical systems, however, are limited to relatively short water paths due to the strong absorption and scattering of even the clearest water. Better understanding of light propagation in a scattering/absorbing medium and the development of techniques to extend operating range are among our most important tasks.

This issue is devoted to a variety of topics in Ocean Optics. The fundamentals of diffusion of light in the sea are reviewed by Willard Wells. He also describes an exact solution for radiance transport using an expansion in spherical harmonics.

The metrical fundamentals of underwater lens systems are thoroughly reviewed by Gomer McNeil. His analysis of the effects of temperature, salinity and depth on lens/port systems is of special importance for high resolution imaging systems.

System performance is almost always limited by lack of light sources with adequate power, spectral distribution or intensity distribution. Myer Geller examines the use of discharge lamps with either thallium-iodide, zinc-xenon, or cadmium-xenon to provide an efficient incoherent source of tens of watts of cw power in the water pass band, while Matthew White discusses the present status and future possibilities of blue-green laser technology. It is likely that blue-green sources will be available within the next three to five years which will satisfy most ocean optics needs. Some of these needs will undoubtedly be best satisfied by the more conventional incoherent discharge sources, but there are some applications that can be satisfied only by an efficient laser source.

Milton Green describes laboratory experiments for determining the maximum detection range of a nearly coaxial transmitter-receiver configuration which is applicable to volume scanning systems. Limiting ranges in excess of six attenuation lengths are shown to be feasible despite the very small transmitter receiver separation.

Remote sensing of ocean color offers the potential of monitoring important characteristics of the ocean surface layers on a global basis. W. A. Hovis describes several remote sensing experiments and the resulting data.

A system approach is absolutely necessary to coordinate the design of the optics, sensor, illumination, and other elements, into a practical system having near optimum performance. Joe Hughes explores some of these system aspects and describes several optical designs which permit orienting the line of sight by rotating the optics rather than the camera.