

## FORTHCOMING PAPERS

### Second-Harmonic Detection with Tunable Diode Lasers - Comparison of Experiment and Theory

*J. Reid, D. Labrie (Canada)*

A series of experiments are carried out by current modulating a tunable diode laser, and slowly ramping the wavelength to scan weak absorption lines in gases at pressures ranging from 2 to 60 Torr. A lock-in amplifier detects the second harmonic (2f) of the modulation frequency, and the experimental 2f signals are compared with theory. Detailed measurements are made on Lorentzian, Voigt, and Gaussian line profiles, over a wide range of modulation amplitudes. Excellent agreement between experiment and calculation is obtained in all cases. This quantitative understanding enables one to derive true lineshapes and linewidths of very weak absorption lines from measurements of 2f lineshapes only. Results are applicable to trace gas detection using tunable diode lasers, and to other areas of spectroscopy and magnetic resonance where harmonic detection techniques are routinely employed to monitor weak signals.

### Michelson Mode Selectors and Spatial Hole Burning in Single-Mode cw Dye Lasers

*C.G. Aminoff, M. Kaivola (Finland)*

Single-mode selection with Michelson selectors in cw standing-wave dye lasers is analyzed. The application of single and double Michelson mode selectors for compensation of spatial hole burning effects is described in detail. Upper limits for the pumping are considered. It is shown that with spatial hole burning compensation, even the single Michelson selector provides sufficient selectivity for high power single-mode operation in linear cavities.

### Theory of Passive Mode-Locking of cw Dye Lasers with Contacted and Non-Contacted Absorbers

*J. Herrmann, F. Weidner, B. Wilhelmi (German Democratic Republic)*

A theoretical treatment of the influence of a saturable absorber in close contact with a highly reflecting mirror on a light pulse is given. The shaping of a Gaussian pulse during a single passage through such an absorber is calculated for various absorber lengths. The influence of absorber position and length on the pulse parameters and the stability of a continuously pumped dye laser are investigated. The shortest pulses and the most favourable operation conditions of the laser are to be expected in the case of a short contacted saturable absorber.

### Non-Gaussian Scattering by a Random Phase Screen

*E. Jakeman, J.G. McWhirter (UK)*

A theoretical investigation of non-gaussian scattering by a smoothly varying deep random phase screen is presented. New analytical results, valid for arbitrary illuminated area, are derived for the contrast of the intensity pattern in the Fraunhofer region and the effect of two scale sizes in the screen is calculated.

### Dynamics of the Nonlinear Four-Wave Mixing Interaction

*J.-C. Diels, W.-C. Wang, H. Winful (USA)*

We present an analysis of the impulse response of four-wave mixing, in the case where the "two-photon term" of the nonlinear susceptibility is dominant. The nonlinear interaction itself will be considered to be steady state. The conditions of negligible pump depletion are considered first. It is shown that the reflected beam has only the character of perfect phase conjugation if the pulse length is longer than the medium length, and the latter is short compared to the characteristic distance of the problem. The "weak-pulse" approximation involving only two coupled equations is compared to the exact four-wave solution, when the medium thickness approaches the critical oscillation threshold. Finally, the stability and existence of steady-state solutions is analyzed for very long media (compared with the oscillation length).

## Notes from the Editors

*Applied Physics* has developed into a major journal for the rapid publication of application-oriented research results. The journal's coverage has become so broad that it appeared advantageous to publish the journal in two parts. Part A entitled "*Solids and Surfaces*" is mainly concerned with solids and their surfaces, including device concepts by surface engineering. Part B entitled "*Photophysics and Laser Chemistry*" is mainly devoted to optical radiation and its interaction with gases and liquids, concentrating on laser radiation and its application in chemistry.

A more detailed description of the topics of Parts A and B may be inferred from the appropriate listings of the Physics and Astronomy Classification Scheme (PACS) in the September 1981 issues. Since there is some overlap between the two parts, authors are invited to indicate their preference on submission of papers.

The subdivision of *Applied Physics* will provide an opportunity for extending the journal's coverage. For example, Part A "*Solids and Surfaces*" will put a new emphasis on amorphous materials and on devices resulting from surface modifications. Integrated optics and optical communications will be assigned to Part A due to the device aspects. Part B "*Photophysics and Laser Chemistry*" will concentrate on optical and infrared radiation, due to lasers and other sources, and its interaction with gases and liquids. If the subject under study is a solid, such as in laser annealing or in light scattering in solids, papers will, however, be considered for Part A. Laser chemistry is considered that aspect of chemical physics which deals with laser applications, whereas chemical physics of surfaces including catalysis is covered by Part B. Modern as well as nonlinear optics are closely related to laser physics and its applications. They will be treated in Part B except when the emphasis is on the condensed state (as in solid-state and semiconductor lasers).

The reference to a paper published in *Applied Physics* should be done as before with the exception of supplementing the volume number by A or B.

The subdivision will take place in September 1981; consequently this year's remaining volume, Volume 26, will be issued in the form of twin issues denoted by A and B. Only from January 1982 onwards can an individual part be ordered separately. Although each part will be priced lower than the current single issue, it will be advantageous for a library to subscribe to both parts to take advantage of a special subscription offer.