

#### Forthcoming Papers (cont'd)

##### FLUORESCENCE QUENCHING IN Nd:YAG

H.G. Danielmeyer, M. Blätke and P. Balmer  
(F.R. Germany and Switzerland)

We show that quenching of the Nd fluorescence is in principle not associated with the  $\text{Nd}^{3+}$  ion but with the host. The process is due to near-field electric dipole interaction between Nd pairs, and cross relaxation via the  ${}^4\text{I}_{15/2}$  manifold. We present for the first time the complete fluorescence spectrum and level scheme of Nd:YAG, and find that Nd:YAG has an exceptional level configuration which boosts cross relaxation. Our results encourage the search for new Nd laser materials which have a slightly different position of the  ${}^4\text{I}_{15/2}$  manifold so that higher Nd concentrations can be achieved for integrated-optics applications. Finally, we report on implications of energy migration which we found to be quite effective in Nd:YAG.

##### DIELECTRIC PARAMETERIZATION OF RAMAN LINE-SHAPES FOR GaP WITH A PLASMA OF CHARGE CARRIERS

D.T. Hon and W.L. Faust (USA)

We have studied the Raman lineshapes of several samples of GaP with appreciable carrier concentrations. There is no feature identifiable as a plasma resonance, but there are pronounced effects of interaction with the LO phonon resonance. For analysis we have developed a model along lines laid down by Barker and Loudon, employing Nyquist relations to calculate infrared fluctuations which scatter light. We introduce a response matrix  $\alpha(\omega)$  with several resonances; and we uncover some points which seem to be new, for such coupled-mode scattering systems. In the GaP-plasma problem the data do not necessitate inclusion of the scattering amplitude from the plasma; we ascribe this to large plasma damping rates ( $\omega\tau \leq 1$ ). This provides an account for the lack of any apparent plasma resonance in the scattering and for the modified appearance of the LO phonon, relative to the pure crystal. We emphasize that the following parameters suffice: Lorentz parameters measured in linear infrared experiments, the nonlinear parameter C from a visible-infrared mixing experiment, and the plasma frequency and damping fit to each sample.

#### ERRATUM

##### UNIFIED THEORY OF TOTAL REFLECTION PHENOMENA AT A DIELECTRIC INTERFACE

B.R. Horowitz, T. Tamir: Appl. Phys. 1, 31 (1973)

Part of this work was carried out when one of the author (B.R.H.) was at the Physics Institute of the University of Oslo, Blindern, Oslo 3, Norway.

# Falk-Ruppel

Die Physik  
des Naturwissenschaftlers

# Mechanik Relativität Gravitation

Von Professor Dr. G. Falk und Professor  
Dr. W. Ruppel, beide Universität Karlsruhe

183 Abbildungen. XVI, 442 Seiten. 1973. DM 38,-

„Mechanik, Relativität, Gravitation“

ist ein Lehrbuch, das Experimentalphysik und theoretische Physik als Einheit auffaßt.

Es begreift die Physik nicht als Sammlung von Einzelheiten, sondern stellt die Begriffe in den Vordergrund, die für die gesamte Physik wesentlich sind, wie Energie, Impuls, Drehimpuls.

Mit ihnen wird ein Konzept entwickelt, das für alle Teile der Physik tragfähig ist.

Ohne auf wissenschaftliche Genauigkeit zu verzichten, werden nur elementare mathematische Kenntnisse der Analysis und Vektorrechnung benötigt. Dennoch werden auch Probleme und Resultate der aktuellen Forschung ausführlich dargestellt. Das Buch soll den Studenten während seines ganzen Studiums begleiten. Darüber hinaus bietet es auch dem erfahrenen Lehrer und forschenden Naturwissenschaftler neue Einsichten in den begrifflichen Aufbau der Physik.

#### Inhaltsübersicht

Einleitende Orientierung. Impuls und Energie. Stoßprozesse. Felder. Drehimpuls. Relativitätstheorie. Gravitation. Astrophysikalische Daten. Sachverzeichnis. Naturkonstanten. Wichtige Einheiten.



Springer-Verlag  
Berlin Heidelberg New York  
München London Paris Sydney Tokyo Wien