One distinct advantage that rangefinder cameras have over SLRs is that their lenses can have a very short back focal length. In the case of extremely high aperture lenses, the relaxation of the back focal length requirement allows the use of a field flattener to control field curvature and astigmatism, which relaxes the design and allows much better aberration correction.\(^1\)\(^3\)

This month's design (see Fig. 1) is a modification of the familiar double-Gauss design that has a very weak thick element and a negative field flattener located close to the image plane. In addition to the unusual field group, the design uses three aspheric surfaces to achieve extremely good imaging performance at an aperture of \(f/1\). The correction of oblique spherical aberration is particularly noteworthy, as this is the aberration that limits the performance of all conventional wide-aperture double-Gauss designs. Figure 2 shows transverse ray aberrations and Figure 3 shows a plot of MTF versus image height.

One drawback to the use of a field flattener is that it places the exit pupil near the image plane, which increases the light falloff at large field angles. Figure 4 shows the relative illumination as a function of image height, and indicates that the light falloff will definitely be noticeable. Stopping down to \(f/2\) eliminates all mechanical vignetting.

The lens prescription is given in Table 1. The design consists of three separate groups that move independently during focusing to compensate for variations in coma, astigmatism, and spherical aberration. Surfaces 3, 15, and 17 are aspheric, and are described by the equation

\[
z = \left(\frac{h^2}{r} + \left[1 - (1+k)\left(\frac{h^2}{r^2}\right)^{1/2}\right]a_4h^4 + a_6h^6 + a_8h^8 + a_{10}h^{10}\right),
\]

where \(z\) is the direction along the optical axis, \(h\) is the direction perpendicu-
PARALLEL PROCESSING

tools for today's optiker

lar to the optical axis, r is the paraxial radius of curvature, k is the conic constant, and $a_4$, $a_6$, $a_8$ and $a_{10}$ are polynomial deformation constants.

References

Table 1. Optical prescription for the objective where measurements are given in millimeters. Focal length is 55 mm, aperture is f/0.997, and full field-of-view is 41.88°.

Table X. Optical prescription for the objective where measurements are given in millimeters. Focal length is 55 mm, aperture is f/0.997, and full field-of-view is 41.88°.

**Recent Research**

**SUMMARIZED BY GEORGE LEOPOLD**

These post deadline papers were presented at CLEO®/Europe-EQEC '98 September 14–18, 1998 Glasgow, Scotland, U.K.

**MAPPING AN OPTICAL STANDING WAVE WITH A SINGLE MOLECULE**

Control and determining of the position of a particle while studying its interaction with a single mode of the electromagnetic field in the optical domain remains a challenge in the study of the manipulation of atoms, ions, and molecules.

The German researchers report on studies using single molecules in a solid matrix. They aimed at combining the spectral resolution provided by high-resolution spectroscopy of single organic molecules with a high spatial resolution.

To achieve high 1-D resolution, they first isolated a single molecule from the sample in frequency space. They then scanned the sample through standing wave while recording a spectrum of each position. Similarly, they mapped the Gaussian profile of the focused excitation beam in all three dimensions.

Future experiments are planned in which the high-resolution spatial and spectral information from a single particle in a microscopic matrix can be used to examine its coupling with the electromagnetic field in more complex environments.

J. Michaelis, C. Hetlich, B. Eltermann, A. Zayats, J. Mlynek, and V. Sandoghdar, Universität Konstanz, Konstanz, Germany.

**ABLATION PRODUCTS FROM UV-LASER IRRADIATED POLYMER SURFACES DEPOSITED ONTO DIFFERENT SUBSTRATES**

Some effects of UV-laser ablation, such as material removal, are well understood. The Austrian investigators focus on the relatively new field of deposition of ablation products both onto an extra substrate (pulsed laser ablation) and back onto the laser-irradiated sample (re-deposition).

They observe that this type of material is of importance in fields such as the laser-induced permanent conductivity enhancement of polyimides, the formation of branched self-similar surface structures (dendrites) on polyesters, and the pulsed laser deposition of PTFE (Teflon).

The researchers report new results on deposited surfaces and demonstrate the formation of carbon nano-wires on polyimide substrates. Well defined nano-roughness of several 10 nm in height, covering the whole irradiated surface area of PET, is achieved on the basis of ablation products re-deposited and partially embedded into the amorphized ablated area.


**RADIATION PRESSURE EFFECTS IN A HIGH-FINESSE OPTICAL CAVITY**

Radiation pressure exerted by light plays an important role in quantum limits of very precise optical