and the function of the immune system. They may also be dependent on antigen stimulation and T-cell activation, which may be more frequent in homosexuals in whom Kaposi's is more common.

(5) The presence or absence of anti-*tat* antibodies or *tat* protein in the sera of HIV-1-infected individuals obviously does not exclude the role of *tat* in the pathogenesis of Kaposi's because it could be released and taken up by target cells in close proximity or by cell–cell contact.

(6) Finally, if high levels of anti-*tat* antibodies were found, Reiss *et al.* could argue that high levels should be protective by inactivating *tat* as might occur, for example, in polio. Therefore, *tat* would have no role in Kaposi's. But antibodies are not always neutralizing, and the meaning of high levels can be just the opposite — high levels of antibodies to HTLV-1 are not protective (unless present before infection). High levels, in fact, suggest the presence of more virus. Conversely, what do low antibodies mean? Would they indicate that not much *tat* is present; or that there are insufficient neutralizing antibodies? Therefore, it is not clear to us what an average level of antibodies really means.

Thus, in our view, the titres cannot be used to draw any meaningful conclusions regarding the role of *tat* or the anti-*tat* antibodies *in vivo* in the pathogenesis of Kaposi's.

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Sunlight brighter than the Sun

SIR—We have concentrated terrestrial sunlight by a factor of 84,000 to intensities of 72 W mm^{-2}, establishing a new world record for solar flux concentration that exceeds our previous result by a factor of 1.5 (refs 1,2). This concentration exceeds the intensity of light at the surface of the Sun itself, which is 63 W mm^{-2}: we have thus produced the highest concentration of sunlight in the Solar System.

We use a device designed according to the principles of nonimaging optics[3]. A nonimaging concentrator is essentially a 'funnel' for light, and can concentrate light to intensities four times greater than those obtained with conventional imaging devices. (Aberrations in image-forming devices limit their ability to concentrate light.) A laser crystal or a solar furnace does not need to receive a perfect image of the Sun, rather the maximum power per area. By dispensing with image-forming requirements, we can attain concentrations that approach the theoretical limit of:

$$C_{max} = n^2/\sin^2\theta \qquad (1)$$

where n is the index of refraction at the target surface and θ is the semiangle subtended by the Sun. The limit can be derived from both phase space conservation[4] and thermodynamic arguments[5].

Our concentrator is designed according to the 'edge-ray' method[3], in which all light rays entering the device at the maximum collection angle are directed after one reflection at most to the rim of the exit aperture (see figure). The other rays are therefore reflected within the aperture itself.

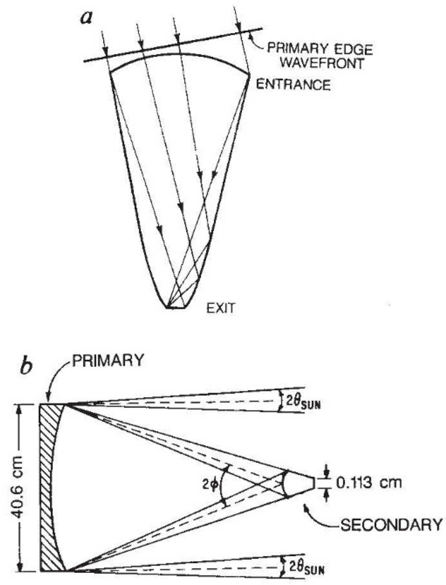
A nonimaging concentrator alone, could attain high concentrations of sunlight, but would be large and unwieldy. We therefore use a two-stage system incorporating a parabolic mirror and a nonimaging concentrator. The overall concentration is the product of the concentrations of the parabolic mirror and of the nonimaging concentrator:

$$C = n^2\cos^2\phi/\sin^2\theta \qquad (2)$$

which falls short of the theoretical limit in equation (1) only by the factor of $\cos^2\phi$, where ϕ is the rim angle of the mirror.

Using such a technique, we previously achieved a concentration of sunlight of 56,000 times the intensity at the surface of the Earth[1]. Our modified apparatus reaches still higher concentrations. We use a 40.6-cm-diameter silver-coated telescope mirror with rim angle 11.5° (focal ratio 2.5). Sunlight is concentrated to a 1-cm spot 1 m away from the mirror. The light is further compressed to a 1-mm spot by a sapphire nonimaging concentrator, chosen for its low absorption and high index of refraction, $n = 1.76$. Substituting these values into equation (2) gives the theoretical limit to the concentration of our new two-stage system, 137,000, which is a 31% increase over the theoretical upper limit of 104,000 in our earlier device.

Another modification is that our concentrator now works by total internal reflection. In the previous experiment the walls of the concentrator were silvered, and allowed losses due to absorption. Total internal reflection is, however, nearly loss-free, and increases the efficiency of the concentrator.



In a nonimaging concentrator designed by the edge-ray method (shown in *a*) all light rays entering the device at the maximum collection angle are directed after one reflection at most to the rim of the exit aperture. The edge-ray principle is slightly modified for the concentrator described here, to ensure that light is reflected by total internal reflection near the top. Hence, the exit angle of the light is reduced slightly, from 90° to 86°. Panel *b* shows the two-stage approach to concentrating sunlight.

In a series of trials over several cold, crisp days in January and February we measured an average power per area at the exit aperture of the sapphire concentrator of 72 W mm^{-2}. This intensity is 84,000 times greater than the direct incident intensity, 0.86 mW mm^{-2}.

Potential uses for such high levels of solar flux are only now being explored. In the past it has been difficult to make efficient solar pumped lasers because of the limited materials available and the lower levels of concentration of sunlight that could be achieved. We believe our approach should increase the attained efficiencies, with the aim of making a tunable solar-pumped laser. Other applications include the destruction of hazardous waste and high-temperature processing of specialized materials.

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