mM CaCl$_2$, 1 mM MgCl$_2$ bubbled with a mixture of 95% O$_2$ and 5% CO$_2$. For experiments, slices were bathed in the same solution. Patch-clamp recordings were made [O. P. Hamill et al., Pfluegers Arch. 391, 85 (1981)] from swellings ranging from 5 to 15 µm, which were clearly visible under Nomarski optics at ×600. Pipette-filling solutions for whole cell recordings are given in the figure legends. Additional methodological details can be found in (8) and (9).

15. The patch pipette solution contained 140 mM KCl, 10 mM EGTA, 4 mM magnesium adenosine triphosphate (MgATP), 10 mM Hepes (pH 7.3) with the addition of 100 µM guanosine triphosphate (GTP) to support GTP-binding protein function.

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1. Rates of phytoplankton photosynthetic assimilation in samples in glassware (open circles) compared with those in polyethylene bags (closed circles), as determined by analyses of variance tests. Some of the samples were covered with mylar (50% transmission at 323 nm), some with Plexiglas (50% transmission at 360 nm), and others with Plexiglas (UFS) (50% transmission at 400 nm). Circles represent the mean value for each treatment (n = 48 paired samples with no prefilter, 15 paired samples with UV radiation cut off at 323 nm, 15 paired samples with UV radiation cut off at 360 nm, and 38 paired samples with UV radiation cut off at 400 nm). Dashed lines indicate one standard deviation around the mean.

![Fig. 1. Rates of phytoplankton photosynthetic assimilation in samples in glassware (open circles) compared with those in polyethylene bags (closed circles), as determined by analyses of variance tests. Some of the samples were covered with mylar (50% transmission at 323 nm), some with Plexiglas (50% transmission at 360 nm), and others with Plexiglas (UFS) (50% transmission at 400 nm). Circles represent the mean value for each treatment (n = 48 paired samples with no prefilter, 15 paired samples with UV radiation cut off at 323 nm, 15 paired samples with UV radiation cut off at 360 nm, and 38 paired samples with UV radiation cut off at 400 nm). Dashed lines indicate one standard deviation around the mean.](http://science.sciencemag.org/content/255/5051/557/F1.large.jpg)

In their study of the effects of solar ultraviolet (UV) radiation on natural phytoplankton assemblages in Antarctic waters, R. C. Smith et al. (1) used Whirlpak polyethylene bags as used by Z. Z. El-Sayed et al. (2) as sample containers during their in situ incubations. On a cruise in the Pacific from Chile to California, in March and April 1992, we placed replicate aliquots of water samples, taken from a depth of 5 to 10 m, in Whirlpak bags (18 ounces) and in round quartz glassware vessels (250 ml). Samples were then placed in deck incubators with the temperature controlled by flowing surface seawater and were exposed to direct solar radiation. Some samples were covered with plastic filters for 6 to 8 hours, centered at local noon. Rates of photosynthesis were determined by standard radiocarbon techniques (3); chlorophyll a concentrations were determined by fluorometry after extraction in methanol (4).

We found a significant difference (P < 0.001) in photosynthetic assimilation rates for samples in glassware as opposed to bags when the samples were exposed to solar radiation without any filter and when they were covered by mylar, which absorbs ultraviolet B (UVB) radiation (280 to 320 nm) (Fig. 1). This inhibitory effect was not decreased by leaching the bags in 1 N HCl for 12 hours. The results of our transmission tests agree with those in (2), which showed only 68% transmission of UVB at 300 nm. It is apparent that polyethylene bags absorb UVB, which results in a toxicity that significantly lowers the rate of CO$_2$ assimilation.

In spite of artifacts associated with the use of polyethylene bags, the general conclusions reached by Z. Z. El-Sayed et al. (2) and by Smith et al. (1) are similar to our results (3, 5), which were obtained with glassware. There does not appear to be a temperature dependence associated with the toxicity produced by polyethylene bags, as similar results were obtained in Antarctic and in tropical waters. We do not know, however, whether different taxonomic groups of organisms would react in the same way as that noted in our experiments. It would therefore seem advisable for those studying the effects of solar UV radiation on

microbial populations to first ascertain the validity of measurements made with the use of polyethylene bags.

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REFERENCES AND NOTES

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Response: Clean techniques and control studies (1–3) were performed before, during, and after the icecovers ’90 cruise. We checked and found no evidence for polyethylene bag contamination or toxicity.

Before the cruise, laboratory cultures and field samples of mixed phytoplankton communities were incubated in 250- or 500-ml untreated Whirlpak bags for different periods (up to 8 hours) while being exposed to darkness or to light-saturating fluorescence that had passed through a glass plate [photosynthetically available radiation (PAR) only]. When compared with replicate samples in wide-bottom glass Eremleyer flasks, we found no decrease in volumetric production rates (mg C/m$^2$/hour) and no toxic effect.

At sea, we observed that extended (up to 14 hours) exposure to low amounts of UVB or UVA radiation, or both, had no effect on the in situ primary production.
Polyethylene Bags and Solar Ultraviolet Radiation
Osmund Holm-Hansen and E. Walter Helbling

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