the technique described here as the method of choice for maintaining hydration in the electron microscope. (i) Unlike liquid hydration methods, the frozen-specimen technique does not require delicate regulation of water vapor pressure, because the vapor pressure of ice at temperatures below $-100°C$ is negligible. (ii) The thin support films on both faces of the specimen greatly reduce the area available for sublimation. (iii) Frozen specimens are mechanically stable compared to fluid specimens. For example, colloidal particles can be expected to move quite rapidly due to Brownian motion in a liquid water hydration stage. (iv) Instrument modifications are minimal for the use of frozen specimens. A stage cooled with liquid nitrogen and suitable methodology for introducing a frozen specimen into the microscope vacuum are all that are needed to use this method.

With techniques now available for maintaining specimen hydration in the electron microscope, it is important to note the advantages and disadvantages of unstained, hydrated specimens compared to stained, dried specimens. Contrast in hydrated specimens should be directly interpretable as structure rather than as stain (*8*). Fixation and drying artifacts are avoided. Hydrated protein crystals retain a high degree of periodicity, whereas negatively stained protein crystals are rarely periodic to resolutions greater than 8 Å. On the other hand, radiation damage is expected to be much more severe in hydrated specimens.

There are two possible ways to overcome the limitations that radiation damage imposes on working with hydrated specimens. One way is to use a theory for interpreting the diffraction intensities, which are expected to be dynamical. Perhaps a more direct way is to use spatial averaging of statistically noisy pictures (*9*) or any equivalent method, which would utilize both the full, high-resolution potential inherent in hydrated specimens and the imaging properties of the electron microscope. It is generally believed that the phase problem is more easily solved for image intensities than for diffraction intensities, but the dynamical effect will be present in either case.

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Sunday and Workday Variations in Photochemical Air Pollutants in New Jersey and New York

Abstract. *Concentration distributions of air contaminants and meteorological variables in New Jersey and New York for workdays (Mondays through Fridays, omitting holidays) and Sundays are compared by means of quantile-quantile plots. The ozone distributions are slightly higher on Sundays, and the primary pollutant distributions are lower. These results raise serious questions about the validity of current concepts underlying ozone reduction in urban atmospheres.*

Bruntz *et al.* have reported (*1*) that O_3 diurnal patterns in New Jersey and New York show only minor differences on weekdays and Sundays, despite markedly different traffic patterns. The situation appears to be similar in the Los Angeles Basin (*2*), even though the pollutant characteristics of the two regions differ substantially in many respects. In this report we present more detailed statistical evidence for the ozone "Sunday effect" and for the workday-Sunday behavior of related atmospheric variables.

Sunday and workday (Mondays through Fridays, omitting holidays) data have been studied for measurements (*3*) of the following pollutants and meteorological variables in New Jersey and New York for the "photochemical seasons" May through September of 1972 and 1973 (the number in brackets indicates the number of investigated sites): NO [7], NO_2 [7], SO_2 [8], aldehydes [4], CO [9], total hydrocarbons [5], CH_4 [1], nonmethane hydrocarbons [1], aerosols [2], O_3 [9], visible solar radiation [1], ultraviolet solar radiation [3], wind speed [8], wind direction [5], mixing height [1], temperature [1], standard deviation of the vertical wind direction (vertical sigma) [2], standard deviation of the horizontal wind direction (horizontal sigma) [1], and precipitation [6]. For all wind and solar radiation variables and for all air quality measurements except O_3 the average value from 5 a.m. to 1 p.m. was used since this interval includes the time of major O_3 production and early morning primary pollutant injection. For O_3 the maximum hourly average from 11 a.m. to 6 p.m. and the average from 7 a.m. to 8 p.m. were used; for temperature, the daily maximum, minimum, and average; for precipitation, the daily total; and for mixing height, the 7 a.m. reading.

The goal of the analysis is to compare the distribution of the Sunday values of a measured variable at a particular site with the distribution of workday values. One procedure is to compare the arithmetic mean of all the Sunday values with the arithmetic mean of all the workday values. However, the arithmetic mean is only one facet of the distribution and does not necessarily characterize the entire behavior. (For example, the three sets of numbers {10,20,30,40,50}, {28,29,30,31,32}, and {21,22,23,24,60} differ substantially but have the same arithmetic mean.) In this analysis the entire distribution of the Sunday values was compared with the entire distribution of the workday values via a statistical technique called a quantile-quantile (*Q-Q*) plot (*4*). The quantile of order *p* of a set of data is defined to be a value such that a fraction *p* of the data is less than or equal to the value. For instance, the median would be a quantile of order ½. On the *Q-Q* plot the quantiles of one set of data (in this case the Sunday values)

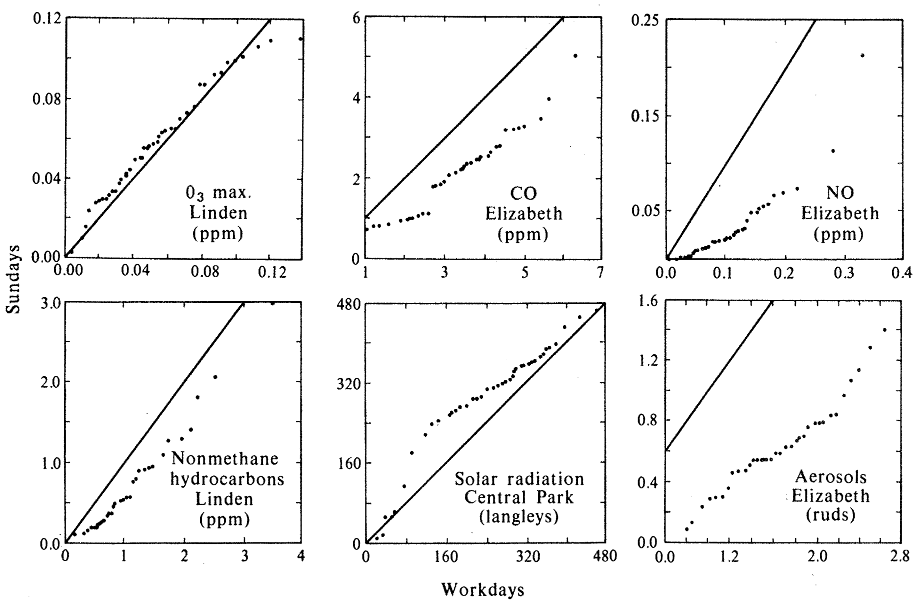

Fig. 1. Quantile-quantile plots for Sundays versus workdays.

are plotted against the corresponding quantiles of the other set of data (in this case the workday values). If the distributions are nearly the same, then the points of the plot lie nearly along the straight line $Y = X$.

Such *Q-Q* plots have been made for each of the 92 sets of air quality and meteorological data described above. For each of the variables the following patterns are consistent from site to site. The Sunday quantiles of NO, NO_2, CO, nonmethane hydrocarbons, aerosols, and total hydrocarbons are markedly lower than the workday quantiles, since on the *Q-Q* plots all these points are well below the line $Y = X$. The quantiles for aldehydes and CH_4 are slightly lower on Sundays than on workdays, whereas SO_2 shows no consistent pattern. The O_3 maxima are only slightly higher on Sundays, whereas O_3 averages are markedly higher. For all the meteorological variables the workday and Sunday quantiles are similar except solar radiation, mixing height, and vertical sigma which have noticeably higher Sunday quantiles.

Examples of patterns occurring at a particular site are presented in Fig. 1. Measurements from the Elizabeth, New Jersey, monitoring station (New Jersey Department of Environmental Protection) of NO, CO, and aerosols are shown, as are the closest data on O_3 and nonmethane hydrocarbons (Linden, New Jersey, Esso Research and Engineering Company, 2 km west of the Elizabeth site) and solar radiation (Central Park, New York City, National Weather Service, 21 km to the northeast). On all plots the line $Y = X$ has been drawn to facilitate comparison.

The *Q-Q* plots also convey several important facts that can only be seen by studying the entire distribution of each of the variables: the very highest O_3 maxima occur on workdays in this data set, but *all other* O_3 maxima and *all* average quantiles are higher on Sundays; for CO, NO, aerosols, and nonmethane hydrocarbons, the differences between Sunday and workday quantiles tend to increase with increasing concentration; for solar radiation the lowest and highest quantiles are nearly the same on Sundays and workdays, whereas the middle quantiles are considerably higher on Sundays. This increase in solar radiation would tend to increase vertical turbulence, which is consistent with the increased vertical sigma and mixing height. Since aerosols are a major absorber and scatterer of solar radiation in the troposphere (*5*), the increase in solar radiation on Sundays may well be due to the decrease in the Sunday aerosol concentrations (motor vehicles and industrial operations are major sources of aerosols).

We note in conclusion that the reduction in the concentrations of primary pollutants from 5 a.m. to 1 p.m. on Sundays may be regarded as a regional experiment to shed light on the effectiveness of reducing the O_3 concentration by a morning reduction of primary pollutants. Since the O_3 concentrations show little change in this experiment, it would appear that serious questions are raised about this reduction procedure.

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1α-Hydroxyvitamin D_2: A Potent Synthetic Analog of Vitamin D_2

Abstract. *A hydroxy analog of vitamin D_2, 1α-hydroxyvitamin D_2, has been synthesized and tested for biological activity. This vitamin derivative is active in stimulating intestinal calcium transport and bone calcium mobilization in the rat and exhibits antirachitic activity. Its biopotency is comparable to that of the corresponding vitamin D_3 analog, 1α-hydroxyvitamin D_3.*

Expression of biological activity of vitamin D_3 requires prior metabolic conversion of the vitamin to 1α,25-dihydroxyvitamin D_3 [1α,25-$(OH)_2D_3$] via the intermediate 25-hydroxy derivative (*1*). An entirely analogous transformation of vitamin D_2 (**1**, Fig. 1) to 25-hydroxyvitamin D_2 (25-OH-D_2) (**2**, Fig. 1) could be shown some years ago (*2*); and recent work (*3*) has established the further metabolism of **2**, by chick kidney preparations, to