lysis (mainly a thermal process) and radiolysis (an ionization process).

We next examined the sonolysis of pure CCl_4 under the same experimental conditions. The rate of its decomposition was determined by measuring the yield of elemental chlorine, as analyzed by extraction into an aqueous iodide solution at *p*H 4.0 (phthalate buffer) and subsequent spectrophotometric determination of the triiodide formed (*8*). The rate of chlorine formation under oxygen was 5×10^{-7} mole liter^{-1} min^{-1}. Under argon, however, the chlorine formation reached a steady state value of only about 10^{-8} mole liter^{-1} because of the back reaction of chlorine with the CCl_3 radicals. When *n*-butyl iodide was added in 0.03*M* concentration to the CCl_4 to suppress the back reaction, the rate of chlorine production under argon rose to 8×10^{-7} mole liter^{-1} min^{-1}, as measured by the overall yield of iodine. Inasmuch as CCl_4 (a liquid of low dielectric constant) undergoes sonolysis at a rate only an order of magnitude less than that of water, it is unlikely that electrostatic phenomena (*9*) are important in sonochemistry, in comparison to the thermal processes which occur (*3, 10*).

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Strontium Isotopes: Global Circulation after the Chinese Nuclear Explosion of 14 May 1965

Abstract. *Strontium-89 and strontium-90, released into the atmosphere by the Chinese nuclear device on 14 May 1965, circled the world in less than a month and caused a sharp peak in the Sr^{89}/Sr^{90} ratio in rain at Tokyo on 12 June.*

The second Chinese nuclear test explosion took place in the Lop Nor area (90°E, 40°N), Sinkiang Province on 14 May 1965. Because Lop Nor and Tokyo (140°E, 36°N) are at approximately the same latitude, and also because of the timing of the test explosion, which coincided with the rainy season (Tsuyu) in Japan, it seemed worth while to investigate the fallout pattern of the Sr^{89} and Sr^{90} in individual samples of rain. The radiochemical procedure that has been in use for several years in the laboratory of one of us (P.K.K.) was used for isolation and purification of the isotopes in rain (*1, 2*). The rain samples were collected at the Meteorological Research Institute, Kōenji, Kita, Suginami-ku, Tokyo. An Aloka radiation counter (model DC4) was used to measure radioactivity. The background of this low-level counting system was about 0.7 count/min.

The data are shown in Fig. 1. The air trajectory in the Northern Hemisphere during May and June 1965, prepared by one of us (J.N.) at the Long-Range Forecast Section, Japan Meteorological Agency, is shown in Fig. 2. The dates in Fig. 2 show the calculated positions of the tropospheric debris. The straight-line aS'_0 in Fig. 1 illustrates the Sr^{89}/Sr^{90} ratio in the stratosphere prior to the explosion of 14 May; it was deduced from data obtained at Fayetteville, Arkansas, after the first Chinese explosion of 16 October 1964 (*2*). A sharp increase in the Sr^{89}/Sr^{90} ratio in rain occurred in Tokyo on 20 May 1965; it coincided with the arrival of the first wave of the debris via the troposphere, shown in Fig. 2. The debris which entered the stratosphere traveled with greater speed and was picked up as dry fallout at Tokyo on 16 May and was also intercepted by an airplane of the Japanese Self-Defense Agency on the same day over Hokkaido Island.

The rapid decrease in the Sr^{89}/Sr^{90} ratio during the next 10 days or so was probably caused by the fact that the bulk of the fresh debris moved eastward over the Pacific Ocean. Frequent and heavy rains, which occurred during this period in Japan, may also have contributed to removal of fresh debris from the troposphere. A small peak in the Sr^{89}/Sr^{90} ratio in rain observed on 27 and 28 May coincided with the arrival of typhoon No. 6 at Tokyo. This typhoon reached Tokyo from the vicinity of Okinawa, to the southwest.

The pronounced peak in the Sr^{89}/Sr^{90} ratio in rain observed during the middle of June shows the arrival of the debris which circled the world. The data are in excellent agreement with the calculation of the air trajectory shown in Fig. 2. Miyake *et al.* (*3*) reported in 1956 that the average velocity of movement of debris from the Nevada test site eastward to Japan was 20 m/sec. The tropospheric debris from the Chinese nuclear explosion of 14 May 1965 circled the world from Tokyo back to Tokyo in 22 days, and the average velocity of

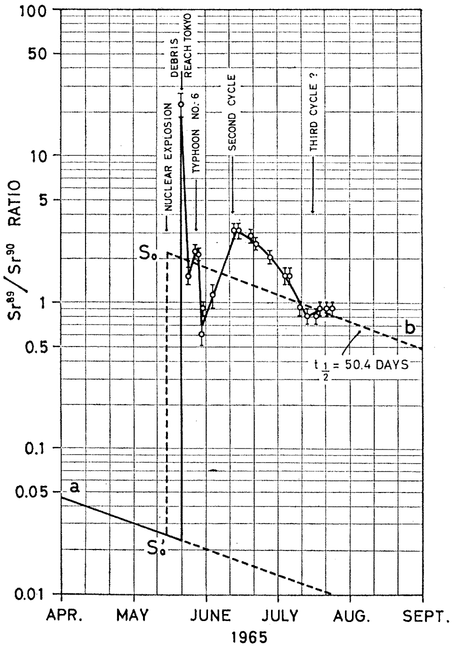

Fig. 1. Variation of the Sr^{89}/Sr^{90} ratio in rain after the Chinese nuclear explosion of 14 May 1965. The error limit indicated is due primarily to the counting statistics. The straight line aS_0' is the Sr^{89}/Sr^{90} ratio in the stratosphere prior to 14 May. The straight line S_0b indicates the estimated Sr^{89}/Sr^{90} ratio in the stratosphere after the second injection of strontium isotopes by the Chinese.

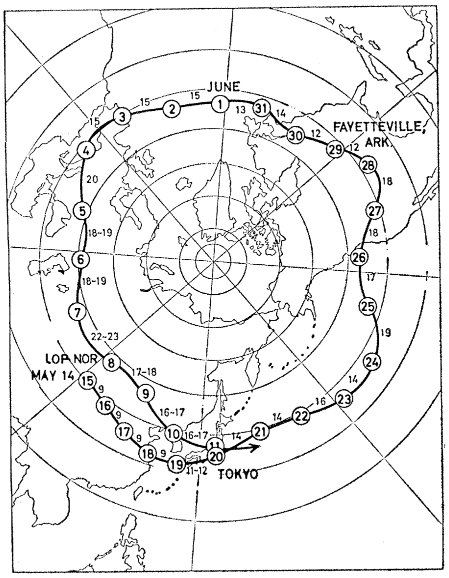

Fig. 2. Air trajectory in the Northern Hemisphere during May and June 1965. This figure indicates the air movement at the height of 5650 meters in the troposphere, which is known to give a representative overall average value of the tropospheric air movement. The numbers in the circles show dates and the numbers between circles show average wind velocities in meters per second.

the movement was about 16 m/sec.

The Sr^{89}/Sr^{90} ratio in rain gradually decreased during the second half of June because of decay of Sr^{89} (half life, 50.4 days), and because of removal of the strontium isotopes from the atmosphere through tropospheric fallout and addition of old debris from the stratosphere. It appears that the Sr^{89}/Sr^{90} ratio will eventually approach a straight line such as S_0b, which corresponds to the Sr^{89}/Sr^{90} ratio newly established in the stratosphere. However, a small irregularity was again observed in the middle of July, approximately a month after the 12 June peak occurred. It is probable that this irregularity coincides with the arrival of debris which had by that time circled the world twice and was then beginning its third circuit.

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Amino Acid Changes Provoked by Streptomycin in a Polypeptide Synthesized in vitro

Abstract. *The misincorporation of isoleucine provoked by streptomycin in a polyuridylate-directed incorporating system from* Escherichia coli *has been examined by a double-labeling technique with phenylalanine-^3H and isoleucine-^{14}C. The polypeptides synthesized are associated with 70S ribosomes and contain only phenylalanine in the absence of streptomycin, and both phenylalanine and isoleucine in the presence of the antibiotic. Results of acid hydrolysis and subsequent chymotryptic digestion of the polypeptides indicate that the misincorporated amino acid is inserted by peptide bonding with phenylalanine and is randomly distributed along the chain.*

The ability of streptomycin (Sm) to replace a required growth factor in conditional streptomycin-dependent (CSD) mutants has been interpreted in terms of Sm-activated suppression, whereby a defective protein can be corrected by an amino-acid substitution (*1*). Studies in vitro support this hypothesis, in that Sm provoked the misreading of synthetic polynucleotides in a system containing ribosomes from Sm-sensitive cells with resulting significant misincorporation of amino acids into the material precipitable with trichloroacetic acid (*2, 3*). These studies indicated the ribosome as the site sensitive to streptomycin action and, therefore, implicated the translation process. The sensitivity was later more precisely located as occurring at the step of codon recognition (*4*).

However, the reasonable assumption that this misincorporation is expressed by corresponding changes in the amino acid composition of the resulting polypeptide and the sequence by which the misreading occurs remains to be established directly. We have studied the effect of Sm in the polyuridylate-directed synthesis of polyphenylalanine, which from the incorporation data (*2, 3*) should change from a homopolymer of phenylalanine to a polypeptide consisting of five amino acids. We have used a double-labeling technique with phenylalanine-^3H as the correctly incorporated amino acid and isoleucine-^{14}C as the misincorporated amino acid. This procedure also allows us to follow simultaneously the inhibition of phenylalanine incorporation and the stimulation of isoleucine misincorporation with subsequent analysis of the reciprocal relationship of these two events.

The incorporating system used was derived from *Escherichia coli* (*5*), containing full complement of unlabeled amino acids in addition to the designated labeled ones. From Fig. 1 it can be seen that, as the Sm concentration is increased, the inhibition of phenylalanine incorporation increases and there is a concomitant increase of the misincorporated isoleucine. At a concentration of 2.5 μg of Sm per milliliter the effects were near a maximum, and at 20 μg per milliliter (the usual concentration) the isoleucine replaced 60 percent of the phenylalanine. Moreover, there is an overall stimulation of amino acid incorporation. The degree of stimulation (about 12 percent) deducible from Fig. 1 is a minimum estimate, since only phenylalanine and isoleucine were considered; whereas the contribution from serine, tyrosine, and leucine must also be taken into account.

The study of the polypeptides synthesized in vitro has been carried out on nascent chains bound to ribosomes. Figure 2 shows the sucrose-gradient fractionation of the incubated incorporating system after ribonuclease treatment to destroy messenger RNA. In Fig. 2*a* it is verified that after this treatment phenylalanine (tritium label) remains associated with the 70*S* ribosomal peak (*6*); but more pertinent to this study is the fact that the ^{14}C la-