The consumer is the man who buys threaded fasteners or threaded articles to be assembled in his plant into manufactured durable goods—automobiles radios, washing machines, and any number of other articles. He too has a problem during the transition period. His inspection will need to cover either the old or new standard. His warehousing, manufacturing, and assembly operations will need to be flexible to accommodate both standards. He will find it expedient to accept purchased articles, during the transition period, which may have been produced in accordance with either the old or the new standard. His inspectors will no doubt be instructed to accept either standard during the transition period, regardless of which specific standard may have been ordered. It would be simple, from the consumer's standpoint, if on a certain day he could discontinue using the old and start using only new standard threaded articles, but this is obviously impractical. What might have been a complex transition, however, is made easier by the interchangeability of the old and new standard articles.

The entire problem resolves itself into the elements of time, patience, and money. The time, as noted, may be as much as five years, and the patience of both producers and consumers will be tested during this transition. The money is a real consideration—many thousands of dollars will have to be spent on new standard tools, dies, and gauges, on product identification, and on storage systems.

The new standards offer so many advantages to everyone concerned that they will be placed in effect as quickly as possible by all producers and users of threaded articles. Requests for new standard threaded fasteners are already being received from some of the leading national industries. The wheels of industry have been set in motion to accomplish this gigantic task and it may be completed much sooner than we expect.

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Solar Eruption of May 10, 1949

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AN OUTSTANDING SOLAR FLARE and its effects on the ionosphere were observed in unusual detail on May 10, 1949, at the Sterling Field Station of the National Bureau of Standards. In addition to the usual magnetic variation and continuous wave radio field intensity observations that are always in progress, data were also obtained with solar noise radiometers (Wurzberg) at 480 and 160 megacycles, and rapid sequence, vertical incidence multifrequency (h′-f) observations of the ionosphere. Preliminary determinations of the times of significant activity have been communicated by Helen Dodson, of the McMath-Hulbert Observatory, who estimates the flare as of importance 3+, the greatest reportable on the scale of the International Astronomical Union.

All observations of the eruption and its absorption effects show that it began between 20:00 and 20:03 Universal Time (see Table 1). The solar burst of radio noise seems to have been detected before any terrestrial effect. Estimated errors in time determination are ±0.25 minute for solar noise observations, and ±1 minute for ionospheric measurements. The precision of the McMath estimates is not known. The maximum effect was reached for all types of observation of the phenomenon at between 20:10.5 and 20:12.5; again the solar burst attained maximum first. The duration of the extremely intense portion of the solar noise burst lasted only two or three minutes. The severe ionospheric absorption effects lasted considerably longer, the duration being greatest for oblique incidence paths.

The intensity of the noise burst, presumably emanating from the small visibly active area, was about 290 times the normal energy output of the entire disk of the quiet sun on 160 megacycles, while the intensification on 480 megacycles was probably 1000 times the background radiation. The mirror and antenna of the 480-megacycle radiometer were not set directly on the sun at the time of maximum of the burst, so that the value given is an estimate; the possible range of intensification ratio appears to be between 800 and 1550. This is the strongest burst observed thus far with these radiometers. Minor bursts previously observed with these instruments have yielded the larger ratio at 160 megacycles.

ginning of the brief disturbance, or "crochet," which appears in the magnetic recordings, is aligned with the other phenomena; no maximum can be defined.

TABLE 1

SUMMARY OF SOLAR-TERRESTRIAL PHENOMENA OF MAY 10, 1949

Phenomenon	Time of beginning U.T.	Time of maximum U.T.	First stage of recovery U.T.	Return to normal U.T.	Remarks
H_a flare	20h02m	20h11m	20h30m	After 22h20m	Importance 3+ (preliminary estimates)
Solar noise outburst 160 megacycles	20 00	20 10.6	20 11	20 37	Increase of solar radiation at maximum of 290 times
Outburst 480 megacycles	20 01	20 10.6	20 12	20 53	Intensification at maximum order of 1000
S.I.D. h′-f trace	20 03	20 11	20 30	After 21 11	Absorption of vertical incidence signals up to 6.5 megacycles
S.I.D. (Signal from GLH, England)	20 03	20 12	20 28	21 10	Decrease of 42 decibels
S.I.D. (Signal from W8XAL, Ohio)	20 02	20 11	21 23	22 00	Decrease of 45 decibels
Magnetic crochet	20 03		20 30	20 45	Increase of 24 gammas in horizontal intensity

The strongest outburst of energy occurred during the same period on the two frequencies. The phenomenon started abruptly on 480 megacycles (Fig. 1), with a 39-fold intensification in less than a minute. Thereafter the radiation increased in steps to the maximum. The initial postmaximum decrease was very abrupt. By contrast, on 160 megacycles the phenomenon began gradually, and then there was a 37-fold increase in about two minutes. Again decrease was rapid. The field intensity records indicate a small increase in absorption at the start of the flare, followed within three or four minutes by the abrupt increase (sudden ionospheric disturbance). The be-

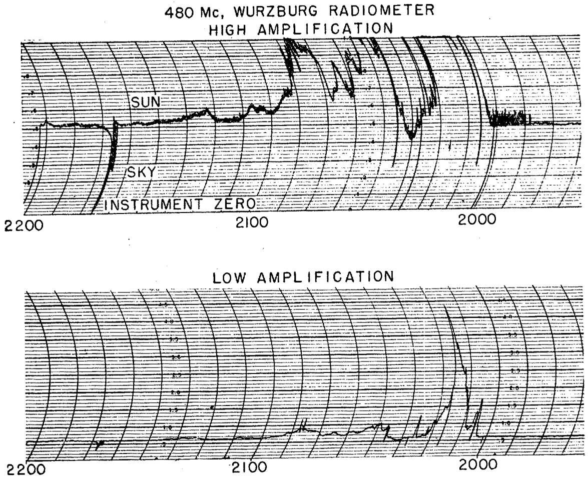

FIG. 1. Solar noise burst at 480 megacycles, May 10, 1949.

A secondary maximum of the 480-megacycle record at 20:18 coincides with a brief increase in the mini-

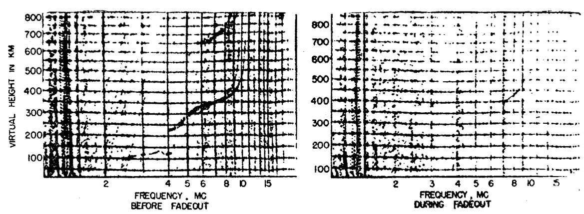

FIG. 2. Multifrequency ionospheric record at beginning of solar flare (left) and at stage of maximum absorption (right).

mum frequency returned at vertical incidence (Fig. 2). Otherwise none of the features of the postmaximum solar records corresponds with details of the recovery stage of the fadeout. The flare had subsided, but had not disappeared, by 22:20 on spectroheliograms taken in the light of the alpha line of hydrogen. The 480-megacycle solar noise became relatively quiet much earlier (by 20:53), while on 160 megacycles, solar radiation was relatively steady after 20:37, though at an enhanced level and with minor fluctuations. Ionospheric absorption effects continued to be noticed as late as 23:00 at the very lowest transmitting frequency; for higher frequencies the effect of the disturbance had disappeared soon after 21:00.

The flare was observed in a rather small sunspot region, with area only 450 millionths of the sun's visible hemisphere. Assuming that the radiation originated entirely in this region implies that the intensity of the source was 2×10^6 times as great as the average energy from the entire disk at 480 megacycles. This region crossed the central solar meridian on May 11.5 in latitude 18° S. An intense magnetic storm began at 06 : 24 May 12, 34 hours 22 minutes after the flare, during an interval when disturbance had been forecast by the Central Radio Propagation Laboratory.

This occurrence supports previous evidence that great flares and severe fadeouts start very nearly simultaneously. The observation that the times of maximum intensity of the bursts of solar noise at 480 and 160 megacycles coincide to within a few seconds differs from the condition observed with the lesser bursts. That this time of maximum intensity is also very nearly the time of maximum absorption is further evidence that the radiation which ionizes the absorbing layer varies in intensity similarly to radiation in the H_{α} and the 480- and 160-megacycle regions.

TECHNICAL PAPERS

Low Temperature Studies with Colloidal Silicic Acid

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A number of observations have been made in this laboratory during the past two years pertaining to the thermal behavior of silica sols which appear to be related to the properties of ice. The following gives a brief summary of the findings. More detailed reports will be published elsewhere.

The effect of freezing on the stability of colloidal silicic acid is known to be related to pH (*4*). An extension of the study to liquid air temperatures has revealed that the rate of thawing may have a profound effect with systems frozen at temperatures below about − 55° C (e.g. at − 65° or in liquid air). When thawed rapidly by immersing the containing vessels (test tubes) in water at room temperature the colloidal system remains stable. However, when the same system is thawed slowly in air at room temperature it coagulates.

An explanation of this phenomenon may be that the ice lattice is more disordered when formed by rapid freezing below about − 55° C than it is when formed above this temperature. Freezing the colloidal system in liquid air produces a solid system which approaches an amorphous condition (*2*). At temperatures higher than about − 55° C the ice lattice is more orderly and this causes the colloidal particles to be coagulated when they are crowded together into pockets.

When the system described above is frozen by immersion in liquid air and thawed slowly, the solid state is retained long enough above − 55° C for well-defined crystals to form. This results in the dehydration of the colloidal particles in the pockets which serve as loci for coagulation. Under conditions of rapid thawing the more stable lattice does not have a favorable opportunity to form, hence freezing and thawing do not produce coagulation under these conditions.

It has been demonstrated in a striking way that this fundamental change can occur in the solid state. A sol frozen in liquid air may be held for an undetermined length of time at temperatures below about − 55° C (e.g. at − 65° or in liquid air), and it will not coagulate if it is thawed rapidly. However, when the sol is frozen in liquid air and then transferred to a temperature above − 55° C, but substantially below the melting point, e.g. − 35° C, and held at this temperature for 15 min it coagulates irrespective of the rate of thawing. Fifteen min is a relatively short time and it is apparent that the disoriented lattice is metastable with respect to the crystalline lattice.

These observations tend to clarify the reported behavior of a variety of different systems and to strengthen the view that the properties of ice at different temperatures may be a determining factor in the stability of a colloidal system. Thus, it has been reported that hemoglobin and vanadium pentoxide sols coagulate when frozen at − 5°, − 15°, and − 21° C but not at − 190° C (*1*). The rate of thawing of synthetic rubber dispersions frozen at − 60° C has been found to have a similar marked effect on the amount of coagulation (*5*).

It is tempting to correlate the behavior described with the fact that the dielectric constant of ice diminishes abruptly at about − 55° C (*3*). On the basis of free rotation of the water molecule, it can be said that at about − 55° C a polymorphic transition from a fine ice structure with a disoriented lattice (not a glassy state) to a more orderly lattice with a higher lattice energy occurs. It is the condition of the ice above − 55° C which is responsible for the precipitation phenomena. The lattice energy under these conditions is sufficient to overcome the solvation energy.

Additional information concerning this complex behavior has been obtained by observing the freezing precipitation in the presence of alkali metal halides. Some success has been had in correlating the effect of these