The main events, which occurred on July 25 and August 2, 1946, are plotted in Figs. 1 and 2 respectively. The left-hand ordinate gives the measured solar radiation flux density in watts/cm.^{2}/c.p.s. band-width, and the right-hand ordinate the factor by which this exceeds the normal black-body radiation on this frequency. The very large surge of energy at 1624 U.T. on July 25, which exceeded 10^8 times black-body radiation, was followed by abnormally high noise throughout July 26–27, fluctuating between 6×10^{-22} and 8×10^{-25} watts/cm.^{2}/c.p.s. band-width. On July 28 the radiation had fallen below the minimum value detectable by our apparatus except for occasional minor surges. Unfortunately, a prolonged thunderstorm began at 1200 U.T. on July 26 and caused disturbances which may have obscured some of the solar radiation maxima during the rest of that day. On August 2 three large surges were observed, each lasting for about two minutes. In the intervening periods between these surges the solar radiation was below the minimum detectable by our equipment. These surges were plotted automatically by a pen recorder and their detailed structure is reproduced in Fig. 2.

In addition to these main events, other appreciable surges of energy were recorded on July 22, 24 and 25. These are detailed in the accompanying table. No other significant increases of radiation were noticed between July 22 and August 14, although observations were not continuous throughout the period, and the possibility that other surges occurred cannot therefore be excluded.

Date	Time (U.T.)	Remarks	Radiation flux density in watts/cm.^{2}/c.p.s. band-width	Ratio to black-body value
July 22	1629–1642	Several surges	$5 \cdot 0 \times 10^{-24}$	$7 \cdot 7 \times 10^4$
July 24	1628	3 surges each of a few seconds duration	$5 \cdot 0 \times 10^{-24}$	$7 \cdot 7 \times 10^4$
July 25	1031.30	Surge approx. 1 sec. duration	$3 \cdot 8 \times 10^{-23}$	$5 \cdot 8 \times 10^5$
,,	1032	,, ,,	$3 \cdot 8 \times 10^{-23}$	$5 \cdot 8 \times 10^5$
,,	1434	Surge approx. 2 sec. duration	$5 \cdot 6 \times 10^{-23}$	$8 \cdot 6 \times 10^5$
,,	1435.30	Surge approx. 0·5 sec. duration	$5 \cdot 4 \times 10^{-24}$	$8 \cdot 3 \times 10^4$
,,	1437.30	,, ,,	$5 \cdot 4 \times 10^{-24}$	$8 \cdot 3 \times 10^4$

The main event, beginning at 1624 U.T. on July 25, would appear to be closely associated with the intense solar flare which began at 1600 U.T. on that date and, according to Ellison[4,5], reached its peak brilliance at about 1627 U.T. The peak value in the solar energy of $1 \cdot 3 \times 10^8$ times black-body value lasted from 1624 until 1627.30 U.T. Surges of almost identical magnitude associated with solar flares were found by Appleton and Hey during the large sunspot of February 1946. These results (in publication, *Phil. Mag.*) have been communicated privately.

A. C. B. LOVELL
C. J. BANWELL

Physical Laboratories,
University of Manchester.
Aug 16.

[1] Appleton, E. V., *Nature*, **156**, 534 (1945).
[2] Hey, J. S., *Nature*, **157**, 47 (1946).
[3] Pawsey, J. L., Payne-Scott, R., and McCready, L. L., *Nature*, **157**, 158 (1946).
[4] Ellison, M. A., *Nature*, **158**, 160 (1946).
[5] Ellison, M. A., *Nature*, **158**, 450 (1946).

Use of Lead Sulphide Photo-conductive Cells for High-speed Pyrometry

LEAD sulphide photo-conductive cells were first manufactured during the War in Germany by Gudden, Kaspar, Kutzscher and others, though details have not yet been published. In late 1944 work on these cells was begun in Great Britain, and methods of manufacture were developed at the Admiralty Research Laboratory. This work will be described elsewhere. It is the purpose of this note to emphasize the value of these detectors for the measurement of rapidly varying surface temperatures, a problem which often arises in physical and engineering laboratories.

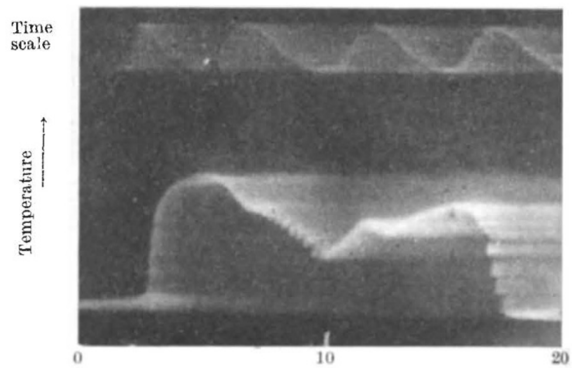
The cells are usually sensitive in the visible region of the spectrum, but the peak response lies in the infra-red region at 2·7 microns and the long-wave threshold is near 3·5 microns. An average cell of area 10 sq. mm., used at normal temperatures in conjunction with a radiation chopper and a tuned amplifier of response time 30 milliseconds, gives a signal equal to noise with 10^{-9} watts of radiation falling on it of wave-length between 1 and 3 microns. The response time can be decreased at the expense of sensitivity by increasing the amplifier band width. The response time of the cells themselves is of the order of 0·1 millisecond.

The radiation in the region 1–3 microns emitted by a black body at various temperatures is given below.

Temp. ° C.	100	200	400	600	800
Watts/cm.^{2} emitted (1–3 μ)	$1 \cdot 2 \times 10^{-4}$	$2 \cdot 4 \times 10^{-3}$	$7 \cdot 9 \times 10^{-2}$	$5 \cdot 5 \times 10^{-1}$	2·35

It will be seen that there is sufficient radiant energy available for pyrometric measurements of reasonable accuracy at temperatures as low as 100° C. Surfaces which are not black will, of course, give correspondingly reduced signals, and constancy of surface conditions is required for accurate temperature measurement.

Cells made at the Admiralty Research Laboratory have been applied successfully to problems of this kind. In particular, the determination of temperature changes taking place along the circumference of a 36-in. diameter railway wheel when subject to service braking from speeds up to 60 m.p.h. is being made at Messrs. Ferodo Limited, Chapel-en-le-Frith. Radiation from a 5 sq. mm. area of tyre falls on to the cell via an arrangement which comprises a water-cooled copper sighting-tube and a rotating slotted disk which serves as the radiation chopper. After amplification the signal is fed to one beam of a Cossor double beam C.R.O., while the other beam registers small angular deflexions of the wheel and a 50-cycle time trace. The amplifier employed, which was very kindly loaned by the Telecommunications Research Establishment, Malvern, has a response time of 1 millisecond. Deflexions of the beams are recorded by a moving film camera and so give variations of the temperature along the tyre circumference as the wheel decelerates. Calibration is effected by focusing the cell on a small cylinder of tyre material contained in a specially designed vacuum furnace, care being taken to match the optical paths and the surface condition of the metal.



Distance along circumference (in.)

A short length from a typical record is shown in the accompanying figure. The maximum temperature in this example corresponds to about 400° C., and it would appear that part or the whole of the tyre area viewed by the cell was in close contact with the brake for this limited period of the deceleration. In this equipment temperatures from 150° C. to 950° C. are covered in two ranges. The accuracy of measurement, which is determined by the width of the trace, is between 5° C. and 25° C., depending on the range of temperature covered. The nature of the variations of temperature over the surface will be discussed in a further publication.

E. LEE

Admiralty Research Laboratory,
Teddington,
Middlesex.

R. C. PARKER

Ferodo Research Laboratory,
Chapel-en-le-Frith.

Absorption Spectrum of Trithioformaldehyde and Thiometaformaldehyde

THE ultra-violet absorption spectrum of formaldehyde has been investigated by various workers and is now well known. In an attempt to investigate the corresponding spectrum of monomeric thioformaldehyde, the ultra-violet absorption of gaseous trithioformaldehyde and thiometaformaldehyde at temperatures up to 250° C. has been examined. Using silica tubes up to 50 cm. in length, no band spectrum was observed, absorption being continuous from 2739·5 A. to the lower range of observation, the intensity and extension of the absorption increasing gradually with the temperature.

The ultra-violet absorption spectra of saturated solutions of trithioformaldehyde and thiometaformaldehyde in chloroform, ethyl alcohol, sulphuric ether and carbon tetrachloride did not show any dependence on the nature of the solute, except for chloroform in which the absorption of the trimer started at a somewhat higher wave-length than the absorption in the meta solution.

A detailed account will be published later.

M. DESIRANT

Institut de Chimie,
University of Liège.
Sept. 5.

Feeble Paramagnetism of Hexavalent Chromium

FEEBLE paramagnetism[1] is exhibited by certain ions in the ^1S state. As the spin quantum number in this case is zero, van Vleck[2] suggested that there remains only the contribution of the high-frequency elements of the orbital moment, as given by the second term in the formula:

$$\chi_{\text{mol}} = -\frac{Nc^2}{6Mc^2}\Sigma\bar{r}^2 + \frac{2}{3}N\sum_{n' \neq n}\frac{|M^0(n';n)|^2}{h\nu(n';n)}.$$