Table 3. Recovery owing to cysteine after 20,000 r of x-rays (calibrated by non-irradiated cells).

Treatment before irradiation	Treatment after irradiation	Survival (%)
Malonic acid, $10^{-3}M$	Cysteine, $10^{-3}M$	67.2 ± 2.4
None	Cysteine, $10^{-3}M$	72.1 ± 2.6

Table 4. Sensitization by maleic acid applied before 20,000 r of x-rays (2000 cells were counted as a whole, and calibration was held by control).

Molar concn. of maleic acid in Nägeli's soln.	Survival (%)	
	Irradiated	Non-irradiated
10^{-3}	22.6	85.3
10^{-4}	36.1	96.2
10^{-5}	43.4	102.1
0	47.1	100

acid was not used (compare Table 2 with third line of Table 1). This may be explained on the hypothesis that fumaric or aspartic acid removes the block produced in the tricarboxylic acid cycle by malonic acid.

In other experiments, cysteine was added to the Nägeli agar to reactivate altered sulfhydryl groups in the irradiated cells (Table 3). Although there was a substantial recovery owing to cysteine (compare Table 1 with Table 3), the sensitizing action of malonic acid was not completely overcome by the cysteine; there was the statistical significance of the difference between 67.2 and 72.1 percent.

The effect of maleic acid on radiosensitivity is shown by the data in Table 4. This acid, in concentrations less than $10^{-3}M$, has no inhibiting influence on growth of the yeast cell but seems to sensitize the cell to radiation, the effect varying directly with concentration in the culture medium. However, its concentration and distribution in the cell are unknown.

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References and Notes

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Tests of a Soil Sterilant for Forestry Use

The chemical compound 3-(*P*-chlorophenyl)-1,1-dimethylurea (CMU) (*1*) has been tested in the sand hills of western Florida to determine whether it would kill scrub oaks and wire grass and permit reforestation with planted pines. CMU (*2*) is a nonvolatile, slightly acid, grayish-white powder with a very low solubility in water (230 ppm). It has relatively low flammability and mammalian toxicity.

The chemical was applied to the soil as an aqueous suspension in 10 dosages from 0 to 37 lb/acre in March 1953, each treatment being replicated four times. Mortality of woody plants was determined by actual stem count, while ground cover was surveyed by line-spot transects. The results are based on differences between pretreatment and posttreatment vegetation surveys.

A vegetation survey that was made 16 mo after application showed that dosages of 11 lb or more per acre had controlled scrub oaks of all sizes. Twenty-two pounds or more was necessary to control grass and other ground cover. Necrosis first appeared around the leaf margins of oaks and on the tips of pines and grasses. Oaks (*Quercus laevis* and *Q. incana*) that received dosages of 22 lb or more lost as many as three sets of leaves during the first growing season after treatment. Wire grass (*Aristida stricta*), the pretreatment dominant, was nearly eradicated at dosages around 7 lb/acre, but it was replaced by *Sorghastrum nutans, Panicum virgatum, Andropogon scoparius,* and *Andropogon floridanus* during the second growing season after treatment (Table 1). Ingressive grasses in treated plots were much taller and more vigorous than those in untreated border strips. Weed species that were the most resistant to CMU included cactus (*Opuntia* spp.), saw-palmetto (*Serenoa repens*), sassafras (*Sassafras albidum*), and yucca (*Yucca* spp.).

Table 1. Mortality of oaks and ground cover at end of second growing season after application of CMU to the soil.

Dosage (lb/acre)	Mortality (%)			
	Oaks 8 ft and taller	Oaks 4–8 ft tall	Oaks 1–4 ft tall	Ground cover
0	0	19	13	5
1	26	0	0	31
2	23	12	19	11
4	57	20	4	14
7	87	84	13	14
11	98	99	97	3
16	100	100	99	43
22	100	100	99	74
29	100	100	100	86
37	100	94	97	79

Forty-nine slash pines (*Pinus elliottii* Engelm.) were planted in each plot in January 1954, 9 mo after application of the chemical. Analyses of soil samples for residual CMU were made in July 1954. Phytotoxic amounts were found even in soil that had received dosages of 4 lb/acre; pine survival counts made in September 1954 revealed that 24 percent of the trees in this treatment were dead or severely chlorotic. Pines in the 37-lb treatment suffered 98-percent mortality and injury. The persistence of CMU even at low dosages makes its value for use in forestry questionable.

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Notes

1. It is also known as Karmex W.
2. E. I. du Pont de Nemours and Co. supplied the chemicals that were used in this study and made analyses of soil samples.

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Sound of Boiling

An interest in the sound of boiling liquids has been apparent for years. Chemical plant operators in charge of evaporators and reboilers sometimes judge the performance of their equipment by the noise emitted. A general superstition is that the louder the noise of boiling the better the performance of the equipment. The noise that occurs as a hot metal is quenched in a liquid has received notice. A change in pitch accompanies the drop in temperature (*1*). The noise accompanying the overloading and resulting burnout of electric heaters immersed in water has been reviewed (*2*).

Researchers also occasionally depend on the sound of boiling. When boiling data are obtained, it is important to know which type of boiling is occurring. Boiling can occur by at least three different mechanisms. These are different to the eye and the ear and also in the manner in which the heat transfer depends on the temperature driving force.

The relationship between the heat-transfer rate and the over-all temperature driving force for each type of boiling, with methyl alcohol, is shown in Fig. 1. The short crosslines indicate the boundaries between the types of boiling: nucleate, transition, and film boiling.

Visual studies of the types of boiling have been made with still photography, using exposures of 10^{-6} sec, and with