Table 2. Effect of inhibitors on the formation of red pigment in *Amaranthus* seedlings.

Concn. of inhibitor (*M*)	Light	Dark and kinetin
	Catechol	
10^{-3}	Slight inhibition	50% inhibition
	Thiouracil	
10^{-5}	Slight stimulation	Slight inhibition
10^{-4}	No germination	No germination

might be explained as follows. In the presence of both kinetin and light, processes leading to pigment destruction predominate initially. Later, pigment formation exceeds pigment destruction, and the amount of red pigment rises. This might be due to the slow formation in the light of pigment precursors, which are converted to the red pigment in the presence of kinetin (*8*).

E. BAMBERGER
A. M. MAYER
Botany Department, Hebrew University, Jerusalem, Israel

References and Notes

1. C. O. Miller, *Plant Physiol.* **31**, 318 (1956).
2. W. S. Hillman, *Science* **126**, 165 (1957); R. A. Scott, Jr., and J. L. Liverman, *Plant Physiol.* **31**, 321 (1956).
3. C. O. Miller, *Plant Physiol.* **33**, 115 (1958).
4. A. Kadman-Zahavi, *Nature* **180**, 996 (1957).
5. R. Robinson, *ibid.* **182**, 46 (1958); R. G. Peterson and M. A. Joslyn, *ibid.* **182**, 45 (1958).
6. K. V. Thimann and B. S. Radner, *Arch. Biochem. Biophys.* **58**, 484 (1955); **59**, 511 (1955); L. Bogorad, *Ann. Rev. Plant Physiol.* **9**, 417 (1958).
7. K. Mothes and L. Engelbrecht, *Proc. Intern. Botan. Congr., 9th Congr.* (1959), vol. 2, p. 173.
8. This report is part of a thesis submitted to the Hebrew University by one of us (E.B.).

18 January 1960

Behavior and Beliefs during the Recent Volcanic Eruption at Kapoho, Hawaii

Abstract. The recent volcanic eruption at Kapoho, Hawaii, resulted in rituals and offerings to the Hawaiian Volcano Goddess, Pele.

In 1955, a volcanic eruption occurred in the populated Puna District of East Hawaii. This renewal of volcanic activity followed a period of quiescence lasting well over 100 years. During the 3 months of intermittent volcanic action there was no loss of life, but damage to property and crops was extensive. On 13 January 1960, eruption resumed near the village of Kapoho for the second time in 5 years. The resulting emergency was preceded by a sharp increase in the frequency and magnitude of earthquakes. More than 250 individuals left their homes prior to and during the first night of the eruption. One hundred and one individuals were relocated to the Red Cross disaster shelter. The remaining evacuees were sheltered by relatives or friends, or by means of house rentals. Most transportable belongings were removed during the first two days.

On the fifth day of the eruption, the first dike was built to contain or divert the lava from the Warm Springs recreation area, which was destroyed the following day. A series of earthen dikes were constructed with bulldozers during the following weeks. The lava circumvented, overran, filtered under, or pushed aside each of the dikes. Numerous buildings in the path of the flow were destroyed. It was suggested that the flow might be diverted by bombing with military aircraft. The major landowner in the area emphatically refused to give permission.

During the 15th and 16th days, most of the village of Kapoho was covered by the lava. The destruction of Kapoho was almost complete as of the first week in February.

Since the initial day of the emergency, periodic observations have been made of the behavior patterns of the evacuees and others at the site of the eruption and in the evacuation center. Concurrently, a questionnaire is being administered to most of the evacuees and to a control group in a similar rural community that is quite distant from any volcanic activity. Responses are sought to questions concerning "security seeking" behavior, communication of the state of emergency, self-reliance, manner of relocation, and so forth. The questionnaire interview is being conducted by a group of students of the Hilo Campus, in English, local pidgin English, Japanese, Korean, and three Filipino dialects. A photographic account of the behavior is also being made.

A number of behavioral scientists entertain the working hypothesis that in times of stress and uncertainty, many individuals seek security in supernatural beliefs, rituals, and related behavior. One of the objectives of our research is to measure this phenomenon as it is occurring in the unique cultural environment of Hawaii. The study is seeking to establish the relationship between the current observations of "security seeking" behavior and other variables such as ethnic group membership, degree of acculturation, level of education, and previous experience under stress, such as the conditions of social disorganization in the 1955 eruption.

One unusually interesting class of "security seeking" behavior emerges consistently during Hawaiian eruptions: rituals and offerings are made to the Hawaiian Volcano Goddess, Pele. Pictorial records have been made with or without permission from the individual performing the ritual. Permission to take the picture in Fig. 1 was granted. This picture shows a Hawaiian language chant to Pele being read by a Chinese-Hawaiian. The traditional offerings of breadfruit, bananas, pork, and tobacco are at his feet. The Western influence is manifested by the Christmas gift wrapping and green ribbon for the box of offerings to Pele. The throwing of the offerings upon the lava flow was accompanied by the singing of a Chinese song.

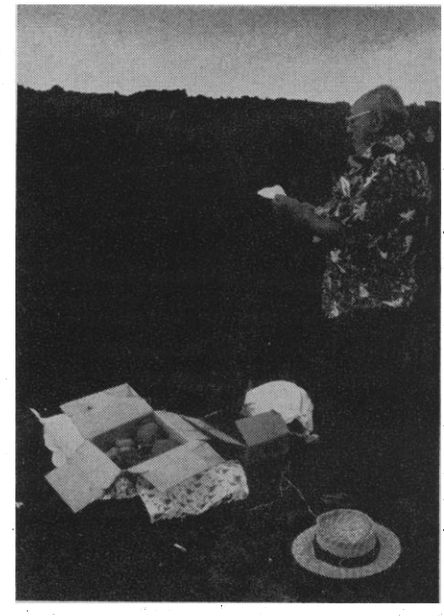

Fig. 1. A Chinese-Hawaiian stands next to the lava flow reading a chant to the Volcano Goddess Pele. Note the Christmas gift wrapping around the offerings.

Preliminary data indicate that this behavior and especially the related be-

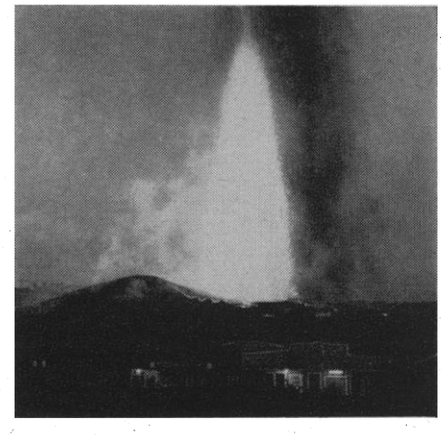

Fig. 2. The immense lava fountain is shown behind the main street of the village of Kapoho. [Hilo Tribune Herald]

liefs are not limited to any one religious creed, ethnic group, age level, or degree of educational achievement. Among the believers in Pele are some highly educated individuals and some prominent citizens of the island.

The old Hawaiian beliefs are remarkably rational and provide an apparently consistent explanation for geological growth processes. The beliefs appear to be reinforced by a number of factors. One such factor is the very sight of the lava fountains which are often over 1000 ft in height (see Fig. 2). This magnificent phenomenon is accompanied by auditory, olfactory, and tactile stimulation produced by the fountain and its accompanying fallout.

Another source of reinforcement for belief in Pele is the inability of science and technology to cope with the destructiveness of the lava flows. The building of dikes to contain or divert the lava appears to be uniformly unsuccessful.

The nature of the beliefs in Pele and the source of their perpetuation are being systematically investigated. Belief in Pele is openly acknowledged by many of the evacuees.

ROY LACHMAN
WILLIAM J. BONK
Department of Psychology, and
Department of Anthropology and Sociology, University of Hawaii, Hilo

Note

Research conducted to date has been aided by funds granted by the University of Hawaii. We thank Wayne Richardson, president of C. Brewer and Co. (Hilo branch), for providing I.B.M. facilities, and for granting access to one of the company's plantation towns, which was used as the control group. Excellent assistance is being rendered by the Civil Defense, American Red Cross, Hawaii County Police Department, Department of Public Instruction, Department of Social Welfare, Hawaii National Guard, U.S. Army Reserve, and Geological Survey volcanologists.

9 February 1960

A Nonsteroidal Androgen

Abstract. 2-Acetyl-7-oxo-1, 2, 3, 4, 4a, 4b, 5, 6, 7, 9, 10, 10a-dodecahydrophenanthrene possesses androgenic activity when applied directly to the chick's comb. This action is in addition to the antiandrogenic activity previously reported for this compound. This is the first demonstration of androgenic activity by a compound not possessing the steroid nucleus.

Up to the present time androgenicity has always been associated with compounds possessing the steroid nucleus or those having only minor modifications in the nucleus, such as the *D*-homo analogs of testosterone (*1*). It has now been demonstrated that a perhydro phenanthrene derivative, previously reported to be an antiandrogen in rats (*2*) and in chicks (*3*), also exhibits androgenic activity when applied directly to the chick's comb.

Table 1. Androgenic activity of Ro 2-7239 inthe chick, when inuncted in absolute alcohol to the comb.

Material inuncted	Total dose (μg)	No. of chicks	Mean comb ratio ± S.E.
	Experiment A		
None	0	18	0.39 ± 0.021
Testosterone	1	14	0.36 ± 0.016
Testosterone	3	14	0.48 ± 0.028
Testosterone	9	13	0.59 ± 0.038
Testosterone	27	13	0.97 ± 0.052
Ro 2-7239	1	14	0.42 ± 0.024
Ro 2-7239	10	14	0.42 ± 0.024
Ro 2-7239	50	13	0.50 ± 0.029
Ro 2-7239	250	14	0.52 ± 0.033
Ro 2-7239	1000	12	0.56 ± 0.034
	Experiment B		
None	0	15	0.33 ± 0.018
Testosterone	1	14	0.43 ± 0.019
Testosterone	4	15	0.47 ± 0.027
Testosterone	16	12	0.68 ± 0.047
Ro 2-7239	10	12	0.42 ± 0.018
Ro 2-7239	100	12	0.47 ± 0.024
Ro 2-7239	500	13	0.60 ± 0.036

Table 1 documents typical results on the influence of Ro 2-7239 (2-acetyl-7-oxo-1, 2, 3, 4, 4a, 4b, 5, 6, 7, 9, 10, 10a-dodecahydrophenanthrene) on the chick's comb when applied directly to it. For this test, 1-day-old white leghorn male chicks were inuncted once daily with 0.05 ml of an absolute alcohol solution of the test compound, the standard testosterone, or solvent alone. After seven daily inunctions, the combs were removed and weighed to the nearest 0.5 mg, and the results were expressed as the ratio of comb weight in milligrams to body weight in grams.

Statistically significant increases ($P = 0.01$) in the comb ratios were found at dose levels of 50, 250, and 1000 μg in experiment A and at 10, 100, and 500 μg quantities in experiment B for Ro 2-7239. The comb response to Ro 2-7239 was strikingly different from that found for testosterone. Although relatively small doses produced significant growth of the comb, increasing the amount inuncted on the comb by a factor of 20 produced only minor further increments (*4*).

RALPH I. DORFMAN
Worcester Foundation for Experimental Biology, Shrewsbury, Massachusetts

References and Notes

1. M. W. Goldberg and R. Monnier, *Helv. Chim. Acta* **23**, 840 (1940).
2. L. O. Randall and J. J. Selitto, *Endocrinology* **62**, 693 (1958).
3. R. I. Dorfman, *ibid.* **64**, 464 (1959).
4. I am grateful to Theresa Rutkiewicz and Albert Tomolonis for valuable technical assistance. This work was supported in part by U.S. Public Health Service grant No. CY-2193 and by a grant from Hoffmann-LaRoche, Inc.

8 December 1959

Nervous Regulation of Conditioned Hyperglycemia to Nociceptive Stimulation

Abstract. A conditioned rise in blood sugar occurs in rats during a 10-minute waiting period prior to nociceptive stimulation. This conditioned "preparatory hyperglycemia" is abolished after a bilateral lesion is produced in the mid-line thalamic nuclei; the experiments point to the importance of the thalamic reticular formation in adaptative metabolic reactions.

Cortical and subcortical mechanisms apparently participate in the nervous regulation of blood-sugar levels. The importance of mechanisms of higher nervous activity has been shown by the method of conditioned reflexes (*1*); evidence concerning the importance of subcortical regulation is, however, less clear. Interest had been concentrated especially on the influence of hypothalamic nuclei in experiments in which stimulation (*2*) or lesions (*3*) of these nuclei were used.

With increasing evidence concerning the role played by nonspecific brain-stem mechanisms in the establishment of conditioned reflexes (*4*), information has also been obtained indicating the importance of the activation of the reticular system on homeostatic processes (*5*), the action of adrenalin as a powerful stimulant of ascending and descending reticular facilitating systems being of special interest in this connection (*6*). Experiments in which the conditioned hyperglycemia that precedes nociceptive stimulation is studied offer a new approach for investigation of both aspects of the function of the reticular system in adaptative behavior, through study of the increasing alertness and the increase in blood-sugar levels which occur when animals are repeatedly conditioned to a nociceptive stimulus.

Rats were put into a cage, and after a "waiting period" of 10 minutes, electrical shocks were applied through the floor of the cage. Blood-sugar levels were then determined, before and at the end of the "waiting period," before the nociceptive stimulus was applied. No increase in blood sugar was found after the first exposure, but there was a statistically significant rise in blood glucose during the period of conditioning to nociceptive stimulation—that is, a "preparatory hyperglycemia" usually appeared after the third conditioning period. This conditioned metabolic reaction to nociceptive stimulation was accompanied by a considerable decrease in motor activity, this being especially marked at the end of the "waiting period."

In further experiments the development of this preparatory hyperglycemia reaction was studied in animals in which bilateral lesion of the mid-line thalamic