intensity intracranial stimulation cannot be "ingested" as rapidly as lower intensities, but as judged by either preference tests or ability to compete with other rewards it is the more potent reinforcer of behavior. It is unlikely that any single measure will adequately describe all that is implied by the concept of reward strength, but in self-stimulation experiments it is necessary to be particularly cautious about conclusions based only on response rate. It is evident that the relative reinforcement strength of brain stimulation and other reinforcers must be stated with reference to the intensity parameter of the intracranial stimulation.

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Incidence of Color in Immediately Recalled Dreams

Abstract. With careful interrogation close to the time of dreaming, color was found to be present in 82.7 percent of the dreams. This figure is substantially higher than figures reported by previous investigators using questionnaire and other methods.

Previous studies indicate that color is present in a minor portion of dreams. These studies have sought to determine either the percentage of dreams that were colored, the percentage of individuals who experience colored dreams, or the percentage of color that was present in each dream. For studies of the percentage of colored dreams, the following investigators arrived at the percentages indicated: Hall, 29 (*1*); Monroe, 21 (*2*); and Knapp, 14 (*3*). For the percentage of individuals who experience colored dreams, Husband reported 40 (*4*); Middleton, 29 (*5*); DeMartino, 17 (*6*); Lovett Doust, 13 (*7*); and Tapia, Werboff, and Winokur, 14 (*8*). For the percentage of color reported in each dream, Bentley reported 19 (*9*).

Table 1. Summary of dream recalls when subjects were awakened during periods of eye movement.

Awakenings of single subjects	Subjects	Total No. of awakenings	Dreams (No.)				
			Recalled	Colored	Vaguely colored	Not colored	Vague or no recall
1	14	14	13	11	—	2	1
2	8	16	12	12	—	—	4
3	7	21	20	10	5	5	1
4	3	12	11	6	2	3	1
5	1	5	5	2	2	1	—
6	3	18	14	11	—	3	4
7	2	14	12	9	2	1	2
Totals	38	100	87	61	11	15	13

In comparison with the low values reported by these investigators, Tauber and Green (*10*) observed with patients in analysis and with others that although color was not a prominent characteristic of dream reports, when attention was focused on color, reference to it increased substantially. This study, while nonquantitative, encouraged support for the hypothesis that color is commonly experienced but is underreported for a variety of reasons. Specifically, we hypothesized that dream reports obtained close to the time of dreaming and after careful interrogation would reveal a substantially higher incidence of color than is reflected in the current literature.

In order to reduce the time interval between dreaming and reporting, the technique of Aserinsky and Kleitman (*11*) was used. This technique utilizes the electroencephalogram and eye movements as indicators of dreaming, and has been extensively described elsewhere (*12–14*). Subjects were awakened during periods of eye movement and asked to report any dreams that were in progress prior to their awakening. They then narrated the dream material into a tape recorder. After the uninterrupted description of the dream, the experimenters attempted to elicit additional information about specific items of content in order to determine the nature and color of the objects reported. To minimize suggestion, questions about color were imbedded randomly among other questions dealing with size, shape, location, and so on.

The dreams reported by the subjects were scored as *Colored* (the dream or part of it was colored); *Vaguely Colored* (the dream or part of it appeared in vague, dull, light, or tinted colors); or *Not Colored* (the dream description contained no mention of color). We also classified the dreams into the categories of *Vague Recall* (the recall of the dream was vague or hazy or foreshortened) and *No Recall* (no dream content was recalled). The colored dreams were further subdivided into those in which color was mentioned *spontaneously* in the initial dream narrative and those in which it was *elicited* during the questioning period.

To illustrate the procedure, two excerpts from typical dream reports are presented along with the type of questions that were asked after the narrative description was given. One subject mentioned that she saw "a bar of soap in the bathtub with the baby." After completion of the narrative, in which no reference was made to color, the experimenter asked, "What did the soap look like?" The subject replied, "Like any bar of soap looks. It was round, it was *pink*, and the baby was playing with it in the bathtub." This was scored as an *elicited* color response. Another subject stated in part of his dream narrative, "I saw all the girls come in and they were wearing bright *red* bathing suits." During the questioning period the experimenter asked, "What kinds of bathing suits were they?" The subject answered, "Well, they were ordinary one-piece bathing suits, not bikinis." Then the experimenter asked, "You say the bathing suits were red; how did you know?" The subject answered, "How did I know? I saw them. They were red." This report was scored as a *spontaneous* color response.

A total of 100 awakenings were made on 38 subjects (28 males and 10 females) who ranged in age from 18 to 33. These subjects were college students and other persons available to the experimenters. They had indicated before the study that they usually recalled dreaming. None of the subjects slept in the laboratory more than two nights. From these 100 awakenings,

there were 87 instances of dream recall. Table 1 presents the results according to the number of awakenings made on individual subjects. The table was set up in this manner in order to take into account the unequal number of awakenings per subject.

Of the 87 dreams recalled, color was present in 61, or 70.1 percent. Vaguely colored dreams were reported in an additional 11, or 12.6 percent, and no color responses were given in the remaining 15, or 17.3 percent.

Of the dreams in which color was reported, the color was given spontaneously in 22 dreams and only after some questioning in the other 39. In addition, at least one colored dream was reported by 31 of the 38 subjects (81.6 percent). At least one vaguely colored dream was reported by three more of the subjects. No color was present in the dreams of two of the subjects. Two additional subjects could not recall any dreams at these awakenings. Of the last four subjects, three were awakened only once and one was awakened twice. No attempt was made to determine the percentage of color in the content of single dreams.

A further check was made to see how frequently subjects reported color spontaneously after awakening when there was no investigator interest in the incidence of color. The same technique of awakening after rapid eye movements was used. Two hundred and eight transcribed dream narratives, collected from 16 subjects in two previous studies (*12, 14*) were available for examination and comparison. In these studies there was no interrogation about color. It was found that color was mentioned spontaneously in only 33 of the 208 dreams (15.9 percent). This figure is not significantly different from the percentage of spontaneous color responses in the present series of awakenings (25.3 percent or in 22 of the 87 recalled dreams). Our somewhat higher figure, although not significant, may be explained by the possibility that at some point after the first awakening the subjects were able to guess at the purpose of the study and consequently were more motivated to attend to and describe color. Despite this slight discrepancy in the two series, both substantiate the fact that the incidence of color in dreams cannot be assessed validly by working with spontaneous narratives of dreams even when the narratives immediately follow the dream experience.

In order to arrive at a more valid assessment of the percentage of color in dreams, some probing is necessary. Color is not a salient characteristic in dream reporting, and, indeed, may not be a frequently mentioned characteristic of descriptions of everyday events of waking life. The fact that color was present in 70 percent of the dreams, or in 83 percent when the Vaguely Colored category is included, suggests that dreaming should be considered a colored rather than a black-and-white phenomenon. It would appear that it is the lack of color rather than its presence in dream recall which requires explanation (*15*).

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Melting Point of Graphite at High Pressure: Heat of Fusion

In 1902, Ludwig reported that carbon rods, when heated electrically in a high-pressure atmosphere of hydrogen, exhibited abrupt, large rises in resistance at very high temperatures (*1*). He thought this form of carbon was liquid, or diamond-like, and tried to preserve it by rapid quenching. The material recovered was always graphite. In 1939

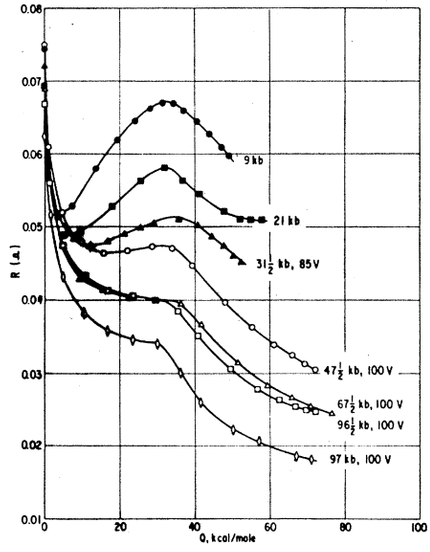

Fig. 1. Resistance versus energy insertion for samples of spectroscopic rod graphite flash-heated at various pressures.

Basset published the results of extensive experiments in which carbon rods were electrically heated in an atmosphere of high-pressure argon (*2*). He found that the graphite-liquid-vapor triple point is at about 110 atmospheres and 4000°K, and that the melting point of graphite rises slowly with increase of pressure. In 1959, Noda reported (*3*) work, and results, similar to those of Basset. Theoretical studies of Pitzer and Clementi, published in 1959, suggested that the molecules of liquid carbon should be very long graphitic chains, and that the heat of fusion should be about 10 kcal/mole at 4000°K (*4*).

The simultaneous development of improved high-pressure apparatus, processes, and techniques in recent years has made it possible to study graphite at very high pressures and temperatures. This paper briefly reports the main results of an experimental program aimed at determining the melting temperature of graphite as a function of pressure, the heat of fusion, and the pressure and temperature of the graphite-diamond-liquid triple point.

Modified "belt-type" high pressure apparatus was used (*5*). In the high-pressure cell the slender graphite test rod was surrounded by a sleeve of boron nitride, pyrophyllite, magnesia, or diamond powder. The graphite rod was transiently heated by passage of a pulse of electric current from a charged electrolytic capacitor. Transient heating was necessary because at the very high temperatures required for melting