tation (but slower fermentation per gram of dry matter) could result from retention of food in the rumen for a longer time, permitting more complete digestion. But longer retention necessitates a larger rumen and the rumen/body weight ratios in Table 1 do not indicate a greater ratio with decreasing body size.

The demand for extra energy in small ruminants could also be met by greater consumption of food. Increased food consumption, if not accompanied by an increase in rumen size, would cause faster turnover and a greater fermentation rate per unit of dry matter. The suni, the smallest ruminant studied, showed the greatest fermentation in relation to body weight, the greatest rate per unit of dry matter, and the smallest ratio of rumen contents to body weight. Apparently a greater turnover rate rather than a larger rumen volume accounts for the relatively higher yield of fermentation products. A greater digestibility of the food consumed could also be a factor. Observation of the suni rumen contents disclosed green seeds and foliage rather than grass.

A faster turnover in the small ruminants is also indicated by the lower percentage of methane in the total rumen fermentation products. In hay-fed zebu and European cattle (*1*) a lower percentage of methane is correlated with a higher fermentation rate and decreased retention time. On the assumption that this relationship also holds in wild ruminants, the low methane values indicate faster turnover.

Since more fermentable food would leave the rumen of animals having a rapid turnover, the fermentation in subsequent parts of the alimentary tract should be higher if the turnover rate is the only difference. The rate in the caecum and intestinal contents of the smaller animals is not higher (Table 4), suggesting that factors in addition to turnover affect the completeness of food utilization in the rumen.

From the relationships disclosed in these comparative studies it would be expected that in domestic ruminants with extra energy requirements, as in pregnancy and lactation, an increase in rumen turnover would be the chief means for satisfying the increased need. This would involve increased consumption, presumably through interaction with physiological and psychological factors which control appetite (*9*).

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Table 4. Fermentation rates (mmole/hr per gram dry wt.).

Animal	Rumen	Caecum	Large intestine
Zebu	125	37	45
Grant's gazelle	233	45	58
Thompson's gazelle	142	42	42
Eland		53	32
Suni	629	79	64
Zebu No. 1	91		
Zebu No. 2	93		
Female camel	92	46	32
Male camel	59	69	56

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Catalepsy in Two Common Marine Animals

Abstract. Two common marine animals of the South Atlantic and Gulf coasts, *Sicyonia brevirostris*, a penaeid shrimp, and *Opsanus beta*, a toadfish, may be induced to go into cataleptic states in the laboratory when they are threatened or molested. The behaviors of these two animals as they go into catalepsy are described. There is considerable paling in the fish but none in the shrimp.

Catalepsy is an interesting phenomenon which, aside from various fundamental physiological ramifications, may be of interest to surgeons and psychologists in the future in connection with anesthesia, hypnotism, and other matters. It may be defined as a state of bodily inactivity and rigidity in which the organism has an appearance very similar to that of a dead individual.

We have recently observed the cataleptic state in two common marine organisms. The observations seem to be of some intrinsic interest, besides possibly providing a basis for further experimentation.

The first case pertains to a fairly common shrimp, *Sicyonia brevirostris*, one of the so called "rock shrimp" of the family Penaeidae. This is a beautifully colored shrimp, basically white or cream-colored with splotches of pink and old rose on the legs and extremities and purple along the back. It belongs to the family which supports the largest American shrimp fishery, and it is to be found in offshore waters of the Atlantic and Gulf coasts of the United States and Mexico, from Virginia to Yucatan, out to depths of about 40 fathoms. This shrimp has a hard shell and is quite hardy, if kept in water of high salinity. There are other closely related species.

We have noted that when this shrimp is chased about an aquarium and caught by hand, it will go into a rigid state with the body arched concavely from the head to tail and with the legs and swimmerets drawn up tightly against the body. When released, the animal will fall through the water and come to rest on its side on the bottom, where it will lie for several seconds, up to a half minute. No preliminaries to this state have been observed, aside from the usual tail flipping which shrimp display when molested. This state is entered into very quickly, and probably no more than a second intervenes between the active state and the rigid one with the arched back, which is quite characteristic. No color change was noted.

A somewhat different behavior is presented by the toadfish *Opsanus beta*, of the Gulf coast of the United States. This fish is a cognate of *Opsanus tau* of the Atlantic coast, which, because of its large and easily obtainable eggs, has become classic material in studies of the embryology of fishes. This species has also been utilized in many physiological studies because it lives in very shallow water and is easily obtainable; furthermore, it is an inactive, bottom fish. The toadfishes have also been studied by students of undersea noises, because of their well-known ability to produce little honking or beeping sounds. The toadfishes have no scales, and their coloring is generally a mottled brown.

We have noted that in the laboratory these fishes may be induced to go into a cataleptic state, but the process is not so simple as that described for the rock shrimp. At first the fish are induced fairly easily to go into catalepsy, but they become more and more recalcitrant as the process is repeated. Initially a fish might go into the cataleptic state when pursued by a few sweeps of the hand around the aquarium. After several repetitions, however, it may become necessary to grab the fish and shake it, or, in short, threaten it with injury. We have tried several specimens —more than a dozen over a period of several weeks—and they all react in the same way. First the fish gives a honk, which from the subjective view sounds very sad. As one student said, "That fish says 'I've had it!'" Immediately thereafter the fins stiffen, the operculum distends to a maximum, and the gills themselves are seen to be widely separated from one another. All in all, the fish has the appearance of one which has been asphyxiated or has died out of the water. Then the fish begins to pale all over and rapidly loses its color, to such an extent that it becomes yellow. This state lasts from several seconds up to 2 or 3 minutes. Finally the fish gives a convulsive gasp and revives. The fish recovers its color slowly, and even for a period of several minutes to a half hour afterward, a fish which has undergone the cataleptic experience has a pale appearance.

It would be interesting to find out whether related shrimp and fishes of the same genus have similar behaviors. Various other interesting questions arise, such as the rate of heartbeat change, the possible connection of this state in the toadfish with the well-known ability of this fish to live in water of low oxygen content, and the cause of the color changes themselves. We have no plans to carry these studies further and wish to call attention to the fact that this material is available along most of the East Coast of the United States.

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Spectrum of Venus in the Violet and Near-Ultraviolet

Abstract. Recent observations of the spectrum of the planet Venus, with spectrographs of low and high dispersion at the Georgetown College Observatory, show that a wide, continuous absorption band is present in the violet and near-ultraviolet. The band begins near wavelength 4500 A and extends to the short-wavelength limit of our spectrograms near 3800 A. It is similar in structure to the strong absorption, reported by others, for gaseous nitrogen tetroxide.

In his book on the planetary atmospheres Kuiper (*1*) suggests the need for further observations of their spectra in the ultraviolet. Recently we obtained, with the 1-prism Reiss spectrograph of the Georgetown College Observatory, a spectrogram of Venus that shows practically no spectrum on the short-wavelength side of the H and K lines. During the current season, with Venus as an evening star, we have secured additional observations confirming the earlier result.

For the later observations we have used a concave grating of 21-ft radius. It was ruled with 30,000 lines per inch by the late H. G. Gale of the University of Chicago and is now the property of the National Geographic Society. It is set up in a Wadsworth mounting, at the Georgetown Observatory, and gives a dispersion, in the first order, that varies from 2.5 to 1.7 A/mm, according to the spectral region. With it an exposure of about 100 minutes is sufficient to record the spectrum of the planet, whereas an exposure of about 30 minutes is ample for the Moon when it is near full phase.

Figure 1 shows our results. The spectrum of Venus, beginning near 4500 A, declines steadily in intensity toward the H and K lines, beyond which little or no spectrum is visible to the short-wavelength limit of our plates near 3800 A. This is in agreement with Kozyrev's (*2*) observations at much lower dispersion, in which he reports a decrease in the albedo of Venus from 0.63 at 4600 A to 0.12 at 3800 A. However, there is no evidence on our spectrograms for the selective absorption that he reports at 4372 and 4120 A, nor do we find any evidence of selective absorption by the molecules suggested by Urey and Brewer (*3*) as probable sources of the absorptions reported by Kozyrev.

Part of the effect revealed by our spectrograms is attributable to loss of reflectance by the grating, as may be noted by comparison with the juxtaposed spectrum of the Moon. The general effect, however, is real and is similar to that observed in the spectrum of Jupiter by Kiess and Corliss (*4*) and reported by them to the American Astronomical Society at the recent meeting in Rochester, N.Y. This structureless, continuous absorption is practically identical with that described by several investigators, notably by Harris (*5*) and by Hall and Blacet (*6*) for nitrogen tetroxide, N_2O_4, the molecule polymerized at low temperatures from the molecule NO_2. The presence of this absorber in the atmospheres of Jupiter and Venus may thus account for the failure to detect molecular oxygen in them; and depending on conditions of temperature and pressure, it may account for the color effects. As may be seen from our illustration, the Doppler shift toward shorter wavelengths of the spectrum of Venus relative to that of the Moon is adequate to separate lines of planetary origin from their terrestrial counterparts, such as those of O_2 and H_2O; but no such lines, although sought, have been observed by us in the spectrum of Venus (*7*).

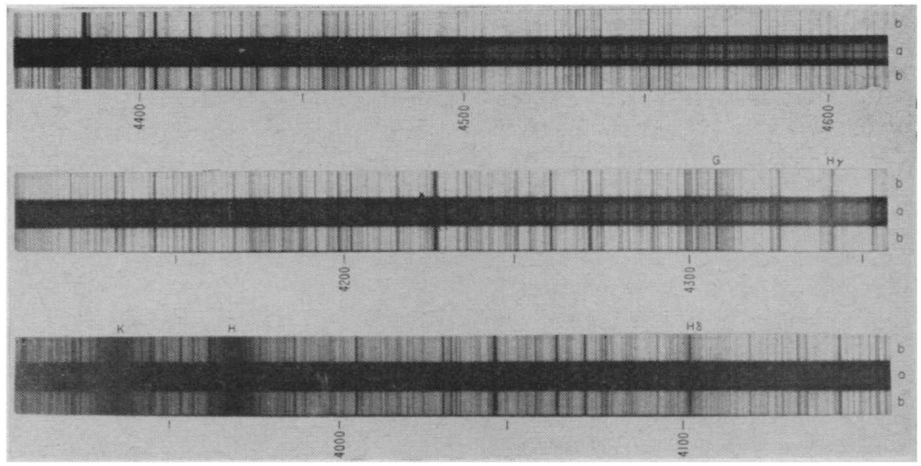

Fig. 1. High-dispersion spectra of Venus (*a*) and the Moon (*b*). Note the shift in spectra between the spectra due to the motions of Venus and the Moon relative to the Earth.

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