It is possible that the hemoglobin fulfils the same function as the ash, only more efficiently. When normal fibroblasts of the rat were used in place of sarcomatous fibroblasts, they also were found to proliferate more rapidly when glutathione, ash of liver and hemoglobin were present in the artificial medium, but the results were not as marked as were those with sarcomatous fibroblasts. As has been observed before, normal cells are more subject to the deficiencies of artificial media than are sarcomatous fibroblasts. It seems probable that hemoglobin and glutathione function not only by regulating the respiration and oxidation or reductions within the cell but also by causing a desirable oxidation-reduction potential in the medium. This hypothesis will be tested in the near future. Without doubt, they furnish constituents which are essential as foods for the synthesis of cell protoplasm.

LILIAN E. BAKER

ROCKEFELLER INSTITUTE,
NEW YORK, N. Y.

ZOOPHILOUS MOTHS[1]

THE night-flying moths in the vicinity of Iguazú Falls (Misiones, Argentina) have a perversion of taste remindful of the perverted food habits of the keas of New Zealand.

The writer, in company with Dr. Eduardo Del Ponte, first became acquainted with their abnormal habits while investigating the anopheline mosquitoes of the Rio Alto Paraná for the Departamento Nacional de Higiene de Argentina (June, 1927). Mr. Adams, manager of the hotel at the Cataracts, related to us that swarms of night-flying "butterflies" caused his horses considerable annoyance by "getting" into their eyes, and the consequent irritation sometimes resulted in temporary blindness. We thought they could not be true butterflies, as these are diurnal; neither could we believe they were moths, as it seemed incredible that they could have such habits. However, Mr. Adams insisted the insects were like butterflies.

During our stay we used two of Mr. Adams's horses as bait to attract mosquitoes. The first evening a moth was seen to alight on the lower eyelid of one and immediately, as we could observe by means of flashlights, it extruded its proboscis and began to feed upon the secretions. We were unable to capture the moth as the horse frightened it away by winking its eye. At this time of year (the winter season) moths were very scarce and no more were seen. However, our observation confirmed Mr. Adams's statement that the insects were butterfly-like, and also gave the clue to the correct group of insects to be implicated, namely, the Geometridae.

[1] Contribution from the Instituto Bacteriologico, Buenos Aires.

The following October, in company with Mrs. Shannon and Señor Marcos Reisel, I was again making anopheline investigations at the Iguazú Falls and as the season was favorable, we were able to collect a number of moths off the horses. A surprising thing is that a large number of species, representing several families, including even the Sphingidae, are attracted to the horses.

Dr. H. G. Dyar (National Museum) kindly identified the moths and their names are given below:

LIST OF SPECIES

Pyralidae:	*Pyrausta* sp.
Notodontidae:	*Crinodes beskei* Hubn.
Geometridae:	*Pergama polygonaria* H.-S.
	Pergama speciosata Gn.
	Pergama pumaria Feld.
	Meticulodes xylinaria Gn.
	Pero stolidata Gn.
	Pero maculicosta Warr.
	Dichromatopodia deflexa Warr.
	Pterocypha tabascana Schaus.
Sphingidae:	*Xylophanes tersa* L.

Upon our return to Buenos Aires, we related our experience to Dr. Carlos Bruch (local entomologist) who then told us that in 1904 he received a letter from a friend in Paraguay (eastern part?) saying that his horses were being troubled by "mariposas" coming to their eyes, producing thereby great irritation. This is the only additional record so far obtained.

The reason for this perversion of habit is not plain. Mr. Adams suggested that possibly the moths were attracted by the light reflected from the eyes of the horses. The fact that we saw numerous moths sucking the eye secretions, and also visiting other parts of the body and endeavoring to feed on the perspiration, indicates clearly enough that they desire the food, salt or moisture contained therein. The last factor appears of small consequence as the region is well supplied with moisture by ample rainfall.

We are also left to wonder why so many kinds of moths choose horses (and probably cattle as well) as a source of nourishment. But this in itself may help to explain why they have developed their anomalous taste. Possibly, the explanation lies in the fact that, in spite of the superb development of plant life in the region, flowers (the usual source of food for moths) are very scarce and, therefore, the moths are forced to seek food elsewhere. This is corroborated to some extent by finding many kinds of flower-feeding flies and bees, existing in the region, feeding upon carrion and fecal matter; apparently, they are likewise forced to obtain their food from unnatural sources due to lack of flowers.

Another explanation may be based on a craving of the moths for salt. It is well known that butterflies alight on people and probe about on the skin with their proboscides as if trying to absorb the free perspiration. It is commonly believed that their object is salt.

Perhaps this region shares in common with certain large areas of Brazil an absence of salt in the soil. It may be of interest to investigate the salt requirement of insects and the power of salt to attract adult insects after they have been deprived of it in the larval stage.

R. C. SHANNON

THE FUNCTIONAL FORM OF THE CONSTANT OF MASS ACTION AND ATOMIC ACTIVATION

IT was shown by the writer in a previous paper (*Phil. Mag.*, 5, 263 (1928)) that the constant of mass action of an interacting gaseous mixture may be a function of the volume and masses of the elemental constituents as well as of the temperature. The differential equations of a reacting mixture were subsequently given (*Phil. Mag.*, 5, 620 (1928)) and applied to certain reactions by the help of the orthodox gas equation $pv=MRT$. In a paper that recently appeared (*Phil. Mag.*, 5, 1191 (1928)) it is shown that according to thermodynamics the gas equation should have the form $pv=M\xi RT$, where ξ is a function of the number of mols of the gas, its volume v, and absolute temperature T, which differs inappreciably from unity under ordinary conditions, but which is less than unity when the volume is very large, or the molecular concentration very small. It appears therefore that the law of mass action, as usually understood, breaks down completely if the volume of the gas is sufficiently increased. The pressure at which this begins to take place can not at present be predicted theoretically—probably it is extremely low—and it might therefore form the subject of some interesting experimental investigations.

It also follows from this result that strictly under all conditions the constant of mass action is not only a function of the temperature but also of the volume and masses of the constituents. This indicates that what happens to two molecules in a gas does not depend only on their chance of encounter, but on their previous encounters with other molecules during which they get activated for chemical change. It will therefore be of interest to see if some indirect evidence exists indicating that such activation may take place.

If the temperature of a gas is increased the spectrum emitted undergoes a change. This shows that the emission of the spectrum is associated with molecular collisions and their violence. Some experiments by Liveing and Dewar show besides in a striking way that the light emitted depends on the persistence of the effect of collision, or activation of the molecules. Thus if a small quantity of NaCl is put into a flame its spectrum shows the D lines of sodium sharply defined. On adding more salt the breadth of each line is increased, and on further addition of salt a further broadening of the lines takes place till a stage is reached at which they coalesce into one broad band.

The effect of one kind of atom on the light emitted by another is shown by the spectrum of the carbon arc containing a salt. The lines in the spectrum due to the salt are displaced when the pressure of the air is changed, showing that the effect produced in an atom of a salt molecule through collision with an air molecule persists for a longer time than the period between two consecutive collisions.

A mixture of PH_3 and air explodes if suddenly expanded beyond a certain limit. This remarkable effect was first observed by Houton de Labilladiere and studied in detail by J. V. D. Stadt, and found to be due to the oxygen present. A gaseous mixture of PH_3 and O_2 at ordinary temperatures and pressures does not interact, but if suddenly rarefied combination takes place with explosion. If the mixture is allowed to stand for some time at 50° C. a gradual decrease in pressure of the mixture takes place till a state is reached at which explosion occurs. The phenomenon possesses other peculiarities, one of which is that water vapor has a retarding effect on the explosion.

Chemical combination between molecules may be induced by ultra-violet and other radiations. The activity thus given to molecules may by contact be imparted to other molecules.

The foregoing results show that a molecule may undergo a temporary change through interaction with other molecules, and in other ways. Chemical interaction must be affected by these changes, and render the constant of mass action of a gaseous mixture in some cases appreciably a function of its volume and masses of the constituents as well as of the temperature. If the pressure undergoes a continual change, the average activation of a molecule at any instant is likely to differ in nature and magnitude from that corresponding to a state of equilibrium, an effect which is probably connected with the experiments with PH_3 described.

R. D. KLEEMAN

SCHENECTADY, N. Y.