methyl compound is more toxic than the tetraethyl compound for laboratory rats.

A recent report (*3*) dealing with the use of Arasan-DDT-treated seed corn (simultaneous with an epsom-salt flush) in a small farm flock of hens has come to our attention. Egg production was observed to decrease rapidly. However, no conclusions were drawn regarding the causative agent. We are aware of no other published information related to the extreme toxicity of Arasan for hens (*4*).

A sample of corn meal obtained from a farm severely affected during these outbreaks contained 470 ppm of TMTD. Fully treated seed corn contains about 630 ppm of TMTD. The corn meal in field rations A and B contained about 35 and 160 ppm of TMTD, respectively. Thus Arasan-treated seed corn could be diluted heavily with nontreated corn and still produce disastrous results. The label on the container of Arasan-SFX used in this study stated: "The use of this seed for food, feed, or oil purposes is not recommended" (*5*).

Because of the hen's rapid reproductive rate (200 to 300 eggs per year), ease of maintenance, and sensitive reproductive mechanism, it would seem to be an ideal subject for toxicologic studies. Certainly, routine growth studies leave much to be desired in the evaluation of potentially toxic substances.

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References and Notes

1. Ghostley Poultry Farm, Anoka, Minn.
2. The percentage composition of the experimental diet was as follows: ground yellow corn 50, wheat bran 10, wheat middlings 10, alfalfa meal 5, meat and bone scraps 7.5, fish meal 2.5, soybean meal 10, bonemeal 3.0, ground limestone 0.75, iodized salt 1.0, feeding oil (300 D-2250 A) 0.6, and $MnSO_4$ 0.025. The following were added per kilogram; riboflavin 2.75 mg and vitamin B_{12} 3.3 μg. Oyster shell was supplied *ad libitum* for all birds.
3. G. J. Cottier, *Auburn Veterinarian* **10**, 115 (1954).
4. This article is paper No. 3295, Scientific Journal Series, Minnesota Agricultural Experiment Station, We wish to express our appreciation to Norman E. Foster, chief chemist, Minneapolis District, Food and Drug Administration, for his cooperation during this study.
5. Arasan-SFX (Du Pont) contains 75 percent tetramethylthiuram disulfide, which is the active fungicidal ingredient in seed treatment.

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An Application of Statistics

It is commonly stated that one can prove anything by statistics. The mere fact that two variables are significantly correlated by accepted statistical treatment of valid observations does not *ipso facto* prove that the correlation has any biological meaning. In searching for a phenomenon that would illustrate these truisms, I was struck by the fact that months with short names are generally, in the north temperate zone of the continental United States, the warm ones, and those with long names are the cold ones. The short-name months also tend to have more rainfall than the long-name months.

To test whether or not there was a statistically significant correlation between the length of the name of the month and the temperature and precipitation, meteorological data for Chicago, Illinois, were chosen. The data represented the mean monthly temperature and the mean monthly precipitation for that station; the source was *Annual Climatological Summary, 1947*. The statistical procedures employed were taken from F. E. Croxton [*Elementary Statistics with Applications in Medicine* (Prentice-Hall, New York, 1953)]. The regression equation that related the number of letters in the names of the months (Y) and the mean monthly temperature (T) was $Y = 8.46 - 0.047T$. The correlation coefficient was -0.448 ($P = 0.15$). This association was suggestive but not statistically significant. The regression equation that related the number of letters in the names of the months (Y) and the mean monthly precipitation (P) was $Y = 11.92 - 2.10P$. The correlation coefficient was -0.611 ($0.05 < P < 0.025$). This association was significant at the 5-percent level. These associations have proved to be useful teaching examples of what can be done by the application of statistics, for here are significant correlations without *a priori* or *a posteriori* bases.

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Note on a Visible Thermocline

On the afternoon of 5 May 1954 I was exploring the reef off Vaiala, slightly more than ½ mi to the east of the harbor of Apia, Upolu, Western Samoa, in search of a good collecting site for the invertebrates I was studying [under a grant from the Bernice P. Bishop Museum in Honolulu]. I was wearing "skin-diving" equipment, a face plate and swim fins.

The day had been very hot and still, and the surface waters over the ½-mi broad fringing reef were extremely warm, actually hot to the body upon entrance. Moreover, this water was so turbid from suspended matter carried down from the hills in a recent storm that the underwater visibility was less than 3 or 4 ft. There was very weak surf on the reef front.

At the reef front I dived down to explore the bottom, about 30 ft deep. As I went down I was able to detect three layers in the water. The hot turbid layer was 4 or 5 ft deep and sharply delimited from the intermediate layer, which was moderately warm and quite clear. Below the intermediate layer, which extended down to about 15 ft, there was a markedly cooler and clearer layer extending to the bottom.

On the completion of my first dive to the bottom I "coasted" back up, allowing the buoyancy of my body to carry me slowly to the surface while I looked at

the reef. As I passed from the bottom layer to the intermediate layer I noticed a discrete horizontal line in the water, somewhat similar to the edge of a piece of glass. I wondered about this line and made a series of dives to investigate it. Diving down the motions of swimming caused so much agitation that the line was not visible, but by returning slowly to the surface through the undisturbed water the demarcation between the layers was visible each time. It could not be seen from more than 2 or 3 in. above or below the interface, and viewed horizontally it seemingly had no thickness but was merely a refractive plane.

Unfortunately in my field gear I had no equipment to measure salinity, temperature, or even depth, so I could not confirm my observations with any measurements. However, there can be only one way to account for the plane that I observed. It is well known that the refractive index of sea water increases with decreasing temperature and increasing salinity [H. U. Sverdrup, M. W. Johnson, and R. H. Fleming, *The Oceans* (Prentice-Hall, New York, 1946), p. 70]. These two masses of clear, still water certainly had different temperatures and probably different salinities. The plane seen was the result of the difference in their refractive indices and marked the location of a very sharp thermocline.

Although I have often seen a sharp demarcation between turbid water and clear water while diving, in my years of skin-diving in the Pacific I have never before seen this phenomenon. I have never heard it remarked upon by other divers, nor have I seen it reported in the literature.

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Prevention of Evaporation in Horizontal Strip Ionography

In a recent communication concerning electrophoresis in paper stabilized media, [*Science* **120**, 677 (1954)], Samuel Raymond has performed a useful service by focusing attention on the question of whether the current or the voltage ought to be held constant when one is determining mobilities. The answer to this question, which was previously considered in detail by Marbach (*1*), does not depend, under proper experimental conditions, on whether the paper strip is open to a gaseous atmosphere or is sandwiched between glass or plastic plates.

Raymond states, "When the paper is exposed to an atmosphere, whether saturated or not, evaporation from the paper occurs because of heat generated by the electric current." This statement is not necessarily true and may mislead some persons into thinking that the horizontal paper-strip technique, which is in wide current use, is unsuitable for mobility determinations. As has been pointed out (*2*), the addition of 5 to 15 percent glycerol, ethylene glycol, or other similar low-molecular-weight substances to the buffer solution, causes the vapor pressure of the solution saturating the paper strips to be lowered below that of the water in the space surrounding the buffer vessels. Since the enclosed air or helium gas space (which is kept minimal by the addition of the maximum allowable water to the chamber) is saturated with respect to pure water, the paper strips saturated with buffer solution containing glycerol can be maintained at a temperature above their surroundings without the occurrence of any net loss of water, owing to evaporation. The strength of the electric current carried by the strips can be varied empirically to a point where the escaping tendency of water molecules from the buffer-saturated strips is just equal to the escaping tendency of water molecules from the pure water in the chamber, and under these conditions, no net loss of water whatever occurs from the paper surface.

It is then possible to maintain a constant current and potential gradient for hours, and with such an arrangement the field strength is calculated directly by dividing the applied voltage by the length of paper measured between the surfaces of the buffer solution in the end vessels. Other things being equal, the lower the molecular weight of the addition compound, the greater the vapor pressure lowering achieved at a given weight concentration. The additives should not of course, in general, alter to any appreciable extent the electrochemical characteristics of the buffer solution, such as its conductivity, *p*H, ionic strength, dielectric constant, and so forth, and should not form complexes with either the migrant or the buffer. Other methods for determining meaningful mobilities using the horizontal paper-strip technique are considered in greater detail in a forthcoming monograph (*3*).

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References

1. E. P. Marbach, Ph.D. dissertation, Loyola University (1954).
2. H. J. McDonald, *J. Chem. Educ.* **29**, 428 (1952).
3. ——— *et al., Ionography; Electrophoresis in Stabilized Media* (Year Book Pub., Chicago, in press).

1 December 1954.

Aside from its effects on viscosity, dielectric strength, and other factors that affect the electrophoretic mobility, the chief effect of glycerol in the buffer solution is to increase the temperature difference between the buffer and pure water at vapor equilibrium. A tenth-molar buffer is at vapor equilibrium with pure water when its temperature is approximately 0.1°C above the water temperature. This is increased 0.4°C in a 10-percent glycerol solution. If vapor equilibrium is maintained, this small temperature difference must account for all the cooling of the paper in hanging-strip apparatus. The permissible power dissipation in the paper is thereby severely limited.