not a function of leaks. Also, stray light is distributed throughout the light beam and is not affected materially by changing slit widths. Decreasing the light path through the sample reduces the proportion of stray light but also causes a corresponding decrease in the magnitude of density read for a given sample. The proportion of stray light can also be reduced by the use of purer monochromatic light, which can be obtained with special light sources, filters, or additional monochromators. For example, when light from a mercury arc (H100-A4) passed through one Beckman monochromator was used as a source for a second Beckman spectrophotometer, accurate measurements could be made on solutions with background optical densities exceeding 5. Similar values were obtained with the Cary spectrophotometer, which has a double monochromator.

It is not practical to attempt to define specific limits of usefulness for any instrument, since the optical density at which serious errors are obtained is a function not only of the light source, monochromator, and phototube but also of the wavelength selected and the absorption spectrum of the samples. Therefore, each instrument must be tested with substances of known extinction, the backgrounds desired, and the required wavelengths in order to determine the conditions that permit accurate measurements.

The limitations of optical instruments discussed here have been understood by spectroscopists for many years. The purpose of this communication is to emphasize a source of error that may be significant in biological studies. I am indebted to Drs. F. Brackett and R. Olson for many helpful discussions.

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Sex Differences in the Packed Cell Volume of Vertebrate Blood

The existence of sex differences in the packed cell volume (PCV) of human blood seems to be established (*1*). Sex differences in PCV among the lower, as well as the higher, vertebrates is reported here.

Blood was obtained from the exposed heart in frogs (*Rana pipiens*) stunned by a head blow (*2*), from the axillary vein in unanesthetized pigeons (*Columba livia*), and by cardiac puncture through a cervical approach in unanesthetized turtles (*Pseudemys* sp.), and through the intercostal spaces in etherized guinea pigs (*Cavia porcellus*). Only mature animals were used.

Table 1. Statistical analysis of sex differences in the packed cell volume of vertebrate blood.

Animal and sex		No. of animals	Mean PCV (ml/100 ml blood)	t-values
Frog	M	304	30.1* ± 7.7	8.0
	F	233	24.8 ± 7.4	
Turtle	M	101	27.9 ± 7.0	3.6
	F	101	24.3 ± 6.5	
Pigeon	M	112	58.5 ± 5.9	2.63
	F	100	56.4 ± 5.6	
Guinea pig	M	67	47.1 ± 4.5	9.5
	F	67	39.8 ± 4.4	

* Mean ± standard deviation.

The Wintrobe method was followed (*3*), with the blood centrifuged for ½ hr at 3000 rev/min. The anticoagulant in frogs was 3 percent sodium citrate, added just to the lowest mark of the hematocrit tube. For the other animals, 0.8 g of potassium oxalate and 1.2 g of ammonium oxalate were dissolved in 100 ml of distilled water, 0.5-ml samples were withdrawn and dried, and to each sample 1 ml of blood was added. It is assumed that hematocrit corrections for anticoagulant were unnecessary and irrelevant to the present study.

Table 1 shows a statistically significant sex difference in the PCV in representatives of each vertebrate class studied. The Student t-test showed all differences to be significant at the 1-percent level. Among mammals, sex differences in PCV are controversial in dogs, rabbits, and rats (*4*).

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References and Notes

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A paradox is never terrifying to the scientist. Faraday wrote to Tyndall, "The more we can enlarge the number of anomalous facts and consequences, the better it will be for the subject, for they can only remain anomalies to us while we continue in error."—GILBERT N. LEWIS, *The Anatomy of Science.*