transparent spheres (do not confuse with yolk granules which are smaller and more opaque). Some 5–10 nuclei are taken up and then injected into recipient eggs in twos or threes. After some practice, it may be possible to inject only 1 nucleus. The same donor egg can serve as a source of nuclei for several injections if one picks nuclei each time from an area which was not injured. After injections are done, the donor eggs should be removed from the slide to avoid confusion.

Transplantation of pole cells. Recipient eggs should be at syncytial blastoderm stages (stages 11–13[5]). Slight drying will retract the ooplasm and leave a free space near the pole cells. The eggs are oriented parallel to the direction of the pipette.

The best source of donor pole cells is the late blastoderm stage. The egg should be oriented at a wide angle to the pipette. One pierces the egg on the side and works the needle to the base of the pole cells by pushing and pulling (fig. 5). The cells are aspirated, the pipette withdrawn and inserted into the posterior pole of the recipient egg. Since the needle usually penetrates deeply into the egg after piercing the vitelline membrane, it has to be retracted to bring the opening just under the membrane. If the egg has been properly dried, it will accept all the cells injected. Post-operative care is as for other injections.

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Improving laboratory safety: replacing benzene by toluene in phosphate analyses

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The determination of organic phosphorus compounds using phosphate analysis reported by several authors involves the use of an organic solvent mixture containing benzene. This old but very accurate and sensitive method is widely used for several enzymatic assays, including 5′-nucleotidase (EC 3.1.3.5)[1,2] and 2′,3′-cyclic nucleotide 3′-phosphodiesterase (EC 3.1.4.37)[3]. Concerned with the danger of acute and chronic benzene toxicity, we tried substituting toluene for benzene. We obtained identical phosphate values using either benzene or toluene in the solvent mixture. Therefore, we recommend discarding benzene in phosphate analyses and replacing it with toluene, which is much less toxic.

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A field-portable racetrack and timer for measuring acceleration and speed of small cursorial animals[1]

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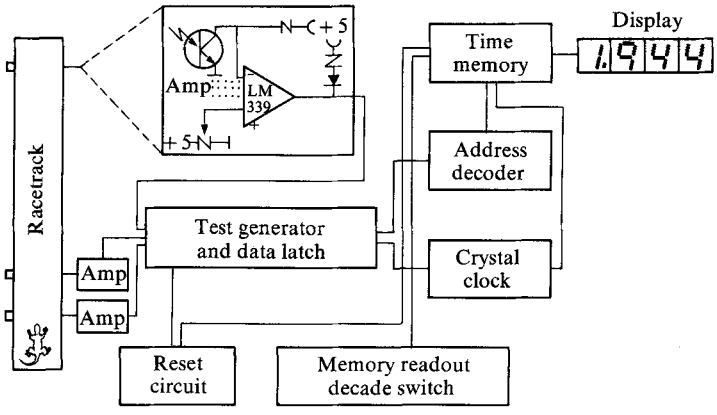
Summary. We describe a relatively inexpensive, field-portable racetrack and timer that can be used to measure acceleration and maximum speed of small cursorial animals. Procedures for interfacing the racetrack to microprocessors are also outlined.

Measurements of acceleration and velocity are basic to various physiological, morphological and ecological studies. Average velocity can be estimated easily by connecting 2 photocell detectors to an electronic clock; but acceleration and maximum velocity require more elaborate equipment. The usual technique involves frame-by-frame analysis of films or videotapes. However, this method is relatively expensive, tedious, and inconvenient for field research. More importantly, data reduction is not immediate.

Here we describe a field-portable racetrack and timer that instantaneously provide data necessary to quantify acceleration and velocity. The timer and photocells cost between US$250 and $500 (exclusive of labor), depending on options selected. We also outline procedures and programs for attaching the racetrack to microprocessors to speed data recording and analysis. Complete circuit diagrams (timer and photocell stations) and computer programs are available on request from the senior author.

Apparatus. The racetrack consists of a narrow runway that contains several photocell stations positioned at known distances along the walls of the track. An animal is placed just behind the 1st photocell beam and is stimulated to sprint. When the animal breaks the 1st beam, a multichannel timer is activated; and the time when each subsequent beam along the track is broken is stored into memo-



ry. The experimenter then manually recalls each time on a digital display and clears all registers for the next run. Elapsed times and distances can then be fitted to curvilinear equations to estimate acceleration and maximum velocity[2].

The timer uses transistor-transistor logic (TTL), has a 1-MHz crystal clock, and includes a self-test function (fig.). The timer is relatively stable (ours has drifted by only 30 ppm in 14 months) and insensitive to ambient temperature (75 ppm drift between 15 and 40 °C). Power can be either AC or DC (9–12 V). For our studies of lizards, the timer is adjusted to read from 0.001 to 9.999 sec. A maximum of 15 times can be stored in either cumulative or interval modes.

Each photocell station consists of a pre-focused bulb and 4 vertically aligned photo-transistors. Because an animal thus interrupts a 'plane' of light, the discrepancy for each time interval is minimized to the width of the light plane. (However, if only 1 photocell were used, the animal's nose might fail to break the beam, thereby potentially adding a substantial source of error to estimates of velocity or acceleration.)

To facilitate data storage and analysis, the photocell stations can be connected to an AIM-65 microprocessor (4K), which can be programmed to accept input from a maximum of 16 photocell stations. A control program (BASIC) activates a machine-language program (which records elapsed times) and then calculates and prints relevant data (e.g., species, animal identification number, elapsed times, interval times, and interval velocities). Data can also be stored on an audio-cassette or disk for detailed statistical analysis on a larger computer.

We have also connected the photocell stations to an Apple II + microcomputer (48K) using a Versatile Interface Adaptor (VIA, John Bell Engineering, Redwood City, California). Programs are modified as appropriate.

Results and discussion. The compact electronic package, battery power supply, stability, and thermal insensitivity permit the use of this timer in remote field situations for extended periods. Because times can be read immediately, delays and expense of processing and analyzing film are eliminated. Moreover, an experimenter can easily monitor the status of the apparatus as well as detect and capitalize on experimental results while still in a position to gather additional data.

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Assay of aminoglycosides is influenced by tissue homogenization technique[1]

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Summary. Recovery of neomycin from tissue homogenates was lower when glass/glass homogenizers were used due to the abrasion of glass which will bind to the drug. Glass homogenizers should be avoided for the determination of aminoglycoside levels in tissues.

Adhesion of aminoglycoside antibiotics to glass surfaces is a well known phenomenon. Instructions for assay of serum drug levels commonly include warnings that tests should not be carried out in glass tubes. Recent experiments in our laboratory indicate that aminoglycoside-glass interactions may pose a considerable problem in the analysis of tissue drug levels.

The analysis of body tissues requires prior homogenization. A random survey of 8 publications reporting drug levels in human and animal tissues showed that 7 indicated a homogenate was prepared by a non-specified procedure. 1 publication mentioned the use of glass-glass homogenizers. While studying neomycin levels in guinea-pig tissues we used 2 different homogenization techniques. For large body tissues, such as liver and kidney, a Polytron blender (Brinkman Instruments, Westbury, NY) was employed while small samples of inner ear tissues were prepared in a glass homogenizer. Homogenates were transferred to polypropylene tubes in which all subsequent manipulations were performed.