Lock in
simplified retrieval of noise buried signals with
ithaco's 353 Phase-Lock amplifier

- no tuning required
- phase and gain not affected by adjustment or drift in reference frequency
- adapts automatically to virtually any reference input
- ultra stable, highly linear detector—no overload at 1,000 : 1 noise to signal ratio
- 1.0 Hz to 200 KHz operation

See us at '69 Physics Show, Booth 177.

New toploading balance is fast, accurate...yet RUGGED!

New Torbal ET-1 toploader (160g capacity, 1 mg accuracy) makes accurate weighing easier and more foolproof than ever before.

NEW EASE thanks to complete digital display without the use of optical projections or verniers to read, no estimating.

NEW EASE because the one piece construction of the exclusive Torsion weighing mechanism has no knife edges to chip, wear or collect dust—hence there’s no loss in accuracy.

NEW EASE—thanks to the electronic null readout feature, the ET-1 is not affected by sensitivity changes—from temperature or humidity variations or effects of foreign matter or wear. As long as you can see the null needle move for a 1.0 mg weight change, then a difference of 1.0 mg in weight-reading means 1.0 mg—today, tomorrow, next month, next year.

NEW EASE because the ET-1’s Torsion mechanism is far less affected by vibration than optical balances. You can use an ET-1 in conditions other balances can’t take.

NEW EASE thanks to out-of-level accuracy. For minor changes in level of the ET-1, zero point does not change.

Drosophila: Tender Loving Care

Sonneborn could have found no more apt appellation for H. J. Muller than “Crusader for human betterment” (15 Nov., p. 772). I knew Muller well. As his student assistant at the University of Texas, he and I, together with our wives, spent much time cycling in and around Austin.

Muller was an intense, hardworking scientist who had little time for social frivolities. In addition he was quite shy and sensitive, although he easily lost himself in his scientific pursuits. One of my jobs was the care and feeding of Drosophila. This may sound simple but Muller was exacting in his requirements. I remember one Christmas vacation period in Austin when the weather turned quite cool, so that I was afraid the Drosophila might suffer in the unheated university building. I carried the tubes housing them home in my inner pocket, and since my meager quarters were not too thoroughly heated at all times, I took them to bed with me. I was very proud of their survival, and when I told Muller of this at the famous Dartmouth conference on “Great issues of conscience in modern medicine” some years ago, he conscientiously asked me, “Do I still owe you something for this?”

Muller contributed a great deal to the development of my career in medicine. I am one of many who have owed much to this man, rather small physically, but a giant in every other respect.
If Not Grades, What Criteria?

Schagrin's letter (15 Nov.), proposing a system in which grades would be used internally at the college but not transmitted to graduate schools, prospective employers, and others, and would be replaced by "letters of recommendation or perhaps evaluation forms," seems at least a trifle naïve. No sensible person attributes more than modest importance to grades, but they do have value, particularly in some fields of study, in giving some indication of mastery of the subject matter—a point of some interest to institutions with which the student might like to become associated. It is obvious that if grades, as now constituted, are not made available, the letter of recommendation will perform exactly the same function under another name.

Schagrin's solution is reminiscent of the Midwestern legislator who observed that railway accidents often involved the last car on the train, and introduced a bill requiring the omission of the last car.

R. L. HALL
McCormick & Company, Inc.,
11350 McCormick Road,
Cockeysville, Maryland 21030

Schagrin's proposed solution to the difficulties and dilemmas of grading interest me greatly and should interest many others as well. I would especially like to know about the other criteria for selection (besides grades) that he is suggesting for institutions, such as business, government, and the military, to use which have demonstrably higher correlations than grades with subsequent performance. On what basis, if not on the basis of performance in college, is he suggesting that letters of recommendation be written, and on what basis would evaluation forms be executed if not on the basis of performance in college? On what basis are grades assigned if not on the basis of performance in college? If grades cannot be trusted to be anything more than "tokens to purchase favors for graduates," how can letters of recommendation and the ratings that appear on evaluation forms be trusted to do more?

Is Schagrin suggesting (perish the thought!) that scores on standardized tests be used as a substitute for grades for evaluating students' performance?

WILLIAM H. ANGOFF
Educational Testing Service,
Princeton, New Jersey 08540

CHEMICAL PROFILES

... drawn by Durrum

PROVING THE MIRROR-IMAGE CHARACTERISTICS OF TWO ASPARTIC-ACID ISOMERS

Aspartic acid, with its three donor sites, can form a variety of hard-to-identify chelate isomers. The circular-dichroism profiles drawn here, plotted from data gathered by a Durrum-Jasco CD recorder, are typical of the molecular detective work* that can be achieved with this versatile instrument.

The steric requirements of aspartic acid indicate that in a cobalt-diethylenetriamine complex, three isomers will predominate: one s-cis (symmetrical), shown as a dashed-line profile in the drawing above, and two u-cis (unsymmetrical) isomers, shown in color. The latter are essentially mirror images of each other, and the Durrum-Jasco instrument provides a way to identify one from the other.

The configurational contributions to the CD traces of the two mirror-image isomers should, in theory, cancel out, leaving an "average" trace that approximates that of the s-cis isomer where there are no configurational contributions. As seen here, a very close correlation is achieved, proving that the two u-cis isomers are indeed pseudo-mirror images and giving clues as to their specific forms.

The Durrum-Jasco CD recorder is a powerful analytical tool, used throughout the world to classify and identify complex organic and biochemical compounds. In addition to detailing the conformation and configuration of such substances as steroids, alkaloids, proteins, nucleic acids and synthetic polymers, the instrument can serve to measure their concentrations, kinetic properties, and stereochemical characteristics. Durrum-Jasco CD prices start at $29,600.

*AS REPORTED BY J. RAN LESLIE AND SEAN W. OFFICE IN THE DECEMBER 20, 1969 ISSUE OF JOURNAL OF THE AMERICAN CHEMICAL SOCIETY.

DURRUM
3950 Fabian Way, Palo Alto, California 94303. Call (415) 321-6302
Cable: DURRUM, Palo Alto

24 JANUARY 1969

341
Now you can get precisely exposed photomicrographs ... automatically. You may wait for hours for a photomicrograph opportunity. Why risk spoiling it by a wrong meter reading? Or why take a chance on missing the picture completely while you’re busy with camera controls?

The Leitz ORTHOMAT Microscope Camera leaves your hands and your mind free for more important things. All you do for a perfect photomicrograph is select your field and push a button. Attachable to most microscopes, this automatic 35mm camera trips the shutter, calculates exposure and advances the film. Even automatically compensates for changes during exposures! Exposures range from 1/100 second with electronic flash to over ½ hour with fluorescent.

The shutter of the Leitz ORTHOMAT is specially dampened against vibration. You can switch from black and white to color film, or vice versa, even in the middle of a roll. Use any system of microscope illumination you want. And, of course, the ORTHOMAT is built with the famous Leitz precision.

Let the Leitz ORTHOMAT Microscope Camera automate your clinical and research photomicrography. Write for an ORTHOMAT catalog.
The TEKTRONIX Type 502A means...

DUAL BEAM
Separate vertical amplifiers and CRT deflection systems provide no-compromise viewing of two time-related signals regardless of repetition rate. This means brighter, sharper, easy-to-control displays.

100 μV/cm DEFLECTION FACTOR
Usable sensitivity for difficult low-level measurements. Bandwidth is 100 kHz at 100 μV/cm, increasing to 1 MHz at 5 mV/cm and above. Drift is typically ≤400 μV/h with constant temperature and line voltage. Internal noise is typically ≤30 μV referred to the input.

DIFFERENTIAL INPUTS
Common-mode rejection ratio is ≥50,000: 1, DC coupled, from 100 μV/cm to 2 mV/cm with a dynamic range of ±15 V. Translated into operational terms this means the ability to exclude unwanted signals or dc levels over a wide range of applications.

IDENTICAL X-Y AMPLIFIERS
The upper beam vertical amplifier can be switched to drive the horizontal deflection system. The result is an X-Y measurement capability with less than one degree phase difference between channels (DC to 100 kHz measured at 100 μV/cm) and the operational control of identical, high sensitivity, differential amplifiers.

SINGLE TIME-BASE
The single horizontal sweep circuitry deflects both vertical beams simultaneously making time measurements between channel convenient and accurate. Sweep rates are from 1 μs/cm to 5 s/cm. Calibrated horizontal magnification to X20 increases the time resolution capability in many applications.

CONVENIENCE FEATURES
Direct-coupled vertical signal outputs for monitor/high-gain amplifier applications. Single sweep function for photographic control. Push-button beam finders and front panel DC balance controls. A common trace intensity and an intensity balance adjustment offer effective brightness control.

TYPE 502A OSCILLOSCOPE

........................................ $1150.00

U.S. Sales Price FOB Beaverton, Oregon

For a demonstration, contact your local Tektronix Field Engineer. For complete specifications, consult your Tektronix catalog, circle the reader service number or write Tektronix, Inc. P. O. Box 500, Beaverton, Oregon 97005.
The finest
$150. Flowmeter
Ever Made.

New thermal technique gives Matheson Flo-Tronic Flowmeter accuracy without a big price tag.

Flo-Tronic Flowmeter offers many distinct advantages over rotameters, yet costs little more. As with mass flowmeters, changes in pressure and temperature have little effect on accuracy of reading.

FEATURES: Adapted for Recorder Use • Remote Monitoring Use • Fast Response—2 sec. (0 to full scale) • Accuracy ±3% of full scale • Reproducibility ±2% of full scale • Four Flow Ranges—0-300 to 0-10,000 std. cc./min.

MATHESON BAS PRODUCTS
Write for Engineering Report to Matheson, P.O. Box 85, East Rutherford, N. J. 07073.

FOLK SONG
STYLE AND CULTURE

By Alan Lomax
and the staff of the Cantometrics Project, Columbia University

Included are:
Styletic Method
Consensus on Cantometric Parameters
Songs as a Measure of Culture
Dance Style and Culture

Price: $16.75; AAAS Members Casual Orders, $14.50

AAAS
1515 Massachusetts Avenue, NW
Washington, D.C. 20005

resolved by polyacrylamide gel electrophoresis. These segments ranged in size from $2.5 \times 10^3$ to $7 \times 10^3$ daltons which would suggest that they might represent monocistronic sequences of polynucleotides. Evidence was also presented (Pons) that the replicative form (RF) of influenza RNA obtained from virus-infected cells can be resolved as five components resistant to ribonuclease. These observations evoked discussion as to the actual physical state of the RNA genome within intact vi- rions versus its intracellular form. The suggestion (Braun) that the RNA may exist in influenza particles as a single molecule but may be replicated as separate fragments appears worthy of considera- tion. Pons ended his discussion of physicochemical studies with recent data concerning the molecular basis for the classical "Von Magnus phenome- non"; that is, the multiplicity-dependent production of incomplete, noninfectious influenza virus. Analyses of radiolabeled virus by gel electrophoresis showed that the incomplete form of virus con- tained the same protein components as fully infectious virus, but that it lacked one of the five RNA components. It will be of ob- vious interest to determine what genetic function or functions this missing RNA segment can perform in intact genomes.

Frank Fenner has long advocated the use of conditional lethal mutants for circumventing the technical problems that have hampered genetic studies of animal viruses. One could scarcely doubt the usefulness of this approach when considering the work discussed by Fen- ners on temperature-sensitive (ts) mu- tants of influenza virus, strain WSN. These data, many derived from a recent doctoral dissertation (J. Mackensie), showed that a genetic map can be con- structed with influenza ts mutants pro- viding that conditions for recombin- ation are highly standardized including treatment of cells with *Vibrio cholerae* neuraminidase. Sixteen ts mutants of WSN virus were first ordered along a linear map that showed reasonable addi- tivity and a maximum recombination frequency of 12 percent. However, to resolve the discrepancy of lower-than- expected recombination between the terminal mutants a circular map was constructed which Fenner stressed as being quite tentative. For unexplained reasons attempts were not successful to obtain complementation between these ts mutants which differed from one an- other for various defects. Hirst dis- cussed recent recombination studies

AUTOMATIC
ANIMAL
WATERING...
can save you time, money, and a lot of grief. With a Hardco Automatic Watering System, lab animals always have a supply of fresh, filtered water. There are no bottles to refill, wash or replace. Personnel are free to do other things.

Heart of the Hardco System is a leak- proof dispenser that can be easily activated by a small animal. A dispenser is installed in each cage and is connected to the water source by a network of special plastic piping. Hardco designs and installs systems for all species of lab animals... for both planned and existing facilities. Our catalog goes into the details. Write for it today.

Hardco Scientific
The Fieldstone Corporation
Hardco Scientific Division
6811 Grace Avenue
Cincinnati, Ohio 45227
with similar ts mutants of WSN originally isolated by Simpson and Hirst and he was able to group nine nonrevert- ing mutants within a linear map giving a maximum distance of 13 percent. Except for the suggested circular arrangement of the genetic map obtained in Fenner’s laboratory it was obvious that fairly good agreement existed between these two independent sets of data.

The writer (Simpson) opened a discussion on heterozygosis with a presentation of recent results suggesting that, with some crosses between influenza (WSN) ts mutants, some clones presumptively classified as ts+ or “wild-type” recombinants are probably segregating heterozygotes. It was suggested (Zinder) that most of the influenza “recombinants” obtained from crosses with ts mutants might be heterozygotes rather than true recombinants, similar to the events detected in crosses involving amber mutants of bacteriophages (fl). Some participants pointed out that good evidence for the occurrence of true recombinants of the influenza virus exists. However, since the very high recombination frequencies (10 to 13 percent) of influenza ts mutants remain unexplained (considering genome size), it is not at all inconceivable that either genetic or replicative heterozygotes could account for this anomaly by exaggerating and masking true recombination frequencies. Evidence was also presented (Simpson) that stocks of the influenza ts mutants contain a large proportion of virus that is noninfectious but genetically competent in recombination.

The genetics of paramyxoviruses was discussed by Simon who presented data from a dissertation (J. Dahlberg) on ts mutants of Newcastle disease virus (NDV). These workers performed complementation tests with 48 ts mutants that fell into eight or nine groups although there was strong clustering within a single group. While segregation analyses or other tests for heterozygosis were not carried out, it was concluded that recombination did not occur (<5 × 10⁻²) with these mutants and that all “ts-” clones were actually complementing heterozygotes. Simon presented evidence that populations of NDV are heterogeneous with regard to their ploidy, many particles incorporating more than one genome. The occurrence of ploidy and heterozygotes among myxoviruses (influenza) and paramyxoviruses (NDV) has long been recognized but it is apparent that their full significance in genetic interactions is yet to be evaluated.

Pereira closed the discussion on genetic recombination with a review of his work on interaction of human and avian strains of influenza A virus. Using the technique of cross reactivation, it was shown that reactivation of fowl plague virus with different human strains of influenza resulted in transfer of the genetic determinants for neuraminidase protein of the helper virus (noninactivated human serotypes). The polygenic nature of these determinants was suggested. The final discussion topic of the genetics session involved the recent work of Chanock and associates concerning progress in the development of vaccine strains employing attenuated ts mutants of various respiratory agents including respiratory syncitial virus (RS), rhinoviruses, and even Mycoplasma pneunoniae. The desirability of isolating such mutants with presumed affinity for localization in the upper respiratory tract, where they should be capable of stimulating local production of IgA-type antibodies, was suggested by the finding that circulating antibodies actually exert an adverse effect in the case of infections evoked by RS virus. The successful isolation of several ts mutants of these respiratory agents was described (Chanock, Perkins, Steinberg). One now awaits an experimental confirmation that such mutants will be as useful as one might anticipate. Appearance of virulent revertants may be precluded by selection of appropriate mutants under conditions where multiple mutations are almost certain to have occurred.

The session on the biosynthesis of influenza virus and its components was disappointing in the sense that no new data became available shedding light on some of the enigmas surrounding the replication of these viruses, such as the nature of the actinomycin-sensitive, host-controlled functions. Pons reviewed his earlier work showing that actinomycin D blocks formation of the influenza replicative form of RNA. It was suggested (Braun) that some insight into this problem might be gained if the influence of agents stimulating nucleic acid synthesis (for example, by oligonucleotides) were investigated. Zinder suggested that a more critical examination of the effect of protein inhibitors, added late in the infection cycle, on viral RNA synthesis might be warranted. Interesting new findings concerning the surface structural proteins of influenza virions from studies of