found that such sera did possess a demonstrable activity which, however, was usually only from one fifth to one third of the values found for the sera from mature females.

Activities found by the titrimetric method are reported as cc 0.01 N acid liberated by 0.50 cc serum in 20 min.; by the Warburg method as cubic mm CO_2 liberated by 0.50 cc serum in 20 min.

In order to determine whether or not there were any activators in the mature female sera or inhibitors in the mature male sera, equal portions of these two were mixed and the activity of the mixed sera determined. The results are shown in Table II. The cholinesterase activity of the mixed sera being equal to the average activity of the component sera indicates the absence of activators or inhibitors in the female and male sera, respectively.

TABLE II

ACTIVITY OF MIXED MALE AND FEMALE SERA

Warburg method		Titrimetric method	
Calc. mean	Found	Calc. (from Warburg)	Found
272 cu. mm.	263 cu. mm.	1.22 cc	1.30 cc
283	282	1.27	1.35

SUMMARY

(1) The serum cholinesterase activity of mature female rats is three to five times as great as that found in mature male rats. Mice sera exhibit similar sexual variations in activity, but to a lesser degree.

(2) Immature female rats and probably senile female rats possess a low serum cholinesterase activity, in the same range as that of the mature male rats.

J. M. R. BEVERIDGE
C. C. LUCAS
UNIVERSITY OF TORONTO

SCIENTIFIC APPARATUS AND LABORATORY METHODS

THE NEW ELECTRON MICROSCOPE

THE new electron microscope that is now being manufactured by the RCA Manufacturing Company, Inc., has a simplicity and ruggedness which makes it a research tool of importance for scientific and industrial work.

The experimental predecessors of this new instrument, by virtue of their high magnifying powers, aroused the interest of research men all over the country. Magnifications as high as 100,000 opened up many new fields for research endeavor. Previous maximum useful magnification of 2,000 to 3,000 diameters placed severe limitations on such studies as particle size and shape of various materials, crystalline structures, colloidal suspensions, internal structure of bacteriological specimens, filterable viruses and many others. Much information along these lines had to be obtained from tedious and complicated indirect methods which yielded, at best, only mildly accurate results. And even these indirect methods failed to supply many of the answers. Quite often the situation was encountered where two materials were exactly alike so far as ordinary chemical analysis and observation under high power optical microscopes were concerned, yet the materials produced widely different results in actual usage. It was with the hope of solving some of these baffling problems that scientists enthusiastically welcomed the first electron microscope.

This experimental instrument did promise to be of aid. With it, particles only 50 Ångstrom units in diameter could be clearly resolved, and many new and interesting structures were observed. Such organisms as streptococci, typhoid and anthrax bacilli were not the homogeneous masses they appeared to be under ordinary microscopes, but possessed surprisingly intricate frameworks and internal compositions. Also, this electron microscope afforded a means of clearly photographing and observing some of the previously invisible filterable viruses, those tiny little agents of destruction that are so mysterious to even our most learned bacteriologists. An idea as to the importance of this may be had from glancing at the imposing list of diseases apparently caused by viruses of this sort. To name just a few—the common cold, infantile paralysis, sleeping sickness, yellow fever, and—who knows—perhaps even cancer.

However, as in most new developments, there were a few disadvantages that had to be overcome. The experimental microscope was bulky—its power supply alone occupied an entire room—it required installation in a location absolutely free from vibration and magnetic fields, and last but by no means of less importance to a prospective user, a specially trained electronic engineer was necessary for its successful operation. Obviously, these facts imposed conditions that could not be met by the average research laboratory. Their need was for an instrument that could be set on the floor of a small-sized room, plugged into a light socket and put into operation by simply throwing a switch.

The new electron microscope was designed expressly to fill this need. A microscope, power supply and all, is contained in one rack about seven feet tall and weighs approximately five hundred pounds. It fits into a corner of the room and obtains current from the normal 110-volt power line. The operator can seat himself on a chair in front of the instrument from

where he can easily reach the switches and controls (all located on the front panel of the rack) and then can look through the large eye pieces at the magnified image of the specimen under observation. At the twist of a knob, he can adjust the brightness of the image, bring it into sharp focus or vary the magnification over a wide range. He can turn another knob and adjust the position of the specimen until the most interesting portion of the field comes into view. This latter control, by the way, affords an extremely fine vernier motion by means of which the image position can be set to within a sixteenth of an inch even when the image magnification is 30,000 times. This means that the actual position of the specimen can be set to within two one-millionths of an inch!

Exposures of the image can be made on a photographic plate by simply twisting a control on the side of the instrument. The average exposure time used is about twenty seconds.

A special interlocking valve system enables specimens and photographic plates to be changed without breaking the vacuum in the entire system, thus greatly speeding up operations. Only about one minute is required for changing specimens, and approximately three minutes suffice for introducing a fresh photographic plate.

The plates are of the standard glass type used in ordinary photographic work and are ten inches long so that several exposures can be made on each plate. A control on the side of the microscope column varies the width of the electron image so that exposures of several sizes can be made.

The facility of operation of this microscope is such that as high as one hundred and fifty pictures can be taken in a single day, provided the specimens have been prepared in advance or are of such a nature as to lend themselves to ready preparation.

The power supply contains the most important improvements of all, however. No bulky transformers or filter packs are used even though a voltage of 60,000 volts is produced. Unique circuits are employed to generate this voltage and, incidentally, regulate it to better than one part in 50,000. The low voltage supplies which produce current for the condenser, objective and projection lenses are also regulated to the same degree. This stability assures good results under a wide variety of working conditions.

H. E. RHEA

RCA MANUFACTURING COMPANY, INCORPORATED

A SENSITIVE COLOR REACTION FOR 2-METHYL-1-4-NAPHTHOQUINONE AND RELATED COMPOUNDS

THE color reaction of Dam and coworkers,[1] while lacking in specificity,[2] has been useful in the investigation of vitamin K concentrates and in studies relating to its distribution, etc. Unfortunately, it is not suitable for a quantitative test because of the changing color.

We have found that the sensitivity and stability of the reaction is greatly increased when it is not based directly on the quinone, but on 2-4-dinitro-phenyl-hydrazine. This reaction can be employed for a quantitative test.

To 1 or 2 drops of a methanol or ethanol solution, containing not over 0.1 mg of 2-methyl-1-4-naphthoquinone, or related compounds, add 3 drops of a 1 per cent. solution of 2-4-dinitro-phenyl-hydrazine in 2N hydrochloric acid. Warm gently for a few seconds, cool, add 3 drops of ammonia solution (D: 0.910), shake, and then add 1 cc of amyl alcohol. A green color appears. On the addition of water the color is separated in the amyl alcohol phase. Its depth is proportional to the quinone present, and it is stable. Instead of ammonia, sodium methylate (0.5 cc of a 5 per cent. solution in methanol) can be used. In this case the color is bluish green, and it is not necessary to add amyl alcohol for its development; however, it is also soluble in this substance.

ARMANDO NOVELLI

FACULTAD DE CIENCIAS MEDICAS
LABORATORIO DE QUIMICA ORGANICA
BUENOS AIRES, ARGENTINA

[1] Dam *et al.*, *Helv. Chim. Acta*, 22: 310, 1939.

[2] Fernholz, Ansbacher and Moore, *Jour. Am. Chem. Soc.*, 61: 1613, 1939.

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