for example, the letter key A is pressed, the a electro-magnets are actuated, this sustains the a pointers (i.e., the A's drop to the vertical when the operation key is set to position *3*). If the a key is pressed the A pointers are similarly sustained, and so on for other positive and negative letter keys.

The operation key circuit worked by a separate battery is connected to the *16* electro-magnets through a three-way switch, "the operation key" (the 2nd position of which is wired to a rheostat). Position *1* of the operation key raises all the fallen pointers to the horizontal thus indicating the logical universe or truth-table for four terms; it prepares the machine for a new problem. Position *2* sustains the pointers at the horizontal (it passes sufficient current to sustain the armatures of the electro-magnets actuated by the letter key operations) but does not raise the fallen pointers. Position *3*, which switches off operation key circuit, causes unsustained pointers to fall.

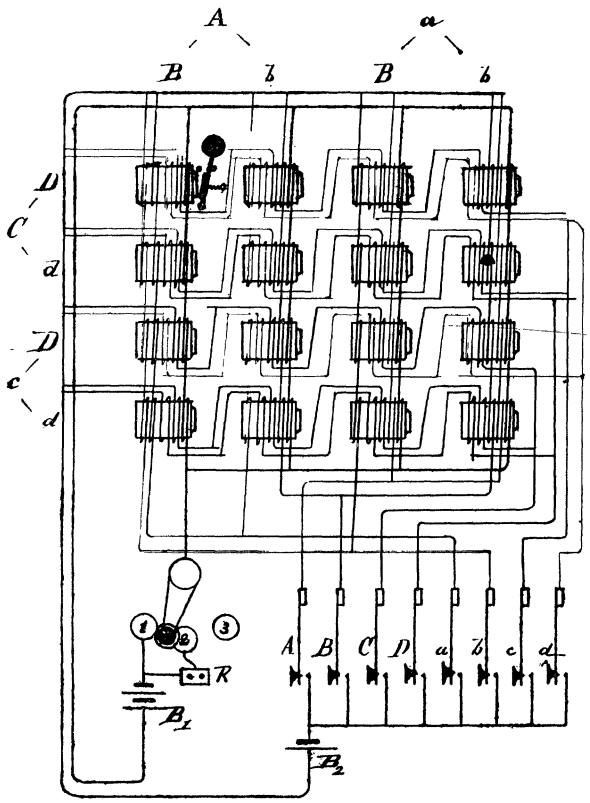

FIG. 1.

On Marquand's system the premises are inserted in a negative form. For example, the premise $A \supset B$ (A implies B) in Marquand's notation $A \prec B$, is identical with $-(A. -B)$ (it is false that both A and not B are true) or as he expresses it $A\ b \prec 0$; the premise $B \supset C$ is translated into $-(B. -C)$ or $Bc \prec 0$.

In operating the machine, the operation key is first set to position *1*; this raises all the pointers to the horizontal. Assume that the proposition to be fed in is $A\ b \prec 0$ (i.e. $A \supset B$): we press the letter key A; this has no visible effect. The operation key is set to position *3*, which causes all pointers except the a's to fall and then to position *2*; this sustains the a's at the horizontal. Letter key b is then pressed and the operation key set to position *3*. On the dial plate the $A\ b$ pointers fall to the vertical. We may thus continue to impress as many of the premises of a problem as we please until all the pointers have fallen. The conclusion can be read from the fallen (vertical) pointers as a negative expression in the normal conjunctive form, or from the remaining horizontal pointers as a positive expression in the normal disjunctive form. It would appear that the letter keys involved require to be closed while the operation key is set to positions *3* or *2*; this seems to restrict the machine's possibilities.

The actual cardboard diagram in the Princeton Library, of which Fig. 1 is a photostat copy, is in color. Wires extending from the letter keys are colored thus: A brown (probably red faded) a red, B and b blue, C and c green, D and d yellow; the rest of the wiring is in black.

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Radioactive Colloids—Increased Danger

REPORTED recently (*1*) is a technique for recording the anatomic configuration of the liver by means of intravenous injections of radioactive colloidal gold (Au^{198}). The reticulo-endothelial (RE) system will pick up this colloidal matter with 80–90% being taken up by the liver RE cells. Due to the gamma radiation of Au^{198}, the shape and location of the liver may be estimated by measuring the gamma radiation intensity at different points over the skin. Authors of the report used the technique successfully in animal experiments, and they further state . . . "instrumentation developments are currently in progress at this laboratory in an effort to determine if such instrumentation would permit the use of a dose of radioactive colloidal gold which would be fully within the limits of safety for application to human beings."

The "limits of safety" of radiation dosage for RE cells would seem puzzling to the radiobiologist at the present time. Some experimental data published during the past few years suggest that RE cells be considered as one of the highly radioresistant tissues of the body. As much as 300 r (*2*), according to one author, and 800 r (*3*), according to another, whole body x-ray irradiation in rabbits did not alter the phagocytic function of the RE system. However, some recent direct experimental results indicate that RE cells are the most, or at least one of the most, radiosensitive cells of the organism. In rats, 25 r whole body x-ray irradiation considerably impaired RE functions, as reported by our laboratory (*4*). Another factor which has to be borne in mind is that

the radioactive particulate matter is not evenly distributed throughout the liver or spleen, but is concentrated in RE cells. Therefore, the dose of radiation absorbed by RE cells in these organs will be higher than in the case of uniform distribution (*5*). Furthermore, the claim of the earlier literature that there is a rapid regenerative tendency of the RE system based on qualitative histological observations appears not to be confirmed by more recent investigations in this laboratory.

The significant role of the RE system in serum globulin synthesis, antibody production, fat metabolism, infections, general resistance, etc., is fairly well established despite the fact that much more quantitative work is desirable. If one considers the RE system as being highly radiosensitive, it would appear to be a matter of great importance to point out at this time the danger of injecting intravenously radioactive colloids for diagnostic purposes in humans.

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Terminology of Atmospheric Shells

IT might be interesting, in view of the confusion now existing in the terminology of the various atmospheric shells, to indicate the system now employed by the Geophysics Research Directorate. This system considers that the atmosphere is divided into six "spheres" or shells, not necessarily either spherical or concentric. The approximate altitude ranges of these shells and the names of the dividing surfaces are shown in Table 1.

It should be noted that a "dividing surface" may have appreciable thickness and hence not be strictly a surface. In the case of the tropopause, for example, this thickness may be several kilometers and in the case of the chemopause it may, perhaps, be 10 km or more. Figure 1 diagrammatically portrays the nomenclature adopted.

TABLE 1

ATMOSPHERIC SUBDIVISIONS

Atmospheric region	Altitude (km)	Dividing surface*
Troposphere	0–11	Tropopause
Stratosphere	11–32	Stratopause
Chemosphere	32–80	Chemospause
Ionosphere	80–400	Ionopause
Mesosphere	400–1000	Mesopause
Exosphere	Above 1000	

* Between the shell concerned and the next higher shell.

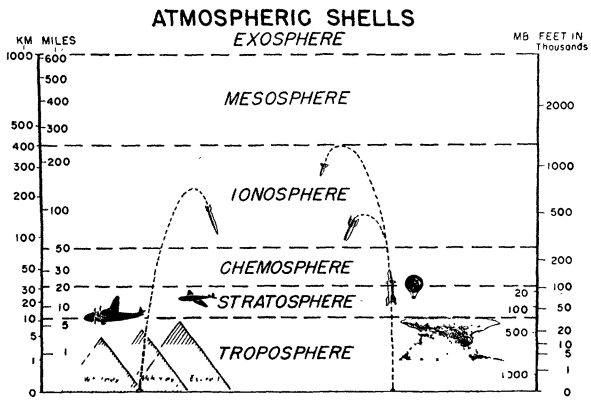

FIG. 1.

The various altitudes given represent mean conditions at middle latitudes.

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Book Reviews

Introduction to Organic Chemistry. Leland A. Underkofler. New York: D. Van Nostrand, 1953. 352 pp. $4.25.

Professor Underkofler's text is designed specifically for very short courses in organic chemistry and for students in colleges of agriculture, home economics, and nursing. As such, much of the detailed treatment considered desirable for science or chemistry majors is omitted. On the other hand, the book is not simply a descriptive exposition of well-known organic materials but includes discussions of carefully selected principles and practices of the science. The interested student will attain a working knowledge of structural chemistry, systematic nomenclature, and synthetic methods. Reaction mechanisms and the electronic concepts of valence and resonance are scarcely considered. Biochemical topics have been kept to a minimum since it is expected that they will be considered in subsequent courses.