mm Hg., and the diastolic pressure, 60 mm Hg. Some fluid may leak and spurt from small blood vessels without markedly lowering the pressure. The progressive decrease of the pH of the medium is detected by comparing the color of the fluid feed tube of the apparatus with that of a set of standard tubes.

Twenty-six experiments have been performed since the last model of the apparatus was made. The organs were thyroid, ovary, suprarenal, spleen, heart and kidney. Some organs were transferred several times from apparatus to apparatus. Infection occurred twice only. This accident took place in spleens that obviously were contaminated before removal from the abdomen. Thyroid glands were kept more than 20 days with pulsating arteries and active circulation. They could have remained in the apparatus much longer. No emboli and no important hemorrhages were observed. The lowering of the pH of the medium occurred more or less rapidly according to its composition. In diluted blood serum, cat's thyroid glands consumed only about 7 mg of glucose per 24 hours. When they were perfused with a growth-promoting fluid, the glucose consumption increased more than three times.

Changes in form and volume took place in the organs from day to day. Thyroid glands perfused with diluted serum were observed to decrease in size progressively. On the contrary, ovaries or thyroids perfused with a growth-promoting medium modified their form and grew rapidly. In 5 days, the weight of an ovary increased from about 90 to 284 mg. Simultaneously, three corpora lutea developed. At the end of the experiments, that is, after from 5 to 21 days, small fragments taken from the organs and cultivated in flasks engendered active colonies of epithelial cells and fibroblasts. The epithelium of an adult thyroid was found to have recuperated its fetal activity after being perfused for a few days with a growth-activating fluid. The sections showed an almost normal structure of fragments of the thyroid, even when the gland had been roughly treated and perfused with dilute serum for a long period of time, when the pH had been lowered to 7.2 for several days or when the circulation had markedly decreased. The presence of colloid was observed in some follicles. If perfused with a growth-promoting fluid, the structure of the gland was altered. The colloid substance disappeared. The epithelial cells proliferated within and also outside the follicles. In ovaries treated in the same manner, growth was also accompanied by disorganization. There was a luxuriant and disordered proliferation of the stroma and of the epithelial cells. Obviously, a large amount of new tissue had been manufactured by the organ. The fluids that had circulated through the apparatus were tested for modifications induced by the organs. In every case, the thyroid glands were found to have set free substances that stimulated the proliferation of leucocytes more or less markedly.

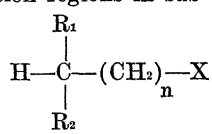
The structural and functional changes undergone by the organs during their life *in vitro* are complex. They obviously depend on the chemical composition and the physicochemical and physical conditions of the perfusing fluid. They will be discussed in subsequent articles. From the present experiments, it must merely be concluded that an entire organ, such as an ovary, has been maintained alive *in vitro*. It not only survived, but increased in size and in weight. This increase was due to the appearance of new cells and tissues. It is, therefore, probable that this method provides important uses in physiological chemistry, physiology and pathology.

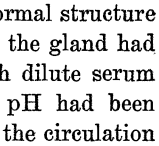
ALEXIS CARREL
CHARLES A. LINDBERGH
THE ROCKEFELLER INSTITUTE
FOR MEDICAL RESEARCH

ANALYSIS OF ROTATORY DISPERSION OF CHEMICALLY ANALOGOUS SUBSTANCES

IN view of an article by W. Kuhn and H. Biller announced to appear in *Z. phys. Chem.*, "Drehungsbeitrag chromophorer Gruppen bei analog gebauten Verbindungen," we wish to report briefly the results of similar work which has been in progress in our laboratory in course of several years.

In Table I are given the directions of the partial rotations of the individual absorption regions in substances of the general type of



(R_1 and R_2 being alkyl groups, X a functional group, , N_3, SH, Halogen; n = 0 or an integer). All substances in which X = N_3, NH_2 and  are configurationally correlated; when X = SH or Halogen, all substances in which n = an integer are likewise configurationally correlated by direct chemical methods and those in which n = 0 are not so correlated.

The most significant facts appearing from the data given in Table I are:

(1) The band of group X with the lowest frequency in some instances furnishes the principal partial rotation determining the direction of the optical rotation of the substance in the visible.

In other substances the partial contribution of the absorption region of low frequency depends upon the

TABLE I

	Compounds	Rotation in the visible	First absorption band in A.	Contribution of first band.	Second absorption region	Contribution of second absorption region	Sum of all other contributions
	Aldehydes						
	2-methylbutanal-1	−	2960	−			?
I.	3-methylpentanal-1	+	2940	+			−
	4-methylhexanal-1	−	2940	+			−
	Azides						
	2-azidooctane	+	2880	inactive	from 2200	+	?
II.	1-azido-2-methylbutane	−	2880	"	"	−	+
	1-azido-2-methylnonane	+	2880	"	"	−	+
	1-azido-3-methylpentane	−	2880	"	"	−	+
	Amino—						
	2-aminooctane	+	≦ 2300	−			+
III.	2-aminooctane hydrochloride	−	≦ 2100	−			
	1-amino-2-methylbutane	+	≦ 2300	+			−
	Thio—						
	2-thiobutane	−	2300	inactive	from 2100	−	?
IV.	2-thioheptane	−	2300	"	"	−	?
	1-thio-2-methylbutane	−	2300	"	"	+	−
	*Iodo—						
	2-iodobutane	+	2630	+	from 2000	+	?
	2-iodooctane	+	2630	+	"	+	?
	1-iodo-2-methylbutane	−	2570	?	"	+	−
V.	1-iodo-2-methylheptane	−	2570	?	"	+	−
	1-iodo-2-methylnonane	−	2570	?	"	+	−
	1-iodo-3-methylhexane	−	2570	−	"	−	?
	1-iodo-4-methylheptane	−	2570	−	"	−	?
	1-bromo-2-methylbutane	−	2000	+		−	
	Isopropyl Derivatives						
	2-iodo-3-methylbutane	+	2670	+	from 2000	−	
	4-iodo-5-methylhexane	−	2670	negligible	"	−	
VI.	1-iodo-2, 3-dimethylbutane	−	2570	"	"	−	
	1-iodo-3, 4-dimethylpentane	−	2570	− (slightly)	"	−	
	1-azido-2, 3-dimethylbutane	−	2880	inactive	from 2200	−	+

* Most of the normal halides were prepared by Mr. R. E. Marker.
The detailed results on these substances will be published under joint authorship.

values of n, and in one case depends upon the value of R_1.

(2) In those groups of substances in which all members are configurationally correlated (I, II, III) the direction of the predominating partial rotation of X changes sign when n passes from the value 0 to that of an integer.

The case of the halides of the normal series needs special discussion. In the secondary halides, both the first and the second absorption regions of the halogen atom seem to be active and to furnish the major part of the rotation in the visible region. In the iodides having n = 1, the principal contribution in the visible apparently is furnished by the third absorption region of the iodine atom, the first and second being of opposite sign and of small numerical value. In the bromide the rotation in the visible seems to be furnished principally by the second absorption region of the bromine atom, the first being of opposite sign and of small value.

P. A. LEVENE
ALEXANDRE ROTHEN

THE ROCKEFELLER INSTITUTE
FOR MEDICAL RESEARCH,
NEW YORK, N. Y.

BOOKS RECEIVED

CURTIS, OTIS F. *The Translocation of Solutes in Plants.* Pp. xiii + 273. McGraw-Hill. $3.00.

DALCQ, ALBERT. *L'Organisation de L'Oeuf chez les Chordés.* Pp. viii + 322. 100 figures. Gauthier-Villars, Paris.

RAMSEY, R. R. *Fundamentals of Radio.* Pp. xiv + 426. 18 figures. $3.50.

Rôle et Formation du Bibliothécaire. Pp. 384. Institut International de Coopération Intellectuelle, Paris. 50 fr.

The Scientific Journal of the Royal College of Science. Vol. V. Pp. 138. Illustrated. Edward Arnold, London. 7s., 6d.

VERDOORN, FR., Editor, and others. *Chronica Botanica.* Vol. I. Pp. 447. Illustrated. Chronica Botanica, Leiden, Holland.