TABLE 2

CAROTENOID CONTENT OF THE RIND OF MATURE GREEN AND TREE-DEGREENED (FULL-COLORED) CITRUS FRUITS

Variety	Mature green		Degreened on tree (Full colored)	
	Carotene (mgs per 100 gms fresh peel)	Xanthophyll (mgs per 100 gms fresh peel)	Carotene (mgs per 100 gms fresh peel)	Xanthophyll (mgs per 100 gms fresh peel)
Villa Franca lemon	.085	.830	.060	.275
Grapefruit (Duncan type)	.045	.435	.004	.000
Persian limes	.045	.500	.010	.000
Perrine lemons	.065	.670	.020	.160
Key limes	.100	1.090	.055	.310

Recently Zechmeister[1] and Tuzson have shown that in the determination of carotenoids in orange peel the epiphasic petroleum ether layer contains mostly cryptoxanthin. However, since cryptoxanthin has not been reported in limes, lemons and grapefruit, the conventional method of expressing the results as carotene and xanthophyll is employed for this type of fruit.

Most of the yellow substances in the rind of the full-colored limes, lemons and grapefruit were washed out of the extract by the dilute sodium carbonate solution which is employed to remove the flavone pigments. Schunck[2] reported that the yellow pigment in the lemon rind consisted principally of a water-soluble pigment together with the acid derivatives of two xanthophylls. From the context it is evident that the author referred to ripe lemons. Hardy and Warneford[3] noted "the almost entire absence of chromoplasts in the rind cells" of limes but apparently did not analyze the green fruit. These authors reported that the color was due to the presence of a phlobatannin and stated that in this respect the lime resembles the lemon and grapefruit.

The above results are in striking contrast to those found in the analysis of orange rinds in the present investigation. Carotenoids are present in the rinds of mature green oranges, and they increase as the fruit ripens. Inasmuch as a more detailed report will appear elsewhere only one example is presented here (Table 3). These analyses were made while the fruit was still green in color but legally mature according to state and federal standards, when it was yellow (just before commercial picking), and again about two months after the fruit of the adjoining trees had all been picked for the market.

If the underlying cause for this phenomenon were known it might help explain the great variation in color of citrus fruits grown in different sections of the country or even in different sections of the same state.

TABLE 3

CAROTENOID CONTENT OF THE RIND OF PARSON BROWN ORANGES DURING RIPENING

Date sampled	Rind color	Sugar/acid ratio of juice	Total carotenoids (mgs per 100 gms fresh peel)
September 28	Near* Parrot green	9.38	1.045
December 1	Yellow ochre	14.64	2.470
February 1	Near Ochraceous orange	27.50	5.340

* Ridgway's Color Chart.

1 L. Zechmeister and P. Tuzson, *Berichte der deutschen chemischen Gesellschaft*, 69 (8): 1878–1884, 1936.

2 C. A. Schunck, *Proc. Roy. Soc. London*, 1903: 165–176, 1904.

3 F. Hardy and F. H. S. Warneford, *Indust. and Eng. Chem.*, 17 (1): 48–50, 1925.

ERSTON V. MILLER

DIVISION OF FRUIT AND VEGETABLE CROPS AND DISEASES
BUREAU OF PLANT INDUSTRY

THE MOLECULAR WEIGHTS OF UREASE, CANAVALIN, CONCANAVALIN A AND CONCANAVALIN B[1]

THE jack bean, *Canavalia ensiformis,* contains four crystallizable globulins, urease, canavalin, concanavalin A and concanavalin B. The first of these is an enzyme, while the third is a hemagglutinin. In this paper we describe briefly the determination of the molecular weights of these four globulins. The results and methods used will be given in a later publication.

Urease was prepared from jack-bean meal; some was recrystallized once and some twice. We centrifuged six preparations of varying degrees of purity in the Svedberg ultra-centrifuge. All preparations contained a main constituent with a sedimentation constant of approximately 19×10^{-13}, and one preparation was nearly free from impurity.

Determination of the diffusion constant for urease was especially difficult because the urease became opalescent upon standing even at 0° and eventually precipitated from solution. However, by dissolving in neutral phosphate containing a mixture of $NaHSO_3$ and Na_2SO_3 the urease was stabilized and we were able to determine the diffusion constant as well as the partial specific volume.

Crystals of concanavalin A, concanavalin B and

TABLE I

Protein	$s_{20} \times 10^{-13}$	$D_{20} \times 10^{-7}$	Partial specific volume	Molecular weight
Urease	18.6	3.46	0.73	473,000
Canavalin	6.4	5.1	0.73	113,000
Concanavalin A	6.0	5.6	0.73	96,000
Concanavalin B	3.49	7.4	0.73	42,000

1 From the Institute of Physical Chemistry, The University, Upsala, Sweden.

canavalin were likewise obtained from jack-bean meal and were twice recrystallized. The sedimentation constants of these proteins were obtained by using the ultra-centrifuge. The diffusion constants and partial specific volumes were determined also. Table I gives values for the sedimentation constants, diffusion constants and partial specific volumes as well as the molecular weights calculated for all four jack-bean globulins.

We wish to express our appreciation to Professor The Svedberg for the use of his laboratory, and the senior author wishes to acknowledge his indebtedness to the Guggenheim Foundation for the grant which made this work possible.

JAMES B. SUMNER
NILS GRALÉN
INGA-BRITTA ERIKSSON-QUENSEL

SOME EFFECTS OF ANDROSTERONE ON SEXUAL DEVELOPMENT IN THE FEMALE RAT

THE production of intersexuality in the female rat by the ante-natal administration of testosterone and testosterone propionate has been reported.[1, 2] These findings have been confirmed in the mouse by Raynaud,[3] and partially confirmed in the rat by Hamilton and Gardner.[4] Intersexual changes in genetic female chickens have been produced by Willier[5, 6, 7] and others by injecting testosterone, androsterone and dehydro-androsterone into the incubating eggs.

Androsterone[8] in divided doses has been administered to female rats during different periods of pregnancy. Thirteen litters have been delivered to date. The total amount of androsterone administered in each case varied from 40.0 mg to 280.0 mg. At least one female new born from each litter has been killed and examined under a dissecting microscope. The remaining animals are still alive and will be examined after maturity. Of the 23 new born examined, bilateral persistence of Wolffian duct derivatives was found in seven cases, unilateral persistence in three cases. The vas deferens in these animals lies adjacent to and parallel with the uterus. No definite evidence of Mullerian duct inhibition has been found to date. In a few animals the gonads have been displaced caudally, and development of the ovarian capsule is inhibited. Study of serial sections has confirmed these findings and revealed efferent tubules continuous with the rete of the gonads and continuing into the epididymis. The latter is continuous with the vas deferens, which communicates with the urethra in the normal male position. Seminal vesicles and prostatic diverticula are present. The caudal portion of the vagina is absent, and the cranial portion has bilateral connections with the urethra medial to the orifices of the ejaculatory ducts.

The degree of masculinization seems to be dependent not only on the total quantity of androsterone administered, but also on the periods of pregnancy when treatment is given.

R. R. GREENE
M. W. BURRILL
A. C. IVY

NORTHWESTERN UNIVERSITY
MEDICAL SCHOOL, CHICAGO

SCIENTIFIC APPARATUS AND LABORATORY METHODS

METHYL METHACRYLATE AS A LABORATORY TOOL[1]

CERTAIN physical and chemical properties of polymerized methyl methacrylate[2] adapt it to many services in the laboratory. As is well known, this material has the power to conduct light; it is elastic; it does not break if dropped; it can be turned in a lathe, cut with a saw and polished by buffing. Although it can be ignited, combustion is slow and gentle, not violent as it is in the case of celluloid. Heated to a temperature of 130° C. it does not melt, but becomes plastic so that it can be molded or shaped; it will retain its new form after chilling in cold water. It is insoluble in water, and quite or nearly insoluble in ethyl alcohol, amyl acetate or xylene. On the other hand, it is readily soluble in chloroform.

A rod of methyl methacrylate will conduct light with but little loss, even if sharply curved. It may be tapered or machined on a lathe or slow-moving emery wheel. Rough surfaces may be smoothed with a file or sandpaper, and a coating of the plastic, dissolved in chloroform, applied to such surfaces. As soon as the chloroform has evaporated a comparatively smooth

[1] R. R. Greene and A. C. Ivy, SCIENCE, 86: 2226, Aug. 27, 1937.
[2] R. R. Greene, M. W. Burrill and A. C. Ivy, *Proc. Soc. Exp. Biol. and Med.*, in press, February, 1938.
[3] A. Raynaud, *Compt. Rend. Soc. de Biol.*, 126: 866, December, 1937.
[4] J. B. Hamilton and M. U. Gardner, *Proc. Soc. Exp. Biol. and Med.*, 37: 570, December, 1937.
[5] B. H. Willier, T. F. Gallagher and F. C. Koch, *Proc. Nat. Acad. Sci.*, 21: 625, 1935.
[6] B. H. Willier, T. F. Gallagher and F. C. Koch, *Physiol. Zool.*, 10: 101, 1937.
[7] B. H. Willier, SCIENCE, 86: 409, November 5, 1937.
[8] Crystaline androsterone has been furnished through the courtesy of Dr. Ernst Oppenheimer of Ciba Co. This investigation has been supported in part by a grant from the Macy Foundation.

[1] This work was aided by a grant from the Williams 1900 Fund.
[2] This plastic is sold by E. I. du Pont de Nemours and Company, under the trade name of Lucite.