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.

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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.

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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.

surface will be obtained which may be brought to a high polish by buffing with very fine carborundum powder. For some purposes this material offers a convenient and inexpensive substitute for quartz rods, such as were used by Knisely,[3] in illuminating the organs of living animals. The apparatus described below furnished enough illumination for microscopic observation but has not been tried as a light source for the taking of motion pictures. Without the addition of cooling devices it seems probable that the heat evolved from more intense light sources would soften the end of the rod to such an extent as to limit its usefulness. This aspect is being investigated. The writer has used the concentrated filament of a 50 c.p. automobile lamp as a light source, drawing power from a Voltrol transformer connected with 110 volt A.C. circuit. The lamp was supplied with a metal housing, containing a circular opening through which a rod could be inserted. The end of a methyl methacrylate rod of one half inch diameter, placed one eighth of an inch away from the lamp, captured sufficient light to furnish strong illumination at the other end, the light being intensified if the distal end had been tapered to a diameter of about one quarter of an inch. This illuminated tip, placed under the web of a frog's foot or under the frog's kidney or lung, furnished enough light to enable one to view the circulation of the blood in the vascular system. A rod of one inch diameter was also used with excellent results. One end was tapered to a diameter of one half inch, and the surfaces polished by buffing. The larger end of the tube was inserted in the lamp housing about one eighth inch away from the lamp, the other end was provided with a short rubber sleeve. One end of a rod 12 inches long and one half inch in diameter was rounded and polished; the other end was bent at a right angle, near the tip. When the rounded end was slipped into the rubber sleeve, a flexible joint was formed. Since the rounded surface of the small rod remained in contact with the end of the large rod, the free tip could be moved to diverse positions without serious loss of illumination.

Whenever the rod was bent at right angles or where it was tapered abruptly, there was some loss of light. The application of powdered aluminum did not remedy this difficulty, since the aluminum powder absorbed a noticeable amount of light. Chinese white or French chalk mixed with a chloroform solution of the plastics and applied at the angle conserved some of the light. Fortunately the light transmitted is more than adequate for routine observations through the microscope even when the angle of the rod is not painted with reflecting materials.

A methyl methacrylate rod was also used to direct light upon an object to be viewed, by reflected light, under the hand lens or binocular microscope. In making difficult dissections such a rod was used to illuminate the particular area under dissection.

A dioxane solution of methyl methacrylate made an excellent quick-drying label varnish, suitable for pencil or ink-written labels. There was a slight tendency for typed labels to "run."

This same solution served as an excellent water-white mounting medium in place of balsam or dammar. Unlike balsam it showed no tendency to turn yellow with age. It dried more quickly than either balsam or dammar. It appeared to have no harmful effect on the usual stains. Slides were stained, run up the alcohol series and placed in a mixture of equal parts of chloroform and xylene. Because of the high volatility of the solvent, sections of the tissue were covered promptly with the mounting medium after the slide was removed from chloroform-xylol. The index of refraction of this plastic is 1.50–1.52, and the visibility of sections mounted in it was entirely satisfactory.

Tubes varying in diameter from 1½ inches to 6 inches, having a wall thickness of ⅛ inch, may be secured,[2] and from these cylinders of varying height may be cut, by use of a fine-toothed saw. A cylinder or ring was attached to a plate of methyl methacrylate to form a box, the edges being coated with a chloroform solution of the plastic to insure fusion. (At present it is difficult to secure polished plates at a moderate price, but the writer has been assured by the manufacturers that this will be possible in the near future.) A specimen preserved in formalin or in glycerine was placed in such a container and the cover sealed on by use of chloroform. Two small holes were then drilled in the cover: one to serve as an air port, the other as an inlet through which additional preserving fluid was forced by means of a hypodermic syringe. To allow for changes in the volume of the solution at different temperatures, it was found necessary to leave a small bubble of air in the chamber. The two minute openings were then sealed with paraffin. When glycerine was used, the openings were sealed with litharge (mono lead oxide) with which the glycerine formed a hard cement. Methods of trapping the air bubble so that it will be inconspicuous are being attempted.

Such containers possess features which adapt them for use not only for museum specimens, but also for delicate specimens which are to be handled by students. They are not easily broken, for the material is tough and elastic. Once sealed the container is a single unit, since the chloroform causes an actual fusion of the separate pieces used. The visibility is high; the specimen can be viewed from all angles.

[3] M. H. Knisely, *Anat. Rec.*, 64: 499–523, 1936.

Evaporation of the preserving fluid is reduced to the minimum. The cost of a container made of this plastic is far less than an equivalent glass container. As soon as polished plates of methyl methacrylate can be secured at a low cost, it will be easy to prepare containers of rectangular form by cementing the sides and ends in the manner described above for cylindrical containers.

Hibben[4] has reported that it is possible to embed biological materials in this plastic. However, Knight[5] pointed out that the process is by no means simple. The solubility of methyl methacrylate in chloroforms suggests that it might be possible to embed rather large objects in a solution of this plastic without recourse to polymerization of the monomethyl methacrylate. However, the writer has so far been unable to secure entirely satisfactory results, due chiefly to excessive shrinkage and the inclusion of air bubbles. The addition of xylene to a chloroform solution of the plastic gives better results and offers an attractive field for further experiment.

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A SIMPLE FEEDER FOR RATS AND MICE

CONTROLLED feeding of dry foodstuffs in nutrition experiments on rats and mice presents several technical difficulties. For exact work the usual wire hopper method is useless, while pastes are subject to infection by moulds and they introduce errors from evaporation.

We have designed a feeder meeting the following demands: (1) The amount must be exactly and quickly ascertainable; (2) enough food to satisfy the appetite must be readily available; (3) soiling of food by urine and feces must be prevented; (4) introduction of extraneous matter, such as sawdust, from the cage must be minimized; (5) the fondness of the animals for eating by holding the food in the front paws should be given scope; (6) the container should be easily filled, weighed and emptied when necessary; (7) it should be cheap and easily made.

We utilized a tall cylindrical tin-can (height, 6½ inches; diameter, 3 inches) having a removable lid. Two platforms were fixed inside the can (these were made from discarded fruit tins) and a rectangular entrance-hole was made in the side. This hole was just large enough to accommodate the head and shoulders, together with the front paws, and we found it convenient to make the hole by crossed cuts so that the triangles which were formed might be turned inwards. The upper and lower ones helped to support the platforms, while the side ones prevented too much lateral movement of the head and shoulders inside.

[4] J. H. Hibben, SCIENCE, 86: 2228, 247–248, 1937.
[5] Henry G. Knight, SCIENCE, 86: 2232, 333–334, 1937.

The lower platform is perforated, with holes large enough to permit food particles to fall through to the bottom of the can, and it extends inwards to a distance about equal to the length of the animal from the tip of the snout to just behind the shoulder blades. From this innermost edge a vertical partition (unperforated) extends to the bottom of the can and is closely applied to its sides. We made the horizontal and vertical parts in one piece.

The upper platform (unperforated) was fixed above the upper edge of the entrance hole, and it extends almost completely across the can except at the back, where it has a vertical drop-piece, as in the case of the lower platform. This partition, with a "pigeon-hole" in its lower end, extends a short distance (less than the height of the "pigeon-hole") below, and behind, the vertical part of the lower section to which it is closely applied. This upper platform acts as a hopper, and its efficiency is, of course, increased by having the front edge higher than the back one.

If the entrance hole is properly made the animal has some little difficulty in withdrawing itself, so that it is obliged to drop any food it holds and use its front paws. This food falls through the perforations and is not lost.

To prevent sawdust being swept into the container we suspend it above the floor of the cage and fit a few wire rungs below the entrance hole to provide support for the hind legs and to permit the animal to squat whilst feeding.

We are at present using a dross made up according to the recipe given by Thomson in the *Journal of Hygiene*, 36: 1, 1936, and find it highly satisfactory.

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