located at the base of the brain, produces precocity, but growth is stunted and the precocious rats remain like dwarfs all their life.

Arthur Steinberg, Philadelphia Institute for Medical Research—(See article and illustration on this page.)

Enigma of the Forest

One of the commonest of materials—and the least known—now joins the Research Parade. It is the enigma of the forest—and it has been the enigma of chemistry for many years. Its name is lignin.

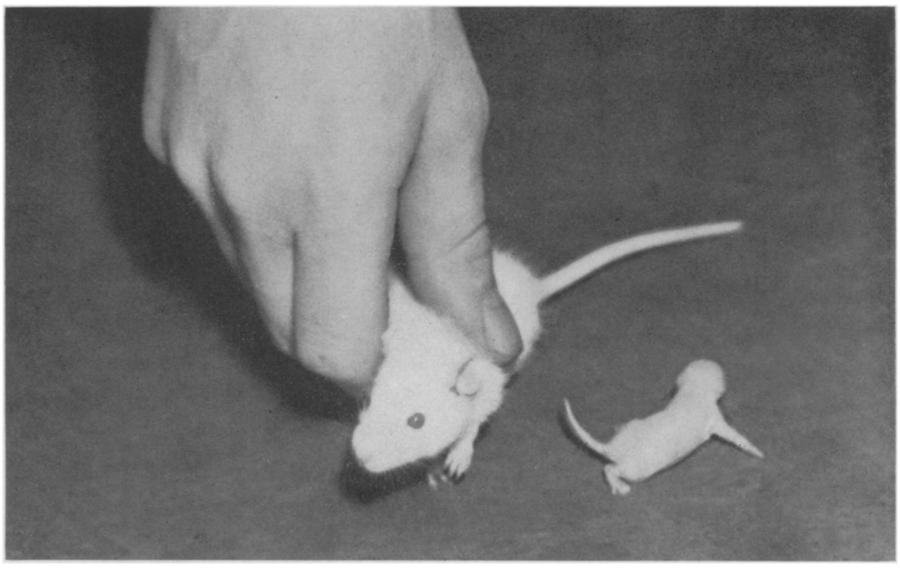
Carlile P. Winslow and Dr. E. C. Sherrard, U. S. Forest Products Laboratory—Lignin is a bulk constituent of all woody and vegetative growth, making up 20 to 30 per cent of the weight of the plant stem. Billions of tons of it are present in the world at any one time. The supply renews itself indefinitely.

One million tons of lignin are dumped into our streams annually as waste liquor from pulping mills; 15 million tons more are contained in four times that tonnage of waste wood.

Lignin is the cementing and reinforcing substance around cellulose fibers. *Cellulose* has structure. *Lignin* is amorphous or structureless. The chemist finds it unresponsive to hydrolysis or organic manipulation, and stubbornly resistant to conventional patterns of analysis.

Lignin is combustible; as waste wood or as recovered from waste pulping liquor we can burn it to warm a room or heat a boiler, or simply to get rid of it; it supplies heat also in one important process of recovering pulping chemicals. Again, waste pulp liquor is boiled down to make many thousand barrels of linoleum adhesive. Mixed with road materials, pulping effluent is giving interesting experimental results as a road binder. It also yields a material which has a limited use in the tanning of leather. Lignin has been combined with nitrogen to produce a compound available as plant food.

The formation of pure oxalic acid from lignin is now at a stage to invite commercial comparisons. By nitration we obtain colored compounds of the dye type. And the tendency of the furane aggregate discovered in lignin to condense further and form resinous products leads directly into the field of low-cost high-tonnage plastics from wood waste—panels, wallboards, and the like—to which (*Turn to page* 362)



GLAND-MADE GIANT

This little rat (on left) had thymus extract; this little rat (on right) had none. Both are of the same age.

ENDOCRINOLOGY

Growth Speeding by Thymus May be Due to Glutathione

CASUALLY pulling rats out of his pockets like a magician instead of a scientist, Arthur Steinberg of the Philadelphia Institute for Medical Research just as casually made the first announcement of what may prove the major medical discovery of the decade in his demonstration in the Research Parade arranged by Science Service as part of the centennial celebration of the American Patent System.

Glutathione, the chemical believed responsible for normal growth and for cancerous growth, is found in the thymus gland, Mr. Steinberg told his audience after first amazing them with a demonstration of the precocious growth and development attained by rats treated with thymus gland extract.

The extract was prepared by Dr. A. M. Hanson, practicing and researching physician of Faribault, Minn. Its role in stimulating growth and development was demonstrated at the Philadelphia Institute for Medical Research under the direction of Dr. L. G. Rowntree. Feeding this extract to white rats makes the next generation of rats develop much earlier and grow much larger than their parents. As each successive generation is fed the extract, growth and development is speeded up in the offspring at a truly amazing rate. In the tenth generation the rats matured in about one-fifth the time it takes for a normal rat to mature.

The thymus gland plays its role of controlling growth and development in the young, it now appears, by means of the powerful chemical glutathione. This chemical, scientists have already learned, can speed up cell division and thus influence both normal growth and the abnormal growth that is cancer. When chemical analysis of thymus gland extract showed that it contained glutathione, Dr. Rowntree and associates started feeding the pure chemical to white rats, as they had fed the animals thymus extract. The results were the same as with the gland extract, only even more striking. Successive generations of rats whose parents were fed glutathione grew and developed at an even faster pace than the animals that had been fed the thymus gland extract.

Whether the gland manufactures this chemical, as the pancreas does insulin, or whether it merely is a storehouse for the chemical, Mr. Steinberg did not state. That and possible practical applications of the latest discovery must await further research.

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