stances listed, the full therapeutic doses expressed in micromols are of similar magnitude. The agreement is better than that obtained if animal lethal potencies are compared. In these four glycosides the hydroxyl

TABLE I

Glycoside	Molecular weight	Intravenous digitalizing dose for man		Cat lethal micromols*	Configuration C_3	Sugar
		mg	micromols‡			
Ouabain	584	1.0[2]	1.7	0.21	α–OH	Rhamnose
Digitoxin	764	1.2[3]	1.6	0.43	α–OH	Digitoxose
Lanatoside C	984	1.5[4]	1.5	0.22	α–OH	Digitoxose
Digoxin	780	1.0[5]	1.3	0.28	α–OH	Digitoxose
		1.5[6]	1.9			
Thevetin	858	4.2[7]	4.9	1.06	β–OH	Digitalose?
Scillaren A and B	692	0.5[8]	0.7	0.22	no–OH?	Rhamnose
		0.7	1.0			

* The correction for water of crystallization has been neglected in these calculations. The value is unknown for the materials used by the several investigators. If the proper correction could be applied the molar dosages would be smaller, the largest correction probably being for ouabain.

at C_3 in the nucleus has the α configuration. Fieser[9] has pointed out certain correlations between physiological activity measured by toxicity and the configuration at the C_3 position.

In the case of thevetin the human intravenous dose in question is about three times as great as in the first four on a molar basis. In this glycoside the hydroxyl at C_3 has the β position.

On the basis of one report on the use of a mixture of Scillarens A and B a somewhat lower effective dose is indicated. The structures of Scillarens A and B have not been satisfactorily investigated, but absence of the hydroxyl at C_3 has been reported.

The comparable full therapeutic doses for the glycosides ouabain, digitoxin, lanatoside C and thevetin are satisfactorily established. In the cases of the other glycosides less extensive studies have been made. Moreover, it must be pointed out that the criterion of effectiveness in studies on rapid digitalization in auricular fibrillation is an arbitrary one, namely, a reduction in pulse rate, usually to 80 per minute or below, within a specified time. Although it has frequently been so assumed, there is no satisfactory proof that this initial slowing of the pulse is due entirely or majorly to an effect upon the heart directly. In fact, since it is largely abolished by atropin, the early slowing is probably not due to a primary action on the heart, but rather to one upon the nervous cardioregulatory mechanism. Cushny[10] showed that the early rate changes in digitalization in auricular fibrillation are mediated by vagal influences.

It is by no means certain that the approximate identity of molar doses for full digitalization in fibrillation reported for the first four glycosides in Table I would be found if other criteria were employed. The lack of corresponding agreement in cat lethal doses points to such differences in regard to certain actions at least.

It may be noted that there is no apparent correlation between the nature of the sugar in the glycoside and the physiological action in question.

Attention is being called to the remarkable coincidence of human intravenous doses of several pure glycosides for a particular effect, not so much because it is believed that the configurational peculiarity referred to is more important than others may be found to be, particularly if other criteria of effectiveness are studied, but rather to emphasize the possibility and desirability of further studies in the direction of correlation of action with structure.

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A NOTE ON SZENT-GYORGYI'S "TOWARD A NEW BIOCHEMISTRY"

IN his recent paper[1] Professor Szent-Györgyi advances the hypothesis that a quantum of energy, made available at one point in a living system by chemical action or absorption of light, for example, may be transmitted to a relatively distant point of the system without degradation or dispersion, there to cause some highly localized reaction, such as photosynthesis or the splitting of a protein. The examples cited by Professor Szent-Györgyi prove, of themselves, that this brilliant hypothesis must be considered in any future biochemical or biophysical speculation.

Professor Szent-Györgyi postulates, in his paper, that the mechanism whereby this energy is transmitted is that which has proved effective in fluorescent crystals of ZnS and other substances, the excitation of an electron to an unfilled extended state "belonging" to the entire structure rather than to one or two atoms. To the present writers, this second postulate would appear to limit seriously the generality of the original

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3 H. Gold, N. Kwit and McK. Cattell, *Jour. Pharmacol. and Therap.*, 69: 177, 1940.
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8 L. Zwillinger, Wien, *Arch. f. inn. Med.*, 31: 201, 1937.
9 L. F. Fieser, "The Chemistry of Natural Products Related to Phenanthrene," Reinhold, New York, 1937.
10 A. Cushny, "The Action and Uses of Digitalis and Its Allies," Longmans, Green and Co., London, 1925.
1 SCIENCE, 93: 609, 1941.

hypothesis, without bringing any compensatory advantages. As a matter of fact, the whole chemical and physical behavior of proteins and other biochemical substances would suggest a Van der Waals' binding, which does not have extended electron states, rather than the electron band binding typical of salt or the diamond. There are other mechanisms already well known to which appeal may be made.

It is well known that neutral or excited atoms, molecules or free radicals may be adsorbed on solid or liquid surfaces as a mobile two-dimensional gas. Such excited mobile entities constitute a second possible mechanism for the effects which Professor Szent-Györgyi discusses. Others are known, and it would be a daring biologist who would suggest that there are no more undiscovered mechanisms.

To summarize, this note suggests that Professor Szent-Györgyi's hypothesis may be of greater use to biology if it is left in its simplest and most general form, "There exists *a* mechanism which permits the energy of absorbed light or chemical reaction provided in one portion of a living system to be available, without degradation or dispersion, for chemical reactions in relatively distant portions of the system," without tying to any particular mechanism or even to any known mechanism, until much more information is available.

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ONE SOURCE OF CLAY BALLS

THE Smoky Hill River has a variable flow like all the streams of Western Kansas. Commonly it occupies only part of its channel. During high water and its recession much mud is plastered on the banks and bars. During the succeeding low-water stages mud cracks develop in this layer, often penetrating to considerable depth. As the mud dries further the layers become separated. The oblong, flattened chunks of dried mud which result from the cracking and separation of layers are later washed or otherwise tumbled into the stream.

The mud, having been water-laid in that fashion, is of finely divided clay particles, giving a uniform clay which is quite plastic when wet. I have molded bits of this mud and fired them. The chunks which fall into the stream cohere during transport and are rounded by rolling along the stream bed. Some of them are shunted out of the current and come to rest among the pebbles and sand on the shoals and bars, where they may be further rolled, accumulating an armor of sand and pebbles, or they may be buried among the other sediments in the stream bed.

All stages of this process have been observed. My interest was first aroused by finding some isolated clay masses in the sand on the bank of the stream south of Gorham, Kansas. Knowing that the available clays along the course of the stream west of this point are quite limy, I looked for a source of more plastic clay such as in these masses. The stages of development were found just east of Highway U. S. 183 near Schoenchen, Kansas.

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A FLORIDA WHITE BLACKBERRY

THE author recently discovered a large wild colony of a white-fruited blackberry near Gainesville, Florida, and has named it *Rubus cuneifolius* Pursh, forma *albifructus*. The plants closely resemble those of the species and the fruits differ chiefly in lacking the black color. Experiments will be undertaken to determine the origin of this form and to improve it, if possible, for local use. The white blackberries at present offered for sale are not suited to the Florida climate.

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AN ANALYSIS OF THE MAJOR INTERESTS OF THE MEMBERS OF THE BOTANICAL SOCIETY OF AMERICA

THE recently published Year Book (1940–41) of the Botanical Society of America[1] includes a list of members with their addresses and major fields of interest. A study was made of the latter to determine the distribution of interests among the various botanical subsciences. Table 1 presents the results of this analysis. It will be noted that approximately one half of the total "interests," *i.e.*, 948, lie in the morphological sciences. The low percentages of women interested in the fields of plant pathology (6 per cent.), plant geography (3 per cent.), economic botany (6 per cent.) and phylogeny (0 per cent.) are noteworthy.

It should be emphasized that the figures in the table do not indicate numbers of individuals in the various divisions of plant science, for many of the botanists listed in the Year Book have given several fields of interest. Therefore, this table is a summary of *interests*, not *individuals*. Accordingly, the fact that the total number of "interests" listed in the table is 1,829, whereas there are but 1,365 members in the society, should occasion no surprise. It should also be pointed out that this table gives but a partial picture of the "interests" of American botanists, for many plant scientists are not members of this society but may be affiliated with various special organizations, such as

[1] Miscellaneous Series, Publication 124, January, 1941, Office of the Secretary, New Haven, Conn.