to the number of sites in the control rats from the short-term reserpine experiment is a function of age. We have previously demonstrated that [^{3}H]haloperidol binding significantly decreases with age (*18*), and the lesioned rats in the present experiments were 2 to 7 months older than the rats used in the reserpine experiment. In the rats with unsuccessful lesions (such rats may be considered equivalent to sham-injected rats of the same age), binding in their control striata ($B_{\max} = 18.7 \pm 2.3$ pmole per gram of tissue, $N = 10$) was comparable to that in the unlesioned striata of the behaviorally supersensitive rats. This indicates that rotation is associated with an increase in [^{3}H]haloperidol binding on the lesioned side rather than a decrease in binding on the control side.

The major finding of this study is that [^{3}H]haloperidol binding sites increase in rats with lesions of the nigrostriatal dopamine pathway. This increased number of dopamine receptors could account for the behavioral supersensitivity to dopamine agonists which results from the lesion. The increased sensitivity to apomorphine in rats with bilateral lesions of the nigrostriatal pathway (in which the same behavioral response can be measured before and after the lesions are made) is many times greater than the 20 to 120 percent increase in binding seen here (*1*). This indicates that other components in the overall system determining the behavioral response may also be changed by the lesion and thus produce additive effects. However, measurements of striatal dopamine-sensitive adenylate cyclase after nigrostriatal lesions have been made have proved equivocal (*6, 7*). In studies of butyrophenone neuroleptic drugs we have also observed a similar poor correlation between their influences on dopamine receptor binding and on the cyclase (*11*). Recently, Kelly and Moore (*19*) have demonstrated that although effects of 6-hydroxydopamine in the caudate nucleus determine the direction of rotation and the sensitivity to apomorphine, the nucleus accumbens is also involved in determining the rate of rotation. Since lesions induced by 6-hydroxydopamine in the region of the substantia nigra probably destroy the dopamine innervation in the nucleus accumbens because they also destroy the neighboring A10 cell bodies, the apparent greater behavioral supersensitivity as compared to augmented receptor binding may result from enhanced receptor activity in the nucleus accumbens as well as the caudate.

Behavioral supersensitivity to apomorphine also occurs in rats subjected to long-term treatment with neuroleptic drugs, and such rats provide a model for tardive dyskinesia, the increased bizarre motor activity that occurs in patients treated for long periods with neuroleptics (*17*). The behavioral supersensitivity to apomorphine in such rats is also associated with enhanced [^{3}H]haloperidol binding to dopamine receptors, resulting from an increased number of binding sites with no change in K_d value (*16*).

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Electrochemical Concentration Cells

I would like to add a few thoughts on the extraction of energy from seawater by means of electrochemical concentration cells (*1*). A few simple analyses will illustrate the critical role of membrane resistance in any practical system for the extraction of energy from seawater based on the use of concentration cells.

In the analysis by Clampitt and Kiviat, R_i, the internal cell resistance, is taken to be the resistance of the low-concentration (freshwater) side of the membrane. However, if one considers a reasonable geometry comprising closely spaced parallel plates separated by intervening membranes and electrolyte compartments, the following relationship describes R_i:

$$R_i = (n/a)(r_m d_m + r_{C_A} d_{C_A} + r_{C_B} d_{C_B}) \qquad (1)$$

where n is the number of concentration cells in series (as in a voltaic pile); a is the area of the membrane (assuming electrode plates and membranes of equal areas); d_m is the membrane thickness; d_{C_A} and d_{C_B} are the electrode-to-membrane distances on each side of the membrane; and r_m, r_{C_A}, and r_{C_B} are the specific resistivities of the membrane and each solution.

The maximum theoretical power of a series of such "seacells" based on Na$^+$ transport is

$$P_{\max} = \frac{2an\left[\dfrac{t_{Na}RT}{F}\ \ln\left(\dfrac{C_A\gamma_A}{C_B\gamma_B}\right)\right]^2}{d_m r_m + 1000(H_A + H_B)}$$

where $H_A = d_{C_A}(\Lambda_\infty C_A - bC_A{}^{1.5})^{-1}$ and $H_B = d_{C_B}(\Lambda_\infty C_B - bC_B{}^{1.5})^{-1}$; in Eq. 2 t_{Na}

is the Na^+ transport number, F is the faradays of charge, R is the ideal gas constant, T is the absolute temperature, C_A and C_B are the concentrations of salt in each compartment, γ_A and γ_B are the respective mean molal ionic activity coefficients, Λ_∞ is the equivalent conductance at infinite dilution, and b is the Onsager slope constant. If the same handbook values for the P_{max} condition used by Clampitt and Kiviat are substituted in Eq. 2, we obtain

$$P_{max} = \frac{1.08 \times 10^{-3} an}{d_m r_m + 231\, d_{C_A} + 28.4\, d_{C_B}}$$

at 25°C.

Thus, in order to realize maximum theoretical power from a "seacell," the product of membrane specific resistivity and membrane thickness should approach zero. If we visualize a "pile" of plates and membranes 1 m on an edge, with intervening electrolyte compartments 0.01 cm wide, we can estimate the nature of the power dependence on r_m and gain an appreciation of the power-to-volume factor. If we generously concede that the state of the art will eventually permit membranes and plates 0.001 cm thick and electrolyte compartment concentrations maintained by countercurrent flow, the corresponding limiting P_{max} for $r_m = 0$ is 19 kw/m³. However, if r_m were on the order of 0.5 megohm-cm, the limiting P_{max} would be 98 watt/m³, just about enough to maintain a feeble incandescent lamp. It appears that the success or failure of efforts to develop a practical "seacell" depends on the availability of rugged and long-lived, low-impedance permselective membranes.

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Hexagonal (Wurtzite) Silicon

The existence of a hexagonal form of silicon with a wurtzite-type structure and with lattice parameters of $a = 3.80$ Å and $c = 6.28$ Å was established in 1963 (*1*). The pertinent data are given in (*1*) and also in various collections of structural data, most notably *Crystal Data* (*2*) and the *Handbook of Lattice Spacings and Structures of Metals* (*3*).

A new claim for the identification of wurtzite silicon has now been made by Jennings and Richman (*4*), who report very different lattice parameters, namely, $a = 4.04$ Å and $c = 6.60$ Å. We believe this claim to be incorrect, and we wish to make clear that there is no ambiguity regarding the nature of wurtzite silicon.

For the established wurtzite structure (*1*) the interatomic distance d (2.35 Å) and the density (2.33 g/cm³, calculated and measured) are the same as for cubic silicon with the diamond structure. On the other hand, the cell proposed by Jennings and Richman would give untypical values of 2.48 Å for the silicon-silicon distance and 2.00 g/cm³ for the density, 14 percent less than the density of cubic silicon. No experimental density is given by Jennings and Richman.

The most significant weakness in the new claim, however, is that the proposed unit cell is not supported by the observed diffraction data. By any reasonable criterion there is a serious lack of correspondence between the calculated and observed patterns in table 1 of (*4*). It is quite unacceptable to consider 3.5 Å (calculated d_{100}) as agreeing with 3.79 Å (observed d_{100}). The occurrence of strong and medium intensities at d-spacings not compatible with the unit cell is equally serious, for example, the d-spacings of 2.88, 2.67, and 2.46 Å. These are the more serious deficiencies in the purported correspondence of the patterns. Curiously, the calculated intensities are not those for silicon. They are the calculated intensities for hexagonal diamond reported by Bundy and Kasper (*5*).

Table 1. Debye-Scherrer pattern for wurtzite silicon: $a = 3.80$ Å, $c = 6.28$ Å; space group, $P6_3/mmc$; atoms in $4(f) \pm (1/3, 2/3, z; 2/3, 1/3, 1/2 + z)$, where $z = 1/16$. Abbreviations: vs, very strong; ms, medium to strong; m, medium; and w, weak.

hkl	d_{calc} (Å)	d_{obs} (Å)	Intensity	
			I_{obs}	I_{calc}
100	3.29	3.30	m	10
002*	3.14	3.15	vs	6
101	2.91	2.92	m	6
102	2.27			3
110*	1.90	1.90	ms	8
103	1.77	1.77	m	8
200	1.65			1
112*	1.63	1.63	m	5
201	1.59			1
004	1.57			0
202	1.46			1
104	1.42			0
203	1.29	1.30	w	3
210*	1.24			1
211	1.22			1
114	1.21			0
105	1.17	1.17	w	2
212	1.16			3
204	1.14			0
300*	1.10			1
213	1.07	1.08	w	3

*Reflections coincident with or overlapping those of cubic silicon.

Jennings and Richman refer to the original report on wurtzite silicon (*1*) but state inaccurately that only a hexagonal phase with $a = 3.80$ Å and $c = 6.28$ Å, but presumably not the wurtzite structure, was observed. They emphasize that the diffraction pattern was not published. We admit the desirability of publishing the pattern but not for the reasons considered important by Jennings and Richman. A typical pattern obtained with CuKα radiation is given in Table 1. As mentioned in (*1*), patterns for specimens of dense silicon heat-treated in the range of 150° to 200°C showed varying amounts of the initial dense silicon and of cubic silicon in addition to the hexagonal wurtzite form. The specimen providing the pattern of Table 1 was heated to 200°C and maintained at that temperature for 30 minutes. Only one very faint line at 2.65 Å (probably the most intense line of dense silicon) is not included in Table 1. The indexing is quite satisfactory and the intensity agreement acceptable (some cubic silicon is probably present). This wurtzite pattern does not correspond at all to the observed pattern of Jennings and Richman. We conclude that their specimen might possibly contain wurtzite silicon as a minor constituent as well as some cubic silicon; it is difficult, however, to ascertain what the preponderant portion of the specimen may be and it is not clear that only one phase is involved, because several strong or medium lines remain unidentified.

For the record, we wish to correct the statement [included in (*4*)] that the specific volume of dense silicon is 1.9 percent less than that of the cubic diamond form of silicon. The appropriate figure is 9.4 percent.

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