it is. . . ." Seven of these nine patients gave no evidence of this phenomenon although eight had disorders involving the left temporal area.

Damage to one hemisphere of an adult has different effects on intelligence depending on the side of the lesion; the scores of patients with lesions in the left hemisphere are more reduced on the verbal subtests of the Wechsler-Bellevue scale than on the nonverbal tests (*2*). The purpose of the present study was to answer the question: Do these right-hemisphere speech (RHS) cases resemble cases with left-hemisphere epilepsy and postictal dysphasia, or cases with right-hemisphere epilepsy and no postictal dysphasia?

Of 66 patients given the amytal test, 45 were classified as having their speech mechanism localized in the left hemisphere; for nine cases the test was deemed indeterminate, and 12 cases were found to have speech impaired from the injection on the right (*3*). Three of the latter were excluded from this study for these reasons: there was no localization of the epileptic disorder in one case; one case had already undergone a temporal lobe resection of limited therapeutic success; the other had an epileptic focus in the right hemisphere and had postictal dysphasia. The remaining group of nine RHS cases contained six males and three females. The averages (and standard deviations) of their ages and IQ's were 31.2 (9.6) years and 87.5 (17.5), respectively. All but two males wrote with the left hand.

Two comparison groups of right-handed patients with unilateral epilepsy were selected from a file of several hundred cases that had been tested with form I of the Wechsler-Bellevue intelligence scale; the selection was made so that the sex distribution, average age, and IQ would be the same as in the RHS group. The average age and IQ (and standard deviations) of the nine cases with right-hemisphere epilepsy were 30.8 (9.0) years and 87.8 (14.8), of the nine cases with left-hemisphere epilepsy, 30.8 (10.9) years and 87.2 (11.8). All these cases with left-hemisphere epilepsy had postictal dysphasia (one case provided doubtful evidence, but both the amytal test and the EEG were clear); none of the cases with right-hemisphere epilepsy did.

The epileptic disorder was not unequivocally restricted to one hemisphere in all 27 cases according to the EEG; however the final neurological diagnoses were such that unilateral surgery could be attempted or advised in 20 cases, and in the other seven there was no doubt about the side of the disorder.

Table 1 shows the average weighted scores for each of the three groups of patients on each of the eleven subtests of the intelligence test. On the vocabulary subtest the score of the cases with right-hemisphere epilepsy is identical to that of the RHS cases with left-hemisphere epilepsy; both groups scored better than the group with ordinary left-hemisphere epilepsy. The vocabulary test often has the highest loading on the "verbal factor" in studies of this type of intelligence test (*4*). The three other tests with high factor loadings on verbal intelligence showed the same relationship (Information, Comprehension, and Similarities). The sum of the scores on these four subtests was compared with the sum on the other seven for each patient by dividing the latter sum by the former. The average value for the cases with right-hemisphere epilepsy was 1.49; the RHS cases averaged 1.47, and the cases with left-hemisphere epilepsy averaged 1.88. The difference between the averages of the last two groups was significant ($t = 2.89$, df $= 16$, $p < .02$).

The average age of onset of neurological disorders was lower in the RHS group (3.8 years) than in the group with left-hemisphere epilepsy (13 years) which may explain why the latter group still had their speech on the left. There was some right-sided muscle smallness in four of the RHS cases, but for seven of them the left hemispheres may have had the relatively circumscribed disorders suggested by the EEG.

The data indicate that when the right hemisphere is required to develop speech after the fashion of a normal left hemisphere, it also becomes more involved with the verbal factor in intelligence (*5*).

Table 1. Mean weighted scores for three types of patients on the Wechsler-Bellevue subtests. LHE and RHE indicate ordinary cases with left- and right-hemisphere epilepsy, respectively; RHS refers to cases with left hemisphere epilepsy but with right hemisphere speech.

Subtest	Mean weighted scores		
	LHE	RHS	RHE
Vocabulary	6.2	8.6	8.6
Information	6.8	8.0	9.0
Comprehension	7.3	8.4	8.8
Similarities	7.6	8.2	8.4
Picture Completion	6.8	7.4	6.8
Arithmetic	5.8	5.6	6.5
Picture Arrangement	7.7	7.1	6.4
Digit Span	8.3	7.1	8.2
Block Design	7.7	7.1	7.2
Object Assembly	9.4	8.6	7.8
Digit Symbol Substitution	6.7	5.4	6.1

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5. Acknowledgement is due Dr. E. Laskowski who performed the amytal tests and Dr. M. Baldwin, clinical director of the National Institute of Neurological Diseases and Blindness, who encouraged this psychological research on his patients.

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Surface Textures of Sand Grains: An Application of Electron Microscopy

Abstract. Crushed quartz was subjected to wind, ball mill, and shaking-table action to simulate eolian and beach conditions. Electron microphotographs of these surfaces were then compared with those of grain surfaces which had been frosted naturally, and the correspondence between them was good. Thus, the transportation history of many sand deposits may be identified by this technique.

During transportation, sedimentation and compaction, sand grains may be subjected to mechanical abrasion and/or chemical action (*1*), which produces microscopically irregular surfaces that appear to be frosted. This is one of the more characteristic surface textures of sand grains, but its precise causes and geologic significance are not fully understood. To the best of our knowledge, the submicroscopic surface textures of sand grains have not been examined systematically, although Biederman (*2*) has shown that solution pits in aqueous sand follow crystallographic form as opposed to the irregular collision pits

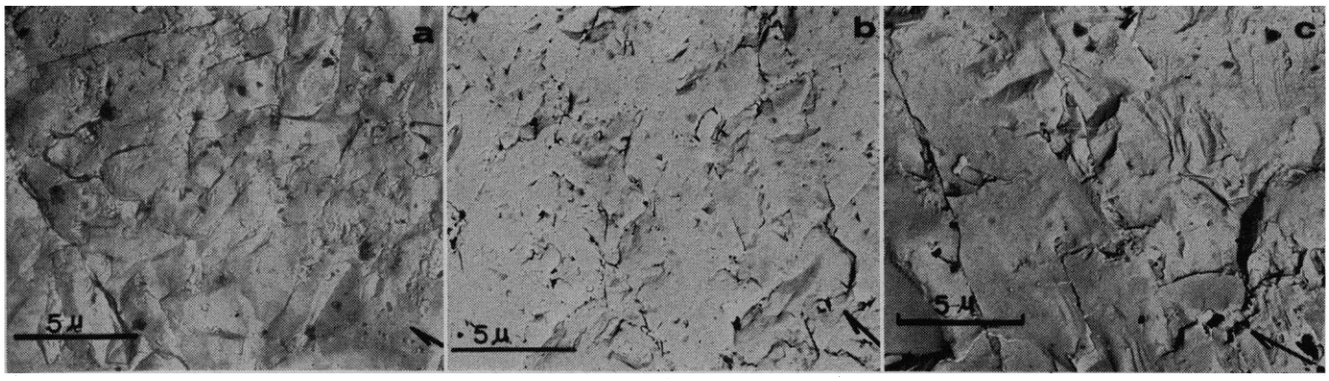

Fig. 1. Artificially frosted surfaces of sand grains (about × 2500). *a*, Surface abraded in a wind circuit device (left). *b*, Surface abraded in a shaking table (middle). *c*, Surface abraded in a ball mill (right).

of wind-abraded grains. The present report is concerned with mechanical effects on eolian and beach sand surfaces on a submicroscopic scale; work on chemical action, glaciation, and compaction is presently under way.

We employed an RCA E.M.U. 3-B electron microscope to study several hundred sand grain surfaces by a Fax-film (*3*) replication technique; the specimens were shadowed with platinum-palladium metal and strengthened with a carbon backing.

In a series of laboratory experiments, three devices were employed to produce artificially frosted surfaces. A wind circuit device (*4*) simulated mechanical abrasion under eolian conditions, and both a ball mill with sand, pebbles, and water and a shaking table with sand and water only simulated mechanical abrasion under beach conditions.

A single Brazilian quartz crystal was crushed and sieved to between 8 and 10 mesh for use in the ball mill, shaking table, and wind circuit device. Electron microphotographs were taken of these artificially prepared surfaces as well as of natural grains of known origin. Not only do sand grains in a single sample differ somewhat, but portions of a given sand grain surface differ in some detail, which of course is to be expected.

The specimens were shadowed at a 45° angle from one side; the shadows indicate whether an area is a topographic high or low. If a given area has an apparent dip greater than 45° away from the shadowing direction, then it appears light on the photographs. As the angle becomes greater, the area lightens, and thus black lines indicate sharp ridges. The arrows on the photographs point away from the shadowing source. Photographs of conchoidal quartz surfaces were essentially featureless, and therefore are not shown here. Figure 1*a* is the surface of a grain that has been artificially wind abraded, while Fig. 1*b* is a sand surface that was abraded in a shaking table with water. Figure 1*c* shows a grain that has been mechanically abraded in a ball mill

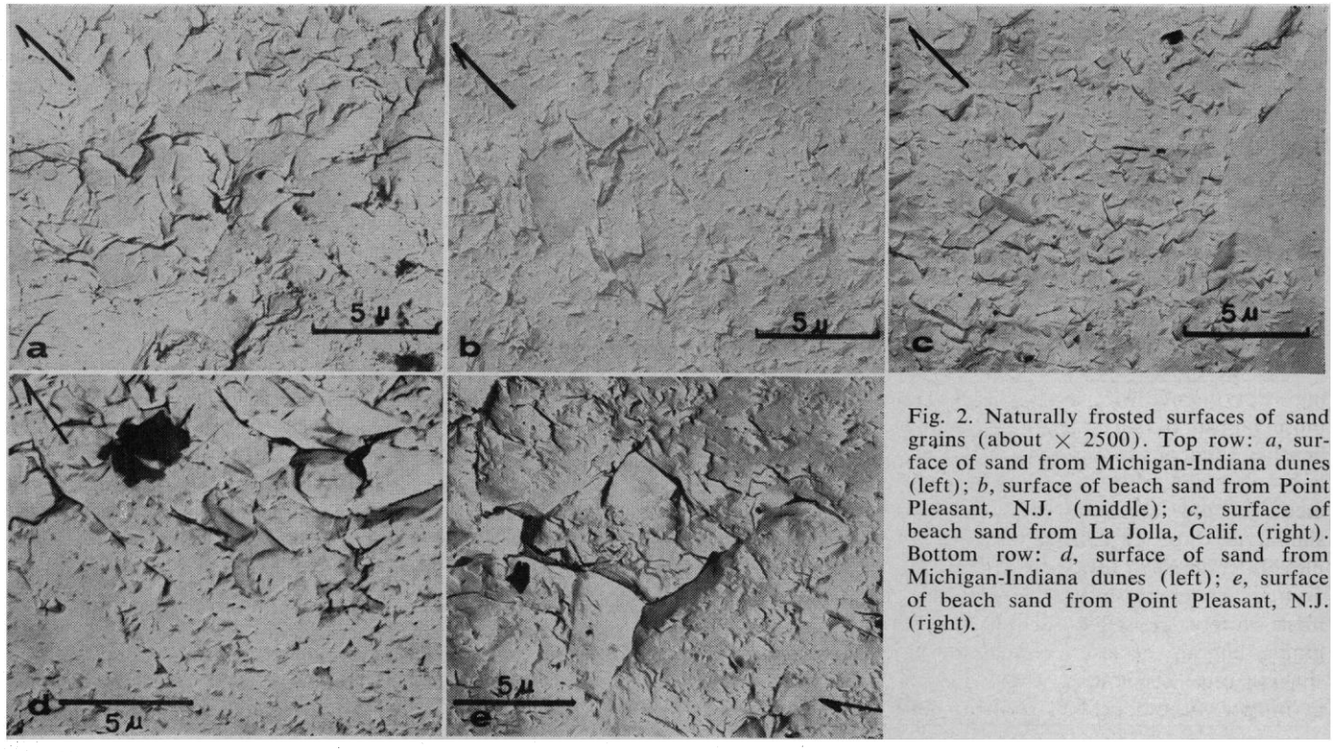

Fig. 2. Naturally frosted surfaces of sand grains (about × 2500). Top row: *a*, surface of sand from Michigan-Indiana dunes (left); *b*, surface of beach sand from Point Pleasant, N.J. (middle); *c*, surface of beach sand from La Jolla, Calif. (right). Bottom row: *d*, surface of sand from Michigan-Indiana dunes (left); *e*, surface of beach sand from Point Pleasant, N.J. (right).

with water and pebbles. The wind-abraded grain (Fig. 1*a*) is characterized by numerous curved surfaces whose intersections form meandering ridges. Figure 1*b* contains V-shaped patterns as well as irregular pitting. Characteristic features of sand grain surfaces processed in a ball mill are rather prominent conchoidal breakage patterns and blocky textures (Fig. 1*c*). All of these patterns are probably related to the impact velocity of impinging particles.

A sand grain surface from the Michigan-Indiana dunes along the shore of Lake Michigan is shown in Fig. 2*a*. This photograph strongly resembles the artificially wind-abraded sample, and it is characterized by numerous curved surfaces, but it should be noted that the texture of the dune sample is somewhat more rounded than that of the artificially produced wind surfaces. This could be attributed to the difference between the actual and experimental conditions; for example, only one grain size and one wind velocity were used in the artificial wind-abrasion experiments. Figure 2*b* is the surface of a sand grain from the beach at Point Pleasant, N.J., and Fig. 2*c* represents the grain surface of beach sand at La Jolla, Calif.; the similarity of their features and shaking-table textures is apparent.

Combined wind and beach action can be seen in Fig. 2*d*; this is another specimen from the Michigan-Indiana dune area. Curved surfaces, representing wind action, can be noted in the upper part of the photograph, while the lower portion shows typical V-shaped patterns characteristic of beach action. The dunes are located along Lake Michigan, and thus this sand might be expected to contain both beach and dune characteristics. A portion of another beach grain from Point Pleasant (Fig. 2*e*) resembles the barrel sand (Fig. 1*c*) and exhibits blocky texture and V-shaped patterns; however, the former is not often observed.

Kuenen (*5*) has suggested that rounding experiments with a ball mill are more typical of surf action on pebbly beaches than of stream action, and we have assumed that rounding experiments would create surface textures similar to those of natural beach samples. In contrast to his observations, the features on many natural beach specimens rarely resemble the ball mill grains, but are almost identical to the shaking table specimens. Thus, the experiments without pebbles seem to represent a closer approach to natural beach conditions. A ball mill may produce sand representing beach or river conditions where vigorous agitation with pebbles prevails, rather than ordinary beach action.

Therefore, it seems probable that the history of many sand deposits can be identified by electron microscopy and, further, that the use of these techniques might be applied to the study of sand deposits in the geologic record (*6*).

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Tranquilizing Drugs and Pregnancy Tests in Male Batrachia

Abstract. The reactions for the diagnosis of pregnancy by the use of urine from patients who are receiving tranquilizing drugs of the phenothiazine group have given false positive results when performed in the North American frog *Rana pipiens*. Such false positive reactions are not obtained when the South American toad *Bufo arenarum* is used.

Male batrachia have been used with great success for early diagnosis of pregnancy and for diagnosis and control of hydatidiform mole and chorionepithelioma (*1*). This method is more widely used than other biological tests because of the certainty of the results, the simplicity of the technique, and the low cost.

False positive reactions have been reported (*2*) when use is made of urine (but not the serum) from individuals who are receiving tranquilizing drugs. As far as can be determined from the literature, false positive reactions have been observed only in the North American frog *Rana pipiens*, with urine concentrated by the kaolin method.

In order to investigate the relationship between tranquilizing drugs and pregnancy tests with *Bufo arenarum*, the most common species of toad in the vicinity of Cali, Colombia, a study was made with urine from patients of the San Isidro Psychiatric Hospital. All of the patients studied were receiving daily doses of 150 to 800 mg of phenothiazine derivatives (promazine, chlorpromazine, trifluopromazine). No differentiation was made concerning the age or sex of the patients, the psychiatric diagnosis, or associated treatments.

Two series of tests were performed. In the first test, 10 ml of urine was injected directly, with no modification, into the lymphatic dorsal sac of a toad. In this manner 119 tests were performed with urine from 103 patients (54 women and 49 men). The test was repeated for some patients because of changes in the dosage of the drugs. There were no false positive reactions. Five pregnant patients gave positive reactions.

In order to determine if some substance used in the kaolin concentration method (kaolin, NaOH, HCl, phenolphthalein) could be, either alone or mixed with the urinary derivatives of phenothiazine, the cause of the false positive reactions reported with *R. pipiens*, a second series of experiments was carried out with urine concentrated by the kaolin absorption method. By this method 81 tests were made in 59 patients (34 women and 25 men). No false positive reactions were observed. Four pregnant patients gave positive results.

There was no mortality in toads injected with kaolin concentrated urine, but in those injected with unconcentrated urine, mortality was 7.1 percent.

The results suggest that when *Bufo arenarum* is used for pregnancy tests there are no false positive reactions with urine from patients who are receiving phenothiazine derivatives. False positive reactions reported by those who used *R. pipiens* indicate the possibility of some differential factor related to the species of batrachia. It is suggested that the incidence of false positive reactions in other species should be investigated.

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