prominent is a nearly north-south strike for the group of earthquakes extending northward from Memphis, Tennessee, through latitude 38.5°N (events 2, 3, 6–8, 10–12, 17, 23, 25, 27, 29–33, and 35 in Fig. 1). However, along this trend there is a change from high-angle normal faulting south of 36.3°N to high-angle thrust faulting to the north. Thus, while there is a continuous trend of earthquake epicenters from Memphis to south-central Illinois, a tensional stress system predominates in the southern portion and a compressive stress system in the north.

The second grouping of nodal plane strikes (events 1, 4, 5, 9, 13, 15, 16, 18, 19, 22, 26, 34, and 38 in Fig. 1) consists of the southeast Missouri east-west trend, including the event of 21 July 1967, which has an approximate northwest-southeast strike. This suggests that the present stress distribution of this region is either controlled or significantly modified by the Ozark Uplift. At the junction of the two trends, near New Madrid, Missouri (36.5°N, 89.5°W), the indicated focal mechanisms require the stress distribution to be rather complex.

Two earthquakes, those of 1 June 1969 and 4 January 1967, are located on the Ouachita Front, which is described by Oetking (*4*) as being a thrust feature. Our data, although too few for us to conclude that the Ouachita Front is a compressive feature, do not disagree with such an interpretation. The earthquake of 1 January 1969 has a focal mechanism corresponding to a high-angle thrust fault, whose strike is similar to that of the Ouachita Front. The mechanism of the event of 4 July 1967 indicates a nearly vertical strike-slip character. Such a mechanism could result from the superposition of the thrust fault, compressive stress system associated with the Ouachita Front and a perpendicular normal fault, tensional stress system as found at Memphis. This hints at the possibility of tensional-type faulting extending southward from Memphis to the Ouachita Front. However, the present distribution of seismograph stations is inadequate to determine whether earthquakes are occurring along such an extension.

The results presented in this report bear on two important problems: the state of stress in the interior of a continental lithospheric plate, and the relation of present-day earthquake activity in the central United States to geological features. Concerning the former problem, we find that on a localized scale the compressive stress distribution in the interior of a continental plate can be modified or significantly influenced by local features. In the central United States these features would include the Mississippi Embayment, the Ozark Uplift, and possibly the Ouachita Front (see Fig. 1). With regard to the latter problem, the focal mechanism solutions aid in identifying the active faults, and offer the potential of determining the extent of these fault systems. This information is essential for assessing the seismic risk at specific places, such as metropolitan areas and the sites of nuclear power plants, dams, and highway bridges.

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3. Focal mechanisms based only on *P*-wave data vary in quality, depending on the number of data points available. The well-determined events had approximately 35 *P*-phase polarities. All the earthquakes of Table 1 are in this category except for numbers 6, 7, 18, 20, 25, 29, 32, and 34 through 37, for which only about 15 points were available per earthquake.
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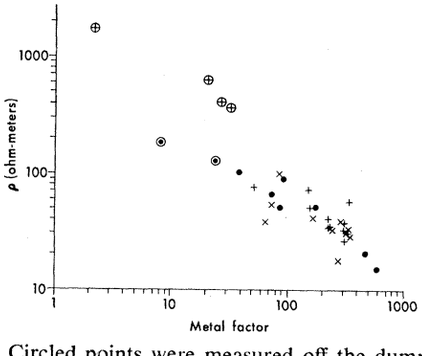
Induced Polarization: A Geophysical Method for Locating Cultural Metallic Refuse

Abstract. *The problem of delineating cultural refuse sites (dumps) arises in civil engineering studies. Induced polarization measurements have been successfully applied in several cases. Laboratory tests on synthetic samples indicate that the effect is due to the metal content of the dumps. The method may be applicable to archeological investigations.*

The induced polarization (IP) method of geophysical prospecting has been in use since about 1948 (*1*) and has been applied principally to the exploration of deposits of metallic minerals (*2*).

The IP method makes use of the observation that the electrical impedance of metallic minerals is a function of the frequency of the electrical current used in the measurement. The conductivity increases with the frequency (*3*). Measurements of the impedance function are made in either the frequency or the time domain (*4*).

In metallic mineral deposits, the conduction of electricity occurs along two kinds of paths. One is made up of connected pore spaces containing pore fluids (*5*). The other is similar to this but it also includes some proportion of metallic minerals along its "length." At each interface in the latter where a boundary occurs between a metallic mineral and the surrounding pore fluid,



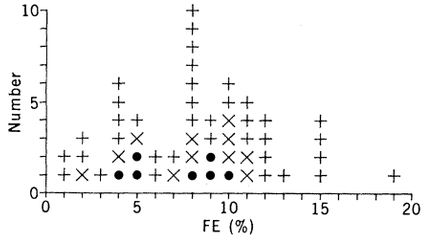


Fig. 1 (left). Resistivity plotted against metal factor measured at several sites. The location code is (●) Bedford (*8*), (×) Lexington (*9*), and (+) Acton (*10*). Circled points were measured off the dump site in an adjacent region. Fig. 2 (right). Histogram of frequency effect (*FE*) measured on landfill and dump sites. The average value is 8 percent. The location code is the same as in Fig. 1.

a polarization effect can occur (*6*). The sum of these effects over the entire deposit is the observed IP.

It has been brought to our attention (*7*) that there is a need for a method of delineating old dump sites, and we considered the possibility that such sites could be distinguished from their surroundings by the presence of an IP effect due to their disseminated metal content. Accordingly, we made IP surveys over a dump site (*8*) and two separate sanitary landfill sites (*9, 10*).

In all three cases, we observed a definite IP effect. Measured values of metal factor (*MF*) (*11*) were in the range of 50 to 1000. These are to be compared to values of 2 to 30 measured outside the dump site in an adjacent area. In addition, resistivity values correlate with metal factors (Fig. 1). Metal factors observed over mineral deposits range from 10 to over 10,000 (*12*). The histogram of frequency effect values shows a peak around 8 percent (Fig. 2).

Synthetic samples were prepared to study the IP effects in the laboratory. These samples consisted of a mixture of rusty "tin" cans and sand, and new aluminum cans and sand. These gave laboratory values of *MF* from 150 to 350. Frequency effects ranged from 4 to 13 percent. The laboratory value of *MF* for the saturated sand alone is 41 ± 41 with less than 1 percent frequency effect.

It appears that the IP technique may be useful in the investigation of dump sites, if one bears in mind the general problems of interpretation of potential data taken on a two-dimensional plane, that is, the earth surface (*13*). The technique should also be considered for certain archeological sites containing metallic items.

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7. R. Preble, private communication.
8. Bedford Town Dump, Bedford, Massachusetts, which was closed in 1969 after being used for more than 25 years as an open-face burning dump. The approximate cross section along the profile consists of 0.3 m of gravel covering about 2½ to 3½ m of dump material. A layer of peat lies beneath the dump material.
9. Hartwell Avenue Sanitary Landfill, Lexington, Massachusetts, which has been used for about 10 years. It has a total depth of about 6 m and consist of alternating layers of dump material and gravelly cover material; each layer is about 15 cm thick.
10. Acton Town Dump, Route 2, Acton, Massachusetts, which was in use between 1915 and 1969 as an open-face burning dump. It has been operated as a sanitary landfill site from January 1970 until present. The cross section consists of about 4½ to 6 m of dump material, overlain by about 0.3 m of gravel.
11. We define the metal factor as $MF = 10^5 FE/\rho_{1.0}$, where the frequency effect $FE = (\rho_{0.1} - \rho_{1.0})/\rho_{1.0}$, resistivities are in ohm-meters, and the subscript indicates the frequency in hertz. The traditional definition of metal factor is $MF = 2\pi \times 10^5 FE/\rho$ with ρ in ohm-feet, which is approximately a factor of 2 larger than our definition.
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Positive Control of Transformed Phenotype in Hybrids between SV40-Transformed and Normal Human Cells

Abstract. *Somatic cell hybrids have been obtained between SV40-transformed Lesch-Nyhan fibroblasts, which are deficient in hypoxanthine-guanine phosphoribosyltransferase (HGPRT) and display glucose-6-phosphate dehydrogenase A (G6PD-A) activity, and late-passage HGPRT-positive WI38 human embryo fibroblasts, which display G6PD-B activity. The human-human hybrid clones, which display G6PD-A and G6PD-B and heteropolymers of the two enzyme forms, have the same growth characteristic as the SV40-transformed parental cells and behave as continuous cell lines. The SV40 tumor antigen, the gene for which has been assigned to human chromosome 7, is present in all clones examined.*

The genome of SV40 virus is integrated in the cellular DNA in SV40-transformed cells (*1*), which express several SV40-induced antigens such as tumor (T) antigen, tumor-specific transplantation antigen, and U antigen (*2*). Croce *et al.* (*3*) showed that the SV40 genome and the SV40 T antigen gene are syntenic in SV40-transformed human cells. In addition, the SV40 T antigen gene and the SV40 genome have been assigned to human chromosome 7 in two different SV40-transformed human cell lines (*3*). From the results of Croce *et al.* it also appears that the integration of the SV40 genome in only one chromosome of the chromosome 7 pair is sufficient for expression of the SV40 antigen and for maintenance of the transformed phenotype (*3*). These observations led us to investigate hybrids between SV-40-transformed and normal human cells to determine if the properties of these hybrid cells resemble those of the SV40-transformed parental cells. For this purpose we hybridized SV40-transformed Lesch-Nyhan fibroblasts LN-SV (*3*), which are deficient in hypoxanthine-guanine phosphoribosyltransferase (HGPRT) and display glucose-6-phosphate dehydrogenase A

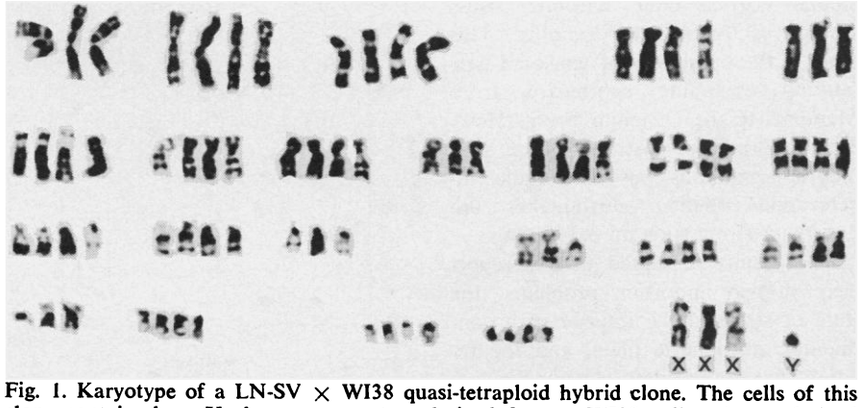

Fig. 1. Karyotype of a LN-SV × WI38 quasi-tetraploid hybrid clone. The cells of this clone contain three X chromosomes, two derived from a WI38 cell and one derived from an LN-SV cell.