related to these charge separations is cheap and easy using a high impedance voltmeter and two specialized electrodes, and forms the basis of the 'self potential' (SP) geophysical technique, which has been used since the 1920's for finding ore bodies and in groundwater and geothermal investigations. Interpreting SP anomalies can be challenging, since charge separation can arise in various ways. Depending on their origin they are described as mineral, diffusion, streaming or bioelectrical potentials. Mineral potentials generated by graphite and massive to disseminated ore bodies are electrochemical in nature, can be as high as 2V, are almost always negative, and are remarkably steady over time. (Geophysicists more familiar with other electrical methods sometimes assume that there are currents associated with mineral potentials, and this idea is perpetrated in recent text books—to the frustration and fury of those in the know.) Other SP potentials are associated with changes in lithology, movement of ions or groundwater, or (a particularly under-investigated field) the behaviour of plants. These potentials are more transient, on a range of timescales.

In a recent study, a well characterized area on the campus of Memorial University was repeatedly surveyed in order to determine which natural and anthropogenic features generated SP anomalies, and whether these anomalies were steady or transient. We found anomalies associated with a building, a buried metallic pipe, trees, and subtler ground variations. The locations of anomalies, both large and small, were remarkably unvarying over a period of days and weeks. The building always generated a significant negative anomaly similar in origin, we think, to mineral potentials, but the sign of other anomalies (including that associated with the pipe) and the magnitude of all anomalies varied with time. In a second area dominated by a shallow sewer pipe, SP data allowed modeling of the burial depth and charge distribution of the pipe. Our results show that SP can be a useful and reliable method for shallow ground surveys, but that the time varying nature of both sign and magnitude of small to moderate anomalies should be taken into account in data collection and interpretation.

Underground electrostatics

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Electrostatic charge separations in the subsurface are generated by natural, although sometimes mysterious, physical, and electrochemical processes. Measuring electric potentials

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