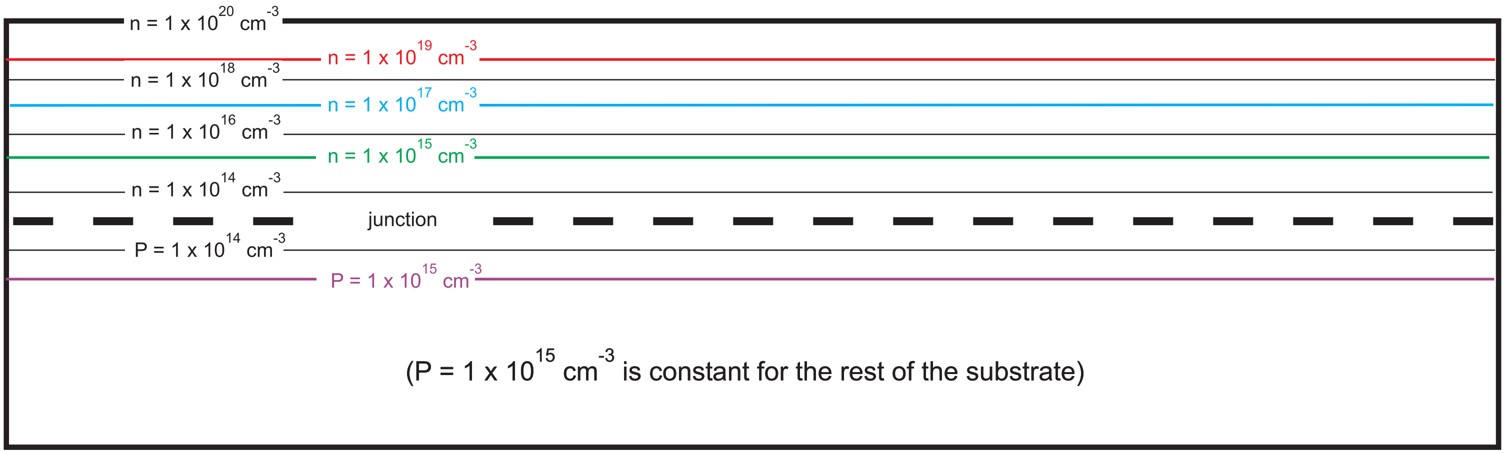
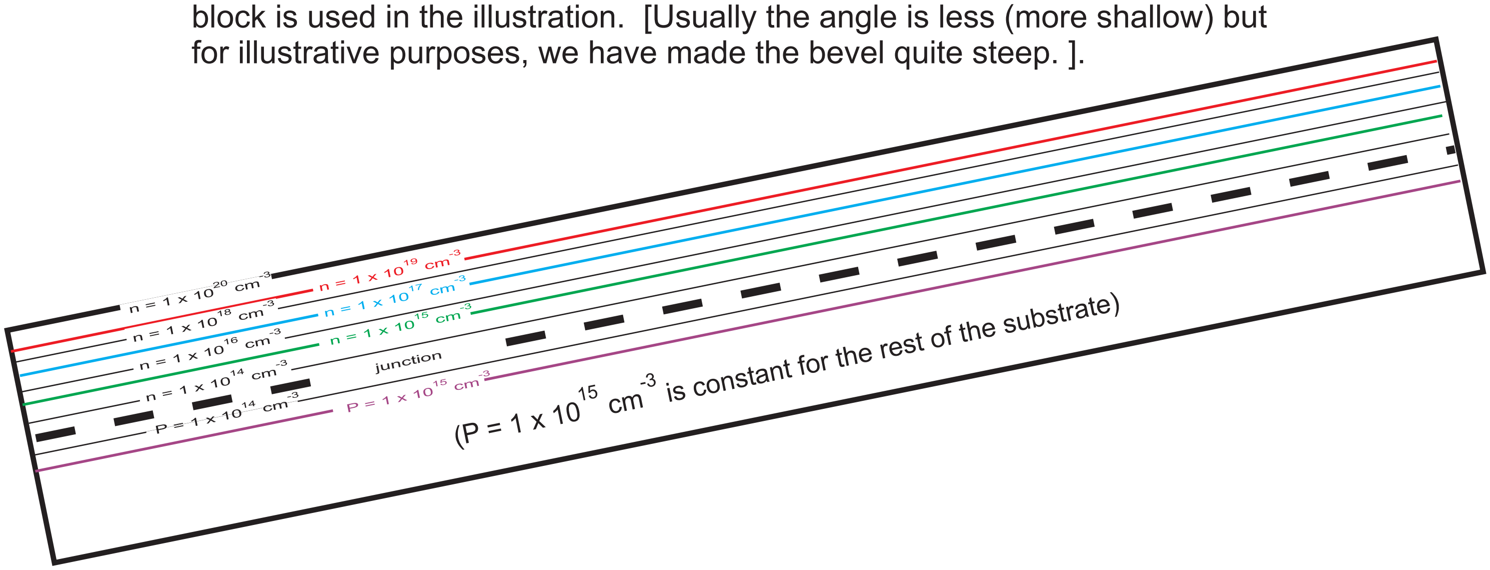
SURFACE ROUGHNESS interferes with one of the requirements of spreading resistance-depth profiling--that all points of equal concentration form a plane that is parallel to the original surface (that also must be a plane).

We will try to illustrate this with an example:

1) Here is a sample with a smooth surface having an n+ diffusion into a reasonably uniform substrate. (Odd number exponents have been color-coded.)

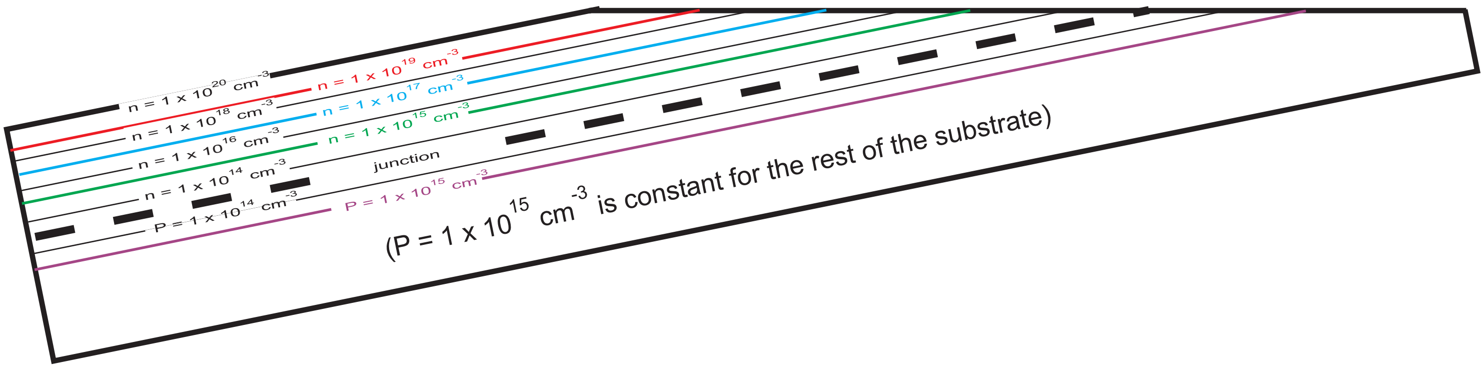


2) The sample is cut to a suitable size and mounted on a bevel block. (A 5:1 block is used in the illustration. [Usually the angle is less (more shallow) but for illustrative purposes, we have made the bevel quite steep.].

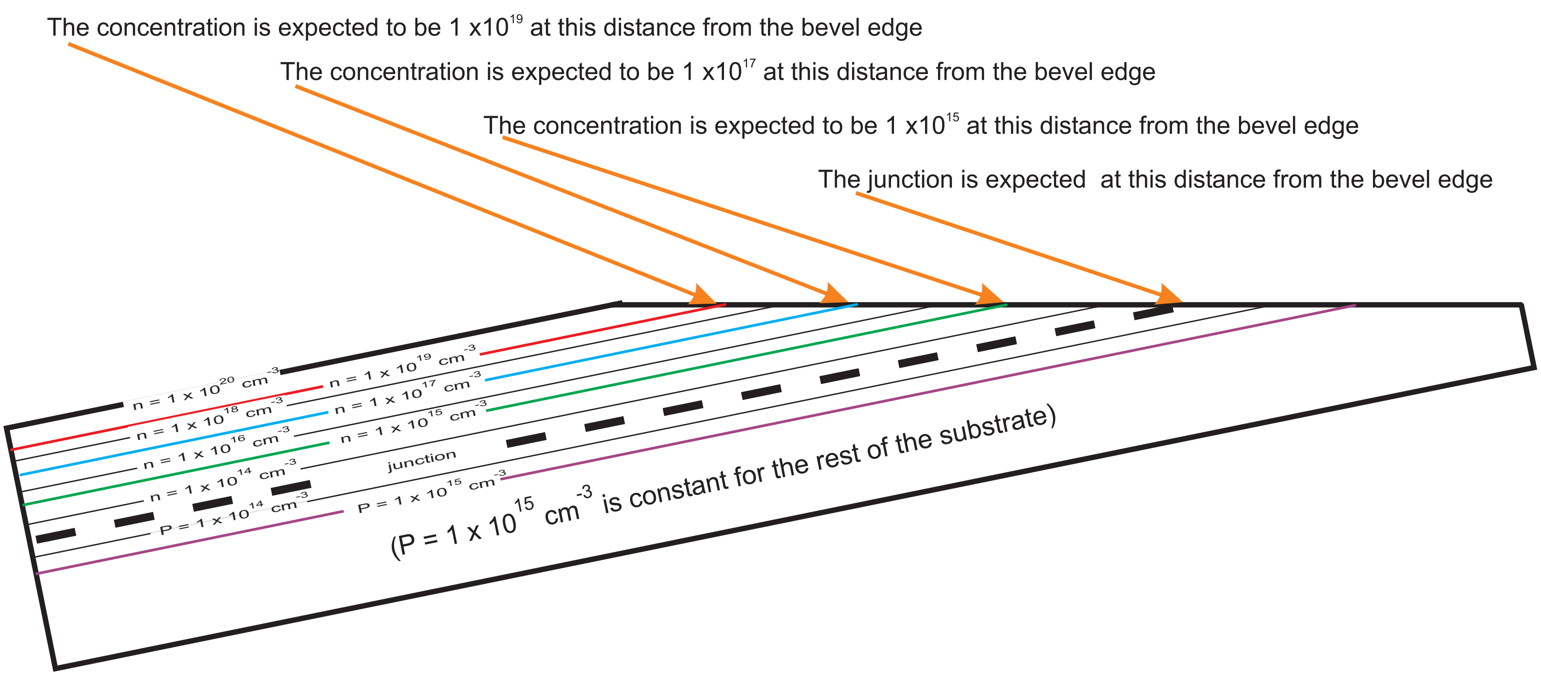


Roger Brennan, Solecon Labs, 08/09/2006

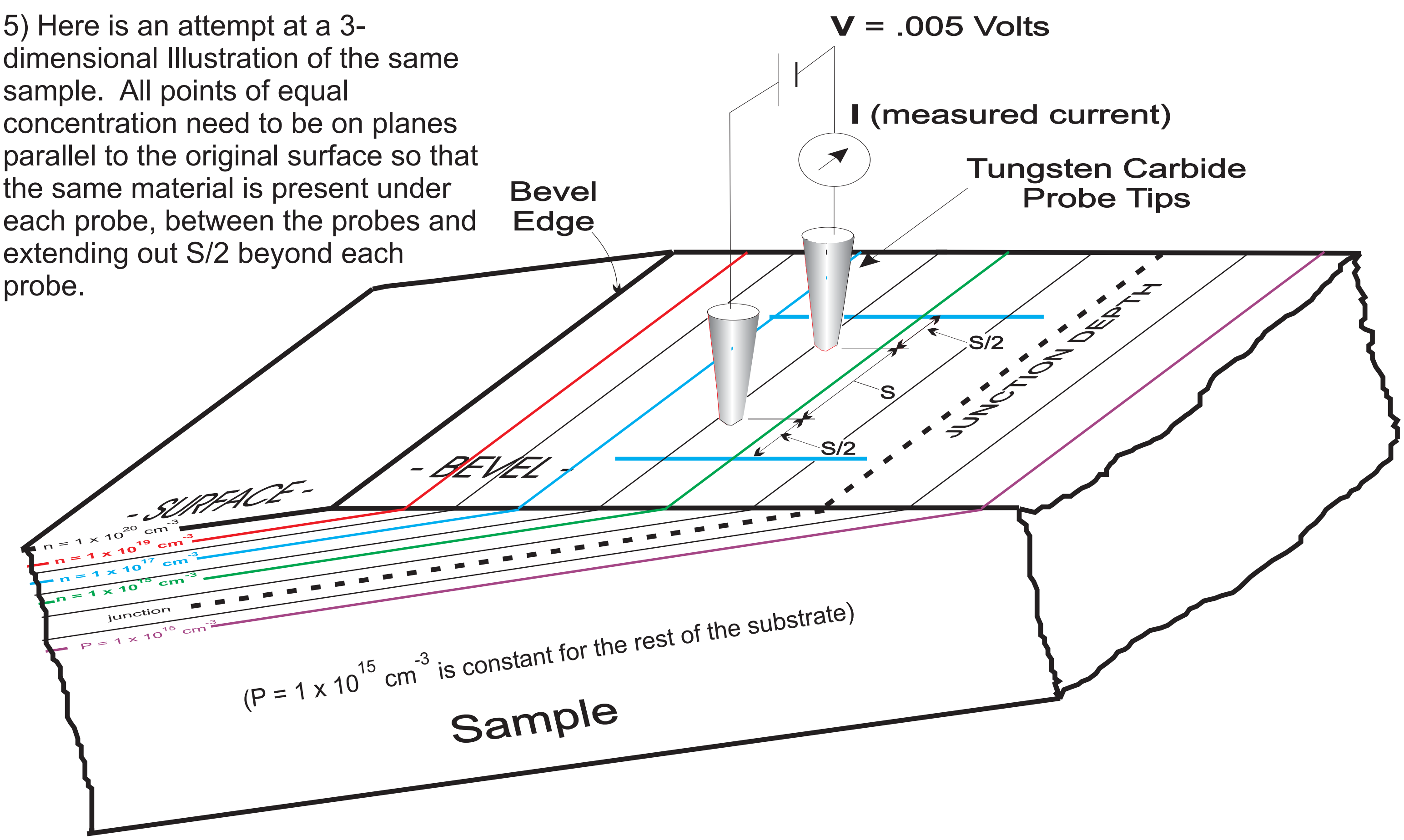
3) A horizontal plane (bevel) is produced on the sample.



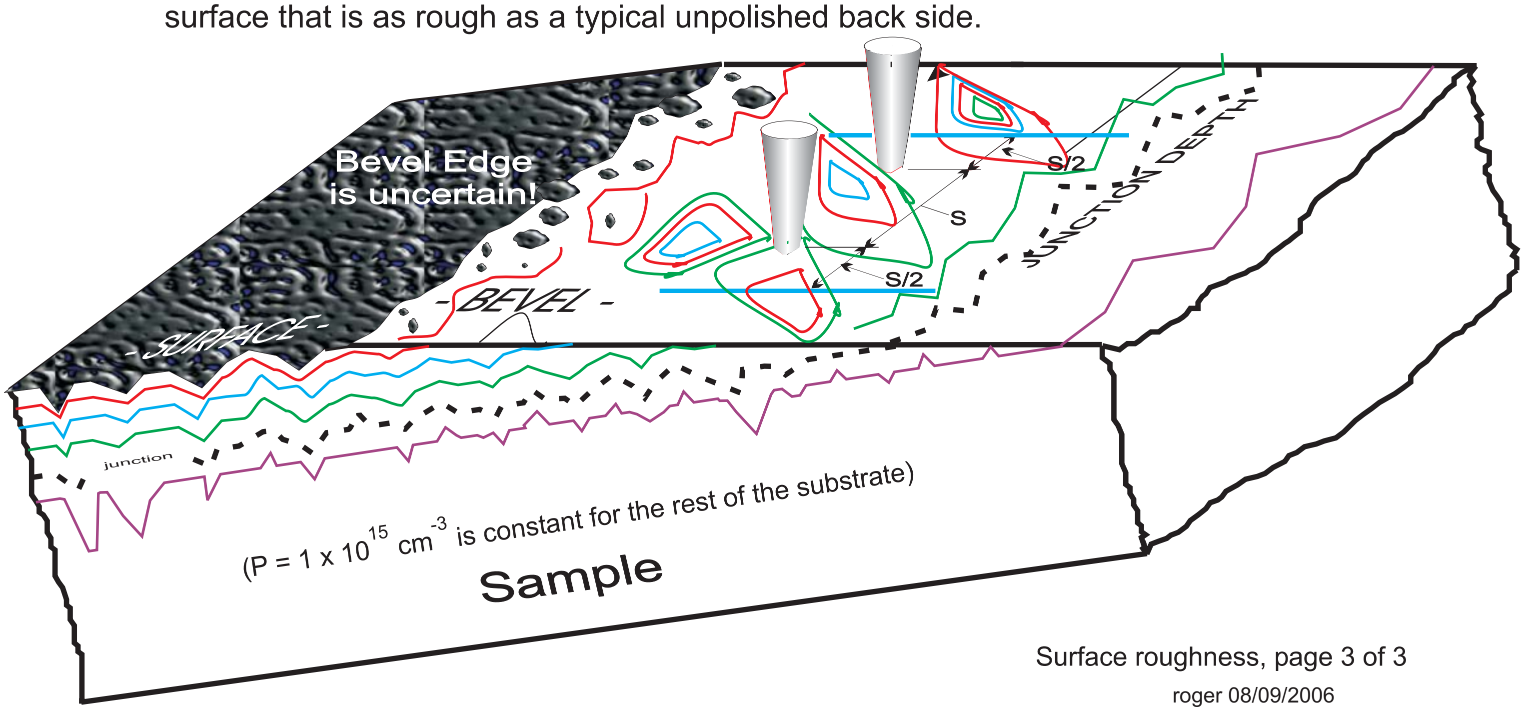
4) Some of the planes of equal concentration are labeled. All points of equal concentration need to form a plane (shown as straight lines in this edge drawing). This is needed because the same profile of material must be present under each probe, between the probes and extending out S/2 beyond each probe.



5) Here is an attempt at a 3-dimensional Illustration of the same sample. All points of equal concentration need to be on planes parallel to the original surface so that the same material is present under each probe, between the probes and extending out S/2 beyond each probe.



6) This is an illustration of what would be expected with a rough surface. The bevel edge is uncertain. The depth below the surface is uncertain. The material is not consistent under the probes, between the probes or in the S/2 length beyond the probes. Junction depth and sample volume correction are both flawed.
The Illustration was done quickly without the aid of a random number generator or computer solution to Fick's law (diffusion theory). Generally speaking, the deeper the diffusion compared to surface roughness, the less interference is encountered. When junctions are 10 or 20 microns deep, we see little interference-- even from a surface that is as rough as a typical unpolished back side.



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