# THE STATUS OF INTERPRETATION IN NATURAL RESOURCE INVENTORIES—PHOTO-MAGNETOMETER INTERPRETATION*

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AEROMAGNETIC maps are like contour maps with their readability or interpretation difficulties compounded a hundred times. As a matter of fact, they are much like a physical contour map with a completely unstable datum that changes constantly along any traverse. This means that, although the basic "contour interval" may be taken as unity, one cannot, because of the shifting standard, rely on the relative spacing between contours to give an idea of the "slope." Imagine two ore bodies of the same mass and magnetic properties and assume they can be moved around. And then assume an uncomplicated surface, like a table top, so that the true topography won't confuse the issue. If Ore Body No. 1 is placed on the table surface and Ore Body No. 2 beneath the surface, say 500 feet, we will see what happens to a magnetic map. After plotting the results of the airborne magnetometer flights, one finds that No. 1 gives a regular mountain for an anomaly—a sharp, high peak of perhaps 8,000 gamma intensity; steep sides (closely spaced "contours").

Ore Body No. 2, although with the same properties, registers a much different land form picture. When the magnetometer passed over this body, it cut through the outer fringes of its field so that there is a very subdued magnetic picture of this body. Comparing it with the first, it is found that this looks like a low rounded hill rather than a mountain—low elevation, perhaps 1,500 gammas high; widely spaced magnetic contours, indicating a gentle "slope," a gradual transition in rock.

All this can be portrayed as being a magnetic contour map in which the datum for each "hill" is different from that for any other. Worse than that, because of that variable position in the magnetic field, the map may as well have been printed on thin rubber sheeting, for the scale changes in unknown degrees. Additional distortions are introduced by such things as magnetic storms when the aurora polaris is active.

This is a realistic picture of the mag maps and their interpretation. Fortunately, when a well defined "mountain" appears on a mag map, it is easily identified. The steep, abrupt magnetic peak registering 8,500 gammas of elevation near Mormora in Ontario needed little interpretation; its size and shape are outstanding on this 25 cent map and, like a real mountain, easy to see. This was quickly noted by Bethlehem Steel Company and staked out to become one of the largest iron ore discoveries made by the magnetometer. But what about the buried mountains covered by water, glacial drift or alluvium? Are the isomagnetic lines only a few miles away from Mormora less significant because they outline a different shape and are not so closely spaced?

It is in this field of natural resources surveys that the greatest promise and accomplishment in progress is being made.

The dual interpretation of aerial photographs *and* aeromagnetic maps makes a vastly more important combination than the unassisted mag map or photograph. An example will show how modern magnetometer mapping confirmed a mineral clue developed by photo interpretation some time ago, and how a combination of a 25 cent magnetic map and a 50 cent photograph paid off. Because

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of airphoto evidence, it has long been suspected that some lakes in the Canadian Shield are related to mineralized zones. Out of hundreds of nearby lakes, one, two or a number of closely associated lakes may have an outline that is out of harmony with the surrounding lakes. These are generally accompanied by stress lines that radiate from the area giving rise to the concept of cones and intrusive and, of course, mineral replacements. When lakes occur at the loci of the stress lines, it leads to the conclusion that the rock was overstressed and weakened to an extent that it was readily excavated by erosion; its shape often ignores the major structural control and the direction of ice movement. The magnetometer, by showing invisible lines of force, ties these patterns together and confirms the fact that can't be seen in the photos—here are host rocks, even underwater; here is a locally intense high with a guaranteed magnetic replacement in a host rock.

Most mag maps do not show contours and obviously do not differentiate between many important structural and other features as do photographs—that substitute well enough in these cases for topography and also contain the essentials for rock identification. When one of these is laid upon the other, they complement each other and add up a grand total of unsuspected information.

There are several characteristics of the patterns formed by isomagnetic lines that are significant when coupled with airphoto interpretation. These are:

1. Shape.
2. Shape in relation to physical features of terrain.
3. Magnetic depressions within an anomaly.
4. Cross section at features, i.e., hills on hills.
5. Slope.
6. Slope in relation to relief and cover.
7. Peak or mesa features of "hill top."
8. Presence of "erosion contours" appears similar to contour maps of some dissected sedimentary rocks.

A final and most interesting development in this field is one designed to provide data that will give, in effect, three-dimensional magnetometer maps. Such data shows promise of being economically available in the future, and it will tend to eliminate the unstable datum, stabilize the accordian contours, and freeze the elusive magnetic scale.

# KEYS FOR INTERPRETING VEGETATION FROM AIR PHOTOGRAPHS*

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AS USED in photogrammetry the purpose of a key is recognization or identification of objects on photographs. This pre-supposed that the user of the key can identify the object itself if he is to be able to recognize it on a photograph. If an interpreter cannot identify a birch tree when he sees it before him, it is very difficult to understand how he can possibly recognize it on a photograph.

It is well to recall that when any object is identified, the mental operation is what logicians would call a judgment. For instance, it may be said that "*A*" is the same or identical with the concept of "*B*." In other words, a type is in mind. When an object is seen, and effort is made to match that type and that

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