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Vince Miglore is a researcher and technical writer with a keen interest in metal detecting. He's written for numerous magazines, including W&E treasures, and is former editor of a hobbyist newsletter.

"I bought a detector back in 1982, and in the first 5 minutes I found an Indian Head penny dated 1881 - right in my own front yard! Since then I've been hooked."

You'll be hooked too, when you see how great this sport is for your physical fitness, your appreciation of natural science, and most of all for the wealth of treasures you can find.

Author of *Metal Detecting for the Beginner* 2nd Edition, 2010 which can be found at Amazon.com

**Before You Buy a Metal Detector** by Vince Migliore

Here's what you need to know before you buy a metal detector.

You need to know what the technical terms mean. Once you understand how a detector works, you can move on to deciding which features are important to you. You can then weigh that against the cost and choose the right detector for your needs.

There are three interconnected concepts which explain how the detector works. These are:

- Phase shift
- Target identification, and
- Discrimination.

The easiest way to understand all three ideas at once is to look at the meter on an older detector. Here is the faceplate on an old White's *Coinmaster* detector (**Figure 1**).


Figure 1. Phase shift meter on an older detector, The White's *Coinmaster*

You can see that there's a dial for phase shift. Notice along the top there are the words *IRON*, *GOLD*, and *SILVER*. That is where different metals fall on what we call the **Phase Shift Scale**. This meter is simply measuring the phase shift of the object in the ground.

Let's zoom in a little (**Figure 2**). Now you can see the lower end of the Phase Shift Scale. Notice the *NICKEL* and *TABS* areas. On this detector, if you find a nickel, the dial moves to the nickel zone and you hear a beep in the headphones. When

you dig, you will most likely find a nickel. That's how **Target Identification** works. The dial points to a nickel; it identifies the coin in the ground.

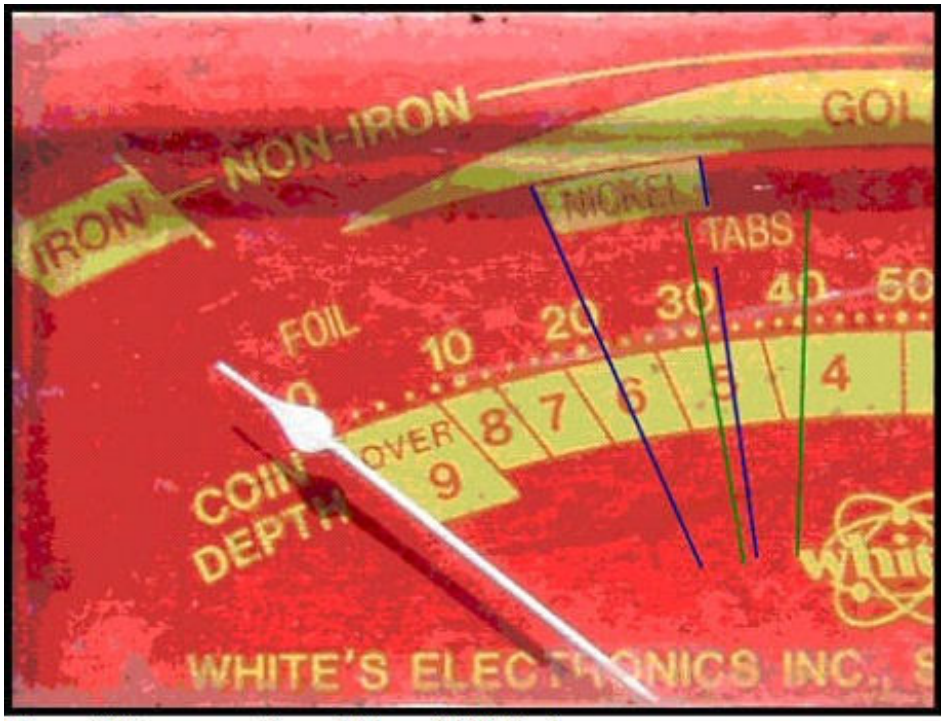

Figure 2. Lower portion of Phase Shift Scale.

Right next to nickel zone is the tabs zone. These are the metal pull-tabs that come off the tops of soda cans. You'll notice that the *TABS* zone overlaps slightly with the *NICKELS* zone. That's deceptive. In reality there is a LOT of overlap between nickels and pull taps. A good metal detector (which means expensive) will be able to tell the difference between a nickel and a pull-tab. That ability to distinguish between two objects is called **Discrimination**. A detector with good discrimination will be able to sort out coins or objects with similar phase shifts. It will be able to tell the difference between a copper penny and a dime for example.

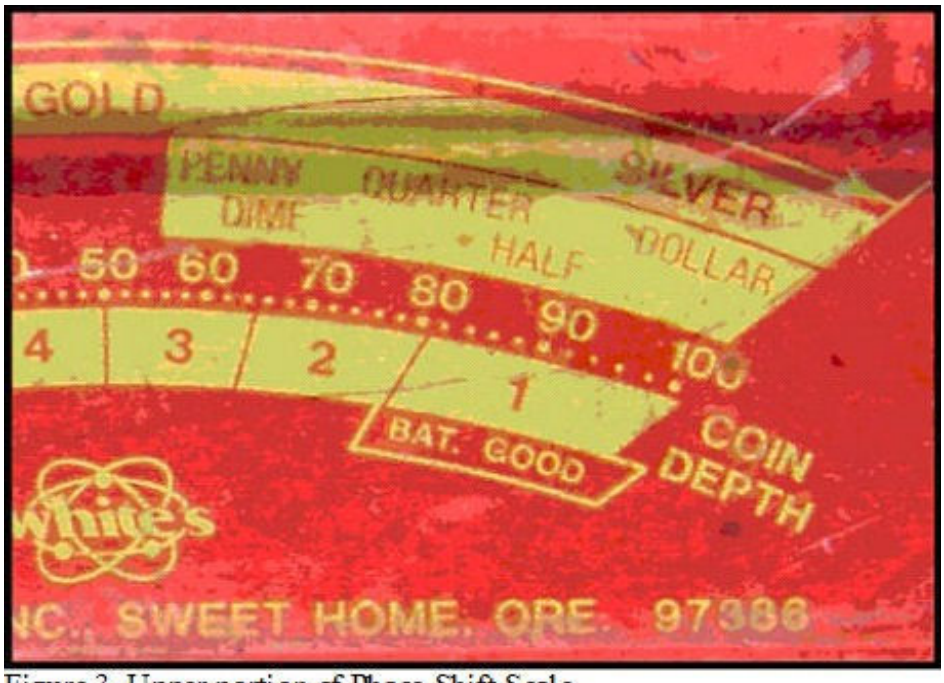

Figure 3. Upper portion of Phase Shift Scale.

Here is the high end of the Phase Shift Scale (**Figure 3**). Notice that most of the coins are at the upper end of the scale. You can see also that *PENNIES* and *DIMES* overlap, just like *NICKELS* and *TABS* do. An inexpensive detector might get the objects mixed up and tell you it's a penny when in actuality it's a dime, or vice-versa. A detector with excellent discrimination will be more accurate in identifying the correct coin. The same is true for its ability to discriminate between coins and other metal objects in the ground.

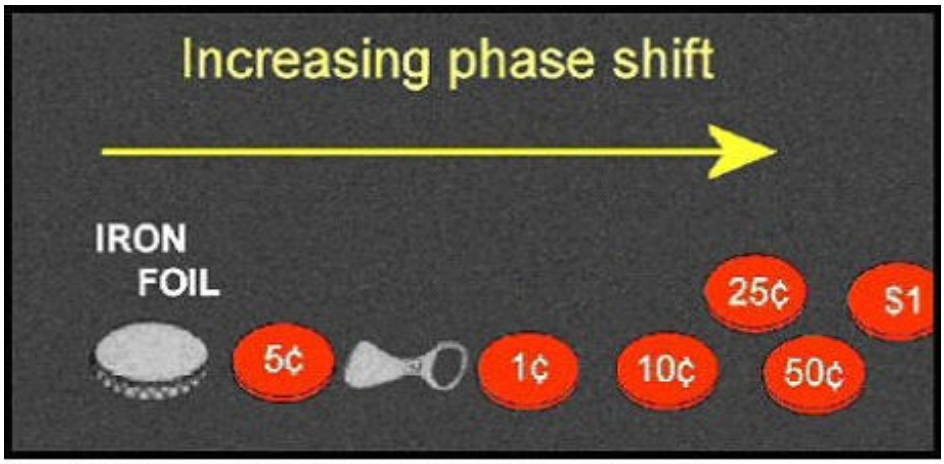

Figure 4. Phase Shift Scale on a modern metal detector.

So, let's see how these concepts work in some real-life examples. Here's what a phase shift scale might look like on a modern metal detector (**Figure 4**). It's similar to the scale in Figure 1. You might notice that pennies no longer overlap with dimes. That's because after 1981 the US Mint switched from copper pennies to copper-coated zinc pennies. The zinc pennies have less of a phase shift than copper pennies.

I'm going to show you three detectors with different methods of discrimination.

- Tesoro *Silver Umax*
- Garrett *Ace 250*
- Whites *MXT*

In general, detectors that have better discrimination abilities will cost more.

Figure 5. The Tesoro *Silver Umax* and the Garrett *Ace 250*.

The first example we'll look at is the *Silver Umax*, a detector that doesn't have a display (**Figure 5**, left). It uses sounds to distinguish targets. There are just four tones: the higher pitched tones represent more phase shift, and therefore are more likely to be coins as opposed to the lower frequency tones which represent junk or pull-tabs. With just four sound categories, you can imagine that each tone represents a very broad section of the phase shift spectrum. This means you don't have a high level of discrimination. You cannot tell a nickel from a pull-tab from the sound alone. You CAN, however, distinguish tabs from nickels by adjusting the Discrimination dial, and if the sound drops out as you adjust the dial past the 5-cents mark, then you can reasonably assume that the target was a nickel. In the same manner, you can tell if you have a dime or a quarter.

In other words, you have to fiddle with the Discrimination dial to get the most accurate target identification. If you rely on the sounds alone, you have a very low level of discrimination. The higher tones could be any of the coins at the upper end of the phase shift scale. The middle tones could be a nickel or a pull tap. The Discrimination dial, then, provides a more accurate indicator of what your detector is picking up.

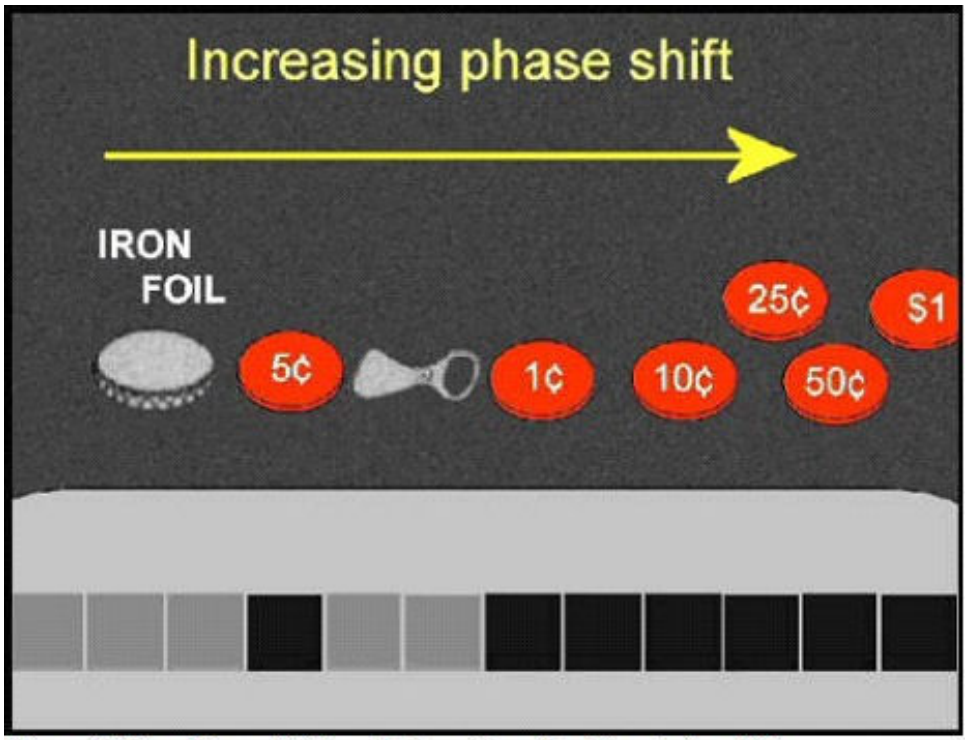

Figure 6. The Phase Shift scale based on the Garret *Ace 250*, with 12 categories of discrimination

Let's look at another detector with Phase Shift icons based on the faceplate of a modern detector, the Garret *Ace 250* (**Figure 5**, right). You'll notice there are 12 slots, or categories, at the bottom (**Figure 6**). The slots that are "turned on" are in black. This arrangement is called Coin Mode, because only slots with coins are turned on. As you can imagine, the 12 slots provide a lot more discrimination ability than just four tones. With the *Ace 250* you can turn any of the 12 slots on or off. This is called **Notch Filtering**. If you turn off slots 5 and 6, you will not hear a signal for most of the pull-tabs. Can you see how turning each slot on or off will provide a much greater degree of control over what you detect?

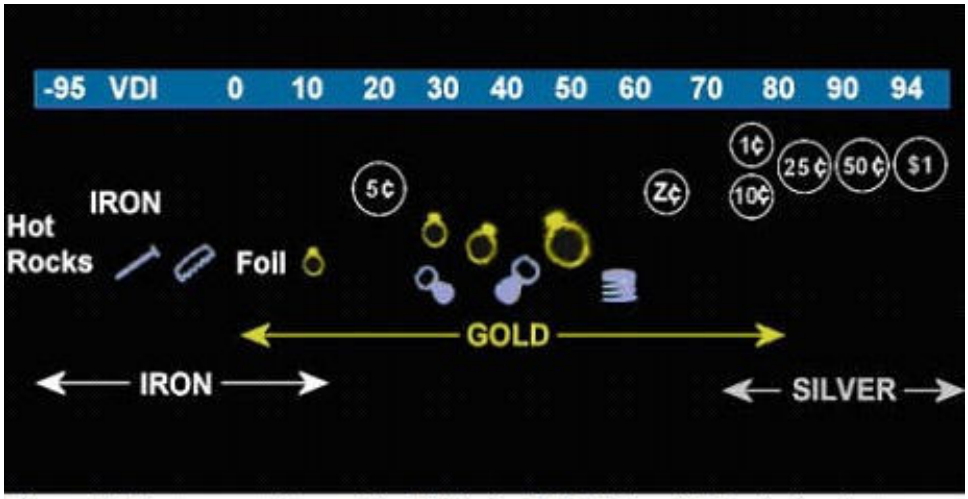

Figure 7. Representation of the White's *MXT* Visual Discrimination Indication (VDI) numbers, which range from -95 to +95.

Finally, let's look at one of the high-end detectors. Here is a representation of the faceplate for the White's *MXT* detector (**Figure 7**). Instead of just 12 categories, the MXT uses Visual Discrimination Identification (VDI) numbers to identify the target. This provides a vastly improved level of detail. Instead of categories you have numbers that range from -95 to +95. Moreover, coins generally have their own distinct VDI numbers. A zinc penny, for example, might have a VDI value of 67, a copper penny might be 77, and a dime might be 80 on the VDI scale. A nickel on this machine is 20, while pull-tabs range from 22 to 37.

As you can imagine, this level of resolution, or discrimination detail, goes a long way in identifying your target even before you dig it up. That saves a lot of time and results in more valuable finds. **Figure 8** shows a VDI number of +86, which indicates a quarter. After using the White's *MXT* detector for a while, you learn which VDI numbers correspond to coins and common objects.

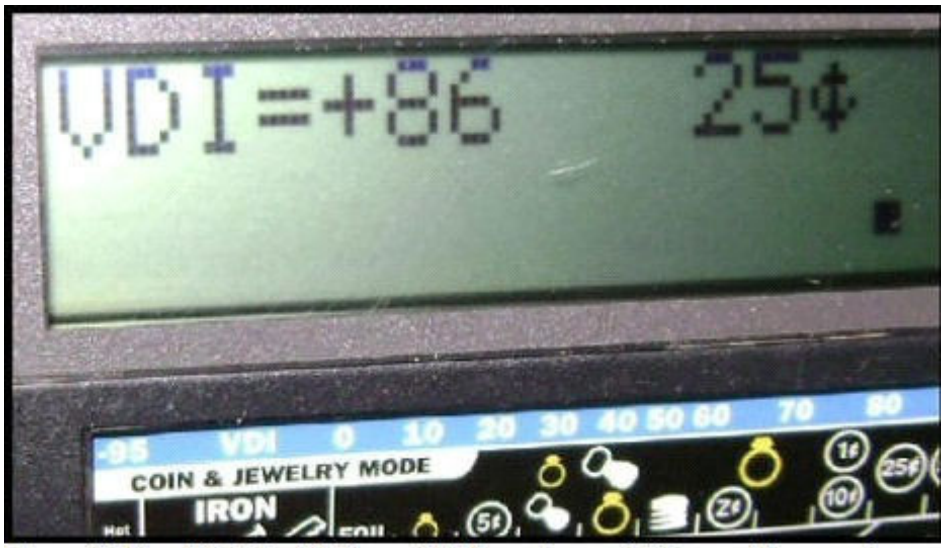

Figure 8. The White's *MXT* uses VDI numbers which provide a much greater level of detail than categories.

So, there you have it! You learned about the Phase Shift scale, Discrimination, Target ID, and the levels of discrimination you can expect on different detectors. Your next step is to review specific detectors and see how they handle discrimination. A good source for comparisons is: http://metaldetectorreviews.net/. You can then decide which features you need, and which machines will fit into your budget. Good Luck!

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Vince Migliore is author of *"Metal Detecting for the Beginner,"* available at most online bookstores.