Editorial on GPR and geophysical archaeology in 2026

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At the risk of sounding like an old-school geophysicist who is out of touch with modern ways, I am writing this editorial anyway, as there are a number of disturbing trends on my mind in this important field. When I started working with GPR in the late 1980s CDs had not been put into use for data storage, and most GPR systems were just becoming digital. We used Zip drives for data storage and 3 ½ inch floppy drives! As a result of these constraints, those few of us who were doing GPR were constrained in our ability to do any data processing that is now taken for granted. We therefore relied on an analysis of reflection profiles, which a few of us had digitized that allowed us to change axes and remove background, but that was about all we were capable of. Dean Goodman had just written the first GPR slice-mapping program, and he and I collaborated on the first book of GPR for archaeology, which was published in 1997. Dean was quick to understand the profit potential of this processing method, which allowed for very fast data analysis, and visual outputs that could be readily understood in ways that reflection profiles were not. He once told me that he considered himself a "GPR cosmetician" who made "ugly GPR" beautiful for the user. I guess the "busy nature of radar waves when displayed in reflection profiles were "ugly" to most? I never thought so! But the GPR community quickly moved toward this method of data analysis, as did I, as it allowed us to produce results quickly. I was like most at this time, looking for a more efficient way to analyze large datasets without having to do manual interpretation of profiles.

It was not until about 2001 that I began to realize that amplitude slice-mapping had become not just prevalent with GPR users, but almost the only data processing and analysis step that most people used. I remember conversations in the early 2000s where people had used various slicing techniques and determined "there is nothing here", if objects or other readily interpretable features were not visible in their results. I spent a little time on some of their "nothing here" results and realized that there was actually much there, but it could only be understood if one were to study the reflection profiles and then compare them to the slice-maps to determine what is in the ground. As I had been lured with the "siren song" of slice-maps. I untied myself from the mast of the ship (see the Odessey or read Homer to understand what I am talking about) and began to develop iterative methods integrating the two data visualizations most used with GPR. Slice-maps

and reflection profiles. This proved to be very effective, and I have written many books and articles on how to perform these methods. I stand by this data analysis method.

https://gpr-archaeology.com/books/

https://gpr-archaeology.com/downloads-of-recent-articles/

Since 2020 I have offered annual advanced GPR interpretative workshops and have had about 160 people from all over the world complete the rigorous 3 months of data processing and interpretation with me. In these meetings we all spend a great deal of time processing data in many ways. Most importantly we do not follow the software instructions for how to proceed, but develop our own workflow based on the site, the ground, our data and our goals. This goes against the way most people are taught GPR these days.

https://gpr-archaeology.com/gpr_workshop/

I am pleased to be peripherally part of a group of 48 recent graduates of the workshop who have met periodically for the last two years to share data and jointly processing and interpret results. While I am no longer "in charge" of that group (if I ever really was!), I have followed along with where they are going as a group. What is interesting to me is that they are now studying how new software will help them with their GPR projects. This is a new trend in GPR. Dean Goodman sold his software to Screening Eagle, based in Switzerland and my friends at GSSI are now teaming up with Geolitix to offer new software for GPR. Both allow for analysis on one's own computer but push users to use their "cloud based" software for robust interpretation.

https://www.geolitix.com/

https://www.screeningeagle.com/

This is an interesting trend, as both new software systems push the ease of use and rapid ability of their software to produce results. Having had some experience with these programs used by a few of last year's workshop participants I am less than sold on this idea. They may be quick, and they may be easy, but their results still rely almost wholly on slice-mapping. Both have the ability to produce reflection profiles, but these tasks are "clunky" and do not allow for anything other than a cursory look at 2-D profiles. It seems like we are still heading in the same direction that we traveled along in the early 2000s where fast visualization was the goal, as opposed to really understanding one's dataset. I get it! This is where the money is, and some who are just getting into GPR perhaps don't really want to be bothered with the actual data and just want results NOW.

Now that GSSI has teamed up with Geolitix, my old friends at GSSI seem to be headed in that direction very quickly. Here is what GSSI says about new collaborative venture with

Geollitix***: Geolitix is an ideal tool for forward-thinking organizations that value flexibility in data collection and expect a modern interface and streamlined data management. As an intuitive and powerful web-based tool that streamlines data processing, visualization, and interpretation, Geolitix makes post-field workflows faster and easier than ever.***

LC: one key phrase here is "forward thinking"….is this trying to put the guilt-trip on me?

I am sure that GSSI will continue to support their stand-alone Radan software. It has its flaws, but also some great techniques too. As my GSSI friend Peter Leach said to me once about Radan (he has feminized the software): "she can be a b…… to use, but she is my b……" That pretty much sums it up with Radan and many of its users.

To sum this topic up, GPR continues to go "full speed ahead" with the "streamlined data processing", touting faster and easier interfaces. At a price or course. But I ask the basic question: "where can one go these days to be able to spend time with one's data and understand it before pushing all of into some cloud-based processing software? Perhaps the GPR community has given up on this? To conclude, I am disturbed by this trend, as it is "dumbing down" GPR and not allowing users to get the most out of their datasets.

Another trend that never ceases to amaze me is that toward more technology, which is thought by younger people in particular to be how all problems can be solved. I had a Zoom session yesterday with a young GPR enthusiast who was consulting me on how he can use wheeled or "dog robots" to collect GPR. He is also interested in developing drone GPR. When I asked him how he presumed to do anything with the data collected, it became apparent that this was not an issue he had considered. Perhaps he thought his collected data could be dumped into an AI system and results would just pop out? Today there is a fascination with things like this, and I am marginally interested in these new technological developments, but I always come back to what can one do with one's data that solves a problem?

In a similar manner I remember once listening to someone at GSSI talk about their new 'hyper-stacking" antennas where he proceeded to tell an audience that these antennas can get energy deeper in the ground than the older antennas. I thought about this a little, and after I was able to get this person alone, I asked if the smart engineers at GSSI had developed a way to produce radar waves that defy the laws of electromagnetic energy first understood by Faraday and Maxwell in the 19th century. Could GSSI really produce waves that defy the physical laws of radar wave propagation? This sales person just laughed and said that this was a great sales technique, and that customers love the idea of looking

deeper in the ground. But what their new antennas really are doing is just stacking many waveforms to produce a final saved wave that has better definition. This allows for more coherent waves from deeper in the time-window, which may or may not be "real" but can be interpreted as such. They sure seem to be from deeper in the ground!

In both these cases, it is the new technology that is seen as the new "go to" method that can make GPR "better" or at least faster and easier. I once again return to my own personal quest to understand how radar moves in the ground, how it is reflected, attenuated, recorded and then available for us to study. All the cloud-based software and new technology for acquisition will not help users if they do not study the actual data and understand it.

Bragging-rights are just fine. I am complicit in this sometimes, but it is mostly for fun. Sure, many people can collect huge grids of data with RTK GPS and multiple-antenna arrays that can be uploaded to the cloud to produce results very quickly. Many hectares a day of results almost immediately! WOW! When these huge datasets are presented to me, and I ask to see what the reflections look like here or there in the grid, so I can understand more about what is in the ground, I am usually confronted with blank stares. Once a colleague of mine, when confronted with this question by me, told me that if I went out for coffee and came back in an hour or so, they could figure out a way to pull out the radar wave traces and provide me with something that would perhaps humor me. What? Every time I want to look at a reflection profile l need to go out for coffee and wait an hour? This fun encounter with "big data" demonstrated that "bigger is not necessarily better". It can be flashy, and lots of ground can be surveyed, but when it comes down to understanding what you have, forget it.

So, to conclude, this is my "old school" rant about GPR. Don't get me wrong…I love new technology and big data and fancy software! I will always come back to how this can benefit a project. How can we get the most from our data? And can we arrive at conclusions that are based on the actual radar waves that are collected, and not just on fun and colorful images produced by others.