

## *A quick visit to the equipment room*

*In which ...*

*Lem visits the equipment room,  
becomes paranoid about accuracy,  
recognizes a pack-rat,  
and thinks about what tools measure.*

OH walked quickly down the hall, and in doing so passed Lem. “Come along – right now”, he said. They trotted down several floors of the building to the basement which traditionally holds the equipment room of any organization. “What’s the problem?” Lem asked, as they descended the stairs. “New equipment person hired”, OH said, “no time to lose”.

Lem had also heard that a young lady named Hannah (known as “Hans” to her friends) was going to be appointed to run the equipment room and its moderate budget. Lem assumed that OH wanted some new equipment, and wanted to get his bid in quickly. Far from it.

“Tell me,” said OH after introducing himself to Hannah, “what are your plans for the equipment room?”. She was pretty clear on this. “First I plan to clear out some of this old junk, and get some updated gear in here”, she said, “and then I need to get the records organized”. OH chatted for quite a while with no apparent purpose, except to suggest that he had a great deal of familiarity with the old equipment and would be happy to discuss some of the objects to be discarded. Lem asked a few questions about the newer equipment she had in mind. OH seemed generally uninterested in any new equipment, and eventually they wandered back upstairs.

“I don’t get it”, said Lem. “What just happened down there?”. “We just kept her from throwing out the old equipment”, said OH, “or at the very least put ourselves in a position to see that it ends up in my home storeroom. Most of those instruments are outdated, will never be used again, and the chances are that she would dump them without a moment of thought. Equipment people are like librarians, Lem. Librarians don’t really like books, they like shelf space and order. She was about to clean house - now she is waiting for some advice, and I will make sure she gets it”.

*Seems like a good idea to clean up*, thought The Kid. “So why not throw the old stuff out?”, he asked. “Because that gear is a part of history”, suggested OH. “It illustrates that the people who designed those instruments were brilliant and practical at the same time (and it suggests a bit of humility to the current generation). In addition, the old instruments like the Abney (now quite obsolete) should be used as retirement gifts for the folks that cut their teeth on them as pups. You may notice that I will take particular care to see that any spare parts are preserved. That’s the hardest thing to get hold of in order to recondition these old instruments”.

“The old tools were made to be tough, repairable, and easily tested for accuracy. That’s one of the differences with modern equipment. Today, we have the blessing of oil dampening or digital readouts, but when something goes wrong you often have to send it away for weeks to get it repaired. In addition, the new instruments are expensive, which means that spare ones are hard to get funded. If you need a piece of equipment, you had better have a spare one as well for when that gear is being used by someone else, breaks, is sent out for repairs, or just vanishes. It’s a lot like the lesson that we learned in the early days of increment borers<sup>1</sup>”.

“What about the newest instruments – are they good?”, the Kid asked. “I don’t know”, said OH. “Everything *sounds* good in the catalogs. I will suggest to Hans that we have lunch with a friend of mine who runs an equipment room for a larger company with a larger budget. When there is a question, we will arrange to borrow their gear and test it before we buy our own. Can you read the scale under dark field conditions? How fast does it operate? Can you transfer the data easily? Can you read the manual? Is it calibrated correctly? In addition, the other company may know if it can be fixed or replaced in a reasonable amount of time. You want to know all those things before you spend any serious money. I always spend time looking at equipment displays at conferences and I ask who they sold it to, then I can call that buyer and ask about their experience with it”.

A few days later, OH and Hans were sorting through some old gear that was going to OH’s storeroom when he asked about how she planned to test and calibrate new and older equipment. Her view that the new equipment was OK (because it came straight from the factory) triggered a reaction from OH. “Take that new extendible height pole right out of the box”, said OH. “Now compare it to this older one”. They were not the same. “Now let’s

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<sup>1</sup> Short Story : Guy is studying tree rings. Guy only has one increment borer. Guy gets it stuck in tree (end of project looms before him – no spare instrument). Guy has to recover instrument via chain saw. Guy fells the *oldest living tree known* at the time (not anymore, fella). Guy is known for this for the rest of his life. Bummer. *Have extra instruments* or be able to borrow them quickly. Project management is important, and sometimes depends on your instruments.

find out if either of them is right”, he suggested. They were both wrong. The older one had been repaired, but a chunk was missing. The newer one was wrong (surprising even OH) because of how one section incorrectly locked into position. It might not have been noticed for years.

“I’ll fix those”, she suggested. “Whoa”, said OH. “The older one has been used for research projects. Let’s make sure the users know about the error so they can correct their data. It’s no problem that the measurements were wrong if we can correct them. The problem is that when you replace or recalibrate equipment you now have a different bias, and may have no way to know which set of data is from which calibration date”.

“Is that why you suggested that each of these instruments be given an individual number that is recorded with the data?”, asked Hans. “Yes”, replied OH, “and with the date on which it was calibrated (and used). As the equipment guru you might want to record any problems you found with the equipment in case anyone is thoughtful enough to ask”.

“When you recalibrate weight scales, for instance, you want to record how much they were adjusted, and when they were adjusted. Once again, a bias in the readings is not as critical if you can (and do) correct it later”. “The users should have been more cautious”, suggested Hans, “and they should have checked these at the start of their work – perhaps several times along the way”. “Would you have checked that pole straight out of the box if I had not insisted?”, asked OH. She got the point. “As the equipment chief, you also have an opportunity to arrange for some healthy quality control attitudes”, OH insisted. “People are not suspicious enough of instruments or the accuracy of their readings”.

“I notice that many of the cruisers use Relascopes and some of them use prisms”, observed OH. “How do they calibrate them?”. “They are already calibrated”, said Hans. OH suggested that unless she had checked the instruments, she had no reason to believe that. “Put a target on the wall”, he suggested, “and mark the distances on the floor where it is ‘borderline’ at various BAFs. You might be surprised at how prisms are calibrated. Have you ever watched them do it? The company is not far from here.” Of course she had not. Within the month they were standing next to people who were grinding prisms by hand, sighting targets on the wall and dropping them into boxes (what happens if they fall into the wrong box? They get *labeled wrong*).

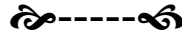
During the next few months, Hannah learned to buy good quality equipment, learned to test it, and learned how to teach others to do the same. She offered a reward to anyone who detected a problem. She made sure the reward was in the form of something that went on a wall or a desk in order to advertise the idea. The cruisers were already careful about checking their equipment, but the biologists were a bit more naïve, and often had no idea

how to check for accuracy. Lem learned that instrument room people make good contacts, and he started to think differently.

“Learn how your instruments work, Lem”, advised OH, “but better yet, ask yourself what you were **trying to accomplish** in the first place. When someone offers you a different instrument, ask yourself if it ‘answers the question’ better – not just if it ‘efficiently replaces the current instrument’ used in the current way”.

“Many of the advancements in measurements and sampling have been tied to the development of a better instrument. The greatest advancements have been when something new was done, not when the same thing was replaced with plastic rather than metal. Part of your job, Lem, is to know what to say when someone offers to measure anything you want and waits for you to tell them what you would like”. Lem immediately thought about what their current instruments did – then caught himself, and started wondering what he actually needed. These were not the same question.

“Ask yourself, Lem, what you would do if LIDAR gave up ‘trying to estimate the volume of stands’, but could inexpensively tell you the *relative amount* in each stand”.



OH, recovered much of the outdated equipment that would never be checked out again, added it to his collection, and made good use of it. The older cruisers enjoyed seeing these instruments displayed and demonstrated at meetings. They particularly enjoyed showing the younger generation arcane skills such as how to “throw” a chain (and how to do it one-handed). Extra old compasses and Abneys were mounted on plaques for retiring members of the profession. Lem was less interested in these historic items, and concentrated on the details of current instruments – perhaps not realizing that these were the future antiques of his craft. He did, however, learn to be diligent in checking their calibration.

*Note to readers ... the next chapter is about how to get an outside review of projects*