Surface Matters
What Arizonans are doing with geospatial technology
Newsletter of the Arizona Geographic Information Council

What Does it Take to Become a Surveyor?

Most people who receive this publication are involved in the arena of geographic information science, a discipline that has come to fruition in the computer age. Many of the basic principles go back centuries, but the computerized incarnation had its birth in 1968. Surveying, in contrast, predates this modern practice by millennia. The ancient Romans had surveyors, the Egyptians must have had them to build their pyramids and temples that still rise from the desert floor, and even Stonehenge must have required surveying techniques to place its massive stones in a perfect circle. Surveyors today are unlikely to work on Neolithic religious monuments or immense stone tombs, but they continue to play a vital role in all manner of construction projects, boundary investigations, and similar pursuits.

How does someone become a surveyor today? That is, if you wanted to become a registered surveyor in Arizona, what would you have to go through to reach that goal?

One of the first things to be aware of is what that goal entails. Registered surveyors must have an extremely thorough grounding in mathematics, various branches of science, modern geospatial technology, and state statutes, as well as being recognized by their peers as being responsible, reliable, and of high ethical repute. Potential surveyors must be willing to take several grueling exams and spend at least six years building up their experience and education before they can become registered.

If you decide you're willing to embark on such a path, where do you start? Well, you start in school. Or on the job. It's essentially up to you. Arizona requires a minimum of four years of education or experience or a combination of both before one can take the first exam on the road to registration. The experience must be under the supervision of one or more registered surveyors (also called registrants) and must include a wide range of responsibilities. A number of schooling options are available. One can go to a community college and earn a surveying certificate without a degree, or earn an Associate's degree in surveying, or attend one of the universities in the country that offers a Bachelor's in surveying. None of those universities is in Arizona.

After you complete your minimum four years, you can apply to take the exam to become a Land Surveyor in Training (LSIT). At this point you get to have your first encounter with the Arizona Board of Technical Registration (BTR). You must submit to the Board a four-page application form (with $40 application fee), an authorization and release letter, two certificate of experience forms, and a statement of citizenship form. Among other things, these forms require a detailed history of your work experience, three references of registrants who can attest to the quality of your field work and character, at least one supervisor's signature, and the signature of a dean or faculty advisor to verify your class work.

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Once you gain acceptance to take the LSIT, you must be prepared for a mentally exhausting ordeal that you might not finish or pass on your first try. It's divided into two four-hour tests. The questions will be very challenging and will address many subjects, such as: complex mathematical problems involving algebra, geometry, trigonometry, and calculus; techniques of field surveying; physics; optics; the expansion properties of soils and/or building materials; geology; archaeology; field safety and first aid; reading comprehension; GPS (both the equipment and the satellites); spatial reference systems; the National Geodetic Survey; GIS; databases; photogrammetry; remote sensing; rasters; file compression; computer science; binary logic; and other subjects not listed. All required formulas will be given on the test, but an applicant must know them thoroughly because the calculations will be lengthy and time-consuming. After all of that, it takes two to three months to get the results. Most people don't pass on their first attempt.

Successful candidates become Land Surveyors in Training and can write LSIT after their names. This is a substantial designation which tells others in the profession that an individual has achieved a significant level of competence and proficiency.

It usually takes at least two years of further experience before someone is qualified to take the test to become a registered surveyor. This requires another flurry of forms (and a $100 fee) to be sent to the Board of Technical Registration. These forms again require signatures and references from acting registrants, which exemplifies the point that someone who wants to become a surveyor must be recognized by his peers as being a competent, qualified and trustworthy professional.

Three more tests await the surveying candidate. Two of them are national tests that are prepared by the National Council of Examiners for Engineering and Surveying. These again are exhausting multi-hour ordeals. One is the Fundamentals of Land Surveying and the other is the Principles and Practice of Land Surveying. Once a candidate gets through those, he is eligible to apply to any state for its final test to become a registered surveyor. A person can become registered in many states, but each state has its own test and its own application requirements. Some states have extremely challenging tests and very heavy requirements just to take it. Other states are more relaxed.

The registration test for Arizona is called the Arizona Land Surveying Examination, or AZLS. This is a 90-question multiple-choice test that's prepared by the BTR. It's given in downtown Phoenix and is graded immediately.

After a person has passed all of the required tests, he then becomes a Registered Land Surveyor with all of the rights and responsibilities attached to that designation. He is a recognized professional within the state of Arizona and may pursue his career in that capacity. ◇

Surveying and the Geospatial Revolution

The ancient lineage of surveying makes it clear that accurate surveying has never required modern, high-tech equipment, though it has always required highly skilled and knowledgeable experts. For literally thousands of years surveyors have held the unique position of being the sole recognized authorities in determining precise locations, measuring distances and angles between objects widely separated across the terrain, and accurately conveying the ceaselessly changing shape of the earth's surface. It is a long and respected history that surveyors take great pride in.

The seemingly unshakable foundation upon which surveyors have stood for so long appears to be crumbling, not under the weight of some great catastrophe but from the relatively swift rise of technology. The key elements of their profession have been usurped by satellites and computers, that is, the ability to precisely locate points and describe the surface of the earth. Today plenty of people with the right equipment and a bit of training can get location points down to a few centimeters, in many cases down to millimeters. From there, measuring distances, angles and elevations is a snap with the proper software. Surveyors understandably find this alarming and threatening. Skills that were rare and required years of training, skills that made their profession unique and indispensable, have become widespread and commonplace. A great deal has been written in surveying and geospatial publications about this state of affairs.

How are surveyors to cope with this? When your primary skills have seemingly become obsolete, what in the world do you do?

One argument puts forth the idea that surveyors are far more than the sum of their measurements, as it were, and need not fear what appears to be a shrinking economic pie. Rudy Stricklan, a member of the AGIC Board who represents the Arizona Professional Land Surveyors organization, is a registered surveyor who has spent his career in the geospatial realm. He obtained his registration in 1975 because he thought an expertise in surveying was the ideal perspective from which to approach spatial technology. He has argued for years that surveyors, because of their rigorous training and unique set of skills and knowledge, have a great deal to offer a wide range of potential clients. A major hurdle, however, is that most surveyors appear not to be accustomed to thinking in terms of wider career possibilities. A surveyor does surveying, right? What else would one do?

If you read the article above this one and you didn't know much about surveying, it's quite possible that your jaw dropped when you learned about the years of experience, rigorous testing, and breadth of knowledge that surveyors are required to have under their belts. Their facility with complex mathematics, their expertise with precise measurements, their understanding of terrain and their broad scope of knowledge would present a great asset to many organizations. At the risk of sounding condescending (which is certainly not the intent), what the surveying profession apparently needs these days is some training in public relations. Most people have no idea what types of skills and knowledge surveyors have. Promoting those assets to potential clients could go a long way toward opening up new opportunities.

One such opportunity involves the modern version of ground staking. Traditionally at a construction site a surveying team would put stakes in the ground indicating how the terrain should be graded. Today a GPS-enabled bulldozer with a ground station nearby can push dirt to within a centimeter of grade specifications. The software that enables this includes a digital terrain model. A surveyor would be the ideal person to review not only the terrain model but the results of the bulldozer's work as well. Suppose a long-established company has decades' worth of old surveying records in folders and file cabinets, and the company wants to transfer the data into a GIS. Who better than a surveyor to ensure that the data are put into the system accurately? The result would be much more precise than similar data derived from the acres of maps that were digitized during the 1980s. In the GIS realm there is the seemingly insurmountable problem of quantifying the accuracy and precision of data. Could surveyors offer their expertise in getting a handle on this?

The former president of the GIS Certification Institute, J. Allison Butler, writes in the October 2010 issue of *Professional Surveyor Magazine*: "The surveying profession, as it was defined 20 years ago, is gone. It is now part of something bigger: the geospatial profession." He argues that surveying, photogrammetry and GIS are all part of one large phenomenon. Perhaps that is so. The surveying profession may no longer hold the unique position that it did for thousands of years, but its principles and techniques are fundamental to much of the rest of the geospatial world. ◇

Mr. Butler's editorial can be seen at
http://www.profsurv.com/magazine/article.aspx?i=70814

IDIOTIC MYSTERY THEATER!

It was a normal day in front of the computer screen. I was getting ready to edit a point feature class that resides in SDE. The layer contains 60,000 points, but ArcMap has never cared. Editing it has always been a breeze.

All of a sudden ArcMap began to care. After bringing up my MXD and going into edit mode, I was shocked to find this message:

"Could not edit any of the map's layers. No data sources in the map are registered as versioned or you lack privileges to modify data sources which are registered as versioned."

I stared. I blinked. I tried again. The message returned, insistent as before. This made no sense. It had never previously come up. Then a thought came to mind: I had recently received a new desktop computer. Perhaps my connection to SDE was faulty. I deleted and rebuilt my SDE connection and tried again. No luck. I did it again, making sure I took the proper steps to set up the connection. Everything looked fine, but ArcMap stood fast in forbidding me to edit the layer.

It was maddening. This was a feature class that I had built from scratch, adding points, updating the attribute table, moving point locations according to field-checked maps. I helped it grow like a sapling tree in a well-kept garden. I was the author of this layer, the creator, the Prime Mover. Nothing should have prevented me from editing it. And yet….

A suspicion arose. Perhaps, I thought, this was another instance of unaccountable ArcGIS behavior. Such instances are known to occur. They are the bane of GIS practitioners, a blight on the geospatial landscape. They arise at random, bringing chaos and confusion, and they disappear without explanation.

I opened another MXD, one with the same point layer in its table of contents. I went into edit mode. No error message appeared. I made an edit. It worked! Maybe the tangled electrons had smoothed themselves out. I shut off the second MXD, went back to the original, started edit mode……and the same error message came up.

I checked the path to the point layer. The MXD was indeed pointing to it correctly. I opened the other MXD and checked the path there. It was the same. I had two MXDs, each properly pointed to the same feature class, yet I could only edit the layer in one of them.

A simple trick occurred to me, though it seemed unlikely to work. I removed the point layer from the MXD that wouldn't edit and dragged it over from the one that would. I tried again. It worked! It worked as it had always worked, with no error messages, no problems, nothing. The barrier was broken. The hindrance was dissolved. My work could continue.

And yet the mystery – the mystery of an error message that should never have been seen, the mystery of behavior that should not have taken place – like a fading wisp of smoke, that mystery remained.

Thank you for joining us for this installment of

IDIOTIC MYSTERY THEATER!

ASU/AGIC GIS Career Fest 2011

Once again it's time for the Career Fest! Due to popular demand ASU and AGIC are hosting the 5th Annual GIS Career Fest on Tuesday, April 5th from 12:30-3:30 at ASU's Memorial Union.

The demand for employees with knowledge of Geographic Information Systems is high. Local employers are always in search of qualified applicants for their many jobs that use GIS. What types of jobs are out there? What are the qualifications for those jobs? To help students with the answers to these questions, ASU and the Arizona Geographic Information Council are hosting the 5th Annual GIS Career Fest. Over 30 groups that use GIS will be attending the event to talk to students about what types of jobs they have and the skills they are looking for. Now is your chance to come and meet the people who might hire you someday and to find out how you can prepare yourself to get the jobs.

For more information about this year's event, please visit http://asu.edu/issr/careerfest.

If you've never been to a Career Fest and would like to know what to look forward to, you can read about it in previous issues of *Surface Matters*. Look through the issues from December 2006, December 2007 and March 2009 for coverage of past events. You'll read about what leaders in the field have had to say and what types of skills employers look for. You'll also find responses from students and employers about the Career Fest itself.

All past issues of *Surface Matters* can be found at http://agic.az.gov/newsletter. ◇

So Long, *Surface Matters!*

Esteemed Readers:

Surface Matters, widely regarded (at least by the editor) as The Greatest GIS Newsletter That Exists™, is doomed. The final edition under the current editorship will be June 2011. Thereafter the editor will be moving in other directions and will lay down the quill which has wrought this lively publication.

Whether this newsletter continues with a new hand on the reins is still up in the air. For one thing, the AGIC Board will have to decide if it wants a newsletter at all. For another, someone will have to volunteer to do it.

A six-page quarterly is not an undue amount of work, especially if you're good at time management. It does, however, require a certain level of dedication and interest. A flair for the written word doesn't hurt, either. In its current form, *Surface Matters* has largely been a one-man operation. For a two-person team it would be a breeze.

Are you thinking of stepping up to become the new editor? If so, consider the following. Would you like to –

- Interview geospatial professionals about their work and bring that information to the wider community?
- Report on GIS events around the state?
- Make professional contacts throughout Arizona?
- Develop your writing skills and put them to good use?
- Be regarded with respect and awe by all whom you encounter?
- Publish a quality newsletter for no payment whatsoever?
- Put your professional reputation on the line with each and every issue?

If this sounds to you like a thrill a minute, contact the editor for a chat.

A few words about the focus of the newsletter: If you have a keen eye, you might have noticed that the AGIC newsletter is rarely about AGIC. That may sound contradictory, but State Cartographer Gene Trobia put his finger on the reason why during his remarks at the AGIC Conference last November. He said that observing the activities of AGIC is like watching the seashore. In real time very little seems to happen, but if you speed up the film you can see all kinds of activity by starfish and crabs and other things that don't appear to do much. AGIC is like that. It's a committee, after all, and its activities consist largely of meetings, phone calls, work behind the scenes, and similar functions that aren't going to grab headlines. Important things do get done, like the yearly conference, the Career Fest, the Ramona GIS Inventory, support of Height Modernization, and other worthy projects. For the next several years the focus will be on the clearinghouse. As you can see, though, AGIC pursues long-term projects that require much time to bear fruit.

What, then, is the point of *Surface Matters*? To answer that we must review some history. Back in 1989, people at the highest levels of state government were convinced that geospatial technology was important enough to the functioning of the government that the Governor signed an executive order establishing AGIC. Governors since then have renewed the order, and in July 2009 the Legislature passed a bill establishing AGIC by law. For more than twenty years Arizona's elected leaders have recognized the usefulness of spatial technology not just to the functioning of government but to the state as a whole.

The question arises: What's so special about this technology that state leaders deem it worthy of a committee dedicated to its promotion? A hint of that answer is evident in the subtitle of the newsletter, "What Arizonans are doing with geospatial technology." The answer, however, can't be given in a single sentence. The question arises repeatedly and can only be answered by looking at the work people are doing and the benefits being derived. To that end *Surface Matters* roams the state, bringing to light the work and activities of those who practice the spatial arts. So you see, the AGIC newsletter isn't really about AGIC; the AGIC newsletter is all about *you!*

Here's to the continued success of those pursuing geospatial endeavors. ◇

Contributors

Mike Magyar, RLS, Bonneville Power Administration, Portland, OR
Land Surveyor

Rudy Stricklan, RLS, **GISP**, Mapping Automation, LLC
Principal Consultant

AGIC Roundup

• Jana Hutchins, the outgoing Council Chairperson, symbolically handed the gavel to Keith Larson, the incoming Chairperson, as a statement to the peaceful transfer of power that characterizes the AGIC community. Mr. Larson represents the Natural Resources Conservation Service on the Council. Second in command will be Brian Brady from the City of Yuma, and holding the keys to the treasury will be Gary Irish of the State Land Department. Congratulations and good luck to all!

• A new hosting site is being sought for the AGIC website. ASU has volunteered to create and host the website. Because this is a volunteer effort, a target release date is not yet available. One of the goals of the new content management system website will be to enable Council members or other qualified persons to update website content remotely.

• The Transportation Working Group, a subset of the Data Committee, is helping to coordinate efforts of the Arizona Department of Transportation, the E-911 group within the Arizona Department of Administration, and the Arizona Broadband Project (which is being managed through the Arizona State Land Department). The efforts of all three of these groups are focused on creating a statewide road network.

Calendar of Events

ASU/AGIC GIS Career Fest
April 5
12:30 – 3:30 PM
ASU Memorial Union
Turquoise Room
http://asu.edu/issr/careerfest

Tucson GIS Cooperative
April 8
3:00 – 5:00 PM
Public Works Building
201 N. Stone Avenue, Tucson
Northwest corner of Stone and Alameda
Basement, Conference Room C
http://cms3.tucsonaz.gov/giscoop/gis-cooperative
Meetings are held on the second Friday of each month.

AGIC Executive Board Meeting
May 1
10:00 AM – 12:00 Noon
Maricopa Association of Governments
302 N. 1ST Avenue, Phoenix
Northwest corner of 1ST Ave. and Van Buren St.
2ND Floor, Saguaro Room
http://agiz.az.gov/board/calendar.htm