

MAGNA CUM VISIONE

Commencement Address at the Jackson School of Geosciences (UT Austin)

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Thank you for those kind words, Dean Mosher, and especially for your invitation to be the Jackson School commencement speaker this year. As a proud M.A. degree alumnus of UT I am pre-Jackson and pre-Pleistocene, and I have been around long enough to grasp the fact that commencement and graduation are full of paradox. ‘Endings’ and ‘beginnings’ get all mixed up, don’t they, when we celebrate profound events of conspicuous accomplishment. As a parent during a freshman fall convocation at Washington University, I sat and listened to Poet Laureate Howard Nemerov playfully explore the phrase “*New Beginnings*”, which happened to be the university-chosen theme for the occasion. Nemerov wondered aloud if there was such a thing as an ‘old beginning’? Then he read one of his poems, which was entitled “*Endings*.” Finally, while I was still trying to tell ‘up’ from ‘down’, he recited a poem about the alphabet, starting with the letter ‘k’ and ‘ending’ with the letter ‘j’. He made his points: sometimes endings and beginnings are completely blurred, and this is one of those times.

When I think back to when I arrived at UT to begin graduate studies, I recall the blurring of endings and beginnings. Though I thought I knew what was ‘up’, I frankly had no idea what was in store for me. Had someone told me then that in about 10 months I would be doing my masters field work in the Highlands of the Cuchumatanes in northwestern Guatemala, and having the experience of my life, working with fellow students ‘Big Tom’ Anderson and Alston Boyd III (‘Boyd’ 3), and with Robert Boyer as my research advisor (what energy, what capacity!), ...well, I would have thought it inconceivable. You see, I had just graduated from The College of Wooster, in Ohio. [We always say ‘in Ohio’ so as not to be confused with Worcester, Mass. I never had to worry about such clarification when I told people I went to University of Texas; you won’t either.]

Now where was I?... Oh. I had just graduated from Wooster, in Ohio, spent a summer carrying out geological mapping in Precambrian rock in the Canadian bush, and had driven to Austin. Attached to the side of my car was one of the last physical vestiges of my undergraduate experience: my pole-vaulting pole. I was thinking grand thoughts about trying to join the Texas Track Club. But I was nervous. I had been summoned to the office of Professor Ronald K. DeFord, the Graduate Advisor of the Department of Geological Sciences. Imagine, before I had found a place to live, and before I had unpacked my car, I was called to his office. He had a head *this big*, with eyebrows projecting *this far*. He referred to me repeatedly as “Mr. Davis.” (As a 22-year old, I looked over my shoulder to see if my dad was in the room). Professor DeFord held in his hand a copy of my

college transcript. He expressed his deep concern about the apparent insufficiency of my background in optical crystallography. The issue was whether I needed to pick up 'optical' as an undergraduate deficiency. That word 'deficiency' wasn't what I was hoping to hear at the very start of grad school. He phoned Professor Robert L. Folk and asked him to come up to his office to test me. When Folk entered, Professor DeFord motioned for him to begin. Professor Folk asked me: "*Do you know what 2V is?*" [For those of you not having taken 'optical', think of '2V' as code for exquisitely abstract and impossible to explain.] My head was reeling, but I managed to reply, "Yes." Professor Folk said to Professor DeFord, "He's OK!", then promptly exited.

I reflect back on that experience to underscore this thought: Your graduation is much more than the summation of course work. You are graduating *Magna Cum Visione*; you are graduating *With Greater Vision*. You have acquired geological vision, which has oozed into your consciousness through the sum total of your geological experience in its countless forms: attending classes, doing homework, turning in countless lab assignments (why don't those business majors have to take labs?), reading the literature, hanging out with fellow students, taking field trips, doing research, and slaving as teaching assistants or research assistants. I submit that your raised consciousness of geological vision is akin to a powerful internal 'app', which has become hard-wired inside your brains through the immeasurable value of the entire grounding of experiences along your geosciences educational path.

What exactly are the components of geological vision? There are four that come to mind: paleo-vision, subsurface vision, chrono-vision, and rheological vision.

First: You have acquired **Paleo-Vision** to see ancient landscapes, seascapes, and paleoclimates. As geologists we can describe with amazing certainty the nature of the giant Jurassic dune field that stretched from Nevada through Utah and Colorado to Wyoming; and we know the character of the Jurassic paleo-winds. We can picture the expansive Eocene lakes at high elevations in Utah and Colorado, and we compare them with what we see today at Lake Titicaca in the Andes. Here in Austin we can spend time in the Cretaceous along the shallow-sea carbonate platform of what we now call the Edwards Plateau. Ron Blakey's paleogeographic maps of North America, which are a source of pride for all geosciences graduates, underscore our collective and singular capacities for paleo-vision. We are indeed the only academic discipline that empowers acute paleo-vision of landscapes, seascapes, and paleoclimates. This all came clear to me when, as Provost, I welcomed ~100 fifth graders to a University of Arizona event, where the kids demonstrated to their parents and teachers a newly acquired knowledge of the palette of academic majors and career paths that awaited them. When, in the final presentation, one boy held forth on geology, he started by saying "*Geologists are hundreds and hundreds of years old*". The place cracked up. He had hit upon the power of paleo-vision. How else could we divine the past?

Second: You have developed **Subsurface Vision** to see what lies beneath the surface of the earth. Jeffrey Daniels, a geologist with the Ohio State Geological Survey, emphasized in a talk that I heard him give that *'geoscientists represent the only profession anywhere that knows how to picture the subsurface.'* Well, mining engineers, geological engineers, and hydrologists might take exception with Jeff when he says that we are the only profession with this capacity. Thus, when I gave my GSA Presidential Address in 2012, I put it this way: *"Geosciences is the only scientific community that can actually picture what happens right at, beneath, and deep beneath Earth's surface today, at any spot on the globe; AND we can picture past subsurfaces in relation to past oceans and past atmospheres over the spans of vast time and ever-changing circumstances."* We can see all of this as a kind of a video. Such subsurface vision is absolutely fundamental to success in exploration, for example, in the petroleum industry.

Third: You now possess **Chrono-Vision** to see the duration and passing of time. Here we are not alone in this deep-time appreciation, but are joined by graduates and colleagues in planetary sciences, astronomy, and in ecology and evolutionary biology. Not only are we able to toss around phrases embedded with such numbers as '1650 million years ago', our geochemists and geochronologists have – over the decades – deconstructed the basic physics and chemistry of elements and atomic particles and constructed analytical pathways for pinning down the raw ages and durations of events and process. The alphabet-soup taxonomy of techniques runs something like uranium-lead; samarium-neodymium; potassium-argon; rubidium-strontium; uranium-thorium; radiocarbon; and of course includes cosmogenic nuclide dating. Absolute ages plus time-temperature paths enable the chrono-duration perspectives to embrace a spectrum of rates of geological processes, ranging from instantaneous (in the case of asteroid impacts) to extraordinarily sluggish (for most rates directly tied to plate motions). Now, you parents and friends of geo-graduates, listen up: *Google* tells me that if you drove here yesterday from Amarillo, leaving the house at 9AM, you would have arrived here at about 4:30 in the afternoon, averaging ~65 mph as you covered the 490 miles (790 km). (Boy, you drive fast!). However, had you driven the same route at a reasonable plate tectonic velocity of 50 mm/year, your journey would have taken 16 million years, and you would have been late for this ceremony.

Fourth: You have a **Rheological Vision** ('rheo' from the Greek, meaning 'flow') to see that regions of so-called solid rocks are inconceivably weak, almost without strength, in response to the steady drumbeat of plate motions. We know this from geological mapping of mountain belts throughout the world, and from geophysical interpretation of rocks and structures in deep basins. The fact that solid rock essentially 'flows' under the pressure of weak stresses is something we apply in modeling the behavior of the earth's crust. For example, if we wish to create in the lab a physical analogue model of the Andean mountain belt, and we

need to accomplish this in, say, several hours, we must scale down the length of the Andes from 7000 km to 1 m; and, we must scale the length of time to form the Andes from, say, 30 million years to 3 hours; and, in like fashion, we must scale the strength of the materials from that of solid rock to that of loose fine-grained sand (what Professor Folk refers to as 'spittoon sand'), silly putty, and even honey. In applying rheological vision you geo-graduates have tumbled to the fact that this paradox of rock strength cannot be understood in the context of outcrops or quadrangle maps, but in the character of microstructures at grain and lattice scale. What irony! The strength of regions of rocks is controlled by dislocations and flaws in minerals at the submicroscopic scale.

Now, imagine, following your graduation you go to the eye doctor to have your vision tested. You enter the office. The eye chart is on the far wall. Immediately you see near the base of the chart what would appear completely unreadable, completely blurred, to non-geologists. You would see the words Paleo-Vision, Subsurface Vision, Chrono-Vision, and Rheological Vision. Ironically, however, you might have real trouble with 'the Big E' and other things near the top of the chart. At the top of the chart are vision domains that commonly move us out of our comfort zones.

Our farsightedness (hyperopia), which serves us so well in our 4 domains of vision excellence, causes us to overlook what is right in front of us: the need to communicate and connect more effectively with K-12 teachers, and with public officials and policy makers on matters of abrupt natural disasters, or the continuous decline we see globally in environmental quality.

Our nearsightedness (myopia) worsens as we pursue our nitty-gritty specialty areas, which are clad in colorful terms and taxonomies. I am particularly fond of expressions such as "*mylonite and ultramylonite overprinted progressively by cataclasite and ultracataclasite, and sometimes generating pseudotachylite.*" Yet, this brand of nearsightedness tends to block our effectiveness in partnering with colleagues in medicine, social sciences, the humanities, and even engineering.

And there is a third malady. Some hardening of our vision (a kind of glaucoma) fails to alert us that the field we love so much is only infrequently a career path for students coming from economically challenging rural and urban areas; this is especially true for minorities, just as it was acutely the case for all women when I was here in the geology department. We seem to lack the sustained vision and commitment to bring about continuous change. *Wikipedia* refers to glaucoma as the "*the silent thief of sight.*" Indeed, silence often surrounds societal circumstances of compromised equality and opportunity.

I count on you graduates to enjoy and exploit your paleo-vision, subsurface vision, chrono-vision, and rheological vision. But I ask you as well to take the lead in helping to correct those parts of our vision, individually and collectively,

that remain underdeveloped. *Lead by example; help the entire community of geoscientists change by degrees, from something, to something else. For one of the definitions of graduation is "changing by degrees from something to something else."*

In wrapping up, let me bring back Professors DeFord and Folk into the conversation. ...*"Mr. Davis, do you know what 2V is?"*

"Well, as a matter of fact I do. 2V is a conoscopic interference pattern marked by rings caused by optical interference observed when diverging light rays travel through a non-isotropic substance, and we use it to determine if a mineral is uniaxial or biaxial."

In thinking back, I thank Professor DeFord for being so exacting. And I thank Professor Folk for emphasizing, through personal example, that originality and creativity largely come from within. These two complementary perspectives, which I encountered on my first day at UT, can be summed up in something that physicist Freeman Dyson once wrote: *"Without discipline there cannot be greatness; without diversity there cannot be freedom."*

Finally, to parents, spouses, partners, friends, family, faculty, and staff. ...you heard me tell your graduates that graduation can be thought of as a changing by degrees from something to something else. But YOU are the ones that are 'something else'. You didn't provide this support 'by degrees', but lavished your support upon them, 'from beginning to end', or is it from 'end' to 'beginning'? Oh, you know what I mean!

Congratulations All.

A handwritten signature in black ink, appearing to read "George H. Davis". The signature is written in a cursive, flowing style.

May 17, 2014