

Update: State and Sustainability of Minerals Education in the US

SME Annual Meeting Educator's Forum

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Supply and Demand - March 2006

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This presentation

- * Review - scope**
- * Review findings - 'Mining schools'**
- * Geological/Mining Engineers, Economic Geologists - Extractive metallurgists**
- * Competing for mining talent**
- * Recruiting – the good and the bad**
- * Competency crisis before a numbers crisis**

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Goal...

Products

- ✦ **Provide a first approximation of the Supply / Demand balance of geo-professionals educated by 'Programs at Risk' to allow us and others to prioritize efforts to stabilize these programs**
- ✦ **Time is of the essence**

Scope...

Education Programs at Risk (Supply)

- ✦ **Mining Engineering**
- ✦ **Extractive Metallurgy (and Mineral Processing)**
- ✦ **Economic Geology / Geological Engineering (including Mining Geochemistry and Mining Geophysics)**

Methodology...

Overall

- ✦ Utilize best available information
- ✦ Original data when critical
- ✦ First approximation of the entire product... an evolving document, usable as soon as possible... increasing accuracy
- ✦ Reference (and coordinate?) parallel efforts - time lines, synopsis, role in 'the solution'

Methodology...

Supply and Demand Components

Supply (by discipline)

1. Numbers of graduates
Where they come from
First job by industry sector

Demand (by industry sector)

2. Numbers employed
3. Growth / shrinkage
4. Demographics (Retirements)
5. Career path – movement between sectors
Mentoring / necessary experience
6. Attrition – loss from the profession
7. Balance (numbers and time)
Cycles (non-linear balance)
8. Education (faculty)
Numbers by discipline
Demographics (retirements)

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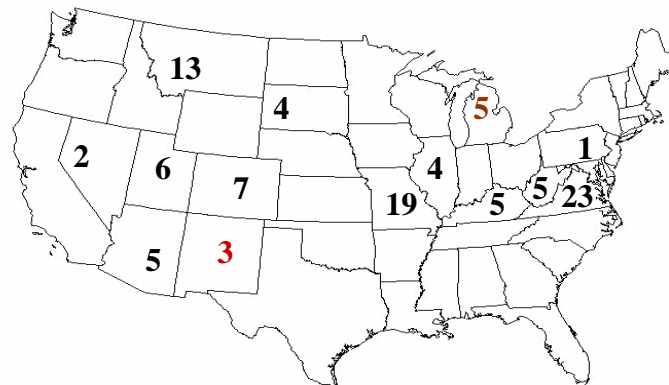
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Fifteen Mining Schools... BS Min Eng 00/01 – 04/05 Average

Alaska 2

N = 104



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Balance...

Algorithm - 5% Growth Scenario

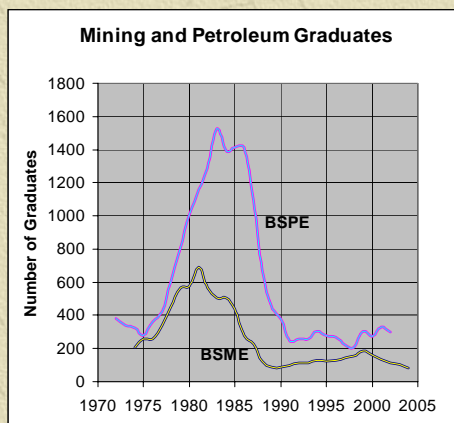
Total Need - net of growth / shrinkage and attrition				
Growth / Shrinkage over next 5 years				5%
Attrition				30%
Assume number of Mining Engineers				5,206
Retirement age	Demographics	Average annual retirement rate		
		62	65	70
Over 50 years	52%	397	332	268
Over 55 years	28%	372	283	213
Over 60 years	10%	446	223	149

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Graduates...

Compare BSPE and BSME



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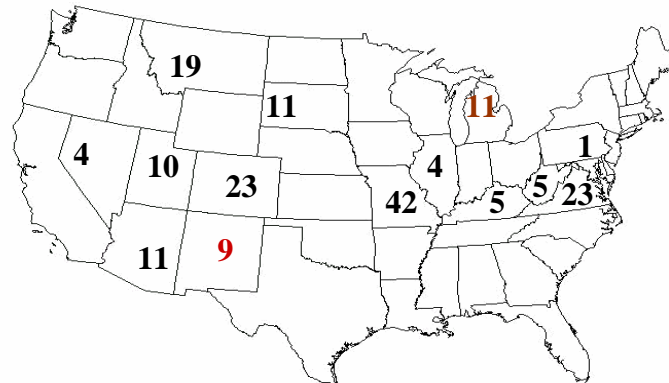
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Fifteen Mining Schools... Min Eng+Geol Eng 00/01 – 04/05 Ave

Alaska 6

N = 184



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Economic Geology

- ✦ **Approx 2,000 geoscience grads/year**
- ✦ **41 schools have at least one professor active in economic geology**
- ✦ **8 schools have 2 or more professors active in economic geology**
- ✦ **6 of the 15 mining schools have 2 or more, five have student chapters of SEG**

Extractive Metallurgy

- ✦ **18 schools have faculty**
- ✦ **13 of the 15 mining schools**

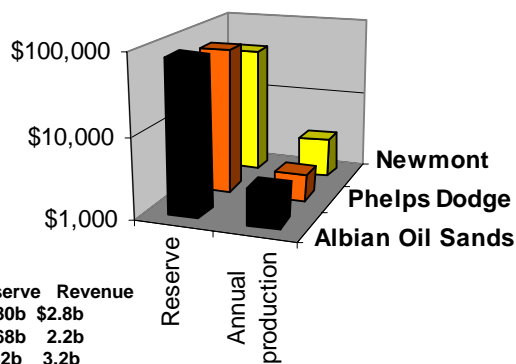
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- ✦ Review - scope
- ✦ Review findings - 'Mining schools'
- ✦ Geological/Mining Engineers, Economic Geologists - Extractive metallurgists
- ✦ **Competing for mining talent**
- ✦ Recruiting – the good and the bad
- ✦ Competency crisis before a numbers crisis

Growth

Mining / Met Eng replacing Petr Eng

Company comparisons



Comparative Salaries Colorado School of Mines

		04-05	05-06	
Environmental	\$ 40,500	-15%		
Civil	\$ 43,139	-9%		
Mining	\$ 47,593	0%	\$54,200	12%
Geological	\$ 50,568	6%		
Mechanical	\$ 50,939	7%		
Metallurgical	\$ 51,927	9%		
Electrical	\$ 52,159	10%		
Chemical	\$ 52,311	10%		
Petroleum	\$ 63,314	33%		
Average	\$ 50,272			

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Comparative Salaries Colorado School of Mines

	05-06		Offers
Coal	\$56,800	13%	5
Metals	\$50,400	0%	6
Cons/Services	\$54,000	7%	5
Oil/Oil Sands	\$60,000	19%	4
Ind Min/Agg	\$48,000	-5%	2
Average	\$54,200		22
Accepted	\$55,400		7

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Comparative Salaries Colorado School of Mines

	05-06		Offers
Accepted	\$55,400		7
Oil Sands	\$64,000	26%	1
Coal	\$60,000	18%	1
Cons/Services	\$55,500	9%	2
Metals	\$50,800	0%	3

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Questionnaire Eleven CSM Seniors

✦ Rank - not important to critical

- ◆ Salary
- ◆ Sector
- ◆ Company reputation
- ◆ Location
- ◆ Career opportunity
- ◆ Continuous development

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Questionnaire

Eleven CSM Seniors

✦ Rank - not important to critical

- ◆ Salary: Most-3, Least-1
- ◆ Sector: Most-1, Least 4
- ◆ Company reputation: Most-4, Least 1
- ◆ Location: Most-4, Least-5
- ◆ Career opportunity: Most-7, Least-0
- ◆ Continuous development: Most-5, Least-0

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Questionnaire

Eleven CSM Seniors

✦ Who did a good job recruiting you? Why?

Questionnaire

Eleven CSM Seniors

✦ Who did a good job recruiting you? Why?

- ◆ Peabody
- ◆ Caterpillar

Questionnaire

Eleven CSM Seniors

✦ Who did a poor job recruiting you? Why?

Questionnaire

Eleven CSM Seniors

✦ Who did a poor job recruiting you? Why?

- ◆ Metals, inconsistent process, less competitive
- ◆ Aggregates, less competitive

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A crisis... Competency before a numbers crisis

Education ← 4 yrs →		First job (last 13 years)		Workforce (after BLS)
	Production	70%		35%
	Precious Metals	10%		5%
	Base Metals	10%		5%
	Coal	35%		15%
	Construction Materials	10%		5%
	Industrial Minerals	5%		5%
	Non-traditional	13%		20%
	Production other industries	5%		5%
	Construction	5%		5%
	Other	3%		10%
	Services and supplies	15%		35%
	Consulting	5%		20%
	Equipment	5%		5%
	Supplies	5%		10%
	Government	2%		9%
	Federal	1%		4%
	State	1%		5%
	Education	0%		1%
←Attrition→			←Attrition→	
				30%?

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Conclusions

- ✦ **A numbers crisis**
- ✦ **Some sectors are less-than-competitive for the best-and-brightest**
- ✦ **Many companies struggle with execution of the recruiting process**
- ✦ **We face a middle-management competency crisis**

Conclusion: Bad today, Hell tomorrow

- ✦ **A triple bottom line... (apologies to Pat James)**
 - ◆ **Too few high school students want to pursue careers in the 'Professions at Risk'**
 - ◆ **Not attracting the best-and-brightest**
 - ◆ **Metals and aggregates talent pool being 'high-graded' by the energy sectors**

Recommendations

Personal responsibility

✦ Industry professionals

- ◆ Get involved with academic institutions... Adopt a school or two, lecture, make yourself available
- ◆ Mentor young graduates... goal... fully functional twice as fast... to allow them to be paid more
- ◆ Improve recruiting.... Don't let interns and young grads fall between the bureaucratic cracks

✦ Academic professionals

- ◆ Links to industry ... Work closely with industry advisory boards. Manage. Delegate. Demand more.
- ◆ Expand courses to develop mid-career professionals

Let's make a pact

Each of us individually....

Let's make a pact....

Each of us individually....

**We're not allowed to retire until we
get this fixed... your company....
and/or your university**

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Crisis

**A competency crises before a
numbers crisis**