S&E Careers: Insights from the 2010 Science and Engineering PhD and PostDoc Survey (SEPPS)

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Overview

Thoughts on data sources on S&E careers – what do we have and what would be great to have?

Insights from novel survey data of PhD students and PostDocs at tier-1 research institutions

- § Reasons for pursuing PhD/PostDoc
- § Funding sources
- § Current research activities
  - § Relationship with funding
- § Career plans
  - § Relationship with funding

PART I : Thoughts on data sources to study S&E careers

Existing data sources (selection)

§ Measures of aggregate stocks and flows

  § Survey of Earned Doctorates (SED). Now including salary.
  § Survey of Doctorate Recipients (SDR), National Survey of Recent College Graduates (NSRCG), National Survey of College Graduates (NSCG)

§ Some data on PostDocs

  § Sigma Xi Survey (http://postdoc.sigmaxi.org/)
  § SDR

§ Bibliometric data (publications, patents)

  § As measures of productivity
  § Changes in employment, location, collaboration (e.g., Marx et al. 2009; Singh & Fleming 2010)

§ Federal funding data (STAR METRICS)

Wish list

§ Career trajectories simultaneously reflect supply (researchers) and demand (employers), but do not allow us to identify their respective influences.

à It would be useful to have <u>separate</u> data on

§ Supply side (e.g., career aspirations, skill sets, preferences)

§ Demand side (e.g., job openings, training requirements)

§ Measures to understand the labor market process, e.g.,

§ Where do students get information about career options and particular employers?

§ How do employers identify promising scientists and engineers?

§ How does the "matching" happen?

Wish list (cont.)

§ Longitudinal data to track actual career paths

  § Ideally begin when individuals <u>start</u> their PhD

    § Track changes in career aspirations during training

    § Insights into training experiences, interactions with advisors, collaboration patterns, etc.

    § Especially important to the extent that Graduate School has long-lasting effects on scientists ("socialization")

    § Information on drop-outs

§ Coverage of those who earn degrees abroad

PART II: Insights from the 2010 Science and Engineering PhD and PostDoc Survey (SEPPS)

SEPPS 2010

Science and Engineering PhD and PostDoc Survey (SEPPS), administered at 39 tier 1 U.S. research universities (Sauermann & Roach 2010).

Collected contact information of 30,000 individuals from department websites. If information missing for a department, approached respondents through graduate student administrators.
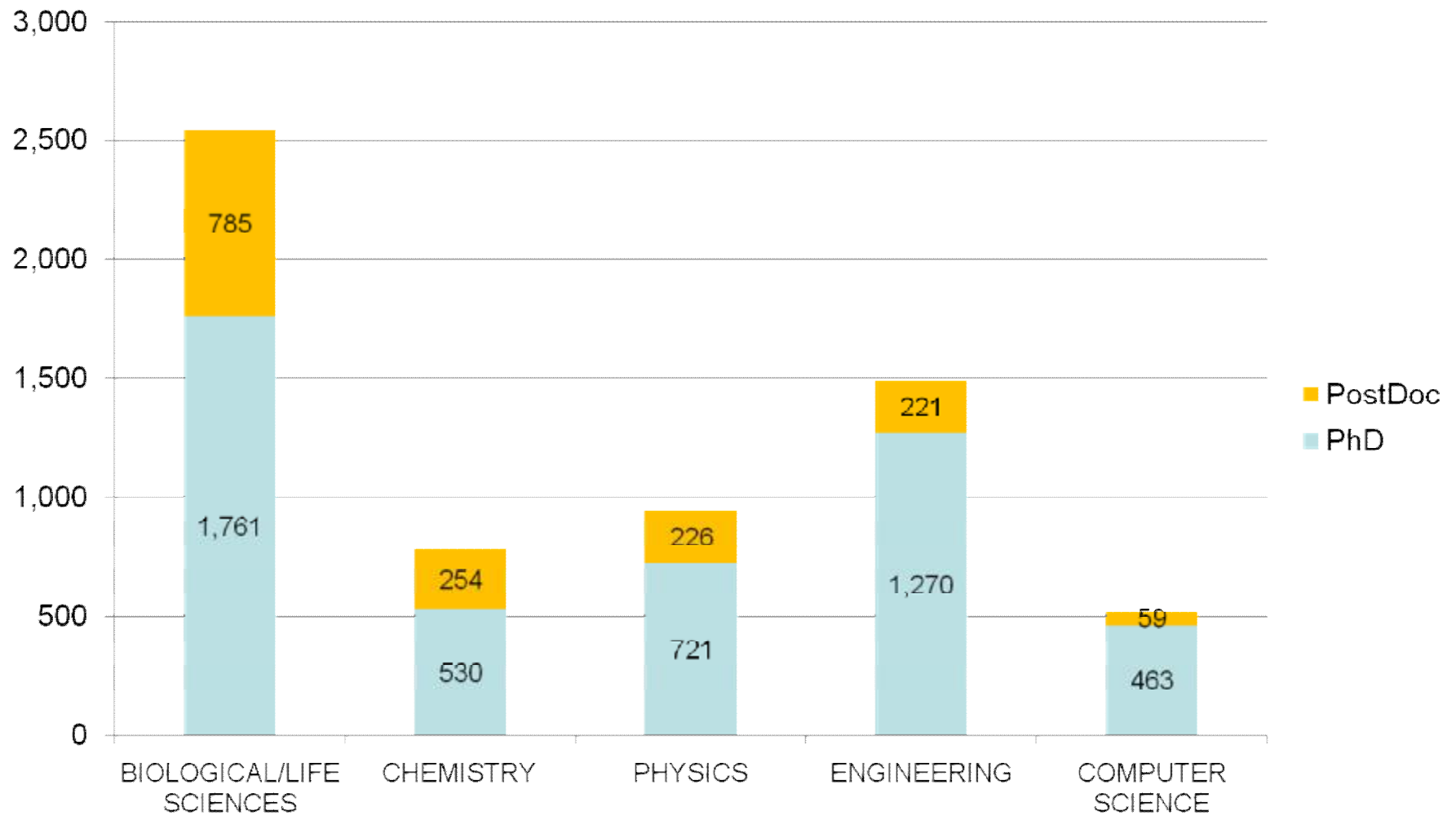
Survey conducted in the Spring of 2010, 4 contacts.

Adjusted response rate for direct survey approach: 30%.

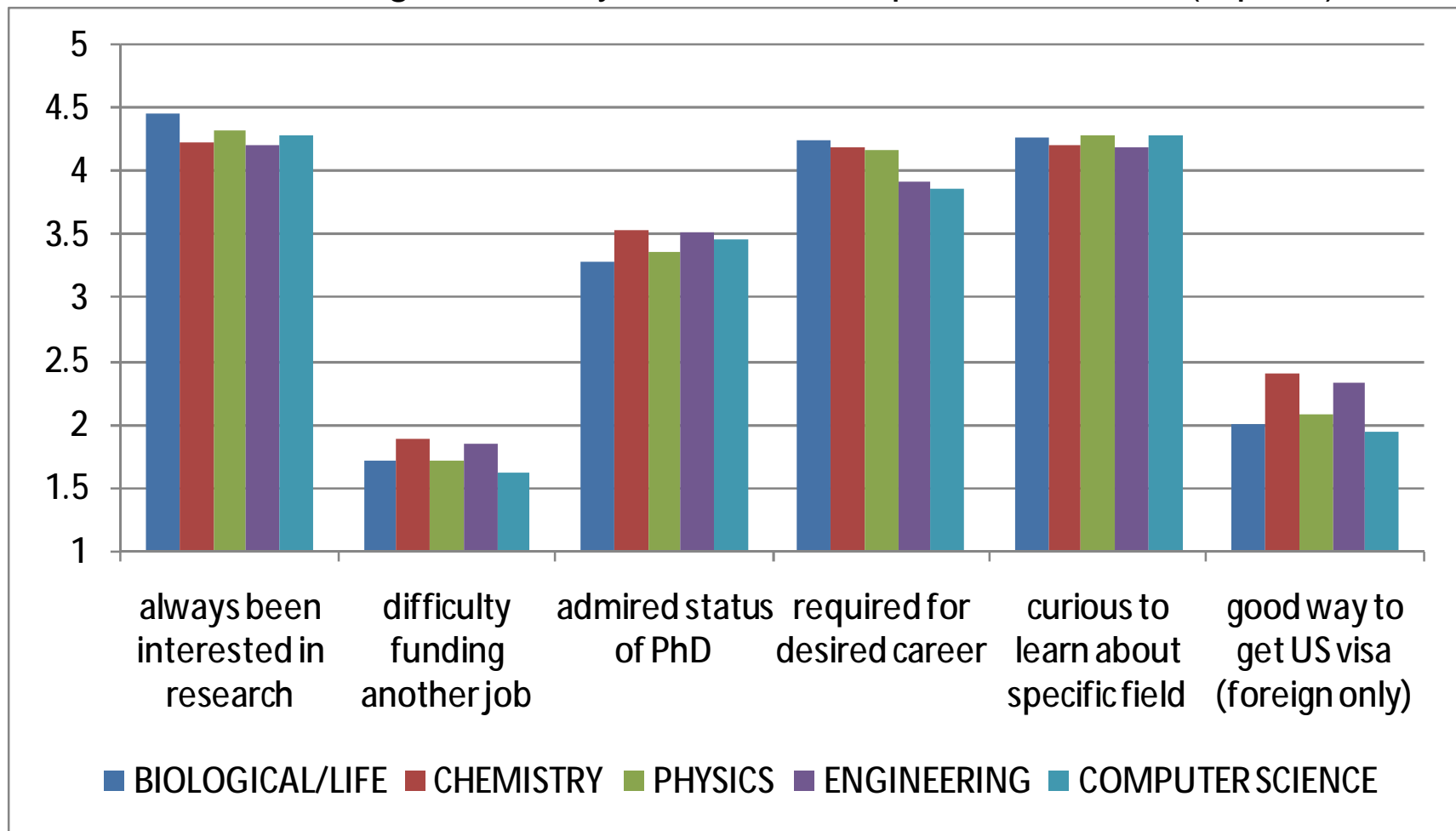For this analysis, we focus on a subset of respondents:

- § Advanced PhD students and PostDocs
- § Life sciences, chemistry, physics, engineering, computer science
- § N=6,290
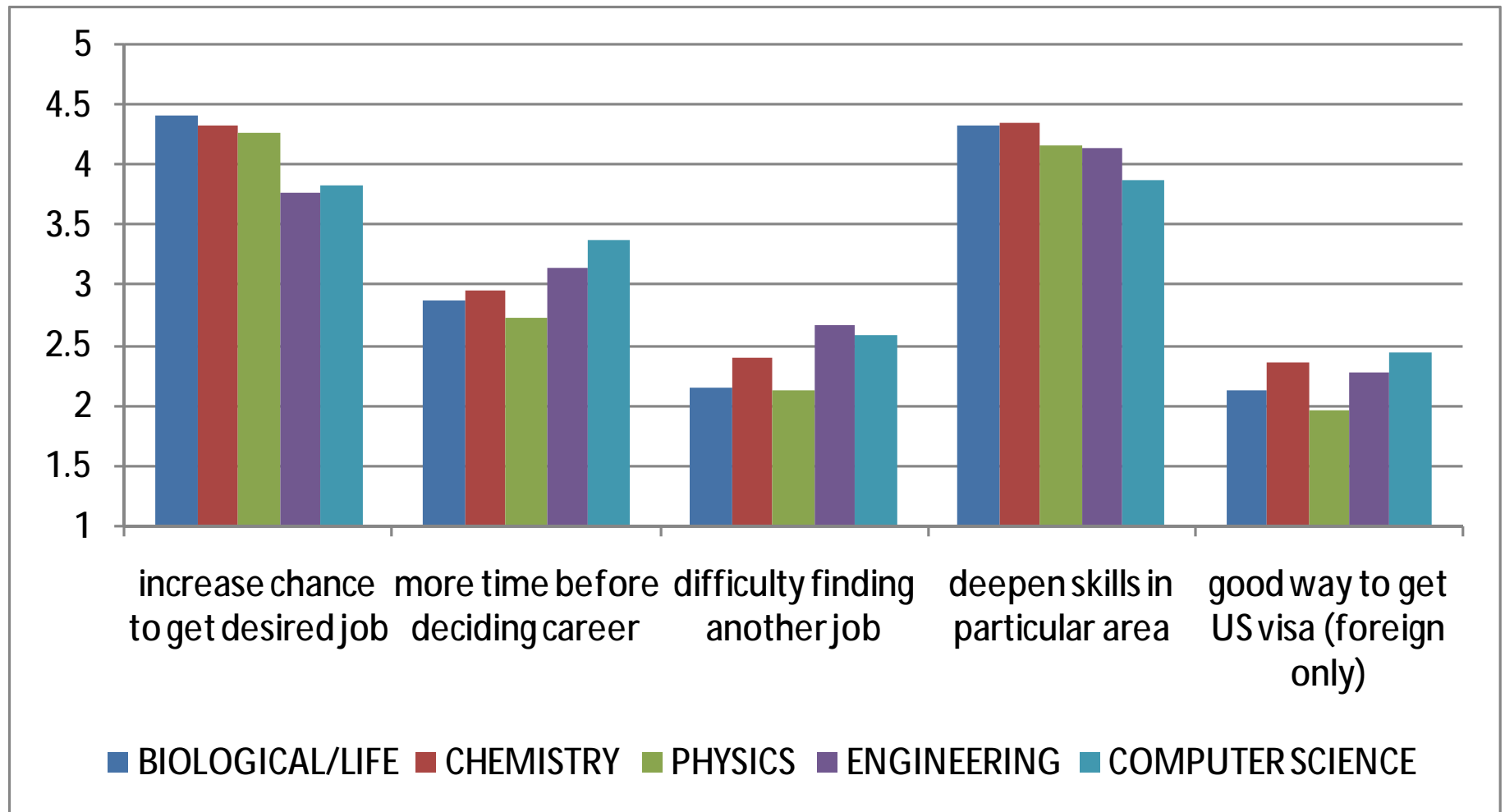
Degree status by field

Why do they do it? - PhDs

"Thinking back to when you began your PhD program in [year], how important were the following factors in your decision to pursue a PhD?" (5-point)
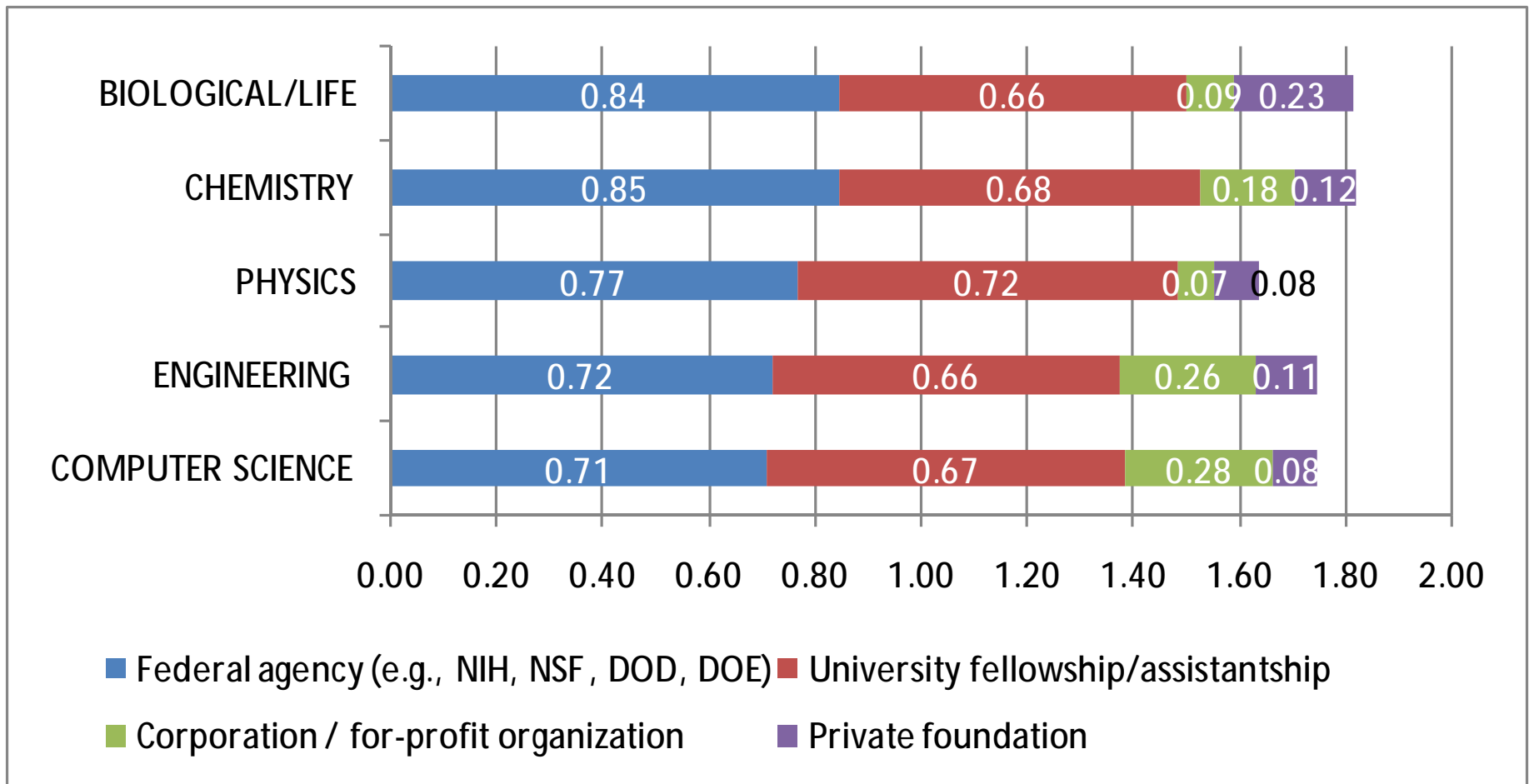
Why do they do it? - PostDocs

"Thinking back to when you began your first PostDoc in [year], how important were the following factors in influencing your decision to do a PostDoc?" (5-pt)

Who funds them? - PhDs

"Which of the following are sources of your current funding?" (Y/N for each)

Legend:
- Federal agency (e.g., NIH, NSF, DOD, DOE)
- University fellowship/assistantship
- Corporation / for-profit organization
- Private foundation

Data:
- BIOLOGICAL/LIFE: 0.84, 0.66, 0.09, 0.23
- CHEMISTRY: 0.85, 0.68, 0.18, 0.12
- PHYSICS: 0.77, 0.72, 0.07, 0.08
- ENGINEERING: 0.72, 0.66, 0.26, 0.11
- COMPUTER SCIENCE: 0.71, 0.67, 0.28, 0.08

Who funds them? - PostDocs

"Which of the following are sources of your current funding?" (Y/N for each)

Federal agency (e.g., NIH, NSF, DOD, DOE) — University fellowship/assistantship
Corporation / for-profit organization — Private foundation

Chart values:

Field	Federal agency	University fellowship/assistantship	Corporation / for-profit	Private foundation
BIOLOGICAL/LIFE	0.87	0.29	0.26	0.11
CHEMISTRY	0.87	0.27	0.10	0.22
PHYSICS	0.88	0.40	0.07	0.04
ENGINEERING	0.82	0.31	0.15	0.28
COMPUTER SCIENCE	0.87	0.33	0.10	0.06
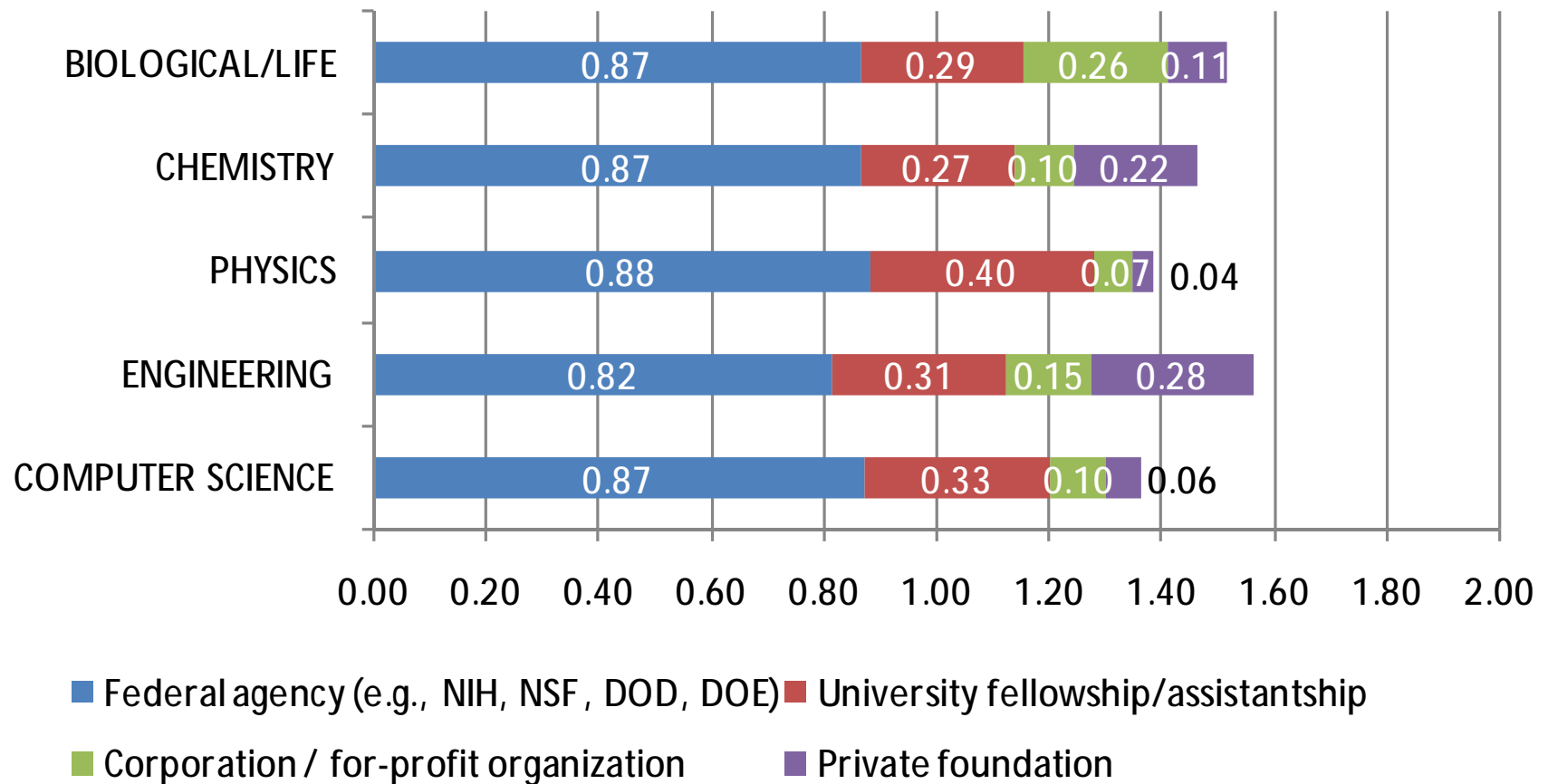
Who got the money? (PostDocs only)

"How involved were you in securing your most important source of funding?"
    Scale from 0 (not involved) to 100 (extremely involved)

Field	Value
BIOLOGICAL/LIFE	50.08
CHEMISTRY	37.52
PHYSICS	27.69
ENGINEERING	38.82
COMPUTER SCIENCE	29.03
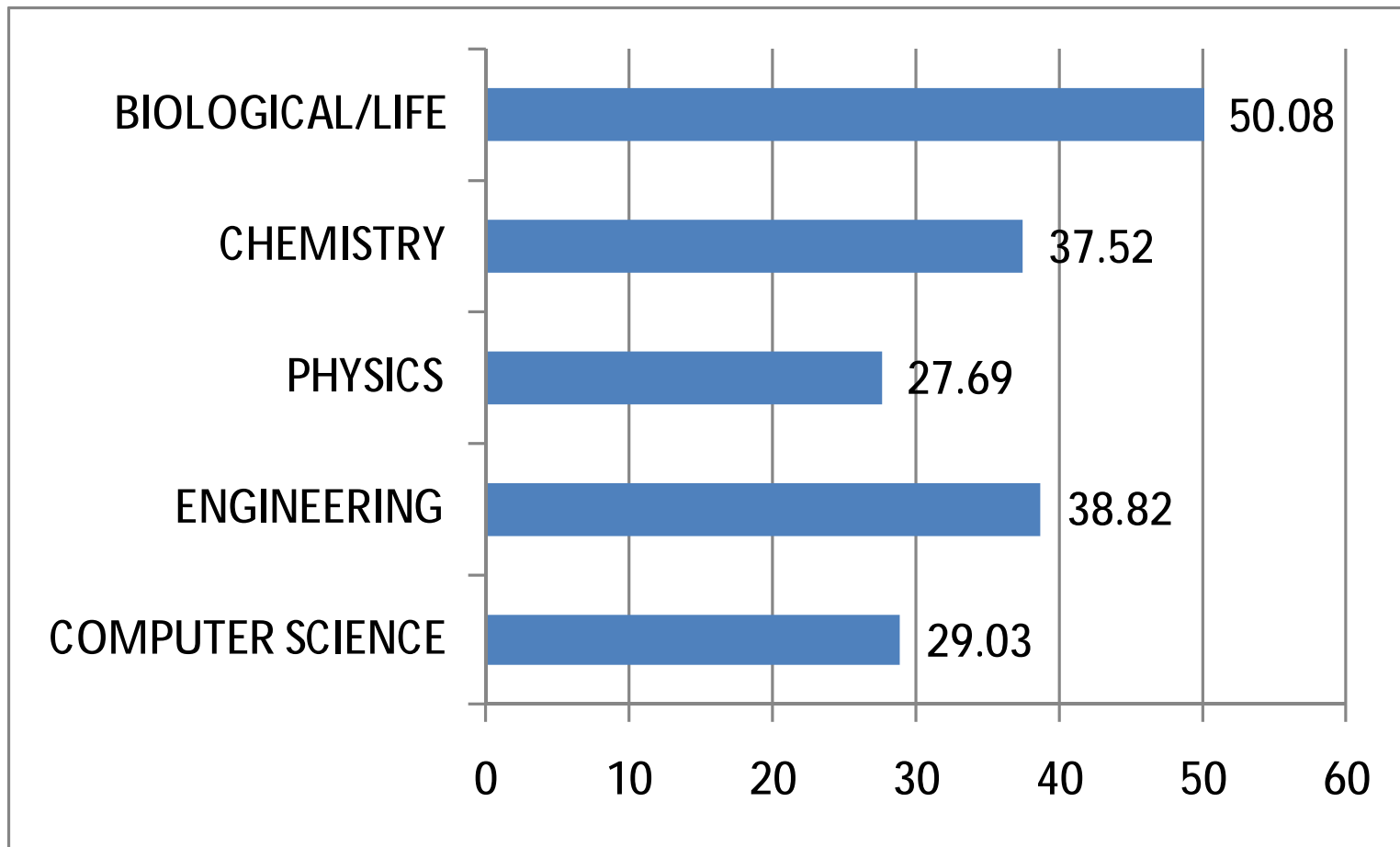
What do they do – and what are they interested in?

"To what extent do you agree or disagree with the following phrases regarding the nature of your current research:

- § My research contributes fundamental insights or theories (basic research)
- § My research creates knowledge to solve practical problems (applied research)

"When thinking about the future, how interesting would you find the following kinds of work?

- § … (basic research)
- § … (applied research)

Funding and type of work

	Life Sciences			
	PhD+PD curr_basic	PhD+PD curr_appl	PhD+PD int_basic	PhD+PD int_appl
	1	2	3	4
funding_government	0.215**	-0.018	0.067	0.014
funding_industry	-0.397**	0.528**	-0.263**	0.137
funding_foundation	-0.033	0.218**	-0.068	0.111
funding_university	0.124*	0.181**	0.08	-0.026
PostDoc	0.098	0.198**	0.350**	-0.02
Male	0.116*	0.163**	0.132*	0.095
Subfield	incl.	incl.	incl.	incl.
University	incl.	incl.	incl.	incl.
Observations	2,095	2,093	2,095	2,097

* significant at 5%; ** significant at 1%

Funding and freedom

"How much freedom do you have in <u>choosing</u> your research project(s)?

…in <u>influencing the direction</u> of your research project(s)?" (5-point scales).

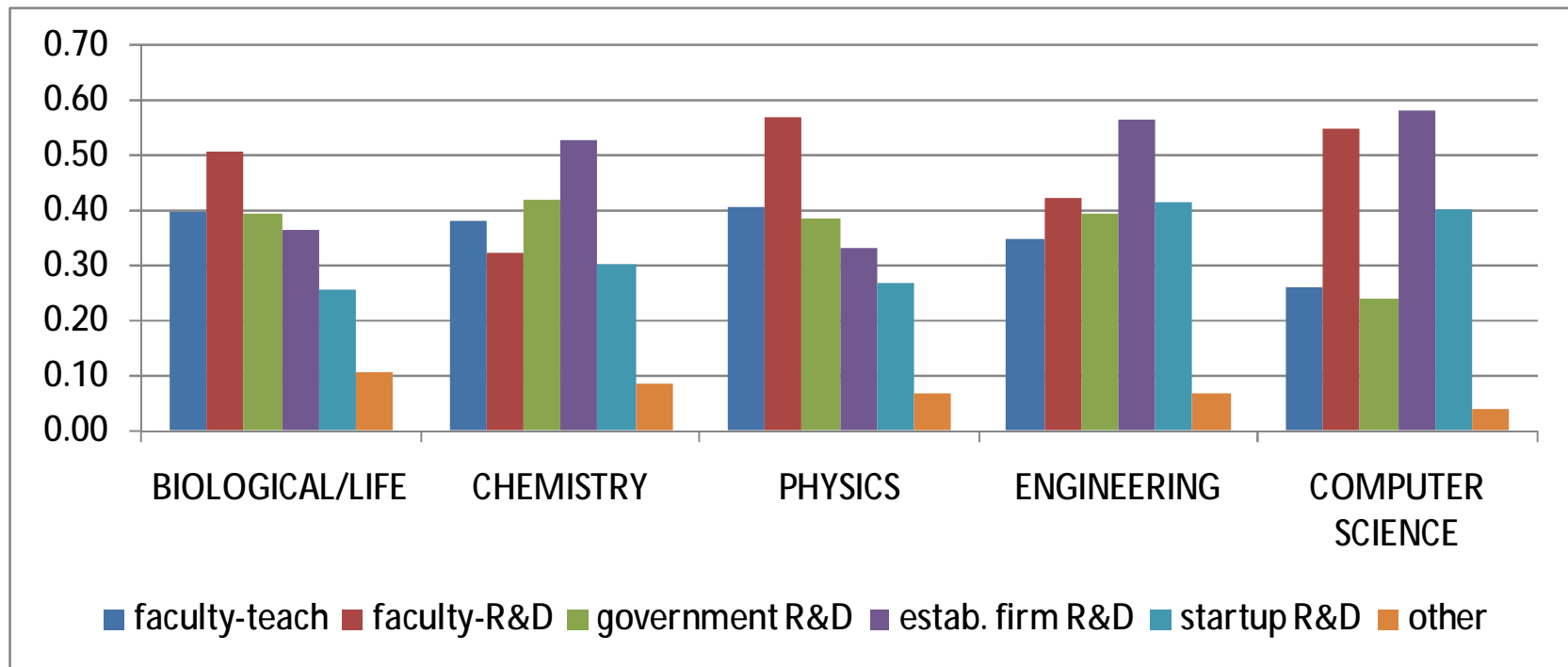|	Life Sciences					
	PhD+PD curr_choice 1	PhD+PD curr_choice 2	PD curr_choice 3	PhD+PD curr_shape 4	PhD+PD curr_shape 5	PD curr_shape 6
Total funding	0.096**			0.092**		
funding_government		0.007	0.157		0.039	0.189
funding_industry		-0.082	-0.337*		-0.076	-0.481**
funding_foundation		0.229**	0.191		0.221**	0.201
funding_university		0.091	0.354**		0.069	0.277*
Involvement in funding			0.047**			0.061**
PostDoc	-0.054	-0.055		0.035	0.028	
Male	0.190**	0.192**	0.276**	0.149**	0.150**	0.098
Subfield	incl.	incl.	incl.	incl.	incl.	incl.
University	incl.	incl.	incl.	incl.	incl.	incl.
Observations	2,095	2,095	584	2,095	2,095	582

* significant at 5%; ** significant at 1%

Most attractive careers (PhDs only)

"Putting job availability aside, how attractive do you personally find each of the following careers?"

- § Each career rated on a 5-point scale.
- § Figure: Percent of respondents who give their <u>highest</u> rating to a particular career (ties possible)

Funding and attractiveness of careers

	Life Sciences				
	PhD+PD faculty-teach	PhD+PD faculty R&D	PhD+PD govt R&D	PhD+PD est. firm R&D	PhD+PD startup R&D
	1	2	3	4	5
funding_government	0.107	0.071	-0.065	-0.11	-0.079
funding_industry	-0.12	-0.370**	-0.147	0.266**	0.282**
funding_foundation	-0.019	0.093	-0.03	-0.052	-0.093
funding_university	0.085	0.146**	-0.071	0.005	-0.086
PostDoc	-0.119*	0.466**	0.153*	0.091	-0.021
Male	-0.013	0.487**	0.005	0.082	0.287**
Subfield	incl.	incl.	incl.	incl.	incl.
University	incl.	incl.	incl.	incl.	incl.
Observations	2,098	2,098	2,098	2,098	2,098

* significant at 5%; ** significant at 1%

Thank you.

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What about "other" careers?

We allowed respondents to write down "other" careers they found attractive.

We coded these answers into common categories.

Other careers (PhDs only)

Other career	Freq.	Percent
Consulting	90	12%
Non Profit/NGO	78	11%
Policy	67	9%
Science writer	63	9%
Teacher lower education	56	8%
Entrepreneur	51	7%
Non-research	41	6%
IP/Lawyer	40	5%
Medical Practice	36	5%
Manager	25	3%
Finance	22	3%
Outreach	20	3%
Medical Research (not univ.)	12	2%
Homemaker	9	1%
Teacher academia (not univ.)	8	1%
Nonfaculty univ. research	6	1%
Other	109	15%
Total	733	100%

Career goals of PhDs…

Then:

§ "Thinking back to when you began your PhD program in [year], how certain were you at that time that you wanted to pursue the following careers?
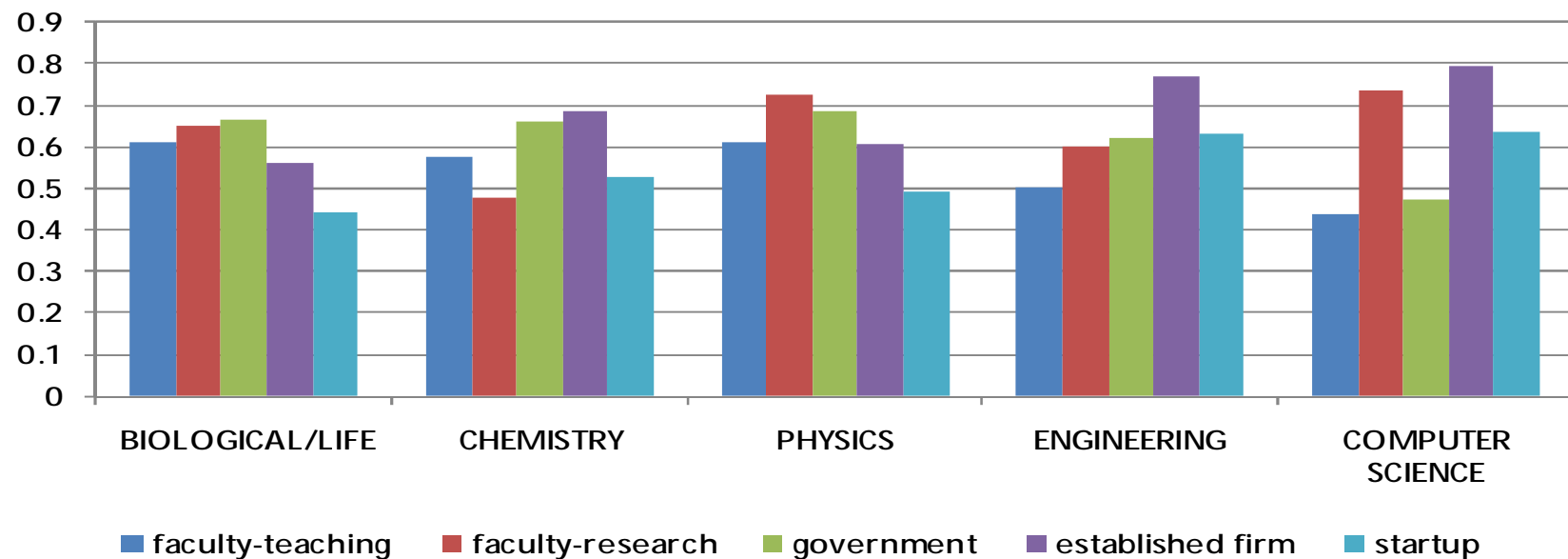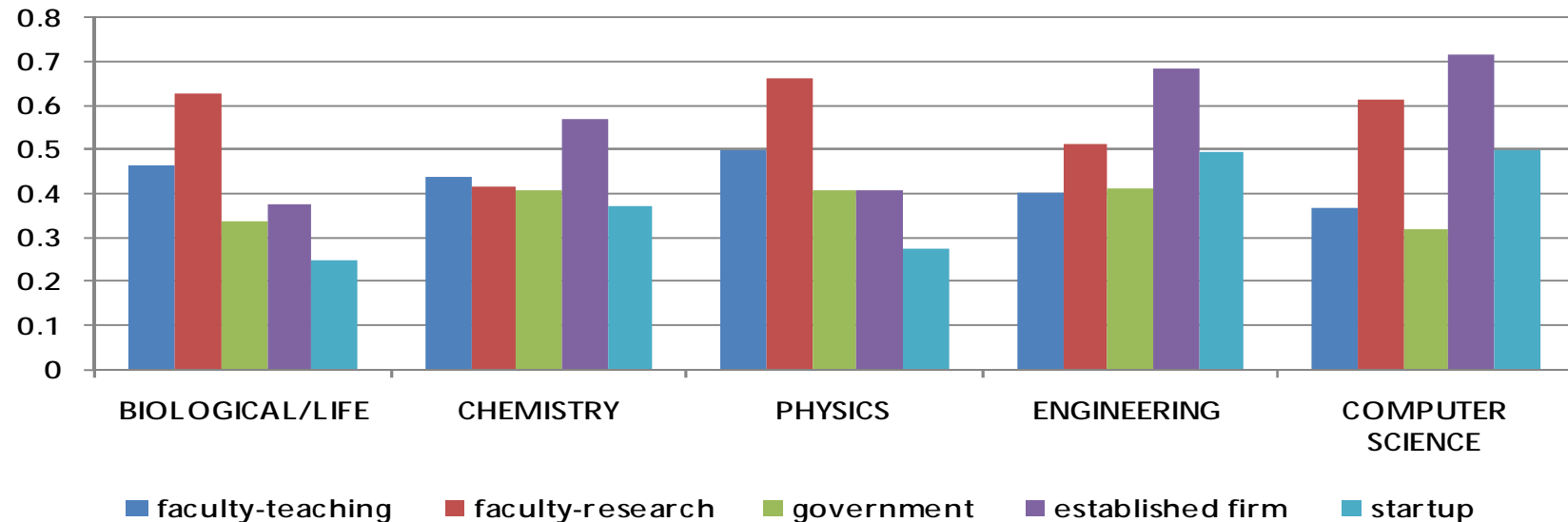
  § 5-point, recoded 0/1 such that 1=likely or certain to pursue

And now:

§ "Putting job availability aside, how attractive do you personally find each of the following careers?

  § 5-point, recoded 0/1 such that 1=attractive or extremely attractive

PhD career goals – start of program & now

Most likely careers (PhDs only)

"Everything considered, please rank the following careers from most likely to pursue (top) to least likely to pursue (bottom)". (Figure: Percent of respondents ranking a focal career as most likely)