

Career Development: Postdocs

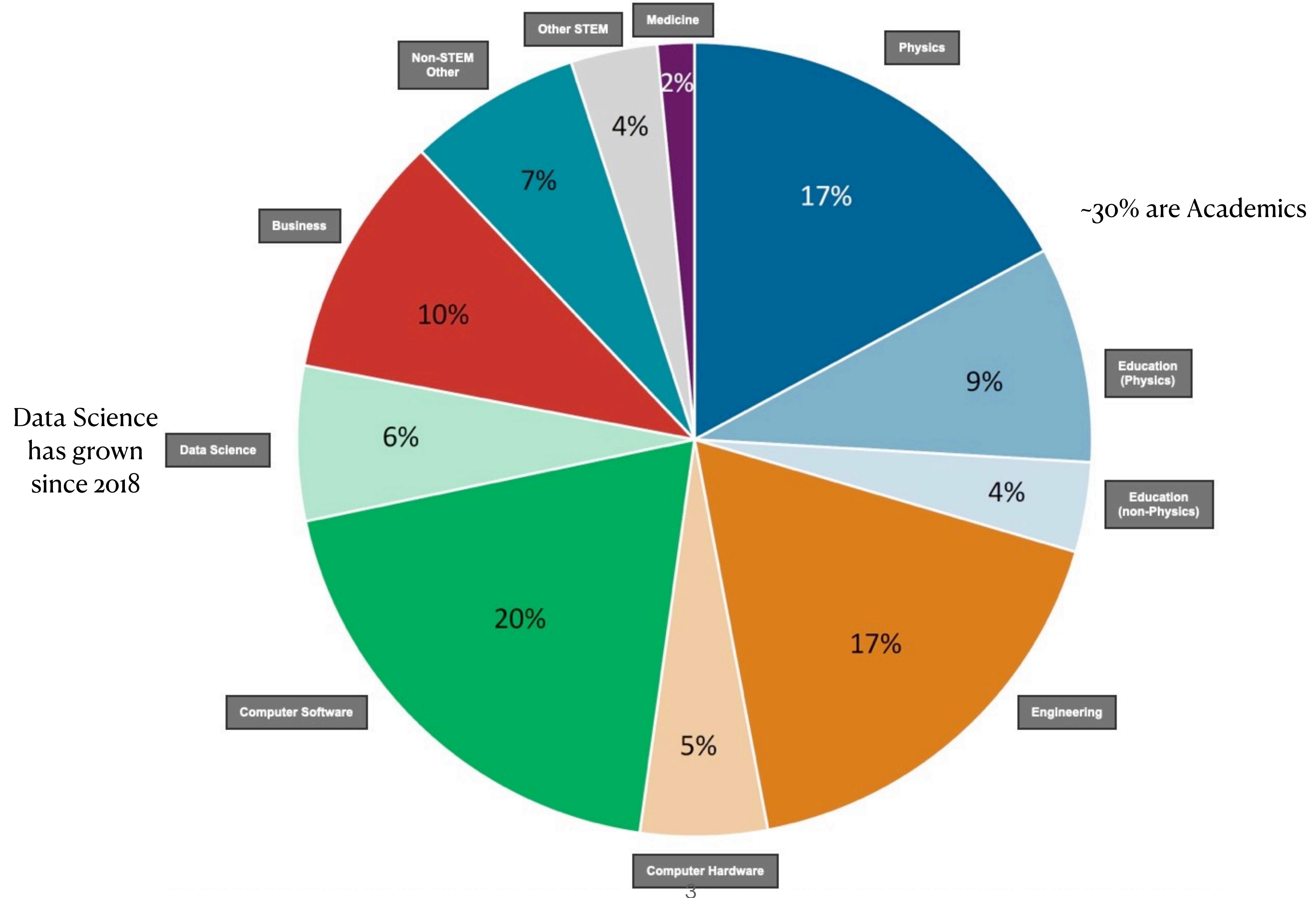
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Outline

- Career Paths
 - Some hard facts
 - Three Most Common Paths
 - Industry/Start Ups
 - Lab Staff
 - Academic Researcher - mostly what we will talk about today
- Your CV - Depends on your target
- The University Hiring Process
 - What typically is asked for
 - Getting on the short list
 - What happens at an interview
 - What they are looking for
 - The Funding Process
- Interview Roleplay

Employment fields for new physics PhD recipients in potentially permanent positions, classes of 2013 through 2018

Hover over field names to see more employment information



Three Common Paths: Industry/Start-Up

Industry/Tech Start-up - It turns out the commercial world likes to hire people who have:

- 1) Problem Solving Skills - finding answers to questions that no one knows the answer to
- 2) Technical leadership - organizing a team to work on/solve technical problems
- 3) Expertise and capabilities in Instrumentation, Computing Frontier (includes Machine Learning, AI and hardware) and Accelerators

Practical Advice Going to Industry/Start-Up

Stolen from my student->postdoc->Salesforce (he could buy us all without thought)

- Learn git
- Get a GitHub
- Put on it a practical project. Mention it in every interview/conversation
- A software CV derived from your GitHub
- Learn SQL
- Learn Python
- Learn to use Machine Learning/AI
- Have a profile on Linked In and the like and use Connections to search for opportunities.
- Networking is very important. Work your network!

Three Common Paths: Staff Scientist

- National Lab Staff/University Staff Scientist
 - Much National Lab Activities not in HEP. Initiatives in Quantum Information Science, AI/ML, exa-scale computing, accelerator light sources
 - Lots of folks who work for the lab or University are at the labs doing stuff
 - Maintaining the software and computing
 - Technical work on the detector, machine, and support infrastructure
 - Interfacing with experimenters to ease the use of lab resources
 - Expertise and capabilities in Instrumentation, Computing Frontier (includes Machine Learning, AI and hardware) and Accelerators
 - The national labs are always hiring and much like industry are looking for the technically minded who can solve problems independently
 - Often these jobs are skill based and thus they are looking for someone with a specific skill for a specific job, but want flexibility and ability to learn new skills as things change in time
 - Hiring process is similar to University Hiring minus Teaching but still look for Mentoring

Three Common Paths: Academic Research

- Academic Research - Tenure Track Professor
- What we most know about
- Jobs are rare and the hiring process is not user friendly
- Most of the advice we offer today is towards this goal
- We will arrange something in the future for the non-Academic path

Your CV

- **Academic CV** - length is as long as it needs to be
 - Name, details, and contact information
 - Education History
 - Work History
 - Teaching Experience
 - Grants and Awards
 - Honors
 - Publications
 - It is best to highlight the publications you actually wrote/contributed to at the top as they can easily get lost in a long list
 - Ideally these highlight your skills
 - Presentations

Your CV

- **Industry/Start Up CV should not be your Academic CV!**
 - Short, no more than two pages
 - Advice from the AIP Career Toolbox is golden: <https://www.spsnational.org/sites/all/careerstoobox/>
 - Contact Information
 - Technical Skills (programming languages, data visualization, data science, etc.)
 - Communication Skills (teaching, writing, public speaking)
 - Work experience history
 - Contacts/Supporters ideally tied to work experience
 - Random miscellany which shows you are a rounded person (hobbies, etc.)

Your CV

- CV's are idiosyncratic
- Get as many examples as possible from advisor/peers
- Examples should be as close to target as possible
 - Same country
 - Same field
 - Same institution
 - Same target job type

University Hiring Process

- **Typically you will be asked for:**
 - **Academic CV**
 - **Cover letter/Research Statement** giving research interests, resources needed, and prospects for funding
 - **Statement on teaching**
 - Universities are starting to ask for a **Statement on Diversity** specifying your plans to enhance diversity in your field
 - **Names** of those willing to write letters in your support
- **Read the advertisement carefully.** Much can be learned and leave nothing requested out.
- **Take advantage of insider knowledge.** If you know someone or multiple someones do not hesitate to get in touch to ask how you should tailor your materials to be attractive to the search committee.
- Search committee reviews all the applications and determines a short list of those invited for interview

University Hiring Process

Getting on the short list

- The highest hurdle
- Insider support can be key - talk to insiders!
- CV has to show a career with broad experience and impact
- Research interests have to be clear
- Resource needs have to not be outlandish - talk with mentor
- Your materials have to be well written (get folks to review), clear, and show thoughtfulness especially on how research will be funded
- Letters in your support:
 - Broad set (outside your group, great if it includes someone not in your collaboration, beyond your postdoc and grad student mentors, folks you know who write well, people who know your work are better than famous people who only know your name)
 - Ask well in advance if they are willing to write letters for you
 - Clearly tell them what job you are applying for

University Hiring Process

- **What you will typically be asked to do if invited for Interview:**
 - **Give a Colloquium talk**
 - Often a stand in for your ability to teach
 - Must be interesting/engaging at the advanced undergraduate level
 - If not good, it can be fatal
 - Practice, practice, practice to senior people, peers, students, even non-HEP folks
 - Give a **Research Resources and Funding Plan** presentation and Q and A to the Physics Faculty
 - Assess if you will be able to pull your weight in the Department
 - Your ability to present your research to other scientists
 - Your consideration of the Funding Process
 - Get advice from your mentor/experts in the target country's research funding process

- **Many one-on-one interviews**
 - All the members of the Search Committee
 - Department Chair
 - Dean
 - Other faculty members/senior HEP group members
- Perhaps an **informal meeting with Post-docs/Grad Students/Undergraduates**
 - Not being nice to students can be fatal
- **Lunch/Dinner** - Are you rounded? Will you be a good colleague?

University Hiring Process

What are they looking for?

- University hiring is complex; there are many “stake holders” with competing/contradictory interests
 - **HEP Group** - Most hires in experimental HEP are to join an existing group thus they are usually looking for a colleague who can:
 - Contribute to an existing/future construction/up-grade project
 - Expand or reinforce the groups unique capabilities
 - Independent physics analysis interest
 - Mentor graduate students
 - Get tenured
 - Get advice from them on what to say to the Department Chair
 - Typically a member of this group will be heading the search committee and have the most say in who gets an offer

- **Physics Department Faculty** wants a colleague who can “pull their weight” and enhance the reputation of the department
 - Need to demonstrate effective teaching - good teaching statement and a good colloquium level talk
 - Need to show independence as this is how Assistant Professors are assessed for tenure/promotion. Support letters are important here.
 - Note how this contradicts what the HEP Group is looking for
 - Need to be willing and able to serve on thankless tasks which keep the Department running (recruiting undergraduates, writing the qualifier exam, serve on the Colloquium Committee, etc.) - they look for evidence you have done thankless service in the past
 - Need to be collegial
 - University hiring decisions are usually “permanent” like a marriage. Are they going to be happy talking to you in the halls and at faculty meetings in year 1, year 5, year 10, year 20...
 - Look for evidence of good behavior in lunch/dinner talk, probe your personal life, try to find commonalities (same school, mutual friend or acquaintance, same cities, same conferences...), evidence of rounding (are you aware/interested in science results outside your field? Do you have other interests?...)
- Typically other members of the faculty will be on the search committee. Almost always there is a member who is not in HEP who may have veto power over the choice

- **Department Chair** wants some one who will get tenured.
 - Can you teach effectively? Do you have teaching experience? Is your statement about teaching good? Was your colloquium interesting to/understandable by the undergraduates?
 - Can you get funded? Have you any experience in the funding process? Can you write effectively? Can you explain your research interests clearly and in terms a non-expert can understand? Have you even thought about this?
 - What do you need to carry out your research? A lab? Special equipment? Staff with special skills? How do you plan to get and take care of that? How many postdocs and graduate students?
 - Do you have a reputation that extends beyond a small circle? Have you given talks at conferences? Is your research broadly interesting in your field? Support letters are important here.
 - Are you organized and can you effectively manage your time? There will be lots of demands on your time as an Assistant Professor.
 - Do you care about students? Have you worked with undergraduates? Have you worked with graduate students?
 - Are you a jerk? Don't be a jerk especially on interviews.
 - Get advice from this person on what to say to the Dean.

- **Dean** (note, this is only conjecture since none of us are Deans. I usually get confused when I analyze the thought process of Deans)
 - Can they explain their research in a way that is coherent and compelling to someone way outside their field?
 - Is this someone who can be tenured (teaching, research, service)?
 - Do they have a plan to get funded? Will they be a source or sink of money?
 - Do they have interest in teaching and mentorship? Any experience?
 - Do they have any skills, talents, features I can exploit to get them to do service work to attract students, to work on a time consuming committee, and/or to do anything else I can think of to help me become Provost?

The Funding Process

- Two sources for new faculty:
 - **An initial University start-up package**
 - When you get an offer. You should already know what you need when this discussion starts. See the Cover Letter/ Research Statement included in your application; should be no surprise here.
 - Typically includes support for a postdoc for 1-2 years, 2 years of graduate student, travel for the group, local computing resources, technical
 - Meant to support your research until you get external funding
 - **Research Funding Agency** such as in the US the Department of Energy (DOE), National Science Foundation (NSF), etc.
- Here a short introduction to the second focusing on the US DOE/High Energy Physics (HEP) process. Every country has its own way of doing things but there are many similarities.
- Basis is Peer Review - think like paper review, but you get no chance to revise
- DOE/HEP Funding Opportunity Announcements (FOA) can be found here: <https://science.osti.gov/hep/Funding-Opportunities>
- Most recent standard FOA is https://science.osti.gov/-/media/grants/pdf/foas/2021/SC_FOA_0002424.pdf. The FY22 one should be out soon and will be incrementally different from FY21
- FY? Fiscal year starts on 1 Oct when ideally the budget for next calendar year is known and money can start being spent.

- The usual funding time line is:
 - FOA appears in July
 - Proposals are due ~1 Oct
 - Proposals are sent out for mail in reviews mid-Oct, due mid-November
 - Review Panels meet in December and January
 - Combine mail-in reviews and panel reviews
 - At least 4 reviews of each proposal
- Standard basis of review is:
 - Scientific Merit (30%) - Is the science interesting and valuable?
 - Appropriateness (25%) - Are the methods being proposed proper?
 - Competency (20%) - Are the proposers competent to do the work?
 - Budget (15%) - Is the budget reasonable?
 - Relevance (10%) - Is the science relevant to DOE/HEP mission? This has a binary component. If the answer is “No” then the proposal is not likely to get funded.

- Panel ranks proposals into four categories:
 - Must fund
 - Should fund
 - Fund if available resources
 - Do not fund
- Sub-categories are budget related:
 - Fund at level of requested budget
 - Fund at mildly adjusted budget level
 - Fund with major budget adjustment
- This is typically done in a couple of rounds with the first being driven by numerical scores and then adjustments based on a free for all discussion.

- Program Managers then take the panel advice and start funding proposals starting at “Must Fund” at “Requested Budget” going down to “Fund if available resources” at “Major budget adjustment”.
 - Typically have $1/2$ to $2/3$ budget to fund all received proposals. Made to stretch by budget adjustments to fund $2/3$ to $3/4$ of received proposals. Fund all in “Must” and “Should” categories at some level.
- US DOE/HEP divides proposals into six “Frontiers”
 - Intensity Frontier
 - Energy Frontier
 - Cosmic Frontier
 - Theory
 - Detector Development
 - Accelerator
- Each Frontier has its own Program Manager with a budget decided at the top level; methodology for this is opaque to me. There is a pool of general funds controlled by the HEP Research Director which the Program Managers can petition for if their budget is too small to cover what they want to fund.

- Around 1 April funding decisions are announced by the Program Managers.
 - A great deal goes on under the covers to make this happen
 - Discussion within the “Frontiers” on how to fund all we would like to fund
 - Discussion among the “Frontiers” on how to fund all we would like to fund
 - Ultimate decision by Director
 - Much “paper” work to check written reviews and write recommendations for funding levels for each proposal.
 - Much bureaucracy to send money from DOE to Universities.
- March and April is also the time DOE is writing budget requests for the next fiscal year and for the next two fiscal years after for “Projects” which need a long term funding profile to work efficiently

Funding Advice

- **Get help.** The FOA is daunting. Starting from an existing template is essential.
- **Read the FOA carefully. Make sure all required is there.**
- You must be “Relevant”. Great proposals which are not on DOE/HEP mission do not get funded.
- **Review your proposal before you submit. Experienced colleagues, collaborators, university research offices often will help with proposal review services. University grant writing seminars can also be helpful.**
- **Start early to give time for review and revision.**
- Best proposals tell a coherent story of a physics interest leading to work on experiment X to do data analysis Y by methodology Z to get result A.
- **Talk to the relevant Program Manager**
 - At the annual DOE HEP Principal Investigators (PI) Meeting held in August
 - Email for a one-on-one meeting
 - Advice up until proposal is submitted, then can only talk about process

Demonstration of Common Interview Questions

Professor Griswold will play the interviewer, Tom will give answers, we will ask you all for better answers, and I will comment on the questions.

Tell me about your research.

Your experiment has 1000 members and 1000 co-authors on every paper. What is your individual contribution ?

How do you plan to get funding for your research program?

What University resources do you need to carry out that program?

What is the long term prospects for the research you are doing?

What will your research group look like? How does that fit in with the existing group here?

What is your teaching experience ? Have you ever mentored a student? What undergraduate courses would you like to teach ?

Tell me about your leadership activities.

What do you do to relax/de-stress?

Tell me about your research.

- This is a soft ball.
- Should be able to talk clearly and crisply about your research interests in terms another physicist can understand.
- If this is not good then things are likely to not go well.

Your experiment has 1000 members and 1000 co-authors on every paper. What is your individual contribution?

- Most physicists in other fields work in small groups and their papers have fewer than 10 co-authors. They genuinely do not understand how our field works.
- Here they are trying to understand what you actually do and see if you can explain it in a way they can understand
- Also looking for evidence of scientific independence; do you have your own interesting ideas about science?

How do you plan to get funding for your research program?

- This question is designed to figure out if you are aware and have thought about the funding process.
- Be aware and think about the funding process.
- Advice from your mentor, other senior researchers leading research groups, insider advice...
- Check out the DOE/HEP Funding Opportunity Announcement page and similar at other funding agencies

What University resources do you need to carry out that program?

- This is again designed to see if you understand what is needed to be a successful Academic researcher.
- It should agree with your written Research Statement. Surprises are unwelcome.
- Has to be reasonable. Check with mentors and insiders as to what is reasonable.

What is the long term prospects for the research you are doing?

- This is a very hard one.
- You can see what you will be doing for the next 5 years or so, but what about after that?
- Does the research technique you are using have other applications?
- Will the physics you do continue in some other form after the current project has ended?
- Insider advice on long range plans is very helpful here.

What will your research group look like? How does that fit in with the existing group here?

- This is another question designed to see if you have thought about these things.
- Do you realize you will no longer be able to devote all your time to research and thus will need a group to carry out your research?
- Mentoring students is perhaps the most important thing Academic Researchers do. Is that clear to you?
- Have you talked with the existing group about how you would fit?

What is your teaching experience ?

Have you ever mentored a student?

What undergraduate courses would you like to teach ?

- Designed to test your commitment to teaching.
- Do you have any teaching experience?
- Do you have a broad view of teaching? It is not just class room work, but includes many other things including mentoring, delegating responsibility, and group work.
- Do you want to teach something that is not graduate level in your field.

Tell me about your leadership activities.

- The job is a leadership role.
- Do you have leadership activities?
- Again this is broad and can be many things such as group leadership, mentoring students, conference organization, etc.

What do you do to relax/de-stress?

- Question that probes at the edge of legality trying to see if you are rounded and are more than just a research physicist.
- Does this person have a reasonable work/life balance? This is actually quite important and is difficult to discover in an interview.
- Hiring an Academic Researcher is a long term commitment
- Do I want to be with this person for decades to come?
- Is there more than what appears in the written material?
- Can this person talk about something else rather than physics?