School project: how to solve any of these open questions?

Form groups of about six, designate a Chair of the committee

A private foundation decided to contribute to understanding of fundamental physics and allocated 200 billion dollars.

They formed ten committees of scientists and gave each 10 billion dollars with 100 billion kept in reserve fund.

Each committee can decide to allocate the funds in any way they want with the only goal is to maximum the chance of discovery new physics and /or solving at least one open problem of particle physics.

You are these committees. Make a *specific* plan – what will you do? You can pick one problem or all of them. You can build whatever you decide, send things to space, organize universities, theory institutes, etc. You can decide to invest in one solutions or many.

Each committee will prepare a brief presentation by Thursday discussion section (use slides). 5 min + 5 min for questions. We will continue on Friday morning.

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For each item on the list describe:

A. What you are building/organizing and order of magnitude cost.
   If 10 billion is not enough apply for all or part of the reserve fund of 100 billion, explain why you need it.
B. What problem can it potentially solve?
C. How will it solve this problem?
D. For experiments and space missions, mark rough “technology readiness” level

1: We know how build it and just need the money.
2. There are prototypes and we need 5-10 years of R&D to get to full design before construction.
3. There is a design with a number of problems to solve but should be possible to do so in 10-15 years.
4. There is an idea. We do not really know how to build it but this should not be impossible at the present level of technology (20 year timeline).
5. Theorists wrote a paper with a great idea. Not sure exactly how exactly will this work but somebody will figure this out in the next 30 years, let start now.
6. Not sure what experiment will do this, but here is what we need to measure.
7. Higher levels are considered science fiction (avoid for the purposes of this assignment).

Do not worry too much about the cost estimate, just be aware of the approximate order of magnitude, i.e. is it in millions, hundreds of millions or billions. Use euros or USD. Here are some examples.

US major experiment definition start from ½ billion USD. This includes collider upgrades, future CMB experiments, neutrino detectors, telescopes, gravitational wave detectors.
LHC cost: 4.75 billion. LIGO: 1 billion. 2022 CERN budget 1.5 billion (in a year).
Dark matter detectors. Light DM to WIMPs 10 – 100 million (LZ seems to be 67 million).
More if you need to dig new huge caverns 2 miles underground ☺
Axion detectors a few million to 50 million for a axion facility,
IceCube neutrino detector at South Pole construction cost 279 million.
Hyper-Kamiokande 700 million construction cost.
Muon g-2 , proton EDM 100 million scale.
Molecular EDMs – 5-10 million, atomic clock 1-2 million, nuclear clock 10-15 million to build prototypes.
For smaller experiments these include full operational cost for several years rather than construction cost.
Sending things to space is expensive for now.
Webb telescope 10 billion.
MicroSCOPE satellite mission (EEP test) 140 million euro.
Cold atom lab on ISS 50 million, high-precision clock with link to optical frequency Earth on a satellite in GEO orbit 400 million estimate.

Institutes: 25 million for 5 years for institute with 30 PIs only gives extra 100k/PI/year.