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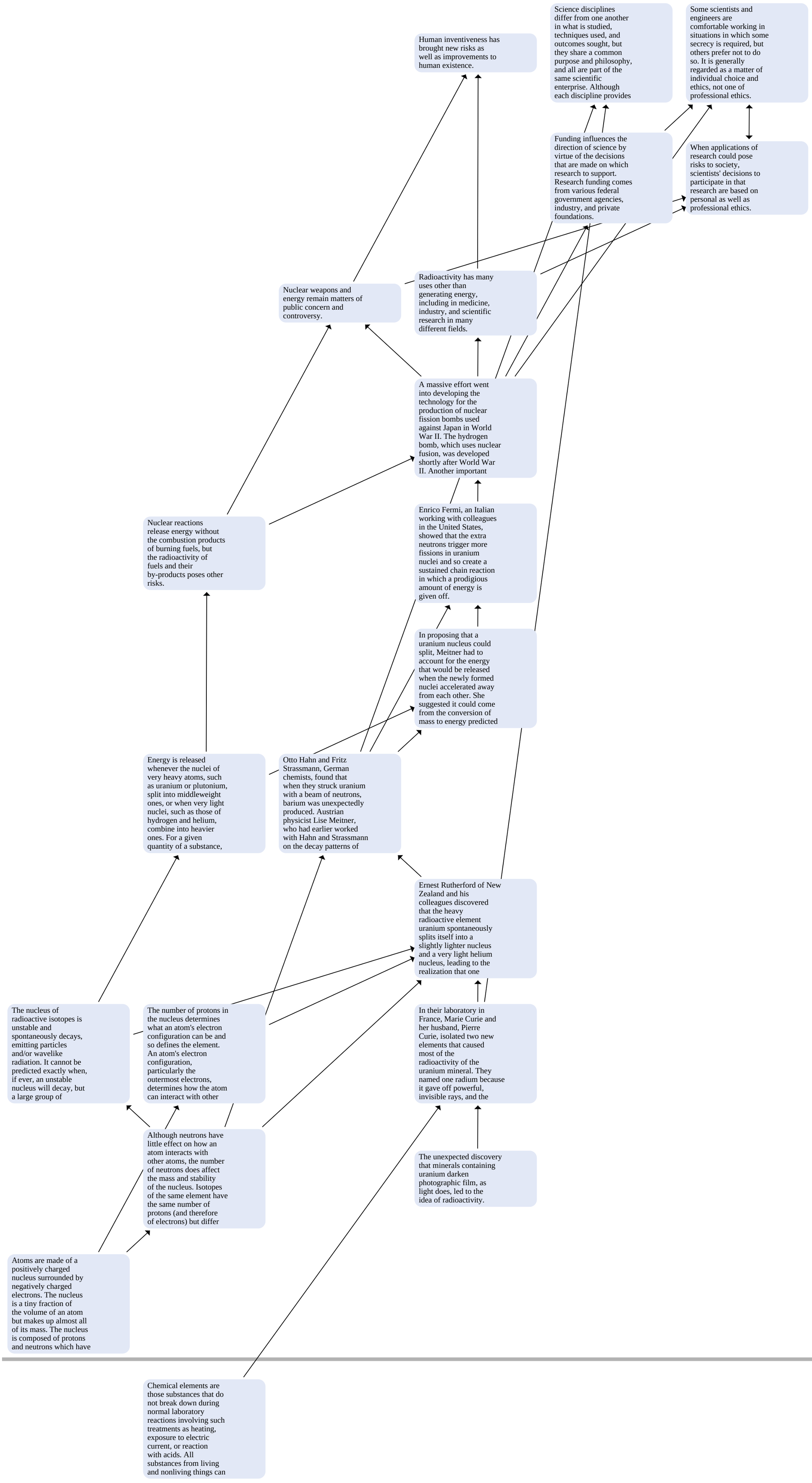
Science disciplines differ from one another in what is studied, techniques used, and outcomes sought, but they share a common purpose and philosophy, and all are part of the same scientific enterprise. Although each discipline provides
Some scientists and engineers are comfortable working in situations in which some secrecy is required, but others prefer not to do so. It is generally regarded as a matter of individual choice and ethics, not one of professional ethics.
Human inventiveness has brought new risks as well as improvements to human existence.
Funding influences the direction of science by virtue of the decisions that are made on which research to support. Research funding comes from various federal government agencies, industry, and private foundations.
When applications of research could pose risks to society, scientists' decisions to participate in that research are based on personal as well as professional ethics.
Radioactivity has many uses other than generating energy, including in medicine, industry, and scientific research in many different fields.
Nuclear weapons and energy remain matters of public concern and controversy.
A massive effort went into developing the technology for the production of nuclear fission bombs used against Japan in World War II. The hydrogen bomb, which uses nuclear fusion, was developed shortly after World War II. Another important
Enrico Fermi, an Italian working with colleagues in the United States, showed that the extra neutrons trigger more fissions in uranium nuclei and so create a sustained chain reaction in which a prodigious amount of energy is given off.
Nuclear reactions release energy without the combustion products of burning fuels, but the radioactivity of fuels and their by-products poses other risks.
In proposing that a uranium nucleus could split, Meitner had to account for the energy that would be released when the newly formed nuclei accelerated away from each other. She suggested it could come from the conversion of mass to energy predicted
Energy is released whenever the nuclei of very heavy atoms, such as uranium or plutonium, split into middleweight ones, or when very light nuclei, such as those of hydrogen and helium, combine into heavier ones. For a given quantity of a substance,
Otto Hahn and Fritz Strassmann, German chemists, found that when they struck uranium with a beam of neutrons, barium was unexpectedly produced. Austrian physicist Lise Meitner, who had earlier worked with Hahn and Strassmann on the decay patterns of
Ernest Rutherford of New Zealand and his colleagues discovered that the heavy radioactive element uranium spontaneously splits itself into a slightly lighter nucleus and a very light helium nucleus, leading to the realization that one
The nucleus of radioactive isotopes is unstable and spontaneously decays, emitting particles and/or wavelike radiation. It cannot be predicted exactly when, if ever, an unstable nucleus will decay, but a large group of
The number of protons in the nucleus determines what an atom's electron configuration can be and so defines the element. An atom's electron configuration, particularly the outermost electrons, determines how the atom can interact with other
In their laboratory in France, Marie Curie and her husband, Pierre Curie, isolated two new elements that caused most of the radioactivity of the uranium mineral. They named one radium because it gave off powerful, invisible rays, and the
Although neutrons have little effect on how an atom interacts with other atoms, the number of neutrons does affect the mass and stability of the nucleus. Isotopes of the same element have the same number of protons (and therefore of electrons) but differ
The unexpected discovery that minerals containing uranium darken photographic film, as light does, led to the idea of radioactivity.
Atoms are made of a positively charged nucleus surrounded by negatively charged electrons. The nucleus is a tiny fraction of the volume of an atom but makes up almost all of its mass. The nucleus is composed of protons and neutrons which have

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Chemical elements are those substances that do not break down during normal laboratory reactions involving such treatments as heating, exposure to electric current, or reaction with acids. All substances from living and nonliving things can