Eve of the Millennium

Science and Technology (Public)

Greensheet

Science, n. *Accumulated and established knowledge, which has been systematized and formulated with reference to the discovery of general truths or the operation of general laws; knowledge classified and made available in work, life, or the search for truth; comprehensive, profound, or philosophical knowledge.*
Webster's Revised Unabridged Dictionary (1913)

Every piece of scientific knowledge can be succinctly expressed as a single English sentence—a Scientific Fact™. Any given Fact involves some of each of the four sciences—Biochemistry (B), Electronics (E), Physics (P), and Psychology (Ψ). We express this by saying that Fact $B^bE^eP^p\Psi^\psi$ has b bits of Biochem, e of Electronics, p of Physics, and ψ of Psych (whole numbers). The *level* of a Fact is the total #bits in it, $b+e+p+\psi$. Conveniently enough, there's exactly one Fact for each (b, e, p, ψ) with level greater than one.

(Biochemistry covers all of Biology and Chemistry, not just their overlap; if you see something that says Biology or Chemistry, this is the Science it means.)

Some of the cross-sciences are more obvious than others. A few examples for each: Bioelectronics (BE) includes pacemakers and most other artificial internal organs, cybernetics, etc. Biophysics (BP) (really bio-chem-physics) covers chemical and nuclear explosives, much materials science, artificial limbs, medical radiation. Psychobiology ($B\Psi$) includes neurobiology, neurochemistry, and psychoactive drugs. Electrophysics (EP) also covers some nuclear and explosives areas, as well as general uses of radiation/radio/radar, electronic warfare and counterwarfare. Psychoelectronics ($E\Psi$) focuses on user interface issues, direct or indirect interactions between mind and machine. Psychophysics ($P\Psi$) studies sensory perception (e.g. that perceived sound intensity is logarhythmic in energy is a real-world psychoacoustical finding).

Obviously many of those have further overlap; presumably if you want to directly plug a brain into a computer you'll want $BE\Psi$, and if you want a drug to alter perception you'd go for $BP\Psi$. Such deep crossovers are not yet well-explored.

The Facts of level two have all been discovered and are known to be:

B ...
B^2 ...
E ...
E^2 ...
P ...
P^2 ...
Ψ ...
Ψ^2 ...
BE
BP
$B\Psi$
EP
$E\Psi$
$P\Psi$

As you see, while Facts are grammatical sentences, they don't always make much sense[1]. The obviously scientific words in them do indicate their content—that is, what the Fact is about, what kinds of things it's useful for. For instance, if $B^2E\Psi^4$ (no Physics, some Electronics, more Biochem, even more Psych) turned out to be "*Cerebral stimulus* fits smoothly with *behavioral feedback* and random *inductive memory* to large *circuits*," it would be a good idea to worry about brainwashing machines. Facts near each other (similar (b, e, p, ψ)) will have similar terms in them. [2]

The quest for knowledge (or money, or power) will undoubtedly lead you to seek new Facts. You'll need to use old Facts, scientists, RTIs, and Labs to do experimental research.

For each of the four Sciences there's one basic science skill; if you have it, it will have some level indicating how good you are at it, e.g. "Physics 3." A typical competent scientist has skill 4, top people in a field can get up to about 6. Grad student skills tend to be around 2.

For each of the sciences there's also exactly one kind of RTI[3]—i.e. there are Physics RTIs, Electronics RTIs, Biochem RTIs, and Psych RTIs, but there aren't capacitors vs diodes. RTIs are normal, non-bulky items, represented by item cards as usual. There are also STIs[4], but we'll cover those later.

To discover a new Fact, you need one of the Facts right next to it (that is, plus or minus one unit of one science) and to do an Experiment for the science they're different in (e.g. $B^3P \longleftrightarrow B^3P^2$ takes a Physics Experiment either way; $B^3P \longleftrightarrow B^3PE$ takes an Electronics Experiment either way). This must be done in a Lab that has the Experimental Science (note most Labs do more than one science).

**** list the Labs here or in the rules or in the scenario, plus on the map ****

With all the scientists who will be Experimenting in the Lab, you announce what Fact you have and what it is, and perform the verification *** write verification mechanic *** on it.

You must have RTIs that at least match the higher Fact ("match" means that if the Fact has n bits of some Science, you have n whatevers of that Science) present; they will not necessarily be consumed.

The scientists must scientifically expend Creativity that at least matches the Fact. Expending Creativity or RTIs for a Science takes skill in that Science—the skill level is the maximum amount of Creativity, and the maximum number of RTIs, you can expend for that Science in any given Experiment. If you have multiple Science skills, you can use as many of them as you like in each Experiment, assuming you have enough Creativity available. Many scientists also have further scientific skills.

For each Science in the Fact, the total of (Creativity spent [brainstorming] + RTIs *destroyed* by a scientist [trial and error] + money/30 [computer simulations]) must be *double* that Science in the Fact; it must be *triple* for the Experimental Science.

So, if you go for pure brainstorming, then you have matching RTIs just sitting there (unconsumed) and you Creatively double-match the Fact and triple-match the Experimental part. If you go for pure trial and error, then you single-match in Creativity, and you burn your matching set of RTIs, and you burn another set for the Experimental Science. If you go for pure computer simulation, you have matching RTIs sitting there, you single-match in Creativity, and you spend $30 *$ (Fact level + experiment level) money.

If a Lab has two Sciences, then after the minimum for each is satisfied (Creativity equal to it expended, and RTIs equal to it present), further Creativity or RTIs expended for either one may be used instead for the other at half effectiveness. Expenditures via Tools cannot be changed this way.

[1] The GMs generated them by computer.

[2] Obviously science hasn't always worked the same way; you will not during game double and triple the total scientific knowledge of the world. Scientific progress goes in phases; calculus and other cool math moved it from one phase to another, as did the scientific method. With the discovery of the last level-two Fact, the last phase ended and the new phase, which will last until the Facts are filled in through level nine, began.

[3] Random Technical Item; a sorta technological thingy whose exact nature you don't care about too much, but which you can use to do science stuff.

[4] Specific Technical Items

An item marked "Tool" can be used to aid in either Experiments or Construction (see below) or both; specifics will be on the item card. General restrictions which always apply unless special skills are involved: Only people contributing Creativity to the Experiment can use a Tool for it (the Tool may be what allows them to do this); each person may only use one Tool at a time, each Tool may only be used by one person at a time. Any given Experiment cannot benefit from two of the same type of Tool, and the maximum number of Tools is half the level of the higher Fact (round down). Finally, if the effect of the Tool is to let you get extra points for a particular Science, these points may *not* be switched to another Science of the Lab.

*** how to actually get the fact, ie look it up in the lab book ***

One thing people often want to do with Facts is build Devices. You must have complete blueprints for the Device; "complete" means that it has all the information the GMs put on the original, and no extraneous information. When you get a blueprint, it and the information on it are completely in game; copy it, falsify it, etc. as much as you want, but you'd better be able to reconstruct the original when it's time to build, or you're screwed. What the GM really wants to see is something that looks just like the GM copy they've got, so be conservative. The blueprints will have an imperfect, incomplete description of the Device, and a list of what Facts are required to build it, which tells you everything you'll need (see below).

Come to the GM room and give us the blueprints you're about to use. We will look at them and then give them back to you along with an envelope, which you don't get to look in yet—this does not (yet) exist in game. Go to a Lab of the Science most heavily involved in the Device (more bits of it in the Facts than of anything else; you pick if there's a tie) with some Scientists, some RTIs, and one STI for each Fact. A Fact in which one Science is a majority needs an STI of that Science; other Facts need an STI crossing the top two Sciences involved (you pick if there's a tie). (Fact B^5P^3E takes a pure-Biochem STI; Fact $B^5P^3E^3$ takes a Biophysics or a Bioelectronics STI.)

The RTIs must match the total Facts. The total skill present in each Science must be at least the *maximum* of that in any of the Facts. So a Device with B^3P^2 and B^4E^3 takes 7 Biochem, 2 Physics, and 3 Electronics RTIs; required total skill is 4 Biochem, 2 Physics, 3 Electronics. *Following a blueprint does not use any Creativity.*

Verify each of the Facts. Put the blueprints you showed the GMs out on the table with the parts. Take a deep breath and open the envelope we gave you (you could stop at any point before this, but not now).

If your blueprints are valid, the envelope will contain an item card for the Device. Good for you; attach the item card to the envelope, and stick the RTIs and the STIs inside the envelope. You now have a working Device. The item card will say exactly what it is, what it does, and any requirements there are to use it, and have a copy of the blueprints.

If your blueprints weren't valid, the envelope will contain a card telling you so. Choose one-third the RTIs (round down) to save; the rest are destroyed. The STIs all remain.

Anyone can pull parts out of a Device; if you do, write "broken" on the item card (but keep it attached to the envelope). To remove an RTI, pull out two of the RTIs (your choice), destroy one (your choice), and keep the other. Any STIs you remove are destroyed. You may keep removing pieces from a broken Device the same way.

If you have a working Device, you can Experiment on it in any Lab to learn its Facts. A careful probe for a Fact from the Device requires the appropriate STI (as for building), skill matching the Fact, and (Creativity + supercomputer use) double-matching the Fact. The STI is consumed.

If you have a working Device and you're in a hurry, you can learn how it works by tearing it apart in a Lab. This utterly destroys the Device (leaving no remains), but doesn't take any Creativity, RTIs, STIs, or computer time. For each of the Facts, if the total skill present at least matches it, you get it. Isn't it cool destroying someone else's hard work for your own sinister ends?