Cybernetics and Other Enhancements

Homo sapiens? You need to upgrade.
-- Overheard at the Club de Chardin, Libreville

We are already the Master Race. It is called the Human Race.
-- Anti-Provolution transhumanist slogan

20 years after the original cybernetic fashion swept over the Core biotechnology has advanced noticeably, and use is creeping into new areas. Especially the colonies are increasingly interested in using enhancements to improve their lives, worrying the nations of Earth. Provolution and the pentapods are introducing new challenges every day – and many people find them neat and useful.

Although a sourcebook like this might make it seem that cybernetics is a huge field and central to public policy, this is not true. Compare the length of an imaginary sourcebook describing the different types of cars today, or kinds of star ships in 2300AD – human enhancement in 2320 is developing rapidly and diversifying, but it is still a minority issue. Even many core citizens have never really met anybody with a real enhancement (although their 120-year old grandmother may have bone replacements, cognition and immune system booster medications and a medical implant – but that is just seen as *medicine*, not *enhancement*).

If there are so many enhancements available, why are people not enhancing themselves so much? The main reasons are culture and practicability. Since the Twilight war technology stopped miniaturizing and instead turned outwards, towards space and large-scale engineering. People were also sceptical to enhancement due to the excesses of Provolution – paradoxically, the group may have hindered enhancement development for a long time. Of course, they would claim that sinister forces of control were behind memetic engineering making human modification beyond the norms unthinkable.

Most enhancements are also of little practical value. Memory enhancement cannot compete with a portacomp, boosted strength might be useful in a competition but has little use in most people's lives. Especially in the Core there was less and less pressure to be enhanced – most people lived safe, predictable and comfortable lives. A bit extra spice and an advantage in a hobby might be desirable, but most enhancements could not give that.

In 2300 technology had advanced to the point where enhancements had become cheap enough that many could try them out. The main advance was the autodoc rather than the implants: using autodocs much of implant work could be automated, bringing down the

price enormously. Another important factor was that the new enhancements were mainly bionical rather than genetic, getting around the moratorium on human DNAM. There was also a cultural shift, as a wave of millennialist disillusionment led some people to begin experimenting with enhancement.

There was also the feedback from the growth of the new cybernetics companies. PsiTechCorp was mainly a producer of psychological test equipment and neurological therapy devices until hitting on neural interfacing as a goldmine. Cedars-Sinai found that they could leverage their know-how about medical prosthetics (a tiny market in 2300) into enhancement prosthetics. As the companies grew they invested heavily in R&D to keep ahead of their competitors, expanding the realm of the possible significantly.

The backlash came just as quickly as cybernetics had become "in", and enhancement retreated to fad status for most in the core. When the cyber-bubble burst many laid-off researchers moved into academia or other fields, spreading their skills. A second generation of cybernetics companies emerged, and quietly the field began to make a comeback. Now enhancements are spreading outside the Core. They are cheap enough to be almost affordable, and in the colonies they are often more useful than in the core. Even on the edge of the frontier, where advanced implants cannot be relied on, enhancements could be lifesavers. Culturally many colonists are also more open to experimentation and taking chances.

Military Enhancement

The military forces of the world have on one hand always been interested in enhancing soldier capacity, but they have also been cautious. Enhanced soldiers can turn into enhanced ex-soldiers, and many enhancements have subtle psychological effects that may not fit military doctrine or conduct. Some nations also worry about the political reliability of enhanced soldiers: both France and Manchuria suspect that enhanced soldiers might become Provolution aligned (or that such people would volunteer for enhancement). The US and Australia have been more open to enhancement, especially in the quasi-official world of mercenary/national military cooperation. Some observers have complained that the US military is using mercenaries as testbeds for military enhancement.

The Kafer war has led to a boom of soldier enhancement, but also the realisation that it does not matter how much subdermal armour somebody has if the enemy is using high-power weapons. The truly successful enhancements have been increases of the ability of human soldiers to survive and manage stress in adverse environments, as well as improved communications – there is no point in trying to wrestle Kafers if one can send in a combat walker or even better, an airstrike. These insights have however not impressed the soldiers themselves, and there exists a subculture of "diamondheads" who take great interest in improving themselves using both legit and very alternative therapies.

Cybernetic Problems and Side-Effects

Psychology

While it is often claimed by people unfamiliar with enhancements that they warp the mind of their users, it is more accurate to say that they allow people to express themselves by changing themselves. If the original self has issues enhancement can easily lead to mental problems if done improperly. Most serious cybernetic clinics both screen patients and offer counselling to deal with the experience of being changed. Black clinics on the other hand rarely turn anybody away who can pay. Hence there is a self-selection process where unstable people get the more extreme enhancements, becoming even more unstable in the process. Add to this the rise in body dysmorphic disorder and surgical addiction and there is no wonder that a small minority gives cybernetics a bad name.

Cybernetic Immune Deficiency

Adding new devices, implants and symbionts takes a toll on the immune system. It tries to reject them, but modern coatings and pentapod biotechnology are too slippery to catch. To prevent the risk of chronic inflammations implants are often slightly immunosuppressive. This works well in people with one or two implants, but as more and more is modified it can build up to dangerous levels.

Sum the number of implants, symbionts, chronic drug treatments, genetic modifications etc. This is the total Immune Load. As long as it is below the Stamina of the character there is no problem. Between Sta and Sta*2 the immune system begins to act up, producing small aches or infections. Between Sta*2 and Sta*3 the immune system is seriously weakened, and all defences against infections, poisoning or other subtle attacks are at –1. Healing times also increase, as if the quality of healthcare was one level less. For each Sta more implants the penalties grows by one.

Number of enhancements	**Effect**
≤ STA	No effect.
STA < enhancements ≤ 2*STA	Inconveniences.
2*STA < enhancements ≤ 3*STA	Weakened immune system, -1 against infections etc. Healing time one level lower.
3*STA < enhancements ≤ 4*STA	Seriously weakened immune system, -2 against infections etc. Healing time two levels lower.

Having proper medical care and doing regular, *careful* maintenance will reduce the problem one level. Another way is to take an immune booster; this will have the same effect, but possibly trigger autoimmune reactions (10% chance per implant, causing it to misbehave, cause pain or even fail).

Damage to Cybernetics

When a part of the body housing an implant is damaged enough (Maimed or worse) there is risk that implants in it are damaged. When recovery starts (and presumably the character comes back to consciousness) roll for each implant to see if it survived the damage and treatment. The chance is 75% if the damage was just down to Crippled. If the damage reached Incapacitated the chance is 50%. Damage that destroys a part of the body will also destroy the

implants in that area. Stun damage will not normally hurt implants; the exception is tasers and implants with electrical parts such as neural interfaces.

How hard it is to replace will depend on the level of damage and the implant. Mechanical devices like garrottes are easy to replace, rfid tags are cheap but a neural jack is expensive and complex enough to warrant attempts of salvaging.

Travel

Travelling with illegal implants can be problematic. While many places content themselves with a metal detector and a RFID scanner that can be spoofed, spaceports and especially orbital transfer stations tend to use better equipment. They use teraherz scanning and magnetic resonance to detect exactly what is in the body. It is hard to fool the screeners unless the implant is exceedingly small or built to look exactly like a legal implant. Cortex bombs and bionic weapons are definitely going to be detected.

The way to travel is to have valid licenses for the implants. This is similar to having weapon licences, signed by the right government bodies. A common method of getting licence is to be a member of an approved mercenary group or militia, although this can backfire if the person enters a jurisdiction that does not accept the group. Most people with heavy implants will need backing or good forgeries to get around.

Often spaceport and starship security demands implants – like weapons – to be disarmed when entering their premises. Sometimes this is done by inserting monitoring software or firing blocks.

Truly paranoid organisations like the OQC scan not just for implants but also for biological alterations. They compare the genomes and proteomes in cells taken from different tissues with each other and (when available) stored pre-departure records and a vast database of normal human variation. Discrepancies will point at illegal gene therapy, symbionts, parasites or infections. Such people will end up being more thoroughly examined. OQC, while fanatic about infection risks, is not overly concerned with drug-based enhancement or surgical enhancement. That does not mean they will not report such findings to the immigration authorities.

Hidden implants
Illegal implants can be made harder to detect by using more biological material, shrinking them, even adding micro-ECM. For each doubling of the price the difficulty to detect the implant increases by one.
TL: 12
Illegal

Background

Providers

Major cybernetics producers: PsiTechCorp (brain implants and other neurotech), Microtec, TransLife, Pacific NuGene, Aquitaine Corp (military implants), Darlan Optique (optical implants), Tao Biogenics, Bayerishe Bioteknik, Ramirez-Abruggo (pharmaceuticals), Momotaro Technologies, DeLambe Frere, Xygene, Sylvester Biotech, Daystrom-Paz Biologique, Axon, Uplink, Cedars-Sinai Prosthetics, Nagano Life Inc, Newton Cognomics, Beyond, Spectra Sensorics, Sense Enhance, Dermatech.

Famous clinics: Charité Universitätsmedizin Neu-Tsingtao (Freihafen, Tirane), Zha Imperial Phoenix Medical Spa (Shenyang, Manchuria), Hopital Théodore Monod (Paris, France), National Neuronics Centre (Canberra, Australia).

Major clinic chains: BlueMedi Spas, Didcot Medical, Levar Medical Services Inc, TransLife Medical, Axon Health.

Anti-enhancement groups

Choix

The most powerful anti-enhancement group is the consumer organisation Choix ("Choice") despite lacking any deliberate intention to work against enhancement. Choix is an international organisation that compiles reports from millions of online subscribers about what they think about things they have bought and then provides authoritative reviews, often with commentaries from experts. While Choix is itself neutral on enhancement, the enormous number of bad experiences people have had with enhancements make their reports subtly negative about all enhancements. Deeper reading will reveal that there is likely an underrepresentation of happy customers and that most Choix customers are from the Core, but emotionally the material from Choix is effective in convincing many that enhancements are risky and not worth it.

Humanist League

Anti-transhumanist umbrella group that argues against human enhancement, in favour of "real human virtue". Has been likened with a conservative NARL (NARL in general also tends to be mildly against enhancement), linking numerous scholarly, ideological and activist groups that are concerned that humanity might lose its way in the 24th century. They are not only against enhancements, but attempting to emulate aliens and relying too much on technology. They idealize the wise frontier colonist who meets the challenge of alien environments with human dignity, perseverance and ingenuity.

The transhumanist league and the humanist league almost always have a few hecklers, counterdemonstrators or opposed experts on any issue. As the transhumanists joke, the humanists ought to be forced to stay at Drexler Station to learn just how awful the real frontier is.

Fondation de l'Intégrité Corporel

Anti-enhancement foundation seeking to safeguard the integrity human body. Argues that modern medicine is too invasive, too driven by the profit of biomedical corporations and also

embodying various dangerous anti-human ideals. While a small organisation it has been active for a long time in France and has a bit of political pull. It has vigorously resisted the use of enhancement in the military.

Pro-Enhancement

Viriditas

Transhumanist group representing the pro-evolution, pro-life, pro-expansion views also expounded by some Provolutionists, but without accepting violence or coercion. They have in particular strongly supported NARL and Life Foundation. They in particular think more terraforming should be undertaken, and are suggesting a joint human-Pentapod project to terraform Mars.

Global Rights Project

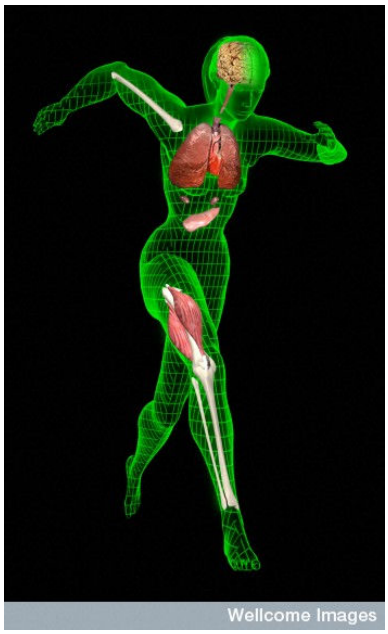
American legal/media group defending enhancement, transhumanism and people's right to choose their bodies. GRH are often debating in media and promoting responsible self-enhancement. They have been involved in several heavily publicized lawsuits related to enhancement. One of their most important cases was McRae vs. FDA in 2299, which established that doctors could do off-label prescription of cybernetics; this paved the way for enhancement in the US. The current high-profile case is LaFarge-Cortez vs. King Colonial Health Board, about the right of King-born to restorative DNAM treatment for their children.

Posthuman Quarterly

Transhumanist link publication, containing reviews of new enhancement, "unbiased" consumer reports, debates about legalisation, reports on various projects as well as the usual subcultural social interaction.

The Quarterly format is due to its broad readership base: a pure Link site would only work in the Core, so every three months a new issue is released and sent out into the arms. In most colonies there are local discussion forums related to the publication where local discussions happens, and the Earth site represents the main discussion. Correspondence and "best of" from colonial sites arrive continuously on Earth and is posted on the main site. Material is then selected by the editors into the next issue. This structure is used for many journals and publications, from Extrasolar Architecture Quarterly to the Ryosaurus Fan Club Dispatch.

Surgical Modifications



Surgery in 2320 is very precise, thanks to both the autodoc robot and biotechnology enabling microscopic treatments, insertion of stem cells or cultured tissue, gluing together tissue and 100% biocompatible materials.

Cloned organs do not have to be identical to the one's the patient had, ex vivo gene therapy can change them in many ways before they are reinserted. As cybernetic implants became popular biomedical companies began a race to demonstrate that they could outdo them with biotechnology. It is not uncommon to "optimise" replacement organs, e.g. by adding extra metabolic pathways to replacement livers or anti-arteriosclerosis features for new hearts.

Stem Cell Accounts

It is common for even moderately wealthy people in the Core to have "stem cell accounts", frozen samples taken shortly after birth with fresh stemcells that can be expanded and used for treatments. In particular, such cell lines are used to revitalize older people and grow new organs. "Stem cell loading" takes a week (usually spent on a medical spa) where various lines of stemcells are reintroduced into the body. It may be superceded by newer anti-ageing treatments

Biosculpting

Biosculpting refers to the modification of the client's body to include such features as horns, tusks, fangs, fur, tails, etc. Exact costs vary on the extent of the transformation, but prices normally range from Lv50 for a simple implant to Lv8000 for complete bodyshaping. Biosculpted individuals (usually called Exotics or Transforms) may need immunosuppressives regularly to prevent their bodies rejecting the foreign tissue. Biosculpted individuals attract everything from admiration through amusement to "racial" hatred. Public opinion is very mixed, to say the least.

Muscle Implants

This technique involves taking a muscle tissue sample from the character and culturing it in a collagen tank, then grafting these new muscles into the existing tendon/ligament system of the character. The technique will increase a character's Strength by up to six points, but for each point of Strength gained, the character will lose 1 point of Dexterity until he has had time to become used to the new muscle mass. This training period lasts Strength months and costs Strength xp per point of Strength gained.

Installing muscle implants is time-consuming, demanding one month of physical inactivity from the patient. It is also expensive, costing Lv1200 per point of Strength gained, plus surgery costs.
Surgery Cost: 2d6 hours, at Lv1000 per hour

Surgery DC: 10
[2320AD]

Neural Sheathing

This technique utilizes modified glial cells, which have been engineered to manufacture and deposit certain organic chemicals around the nerve fibers of a character. The plastic-like sheath improves the myelin, decreasing the electrical resistance of the nerves and various outside electrochemical interferences to neural communication. To perform the process, a doctor takes samples of blood, nerve tissue, and spinal fluid from the patient and determines what genetic modifications are required for the cells to perform properly. The process must be monitored for one full month, with a medical appointment every three days to update the support solution.
The doctor must succeed in 10 successive Medical checks. For every day the character is late for an appointment, the doctor's difficulty goes up by one step, so it is important to be prompt for appointments while undergoing this treatment.

If the Medical check is failed twice in a row, the sheathing is lost, but the process can be retried. If the roll botches, the character permanently loses one Dexterity point, and the process cannot ever be retried, as the character's nerves are permanently coated in a mass of what is technically termed "goo."

If the process is totally successful, then the character receives +1 to Dexterity and +5 to initiative. If the character already has a merit like Lightning Reflexes Feat, add one extra action. As the subject now has a significantly faster reaction time, they must undergo a training regimen. This regimen costs 3 xp, and represents the time lost in training and adaptation.

The cost for this treatment is Lv3000.
Surgery Costs: Lv1000 per visit
[2320AD]

Neural Sheathing, Improved

Improved neural sheathing a new generation of tailored viruses to the process to help regulate and direct the sheathing process. Instead of 10 Skill checks, the doctor performing the process must make only 5 checks. For every day a character is late, the doctor's target goes up 2 difficulty levels rather than one, and failure will never result in the dreaded "goo". The benefits are otherwise the same.
The cost for this treatment is Lv12,000
[2320AD]

Muscle Reanchoring

Rather than simply adding additional muscle mass, Muscle Reanchoring instead alters how the muscles and tendons join the bone, resulting in increased strength and speed. This procedure is quite long and tedious, and has to be done in five steps. The Surgery Skill Check has to be made five times. After the completion of the second roll, the patient receives a +1 to Strength. Upon completion of the fourth roll, the patient receives a +1 to Dexterity, and once the last roll is successfully completed, the patient receives an extra 5m per round to his

movement. Afterwards the patient must be retrained to used their own body. This retraining costs 3 xp.
Surgery Cost: 1d6 hours per stage, at Lv500 per hour. Five stages total.
Surgery DC: 20 per stage.
[2320AD]

Extra Opposable Thumbs

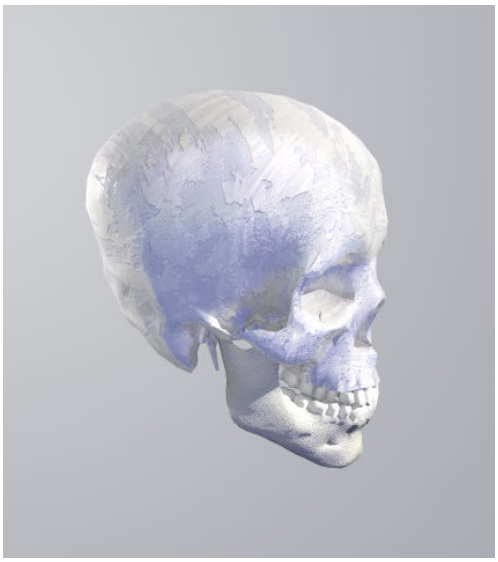
Given that the human hand becomes immensely more flexible thanks to an opposable thumb, why not add an extra for even higher levels of dexterity? This surgical treatment cultures a mirrored version of the thumb (and linked tendons, muscles and some replacement bones) to replace the little finger. After the surgery has healed the user will have the ability to perform the same grasping movements (such as pinch grips) with the ulnar side of the hand as the radial side. Reaching full dexterity and strength will take a few months of daily training.
Basic cost: Lv1,000 (per hand)
Surgery Cost: 1d6 hours, at Lv500 per hour.
(image courtesy of Neil Armstrong)

Grasping Feet

A variant of opposable thumbs, replacing the feet with cloned hands. The new hands will not be able to support the weight of a normal human in normal gravity for long, but are perfectly suitable for a microgravity lifestyle. Some Belters have begun to use this kind of surgery, which was pioneered by Sylvester Biotech on Vesta. These handfeet tend to be deliberately grown a bit coarser and stronger than the normal hands, and take longer to adjust to than the extra opposable thumbs surgery.
Basic cost: Lv1,000 (per foot)
Surgery Cost: 2d6 hours, at Lv500 per hour.

Immune Boost

Samples are taken from the thymus, lymph glands and bone marrow, cultured outside the body and then reinplanted. The effect is a boost of the immune system, giving a +3 bonus to resist pathogens.
Surgery Cost: 1+1d6 hours, Lv 500 per hour.
Surgery; DC 15



Skull armour

While reinforcing bones might prevent fractures, it is seldom worthwhile because damage tends to destroy muscle, tendons and joints instead. The exception is the skull: reinforcing the skull is equivalent to wearing an extra helmet, one that is always available. Skull armouring replaces

part of the bone with a composite matrix that protects against 2 points of damage to the head.
Surgery Cost: 2d6 hours, at Lv500 per hour.
Surgery DC: 20 per stage.

Hepatic Expansion

A replacement liver is grown with extra enzymes to detoxify environmental poisons or drugs. First developed as a treatment for various metabolic disorders, it became a way of adapting to environmental stresses on colony worlds. For example, on planets with dextro amino acids extra enzymes to rid the body of them improve health significantly. While mainly intended as a therapeutic treatment for people who needed a new liver anyway, recently enhancing pathways have been added. These range from ultra-fast alcohol dehydrogenation (the user cannot become drunk) to resistance to toxins.
Price: Lv 200 per immunity, plus surgery and lvier cost.

Subcutaneous Insulation

Fat tissue is good heat insulation and can provide emergency energy in an emergency. This treatment provides fat stem cells that add an insulating layer of blubber. If the body temperature drops too much brown fat cells in the layer will start burning energy to prevent hypothermia. The character will look chubby, but have no ill health effect from the extra fat and will gain a +3 dice pool bonus for surviving in cold climates or when submerged in cool water.
Surgery: 1 hour, at lv 500 per hour plus Lv 300 for culturing the stem cells.

Dolphin Sleep™

Taking a trick from nature to compete with PsiTechCorp's Meta-REM Chip, TransLife recently developed a simple way of staying awake indefinitely. By nanosurgically severing a few decussations between the awareness-regulating nuclei in the brainstem they enable the two hemispheres of the brain to sleep at different times. The result is that normally there is always one hemisphere awake.

During the day both hemispheres are awake (and communicating, this is not a split-brain case). As evening falls one hemisphere goes to sleep while the other remains awake. Halfway through the night there is a switch, and in the morning both hemispheres awake. A slight drawback is that when the left hemisphere is asleep in left-dominant people they lack language, and of course the opposite side to the currently sleeping hemisphere is paralyzed. Still, this is enough to perform many tasks (monitoring, studying, smaller manual tasks, directing robots) that some people are interested in this enhancement.

To regulate the timing a few modified cells are added to the brainstem that allow the hemispheric status to be controlled using simple drugs (simple carbohydrate pills), but there is also the option of making the magnetosensitive so that a magnetic field of the right frequency (and just that frequency) triggers the shift. However, most users discover that they can somewhat regulate their hemispheric sleep pattern by will after a few months.

[While partially asleep INT, EDU and WIT are lowered by one, and skills requiring both sides of the body are impossible. When the other hemisphere dreams the awake hemisphere is distracted and may suffer –1 or –2 dice in dice pools. To fully wake up takes 1d6 turns.]

Surgery Cost: 2d6 hours, at Lv1000 per hour

Enhanced Olfaction

Adding cells expressing new odour receptor genes is a relatively simple process. A tissue sample is taken and used to clone olfactory sensory neuron stem cells that are hybridized to express a new receptor gene. They are then embedded in the olfactory epithelium, where they start linking up to the olfactory bulb.

In principle nearly any chemical can be smelled, or olfaction can be combined with other sensory modalities. One application is "smelling" radioactivity, strong magnetic fields, explosives or the presence of certain viruses or micro-organisms.

A few weeks after insertion the new smell ought to show up. Often it is trained by exposure: the user encounters the smell and learns to recognize it, continuing to training sessions where distinguishing the smell from placebo are used to improve performance.

There is a risk that the new smell becomes too strong or causes olfactory hallucinations, but removal is easy using triggered apoptosis: the modified cells have a "suicide switch" that can be activated by spraying with a special hormone.

Surgery: 1 hour, at lv 500 per hour plus Lv 300 for culturing.

Bloodhound
Unlocking the expression of all odour receptor genes (humans have lost expression of many, but retain them in the genome) is possible. This treatment modifies the olfactory neural stem cells to express a wider variety of receptors. The result varies depending on how they link up to the olfactory bulb. Many of the linkages will be rather random, producing amusing or distressing effects. A flower smell may now have a disagreeable tinge, while a form of plastic have an elegant bouquet that was previously impossible to sense.

Surgery: 1 hour, at lv 500 per hour plus Lv 300 for culturing.

Tetrachromacy

Inserting photoreceptors with an altered opsin gene enables curing colour-blindness, but can also give normal people the ability to distinguish fine nuance distinctions. The enhancement works best if given at a young age so the colours get integrated in the right way in the visual processing. Modern versions work in adults, but take several months (1d6) to come into effect.

The effect is not always desirable; at least one art expert found it unbearable to notice the "vacillation between the use of fence-green and grass-green in Lerand's *The Cottage* where before the field had been a simple friendly holly-green", and opted to have the change reversed. On the other hand, hidden messages can be left in plain sight for other tetrachromats who can distinguish what looks like identical colours.

It is possible to add near infrared and ultraviolet receptors, but neither are as effective as artificial eyes. UV is absorbed by the lens, which needs to be replaced to enable UV-vision.

Surgery: 1d4 hours, at Lv 500 per hour plus Lv 300 for culturing.

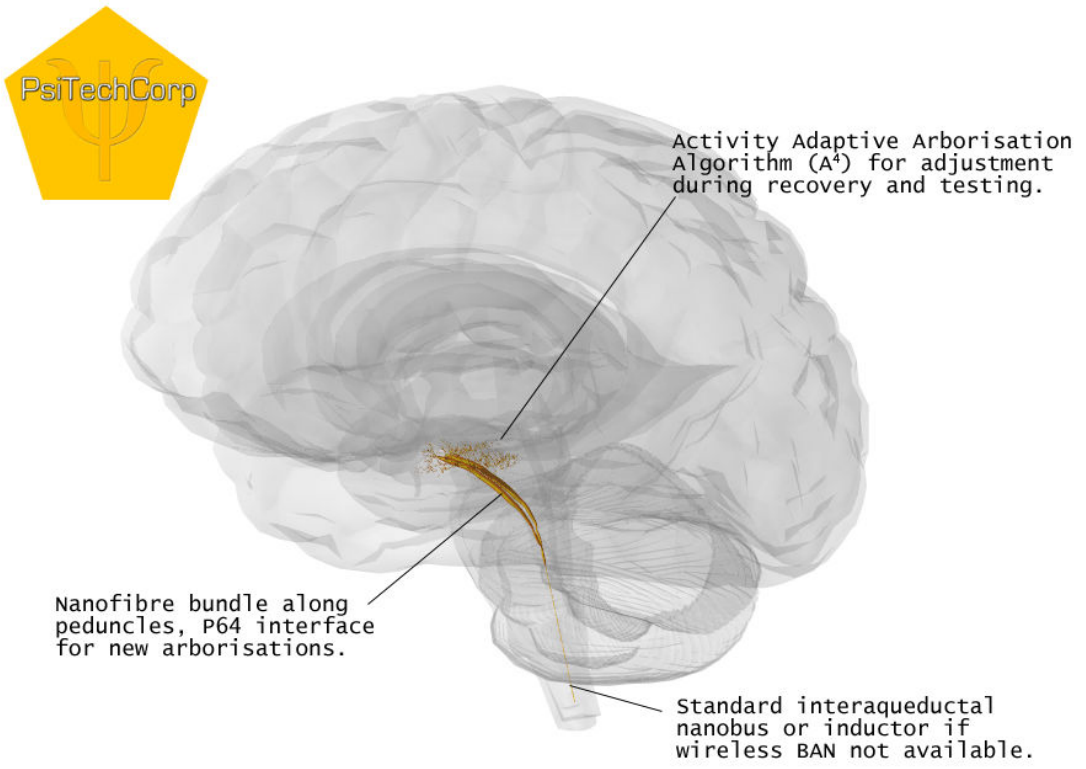
Pheromones

Human pheromones exist and affect the emotional reactions of other people. However, the interplay between biological pre-programming, individual taste and cultural associations is complex. Just dosing oneself with androstadienone will not reliably make others experience one as a sexy "big man". However, a skilled social manipulator can use pheromones to project their presence better.

Simple pheromone implants (actually gene-tailored sweat glands) only produce higher levels of pheromones, making a person slightly more sexually attractive (+1 dice to seduction rolls). More advanced implants allow the user to control which pheromones are released using biofeedback. This requires training and experimentation, but enables more subtle social manipulations (+3 dice to social rolls when interacting in person close up).

Price: pheromone tune-up Lv 100, Lv 600 for advanced version + Lv 1000 training.

Implants



Psychiatric Implants

This implanted chip can add or remove a single psychological complication, personality trait, or compulsive behavior. Several corporations are working hard to develop implants that provide *positive* personality traits or abilities. However, recent developments in reflex repatterning and didactronic is making this obsolete.

Cost: Lv 3000-Lv 10,000 (As a rule of thumb, the cost is 3000+1500*the level of the flaw).
[EG2]

BrainPreserver™

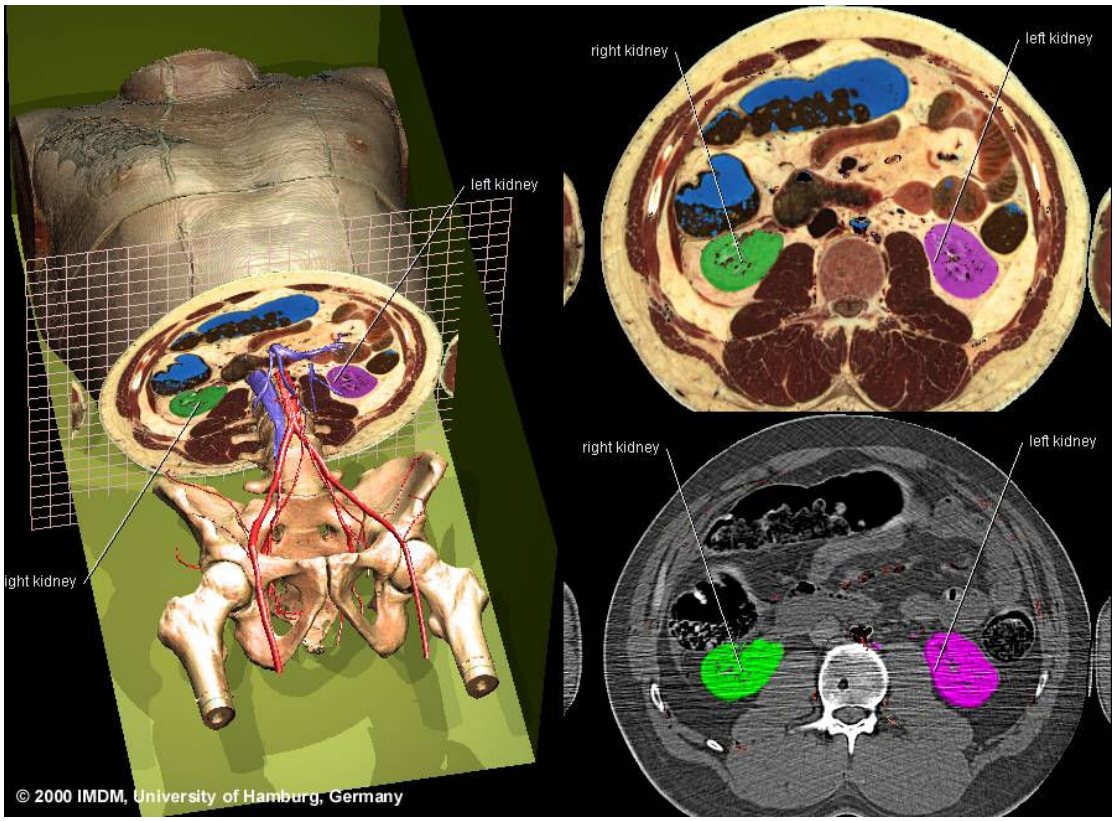
A new emergency implant housed in cisterna magna with fibers running around the brain surface and a subcutaneous battery pack in the chest. It attempts to protect the brain in situations of oxygen starvation or shock. When triggered (generally because hit points are below zero) it immediately releases neuroprotective chemicals into the blood and cerebrospinal fluid. It also starts cooling the brain to 15 degrees C using micro-Peltier elements so that damaging metabolic processes cannot occur. The device also signals on several emergency frequencies.

The system, triggered in the right situation, can at least double the "golden hour" of emergency treatment, if only for the brain. Losses of health are halved until treatment works or permanent death occurs. If the head is severed or the chest seriously wounded so that the battery pack is lost, the implant cannot keep the brain cooled for long and the benefits end after 10 turns.

Cost: Lv 12,000

Meta-REM Chip

With PsiTechCorp Meta-REM Chip you need very little sleep because your EEG and hippocampus are regulated to make up for the loss. You only need about six hours of sleep each week, but you have to sleep every night in order to consolidate your memories (otherwise you will tend to become confused and forgetful about recent events). The chip actually consists of an extensive network of electrodes placed around the cortex, enabling it to go onto "psi-REM™" and "psi-SWS™", accelerated EEG states where memory consolidation is improved. On the down side, you are a deep sleeper: during these sleep periods you simply cannot be woken up since the entire cortex is being used for powersleeping. Dreams are disjointed affairs, and many users complain that while the chip seems to work sleep does not feel psychologically restful.
Cost: Lv 15,000
[EG2]



Chargers

Chargers are devices that are used to store some of the hemoglobin that the character's body naturally produces. The hemoglobin is saved for reintroduction into the body when needed to add extra oxygen to, and remove fatigue toxins from, the character's bloodstream. The charger is installed in a space made by removing all or part of one kidney. Chargers grant one or more Feats based on the type of charger installed. A supercharger gives the Endurance Feat (and requires removal of half the kidney); a hypercharger give both the Endurance Feat and the Great Fortitude Feat (and requires removal of an entire kidney).
Superchargers cost Lv1500; hyperchargers cost
Lv4000
Surgery Cost: Lv2000
Surgery DC: 12
[2320AD]

Pleasure Centre Stimulator

One of Provolution's classics. The ultimate drug, this implant stimulates the pleasure centre of the brain directly for one second when an encrypted key is transmitted to it. The host will do anything to have the Stimulator triggered, making them easily controlled.
Price: Lv1500
[JIEX]

Pain Centre Stimulator

The ultimate torture, this implant stimulates the pain centre of the brain directly for one second when an encrypted key is transmitted to it. The host will do anything to not have the implant triggered, making them easily controlled.
Price: Lv1500

[JIEX]

HeartStopper

A HeartStopper is a thought-triggered electric shock device that stops the user's heart for two minutes, then restarts it. During this time the character takes 2d6 damage. It can be combined with the BrainPreserver to reduce the damage or extend the time up to an hour.
Price: Lv1500
[JIEX]

Black Box Recorder

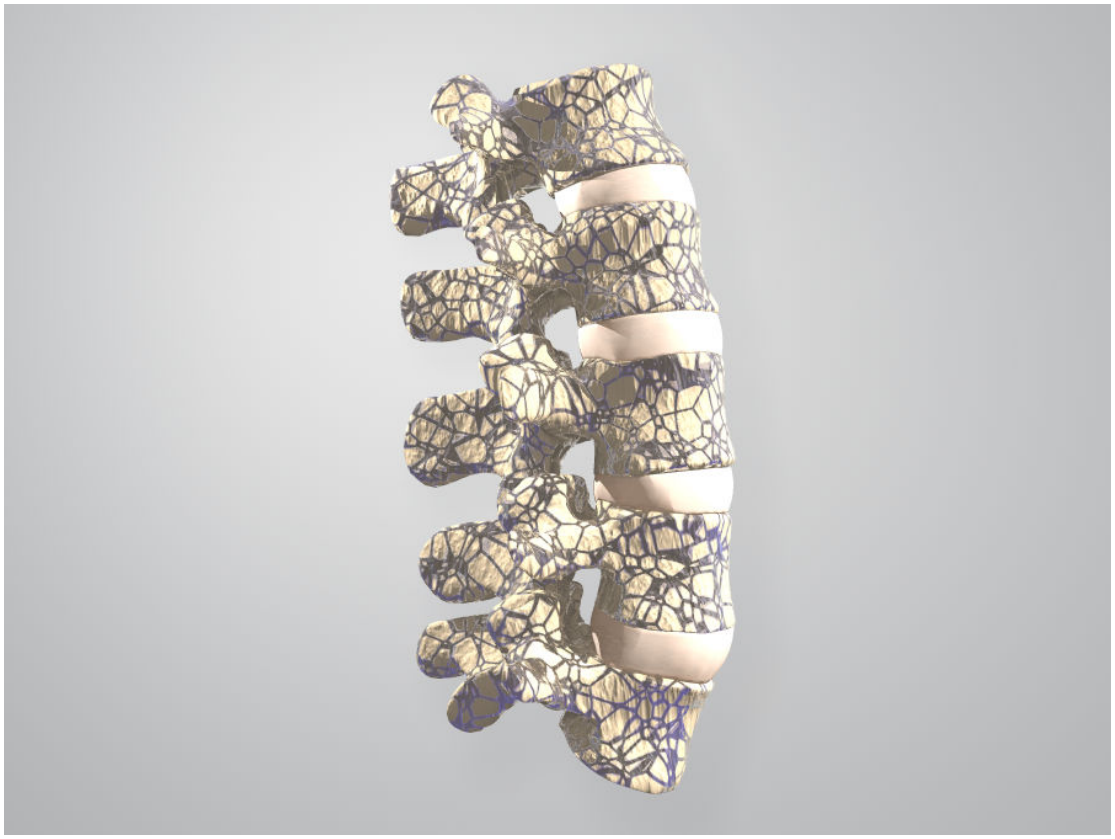
This cranial implant records biometric data and at least the last five minutes of sound and vision heard and seen by the character. It stops recording (and saves the data, if possible to an offsite backup) if the character panics or if they think a command. Black Boxes are used by field agents and other individuals who may need a downloadable record of their actions.
Price: Lv2600
[JIEX]

MediMontor

A biometric monitor with a small radio link that calls for medical assistance if the user's vital signs show any indication of trouble. Medics arrive by air ambulance as soon as possible, 2d10 minutes in a town, 1d10 x 6 minutes in a suburban area, and 1d6/2 hours elsewhere within range of a medical centre on a colony world that supports the technology.
Price: Lv1200
[JIEX]

Direction Sense

This implant is a small electronic compass anchored inside the skull and hooked into the brain with a standard electronic/neural link. It provides the host with a very accurate sense of direction from a built in GPS (when available), magnetic compass and inertial sensor. Whilst the implant works well on most worlds, rapidly fluctuating magnetic fields may result in nausea.
Price: Lv800
[JIEX]



Titanium Lacing™

Titanium lacing™ (the name is due to a marketer at Microtec) is a nanocomposite honeycomb veneer deposited on the surface of bone to help protect against bad fractures. Characters with lacing recover faster from such injuries (double rate) and are less likely to suffer from them in the first place. Titanium lacing also grants a "natural" armour value of 1 in the head and upper torso (this bonus can not be combined with cranial armour). Lacing takes four weeks to deposit during which time the character is incapacitated. It costs Lv4000.
[SotA]

Subdermascale

A layer of small ceramokevlar scales just beneath the skin that lend it a slight reptilian look. These scales provide an armour value of 1 in the locations protected. While this might be useful in combat, it hinders surgery. Subdermascale costs Lv450 for the torso, Lv200 for each limb and the head.
[SotA]

Subdermal Plates

Bionic “brass knuckles”, hardened plates placed under the skin and connected to bone to make martial arts and brawling strikes heavier and more lethal, or defensive plates on the forearms enabling better parrying of attacks.

Defensive plates Lv 200 (+2 dice to parry), Offensive plates (specify knuckles, fingers, hand side, elbow, feet or elsewhere) Lv 200 (+1 damage dice on brawl or martial art attacks using the body part).
[FM]

Pain Shunt

A fine meshwork of nanothreads woven into the dorsal part of the spinal cord, enabling the selective control of pain and touch signals. The earliest model, developed in the 2260's, will block signals from the body, which goes numb. There will be no penalties from body and limb wounds (head wounds still hurt), except when using a damaged limb and a general –1 modifier due to the numbness. Later models are selective and allow touch and proprioception signals to pass, while damping pain (most models never remove it completely, as it gives a valuable signal of where you are hurt). Some of the latest experimental versions from PsiTechCorp even allow selective control of heat, cold, touch and pain stimuli, including an experimental option of recording and replaying touch signals.
Price: Lv 1500 for old version, Lv 2000 for new version. Lv 2500 for experimental variants.

Limbic Cut-off

A neurochip that controls limbic system activation, in particular the hypothalamus. When the cut-off is engaged, hunger, thirst, fear, sexual arousal, anger, nausea, curiosity, diurnal rhythms or even suffering itself can be turned off – or amplified. When suffering is turned off, the character still feels pain but does not care.
Users tend to appear cold or distant, and often behave slightly inappropriately. Implantation is very tricky and the implant itself is heavily regulated.

When bought, each emotion/body function that will be brought under control costs Lv 500 in addition to the base cost of Lv 4000 (and surgery). For example, an implant to control fear and anger would cost 6000, while one covering the entire above list would cost Lv9500.
Price: Lv 4,000+500 per emotion (not including installation).

Arousal Control

An electrode mesh in the *locus coeruleus* in the brainstem, enabling the implant to "turn on" and "turn off" wakefulness. Normally used for rapid awakening in pilots (where it is often combined with a sensor that notices if they are falling asleep), but it can also be used as a perfect alarm clock or stimulant. If the implant is under external control it can also be used to put the person in a reversible coma.

Removes sleep inertia after sleep (normally a sleepy person has –1 for 15 minutes after awakening). If the character fails a Wit roll when going awake, he will be up and acting but still dreaming – hallucinations and bad dream logic applies.

It can act as an anti-sleep drug like Alerzen, but with the same limitations: Normally there is one dice penalty for every 24 hours of sleep deprivation. If Alerzen is taken, for the next 24 hours no penalties due to sleep deprivation will occur. After the drug wears off they return, doubled. Usually the user sleeps a very heavy sleep afterwards, about twice as long as normally. Beyond 96 hours hallucinations and homeostatic problems begin; reduce intelligence and stamina by one dice every 24 hours. When one reaches zero the person collapses, either in delirium or a serious state of bodily dysregulation

Using the implant as a stimulant is illegal, somewhat addictive and normally prevented by a firmware cutoff on the hardware. This firmware can be removed for Lv 500 by a cybernetic hacker. When used as stimulant it can provide +1 to Wit and +3 to initiative. As long as it is active the person will be unable to sleep or relax. Some crazy people have attempted to boost

it even further, doubling the bonus – but every round it is used this way there is a 5% chance that locus coeruleus will be damaged. In this case, the character suffers one point of aggravated damage to the head and will be in coma until parts of the brainstem are cybernetically replaced (cost at least Lv 10,000 at a major research hospital).

Price: Lv 1000

Bodychem sensor

An implanted device that monitors blood chemistry, detecting the presence and concentration of a large number of substances. This helps medical diagnosis in many cases and keeps hypochondriacs looking at their dermacomps.
Price: Lv 500

Autoinjector

A popular implant for soldiers, explorers and drug users. The device contains eight doses of drugs and inject one of them directly into the bloodstream when signalled or set by a timer. Autoinjectors are commonly combined with a Bodychem sensor, and can then inject drugs when pre-set changes in blood chemistry occurs, such as releasing antidotes when poisons are detected. Drugs can be replenished using a special syringe that fits into an unobtrusive slot on the skin. Autoinjectors are usually placed in the abdomen.
Price: 500 Lv (versions with more doses available for slightly higher prices)

Implanted Weapons

It is possible to implant several different types of weapons, mostly melee weapons, but Pentapod biolasers have been found in the hands (literally) of terrorists and criminals in many parts of human space. Any of these devices are extremely illegal, and possession of these weapons is often sufficient provocation for police and security forces to engage in pre-emptive self-defense. Implanted weapons include:

Hand Razors ("slashers")
Implanted into either a flesh or cybernetic hand, the razors extend on command. Typically the command is a difficult hand or finger movement. They are typically undetectable without medical scanning equipment, and even then are hard to find.
Damage: 1d4/2
Price: Lv1000 (black market only)
Surgery Cost: Lv1200
Surgery DC: 18
[2320AD]

Wrist Blades
Larger than the razors, wrist blades are implanted in a sheath which runs up along the top of the forearm, and they can be detected through physical examination of the arm
Damage: 1d6
Price: Lv2500 (black market only)
Surgery Cost: Lv1800
Surgery DC: 20
[2320AD]

Cyberlimb Weapons
Firearms can be installed into a bionic limb. An arm can hold up to a Tiny-sized weapon, while the leg can hold up to a Small-sized weapon. The leg mount can be either a holster, or else an actual firing mount, in which case it receives a -3 to hit rolls due to the awkwardness of aiming a leg.
Price: Weapon cost x 3 + Lv2000
[2320AD]

Bioweapons
Pentapod bioweapons can be implanted into the arms, torso and even the head, and are effectively undetectable to anything but high-resolution medical scanners.
Price: Weapon cost x 5 +Lv3000
Surgery Cost: 1d6 hours for a limb, 2d6 hours for the torso, and 3d6 hours for the head, at Lv2000 per hour
Surgery DC: DC 15 for limbs, DC 20 for torso, DC
25 for head
[2320AD]

"Tooth Gun": The rounds from the so-called Tooth Gun bear an uncanny resemblance to human molars, but are actually used in construction, like a biotech nail gun. The tooth gun takes that one step further, and modifies the basic design for use as a weapon. It has a very short range however. This creature is capable of making its own ammunition, but it takes a day to make a full magazine. The Pentapods have bred a separate creature that is much more effective at making ammunition.
Type: Organic Carbine Country: Pentapod Length: 67cm (Size=Medium) Action: Single shot or bursts Ammunition: 6.2x14mm organic "tooth" Muzzle Velocity: 710 mps Magazine: 32 rounds Magazine Gas Production is sufficient to fire 100 rounds/day ROF: 1/3 Range: 60m Damage: 1d10 (x2). TL: N/A Weight (Empty): 2.2kg Magazine Weight: 0.1kg Price: Lv6700

Flechette Gun: One of the few purpose-built Pentapod weapons, the flechette gun is a creature that uses high-pressure air to propel long darts at its target. The darts are
often chemically-treated by the gun for specific effects, selected by the user.
Type: 3.2mm flechette gun Country: Pentapod Length: 81cm (Size=Medium) Action: Single shot or bursts Ammunition: 3.2x22mm organic flechettes Muzzle Velocity: 540mps Magazine: 60 rounds ROF: 1/3 Range: 40m Damage: 1d8
(x2).

Flechette Effects*: Tranquilize/Paralyze*: Injects a (species-specific) paralytic agent into the target. Requires a Stamina roll to avoid being paralysed. Often used to reclaim bullets for repurposing. The result of a save is -3 to all actions for 1d6 minutes.
Kill: Injects poison into the target. If a Stamina roll fails the target will start take 1d6 points of damage per turn, leading to eventual death. If it succeeds just 1d6 damage is incurred.
Consume: The consumer dart releases a horde of tailored fungal spores in the target. The spores are keyed to the first organic material they encounter, and will utterly consume anything they come into contact with that matches the original material. The fungi does 1 point of damage the first 10 minutes, 2 the next, then 4 and so on until the target is consumed. If the target succeeds in a Stamina it will just take 3d12 damage.
TL: N/A
Weight (Empty): 3.3kg
Magazine Weight: 0.3kg
Price: Lv320

Biolaser: This purpose-built weapon can also be implanted into a Pentapod, and is almost undetectable that way. After all, who knows what's normal for Pentapod internal organs? Powered by an organic battery, the organic chemical laser has enough power for five shots before needing time to rest (about twenty minutes) during which time it also needs to be replenished with the chemicals the laser requires. Some examples of this weapon have recently begun to turn up in human hands (literally) as implanted weapons.
Type: 20-01 biolaser Country: Pentapod Length: 22cm
(Size=Small) Action: Single shot Ammunition: N/A Muzzle
Velocity: C Magazine: 5 rounds ROF: 1 Range: 30m Damage:
1d10 (x2)
Weight (Empty): 2.1kg
Magazine Weight: N/A
Price: Lv3000

Napalm Dispenser: Similar to: Jaschonek Fabrikant A-9 Sturmgewehr, but with a range of 50m. A collection of glands in a small, muscular pod that hold and fire a self-igniting, self-oxidizing flammable gel. The ingredients for the gel are stored safely in separate glands until they are mixed and ejected forcibly by muscular contractions.
[JIEX]

Stink Dispenser: Similar to: Quinn Optronics Restraint Carbine. An early attempt at weaponry that would later give rise to the napalm dispenser, the Stink Dispenser fires a debilitating odorous gel which sticks to its target and leaves them (and their companions) fighting for breath.
[JIEX]

Ultrasound Emitter: Similar to: Brandt Audionique AS-3. A pair of bellows-like lungs and a voicebox that produces high frequency sound waves, focussed by a ribbed mouth cavity to produce bursts of stunning ultrasound.
[JIEX]

Jellyfish Tazer: Similar to: Quinn Optronics Restraint Carbine. Using modified jellyfish DNA, the Jellyfish Tazer is a gelatinous polyp that shoots out long strands of conductive material that stick into the target and deliver a paralysing chemical or electric charge. Inside the Tazer polyp, dozens of these fibrous tendrils are stored in muscular sacks within a ring of electrical and chemical glands.
[JIEX]

Puffball Grenade: Similar to: 30mm Concealment Propelled Grenade fired from GW-12 Grenade Launcher. Rather than using smoke, the Puffball Grenade uses a dense burst of spores to reduce visibility to zero within its area of effect. The Pentapods have been very careful to engineer the spores to be hypo-allergenic, so as not to accidentally cause harm when trying to pacify or escape attackers rather than injure them.
[JIEX]

Egg Grenade: Similar to: 30mm High Explosive Propelled Grenade fired from GW-12 Grenade Launcher. As with the Puffball Grenade, Egg Grenades are grown in egg sacs and ejected through a powerfully muscled tube. The Egg Grenade is a calcite shell containing explosive compounds separated by thin membranes that will break when the Egg Grenade does on contact, casing explosive and shrapnel damage.

[JIEX]

Garrotte
A garrotte of very strong carbofiliament replacing a fingertip. While sharper than a steel wire (it does 1d4 damage if used as a knife) it is most effective for strangulation.
Length: 100 cm Weight: Insignificant Price: Lv360

Hornet
Hornet is the trade name for a fingertip implant. The implant is similar to implanted blades but different in that it consists of replacing the first bone of a finger with a cylinder equipped with an extendable hypodermic needle. The device is constructed entirely of organic materials, and is virtually undetectable, except by thorough investigation of the fingers with advanced medical scanners. The hornet links into the character's nervous system, and enables him to extend and retract the needle at will, as well as control the injection of the poison stored in the cylinder (it is good for two doses).

The needle is not strong enough to penetrate armour, but will go through normal clothing. It does no damage, except for the effect of the poison in the cylinder. The effect depends on what type of poison is used. It can be refilled by a syringe.
Price: Implantation: Lv 300 per finger. Refill: Variable. Note: Detection is a Very Difficult task.
[LaBossiere]

Stingers
Stingers are based on wasp stings and are placed under fingernails. The stingers have damage on their own just like wasp stingers, i.e. mainly cause a 1d4 stun points of pain. However, they may contain a small dosage of a harmful chemical. Stingers cost Lv1500 to install and may retracted when not in use. In this case they are even harder to detect than the Hornet, since they are 100% biological. They are, of course, illegal.
[SotA]

Poison Vial
The poison vial is an addition to an already installed subdermal weapon, such as slashers. It is an implanted container that holds two uses of a toxic substance. The container is implanted in the finger and replaces either the first or second finger bone. The container can be refilled from a suitable source, generally a hypodermic needle. The poison vial may be linked up to slashers. The effect will be that if a being is wounded by the poisoned implement, it will also be subject to the effects of the toxin. The exact effect depends upon the toxin used.
Price: Lv 100 per vial (implanted). The toxins themselves cost extra.
[LaBossiere]

Brain Bombs
This device consists of a small amount of powerful, hard-to-detect explosive material linked to a receiver, a timer, or both. The device is implanted in the base (generally the *medulla oblongata*) of the brain. When the timer runs out or the signal is received (generally from a radio or microwave transmitter), the device explodes, killing the victim. These devices are generally not sold, but they can sometimes be acquired on the black market for a minimum of Lv 1,000. Simple versions are easy to detect (generally by X-ray or more advanced methods) and removed (through surgery performed by a skilled practitioner).

More advanced versions require special detection equipment (like an autodoc) or exploratory surgery, and are more difficult to remove. Common uses for such devices include prisoner restraint (the device explodes if the prisoner leaves a certain area or if the device receives a signal to detonate), ensuring military discipline, etc.
[LaBossiere]

Limb Bomb
A less lethal cousin of the brain bomb, the limb bomb consists of a circular ring of powerful explosives linked to a timer, a receiver, or both. The device is implanted in a limb and is connected around the bone. When detonated, the device severs the limb, causing a serious wound to that part of the body.

Often several limb bombs are implanted simultaneously. In these cases small bombs are planted in the fingers to serve as "warnings"; larger bombs are placed in the wrist, elbow, and shoulder. A similar series of bombs can be arranged utilizing the legs. Neck versions are also available and, as is expected, are fatal. Cheaper versions of the limb bomb include external devices that are locked around the neck or limbs (as in *The Running Man*).

Prices range from Lv 150 for a timed external finger bomb to Lv 950 for an internal timer and receiver neck bomb on the black market. These devices are often used in prisoner restraint, to ensure military discipline, or by organized crime for illegal and coercive activities. Some limb bombs are disguised as jewellery (especially rings, watches, necklaces) or clothing (belts, sweatbands), and are used in assassinations. Internal devices are often difficult to detect unless advanced medical equipment is used, but they are easy to remove through surgery (unless trapped to explode upon removal).

External devices are easy to detect unless disguised, but they are hard to remove without killing the wearer, as they often incorporate electronic security locks.
[LaBossiere]

Bug Bomb
Bug bomb is a generic term for a wide variety of devices that contain chemical or biological agents that are implanted in the body and released by a timer or by a received transmission. They can be implanted almost anywhere within the body. When activated, they release their contents, which range from chemicals that render the victim unconscious to tailored viral agents. Bug bombs are fairly popular with governments and corporations because they can be made with dissolving containers (their timers) that hold naturally occurring fatal or crippling bugs. The effects can then be passed off as having natural causes.

Detection and removal of a bug bomb ranges from a fairly routine job to a nightmare ordeal. Sometimes the containers are fabricated out of normal body materials (like bone or cartilage) and contain only a scant number of viruses or microbes. Such bombs are nearly impossible to locate without advanced medical technology and painstaking effort.
[LaBossiere]

Extremes
Extremes are devices that go beyond the normal methods of controlling or killing people through implants. Even governments and corporations rarely use extremes.
Some examples of extremes include the implantation of large bombs (sometimes nuclear, if the technology permits - see GDW's Earth/Cybertech Sourcebook), implantation of biological agents that will infect others, and implants that turn the victim into a homicidal maniac.

Extremes are often used by terrorists or psychotics to cause terror and to kill seemingly at random. Often an innocent and unknowing victim is selected, implanted, and turned loose. Another scenario involving the use of extremes is when an enemy is captured, implanted, and allowed to escape back to his friends or superiors (along with a bomb or viral agent). [LaBossiere]

Bat

Years of military research in sound-ranging devices and data translation have resulted in the bat skull implant. This device consists of a high-frequency pulse generator, a receiver, and a microprocessor and imager that converts sound reflections into imagery the human brain can interpret. What the person "sees" has been described as similar to infrared imaging, except different reflection capacities yield different colours. The unit can also be switched to a dot display, which shows the position of objects relative to the person (sort of like a radar screen). Two models are available: One provides an area of coverage equal to normal human vision (but may be set in the back of the head for rear "vision"). The other provides a 360-degree field of detection. This model takes some getting used to and is only usable in dot mode - to prevent sensory overload. It can be "scaled down" to normal vision range and used in nondot mode. The device is implanted in a character's head and is linked into the nervous system. While some people complain of headaches after prolonged use, there have yet to be any serious side effects.

The device provides a character with something much like sonar, and it will enable him to detect and range any object that reflects sound waves. Very soft objects will show up faintly, and very dense objects will show up very brightly. While this implant will tell the character what is around him in terms of general shape, size, and density, it lacks the ability to detail features. For example, two humans of roughly the same size will "look" the same. On dot mode a bat is even less discriminating. It displays lines for large objects (walls) and dots for smaller objects (people, furniture). The device has an effective range of 10 meters before distortion makes the results unintelligible (a stronger pulse would correct this problem, but would also require more power and shielding for a person's head). Finally, loud noises and pressure waves (from concussion grenades, explosions, etc.) will create distortions and false signals.
Price: Normal Bat: Lv 1,300. Deluxe Bat: Lv 2,250.
[LaBossiere]

Terhertz bat

The terahertz bat (“T-ray vision”) is a very new implant, still rare and hard to get. It uses submillimeter radiation to scan the surroundings, producing “X-ray vision” that sees through clothes and thin surfaces but can easily spot metal or hidden dense objects. The resolution is much better than ultrasound and it does not penetrate deeply into people or soft objects. Metal and water are opaque, while paper, clothing, masonry, ceramics and plastics are transparent.

The implant consists of a phased array grid placed under the skin of the head. When activated it can both send out terahertz radiation and scan it. The normal mode is active scanning, but it can be set to passively detect terahertz imagery if a special “T-ray flashlight” is used. The “visual range” is about 25 meters; the atmosphere tends to absorb the rays

quickly. Like the bat it can go into 360-degree mode, or a limited visual mode in a particular direction.

The main problem is tissue heating and reflections. Running the implant heats up the head skin; usually people who get it elect to get artificial scalps (including natural-looking hair). Some developers experimented with increasing the range by increasing the energy output, but they found that it began to cause heating inside the head too. Current implants have a safety cut-off (which, however, can be circumvented with some tinkering). Using the implant while wearing anything but a thin hat (especially if it is a metal helmet) will cause reflections that both block vision and cause heating. In confined metal spaces the implant might also suffer strange mirroring and shading effects.

ECM systems can also detect the implant (or "flashlights") when active, making use potentially risky in some combat settings. On the other hand, terahertz vision is much sharper than ultrasound and enables seeing through some walls, which may make it worth the risk.

Another version, the T-ray eye option, is under development. This would allow a cybereye to send and receive teraherz radiation. This would likely be both cheaper and easier to use, but lose the advantages of 360 degree scanning that has made military forces interested.

Price: Lv 13,000

Electromagnetic scanner

A grid of sensitive electromagnetic sensors embedded in the skin, augmenting the sense of touch with electromagnetic modalities. At its simplest it enables feeling what objects are ferrous, electrically charged or carry a current. When the user becomes more skilled and turns up the sensitivity it enables fairly sophisticated signal detection and even some forms of electronic eavesdropping. If linked to the right software in internal computing systems it can do signal processing, bringing up visualisations of the data.

"Reading" signals is an independent skill, learned as a normal skill through training. Successes means the user can interpret the electromagnetic patterns and make use of them; these can be added to rolls for circumventing security, finding hidden objects or understanding some machinery.

Price: Lv 3,000

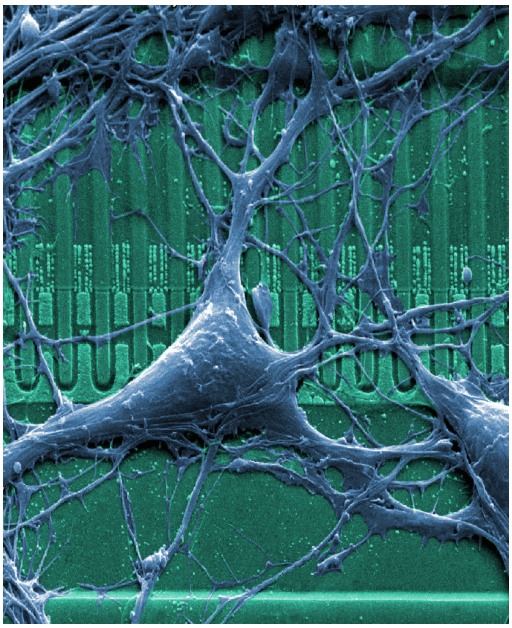
Oxygenator

An oxygenator is a small device consisting of a high-pressure cylinder of oxygen, a cylinder of carbon dioxide-absorbing chemical, and a central component that links both to the person's pulmonary artery and allows blood to flow into and out of the unit. The device also has a sensor that monitors blood carbon dioxide and oxygen levels. Finally, an oxygenator has a link to a suitable information system that informs the person of the chemical status of his blood and enables him to activate and deactivate the unit at will. Essentially, the device serves as an artificial lung for the person in situations in which he does not have access to breathable air.

This device enables the character to last approximately 30 minutes without oxygen or breathable air. (This duration can be modified by the user's degree of exertion, body size, etc.,

if your referee wants to get into these details.) This device does not in any way provide the body with the ability to survive in a vacuum. Replacement/refill of the cylinders will require minor endoscopic surgery to insert refill tubes, unless the character opts to have two loading ports installed in his body. These allow replacement without surgery, but lack aesthetic appeal.
Price: Oxygenator: Lv 600. Loading Ports: Lv 100. Reloads: Lv 20.
[LaBossiere]

Neural Jack



When it first appeared in the late 2290's, the neural jack was hailed as the ultimate tool is ridding humanity of the constraints of the body. It is an electronic socket wired to a person's brain, allowing a person to plug cable connections into a piece of equipment in order to control that equipment by thought. Now machinery could be controlled as if it were the user's own body. Computers could respond at the speed of thought, allowing input without the cumbersome interference of the user's body. In reality, however, the neural jack was somewhat less useful.

The neural jack and the appropriate driver software did allow people to control equipment as if it were an extension of their own body. It does require a great deal of training, however. A new user of Neural Jack must pay a 3 XP cost to learn how to use it. After the initial training period, the Neural Jack grants a difficulty reduction of 2 for using equipment the character is familiar with (new equipment requires a learning period of a few days).

The major drawback to being jacked is that the character is so tied into the equipment's control system that he becomes almost insensible to control of his own body. Any skill checks requiring the character to use his own body while jacked into a piece of equipment have a –3 penalty attached to them. Another drawback of jacking is the relative lack of equipment to plug into. Very little equipment comes with the cybernetic linkages installed. Most have to be either ordered custom-made, or the linkage servos and sensors have to be installed after the fact. This costs roughly 50% more than the standard price. Aircraft and spacecraft, being largely wired already, only cost an additional 10% to be equipped with the linkage equipment. Military starships are the most likely items to be fitted, with approximately 50% of them equipped for linkage in some form or another.

Weaponry is a special case, as any firearm can be equipped with a dual set of linkages, one of which controls the trigger while the other feeds targeting information directly to the optic nerve in much the same way as a virtual display (below). This gives the benefit of a built-in HUD (+3 to hit) along with granting the character in question the benefit of the Improved Initiative Feat, while using that weapon only.
The linkage simply hijacks the command from the brain to pull the trigger, and uses that impulse to fire the weapon, so anyone can benefit from the so-called smartgun link. The cost of having a neural jack installed in a character is Lv7500, plus surgery cost. At the time of installation the player must decide where the jack will be located on the character, the most common places being at the temple or on the forehead (for ease of access), or in the hollow at the nape of the neck (where it can be hidden by hair or clothing).

Those choosing the temple or forehead are often called "bolthead" due to the unsightly neural jacks.
Surgery Cost: 4d4 hours, at Lv2000 per hour
Surgery DC: 18
[2320AD]

Wireless Jack

A replacement for the traditional neural jack. The user's brain is wired to a small wireless transceiver also under the skull rather than a jack plug socket protruding through it. The transceiver's encrypted wireless link to a base station has a range of 3 metres. A major benefit is the reduction in infection risk.
Price: + Lv500
[JIEX]

Skillchips

Actual transfer of procedural memories is beyond current neuroscience, but it is possible to have helper software that contains easy guidance and troubleshooting. Such "skillchips" are downloaded or linked to the neural jack, and will then help the character to the best of their ability. They are only useful for skills where the user can take the time to interact with the software, i.e. not any combat or physical activity. The chip has a skill rating that can be used instead of the character's own, and is always specialised. Typical examples include Survival (Dunkelheim), Astrophysics (black holes) or Linguistics (Arabic).

Price: 1 dot skill: Lv 100. 2 dot skills: Lv 300. 3 dot skills: Lv 1000 (only very narrow skills such as Kufic calligraphy or Ritage 2 missile maintenance are available).

Analogues

A very recent and controversial development is the Analogues from New York-based Albany Biotech. For many years "homunculi", partially whole organisms have been grown using in vitro life support. They were a result of the development of organ cloning and have mainly been used for research and testing. As part of an industry-wide moratorium nervous tissue was never included in the homunculi.

What Albany Biotech did was to grow homunculi around artificial nerves, advanced microwires designed to act as "real" neurons without breaching ethical standards. While their main motivation was to induce more realism in the simulated organism, they soon realized that it would be possible to make a remote-controlled organism. While remotely controlled animals have existed for quite some time, this would enable remotely controlled human bodies.

Making an analogue takes about one year from sampling a person for cells until a fully-grown analogue can be decanted. The analogue lacks brain and in its place has a high-bandwidth radio (driven by a glucose fuel cell) that enables a neural jack equipped person to control the body. When controlling an analogue body all skills are at –2, since the body is foreign, clumsy and often seem to have slightly off sensory-motor mappings.

Needless to say, the public outcry against analogues was fast and shrill. Albany Bioetech defended itself by claiming this would enable severely handicapped people full freedom rather than relying on cybernetic replacements. But many worry that expendable husks would make great infiltration units. Not to mention the possibility of implanting them with bombs, turning suicide bombing into a valid (and safe) military technique.

Price: not on open market yet, likely on the order of Lv 50,000

Bionic Replacements

Most crippling injuries in the 24th century can be simply repaired by growing replacement tissue from the patient's own cells and then grafting it on. Entire limbs and organs can be repaired in this way. The process takes about a month, and the surgery is relatively straight-forward as there is no possibility of rejection.

But some sources offer prosthetic replacements for those who prefer them to the real thing. Prosthetics, while they lack the subtlety of tactile sensation that real organs and limbs give, have many tempting advantages over their flesh-and-blood counterparts. Prosthetic limbs do not tire as easily as natural limbs, nor do they feel pain as more than an abstract sensation. Bionic eyes and ears can offer enhanced senses.

Prosthetics are not illegal, and are defined as mechanical medical replacements that do not extend the user's capabilities more than the original. Bionics, however, do extend the owner's capabilities, and if they violate local laws, they must be registered with national police services, at a cost of Lv1000 per point per year. So a character with a Strength of 12 could get a Strength 12 cybernetic arm with no difficulty, and in America (law level 8) could get a +2 boost with no difficulty. A +3 boost, however, would need to be registered, and cost Lv3000.

Though not illegal, governments and foundation tend to discourage the use even of prosthetic devices, due to fears that the users could become dehumanised from the effects of using the mechanical limbs. Many psychologists feel that those fears are largely groundless, but the debate rages. Prosthetics tend to be more common in military circles, as regrowth therapy takes too long and is too specialized for field surgeries. A soldier who loses a limb can be in action in only a few weeks with a prosthetic, versus 2-3 months for a regrown limb including any retraining time.

Bionic Eyes

Bionic eyes outlasted the cybernetic revolution, largely because of their usefulness. As poor eyesight is often genetically-based, simple regrowth techniques generally won't help, and genetic tweaking is quite expensive. In comparison, bionic eyes are relatively inexpensive, and offer perfect vision that won't fade with time. Bionic eyes also lack the power and maintenance problems of bionic limbs, and the infection issues of neural plugs. Most bionic eyes are fairly easy to detect as they tend to be a standard shade of blue, brown, or grey. Many also have the lensmaker's logo neatly printed around the iris in tiny script. Some are shades that no human eye will ever be, but it is possible to obtain eyes that appear to be completely real. There are several option packages available for use with bionic eyes, which must be purchased at the time of installation.
Price: Lv2000
Surgery Cost: 2d4 hours, Lv1000 per hour
Surgery DC: 12

Colour Enhancement
This option allows the user to see things in computer-enhanced colour, or black and white. Colour enhancement makes it easier to spot camouflaged targets and to observe fine detail.
Price: Lv500.

Low Light
This option allows infrared vision in low light environments, like biocontacts.

Price: Lv650

Night Lenses
These eye implants use low-light enhancement technology rather than the infra-red of the "low light" implants. They do not work in complete darkness, and they cannot see heat sources, but they are not blinded by very hot surfaces or infrared security systems.
Price: Lv550
[JIEX]

Zoom Lenses
These allow the user to focus in on details in the same way as a high-powered camera lens. The character can read a newspaper at 300 metres or spot sub-millimetre details on objects held in the hand. The only limitation is that the character must be able to hold their head still enough for the lenses' image correction to account for head movement caused by breathing and heartbeat. This is a hard task in stressful situations (such as combat or when the character is exhausted).
Price: Lv1400
[JIEX]

Flash Proof
This option protects the owner's vision from sudden flares of light, giving him the same protection as photosensitive goggles.
Price: Lv300

Optic Imager
A favourite of espionage agents, this option lets a person take five high-resolution pictures on thought command and review them later. If the person has a neural jack, he may transfer the pictures to a high-resolution chip. Another option is to transfer them to a subdermacomp, which can hold thousands of images. To erase the pictures, the user simply records over them.
Price: Lv1000

Subtlety
This option makes it almost impossible to detect that the user's eyes are bionic.
Price: Lv850

Laser Rangefinder/Designator
Sometimes seen in espionage and special forces, the rangefinder/designator combination has proven very effective, though the range on the designator is quite short.
Rangefinder Range Increment: 120m
Designator Range Increment: 20m
Price: Lv3750
[2320AD]

Third Eye
This is a cybereye option (at least one cybereye or virtual display is required) that equips the eye with a special monitor device that enables the owner to "see" what remote optics are picking up. This option costs Lv 200. The third eye also requires the owner to have at least one interface plug. There are two basic types of optic devices. The cheapest (Lv 35) consists of an optic, a fiber-optic cable, and an interface plug. The standard cable is 100 meters. Basically, the optic "sees" like a normal human eye (plus any options built into the optic) and transmits

an image down the cable into a converter, then into the interface, and from there into the owner's cybernetics, where the image is seen. The more expensive version (Lv 100) has a built-in transmitter and is linked to an interface receiver. The owner will see what the optic does by "tuning in" to the optic. The range is about five kilometres, but advanced (and more expensive) versions have longer ranges.
[LaBossiere]

Bionic Ears

Bionic ears are an uncommon modification, but enjoy a certain appeal with the avant-garde, even now, 20 years after the cyber-cult peaked. One of the drawbacks of the low-frequency and high-frequency features is that they make the ear obviously artificial in shape and/or material.
Price: Lv1000
Surgery Cost: Lv1200
Surgery DC: 10

Low-Frequency Hearing
This option enables a person to hear sounds below the range of normal humans. Ears with this option do not appear normal—they tend to be larger than normal, and although constructed of cartilage and flesh, they are often of an unusual shape (pointed at the top, for instance). These ears are popular with researchers studying the Eber, as it allows them to hear in the low-range that is part of the Eber aural spectrum. +2 on all applicable Listen Skill Checks.
Price: Lv600

High-Frequency Hearing
This option allows a person to hear sounds above the range of normal humans. Ears with this option also do not appear normal—they are usually of relatively dense materials such as plastics or even metals. +2 on all applicable Listen Skill Checks.
Price: Lv600

Sound Dampening
Although loud or irritating sounds won't damage the bionic ears in any way, they can be unpleasant to the user. This option enables the owner to dampen out specific ranges from the sonic spectrum, allowing sound to be dampened, which can also make it easier to hear a specific sound (such as someone's voice) in a noisy environment. +5 on Listen checks.
Price: Lv250

Recorder
This option allows the user to record ten hours of sound and play it back at a later time. The recording can be accessed at any point and can be recorded over. The recorder option is especially popular with students and music fans. Recordings can be downloaded via neural jack, or dumped to a subdermacomp.
Price: Lv450
[2320AD]

Third Ear
This is the audio version of the "third eye" and operates in a similar manner except with sound and the cyber audio. The cable "ear" costs Lv 25, and the transmitter version costs Lv

85. A character with a radio splice option can use this instead of an interface receiver. The option itself costs Lv 100.
[LaBossiere]

Combination
A person with both third ear and third eye options may use combination units. An optic and microphone unit costs Lv 60, and the transmitter version costs Lv 170.
[LaBossiere]

Switchboard
The switchboard is a large interface plug that comes in two versions. The Lv 100 version can handle four cable plugs and enables the owner to switch among them at will. The Lv 400 version can handle four transmitter units, and the owner can switch among them at will. Switchboards are often used by military sentries as well as corporate security personnel who move around and hence do not have constant access to a television monitor. In this case, the optics are the building cameras.
[LaBossiere]

Voice

Growler
The Growler is a specialized implant used for communication with the Ebers, and allows a person to duplicate the low notes used in parts of Eber speech.
Price: Lv200
Surgery Time: 30 minutes
Surgery Cost: Lv1000
[2320AD]

Mimicker
The mimicker is a rather rare bionic enhancement that enables its user to reproduce the voices of other people. This piece of equipment is grafted directly onto the larynx, where it stimulates the necessary tension in the user's vocal chords. Because the larynx is very close to the surface of the throat, the mimicker apparatus is obvious to any close inspection.

Each mimicker can record and store up to six different voices. With a minimum amount of training, a user can learn the nerve impulses necessary to stimulate the mimicker to play a voice from memory or to record a new voice. Mimickers come with a sample selection of famous voices already installed. The normal muscle movements of the throat provide the power necessary for mimicker operation.

A mimicker cannot fool a voice analysing machine, and some voices are virtually impossible for some larynxes to produce. (For example, a very petite woman would be unable to produce a very bass voice).

Mimickers are considered to be legal bionics, and they have begun to show some popularity among actors and singers. However, in most nations registration is required. A character with a mimicker installed should gain a bonus of one to task rolls involving attempts to disguise himself as a known figure, and a bonus of three when simply trying to disguise his own identity.
Price: Lv 850.

[Smith]

Bionic Limbs

Bionic limbs come with a standard Strength of 2 but can be improved up to a maximum of 8. In most task rolls using Strength as a modifier, a character's normal Strength should be used, but if the referee judges that a particular task warrants it, the Strength of the bionic limb can be used instead. For example, if a character is attempting to lift a heavy weight from the floor, his natural Strength should be used, since all of his limbs and his torso muscles are involved. If, on the other hand, the character is hanging from a ledge by his bionic arm, the Strength of the arm should be used in determining whether or not he can hold on.

As there is some empty space in most bionic limbs, it is possible, though illegal, to have a secret compartment built into one. A bionic arm can have a compartment 20 centimeters long and 3 centimeters in diameter, and a bionic leg can have a compartment 30 centimeters long and 8 centimeters in diameter.

Price: Lv2000 for a Strength 12 bionic arm, plus Lv200 per extra point of Strength; Lv3000 for a Strength 15 bionic leg, plus Lv300 per extra point of Strength. A cybernetic hand is Lv1200, as the hand is the most complex part of the arm, while a bionic foot is usually only Lv500, though that foot has only limited function. At the base Strength rating, these limbs are considered prosthetics, though any extra points makes them Bionics.

Surgery Costs: 1D6 hours, at Lv1000 per hour.
Surgery DC: 12

Equipment
Rather than having a secret compartment, a bionic limb may be constructed with any one-handed piece of equipment built into it. A one-handed firearm can be built into a bionic arm (although it is highly illegal), but is never built into a bionic leg, due to the fact that it would be nearly impossible to aim. The extra cost for such equipment is five times what the equipment would normally cost.

Power
Bionic arms and legs require a power source, typically contained within the limb itself. This power supply is usually a compact super-battery, which can supply power to the limb for up to 24 hours of constant use. These batteries can be recharged from any standard supply, including household current and portable generators. The battery itself weighs 2kg, takes up 1 vol of space,and costs Lv50.

Maintenance
Bionic legs in particular require a considerable amount of maintenance and tuning. Each bionic leg requires 6 hours a month of maintenance. For each month missed, the character suffers a penalty of -1 to all moving actions, and their speed drops by 1 meter. Bionic arms require less maintenance; only 2 hours a month, but still suffer the –1 penalty if the maintenance is missed. Note that this penalty is cumulative for each month missed, and the maintenance time must be made up before the penalty goes away. So if Jeff misses three months of maintenance on his bionic leg, he's at -3 on all moving actions, and will require 18 hours of maintenance on the leg to get back to normal. A full body cyborg would require 6 hours of maintenance per week to remain in optimal operating condition.

Damage to Prosthetic Limbs
All limbs have a base armor rating of 3. Any shot that penetrates that base AR causes damage to the limb's Structural Integrity (SI). Arms have 10 SI, while legs have 18 SI.

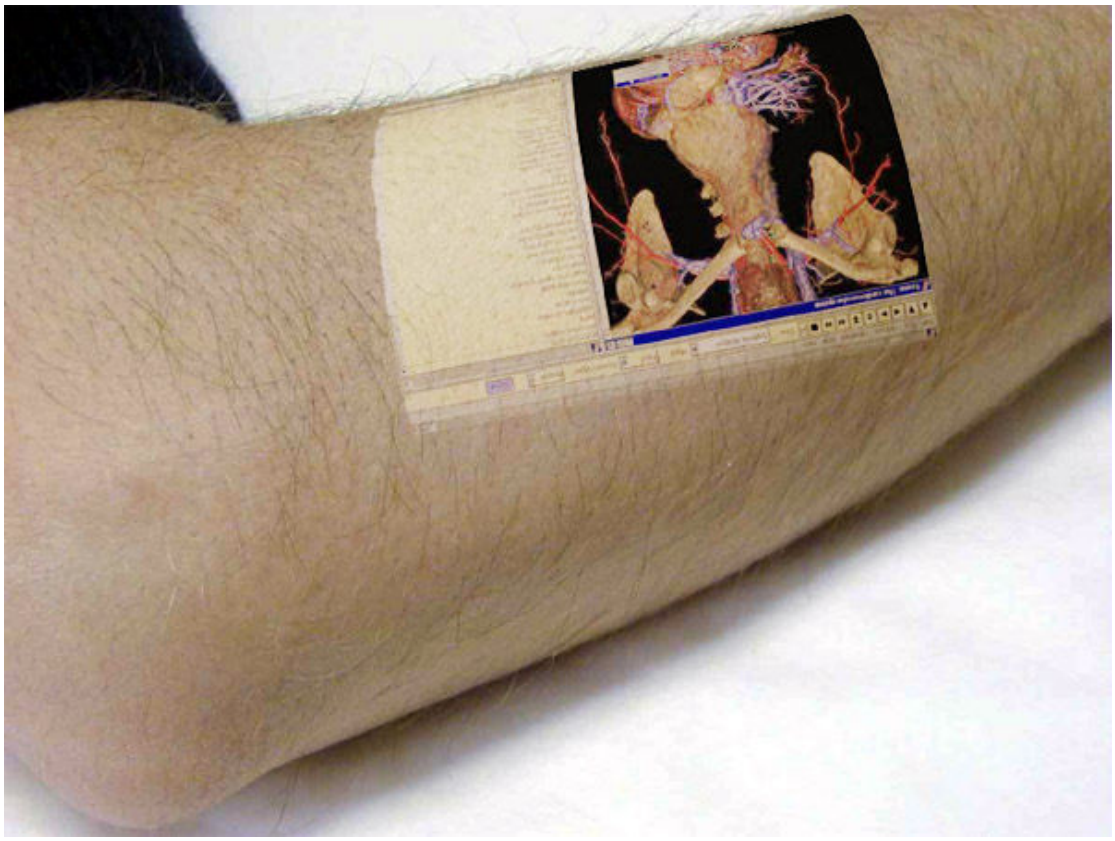
It is possible to armour limbs further, for a cost of Lv 500 per level armour. Beyond 1 extra point the limbs will be obviously artificial.

Bionic Spine

A way of extending the power of bionic limbs is to replace the weak point, the spine, with a stronger artificial spine. This enables enhanced people to use the full strength of their limbs, as well as some amazing contortions if the normal safeguards are turned off (+2 for contortionism and snaking through small openings). Unfortunately this is a very complex operation (since the spinal cord cannot be replaced yet). The recipient will be immobilized for several months as the muscles of the thorax and stomach knit together again and he trains how to make use of the spine.

Surgery Costs: 4D6 hours, at Lv1000 per hour.
Surgery DC: 12

Subdermal Implants



Subdermal Implants are a special case, and are completely legal practically everywhere. These implants do not go as far as full cybernetic implants. They consist of several types of equipment that are implanted in the body, but do not require
mind-machine interfaces. Their control is more basic, typically by wiring the controls into the hands and displays to the optic nerve. To activate the devices usually requires a set of hand motions that are unlikely to be performed by accident. After that, the motions of the fingers control the equipment as if it were being held. This interface technology is called "virtual keyboard/keypad."

RFID Chip

On the Core worlds, most opt to have RFID chips installed, which provide hands-free access for their homes, cars and bank accounts. That the chips can also be used to track them doesn't bother most citizens of the Core, as they see this as another safeguard of their security.
Surgery Time: N/A
Price: Lv50
[2320AD]

Subdermawatch

The Subdermawatch is a basic multifunction digital watch implanted just under the skin of the arm. Powered by body heat, it is widely available and widely used. The display is visible just under the skin at the wrist.
Price:Lv20
Surgery Time: 1d4 minutes

Surgery Cost: Lv50
[2320AD]

Subdermatalk

The simplest of the true subdermals, the subdermatalk consists of a small 15 km range radio implanted in the skull behind the ear, with a microphone placed alongside the larynx. It isn't necessary to talk out loud to use the system – sub-vocalizing is sufficient. For an additional cost, a link phone can be installed that that can make use of the phone networks through the Core and the more developed colony worlds. Numbers can be dialed via the microphone and built-in speech recognition, or a virtual keypad can be installed that works through the fingers of the left or right hand. This is similar to the keypads of the subdermacalc and subdermacomp.
Price: Lv300
Surgery Time: 20 minutes
Surgery Cost: Lv200
Link Option: + Lv20
[2320AD]

Virtual Keypad

The simplest of the three styles of virtual input, the keypad can simulate up to about the size and complexity of a multi-function scientific calculator. This option is included with the subdermacalc.
Price: Lv100
Surgery Time:: 10 minutes
Surgery Cost: Lv100
[2320AD]

Virtual Keyboard

The most complex of the three virtual interface options, the keyboard is as complex as a fullsize computer keyboard. Chording versions are popular, with one key assigned to each finger and input accomplished by key combinations. This option is included with the subdermacomp.
Price: Lv220
Surgery Time: 10 minutes
Surgery Cost: Lv100
[2320AD]

Virtual Pointer

The virtual pointer has to be used in conjunction with the virtual display and either the virtual keypad or virtual keyboard. Essentially, it tracks eye movements, and a mental keyboard command will select the object highlighted by the eye movement.
Price: Lv180
Surgery Time:: 5 minutes if done along with virtual
display, otherwise 20 minutes
Surgery Cost: Lv80 if done along with virtual display,
otherwise Lv200.

[2320AD]

Virtual Display

There are two classes of virtual display. The low-res model is used for subdermacalcs and subdermacomps, as they don't usually require better than a 16-million-color display. A high-resolution option is available, used by some subdermacomps and external systems. This display provides better-than-photo-realistic colours, and has been known to lead to some problems adjusting to the 'regular' palette of colors in the real world. Both of these implant displays actually tap into the optic nerve of one or both eyes, superimposing the generated image over the real-world
image.
Price: Low-Res: Lv150
High-Res: Lv250
Surgery Time: 20 minutes
Surgery Cost: Lv400
[2320AD]

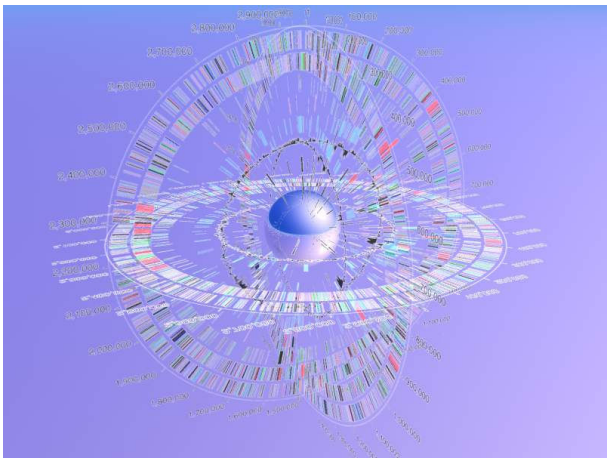
Subdermacalc

The subdermacalc is a multi-function calculator/chronometer/compass installed at a suitable point in the user's limb, and powered by the body's own heat. It is controlled by a virtual keypad, and is linked to the optic nerve via a virtual display. It grants a +1 bonus to any skill requiring calculations, and provides the Natural Compass Feat if the user doesn't already have it. Using the subdermacalc doesn't require an additional action.
Price: Lv750
Surgery Time: 30 minutes
Surgery Cost: Lv200
[2320AD]

Subdermacomp

The subdermacomp is a much larger unit than the subdermacalc, and is similar in performance to a portacomp. The virtual keyboard can be configured for a number of purposes, like the keyboard of the portacomp. The subdermacomp can't use normal plug-in program chips, but it does include a special reader that can interface with
the subdermacomp through an induction link, allowing programs to be downloaded to the computer rather than slotted in. This takes about 1-2 minutes per program. Like the subdermacalc, the subdermacomp uses a link to the optic nerve to provide its display. It provides the benefits of the subdermacalc, plus allowing the user to access any database or program on the computer. If the user has a subdermatalk with link phone access, the subdermacomp can connect to available planetary networks, making their databases and information instantly available. The typical subdermacomp has the following stats:
CPU: 100
Model: B9
Int: 1
PP: 10/5
Weight: 0.5 kg
Price: Lv2100
Surgery Time: 1d4 x 20 minutes
Surgery Cost: Lv400 [2320AD]

DNA Modification



One of the great breakthroughs of 22nd century medical technology was the development of DNA Modification (DNAM) technology. Originally created as a means of curing genetic disorders, DNAMs use tailored retroviruses to rewrite the genetic code of a mature individual. These changes are permanent, and are passed along to successive generations. In the 150 years since they were first developed, they have helped to all but eliminate genetic disorders on the Core worlds. In 2192, a joint American-Canadian team developed the most famous of the DNAMs, the so-called King DNAM, which opened up the hostile world of King to settlement and exploitation.

There are, of course, persistent rumours of DNAM technology being misused, of governments and megacorporations, not to mention Provolution, creating super-soldiers or super-geniuses. There has been no evidence of this to date, though. Each of the three DNAMs mentioned below required upwards of 20 years of development time, something that few megacorporations, governments or terrorist organizations can commit to. These rewrites were largely the work of extra-governmental foundations, in particular the Royal Society, the Life Foundation, and the Alberta Farmer's Cooperative. Since the Gene Protests of the early 2200's, however, there has been no new (official) research into DNA modifications, nor any attempts made to alleviate the problems inherent in the King DNAM.

Game notes: All DNAM treatments are listed with a type, cost and rejection save. Type refers to the severity of the modification. Minor modifications are outpatient treatments, with patient held for an hour or two after treatment to ensure that his body has accepted the procedure. The modification is typically complete within a week, and the patient notices little save the occasion bit of itchiness or hot or cold spells.

Major modifications, on the other hand, significantly rework a sizable portion of the patient's body, and usually require the patient to be sedated for up to a month.
Cost simply refers to the cost of the treatment itself, and in the case of major modifications doesn't include the cost of the hospital stay. As these modifications are usually performed on colonists, the sponsoring government typically picks up the bill.

If the DNA modification is rejected, it can simply be tried again. If it is rejected a second time, however, it cannot be retried. If it is retried the patient will likely get very sick, even if they make the rejection save. If they fail the rejection save the result is often death due to massive shock and tissue rejection.

There are several other DNAM therapies on the market, though most of them are aimed at their original purpose, that of curing genetic disorders. These therapies are all Minor modifications, and cost between Lv500-Lv5000, depending on their seriousness and rarity.

King Massive Worlder Modification

The first, and most-widely known, of the DNAM therapies, the King rewrite is also the most extensive. The primary change is a rebuild of the host's muscular and skeletal system, greatly increasing the strength and density of both. This tends to alter the subject's height as well, resulting in a more compact, but no less massive, individual. Additional changes are made to the host's cardiovascular system, strengthening the heart and altering the circulatory system to ensure efficient blood flow at all times. The lungs were also altered, allowing them to function properly in King's much denser atmosphere. Another aspect of the King modification is the addition of an environmental symbiote, called the AFS (Atmosphere Filtration Symbiote), a cluster of micro-organisms that, in this case, live in the subject's lungs and filter the sulphur out of King's air. These symbiotes require the sulphur in the atmosphere in order to live, and if someone leaves King for any length of time, the symbiotes will die, requiring the person to be reinfected with them upon return.

Less well-known, and little-publicized, are the side-effects of the King modifications. The supercharged cardiovascular system, coupled with King's extreme gravity, sees few colonists living past their 50th year. Their hearts and bodies just wear out. The DNAMs didn't provide any sort of additional clotting mechanism, so any lacerations or penetrating wounds tend to be extremely serious, as the powerful cardiovascular system will send blood jetting out of any serious wound.

Special Qualities: All characters who receive the King modification, and pass the required Save, have their bodies transformed into the Mesomorph body type, in addition, they receive all heavy gravity modifications, plus an additional +1 to Strength and Stamina, and a penalty of 1 to Dexterity.

In any atmosphere type less than Dense (1.25 atm), the character must wear a respirator mask. The character will lose untreated health levels at twice the normal speed when wounded.
Price: Free if sponsored, Lv12,500 otherwise. TheAFS is Lv100 per treatment.

Zero-G Space Adaptation

Though the King modification is the most noteworthy of the DNAMs, the Zero-G modification is the most common. Practically everyone who expects to spend more than a few days in zero gravity receives this modification, and it's so wide-spread that Earth's Orbital Quarantine Command (OQC) lets it pass without mention. The Zero-G modification acts to limit muscle degradation and bone decalcification while in zero-gravity. Like many of the DNAMs, it actually consists of the DNA modification itself, which acts to prevent muscle decay, and an environmental symbiote, in this case a microorganism that fixes calcium out of the bloodstream and back into the bone structure. This symbiote usually needs to be destroyed once the recipient is back in a normal-gravity environment, as some have been known to go awry, and keep fixing additional calcium even though the body no longer needs it. This can result in bone spurs and other ailments, up to and including kidney failure. The symbiote thus needs to be renewed whenever the host goes back to a zero gravity environment.

Special Qualities: Allows a character born in zero gravity or low gravity to use the Zero-Gravity line of the Home World Gravity type, rather than simply being immobilized when in any sort of gravity well. Also acts to reduce the difficulty of Stamina saves needed to avoid muscle and bone loss on long space voyages.

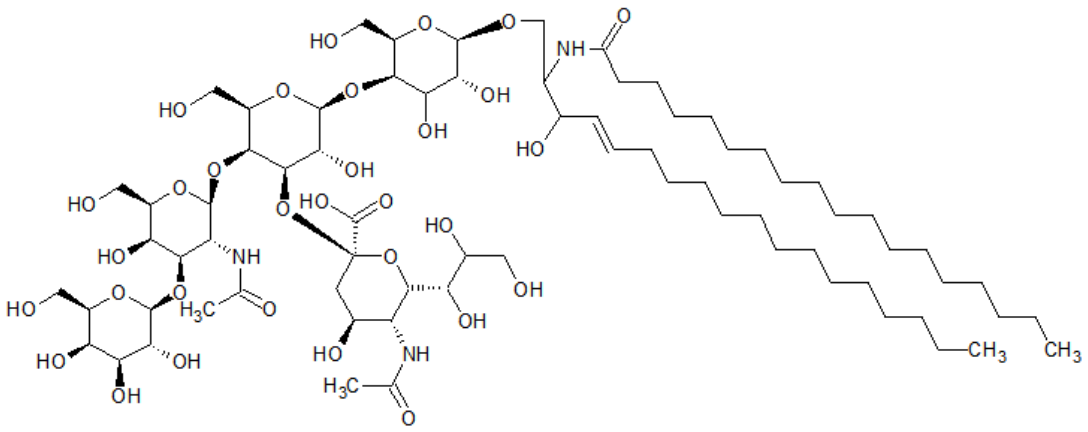
Price: Initial Treatment: Lv550 Subsequent Treatments
(Environmental Symbiote) Lv250

Thinair Adaptation

The Thinair modification was the last of the DNAM treatments to hit the market, developed shortly before the Gene protests led to a moratorium on DANM research. It was aimed at worlds like Crater, where the surface atmospheric pressure is thick enough to breathe, but thin enough to cause a great deal of discomfort. The Thinair modification greatly increases the concentration of blood vessels along the alveoli inside the lungs. This modification acts to increase the amount of oxygen the lungs can draw out of the surrounding air. The downsides of this modification are two-fold. First, normal air feels thick and heavy to breathe, and the increased oxygen can possibly cause the subject to behave erratically. This can be overcome with a special filter mask, which draws out a portion of the atmospheric oxygen. The second drawback is the increased concentration of blood vessels in the upper torso, which can increase the severity of any chest wound. Most consider these drawbacks to be acceptable. This modification is quite popular on Crater, where many of the topside ranchers underwent the modification before the recent security crackdown.

Special Qualities: Allows a character to breathe in Thin and Very Thin atmosphere (<0.60 atm) without a compressor mask. It also adds wound level to any wound that occurs in the chest.

Price: Lv1200



NeoGaucher

One of Provolution's mixed successes, a common example used when people are arguing for a continued moratorium on DNAM but also unquestionably a step towards real intelligence enhancement.

Adapting a treatment for Tay-Sachs disease sometime in the 2280's, Provolution researchers tried to use it to enhance intelligence (some evidence show a higher incidence of exceptional intelligence among people with some lysosomal storage disorders). The result succeeded, sort-of: when given at an early age neural development is favoured and there is a good chance of developing high intelligence. The downside is that recipients accumulate gangliosides and glucocerebrosides, producing a hybrid disease similar to Gaucher's disease:

an enlarged liver and spleen, a weak skeleton prone to bone disease and a tendency to anaemia, but also muscle spasms similar to torsion dystonia. When given to adults mainly the negative effects show up, although occasionally neural growth occurs at the same time as progressive blindness, deafness and paralysis similar to Tay-Sachs disease.

When given in infancy the DNAM gives +2 to Int and +1 to Edu (once education has finished), at the price of –2 to Sta and –1 Dex. If given before adolescence it gives +1 to Int and Edu, as well as –2 Sta –1 Dex. The price (at a Provolution clinic) is Lv1000.

However, the gangliosides and glucocerebrosides can be controlled to some extent by giving enzyme replacement treatment with glucocerebrosidases intravenously every two weeks. If this is done the recipient only suffers –1 Sta. The enzymes have to be ordered specially, since (thanks to DNAM) there are practically no sufferers from Gaucher's Disease anymore, at a cost of Lv 300 per month.

NeoGaucher became known to the public in 2287 during the Ekstein Affair on Tirane. Datamining by WI5 found unusual purchase patterns of enzymes, and investigations led the Wellon authorities to the family of the wealthy industrialist Samuel Maxwell Ekstein. They discovered that his three children had been modified, and further evidence found several other children of prominent families in Victoria and Mirabeau with NeoGaucher. The subsequent child abuse proceedings were spectacular drama and revealed how Provolution had used the ambitious Wellon industrialist to bankroll their research in the hope that his children would become geniuses.

NeoGaucher appeared in the limelight 22 years later, when Linda Lyons-Ruth received the prestigious Pastores Medal for her work in TGKS (Trans-Gödelian Kripke Semantics) at the young age of 26. Since she was not allowed to travel down to Earth's surface by OQC regulations the prize ceremony was held at L5. Despite many questions from the media, she never denounced her father for modifying her. On the other hand she never claimed her modifications were responsible for the TGKS breakthrough, just that "she was lucky to see the problem from a unusual angle". Besides a highly publicized (if esoteric) academic career she married Solomon de Braekeleer, another one of the modified. This led to the controversial birth of their daughter Emma in 2311. Since then two other NeoGaucher children have been born in Wellon. There have been a handful of cases of NeoGaucher use in other parts of human space, but the total number of living enhanced numbers less than 20. As potential *Homo superior* competitors to *Homo sapiens* the NeoGauchers are clearly very limited.

Radiation resistance DNAM

Rumoured to have been under development by AECA, this DNAM would introduce extra DNA repair, cancer control and improved antioxidant production in order to make humans more resistant to ionising radiation and UV (and likely a host of other environmental factors). The project was shelved, but many would like to see what they achieved.

Gene Therapy

While DNAM efficiently rewrites the genome in most of the body, earlier gene therapy treatments only affected some cells (and often patchily, with occasional side effects). They could also affect only a few metabolic pathways or signalling systems, and not fundamentally reshape the body. They also tended to produce serious side effects. Still, the old tools were much simpler than DNAM and are hence easier for underground clinics to acquire today.

Treatment is simple: injections of a vector (either a virus or nanocapusles with DNA), which hopefully affects enough cells. Roll 3D6:

3-6	No effect.
7-8	Weak effect, bonuses halved. (one way to handle is for the bonus to only work 50% of the time)
9-12	The treatment works.
13	Treatment works more strongly than intended. Bonuses doubled.
14	Expression dangerously high. Bonuses doubled but also overexpression penalties.
15-17	Normal treatment effect and overexpression.
18	Overexpression and patient develops serious condition such as leukaemia or a cytokine storm (either 1 point of aggravated damage per month or 1 point of lethal damage per day until successfully removed).

Treatment can be retried an indefinite number of times, but each increases immune load by one. A well-designed therapy includes an apoptosis signal (a "suicide switch" for transfected cells in contact with a certain chemical) so it can be quickly reversed by the right artificial hormone. This is usually an (expensive) extra in black clinics or an undocumented feature of the vector that is not known by the seller.

Cost: Lv 650
Medical use is legal (but rare) in most jurisdictions, enhancement use is illegal almost anywhere.
TL: 8

Anti Drug Therapy
One innovative treatment for alcoholism or other drug misuse developed in the early 2150's was gene therapy that increased the production of enzymes that break down the drug – alcohol dehydrogenase in the case of alcohol, carboxylesterase 1 for cocaine and heroin. When functioning as intended the treatment makes the person resistant to the drug. The method was found to be a bit too risky and random to use compared to psychological interventions. Overexpressing carboxylesterase had the beneficial effect of reducing DNA damage but also made many medications behave unpredictably.

Once treated, the character has three extra dice to resist addiction or drug effects of the selected drug. Overexpression effect: metabolic disturbances or liver changes, the person will suffer –1 penalty for all Stamina rolls unless he takes the drug or a medicine similar to it to block the extra enzymes.

Provolution has of course come up with a nasty variant that does the opposite: it makes people more vulnerable to a particular drug, giving them an innate tendency to be addicted to it. Overexpression in this case makes the victim extremely sensitive to the drug, easily overdosing at even the normal dosage range.

Immune Boost
Increases the activity level of the immune system, similar to a continual treatment with immune boosting drugs. Gives STA+1 for resisting infections and parasites and does not itself count against immune load. Overexpression: autoimmune illness, STA-1

Feelgood therapy
Makes the body produce its own opiates. The user feels cheerful and unconcerned. +3 to willpower for resisting bad moods. Overexpression: confusion, dizziness and headaches (-1 WIT).

Gene doping
The inefficiency of gene therapy didn't stop ambitious people from attempting to dope themselves. This kind of enhancement is regarded as old-fashioned, dangerous and primitive, but is relatively cheap compared to DNAM (which requires enormous research budgets and high-tech equipment). Such gene doping is known as "barracks gene technology" in the colonies, where amateur enhancement doctors have been known to sell their wares to soldiers. Most military forces frown on the practice, since it often wrecks otherwise promising soldiers.

Growth hormone: bulks up the body. One extra Bruised level. (Overexpression: cancer, 1 point of aggravated damage each month)

Myostatin antagonists: increased muscle mass. +1 STR (overexpression: unnatural body shape, -1 APP)

EPO: Erytropoeitin stimulates red blood cell formation, giving extra blood oxygenation +1 STA (overexpression: increased risk blood clots, each week the character has to roll a Stamina roll to avoid getting a 1 point damage somewhere; on botches roll 1d6 for each one in the roll for total damage).

PPAR-delta agonists: improves endurance by making muscles absorb fatty acids for energy more readily. +1 STA (Overexpression: tends to deplete fat from tissues that need it, like the nervous system. –1 Int or Wit)

IGF-1: Locally injected in particular muscles, improves training performance. Halves cost for raising physical stats or skills by experience (Overexpression: pain syndrome, -1 dice due to distraction from aching muscles)

Vascular growth factor: stimulates blood vessel production, gives an extra supply of oxygen and other nutrients to the tissues. Exhaustion is delayed as if Stamina was two levels higher (Overexpression: development of varicose veins (-1 APP) or increased bleeding (lose one health level extra when Wounded)).

Endorphins: reduces pain, wound penalties are one less. (overexpression: sluggishness, -1 DEX or numbness, -3 on skills requiring touch discrimination)

Testosterone: increases testosterone levels, promoting muscle growth, masculine appearance, sexual desire and aggression. +1 STR, with the Lecherous or Short Fuse flaw (overexpression: impotence (with the Lecherous flaw remaining) or cancer, 1 point of aggravated damage each month)

Sympathetic sensitivisation: increases arousal levels, making the recipient more alert. +1 WIT and the Short Fuse flaw (Overexpression: chronic fatigue syndrome, -1 STA)

Genetic Identity Replacement

While biosculpting can change appearance radically, changing one's DNA to become a new person is not practically feasible today (although it might become possible eventually using DNAM). Still, for people who strongly desire not to be identifiable from their DNA there are a number of options, all quite illegal since they help identity theft or hiding from authorities.

Surface replacement: skin and hair are either cloned from another person, or cells from the customer are strongly modified in the lab and then cloned into skin. The customer is then draped in their new skin (often together with bioculpting to a new appearance) and their immune response tweaked to accept it. This makes skin flakes and hair follicles appear to come from a different person. Mouth swabs and blood samples will still show the original person's genetics. Price: Lv 5000

Interior replacement: like surface replacement, but also replaces the membranes of the mouth with cultured tissue. This fools mouth swabs. Price: Lv 2000

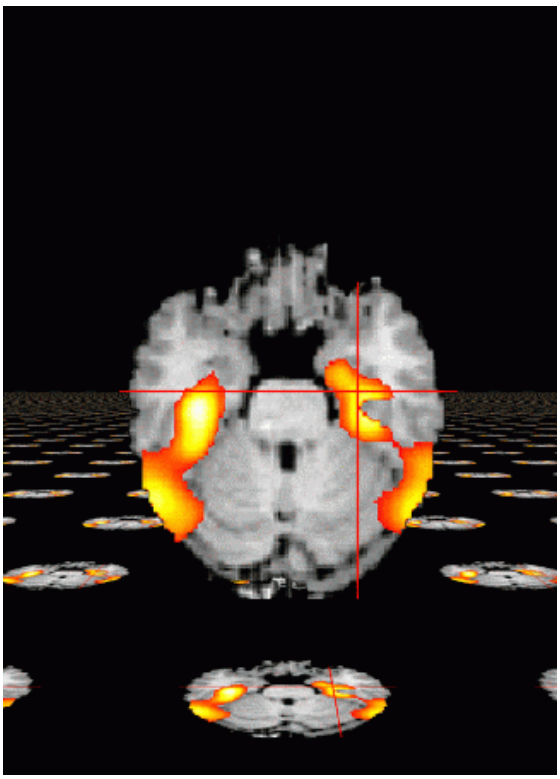
Blood jamming: gene therapy is used to produce short promotor plasmids intended to disrupt the PCR process, making blood-based genetic fingerprinting hard or producing erroneous results. If the investigator suspects jamming it is easy to test for, but most police forensics teams are currently not looking for it. Price: Lv 2000

Chimerism: "a deniable" version of jamming where gene therapy and immune tweaking are used to produce cells that express the DNA of another, closely related person. This mimicks natural chimerism where embryos merge and grow into a composite individual, a rare but natural occurrence. DNA fingerprints will now look mixed, and (if nobody looks for it) different from the original. Unlike jamming this could be natural, making it harder to prove that an identity crime has taken place. Price: Lv 2000

Price: To deliberately copy a certain person (a DNA sample is needed) doubles the price and is considered identity theft. Buying the surface and/or interior replacement together with biosculpting reduces the total cost by 20%.

TL: 10

Psychological Conditioning



Advances in education, teaching software and VR, cognitive psychology and localized nerve repatterning ("didactronics") have enabled forms of conditioning and training that control a person more or less subtly. It does not require any detectable hardware and few have ethical qualms about it. Originally developed to keep people from doing mistakes, now the research front is exploring creating habits and even entire personality constructs. Analysts predict that didactronics might be the next big thing in lifestyle enhancement in the Core.

Most voluntary training like Ambidexterity training takes 4-6 months, while involuntary or high-speed repatterning can be done in a few weeks using drugs and intensive virtual reality conditioning (treat it as brainwashing, where the permanent Willpower of the subject is first removed and then recreated by psychoengineers at a rate of about one point per day as they construct the "new" self).

There is an important court case in France dealing with whether it is possible to patent a reflex itself (as Action Réflexe claims) or only an implementation of it; the outcome will affect the repatterning business strongly.

TL: 12
Voluntary conditioning is legal, although conditioning that produces automatic reactions tend to require professional oversight.

BrainLock Conditioning

The so-called BrainLock has only one effect - to provide a feeling of nausea and fear under given circumstances in order to prevent someone doing a particular activity. Originally used on criminals, Conditioning has found commercial applications with such things as the Chastity Lock, especially popular with parents worried that their children might be up to no good, and the Corporate Loyalty Lock, used to ensure non-disclosure contracts.

It is illegal to place a BrainLock on an unwilling adult. A BrainLock costs Lv500 and consists of psychochemical therapy. To overcome an active Lock requires 3 successes on a Willpower roll (high-quality locks may require 5 successes). Locks can be permanently reversed - the cost is again Lv500.
[SotA]

Coma Training

Members of certain elite branches of the military and intelligence branches are conditioned by hypnosis to be able to induce a coma-like trance in themselves by code words and to come out of them only when signalled by a voice they know. This is reputed to increase the rate of healing too. This trick is very useful in combat and even more so to prisoners of war.
Lv5000

Ambidexterity Training

It is possible to train oneself to become ambidextrous. This is popular among some Core amateur athletes and occasionally useful for others. There is no penalty for using the originally non-dominant side after successful training.
Lv 400.

Checklist Compulsion

Conditioning can produce overriding compulsions that improve operational security. The original version was designed for pilots: whenever entering the pilot's seat in the vehicle it prompts him to complete all steps of a pre-flight checklist before taking off. Later versions have been developed for other professions where it is important that certain routines or procedures are followed.
Lv 500
[FM]

Antistartle

A repatterning of the startle reflex that reduces the spastic, uncontrolled movements when subjected to unexpected stimuli and promotes calm, quick attention. Users become noticeably unfazeable by surprises.

The user gains a +3 bonus to initiative after a surprise attack and to resisting sudden psychological shocks (they might be shocked by what they see, but they will not faint or make a noise).
Lv3000
[FM]

Catfeet™

Cats have a reflex system that enables them to twist in the air in order to land on their feet. Action Réflexe SA has patented a repatterning program to induce something similar in humans. When falling the righting reflex makes the falling person orient himself or herself in an optimal manner, reducing impact damage. The more rigid human torso and higher mass limits the effectiveness, but it can still be a major lifesaver. The training gives three extra dice to Athletics rolls to land on one's feet, *or* acts as three extra soak dice for falling damage.
Lv 1000

Quickness Under Fire

The user is trained to react quickly in combat situations, increasing his ability to notice what is going on and figure out what to do. Increasingly regarded as "a must" by Special Forces

beyond the usual kinds of training, and a major driver for many kinds of reflex programs and conditioning methods. Gives +1 to initiative. Deeper conditioning can add more bonuses for "combat consciousness".
Lv5000

Kata

Reflex training of martial arts moves, essentially taking the practice of katas to the next level. For a given move (such as throwing an opponent approaching from the back, disarming a knife attacker or escaping a grip) the kata is programmed into the reflex system. Given the appropriate stimuli the user can execute the move precisely and accurately each time.

The training gives a +1 success bonus to performing the move. Moves must be specified and be specific (i.e. "kicking an enemy" is too unspecific, while using a roundkick is OK).

The downside is that the move becomes a bit stereotypical; an enemy who observes this (requires at least a Int+Martial Arts roll with more successes than the Martial Arts skill of the character) can ignore the bonus and instead turn it into a bonus for *his* counter-move. Also, the reflex can trigger in inappropriate circumstances, such as disarming a waiter bringing a fork.
Lv5000
[FM]

Lifeguard

A set of reflex actions intended to prevent panic in certain accident situations. The original conditioning made people suddenly immersed in water relax, avoid reflexive inhalation and position her body upwards in order to float. Later versions include fire safety (prevents panicking and makes the victim roll around on the ground when covered with flame) and space safety. The conditioning precludes irrational reflex actions in a specific kind of accident.
Lv500
[FM]

Personality Shift

Conditioning methods developed for psychiatric treatment can produce "artificial personalities", sets of traits and values that at least temporarily override the main personality. Some experimental non-therapeutic conditioning tries to trigger artificial personalities that trigger under some conditions, somewhat like the Lifeguard reflexes but with greater flexibility. The new personality does not have different values or knowledge from the old, but represents a different "style" of the person.

The conditioning creates an alternate personality with its own Nature and mental merits/flaws that trigger in a pre-set condition such as when under attack or when speaking a trigger phrase. The personality must have balanced merits and flaws. For example, a "policeman" personality might have nature Honest Abe, the merits Code of Honor (law), Healthy Skepticism and Patient as well as the flaw Lifesaver (-3).
Cost: 2000 per point merit/flaws.

Multitasking

Cogfac Lyonesse is reputedly working on the next level: independent subpersonalities. Developing natural subpersonalities into full artificial construct personalities and reconditioning the attention system they hope to enable multitasking (especially when supported by neural implants). How far they have come is unknown, and most industry observers think multitasking is years away. Some medical watchdogs are growing concerned that the company (with strong ties to the French military) is doing unethical psychological experiments: to actually develop the technology it would seem to be necessary to deliberately split personalities of test subjects or use people with multiple personality disorder. Cogfac has not filed any such experiments for ethics approval and claims not to be doing them, which doesn't quite square with the rosy hints of progress the company is making.

Symbionts

Microflora therapy, the control of the microorganisms on and in the body, has been a popular way of improving health. Most health conscious people in the Core do not only eat functional food and probiotics that give them "friendly" gut bacteria, they regularly check the health of their internal ecosystem using "census-stick" devices and consult with personal ecosystem counsellors ("microflorists") to optimise them. Others find the idea of sharing the body with trillions of microorganisms distasteful, let alone modified organisms.

Anticavity

A common symbiont, actually first developed before the twilight war but reinvented a century later. The symbiont is a genetically modified version of Steprococcus mutans that does not produce lactic acid and helps break up bacterial biofilms on teeth.
Price: Lv 10 for a mouthspray, lasting four months.

Odorants

Modified skin bacteria help control body odours. Instead of breaking down sweat from the apocrine sweat glands into odorous molecules these bacteria are odourless, provide pleasant odours or even enhance "sexy" odours. Given the variability in what is considered acceptable, personal taste and differences in sweat chemistry selecting the right skin bacteria strains requires help from a microflorist.
Price: Lv 1-10 for a can of spray on bacteria, Lv 100 for a microflorist consultation.

Demodex

The Demodex mite lives in hair follicles in nearly all humans. Cosmetic demodex are modified to produce pigments, skin and hair conditioning. The mites are tailored to be dependent on the particular person buying them, and will not migrate to other persons like normal demodex.
Price: Lv 100 for a colony.

Gut Factories ("Drug bugs")

It is possible to modify gut bacteria to produce medicine or drugs. Most such symbionts are used for vaccinations or preventative treatments; spores make excellent vehicles for exporting them to remote locations. People with chronic diseases also sometimes opt for a symbiotically produced drug rather than having to take medications. But they can be used to produce illicit drugs or enhancers too. Usually such drugs have triggers: ingesting an innocuous chemical such as a certain spice or a particular carbohydrate produces one dose of drug.

Not all drugs are available as a gut factory (sometimes because they cannot be made using bacteria, sometimes because the bacteria have not been developed, sometimes because they cannot be absorbed through the gut). When trying to get a medical drug, roll 1d10. If it is less than 7 it is available somewhere. For enhancers and illegal drugs, roll less than 5, and for very exotic substances less than 2.

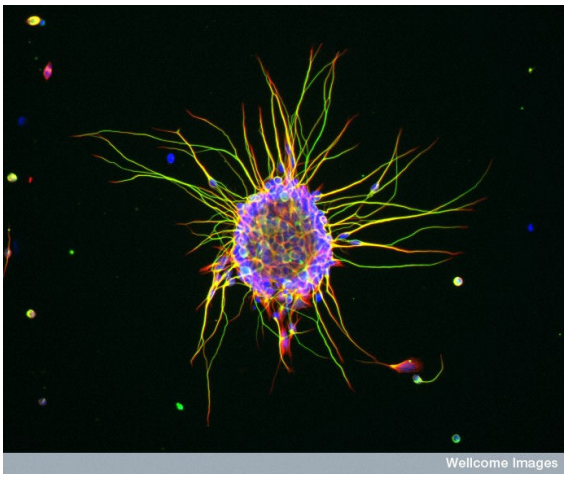
Price: 10 times the normal dose cost of the drug, lasts 1d6 months or until a strong antibiotic regimen. The bacterium is usually mixed with a few innocuous inactive species to prevent

home-culturing; the other species overrun the gut factory bacterium when cultured outside the body. A pure breeding culture costs around 100 times the normal dose cost.

If the drug is not available a geneticist may be hired; constructing the bacterium will take one month, has 75% chance of success and will cost Lv 10,000 (more, if it is obviously illegal or dangerous). Note that this is the price for just constructing the bacterium, actual testing (and *safety* testing) takes 1d6 extra months at 8,000 Lv per month but can be skipped for those feeling suicidal: after all, only 200 died in the Argentinean outbreak of amphetamine-producing E coli in 2287. Culturing a modified bacterium can be done in off-the-shelf lab equipment costing Lv 500.

TL: 8 (culturing TL 6)
Legality: non-medical use, culturing and design is illegal, otherwise local ecological laws apply.

Pentapod Symbiots



Pentapod spine

A secret new product under testing. A creature acting as an artificial spinal cord embeds itself parallel to it. This can cure paralysis and reduce the risk of it happening significantly, but most importantly the symbiot can learn from the host. It will start to recognize motor programs, and can perform them instead of the host when given control over the body. Over time the spine learns to roughly act as the host, sharing his reflexes, habits and skills. If the host becomes unconscious the spine can continue to control the body, trying to keep it alive. The spine-run host appears to be sleepwalking, is somewhat clumsy but impossible to render unconscious.

Each year the spine is implanted, it learns the motor programs of the host one level more. A first year spine has skills to level 1, a second year some to level 2 and a third year symbiont to level 3. Whether the progress will slow at this point is unknown. The spine has INT 1, WIT 1 and no EDU, social skills etc. The spine will only go unconscious if the chest suffers –STA damage.

Atmospheric Filter Symbiots

One of the problems which plagued mankind in the quest to establish colonies on other worlds was that many atmospheres were only marginally suitable for human habitation. A planet might be well within optimum ranges for oxygen content and pressure but contain a higher than acceptable level of other (often toxic) chemicals. For example, the atmosphere on the American/Australian colony world of King contains dangerously high levels of sulphur compounds.

In order to facilitate exploitation of worlds like King, the Pentapods, in cooperation with the Life Foundation, designed a microscopic organism known as the Atmospheric Filtration Symbiot, or Filter. These helpful creatures thrive in the human lung, where they feed on the trace elements that would otherwise prove harmful to their hosts. In the years since their

initial release, Filters have proven to be very effective and have produced no harmful side effect.

Filters must be constructed for each specific environment. For example, those created for the colonists of King would quickly die if removed from the sulphur compounds that they feed upon. Thus, when any citizen leaves the planet and breathes the purified air of a spacecraft, he must receive a new colony of Filters before returning to his native world. Similarly, Filters designed to remove one toxic element from the atmosphere will be wholly unable to fend off other poisons introduced into the lungs. When in a purified atmosphere, the Filters will begin to die after about six hours. Within a day, the entire colony of microbes is destroyed and must be replaced.

Filters expelled from the body (i.e., exhaled or ejected in a cough) die quickly outside of the lungs. On average, Filters outside of the body can live no more than five minutes. While it is possible to transfer Filters from one person to another in this manner, the exchanged organisms cause no harm in the new host.
Price: Lv450/Filter Colony.
[Connors]

Food Converter Tapeworm

After their flop with the food converter some pentapods understood that humans might have concerns about eating the excretions of other organisms - at least when they see them, since most humans appear to like honey and cheese. Hence the proper thing to do would be to adapt a symbiont to work inside the body. They took the food converter and combined it with the terrestrial tapeworm: the new symbiont lives in the small intestine and converts alien food with levo-amino acids into nutrients for humans. The pentapod marketers can hardly wait to see how humans will react to this improvement.

UV protection symbiont

A microorganism that lives on skin flakes, acting as a living sunscreen. The organism is applied as a skin cream, and will remain until washed off with soap. The symbiont produces an UV-protective compound reducing the risk of sunburns significantly. It grows better the more intensive the UV light is, so it will become more prevalent on exposed skin. Overall, the symbiont has not been a great success given existing human sunscreens and tendency to shower regularly. The pentapods have also not quite fixed all bugs yet, and people wearing it will have a subtle whitish tinge to their skin. Still, among personnel on sunny Gamma Serpenti the symbiont is growing in popularity as supply ships occasionally are intercepted.

Sources

These implants have been adapted from the following sources:

[2320AD] 2320AD by Colin Dunn

[LaBossiere] "New Cyber Equipment" by Michael LaBossiere, originally appeared in Challenge #43 (p 52-59). http://home.earthlink.net/~ad2300/newcyber.htm

[SotA] "State of the Art" by Andy Brick. http://www.caco.demon.co.uk/2300ad/NewGear.html

[JIEX] Journal de l'Institut des Etudes Xenologiques by Rob Myers, http://www.robmyers.org/jiex/2302/janvier/new_cybertech.html

[Smith] "Riding the Wave: New Equipment for Cyberpunk Adventures" by Lester W. Smith, originally appeared in Challenge #40 (p 38-43). http://home.earthlink.net/~ad2300/ridewave.htm

[Connors] "Pentapod Constructs for 2300AD" by William Connors, originally published in DGP's The Travellers' Digest #10. http://members.cnetech.com/kevinc/2300ad/penteqp.htm

[EG2] "Equipment guide 2" by the 2300AD Collective. http://2300ad.googlepages.com/eg2.pdf

Medical homunculi are from Levy Ben's writeup of New York
http://www.geocities.com/levybenathome/NYC2300

[FM] Fluid Mechanics, module for Blue Planet

Other good sources for ideas: *Quarantine* by Greg Egan (alternate personalities), *Aristoi* by Walter John Williams (various psychological techniques), *Moving Mars* by Greg Bear.