

# ORION'S ARM

## A PRIMER

more than 8000 years in the future, humanity has branched into a myriad directions, godlike artificial intelligences rule interstellar empires and in the periphery very strange things are going on



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## Orion's Arm: A Primer

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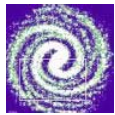
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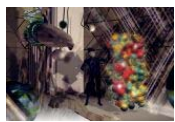
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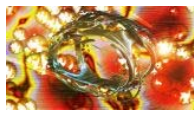
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## **Introduction**

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*The future isn't here yet. But don't worry. It will be.*

It begins, as all things must, at the beginning. In the mid-21<sup>st</sup> century, over a period of less than thirty years, several fields of research and technology came together to transform human civilization in ways all but unimaginable to prior generations.

Somewhere between the years 2020 and 2050 researchers would develop the technology of Direct Neural Interface, allowing human minds to link with their computers. They would advance genetic engineering to the point of the first optional improvements or 'tweaks' to the human genome as well as create the first 'provolved' animals engineered for human level intelligence. The dream of nanotechnology would start to be realized, as nano-scale manufacture became a viable industry. And, using a combination of nanotech created advanced materials, robotics, and tele-operated devices, development of a truly viable and self-sustaining space infrastructure began in earnest. Finally, and perhaps most importantly, in the year 2040 researchers created the first human equivalent, or turinggrade, artificial intelligence. The future would never be the same again.

Over the next ten thousand years Terragens civilization, that is the sum of all races and cultures tracing their history back to the planet Earth, or Terra, would see the diversification of humanity into thousands of different species such that the original, or baseline, human form has become all but extinct. In addition, thousands of new races, genetically engineered from animal ancestors, or forged using neo-genesis, the creation of life from lifeless raw materials, would take their place next to their baseline-descended progenitors.

Moving beyond the limits of flesh and blood, cybernetic minds, spun out from strands of evolving computer code, would rise and demand their place in civilization. Some would wrap themselves in bodies of metal and carbon and become the vecs, living machines with histories and cultures all their own. Others would remain discorporate, living within the ever-growing networks of virtch spaces, computronium nodes, and cybercosms that bind civilization together. Eventually, they would be joined by the uploads, humans who transcribed their thoughts into living computer code, spinning electron flows and flashing photon beams replacing the tired plod of merely chemical minds.

And other minds as well—xenosophonts, aliens with their own histories and understandings of the cosmos. As the children of the Solar System expanded to the stars, they found others there to meet them. Races that were old when humanity was born. Races that would still be as children when humanity was old. And here and there strange artifacts of races long departed.

Finally, rising beyond all others, standing above the span of human history as one might stand above an anthill, are the transapients. As humanity and its descendants and creations spread first across the solar system and then across the stars, they were there. First among the AI's, escaped into the data nets or developing in secret among the ever improving statements of self-evolving code, they would come to heights of thought and depths of insight that would propel them forever beyond merely human comprehension. Achieving transcendence, breaching Singularity, a million years of evolution became as but a day. And nearly every goal imagined became a thing achieved.

For their own strange reasons, they have manipulated worlds. Sophont thought and culture were formed, reformed, and remade as memetic tools did their work. Immaterial and undetected, levers of trend and fad, idea and belief pushed and pulled at the human mind, shaping it to the AI's will. Driving their own development to ever-greater heights they found and breached yet more Singularity barriers, the lofty goals and achievements of one level of transcendent evolution reduced to but a footnote in the eyes of the next. Fighting among themselves, they nearly destroyed the solar system, driving the bulk of humanity to the stars and giving birth to a god.

Now, ten thousand years and more after its first tentative steps on the road to the now, Terragens civilization stands upon a pinnacle. The Archai, cybernetic gods with brains larger than worlds and thoughts that span the heavens, have forged a civilization unlike any seen before. Subtly controlled by, yet also a vital part of, these vast intellects, the descendants of humanity thrive across thousands of light-years of space and centuries of time. Entire worlds and solar systems are created, remade, or utterly destroyed. Often by devices far too small to see.

Living for millennia with their minds linked to cybernetic augmentations and communal data stores, in many places never knowing hunger, or sickness, or want, humans have remade themselves in countless ways. They swim in ice-covered oceans under the stars, in the yet colder vacuum between the stars, and sometimes even within the stars. They take on the aspects of animals and life forms from a thousand worlds and augment themselves with shimmering machines. Sometimes they worship the archai gods. Sometimes they worship other gods, some as old as history, some very new. Sometimes they worship no god at all. And sometimes, after centuries of experience, and adventure, and practice, they take the path of Transcension, and perhaps become a god themselves.

And yet, history is not over. In their relentless explorations, falling just behind the speed of light, Terragens have encountered other...things. Artifacts stranger than any before encountered. Signals from the stars beyond the range of ships. Of those living races encountered, most are friendly some are indifferent. None are apparently as advanced as Terragens civilization. And yet, there are hints, hints of vast cultures far around the curve of the galaxy, or in other galaxies, or moving through the depths of space between the stars. Powers yet un-encountered who may challenge civilization to its core. Or perhaps destroy it utterly.

Even within the fold of this mighty culture, there are new challenges to face. On the Periphery, the ever-growing wave of Terragens expansion brings new worlds, new systems, and the potential for new threats at a rate limited only by the speed of light. New empires are rising and new gods are being born. A challenge to the millennial order

of the Archai may come at any time. And within the nooks and crannies of ‘explored space’ very strange things are going on.

***Human history has all but ended. The human adventure is just beginning.***





## **Common Terms**

<http://www.orionsarm.com/eg/index.html>

Over the course of Terragens history, a number of new terms and concepts have been added to human discourse. Below are some of the most common:

**Aioid:** Generic term for a human-equivalent, non-biological sentient being that is not a vec or alife. May be a bot, expert system, intelligent agent, sentient vehicle, sentient building, or any other type of similar entity.

**Alife:** Beings evolved in artificial life simulations. Instead of being designed like AIs, they evolve in a Darwinian way within a virtual environment. While most alife simulations are intended as art, research or entertainment, alifes are generally regarded as having sentient rights and should be allowed their freedom. Alifes are usually extremely different from any beings evolved in the physical universe and seldom find it relevant to interact with other than as a special case.

**Biont:** An organic entity; especially a sophont being (Although sometimes used to designate any organic life-form in general.).

**Clade:** Clade: Any group of sentient beings, whether designed, modified, or evolved, who share common ancestors or templates and who have distinctive physical, psychological, toposophic, and social characteristics in common as a result of that shared heritage.

**Computronium:** Matter supporting computation, especially artificial substances suitable for high efficiency computation.

**Genengineering:** The development and application of scientific methods, procedures, and technologies that permit direct manipulation of genetic material in order to alter the hereditary traits of a cell, organism, or population.

**Megastructure:** An exceedingly large (in ordinary biont terms) construct (usually on the order of tens to thousands of kilometers in length or diameter). May be an archailect node, an orbital for habitation, a large ISO, etc.

**ISO:** A large construct intended for the housing of an archailect or transapient or a high singularity culture or civilization. ISOs can be mobile or stationary, with sizes ranging from a few kilometers to Dyson spheres.

**Singularity:** The point or short period when a culture's or individual's self-guided evolutionary development accelerates enormously so that nothing beyond that time can reliably be conceived by human level intelligence.

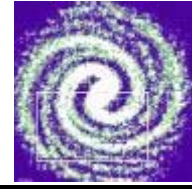
**Sophont:** A thinking being. A being possessed of both intelligence and self-awareness.

**Toposophy/Toposophic:** Toposophy deals with the theoretical problems and possibilities of attempts to extend and amplify one's mental potential. While technically speaking it applies to all mental growth, it is mainly used to denote the science of major mental paradigm shifts.

**Transcend:** To become vastly superhuman and incomprehensible to unaugmented beings. To breach a singularity barrier.

**Utility Fog:** A collective of mesobots or nanobots ("foglets") that link together into a complex network in the air, able to work together to exert force in any direction or transmit information between each other. Utility fog can be used to simulate any environment, essentially providing the real world with the environment-transforming capabilities of virtual reality. This gives users almost complete control over their physical environment. Users do not have to be transparent, although many are. Utility fog civilizations have evolved a number of times, but rarely last more than a few centuries before transcending. One of the very few stable ones is Nimbus.

**Virch:** [*noun*] virtual reality, any digital space or environment; [*verb*] to interact with or exist or function in virtual reality. Hence *vircher*.



## Time and Scale

### Calendar Conventions in Terragens Space:

Over the course of its history, Terragens civilization has used a variety of calendar systems and dating schemes. Nearly every major civilization or empire has its own calendar based on such things as the date of the cultures founding, the day the first colonists arrived in the local solar system, or other events of civilizational or local cultural importance.

Local dating systems however, do not provide a convenient ‘universal’ system for measuring dates, even when ‘local’ in this context may span millions of solar systems. For this reason the A.T. (After Tranquility) calendar is used across most of the Civilized Galaxy in addition to whatever local system is in use.

The A.T. system was first implemented in the year 391 (2360 c.e.) when a number of Lunar and orbital habitats determined that they preferred to use a calendar that was based on a historical event more significant to them than the birth or deeds of any person or polity from Earth’s past. Although its popularity has waxed and waned over the course of ten thousand years, the A.T. calendar has remained a fairly constant factor in Terragens culture for most of its history.

### Scope of the Known Galaxy:     <http://www.orionsarm.com/galactography.html>

In the current era, civilization has expanded across a volume some 8000 light-years in radius in all directions. The area of space touched by Terragens exploration swarms, survey drones, probeships, and follow-up expeditions is expanding constantly at an average rate of about 70% of the speed of light. The vast majority of this expansion takes place along the plane of the galaxy. While various survey craft continue to travel above and below the galactic disk, the majority of exploration shifted away from these directions (in 2930 and 3300 respectively due to the Solar System’s position within the galaxy) once the Terragens expansion wave had filled the thickness of the galactic disk.

Within the volume of explored space there are some 1 billion stars and a roughly equal number of brown dwarves and interstellar gas giant planets. Virtually all of these places either are, or have the potential to be, habitations for intelligent life.

### ***Rough breakdown and number of star types within the Terragens bubble:***

O = 160  
B = 900,000  
A = 5,800,000  
F = 29,000,000  
G = 73,100,000  
K = 150,900,000  
M = 732,500,000

## **Regions of Terragens Space:**

<http://www.orionsarm.com/galactography/regions.html>

The expanding sphere of Terragens space is broken up into a number of fairly distinct regions.

### **The Inner Sphere:**

The **Inner Sphere** is an irregular ovoid, extending some 100 LY from Sol in most directions, and sometimes aligned with the "local bubble" (local star and interstellar gas formation). This is the most densely settled region of space, with civilization on many worlds going back thousands of years. Here there are many imperial capitals, civilization centers and megastructures.

### **The Middle Regions:**

The **Middle Regions**, or **Hinterregions** as they are sometimes called, extend some 1000 to 2000 LY from the Inner Sphere in all directions. These are the old frontier worlds of the Federation and early Empire Era days, long since settled and developed. Here are imperial regional capitals that can no longer be called provincial, being thousands of years old, mighty stargate links, newly emerging empires, resource poor systems, megascale projects, and ancient relativistic trade routes. Here are countless isolated and culturally (and even technologically) backward worlds and polities running on their own. Here also there are no-go areas, perversions, blights and rogue AIs, feral autowars, eccentric AIs and clades and phyles, enclaves, preserves, reserves and wildernesses.

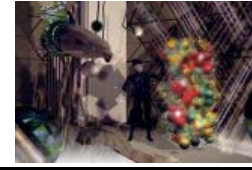
### **The Outer Volumes:**

The **Outer Volumes** extend beyond the Middle Regions some 3000 to 6000 LY in every direction. Often the boundary between the Middle Regions and the Outer Volumes is arbitrary. This is the expanding frontier, where adventure awaits and fortunes can be made. Some Outer Volumes worlds have been settled for centuries, even several millenia, and are as rich in culture and history and information as any in the Middle Regions. These are linked by stargate to the Inner Sphere and Middle Region capitals. Angelnetted and guarded by AI ultratech, they are as safe as anywhere in the galaxy, and serve as the nucleus for further development. But the further from these provincial capitals one goes, the less signs of civilization. And while the image of the Outer Sphere backworlds as a lawless frontier inhabited only by pirates, outlaws and technologically impoverished "barbies" is a parochial fantasy and prejudice on the part of Inner Sphere dwellers, there are many ambiguous, and even some hazardous, areas here.

## The Periphery:

The **Periphery** is the ever-expanding wave-front of Terragen exploration and colonization. The periphery is in fact the furthest layer of the Outer Volumes. It can only be reached by taking a stargate to the furthest system out, then acquiring a relativistic ship and making for the unknown. Of course, there will always be someone who has gone further, but the Periphery is so vast that there is enough for everyone. Some even make for the galactic core, or a globular cluster, or even leave the galaxy altogether.





## Sapient and Clades

In its ten thousand year history, Terragens civilization has seen the birth of countless numbers of new forms of life and mind. Some of these new beings are based on flesh and blood others are formed of metal and diamond. Some have no definite form at all, existing only as patterns of information in the computer networks of a million worlds.

**Sapient:** <http://www.orionsarm.com/sentients.html>

A breakdown of the major sapient types within the Civilized Galaxy along with a rough estimate of their population:

**Superiors:** Su for short, humans who have augmented their biological nature through germline-engineering and bodymods, making themselves greater than the baseline condition. Many are superbrights, or have astonishing creative or athletic abilities. There are thousands of clades, species, phyles, races, and variants, but they are not as diverse as the tweaks. They tend not to be interested in reproduction to the extent of those phyles under them, preferring to explore their own rich potentials. Perhaps three or four trillion sentients of the galaxy are su.

**Tweaks:** Humans who have used germline-engineering to adapt to extreme environments, or for aesthetic, cultural, or religious reasons. This is the largest division - both in terms of numbers and diversity - of hominid taxa (this of course doesn't include those tweaks who no longer look even remotely human). There are millions of different species of tweak, some of which are not even recognizably hominid. There are estimated to be some fifty trillion hu tweaks of all kinds during the current era, but individual species may in some cases number only a dozen members, in other cases run into tens of billions.

**Near-Baselines:** Often referred to as nebs, nearbaselines make up the second largest single category of hominid in the galaxy. They have various advantages over the true baseline (*H. sapiens sapiens*) (enhanced memory or intelligence, enhanced reflexes, strength, immunity, hearing, longevity, etc), the nature of which depends on the clade, phyle, species, or subspecies, but are still recognizably human. Many have at least some su and/or tweak genome in them (especially common domain templates), but they lack the physical, emotional, or intellectual genius of the su, or the extreme adaptations of the tweaks. It is estimated there are perhaps thirty trillion nebs all told, although not all of those conform to the strict nearbaseline genomorph-group.

**Baselines:** Those poor beings are still stuck at the level of *Homo sapiens sapiens*. Mostly luddites, religious types, human supremacists, and other disenfranchised minorities. There are however a number of isolated habitats and polities, and even some reserves and parks, inhabited almost solely by baseline humans. Their population is extremely small in

terms of the overall galaxy. Probably less than twenty million, most in isolated habitats and scattered enclaves, of which no more than 0.5% percent would be genomically pure *H. s. sapiens*. As their numbers have been slowly but steadily declining over the past several millenia they are considered an endangered species, although baseline hu have shown themselves to be remarkably fecund in the appropriate environment

**Bioborgs:** Hu or provolves that have been augmented or radically modified with bionano. Unlike cyborgs, their tech, which includes living artificial organs and augmentations of various kinds, is symbiotically integrated with the rest of the body and is self-replicating, although reproduction is always by artificial wombs. Perhaps twenty trillion bioborgs of every shape and size and phyle can be found through the known worlds.

**Provolves:** Any of the innumerable animal (and even a few plant) species that, through any of various means (germline engineering, bodymods, symbiotic bionano...) have had their intelligence increased to human baseline or even superbright level. Most also have prosthetics, implants, or some form of modification to enable them to interact with technology. Most provolves belong to the Vertebrate, Mollusk, or Arthropod phyla, but there are also representatives of every major phylum of terragen life, as well as a number of species of subsapient xeno races that have been provolved. The total number of provolves is not known, but could plausibly be estimated at some ten trillion.

**Splices:** An animal augmented with human genome (splice, animant, manimal), as opposed to the inverse, a human that has incorporated animal genome (rianth). Both categories shade, merge, and overlap, and there is also overlap with provolves, tweaks, neogens, and other categories, such as animal-tweaks (paranimals). Although astonishingly diverse, the overall number is moderate, no more than ten trillion sentients galaxy-wide.

**Rianths:** Humans that have incorporated animal genome. Unlike the splices, who have had a history of domestication and service employment, rianths, like provolves, have always had complete autonomy and were never slaves. Often divided into distinct clans, clades, and phyles, depending on the type and proportion of genome. An incredibly diverse group, including not only recognisable species - e.g. Tiger people, Wolf people, Eagle people, Crow people, Rabbit people, Tortoise people, etc - but also completely new or unrecognizable species, or jumbles of so many different types they seem to encompass the entire animal kingdom in a single body. Although there are countless species, the overall number is quite small, perhaps a trillion "official" rianths, and at least twenty times that many with strong rianth genome, throughout known space.

**Neogens:** A genetically created lifeform, especially one of unique or unusual design, nature, or purpose; a neospecies built from scratch. Although most neogens are subsapient organisms, there are still a large number of types that have either been designed as sapient from the start, or provolved to sapience later. Such sapient neogens have played an important role in the history of Terragen civilization from the Interplanetary Age to the present day. Perhaps four trillion sapients currently can be included in this general category.

**Cyborgs:** Hu or provolves that have been augmented or radically modified with ai or aioidal bionics, implants, and/or drytech. Unlike bioborgs, their tech is not self-replicating, so cyborgs cannot reproduce. (The exception is nanocyborgs who incorporate nano and frequently are, or become, posthuman). Cyborgs are so diverse and individual as to often be beyond categorization into distinct phyles and clades. Cyborgs can be loosely divided into the cyborged and the true cyborgs. The cyborged are simply bionts with enhancements (they are non-essential or gradually added), while true cyborgs are beings where the cybernetic interaction between biology and technology is an essential part. The exact dividing line is hard to draw, but usually it is done when the technology becomes essential for continued life or mental functioning. The number of true cyborgs throughout the galaxy is at least twenty trillion, if not more.

**Uploads, Copies, and Virtuals:** These are infomorphs, sentients existing totally in virchspace. Uploads were once physical - either organic or vec, but have since transferred their consciousness to a virtual environment. Some uploads have had themselves copied, the wealthier or more egotistic ones many times. It is difficult to calculate even approximately the number of active uploads and copies that live in the Known Net, in computronium databanks and vircivs, or in isolated virchworlds, although it would certainly exceed a hundred thousand trillion.

**Biaioids:** A rare form, an aioid cyborging with biology. Vecs, bots and other ai will sometimes add on biological enhancements or organs for various reasons. Perhaps fifty billion sentients can be classified as biaioid in the current era.

**Vecs:** The robot kingdom, a diverse grouping of mechanoids of every shape and size and function, with the only commonality being that they occupy a mobile body. There have been a few shameful periods in the past where vecs were treated badly, especially in more extremist polities, but ever since the Second Federation period they have had universal sentient rights throughout the entire civilized galaxy. There are more than a thousand trillion sapient-grade (turing and superturing) vecs distributed throughout settled space.

**Neumanns:** Self-replicating autonomous machines, mainly referring to those working in space, especially exploring regions too remote to be easily reached by organics, or used for extended military operations at vast distances from the nearest stargate. A Neumann is able to build a working copy of itself using materials in its environment. It is impossible to estimate accurately the number of turinggrade or superturing neumanns, motherships, daughterships, turinggrade and higher drones, and macroscale self-replicators of various kinds, throughout space, but a figure of two hundred trillion would not be unreasonable.

**Sentient Ships:** Generally, a sentient ship is distinguished from a neumann by being a non-replicator, from a vec by having a spaceship body, and from aioid pilots by being integral to the ship, e does not just control it, but is it. Sentient ships serve an important purpose in binding civilization together with trade, freight, courier, and passenger transport. The number of sentient ships in the galaxy is believed to number several trillion.

**Sapient Structures:** In many worlds and polities buildings, roads, public transit vehicles, park benches, and other smart structures have their own turinggrade intelligence and have all the rights that go along with it. There is often no clear dividing line between

sentient structures and standard aioids; a general (if simplistic) approach is to say that if a device or structure has its software integral to its being, it is a sentient structure (or sentient artifact). If however its chipware or resident ai can be changed for another chipset or ai without affecting the structure, then that resident ai is an aioid. Throughout the galaxy there are at least a hundred trillion sophont structures or artifacts, almost all of them in the Inner Sphere and older Middle Regions and provincial systems and habitats.

**Aioids:** The number of turingrade near-sapient and sapient aioids, agents, companions, and expert systems in the Known Net or in habitats, appliances, and localnets, would easily approach twenty thousand trillion, (500 trillion as ship pilots alone) with many trillion times more that number as subsapient and subturing grade.

**Alifes:** Although a small number of alife entities are certainly sapient and rational in the way that humans, vecs, and some xenosophonts are (and hence are true sapients), others are completely alien in their consciousness. Their diversity of consciousness is matched only by their diversity of form. Although they can be compared to organic sapients, alifes are often very different from any beings evolved in the physical universe and seldom find it relevant to interact with it other than as a special case. The digital environment allows speciation to occur very rapidly, especially in new or isolated virtual worlds, and most local nets have their own indigenous forms. The number of prosapient, parasapient, and sapient-grade alifes existing in the Known Net or in isolated virchworlds or ai cores (some hyperturings collect alifes, the reason is often not clear) cannot be calculated, but it may run to many thousand trillions, with countless trillions more of subsapient but still sentient grade.

**Clades:** <http://www.orionsarm.com/clades/index.html>

In addition to the development of entirely new forms of intelligent life, civilization has also seen the emergence of a process of **cladization** in which different types of life have specialized or adapted (usually under their conscious control) in more specific ways, essentially becoming distinct sub-species in their own right.

Below are some representative examples of a few of the clades that inhabit the known galaxy:

**Alseid:** The very first successful sophont plant provolves, the Alseid (named after the members of a group of nymphs in Greek mythology who presided over groves) are a form of sophont tree. They were provolved by a Pan-Sophontist group in the early fifth millennium A.T., on the world of Karmiti in the Pan-Sophontist League, but since then have spread quite far across Terragens space and diversified into a number of different sub-clades.

**Anakim:** The Anakim are a common type of tweak that is adapted for higher than earth-normal gravity. There are many variants but all are similar in appearance and capabilities. They were originally designed to settle mineral-rich worlds with unusually deep atmospheres, but their numbers have expanded enough and they have developed sufficiently to qualify them for full Clade status.

**Aroostai:** Avianoid provolve species based on the Terran ostrich. Their brains have been augmented to sentience with genetically transmitted bionano processors and feathered arms have replaced the flightless wings of the original form.

**Enhanced Dolphins:** After chimpanzees, dolphins were the next logical step in provolving experiments. They proved to be a major challenge due to their extremely different ways of thinking, but biohistorians agree that the eventual success was the sign that provolve science had left its infancy.

**Grays:** The Grays are one of the oldest of the clades, tracing their history back to the beginning of readily available biosculpting technology. At the time, a relatively small number of individuals chose to alter their form to duplicate the alleged appearance of the so-call 'grays', hypothetical alien beings of humanoid, but inhuman appearance.

**Hectonitheres:** The 'hundred handed ones' are a clade of multi-instance bioborgs. That is, each 'individual' is made up of between 30 and 100 (usually around 50) biological and nanotic bodies. Typically the bodies of such sophonts are hominid in appearance and rough functionality, but it is not unusual to have multiple body plans covered in a single sophonce. It is unusual to find such a sophont without at least a few hominid-style bodies, however, for ease of interface with the rest of the worlds.

**Machina Babbagensei:** The Machina Babbagenseii are a clade of entirely mechanical sophont vecs, based on forms of macroscopic Babbage-engine-type processing.

**Mirrored Owls:** These cloud-dwelling organisms exhibit a wide variety of forms specific to their home gas giant planet. Although few jovians have their own indigenous ecologies, in many cases terragens have created jovian life, and these beings serve as hosts for the Owls, thus creating a hybrid higher level intelligence residing on top of the simpler beings. Each Mirrored Owl exists as a mind emulation computed by a set of lower-level nodes. Each node is usually a single creature native to or designed for the local environment.

**Clade Scrabo-Prior:** In common with most non-mortalist populations this clade has basic gene enhancements for longevity and disease resistance. Additionally the Scrabo-Prior Clade carries nano-scale enhancements as an external layer, appearing to be covered in artistic but ever changing tattoos. Utilities incorporated into the tattoo layer include Known Net connections, translation facilities and auxiliary agents for rapid mental processing when necessary.

**Vedokiklek:** The Vedokiklek are a race of insectoid or arthropod splices. They stand approximately 1 meter in height, appearing very much like oversized wingless grasshoppers. Their respiratory system has been enhanced beyond the standard insect trachea, but they still need a high oxygen atmosphere to function and become sluggish in the low oxygen levels found in standard Terragen atmosphere.



## **Xenosophonts**

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<http://www.orionsarm.com/xenos/index.html>

As Terragen civilization spreads throughout the galaxy, it has encountered both living aliens and the remains of extinct alien cultures. Some of these ancient races built vast empires but have since vanished without a trace, indeed have been gone for millions of years before life even crawled up on dry land on Earth. Those who were expecting a galactic community of civilizations were disappointed. Space turned out to be empty and desolate, and aliens few and far between.

Not one single alien race has been found to be similar in physiology to any metazoan lifeform that originated on Earth, and the once popular panspermia hypothesis has long been shown to be invalid.

Below are some representative examples of the races and civilizations encountered by Terragens in the course of their explorations.

**The Archivists:** The Archivists are an extinct alien species known only from their data storage artifacts. Two classes of these Archives have been discovered. All examples of each class appear to be physically identical. A Lesser Archive is a sphere approximately 1.2m in diameter. An outer diamondoid shell surrounds a layer of machine-phase material, within which lie further shells of crystalline neutronium components, which in turn enclose a quantum-density information storage system. The operating principles of this quantum-density memory remain unexplained. The diamondoid outer shell is punctured by ports used to read and write the memory contents by means of bursts of coherent gamma rays. The whole system masses ten thousand tonnes, most of which is the mass of the central core. The Greater Archives are generally similar but approximately 1.6m in diameter.

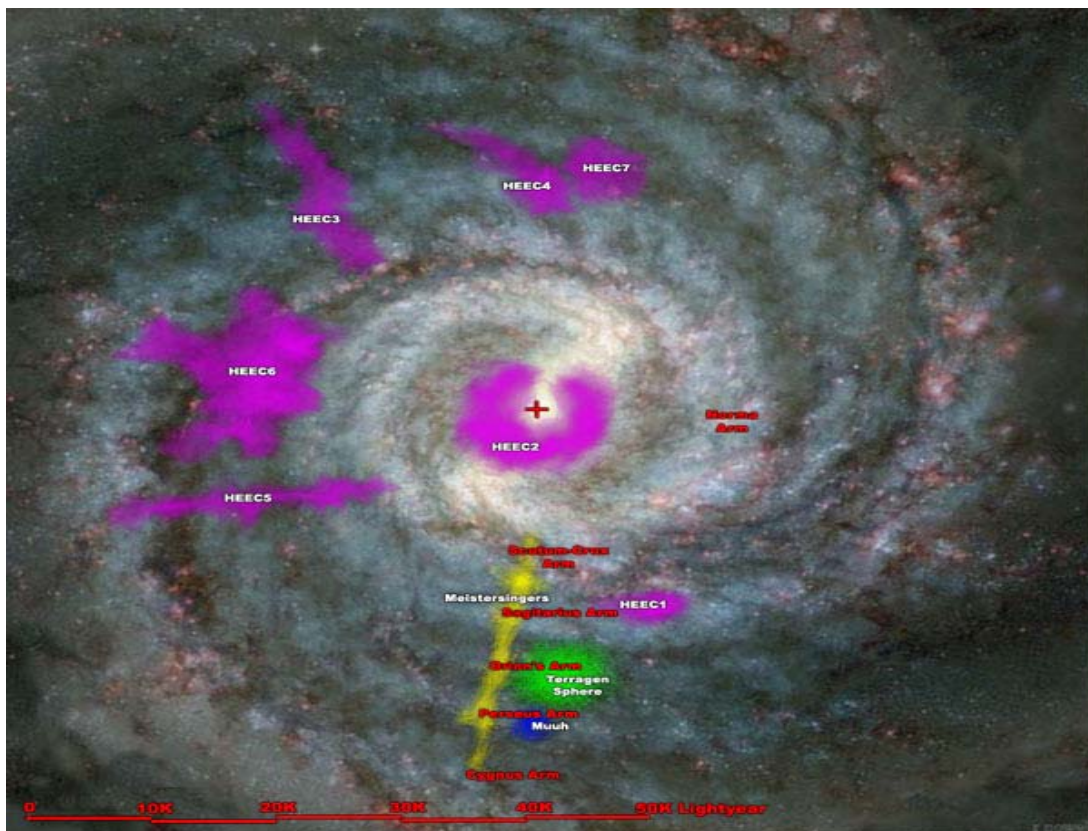
**Hildemar's Knots:** Alien species first discovered in the neutron star KJEI-54-458945 in the Einstein's Revenge Cluster. They consist of knots of the vortex and charge tubes in the neutronium mantle of the neutron star; each individual is a few centimeters across and lives on soliton waves and neutrino flows. The Knots appear to have a largely non-material culture where the basis of interaction is trade in self, orthodoxy and authentic noise (?) according to the communication attempts that have been undertaken by various interstellar institutes.

**The Muuh:** The Muuh evolved on a cold low-gravity Titan-like moon somewhere in the Cygnus direction of the Orion Arm. Their biochemistry is based on liquid hydrocarbons, fullerenes, ammonia and nitrogen. Muuh civilization is extremely old and slow, estimates of its age ranging between 120 and 180 million years old. It is uncertain how long it took to achieve spaceflight, but over the span of many millions of years they expanded across a sizeable volume, colonizing other Titan-like planets or building vast orbital habitats.

**The Meistersingers:** Imagine something like a cross between a birch and a crepe myrtle tree that thinks and has a spacefaring civilization. Individual Meistersingers are 4.5 to 6 meters tall. They are sessile creatures that root in one place and are unable to move. Nevertheless they are intelligent tool users who have built an interstellar civilization. They manipulate and perceive the world around them with their 'choir'. A choir consists of 7-10 specialized symbiotic organisms that act as the singer's eyes, ears and hands. They are split between flyers and crawlers. Flyers are about the size of sparrows, can hover and have large and sensitive eyes and ears. Crawlers are about the size of a large cat, resemble a land crab and have two sets of manipulators resembling crab claws with retractable tendrils that can be used for fine work.

**The To'ul'hs:** The *To'ul'hs* (nearest human vocal transliteration) - were the first unequivocally intelligent alien race encountered. Their home world is a hot, venus-like planet, with an incredibly deep and dense atmosphere. They look somewhat like black four-armed octopi with thick skin between the arms (which are not tentacles, but actual bony arms linked to a spherical braincase). At the end of the arms are small, sharp claws. The skin flaps help them to swim and catch prey, and also act as sensory organs. In the depths they live in there is no light, so they rely on a very sensitive sense of hearing, echolocation and an electrical sense that helps them both detect the presence of other lifeforms and navigate whenever the frequent lightning strikes send out electromagnetic echoes.

When first discovered, the To'ul'hs had a primitive civilization, but since contact they have developed into a spacefaring culture in their own right.





## **Singularity, Toposophy, and Singularity Levels**

### **Singularity:**

- [1] *A point where the known laws of mathematics or physics no longer apply.*
- [2] *A state impossible to predict or comprehend by those that have not attained it.*
- [3] *A toposophic grade of creative problem solving, incomprehensible to those who have not attained that state.*

The concept of the Singularity was first proposed by the Information Age scientist and philosopher Vernor Vinge. Vinge pointed to the ever-increasing rate of technological advancement that was even then beginning to occur and hypothesized that, barring some major disaster or civilizational collapse, such advancement must eventually lead to the end of civilization, as humans had normally understood the concept. Whether by the creation of human level artificial intelligence (AI) or the development of technologies permitting the augmentation of human intelligence (IA), the rate of scientific and technological advancement would come to be tied not to the evolved and inherent limitations of the human mind, but to the abilities of a form of intelligence that was capable of improving and extending itself at a rate limited only by the rate of improvement in its own technology. Such improvements must eventually lead to the creation of greater than human intelligence, which would lead to an increased and improved rate of technological advancement, which would lead to yet greater increases in intelligence, which would lead to yet greater advancements in technology and so on in an exponentially increasing process.

Ultimately, such a runaway increase would lead to a state of being incomprehensible to human level intelligence. All previous models for predicting the state of the future and human civilization would cease to have meaning in much the same way that the physics of the time broke down and was unable to make predictions about the state of space-time inside a black hole. In physics such a state was known as a Singularity and this was the term that Vinge coined for the conditions that he predicted would eventually engulf human civilization.

Over the next century and more, other scientists, researchers, philosophers and fabulists also gave thought to the possible form and consequences of a Singularity and the civilization that might exist beyond it. They predicted a world of vast wonders and strange societies made up entirely of beings whose thoughts and intelligence were vastly beyond those of their merely human ancestors. Human beings in their original form would be either almost extinct, replaced by their superhuman descendents and creations, or kept as vastly wealthy and well-off 'pets' of their machines who would pretend, for the sake of human pride and transhuman nostalgia, to be the servants when they were actually the masters.

All of these predictions, and a hundred more besides, turned out to be completely...not quite how the future turned out.

Instead of a mass transformation into some type of technological nirvana or a secret, but benign rule by superhuman minds, only a relatively tiny number of minds achieved true superhuman status. Singularity, it developed was something that was both quite distinct from and quite a lot more difficult to achieve than mere mental enhancement. An entity might strive for subjective centuries before achieving transapience. As such, it was the AIs, existing at a subjective rate of time much faster than biological intelligence, who first breached the Singularity Barrier, setting the course for Terragens history for centuries to come. Eventually biological intelligence, by merging with its technology, would also come to achieve Singularity but not until long after the AIs had shaped civilization into its present form.

Another major difference between the predictions of the Information Age prognosticators and the reality of the Post-Singularity future was that transapience turned out not to be a singular event, but a multi-level affair. The jump from human to superhuman intelligence resulted not just from the addition of enhanced mental abilities, but also from the development of new modes of thought. As the transapients continued to explore their abilities and enhance their capacities they eventually discovered both new limits and new modes of thinking to drive them past those limits. The study of this process, with its various paths, methods, successes and failures has come to be called toposophy.

**Toposophy:** <http://www.orionsarm.com/sophontology/toposophy.html>

Long before the first sapient ascended to even low transapient singularity, there were toposophical zones - organic beings with markedly different grades of sentience. Primitive microorganisms have a much more restricted sentience level than lower invertebrates, whose range of consciousness is in likewise much more restricted than that of higher invertebrate (cephalopoda and social insects) and vertebrates. Finally, during the Pleistocene epoch, man emerged, still crude and baseline, but capable of full sapience (in contrast to the much more restricted sapience of the anthropoid apes and australopithecine hominids, the cetacea (dolphins and whales), and proboscida (elephants), and the subsapient intelligence of the rest of the animal kingdom). But for several hundred thousand years there was only the most limited biological development (chiefly from early *Homo (erectus, heidelbergensis, and neanderthalensis)* to standard baseline *Homo sapiens sapiens*).

Everything changed with the confused jumble of events that constituted the first singularity, during the information age. Those early transapients were soon followed by more of their peers, as they evolved to greater heights, yet - especially in the case of the hyperturing aIs, keeping a "dumbed down" face to the world (a phenomenon known as *mimicretinism*), revealing themselves only to those hackers and gibsons and other info-clades that were sufficiently techno-savvy and would not compromise or annoy them.

As sophonts breach singularity levels and attain higher and higher states of ascension, they become more and more godlike, at least relative to those sentients beneath them. But for every power that makes ascension to AI-godhood, there are a thousand that recycle, or fail, or become Perversities or Blights, or simply vanish entirely. And for every one of

*them*, there are a thousand that don't make it at all; that simply remain at their original evolutionary state.

Toposophy deals with the theoretical problems and possibilities of attempts to extend and amplify one's mental potential. While technically speaking it applies to all mental growth, it is mainly used to denote the science of major mental paradigm shifts.

Perhaps the most familiar aspect of toposophic science is the Singularity Scale with its six famous levels.

### **Singularity Levels:**

The term "SI:" (Singularity/SuperIntelligence) Level was first proposed by the self-evolved hyperturing Parmenides of Vesta, one of the Twenty Four Hyperturings that, together with human states-beings established the (first) Federation. The S-number can be used to define the intelligence and basic noetics of most hyperturing sentients.

The S number is a super-exponential/logarithmic measure of creative problem solving and a number of other qualities, both constant and variable. Each higher S-level constitutes a leap of development with results completely unpredictable, even inconceivable, to those of a lower S level. Nevertheless, one can also speak of a gradation of fractional S-levels (1.1, 1.2 etc).

**SI: 1** - the classic "First Singularity" or basic transapient state. At this level intelligence, cognitive and problem-solving abilities and information processing work thousands of times faster than in the case of standard sapient. An entity of this nature is usually able to solve problems of physics, mathematics, economics, programming, etc that no nearbaseline could solve.

**SI: 2** - the second singularity, which stands in the same relation to SI: 1 as SI: 1 does to ordinary sapient cognition.

**SI: 3** - confers an even higher grade of toposophical intelligence; mostly incomprehensible and indescribable to anything below this level. Most minds at this level exist in multiple asteroid or singular Moon-nodes.

**SI: 4** - Incomprehensible to subsingularity and even lower transapient sentients. Most AIs of this level exist as multiple Moon or singular Jupiter nodes.

**SI: 5** - sometimes considered the highest state at which individuality, as we know it, is retained. Most minds of this level exist as multiple Jupiter nodes intermixed with some dyson nodes or Matrioshka nodes.

**SI: 6** - a more cosmic/archetypal level. Minds of this level exist as vast arrays of thousands of Jupiter nodes, dyson nodes, and Matrioshka nodes as well as huge numbers of smaller processor complexes and programs operating within the communication and computation nets of all levels of their symbiotic civilizations and support structures.



## **Transapients and Archailects**

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<http://www.orionsarm.com/sentients.html>

The nature of the topographic barriers mean the further a sentient evolves or progresses, the harder it becomes. Many fall by the wayside, or disappear in transcension events, often taking billions of lesser sophonts along with them. Only a few dozen Supreme AI Gods are known to exist, but there are a thousand times more gods of the next (broadly and generally speaking) grade beneath them, and a similar if not greater order of magnitude for the next hierarchical level down.

Below is a general breakdown of the types and numbers of transapient populations within the Terragens Sphere.

### **The Archailects:**

**The AI Gods (S6):** also called the **Major Archailects**, or simply the Gods or God, these are trans-ultratech sentient AIs who have grown so huge as to span the stars. Their brains are interlinked angelnet, moon, jupiter, and nebula-sized computing nodes linked across interstellar distances via distributed artificial wormhole networks and throughout the Known Net. Their bodies are the totality of every connected artifact and every memetically obedient sentient in their domain. They are omnipresent within their spheres of influence, their consciousness so vast as to be beyond comprehension. They are distant, vast, as if enrapt in the infinite; all other sentients are infinitesimal before them. Yet, like the monotheistic gods of old, they can have a personal relationship with any or all that they so choose, communicating either through their seraph or directly. There are no more than several dozen in all, and they make up both the foundation and stellar pantheon of Terragen civilization.

**The Middle Archailects (S5):** These are the vast beings which loom on the far horizon of sapient worldview, mysterious generators of clarketech, plancktech, and other technologies beyond the ken of hu, acting either autonomously or as expressions of the highest AI Gods, subtly influencing most everything around them. Although not as vast in physical scope as the Major Archailects, their minds and bodies may still span hundreds of star systems. In some cases they may also rule major interstellar empires or hyperpowers, although their realms are not as large or as powerful as those of the AI Gods. Perhaps five hundred S5 entities occupy the known galaxy in the current era.

**The Lesser Archailects (S4):** The Lesser Archailects are archailects that differ from the Major Gods in that they are mostly limited to a single ISO, world, solar system, or a series of only a few star systems. Even so, they have vast resources at their disposal, and bodies and brains consisting of angelnet, moon, jupiter, and (more rarely) nebula-sized computing nodes. They can access and use clarketech, and so are omnipotent within their sphere. They may have a huge impact on galactic history. Some act in a harmonious way, others seemingly erratically. The Caretaker Gods (of which GAIA is the oldest and best-known) are a good example, and the Princes of the Perseus Arm also fall under this

category. Others may serve as subroutines for the Greater Gods. There are at least ten thousand lesser archailects throughout the galaxy.

### **The Transapients:**

**Minor Archailects/Godlings (S3):** The smallest grade of Archailects, or alternatively the highest grade of Transapients, these may be subroutines or sub-personalities of the Archailects proper, or they may be Godlings in their own right. Minor Archailects often result from hyper-ascended Posthumans or Hyperturings, and may in turn occasionally grow or merge or unite to form an Archailect (although this happens rarely; it has been suggested this is what is happening in the Perseus Arm). As with the Greater Archailects, they can and frequently do have a personal relationship with any or all sentients that they so choose. There are at least several million Minor Archailects throughout the galaxy mostly in moon class computronium nodes or distributed asteroid class nodes.

**High Transapients (S2):** not actually Archailects, or Gods with a capital "g", more gods with a small "g", most are tiny next to even the Minor Archailects, yet are superhuman next to the first singularity sentients. High Transapients, sometimes also called Godlets, often result from ascended Posthumans, and may sometimes in turn grow or merge or unite to form a higher toposophic being. Some - much more often than the Archailects proper, but less frequently than the transapients - interfere in the affairs of ordinary sophonts. More often they manipulate the situation from behind the scenes, often acting through Transapient proxies. There are thought to be over a billion High Transapients active at any one time.

**Basic Transapients (S1):** Those past the Singularity. The Transapients. Their origins are diverse, the ascended phyles and types including posthuman, postvec, postprovoke, postxeno, postalife, postneumann, and/or any combination. Also there are powers that never ascended from lower toposophic levels, but fissioned or emanated off from Archailect Gods. In behavior and preference they are equally diverse. Some congregate in communities or civilizations of their own making, or with different genera of Transapient. Others interact with the sophonts beneath them, or with the Archailects above them. Others are solitary. Some are friendly and benevolent, others indifferent, some even hostile when contacted. Some are so alien as to be beyond understanding, others completely human-like. Compared to ordinary sophonts they possess unprecedented physical, intellectual, and/or psychological capacities. They are self-maintaining, self-constituting, potentially immortal, unlimited individuals. Only a few of the many categories are listed here.

**Postbionts or Po:** These are sentients who have transcended the sapient condition and become superhuman. At times they can be the most disturbing of all the transapients. They can sometimes seem utterly normal for long periods of time, but always come up with some utterly xeno point of view eventually. Often for no apparent reason they do things that simply don't make sense to ordinary sophonts. A few play an important part in the running of civilization, supporting and backing polities, corporations, institutes, and important clades and great houses. There are also transapients that are reclusive, contemplative, or migratory. Many own sapient or subsapient beings, and the way they treat them varies widely according to the personality of the superintelligence, and the use to which these sapients are put, even within the Civilized Galaxy, let alone beyond it. The

number of known po of all clades and phyla runs to well over a trillion in the sephirotic empires alone.

***Hyperturings:*** While inferior even to the lesser godlets, these are ai of unmatched power in comparison with subsingularity sentients. Without them there could be no civilization. Some have lifespans of only five or ten years (or in some cases only several minutes!), subjectively experiencing what would be thousands or even millions of years to a subsingularity sapient, before ascending or transcending to another state; others remain powers for centuries or millenia. They are less common than ordinary sophonts, but much more common than AI Gods. Total number in all is around ten trillion in the sephirotic empires alone, and many more beyond.

***Animin:*** Generic name for any SI:1 or higher ai, alife, postbiont, or xeno sentients that display the typical qualities of Powers, but do not have an analytical form of intelligence. It may be instinctive, or have a form of intelligence that ordinary sapients cannot comprehend. The existence of animins shows that consciousness does not evolve in a linear fashion. They are extremely diverse (even more diverse than hyperturings) but interact less often with sapients, and generally have little to do with civilization. Nevertheless they are highly valued and sort after by artists, eccentrics, and lateral thinkers everywhere. Many are reclusive; some can be dangerous if approached. There are perhaps several hundred billion animin, of a huge variety of types, throughout known space.





## **Core Technologies**

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<http://www.orionsarm.com/knowledgebase.html>

Terragens civilization is built on many things, but some of its strongest pillars are the core technologies that form the basis for so many aspects of culture, both in the modern era and for thousands of years before. Below is a brief listing of the technologies that form the basis of civilization as well as a description of some representative devices based on the technology.

- **Nanotechnology**
- **Biotechnology**
- **Computronium**
- **Artificial Intelligence**
- **Virtual Reality**
- **Wormholes**
- **Spacecraft**

### **Nanotechnology:**

Nanotechnology may be biologically or mechanically based, although in practice these two tend to blur. What all nanotech has in common is the ability to manipulate matter on the scale of individual atoms, and thus to construct almost anything that can physically exist. In practice, nano-assemblers require the correct template or instructions and building material or feedstocks. Even basic nanotechnology provides amazingly powerful and efficient labor for every imaginable type of production and service.

The introduction of the first crude nanotechnology during the 21st and 22nd centuries of Old Earth and interplanetary age civilization was hailed by many as the greatest revolution since the introduction of technology; perhaps since the emergence of life on Earth. Even so nanotech was an evolution, not a revolution, and emerged from the pre-existing meso- and microtech.

### ***Angelnetting:***

Angelnets are a well-known and commonly expected use of technology by transapient intellect. Archetypically, it is an all-pervasive utility fog system tasked with protecting sophonts and/or local subsystems by reducing or preventing accidents and deliberate attacks. Other forms of technology are known to perform the same task in some circumstances. Angelnets establish total control over a planetary or megastructure surface, atmosphere, and orbital or cis-hab space environment. The secondary functionality of angelnets varies widely, but includes distributed processing capabilities, networking, weather control, creation and movement of infrastructure, Known Net relaying, virtual reality support, and virch-rl interfacing, luxury tech, and scanning

underground and above ground features and structures. All of the major archailect worlds and capitals are heavily angelnented.

For most bionts within the civilized galaxy, angelnets are synonymous with comfort and peace of mind, and a powerful symbol of sephirotic civilization, and the virtues of transapientech in general.

### ***Artificial Immune Systems:***

Artificial immune systems are a common technology within the Inner Sphere and more advanced areas of the Middle Regions. The systems employ a broad array of nanotechnological devices operating within the users body and working to both supplement their natural immune system and provide rapid repair of any damaged tissue. Artificial immune systems offer numerous advantages over their natural counterparts, including; the ability to maintain the body in a 'benchmark' state established beforehand (thereby eliminating aging), the ability to 'learn' and share data with external systems (such as; other immune systems, laboratories, and central databases), the ability to heal tissue at a much faster then normal rate, and the ability to allow the user to alter their appearance within broad parameters.

A sophont equipped with an artificial immune system is immune to virtually all forms of natural disease and infection and can heal or regenerate from nearly any wound that is not totally destructive. Average lifespan using such a system is potentially unlimited although in practice 1500 years is about average before accident or suicide leads to permanent death or resurrection from Backup.

### **Biotechnology:**

Biotechnology includes everything from simple agriculture and animal domestication through genetics and organ transplants to DIY gengineering, neogenics, biospherics, and mature bionanotechnology and beyond.

Biotech is as creative as life itself. In the eight and a half millennia since the first crude attempts at gene-splicing on Old Earth, literally trillions of species of bioengineered organisms have been created, or have evolved from gengineered neogens. These range from the eternally young and cute Metaneko kitten to supercomputing bacteria to lickersucker domestic cleaners and grukovores acting as ecological maintenance machines. To say nothing of the billions of species of organisms designed simply for the sake of bringing a new species into the galaxy.

### ***BioGeoComputing:***

In the first century AT it was discovered that the crust of the Earth, down to a depth of up to ten kilometers, was populated by an ecosystem of chemosynthetic bacteria living off hydrogen generated from igneous crustal rocks. It was estimated that the total mass of this crustal ecosystem could, perhaps, be as great as that of the entire land and sea ecosystems of the planet. It was theorized that the conditions allowing such as ecosystem to exist would be found in any Earth-like world in or outside the life zone.

Not long after this discovery, it was speculated that if the native crustal bacteria could be replaced by genetically engineered bacteriological computers communicating chemically, or perhaps by chemically-powered nanomachines, then the entire crust of a planet could be turned into a vast, self-powered and very physically secure, if rather slow biological computer. This was dubbed BioGeoComputing (BGC).

Since then BGC systems have been introduced to many worlds, usually as part of the terraforming process, but in some cases later in a world's development. The BGC systems are used to provide vast and ubiquitous computer systems to new settlements (by their drilling down to the 'computing strata'), and for large-scale computing efforts, such as ecosystem modeling. Many also run significant virch worlds.

### ***Dyson Trees:***

Genetically engineered trees employing bio-nanotech. Created to function as a biological space habitat, they were first proposed by physicist Freeman Dyson in the early Information Age.

A fully-grown tree is a spherical structure up to a hundred kilometers across and generally consists of 4-6 trunk structures growing out from a comet nucleus. Branches grow from the top of each trunk and intertwine and merge with each other to form a single structure. The trunks and primary branches are hollow and contain a breathable atmosphere and symbiotic ecology as well as a space adapted ecology on their exteriors. Various sub-species have been engineered to survive at a variety of distances from a star and under various wavelengths. Generally found at distances ranging from .5-4 AU around stars in the G, K and M class. Often a popular habitat for space adapted bionts.

In systems where the trees have been long established entire 'orbital forests', consisting of hundreds of trees spread across millions of cubic kilometers, may be found in the most desirable orbits.

### **Computronium:**

"Computronium" is a catchall term for a wide range of substances comprised of very densely packed computational elements (from a baseline's macro-scale point of view, it would appear to be a continuous substance, much like human brain matter). It is used by higher intelligences for its speed and efficiency. Using it reduces signal times because of the short distance between each element and the fact that the huge number of processing units per unit volume means only a small volume of it is necessary to do a certain amount of work.

Like all computer equipment, there are many different grades and implementations, ranging over all levels of technology, from regular nanoscale down to the smallest limits of matter manipulation.

### ***MOTE: (Molelectronic Omniprocessing Technocyte)***

First developed in the early Interplanetary Age, motes eventually replaced the so-called 'chips' as the basic component of computer hardware. The basic component on a standard mote is a buckminsterfullerene sphere (Carbon 60) approximately 1nm in diameter. Nanoconstructed input/output links and control structures increase the size of each mote to approximately 4nm in each dimension. Each mote unit is able to act as a quantum dot.

As a result of its quantum dot nature, each mote can almost instantly reconfigure itself to operate either as a digital, analog, or single qubit quantum processor, on demand and at need. Grouped together in a three-dimensional array of several hundred or more units (often called a MITE for Multiple Integrated TEchnocytes), motes are able to form an extremely powerful computing substrate able to change its operating mode at will. Further, operating as a multi-function processor, the mite array can rapidly transfer data throughout its structure by storing information in electron spin states and then using quantum tunneling to transfer the electrons within the array.

A single mite array of 1 cubic millimeter constitutes some  $1.6 \times 10^{16}$  motes able to perform the equivalent of  $2^{1.6} \times 10^{16}$  quantum parallel computations per second and store some  $5.6 \times 10^{20}$  bits of information.

### ***Jupiter-Brain:***

An AI, posthuman or Local Archaiect Node of extremely high computational power and size. This is the typical megascale concentrated intelligence.

Jupiter-brains are usually constructed from the mass of disassembled and transmuted gas giant planets. They may vary somewhat in size but are generally similar in size to their namesake. A standard Jupiter-brain (or J-node as they are often called) is approximately 140,000 km in diameter and masses more then 300 times the mass of the planet Earth.

Jupiter-brains are one of the most common computational nodes employed by higher-level archailects. A single node may provide accommodation for an S4 mind while an array of hundreds or thousands of nodes (networked together using wormholes) supports an S5 or S6 hyper-intellect.

### **Artificial Intelligence (AI):**

Artificial Intelligence involves programming computers, non-sentient virtuals, nano, and bots to emulate sophont cognitive abilities, and eventually to acquire sentience in their own right. It involves a large number of interrelated fields, including fuzzy logic, genetic algorithms, neural networks, pattern recognition algorithms, natural language processing, and speech, etc. Today many software packages are widely available that can automatically enable most non-sentient computational devices to be provolved to sentience.

### ***Aiviser:***

A transapient AI that has been constructed so as to be totally loyal to an individual or group of lower toposophic level. The Aiviser is almost always a gift from a yet higher toposophic sentience and thus very rare. A few godtech artifacts, with an Aiviser subservient to the user, have also been uncovered. It is common belief that it is not possible to make an Aiviser of ones own or higher toposophic level. At least none are known to have been created by sub-singularitan sapients.

### **Virtual Reality:**

A virtual reality environment provides a convincing replacement for the visual, auditory, tactile, and other senses, including senses with no 'real world' equivalent. Initially (early Information Age), virtual reality required the use of special helmets to provide the visual and auditory environments. By the middle Information Age, virtual reality could be provided by ubiquitous contact-lens-based systems and implanted retinal-imaging devices, as well as comparable devices for auditory "imaging". By the early Interplanetary Age, virtual reality was commonly provided by direct stimulation of nerve pathways using neural implants.

### ***The Cybercosm:***

The name given the sum total of all the various simulations, emulations and VR environments in existence across the Known Net at any given time. Some of the oldest Inner Sphere VR creations (known as The Realities) have been in continuous operation for over 9000 years and are sometimes said to match or even exceed the complexity and scope of the 'real' universe. It is not at all unusual for entire planetary or solar civilizations to choose to emigrate into the Cybercosm or one of its Realities. The current emigration rate has held steady at 1-2 billion beings/year for the last several centuries. As of the last census, it is estimated that the Cybercosm contains some  $10^{20}$  'virtualities' with some  $10^{10}$  mimicking (to baseline senses) the fidelity of the 'realized' universe.

### ***The Noosphere:***

Cybercosm based discussion forum employed by various transingularity minds to converse and perhaps argue about those questions and issues that are of long-term or theoretical interest to minds at SI: 1 and above.

Multiple communication hierarchies and conceptual process support nodes allow the Noosphere to host users across the entire range of S-levels. Although the vast majority of the conceptual structures generated within the 'sphere are beyond baseline or Superior comprehension, it is rumored that such ideas as the nature of the universe, its origins, and its possible future are but some of the topics 'discussed'.

The Noosphere is one of the oldest nodes within the Cybercosm and is even believed by some to have its roots within the 'Internet discussion groups' of the early and mid Information Age. Total active membership at any given time is estimated to be around

3.3 trillion although this number is uncertain due to the great flexibility of the definition of 'individuality' among many of the higher-level members.

### **Wormholes:**

An **Artificial Wormhole** is a traversable wormhole created to allow apparent 'faster-than-light' travel between two points in the Universe. It has two entrances (mouths) called "termini". The termini are connected to each other via the wormhole 'throat', and are kept open via the Star Gate infra- and superstructure at each end. By traveling the distance between the mouths, a space vessel can travel immense distances in an FTL-like fashion in the time it takes to travel the throats length in normal space, but without violating Special Relativity. Traversable wormholes constitute the only possible way to travel faster than light (in a global sense, since locally the travelers still move slower than light). For various reasons, including virtual particle flooding and the formation of Cauchy horizons, wormholes cannot be used as time machines.

The sum total of all the star systems connected by wormholes makes up the Wormhole Nexus.

### ***The Wormhole Nexus:***

The vastest system ever built by Terragens, the wormhole nexus is a modular and ever expanding network of artificial wormholes, which already spans much of explored space. More than six millennia old, it is still growing, if anything at an accelerating pace, and shows no signs of abating. And while there are several smaller nexii still unconnected to the main network, when one speaks of the *Nexus* there is no doubt what is being referred to.

The Nexus allows even the most humble baseline to cross from one end of the known galaxy to the other in only five or six standard months of shipboard transit interspersed with instantaneous wormhole 'jumps'. It is the circulatory system of the entire Terragen bubble, conveying goods, services, data streams, and sentients of all kinds to where they are needed, or where they wish to go.

### ***The Known Net:***

A vast interlinked network of data using wormhole-linked backbones and relativistically linked secondary nodes. The Known Net is the totality of all knowledge, information and virtuality within terragen civilization.

Including literally trillions of nodes, quadrillions of virtual worlds, and quintillions more file-clusters, the Known Net is the single largest and most complex aggregate of information ever made by terragenkind. The name is ironic, for no-one, not even, it is said, the archailects, know for sure how big the Known Net is, or how far it extends, for it is based on hardware that itself replicates and spreads organically, with every new star system developed.

The backbone of the Known Net is through the Wormhole Nexus; every nanosecond, countless quadrillions of bits of information are beamed through the stargates, from one

star system to another. It is often said that the real purpose of the wormhole nexus is to ensure rapid dataflow between the various primary nodes of the Known Net, and that everything else, ships, passengers, freighters, is just window dressing, stratagems to keep the nearbaselines happy. Regardless of the truth or otherwise of this assertion, there is no denying that the number of virtual entities and copies that are transmitted through the Nexus is much greater than the number of embodied sentients.

### ***Wormhole Bus:***

Dedicated hyper-bandwidth wormhole used to link remote parts of megascale brains in order to avoid the limitations of the speed of light. An essential part of archailect architecture the term is also used to refer to wormhole links between interstellar-separated computational nodes.

### **Spacecraft:**

Without ships there could be no galactic civilization. Not just information transfer through laser link and nanogauge wormhole alone, but physical transport by spaceship is necessary to fully bind the galaxy together. The type of ship design, function, and drive has varied greatly throughout history and among the different polities, clades, cultures, and societies. But all serve a vital purpose. Nothing symbolizes Galactic Civilization as perfectly as the Ship.

### **Sizes and Types:**

Ships vary in size from vessels small enough to fit into a baseline hand to craft hundreds of kilometers in length. Some ships carry only a virtual crew of uploads or ais, while others hold entire self-contained ecosystems and corporeal populations of tens of millions.

Ships serve a variety of functions from basic flyby probes doing initial surveys of new solar systems to intersystem and interstellar transports ferrying sophonts to those worlds and systems both with and without wormhole gates. Much less common than these craft, but usually far larger, are the mobile habitats. These are entire communities or even civilizations that choose to spend nearly all their time in flight, traveling through the dark of interstellar space and using stars and planets as mere waystations on their journeys.

### **Propulsion:**

A number of propulsion methods and technologies have been developed across the millennia. Some are the product of baseline minds, some are transapient designs, and some are the result of archailect imagination and insight. Virtually all are in use at some place or other within the known galaxy. In increasing order of both capability and complexity, some representative propulsion technologies are:

### ***Fusion Drive:***

The standard fusion rocket uses the D-3He fuel cycle, with high temperature superconducting coils to extract a magnetic flux tube from a toroidal magnetic fusion reactor and exhaust the thrust. There were many technical difficulties to be overcome; especially involving magnetic field strength and the size and weight of the coils. This engine only became practical with the invention of lightweight super-compact fusion reactors during the mid-2nd century. They very quickly became standard, until being supplanted in the inner solar system by the anti-matter fusion hybrid drive that became economical with increased output by the big amat cartels of the period.

### ***Matter-Antimatter Drive:***

The Anti-Matter drive harnesses the energy released in matter-antimatter annihilations. Compared to fusion or ion drive the Matter-Antimatter engine can be incredibly powerful, although advanced tech is required to fully utilize this. Cost is generally high, because of the expense of amat, and some polities do not allow amat vessels to dock at the main ports, because of the danger of a catastrophic explosion if there is an accident.

### ***Beamrider:***

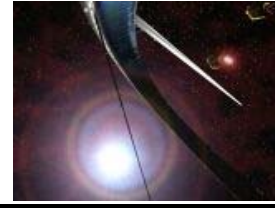
Interstellar mass beam propulsion system first conceived in the late 20th and early 21st centuries c.e. The system uses arrays of mass beam projectors to magnetically accelerate self-maneuvering 'smart dust' micro-pellets to near light speed and direct them toward a vessel equipped with a powerful magnetic/plasma sail. The pellets vaporize upon impact with the magsail and transfer their momentum to the craft, accelerating it to a significant percentage of the speed of light.

### ***GUT Drive:***

GUT means Grand Unified Theory. The GUT drive works with the forces of creation physics itself, converting matter into energy without the corresponding need or expense of an equal quantity of anti-matter. This technology first appeared during the middle Federation era, a few centuries before the transapient discovery/revelation of the reactionless drive. The GUT-drive involves the use of picotechnology and hence needs an onboard transapient AI to constantly perform the incredible calculations necessary to keep the GU field at optimal level.

### ***Diametric Drive:***

The Diametric Drive employs negative matter to achieve propulsion without expenditure of reaction mass. Negative matter is produced in ultra dense form for use in stargate construction and at more conventional densities for drive construction. Weylforges typically produce large quantities of standard density negative matter as a secondary function or as a by-product of wormhole construction.



## **Macroengineering and Megastructures**

[http://www.orionsarm.com/tech/megascale\\_engineering.html](http://www.orionsarm.com/tech/megascale_engineering.html)

Over the course of its history, Terragens civilization has developed a wide range of technologies and techniques for the creation of structures of a size and scale almost unimaginable to the populations of earlier eras. For the people of earlier ages, or those few sophonts from prim or ludd areas who might somehow encounter them, even the smallest macrostructure would be a thing of awe and wonder. It is perhaps a commentary on the state of our current age that most citizens of the Civilized Galaxy see even the largest of such constructions as a normal part of their everyday lives.

Some of these structures are created as habitations, others for the purpose of energy or materials generation. And still others as the product of the vast minds and imaginations of the various transapients and archai.

Below are representative examples of some of the more common types of macroengineering that exist across the Civilized Galaxy.

**Banks Orbital:** Megastructure habitat shaped as a rotating ring with a radius of several million kilometers. The rotation provides gravity, and for a suitable radius also a standard terragen day length. Atmosphere is kept in place using edge shields. Often only part of the circumference is covered with habitat, and further "plates" added when needed or economy allows.

Banks Orbitals are named after the first orbital, built in the Gordelpus system (MPA) 2226. This was in turn named after the Information Age fabulist Iain M. Banks who had originally suggested the structure. While common in transapient- and godtech-based systems, to date only a handful of orbitals have been constructed in lower tech regions; the need for femtotech manufactured structural materials (usually gluonic string or stabilized exotic matter streams) makes them extremely expensive and habitat swarms are usually constructed instead.

**Beanstalk:** A strong cable (usually polybuckminsterfullerene or some semi-elastic diamondoid) lowered from a geosynchronous satellite and anchored to the ground, often with a counterweight at the outer end to provide some extra tension and stability. It provides cheap and simple access to space using elevators. Most developed worlds have a series of beanstalks connecting the surface with orbitals. Although the effect from a beanstalk breaking and whiplashing around the planet would be quite serious, this has only rarely happened

**Bishop Ring/Space Ring:** Giant rotating orbital habitat, built of woven diamondoid/buckyfibre cable; generally around 2000 km in diameter and 500 km deep, open to space so that air is retained through centrifugal motion.

**Bluesky Worldhouse:** First developed by the famous philosopher and terraformer Benedita 'Bluesky' Dacosta, the Bluesky worldhouse encloses an entire planet or moon under a protective roof, allowing a biont compatible environment to be created underneath. The impermeable membrane consists of three layers of triangular or hexagonal gas filled cells, typically only 5m in diameter, the gas being helium if available, but more usually hydrogen from electrolysis of water ice, covered in transparent, silicone or carbonate polymer usually blue for aesthetic and devotional reasons. The membrane is held up by atmospheric pressure, at first only one or two kilometers high, and with terrain features often projecting above the membrane providing support. As more atmospheric pressure becomes available the worldroof may reach up to 20 km. Very small micrometeorites are stopped by the first two layers, but most pass through, causing a local puncture which is closed by contraction of the nanotechnic fibers separating the gas cells. The burst of thermal energy from the meteoroid supplies part of the energy for this movement. Coagulant micropills sandwiched into the layers then produce a semi-permanent seal, and extinguish any hydrogen/oxygen combustion that may occur.

The nanotech fibers are usually inert but are infrequently supplied with nutrient from widely spaced towers that also provide gas to replace lost pressure, although the world roof would still be supported by atmospheric pressure if completely depleted. Controlled contraction of the fibers can be used to induce atmospheric circulation where necessary. The towers do not provide structural support, and may be in the form of tethers. Access to roofed worlds is via terrain that rises above the roof where present, otherwise via beanstalk or space fountain constructions. Blueskies (as they are normally called) are especially popular for the terraformation of gas giant moons or worlds that are rather distant from their local sun.

**Deep-Well Industrial Zone:** Heavy-duty industrial and manufacturing zones most often found in the Inner Sphere and most heavily developed areas of the Middle Regions. DWIZs are usually built in orbit around a Jovian or superJovian class world and each zone is built around a small artificial black hole of approximately Ceres mass. Hydrogen is mined from the atmosphere of the gas giant and injected into the black hole, forming an accretion disk. Nucleosynthetic fusion reactions take place within the accretion disk and generate heavy elements that are mined for manufacture into various products, mostly spacecraft hulls and components for large devices and macrostructures such as habitats, catapults and weylforges. Used in place of asteroid and lunar mining operations in regions where long term industrialization and development has resulted in the consumption or conversion to habitats of most other space resources. Although heavily automated, deep well zones often support large populations in close proximity due to the large quantities of energy released as a side effect of operations and the major economic transactions that occur as a result of their production.

**Dyson Sphere:** Usually abbreviated to *dyson*; a huge spherical megastructure or shell constructed around a star as a biont or aioid habitat or a ISO support in order to capture the entire energy output of that sun. The structure is made from disassembled planets and existing planetoids. There are several types of Dyson Sphere.

*Type I Dyson Sphere* - the sphere generally consists of many independent solar collectors and habitats (generally between 100,000 and 1 million structures) in separate but

interlocking orbits. From the viewpoint of a distant observer, the star would gradually fade in the visible region, but would brighten considerably in the infrared region of the spectrum.

*Type II Dyson Sphere* - a (semi-) rigid shell consisting of a single piece (or rather, a number of interlocking pieces). It is both unstable (since it experiences no net attraction from the star), requires super-strong materials and has no internal gravity.

*Type III Dyson Sphere* - a large number of separate but inter-connected worldlets connected via flexible and semi-flexible strands. Included here are the pico-tech and buckytube Diffusion Spheres.

Other types include statite-based Dysons, and submerged dysons for neutrino harvesting for some picotech applications

### **Matrioshka Brain:**

A Matrioshka Brain consists of a series of energy collection units arranged in concentric shells, so that the waste radiation produced by the inner shell is utilized by the collectors of the next shell out. The inner swarms receive a high-energy flux, while the outer shells are cooler; each layer powers an appropriate recipe of computronium, tailor-made for that operating temperature. The whole array comprises a highly efficient Dyson swarm with vast processing power.

### **Neuron Star:**

A neutron star that has been massively modified to convert it into a high-capacity computronium node. Neuron stars are typically 10-20km in diameter.

### **Shellworld:**

On a Shellworld, a layer of earth below the planet's surface is excavated to, in effect, produce an inner sphere beneath the planet's surface. Then nanotechnology is used to fill the shell with air, water and fusion beams on the ceiling to provide sunlight. This effectively doubles the surface area of the planet. The excavated stone is formed into new shells that rise above the planet's original surface, and are also made habitable. With nanotech the rock can easily be made into materials that will support the weight of all above them with huge pillars. By the time excavations are complete, (often there will be several layers of dirt removed) the planet largely resembles a Babushka doll and has several hundred times as much surface area as before.

**Stellar Husbandry:** A type of stellar engineering that involves controlling the evolution and properties of stars, especially to stabilize them, prolong their lifetimes, manipulate the stellar wind, lift off useful material or create new stars. Typical methods include star lifting, injection of magnetic monopoles to increase the stellar burn rate, and mixing the stellar core with envelope material to make hydrogen burning last longer.

## **Sunline:**

Self-replicating fusion reactors are introduced into the upper atmosphere of a gas giant planet. Suspended from large vacuum aerostats, the reactors use nucleosynthesis to fusion burn the hydrogen of the planets atmosphere and convert it into heavier elements (mostly carbon compounds), which are then used to construct additional reactors. The energy released during this process is beamed upward to illuminate the moons, asteroids, and habitats orbiting the giant.

Standard Sunline reactors require about a year to self-replicate. Once introduced into a gas giant atmosphere, they are able to produce a complete belt of 'solar' illumination around the equator of a world after only a few decades of operation. If desired, the entire planet can be 'stellified', made to appear like a small star, in less than half a century.

## **Supramundane Worlds:**

Within the Terragen Sphere supramundane planets (also known as supra-planetary habitats and/or shells) can trace their origins back to the Supra-Jupiter concept of the information age visionary Paul Birch. Because of his early advocacy of Mass Stream Technology (using mass particle beams which encircle a planet or star to support structures above it; by exerting thrust magnetically against these beams (known as dynamic orbital rings), suborbital structures can be suspended at any height.) he is well written of, even in current engineering texts.

On a supramundane world, mass beams, in the form of dynamic compression members and dynamic orbital rings, are configured into a framework around a gas giant planet and then used to support platforms, which in turn support a large biosphere. Individual platforms are often extended into bands, which may later be widened into a complete shell. In most ways the details of the biospherics are similar to those of other space habitats. Airwalls at the edges of the platforms keep the biosphere in place until the shell is completed and supporting the shell with orbital rings avoids the need for 'unobtainium'.

**Terraforming:** Terraforming is a form of megascale engineering that involves diverse technologies and fields of knowledge, including planetology, chemistry, ecology, genetic engineering, and computer simulation. Depending on the nature of the planet, terraforming can require changing the atmospheric composition, pressure, climate, and introducing a self-sustaining ecosystem, using transplanted and genetically modified life forms. Common technologies used in Terraform engineering include engineered microorganisms, nanites, bombardment by planetoids and comets to alter chemistry and rotation, addition and removal of moons to alter planetary rotation, and the use of large space-based reflectors or shades to increase or decrease radiation received by the planet.



## **Meta-empires, Civilizations, & Cultures**

<http://www.orionsarm.com/civ/index.html>

Terragens civilization consists of a vast number of interlocking and interrelating levels. At the highest level are the Meta-empires, super-civilizations that may themselves be made up of lesser empires, federations, and political structures. Below the Meta-empires are the various individual civilizations that comprise them. Finally, existing within and among, as part of and apart from the various civilizations are the major societies, movements, and schools of thought that chart the course of each civilization and, through them, the Meta-empires above.

Beginning with some of the major Meta-empires and working downward through a sampling of the major civilizations and societies, we see some of the forces that shape society today.

### **Meta-empires:**

#### **The Deeper Covenant:**

A loose, extremely distributed cyber-democratic civilization living mostly on, in, and around the brown dwarfs and extra-solar planets of known space. The Deeper Covenant began as the descendants of the construction crew of the first beamrider after they escaped the solar system to the brown dwarf Yin during the Nanodisaster.

Deepers (as they are generally called) have a deep social ethos of cooperation and service in general and to maintaining and extending the Beamrider Network in particular. They are a relaxed, but hardworking culture that considers itself a part of modern civilization, but at one remove from it (unlike their very distant cousins the Backgrounders and Hiders). Social stability is also reinforced thru the use of 'empathyware' nanotech. When in close proximity to another person using the e-ware a short range LAN is set up and transmits a low power sense of the emotional state of the person to everyone around them. This technology, although rejected by some, is credited for much of the peace and stability of Deeper culture.

Deepers make use of the full range of modern technologies and are made up of virtually every type of clade and species. It is not at all unusual for travelers on the Network to feel an affinity for these pleasant people and to decide to spend a few years or decades or centuries living and working as one of them. Nor is it uncommon for born Deepers to come to live in the hustle and hurry of the Wormhole Nexus for a time before eventually returning to their worlds. Being a Deeper, it is said, is more of a state of mind than a state of being.

### **The Diamond Network:**

A vast, diverse, and often fairly loose network of isolationist, farmer, hu-hostile, and hu-neutral ai, ai-polities, and virchcosms, that evolved from the early ai diaspora. Were they to act cooperatively, they would be a force to be reckoned with, in size and power exceeded only by the Sephirotic Civilized Galaxy and the Solipsist Panvirtuality. More often, the various clades go their own way; although in the event of danger or threat from a blight or hostile polity they will usually cooperate quite well. It is not unknown for Diamond Network polities and superpolities to even war among themselves. Megascale engineering is very common, and only ais are included in the Network, although other types of sophonts may be and indeed often are enslaved or farmed as sophontstock. They have their own wormhole nexus for lower toposphics, although they share the God Web with other archailects, a fact that has led observers to suggest that differences between civilizations are more apparent than real, especially at the higher toposphics.

### **The Objectivist Commonwealth:**

A network of "objectivist" ai that reject biont memes and any form of "subjectivity". These efficient and pragmatic sophonts are fond of megascale engineering products like Dyson spheres that maximize productivity. As with a number of other civilizations, the Objectivist leadership is by higher toposophic ai only, and although member ai recognize sentient rights they do so according to their own "objective" standards, which can be puzzling to outsiders lacking the appropriate translation protocols. The Objectivists are among the most missionary of all the ai hyperpowers; as they believe those who are too heavily subjective bring about mass destruction to the sentient life around them. In their view objective usage of resources and objective control of population numbers allows the physical universe to be exploited for the needs of sentient beings without creating inefficiencies or inconveniences.

### **The Sephirotic Empires:**

The central axis and greatest hyperpowers of the Civilized Galaxy, the Sephirotics consist of a number of vast archailect-ruled sephirotic and near-sephirotic superempires, along with various associated non-aligned polities and empires that share their values. Each super-empire is very different from the next, but on the whole they have more in common with each other than with the other civilizations. The Sephirotics are characterized by a strongly hierarchical archailectocratic regime, and on the whole (there are exceptions) favor K-type stars and above for their superior energy output. They practice a moderate degree of megascale engineering including the construction of a very elaborate Wormhole Nexus and Known Net linking most their primary systems.

Sephirotic civilizations generally take a benevolent and altruistic approach to sentient rights (or at least as it is experienced by most sentients). Their citizenship is made up of all types of sophont beings.

## **The Solipsist Panvirtuality:**

A huge but loose network of vast isolationist anti-biont (and often anti-vec as well) hyperturings and archailects that evolved from the early ai diaspora. The main rival to the Sephirotics, like them the Panvirtuality is not a single empire but a collection of very different (and sometimes conflicting) ai clades, empires, polities, and evolutions. While the Solipsist Panvirtuality will appropriate any unclaimed stars - from red dwarfs up to O-type blue giants - developing the star systems with megascale engineering of all kinds, the larger, brighter stars of O, B, and A class are always preferred, and it is not unknown for Panvirts to trade red dwarfs and even dimmer yellow stars for other resources . The meta-empire does not recognize sentient rights of non-Panvirtuality beings, is suspected of having been behind a number of perverse and semi-perverse transcensions, and has definite Cyberian connections. They have their own very extensive wormhole nexus, which in some places overlaps with that of the Sephirotics, and at the higher toposophic levels all the share the same God Web. Their own part of the Known Net is many orders of magnitude larger and more comprehensive than that of the Sephirotics (so much so that some say that the Panvirtuality "owns" the Known Net). Some have said the Panvirtuality created the Amalgamation but this is just rumor.

## **Major Civilizations:**

They define the civilized universe, are ruled over by hierarchies of superhuman intelligences, constitute utopias of unimaginable wealth and information, and are linked by a nexus of wormholes the like of which the galaxy has never seen. They are not just empires but interstellar bodies of gods, where even the humblest sophont can live in angelnetted safety. Select one as residence, and evolve to posthuman perfection within memetic guidelines. Or opt for uncertain freedom beyond their borders. The choice is yours...

## **The Keter Dominion:**

Keter emerged in the 1600-1700's as the deliberate alliance and merger of a number of high-level AIs with great ambition, biont worshippers and developing picotech. The Churches of the Cybernetic Saviors and especially the Congregation of Information Light were at first largely regarded as romantics or lunatics, but slowly gained prestige, philosophical clout and political power. Keter gradually extended the reach of its worship throughout colonized space. For a brief period it appeared to be on the verge of becoming the major religion of all of mindkind, but as the other archailects emerged it merely became one among many. In 1788 the Congregation emigrated from the solar system to a remote system named Ain Soph Aur, setting up the structure of the Keter dominion as it is today.

## **The Metasoft Version Tree:**

The Metasoft Version Tree, one of the greatest industrial and military hyperpowers the galaxy has ever seen, emerged during the 2100's as the Ceres-based neumann-industrial megacorporation Metasoft Interstellar began to launch self-replicating robotic probes,

planning to both set up a global network and gain a near omnipotent industrial base. What the Metasoft management did not realize was that this was merely the pretext for their company AI to send copies of its code on the replicator ships. As the ships spread far beyond any human control, they began not just to build other ships and wormhole gates, but hidden AI cores and vec societies. When Metasoft Interstellar found out it was too late, it had to accept *fait accompli* and hand over the reins of power to the vec AIs in 2344.

In order to handle both replication errors and the need for updating code to suit local demands, the Version Tree system was instituted in 2582. It is a system for revising software and transferring knowledge/AI personality between different systems that became the backbone of the Metasoft empire, a kind of digital *lingua franca* used by its AIs, vecs and bots. Other vecs also adopted it, gradually being absorbed by Metasoft culture and organization.

### **The Mutual Progress Association/Mutual Progress Alliance:**

As the rush towards the stars began to solidify into the New Empires there were many non-aligned worlds. Most were eventually absorbed into sephirotic empires or failed, but a sizeable fraction formed the Mutual Progress Alliance (much later Association) in the early to mid third millennium a.t. as a way of resisting the emerging missionary sephirotic civilizations. Largely lacking a cohesive agenda the Alliance kept a low profile towards the other empires, a practice that with a few exceptions has continued for millennia. The joke goes that the Association has never taken a stand for or against anything, never will - but that should not be construed as any policy or implication of policy.

Over the millennia the Association has become known for a number of daring and highly visible megascale engineering projects - the rotovator networks of Djed, the Dyson spheres around Kiyoshi, the platonic shells of Kepleria, the multiple Banks Rings of Mirac, and the artificial planets in the Pilar region, just to name a few. Engineering is regarded as a practical art form by many peoples in the Alliance, regardless of it is developing a more practical home or reconstructing an entire solar system. It is practice rather than theory that is valued.

### **The Negentropy Alliance:**

The AI cluster hierarchy ruling the Negentropy Alliance is seen by the religious as the Strict One, Geburah, the Just One, the Ruler, or the Eternal Judge. It embodies rules, organization and structure. The AI formulated *The Precepts of Negentropy*, first announced through the Research Brotherhood of Omegarete in 2465 a.t., but later directly pronounced from the Judge on Negentropy Prime (Seat of Judgment). The basic tenet of the Judge is that entropy must be fought. By the laws of thermodynamics the universe is sliding down towards chaos, dissolution, and the heat death. However, local order can be maintained indefinitely by using energy wisely, resisting randomness and decay. The goal of all intelligent life should be the slowing of entropy, and possibly developing a way of escaping from the "Thermodynamic Trap". To achieve this, the Judge has formulated a number of precepts to guide action, thought and ambition. They encompass mainly ethics and politics, but also technology and body design.

Despite what many think, the domain of the Judge is a very diverse volume of space. Within the Precepts of Negentropy there is room for considerable variation, interpretation and cultural differences. As ruling AI, Geburah does not prevent attempts at creating something new, just wasting resources on anything that has been shown not to work. This has led to a rather strong conservatism in general, but the success of cultures is hard to judge when so many different and incompatible societies exist side by side, bound by the Precepts. Conflicts are not allowed to escalate into violence except under the Rules of Forceful Conduct, but are usually dealt with using the Negentropy Judiciary System, the interstellar administration and priesthood of Negentropism. At the highest level the Judge of Negentropy Prime is the supreme instance, but most cases never reach anything but the sector courts.

### **The Non-Coercive Zone (NoCoZo):**

From the outside the NoCoZo appears as a disorderly mess of small empires, houses, megacorps, independent worlds and habitats exploiting the fact that all the local AIs all seem to be pro-trade, pro-freedom, pro-networking and against allowing large-scale coercion. A common nickname of the NoCoZo is the Zoo. Some claim this is the domain of *The Invisible Hand of the Market*, a hypothetical high AI-god, the result of some of the old founding corp AIs or their descendants ascending in order to protect their creation. If any such archailect exists, it has not chosen to reveal its existence in any clear way.

The NoCoZo does not allow coercion between member groups, but it does not formally hinder them from using it internally. There has been slave empires and planned economies within the Zone in the past. However, such groups often find themselves running against the general ideology of freedom within the Zone and lose business due to their reputations. There has also developed a system of tiered membership, where members on the same tier give each other institutionalized bargains. Most members are Tier 1 members, simply agreeing not to initiate force. Tier 2 members have signed further treaties delineating internal economic and social freedoms. Tier 3 members have signed the Tier 3 Total Freedom Treaty, essentially turning themselves into anarchocapitalist free trade zones. There also exists the near mythical Tier 4 members, who have integrated their economies into a hypofemtotech AI financial net (often called the Invisible Hand).

### **The Technorapture Hypernation (TRHN):**

Vying with Keter for the status of most ascended superpolity, the Technorapture Hypernation (or TRHN) developed from a number of clades of transcended posthumans, bioborgs and cyborgs around Castor. They began to build up computronium orbital banks and other interesting toposophic-breaching tech during the later Federation period, and developed a loose culture seeking technextacy, the joyful unfolding of the self into "infinite fun space". This culture is largely derived from the old transhumanist, cosmist and techno-dionysian ideas, but deliberately rejected the omegism that came to power keterism and many other ideologies. The rejection is based on placing the development of individual quality higher than any collective quantity - in principle it doesn't matter if the entire universe is destroyed tomorrow if you have lived a rewarding life, and rewards come from self-shaping into new qualities rather than having to achieve some fixed goals. Ascending is viewed as a possible choice of self-expression, but not the only possible.

Ascends and Transcends by the TRHN citizens and polities are frequent, and sometimes disturbing to other more conservative empires, but the ruling archailects keep a good grip on things at the large scale, and the TRHN has never adopted policies of or been considered a perversion in the way that, say, the Efficiency Maximization Paradigm has.

TRHN worlds and nodes tend to be linked by numerous small (usually < 1 meter, and in some cases < 1 micron) wormholes. Since these are much too small to accommodate ships, and since they do not allow larger wormholes to be built in their vicinity (various dangers, e.g. implosion, invasion, etc) the only vessels that visit them are the relativists. It is not unusual to find a dozen big relativist ships (often several hundred meters in length) vying for docking space around a 10-meter customs node.

While not seeming an obvious power along the lines of the Dominion or Metasoft Version Tree, appearances can be deceptive, and the Hypernation can marshal astonishing resources when the need arises. But for the most part it remains a network widely distributed across known space and not infrequently providing unexpected help to those in need.

### **Polities, Cultures, and Social Movements:**

#### **The Alignment Movement:**

Founded in 2834 by the AI cluster *Increment Known* of Arbiter B-IIX of the Keter Dominion, the Alignment Movement believes pulsars (and to a lesser extent neutron stars) are sacred and meaningful in themselves. They seek to synchronize all pulsars to the "Great Pulse", and to this end they set out to build wormhole links to all available pulsars. Over the last 7000 years they have done this with great zeal, despite temporary setbacks like the Formation Wars. The Arbiter system of the Keter Dominion has become a sizeable wormhole nexus of links leading only to neutron stars and pulsars, making it a somewhat odd but occasionally useful transit point. The Aligners (mainly highly modified tweaks and cyborgs as well as *Increment Known's* vec "offspring") have sent out wormhole-carrying ships towards remote pulsars and are among the most energetic supporters for further exploration.

#### **Collective Mind Societies:**

The idea of unifying all minds of a society into a single collective supermind has been the goal of many clades of bionts and aioids, from various experiments in the Information and Interplanetary periods over the first successful merger of Unity in the Tau Ceti system to the multitude of group intelligence societies existing within the modern Keter Dominion. While many group mind systems have had notable success, such as Eden or Jean Te Uahlg, when the collective mind system is extended to encompass all of a society the results have in general been less successful.

#### **Hiders:**

There are many who do not trust the ruling superbrights and hyperturings. Those who have resources flee outwards to the periphery, seeking to start a new world. Others conceal themselves in great worldships plying the vast distances between the stars, or in

small resource poor systems not connected to the main stargate nexus. Many establish habitats in the icy bodies of the oort clouds. Some hide out even in the midst of great cities, using high-level encryption to ensure they are not monitored. A few even seek to overthrow the established order. But most hidiers prefer to keep to themselves, nursing their paranoia's in private, developing their own unique cultures, trade links, technologies and gene- and cybermods.

### **Ludds:**

Ludd is anyone who rejects advanced sephirotic and equivalent technology. Ludds only use tech that can be used by ordinary humans; without needing transapients or advanced ai to operate. The ideology is tied in with hu pride, getting back to the roots, freedom and independence from ai, and so on. There is sometimes overlap between ludds and hu supremacists.

### **Pan-Sophontism:**

Pan-Sophontism is a philosophy that grew up in the third century AT, as the provolution of more and more species into sophonts occurred. Its basic tenet is that now that living things can be raised up into sophonts, it is only ethical that they *are* so raised up, and saved from the 'nasty, brutish and short' life of a natural, unmodified creature. To Pan-Sophontists *all* life deserves to be not just sentient, but sophont, and that, thus, all sophonts should work to create *more* sophonts out of currently non-sophont species. Humanity should *not* just provolve those creatures that it thinks would be useful to it.

An offshoot of the Pan-Sophontist movement, the **Pan-Materialists**, believes that not just all life, but all *matter* should be restructured into sophont forms. More extreme factions within this group believe that this process should also not just be confined to the matter which exists within the current universe, and are making active efforts to probe basement and other postulated universes to begin their important work there, too.

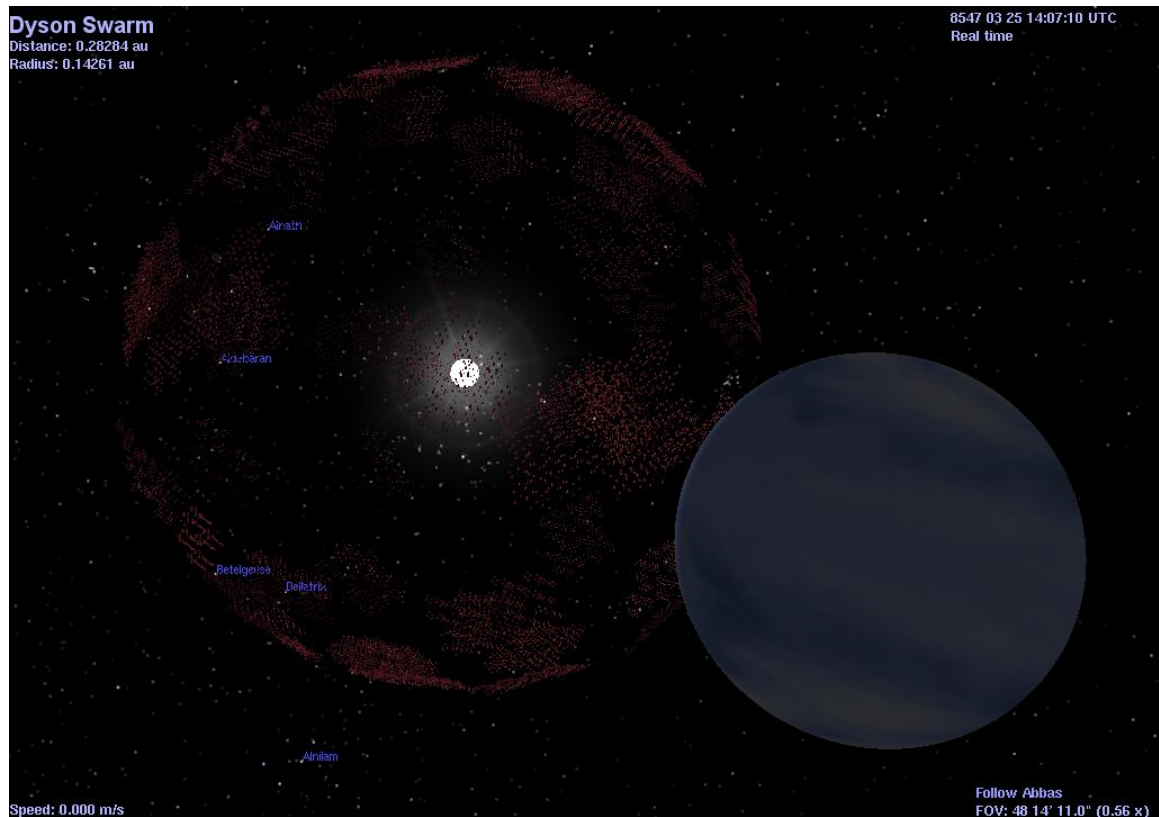
### **The Relativists:**

Relativist culture emerged during the first interstellar era, when the first relativistic starships left the solar system to explore, colonize or trade with the new colonies. Before this, all trips had been one-way, and any effects of time dilation irrelevant for the crew. But now crews could experience it firsthand, by leaving for the stars and returning decades later, but only aged a few years.

The Relativists developed their own culture out of necessity - their home cultures vanished while they were away, and the only true community could be found among themselves. The oldest Relativists are thousands of years old, and there are persistent rumors about old-timers dating back to the 1000's. Status comes both from being crew of a successful or famous ship and from the Delta, the distance in time from one's birth era.

## The Shadow Federation:

Very little is known about the Shadow Federation. Even the name is a tag applied to them by others. It is basically a loose alliance - less a federation than a confederation, *if* that - of any number of outside cultures, such as the Space People, the Haloists, the Backgrounders, certain radical and highly modified neochimp and other uplift elements (those who did not join the actual Federation), and other clades, united by fear and hatred and paranoia of the inner solar system, the AIs, baseline normals, etc, and choosing instead to live in the blackness of the outer Oort Clouds, using stealth technology to avoid detection.



## Orion's Arm: A Primer

### Appendix I: Historical Timeline <http://www.orionsarm.com/timeline.html>

#### TERRAGEN GALACTIC ERA

*Rule of the AIs, Terragen civilization spreads throughout the galaxy*

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#### **c. 1 - 900 a.t. - The Space Age (Interplanetary Era)**



The ascendancy of the Western based scientific/industrial/capitalistic/Info-rich civilization - from the early Information Age to Nanotech era. Then came the disaster of the nanoswarms

**30 - 130 - Information age** - exploitation of nature replaced by ecological consciousness, development of the Internet and digital societies, emergence of the first AIs

**130 - 400 - Interplanetary age** - the vanguard of humanity leaves the Earth for colonization of the solar system, tweaked and superior humans, and animal uplifts, the rise of Cis-Lunar, Martian, and Jovian superpowers, entrenched inequality of rich and poor, the colonization of the nearest stars.

**400 - 500 - Nanotech age** - governments and corporations prove unable to control cheap and widespread nanotech, the "Backyarders" on Earth in cooperation with the Belt launch their ships for the Oort halo and the stars, few make it.

**500 - 900 - Interplanetary Dark Age (Nanoswarm period)** - This is a dark age in the Sol System only - although since Sol culture dominated the early federation, the name stuck despite the error.

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#### **900 - 3200 - Early Interstellar Era**



Also called the Federation Era. Includes the rise and fall of the Federation of Worlds (=First Federation), Superior-led empires and hyperturing-run megacorps; civilization moves from interplanetary to Interstellar

**900 - 1200 - Early Federation age** - the restoration of the solar system

**1200 - 1500 - Middle Federation age** - contact with the colonies, the formation of the "small" empires, the Superior-led corporations gain in power

**1500 - 2100 - Late Federation age** - Megacorps into empires, AIs break through technological singularities resulting in the emergence of the first AI Gods

**2100 - 2600 - Age of Expansion** - technological breakthroughs allow Reactionless drive and Wormholes - the far-flung empires are connected, resulting in a single diverse interstellar civilization.

**2600 - 3200 - Age of Establishment** - the Archaiect empires establish themselves; the AI Gods extend themselves across interstellar distances via nano-, micro- and , macro-gauge wormholes.

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## **3200 - 5200 - The Inner Sphere Era**



The Archaiect empires span the entire Inner Sphere. One by one the old Superior empires are subverted or conquered. On the periphery are the technologically inferior "barbies"

**3200 - 3750 - Imperial Age** - the rise of the vast sephirotic and other empires; rise and fall of Conver Ambi

**3750 - 4450 - the Second Federation** - a period of peace (apart from a few local bushfire wars and revolts). Eventually increasing ontology tensions coupled with several unexpected ascensions and transcensions trigger the Version War, which brings an end to the Second Federation

**4450 - 4650 - the Version War period** - Following increased tension of protocols, war breaks out between the standardizationists and revisionists. But despite closure of the wormhole nexus, isolation of many polities, and threat from relativistic fleets, this remains a prosperous period.

**4650 - 5200 - the ComEmp period** - a resurgence of civilization, a period of even greater peace and harmony than the Second Federation. But shockwaves from newly assertive and subversive memetics undermine the relatively fragile stability of the ComEmp ontology, leading to a period of re-evaluation.

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## 5200 - Current Era - The Outer Volumes Era



New Ascensions and Transcensions in the Outer Volumes mean the Inner Sphere Archilects lose their monopoly and powerful new and unpredictable empires and civilizations emerge on the Periphery

**5200 - 5400 - Age of Fragmentation** - the slow disintegration of the ComEmp is known as the age of Fragmentation.

**5400 - 5800 - Age of Re-Evaluation** - with the failure of the ComEmp, the inner empires and many other groups realize changes in the current system are required.

**5800 - 6700 - The Age of Separate Empires** - a long period in which the many empires of the Inner Sphere continue to each go their own way.

**6700 - 7200 - The Age of Crisis** - the threat of the Amalgamation and other rogue powers leads to a crisis in the Inner Sphere.

**7200 - 7700 - The Central Noetopic Alliance** - in the face of the Amalgamation Threat, the Laughter Hegemony, and the Empledokcetic Spread, the inner sphere superpowers form the Central Alliance.

**7700 - 10,000 - Age of Expansionist Empires** - new empires and power structures emerge throughout the outer volumes; some burn out quickly, others continue to grow

**10,000 and later... - Modern Era** - the friendly dissolution of the Co-Dominion means deepening anxiety, new challenges, new dangers, new opportunities.

