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Analysis of Materials Salvaged from Drifter Hives

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With thanks to the numerous pilots who have flown on and continue to assist with the operations of the Arataka Research Consortium in those systems containing the 'Drifter Hives'. Without their efforts, this report would not have been possible.

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Abstract

Jove and Hikanta Tyrannos corpses, along with associated hardware, have been recovered from multiple wormhole systems following a series of expeditions. These samples have been subjected to both non-destructive and destructive testing, and where necessary multiple damaged specimens have been used in the reconstruction of a composite image of the undamaged artefact.

Corpse analysis consisted of visual inspection, tomographic and sonographic studies, chemical analyses of thin-slice tissue samples, and gross autopsy with the aid of AIMED produced by *Zainou Biotech* and *X-Sense*. Recovered neural implantation was then studied further through compositional analysis and operational simulation in medical testing clones. This included a battery of standard sensory stimulation tests, alongside memory formation and logical diagnostics.

Investigation of the cryostasis chambers dubbed 'canopics' followed the same lines, with medical testing clones being subjected to the action those subsystems retrieved either intact or in a repairable state in order to determine the technology's efficacy and methods of operation.

Subsequent to the completion of study, all remaining tissue and material samples have been remanded to the custody of *Zainou Biotech* for continued analysis. Additional samples have been recovered during the operations of the *Arataka Research Consortium* and *Itsukame-Zainou Hyperspatial Inquiries, Ltd.*[1], and have likewise been surrendered to *Zainou Biotech* following the confirmation of little deviation from the major trends here identified.

[1]Henceforth, simply *Itsukame-Zainou*.

Chapter 1

Jove Corpses

1.1 Introduction

Jove corpses would appear to have been sustained via advanced cryostasis technology, though systems failures have unfortunately contributed to the damage or decay of many recovered specimens. This damage is consistent with the most common repairs observed in the corpses of the Vigilant Tyrannos, and has offered some insight into the techniques used in the reanimation or reactivation of the Tyrannos' pilots. The existence of multiple divergent lines of clone engineering amongst the samples also suggests the possibility that multiple Jove gene-lines are stored in the Enclaves.

The corpses of the Hikanta Tyrannos display the augmentation, decay, and necrosis comparable to that highlighted in the Y.C. 117 autopsy of the Apollo Tyrannos.[1] The samples of the Hikanta recovered vary in the extent of their necrosis and repair augmentation, although it should be noted that generally greater atrophy was found in the Hikanta samples compared to the previous autopsy.

Salvaged hardware includes extensive neural implantation with clear distinctions between 'Sleeper' and 'Drifter' designs. The former technology appears focused on the complete, non-destructive analysis and mapping of neural structures, with periodic updates of neurological changes being made to (and potentially received from) a larger network of undetermined purpose and extent. The latter seems to be an advancement of the Sleepers' designs, permitting an infomorph to interface with both existing neural structures and cloned replacement tissue, complementing the pre-existing Sleeper implant found in all corpses.

Despite the redundancy and efficiency manifest in the recovered cryostasis units, many units had failed by the time of retrieval (cf. 2.3.2). It can be deduced that this is a major factor in the inferior quality of many of the studied cadavers.

[1] See the Y.C. 117 publication by Tetua, A.; Starsurge, M.; Moros, K.; and Askold, K..

1.2 Jove Cadavers

The cadavers here considered were retrieved from the previously-uncharted systems containing the Drifter Hives. A total of 22 such corpses along with their associated canopics were recovered from the following systems during operations commencing Y.C. 117/06/02:

- J110145: 'Barbican'
- J200727: 'Conflux'
- J174618: 'Redoubt'
- J055520: 'Sentinel'
- J164710: 'Vidette'

It should be noted that the initial attempt to retrieve samples from 'Vidette' were a failure due to an unsuccessful engagement with the Vigilant Tyrannos; later operations rectified the problem.

Recovered samples were initially secured in unpressurised, unheated and sterilised cargo bays, and were held in quarantine before transfer via sterile medical drone to zero-gravity clean rooms owned by *Itsukame-Zainou*. After the extraction of all remains and extraneous biological matter from the canopics, specimens were tagged by their origin and order of recovery before subjection to AIMED scans and internal examination. Chemical and mechanical analysis of gross structures was performed, with a priority placed upon the retrieval of any anomalous organs, synthetic tissues, or cybernetic materials.

Four case studies are presented, identifying the nature of their death, neurochemical residue at the time of death or stasis, and other noteworthy irregularities.

1.2.1 Barbican 12: An Ideal Sample

The sample 'Barbican 12' represents an ideal case. Prior to the retrieval of the corpse from space and the presumed removal of the canopic from its parent Enclave with the body intact within, analysis indicates the continued function of cryostasis equipment. Consequently, the interred Jove body was well-preserved.

Known Jove genetic identifiers and the characteristic gross morphology of the race (slight build, atypical facial structure, and the use of cybernetic augmentation and / or synthetic tissue to improve certain bodily functions beyond human baseline) are displayed. Superficial injuries consistent with the shattering of the Canopic's translucent cover (or 'canopy': cf. 2.2.5) are, however, present. No surgical scars are manifest, although fibrous tissue was identified in regions appropriate for the implantation of foreign structures, including the coordinating unit of the subject's various implants. This would support theories that the Jove are cloned in an adult state and modified during development, or alternatively that the gene-line here represented presents heightened healing capabilities, avoiding the heavy fibrosis usually associated with rapid healing.

Barbican 12's circulatory, digestive and pulmonary systems were subjected to vitrification, with the nanite-laden vitrification fluid used both to limit and repair damage caused by the process of suspension. Blood vessels show signs of repair at vulnerable points such as capillaries, where weakened tissue has been reinforced with synthetic structures; excessively-damaged tissue appears to have undergone complete reconstruction. The brain appears protected by extensive neural augmentation, displaying a full mesh penetration allowing connection to a centralised implant infrastructure. Any neural tissue damaged during suspension would seem to have been repaired during the routine operation of the subject's implants.

Neural mapping for this subject was achieved through the complete removal of the brain in conjunction with histological and chemical analyses, as well as the physical imaging of neural structures for the purposes of simulation. The extensive interfacing of the neural mesh with the subject's sensory system would allow for blocking certain senses or sensations, augmented processing, or the virtualisation of sensory input as a minimum; further capabilities cannot be excluded, but a more in-depth study of the implantation is required before more can be said.

Neurochemistry is comparable to the samples obtained from Minister of Information Baniya, M., suggesting standard Jove neurochemistry; neurotransmitters associated with aggression are present in levels far below typical human concentrations, together with synthetic hormone regulators and other engineered neural structures of currently undetermined purpose. Due to the excellent preservation of this particular cadaver, neurochemical analysis allows some insight into the mental state of the subject immediately prior to suspension; while with no further context only broad strokes can be deduced, it is likely that Barbican 12 was experiencing emotions comparable to 'joy' or 'elation' at the moment of storage.

Toxicology review reveals no obvious pharmacological intervention at the time of interment, with any recognisable sedatives and psychotropics totally absent. It is theorised that the subject's implantation may have allowed for manipulation or isolation of sensory inputs, obviating the need for any pharmaceutical aids during suspension.

Barbican 12 Neurological Review

Specimen Barbican 12 was received by *Lai Dai Research Biomedical and Cybernetic*[2] researchers in conjunction with *Itsukame-Zainou*. 10,214 thin-slice plates were created by standard gamma-partitioning methods ($g = 1.00$) and subjected to SAFM mapping in order to reconstruct the specimen *in silico*. Mapping precision

[2]Condensed, henceforth, to 'LDRBC'.

allowed an overall median granularity of 10^{-5}. Kitsoku, M. and Scherezad conducted a multivariate investigation of the Barbican 12 model. Numerous deviations from the *H. Sapiens Stellaris* baseline were recorded. Notable among these were the deformation of the interlaminar structures within the thalamus.

These interlaminar structures contained a population of pyramidal neurons ($\sim$ 25,000) with unknown purpose. Connectivity studies were conducted upon the ILS-T structures. A simulated 1.10 SNTS signal was sent along the typical input pathways to the thalamus. Outputs from the thalamus were determined to be within standard baseline ranges by comparison to the Intercollegiate Neurological Baseline Survey ($p = 0.015$). However, activation of the intrusive ILS-T neurons directly resulted in unusual activation of the thalamus, with signal propagation continuing into the limbic structures and neocortex with an unexpected average strength of 1.44 SNTS.

These connectivity studies suggest that these ILS-T neurons exist as an intermediary between the thalamus and synthetic mesh structures dorsal to the thalamus. The purpose of these mesh structures is unclear, as is the reason why the implant development team responsible for this introduction chose to use more fragile and unpredictable natural pyramid neurons instead of synthetic neural mesh.

Despite this lack of clarity, it can be suggested that the inclusion of ILS-T pyramid cells within the thalamus would result in altered states of consciousness when said neurons are activated, though the nature of this altered state remains unclear. Further studies are possible with the Barbican 12 model, and are currently underway. Please contact *Itsukame-Zainou* for licensing options.

1.2.2 Sentinel 7: Catastrophic Failure of Cryostasis

'Sentinel 7' was the first corpse obtained from the Sentinel Hive, and is exemplary of those Jove corpses that have experienced a total failure of cryostasis. Many gross structures remain identifiable, thanks to the elimination of microbial decomposition provided by the use of vitrification for preservation. Activation of fail-safe mechanisms within the canopic preserved the cadaver itself in a state of bloating, with mechanical and cybernetic structures left entirely intact.

It is suggested that the Sentinel Enclave suffered failures to its coolant plant, provoking periodic interruptions of the coolant supply to canopics. The continued operation of both the computing technology associated with the canopic (cf. 2.2.2) and the remainder of the Enclave continued to generate heat, and so Sentinel 7 underwent repeated cycles of heating and cooling as coolant supplies were interrupted, restored, and again interrupted.

The number of such cycles is unknown, but they appear to have repeated several times while being insufficiently severe to trigger fail-safe mechanisms. It could be that physical maintenance was anticipated by the Enclaves' designers for such a pressing mechanical fault, and so fail-safe procedures were not sensitive enough to prevent damage in the absence of physical intervention.

The extent of the warming is somewhat obscured by the continued operation of the canopic's vitrifying fluid; when solid, medical nanites are capable of migrating throughout the irregular matrix, enabling organised repair of tissue in damaged area through total reconstruction or the introduction of synthetic substances. These nanites appear to have continued to attempt repairs while energy, materials and tissue were available for use, up to the point of cannibalising damaged tissue or failed nanites to prolong their operation.

Undifferentiated tissue, synthetic structures, and reduced bloat are evident where nanites pooled during periods of warming, and appear to have gone uncorrected during colder periods when the nanites were more able to move throughout the interred body.

Repairs to neural structures for which the implantation would typically be responsible also seem to have eventually ceased, despite the neural mesh providing a matrix for the nanites' movement even during warmer periods. As a result, the subject's brain was markedly less decomposed than its body, although still far more damaged than the brains of samples such as Barbican 12 (cf. 1.2.1); this made Sentinel 7 an ideal opportunity for the retrieval of an intact neural mesh and the associated implantation for future study.

Thermal creep (cf. 2.2.2) is present in such canopics' computing modules, though not to the degree that would be expected for such a severe reduction in coolant supply; it is a possibility that the Enclave's operations were gradually reduced in order to diminish the load on a failing coolant plant.

Sentinel 7 Neurological Review

Specimen Sentinel 7 was received by LDRBC researchers in conjunction with *Itsukame-Zainou*. 3,690 thin-slice plates were created by standard gamma-partitioning methods ($g = 1.00$) and subjected to SAFM mapping in order to reconstruct the specimen *in silico*. Precision of mapping allowed an overall median granularity of 10^{-5}. Kitsoku, M. and Scherezad conducted a multivariate investigation of the Sentinel 7 model. While mapping accuracy was appreciably high, the sample was received in a state of natural decomposition as described in 1.2.2. This made examination of fine-detail neurological structures extremely challenging. for this reason, studies have been confined to examination of the neural implant and mesh.

Initial study of the Sentinel 7 model has been conducted on the primary reticulated dopamine pathway. Comparative studies indicate a high degree of parallelization ($a = 0.003$, $b = 1.00$) between the mesh and assumed natural structures as indicated by conformation markings along the supportive wall of the mesh body. Presence of molybdenum rod molecules within nodules along the mesh suggest that the mesh was grown by forced growth cone methodologies. All trace of associated long-chain polymer support are missing, suggesting that these structures were highly abraded, consumed by MEMS processes during reconstructive efforts, or were not used in construction of the mesh.

Coarse-scale mesh structure deviates from parallelization in two locations. Within the forebrain, Jarvier's Sulci shows extreme deformation ($a = 0.083$, $b = 0.91$). Unfortunately, this deformation is accompanied with striation and fracturing suggestive of cold shocking, making connectivity studies difficult and inaccurate. A full-scale hidden decision-forest investigation is currently underway to investigate possible formations of the deformed structure.

Most deformation is found within the hippocampus ($a = 0.114$, $b = 0.88$). Here the mesh conforms to the normal structure of the hippocampus, but internally is characterized by 'regularized vortex' structures. It is unknown how such a structure might operate, but in a baseline human brain, this mesh would introduce amnesia, seizures, anxiety, and eventual death by generalized neurological failure.

External studies are not currently being entertained with the Sentinel 7 model.

1.2.3 Conflux 19: Surgical Intervention

While the canopic housing this cadaver offers little unusual, 'Conflux 19' itself is highly atypical; profound and invasive implantation is present, alongside the total excision of certain common Jove neural structures. The pattern of repeated medical intervention and extensive scarring of the cadaver is in stark contrast to many samples. These interventions involve every aspect of what we now recognize as standard Jove neural architecture, from cloned tissue excision and replacement, firmware updates to implant control systems, and removal or replacement of certain implants or synthetic structures involved in the regulation of some neurotransmitters.

This latter point is the most readily recognizable target for this specimen's surgical intervention. Standard Jove systems targeting dopamine, serotonin, and noradrenaline release and uptake appear to have largely been replaced with non-standard synthetic structures that are individual to this specimen, which display increased capacity for synthesis or decomposition. The system also displays increased use of cybernetics over Jove baseline, including monitoring and transmission capabilities beyond the norm.

Central implant infrastructure also displays variation from the baseline. While the central Sleeper implant infrastructure remains unaltered, a control system for the novel regulation implants has been implanted adjacent to the Sleeper implant, utilizing the mesh originating from the Sleeper implant as a network.

The extent of this augmentation indicates radical efforts to alter or maintain the specimen' neurological function within a defined range, though the equilibrium may not have been stable or sustainable given possible damage to receptors, unorthodox use of existing implant infrastructure, and the layering of surgical scars. The specimen was suspended relatively soon after the last set of surgical interventions, given the unhealed state of some incisions.

While no known examples of a Jove specimen subject to the Jove Disease have fallen into the hands of researchers, it is considered highly likely that this represents an effort to employ a treatment regime for the Jove Disease.

Sentinel 7: Neurological Review

Specimen Conflux 19 was received by LDRBC researchers in conjunction with *Itsukame-Zainou*. 8,259 thin-slice plates were created by standard gamma-partitioning methods ($g = 1.00$) and subjected to SAFM mapping in order to reconstruct the specimen *in silico*. Precision of mapping allowed an overall median granularity of 10^5.

Kitsoku, M and. Scherezad conducted a multivariate investigation of the Conflux 19 model. Immediately apparent on visual inspection of the model was the complete deformation and replacement of large portions of the limbic system, and the infill of numerous fluid cavities within the midbrain and neocortex. These were examined in gross detail before connectivity studies were undertaken.

The dorsal surface of the limbic system of the model has been largely replaced, including complete removal of the reticulated dopamine pathway. Closer inspection reveals the presence of long striated fibers running along the length of the corpus callosum above, connecting down into the cavity. Due to ligature markings along the framework it is believed that these structures were used as communication and structural channels to support a communication network, indicating that the hormone control functions associated with the removed structures had been farmed to a remote control unit.

However, these same markings on the structure indicate a careful but hurried removal. Tearing and fracturing of the polymers indicate surgery being undertaken with less than usual Jovian precision. Believed to be added afterwards, a cylindrical body wrapped in casein fibers is present embedded centromedially on the ventral side of the corpus callosum. A standard mesh network has been force grown from polar nodes on the implant body, extending downwards to connect to the entirety of the pons and medulla, and upwards to connect to the corpus callosum. This fact, combined with atrophy and deneurulation of the limbic bodies within the model, suggest that the new implant is tasked to replace most midbrain function. The fact that this is the case, provided the device's small size, is an impressive feat even for Jovian cybernetics.

Segments of the forebrain of the model have been excised by way of lysosomic therapy. These appear to be areas associated with self control and the FOF Response. Striated polymers as described above have been found on site, but no bodies of implant or replacement tissue has been found. Given that the entire forebrain is heavily encased in mesh networking fibers, it is believed that the site was originally the location of an implant designed to improve instinctive response, and was then removed, replaced with an off-site controller.

The Conflux 19 model is not available for independent license, and remains the property of LDRBC, developed in cooperation with *Itsukame-Zainou*.

1.2.4 Barbican 10: Revival

'Barbican 10' stands apart from the outstanding preservation of 'Barbican 12' (cf. 1.2.1). While many Barbican canopics appear to have remained functional until their removal from their Enclaves by Sleeper drones, Barbican 10 has suffered minor necrosis, damage to extremities including (but not limited to) bone fracturing, the replacement of vitrifying solution with a synthetic blood ersatz, and contusions on the hands, face, and knees.

Given the presence of the blood surrogate and evacuation of vitrifying fluid from the subject's lungs, it may be deduced that this subject was put through a rapid de-suspension process. The injuries and necrosis inconsistent with other samples suggest that, for an undetermined length of time, the subject had regained consciousness.

However, environmental fail-safes appear to have remained engaged even after the subject's revival, preventing it from leaving the canopic and explaining the blunt force injuries consistent with an attempt to break free. The subject's death seems to have been due to asphyxiation or hypothermia, in the absence of any other party assisting the trapped Jove.

The cause of the de-hibernation is unknown; it is impossible to say whether it was by design and the fault lies with the environmental fail-safes alone, or whether the revival procedures began in error.

Barbican 10: Neurological Review

Specimen Barbican 10 was received by LDRBC researchers in conjunction with *Itsukame-Zainou*. 10,132 thin-slice plates were created by standard gamma-partitioning methods ($g = 1.00$) and subjected to SAFM mapping in order to reconstruct the specimen *in silico*. Precision of mapping allowed an overall median granularity of 10^{-5}.

Kitsoku, M. and Scherezad conducted a multivariate investigation of the Barbican 10 model. This model presents an excellent, high-fidelity model of exocluster neurology, on par with the highest caliber produced by *Directive Enforcement Department* or *Sisters of EVE* labs. This is not due to the humble work of LDRBC lab staff, but the excellent preservation and quality of the original sample itself.

Gross structural review indicates what both LDRBC and *Itsukame-Zainou* staff consider near-baseline neurophysiology, with significant but unobtrusive cybernetics. Midbrain structures feature replacement of the thalamus, leading to intrusions within the hippocampus, hypothalamus, and into the forebrain. Connective mesh binds these intrusions into a ring channel, with an additional ringleader implant embedded against the skull.

Connectivity studies and structural review indicate that the individual, while presented with an unfortunate ending, lived a largely happy life. Dopamine producing systems remain natural and are in good health, though those systems are under regulation by the midbrain ring channel. Stress hormones also show signs of regulation with outcomes similar to Cluster-developed stress regulation implants. It is believed by research staff that this may have been one of the few samples found of a healthy, well-adjusted exocluster individual.

The Barbican 10 model is not currently available for public licensing. However, it is believed that it will soon become available. Interested parties may contact LDRBC Kakakela for details.

1.2.5 Hikanta Tyrannos

The remains of the Hikanta Tyrannos have been retrieved from multiple Vigilant Tyrannos wrecks. The samples were handled following the same procedures used for the corpses obtained from the canopics, with the aim of study being to determine any points of divergence from the characteristics of the Apollo Tyrannos identified in the Y.C. 117 autopsy.

No meaningful differentiation from the Apollo Tyrannos is found, except for minor differences accounted for by the use of a different body for the original modification. Examples of such variation include additional tissue repair, tissue grafting to compensate for any gross surface damage, and marginally higher rates of necrosis.

Universally, the corpses of the Hikanta Tyrannos display intact basic Sleeper implant architecture, and minimal necrosis of what neural tissue remains. The heavy cybernetic augmentation originally identified in the Apollo Tyrannos is replicated in all samples of the Hikanta Tyrannos; this additional augmentation does not conform to the known patterns of Sleeper implant architecture, though it is apparently designed as an added extension thereof, exploiting some of its functionality.

As with the Jove corpses from the canopics, continued retrieval of the Hikanta is recommended. Given the damage inevitable in the recovery of these specimens and the much smaller number of samples, much more data is required to begin a study of the Tyrannos implant architecture in earnest. Understanding the origin and capabilities of this infrastructure may enable the utilisation of similar implants, greater knowledge of Drifter interface systems, or the determination of the actual relationship between the Vigilant Tyrannos and the Sleepers.

1.2.6 Conclusions

Considering the age of the equipment responsible for sustaining them, the majority of Jove specimens were recovered in entirely reasonable condition. Nonetheless, an accumulation of equipment malfunctions both on the small and large scales over the years has degraded many bodies noticeably. It would appear that the Enclaves were designed to have periodic maintenance work performed and any medical needs of its inhabitants seen to; that is, that the interred Jove had some intention of reviving themselves again. Why they failed to, and why said maintenance and medical attention were so absent, remains unclear–the fact that so many bodies have only suffered minor damage is a powerful testament to the Jove grasp of cryonics.

Continued retrieval of Jove specimens is agreed upon by all authors. Such retrieval allows *Zainou Biotech* and other corporate sponsors of the expeditionary group access to an unprecedented wellspring of data on Jove biomedical technologies, genetic engineering and cybernetic augmentation. Further study may allow the replication of Jove synthetic organs and cybernetics, potentially leading to a complete unravelling of the Jove clone architecture with a sufficiently dedicated research team.

As regards the Hikanta Tyrannos, it should be noted that the periodic operations of the *Arataka Research Consortium* make this Drifter line a comparatively stable source of bodies; given the similarities between the Apollo and Artemis Tyrannos and the Hikanta Tyrannos, the continued retrieval of the latter would permit deeper analyses of Drifter biotechnology.

Additionally, given enough samples, statistical methods may allow the identification of standard neural structures; with a sufficient corpus of data, such an analysis would provide a far deeper understanding of the Jove infomorph than is current.

Chapter 2

Canopics

2.1 Introduction

At the coarsest levels of detail, the so-called 'canopics' recovered are no more and no less than cryostasis chambers as might be seen in medical facilities throughout the cluster. Following the trend set by previously-obtained samples of Sleeper technology, however, their capabilities far outstrip anything that could readily be found in New Eden; despite the various system failures observed in a majority of the canopics here studied, they have manifestly been designed to preserve the interred bodies with minimal damage over time-scales ranging from centuries to millennia.

Nonetheless, closer inspection of the devices quickly shows any similarity to technology in common use by either CONCORD signatories or the independent factions of the cluster to be purely superficial. The protuberances from the top-rear of the canopics contain almost entirely computational equipment consistent with Sleeper technology already familiar from excursions both into the wormhole space made accessible by the Seyllin Incident of Y.C. 111 and the 'shattered' systems associated with Caroline's Star (c. Y.C. 116); to allocate such an abundance of computational power to a single canopic would indicate some further use for it beyond the relatively minor demands of monitoring the condition of the occupant's body.

Adding to the unusual nature of the canopics, the level of integration between the occupant and the device is noticeably greater than would be seen in conventional analogues to the canopics. Where one might naïvely expect a slight capacity for data transfer to allow the occupant to be monitored in real-time, the interfaces bear more similarity to those used by the hydrostatic capsule than anything else.

A more detailed analysis of the structure and function of the canopics follows. Given the abundance of canopics with which to work, several were subjected to high-energy

X-ray[1] tomography, supplemented by neutron[2] tomography to facilitate the imaging of lower-density internal components that might otherwise be concealed from incident X-rays. Although damage to the most delicate components and the potential for the induction of hazardous levels of radioactivity in treated canopics, it was judged that the sacrifice of a small subset of the overall population retrieved was worth the insight into their structure provided by a high-resolution digital reconstruction. Public licensing of these reconstructions is being entertained as a possibility, but is not available at the time of publication; it is the wish of the relevant research teams that every effort is made to ensure that these models are as faithful as possible before they are released to the Cluster at large.

Where necessary, thin[3] samples were ablated from canopics to establish the microstructural morphology or chemical composition of materials used. Standard techniques were used in the analysis of the materials' micro- and nanostructure, including atomic force and scanning electron microscopy.

2.2 Design and Construction

2.2.1 Coolant and Enclave Interface

The main chamber of the canopic appears to be intended to house a vitrified Jovian body. While it could likely preserve an inhabitant of any other descent with just as much success, to make full use of the considerable processing power associated with the canopic would require a cybernetic interface of the same kind as extracted from the more intact corpses–something which, thus far, has eluded replication.

The substructure[4] emerging from the centre-rear of the device seems to serve as the main point of its integration with the larger Enclave. As might be expected, much of this section is given over to the distribution of an unknown heat-transfer fluid. With no potential coolant reservoirs apparent in even the most-intact samples, it can be deduced that such was intended to be produced, likely in bulk, elsewhere in the Enclave and the required amounts routed to the individual canopics as necessary.

The thicker cabling attached to this interface is largely hollow, being designed to distribute the coolant delivered to the Enclave interface around the canopic. Analysis of the interior of these cables reveals no residues to indicate the nature of the heat-transfer fluid used in the canopics' operation; while there is nothing to exclude the use of a more sophisticated substance, the use of liquid nitrogen (or similar) is probable. Abundant, easily liquefied and comparatively safe, liquid nitrogen would

[1]Mean energy 1.5 MeV.

[2]Neutrons were produced by a white neutron source in the 100 keV to 600 MeV range.

[3]Thicknesses on the order of microns.

[4]For concision, henceforth the 'Enclave interface'.

be more than capable of reducing the canopic's temperature sufficiently and would readily boil away, explaining the absence of residue within the cabling.

2.2.2 Computing Module

Noteworthy is that these coolant channels run not only from the Enclave interface to the body of the canopic, but directly to the aforementioned computing hardware[5]. While it would be natural to seek to cool this rapidly-heating component as far as possible, it cannot be ignored that almost as much coolant is dedicated to this hardware as to maintaining canopic's internal temperature. It is difficult to ascertain whether this was simply designed as a fail-safe, allowing the Enclave to quickly cool a module subject to uncharacteristically high computational load and growing hot enough to risk the interred body, or whether it was a necessary feature in order to handle modules that reached high temperatures as a matter of course or indeed continuously.

While inconclusive, it can perhaps be deduced that the computing modules tended towards the latter mode of operation. Uncertainty as regards the exact age of the samples complicates any analysis that can be carried out in this area, but wear patterns within the relevant coolant ducts suggest sustained high coolant flows to be reasonably common. Likewise, in many samples a degree of thermal creep can be observed in the innermost static components of the modules; at realistic temperatures, this level of creeping would imply that the central regions of the computational modules were consistently at high temperatures. Of course, if the canopics are allowed to be sufficiently old, such effects could still emerge over long enough time-scales: without a concrete idea of the canopics' ages, neither of these alternatives is intrinsically preferable to the other.

2.2.3 Maintenance Unit

The cylindrical structure at the foot of the canopic seems to have been designed to contain a small supply of materials that would allow the canopic to sustain itself for a short time, or perform urgent small repairs to which the central Enclave would respond too slowly. Many of its contents bear more than a passing similarity to devices already well-known from the salvage of Sleeper drones; a cache of what may be likened to the heuristic self-assemblers used in the drones' defensive and maintenance systems allows the canopic to perform repairs autonomously, although the catastrophic damage seen in numerous samples even before their disconnection from the Enclave would suggest their capacity to be limited to patching the most minor leaks and cracks.

However, the canopic's maintenance abilities are not limited to the mechanical alone. An assortment of relatively basic medical nanites can be found in this structure in

[5] Henceforth the 'computing module'.

the most-intact canopics, though their abilities are minimal: faced with a damaged inhabitant, their only recourse is to excise the affected material and replace it with a biologically-compatible but otherwise inert undifferentiated tissue. Particularly incongruous with the Sleepers' medical expertise, it might be suggested that the canopics were designed with the occupants' exhumation possible in principle, but as something to be avoided if at all feasible: the canopic itself is capable of the simplest triage necessary to minimise any further injury to the occupant, but even when the damage is advanced, there is no evidence of canopics being opened to supply the inhabitants with more sophisticated medical care. Similarly, the structure contains a small quantity of vitrifying fluid, but by no means enough to inter a new subject from the start of the process: the canopic would be capable of restricting the damage caused by a small region of the vitrifying fluid transitioning to a crystalline phase and replacing the lost fluid, but would be unable to meaningfully repair said damage.

Additionally, the structure houses a small capacitor fed by thermoelectric catalysts distributed throughout the canopic and most dense around the computing module: some portion of the heat generated in the canopics' operation is recovered and stored in what amounts to an emergency power supply. As already mentioned, the canopic is entirely dependent on coolant supplied by the Enclave in which it is installed: were the Enclave interface to fail through, for instance, mechanical damage, this power supply would be useless for maintaining the canopic's temperature. Such a power supply would thus appear to be used only for emergency repairs to the canopic until it could be reunited with the central Enclave's systems or, potentially, allowing the computing module to remain active. With the computing module generating heat, the efficiency of the Sleepers' thermoelectric catalysts would allow the emergency power supply to endure much longer than would initially be supposed by continually recapturing this heat–if, of course, with diminishing returns.

2.2.4 Occupant-Canopic Interface

The interface between the interred subject and the canopic itself is one of the startlingly advanced technological aspects of the device, even surpassing (though closely intertwined with) the complexity of the computing module. A complete analysis of the cybernetics involved is far beyond the scope of this section and is to follow in a later report; the most striking features at a cursory analysis are the direct connection to the canopic's computing module and gross similarities between the neural components of the interface and the implantation used in the creation of clone soldiers by CONCORD-signatory and independent organisations alike.

2.2.5 Canopy

Analysis of the devices' canopies has been hampered significantly by the fact that many samples' canopies have been destroyed prior to recovery. Nevertheless, some statements can be made based on studies of those in better condition.

From the point of view of material science alone, the canopy comprises by far the most novel aspect of the canopic. Despite being relatively fragile and showing that the canopics were not designed to be removed from their parent Enclave except under the most controlled conditions, the fullerene-based polymer from which the canopies are constructed offers unrivalled thermal insulation. Approximately 3 mm thick, testing indicates that the polymer would be capable of maintaining the interior of the canopic at temperatures as low as 4 K[6] while the exterior could, in principle, be as warm as room temperature without subjecting the material to excessive stress or allowing a problematic degree of heat transfer–although, practically, it is unlikely that the interior of the Enclave would be even close to room temperature during normal operation, with all of its inhabitants interred.

Remnants of microcircuitry can also be found in the studied examples, although left in poor condition with the canopies' destruction and / or vacuum exposure. Far more familiar than the polymer housing them, they would allow for a simplistic display to be rendered on the canopy. The purpose of such can only be speculated upon: options range from indicating the beginning of the preservation process to a soon-to-be-interred Sleeper, on to summarising the condition of a canopic's inhabitant to an external observer, and further on to simply rendering the canopy opaque.

2.2.6 Aside: Gaseous Remains

A small cloud of gas is present around every canopic recovered. While it was initially thought that there might be some additional insight to be gleaned from its composition, it would appear not. While the exact proportions vary, the basic composition is the same across all clouds sampled: a mixture of vitrifying fluid, coolant, and trace amounts of biological material. The presence of all of these is readily explained by the canopics' indelicate removal from their Enclaves.

2.3 Function

2.3.1 Intended Operation

As already mentioned, there is little reason to suspect that, under optimal circumstances, the canopics would be unable to preserve their occupants with minimal external intervention and negligible tissue deterioration beyond what the occupants' vitrification makes unavoidable over time-scales stretching beyond centuries and into millennia.

[6] The boiling point of liquid helium.

2.3.2 Mechanical Failures

The contrast with the degradation of the recovered cadavers and the mechanical damage to the studied canopics could scarcely be more stark. While certain features common to most samples–the tearing at the exposed ends of cabling leading from the Enclave interface and the vacuum damage to corpses–are readily explained away by the Seekers' rough extraction of the canopics from the larger structure, the hallmarks of mechanical failures in the comparatively recent past are manifold.

The variously poor conditions of the corpses recovered are dealt with elsewhere in this release (cf. 1) and the analysis shall not be here repeated, beyond a mention of the exceptional cases of the subjects forced to undergo repeated cycles of heating and cooling (cf. 1.2.2) and hastily ejected from the canopic altogether (cf. 1.2.4).

More within the purview of this section is the comparable state of the canopics. Very few canopics were recovered entirely intact, with the majority suffering at least moderate damage. While there are a handful of examples of major systems failures, much more common is an accumulation of minor faults left unchecked.

Although it is clear that the designers' intent was the minimise the need for external oversight of the interred occupants, there is every indication the some degree of intervention would be periodically necessary. Less clear is whether said intervention was to come from revived occupants or from some external party, but irrespective of its origin, this attention was not supplied. Indeed, thanks to the large number of samples obtained, the mechanical aspect of this research has proven to be a study in Sod's law: "if something can go wrong, it will".

Unfortunately, the reasons for the Enclaves' neglect can only be speculated upon. If the inhabitants were relying on the assistance of some un-interred party for their Enclaves' upkeep, there is no compelling evidence of their presence, nor of why they should abandon their charges. If they instead intended to periodically exhume themselves (or a small subgroup thereof), then why they refused to even as their infrastructure crumbled is, given current data, a mystery.

2.4 Operational Testing

Medical testing simulacra[7] provided by *X-Sense* were used for the activation of those canopics that could be repaired or were retrieved entirely intact when an occupant was necessary.

In the absence of a supporting Enclave, certain approximations had to be made in order to restore canopics to working order. Where certain canopics had been heavily damaged but retained a well-supplied maintenance unit–perhaps due to losing all

[7] Human clones that, while biologically 'alive', are grown with no capability for consciousness or higher functioning. Only autonomic nervous processes remain.

functionality before all of its supplies could be consumed–said unit was used to replenish the reserves of more intact canopics. While the use of approximations to the same substances produced within the cluster were considered, given the abundance of damaged canopics–and hence undiminished maintenance units–the risks of introducing foreign materials to the more complex functions of the canopic were judged unnecessary.

Similarly, the servers connected to the canopics' data interfaces were designed to provide as little input as practical beyond initiating the basic suspension process. Initial deconstructions of the canopics' firmware illuminated how to manipulate this and other fundamental processes, but higher-order functions are at this time inaccessible. As a result, the same stance was taken here as with the maintenance units.

The issue of coolant supply to repaired canopics was less complex. Thanks to the relative isolation of the coolant systems from the most sophisticated elements of the canopics, it was judged that liquid nitrogen would be a suitable choice of heat-transfer fluid on account of its availability and poor reactivity. It was supplied to the canopics by pumps manufactured by *X-Sense* for use with their range of cryogenic caskets, modified by the material research team to properly connect to the relevant ports of the canopic.

For the sake of concision, what follows is a condensed summary of operational testing. Interested parties should contact Moros, K., employed at the time of publication by *Itsukame-Zainou*, for further exposition.

2.4.1 First Phase Testing: Unmodified Simulacra

In order to develop the fundamental techniques necessary for the canopics' operation, initial testing involved simulacra adhering to standard baseline specifications, lacking cybernetic augmentation and falling within one standard deviation of average major physical characteristics within the cluster. While there were initial concerns that the differences between the physiology of the Jove and the cluster at large could provoke partial or complete failure of preservation, no severe problems were observed. It is suggested that the bodily systems most relevant to cryopreservation–particularly the circulatory system–differ insufficiently between the two populations to induce errors in the process.

Simulacra were introduced to properly-stocked canopics with an adequate coolant supply; on receiving the command to begin suspension, canopics sealed and mechanical manipulators ensured that the simulacra were properly aligned within the chamber.

This permitted automated cannulae access to the femoral arteries and veins, placing the subjects under cardiopulmonary bypass[8] Blood temperature was then reduced to

[8] When the femoral artery was deliberately obstructed by sufficiently durable materials, the suspension process was automatically aborted.

275 K $\pm$ 0.1 % prior to its replacement with the vitrifying fluid. The removed blood exited the canopic via a connection identified to be used for the disposal of excess or waste materials; whether it was intended to be discarded or routed elsewhere in the Enclave for recycling is unknown.

Over the course of the next one to two hours, liquid nitrogen circulation brought the subject's temperature below the glass transition temperature of the vitrifying fluid, at which point the suspension process was considered tentatively successful. The following several days saw further cooling to a final temperature of 77 K.

Revival resembled an accelerated, time-reversed process of the above; in place of the blood ersatz used by the Sleepers, the blood of the interred simulacra was recovered and used in its stead to avoid the potential for rejection. On the successful reheating and replacement of vitrifying fluid, medical nanites attended to the repair of minor damages incurred during suspension, most prominently sealing the femoral access points. It should be noted that once the canopics unsealed, external intervention was required to complete the revival process; the next section provides a tentative reason for this apparent shortcoming.

While there is little unfamiliar to modern cryonics found in this phase of testing, the use of the femoral arteries rather than the more direct carotid or vertebral arteries, or the aortic arch, is perhaps indicative of the intent to simplify the preservation process as much as possible. These more immediate routes would require, respectively, thoracic surgery and spinal transection–much more involved procedures than femoral access.

2.4.2 Second Phase Testing: Implanted Simulacra

With the accumulation of cadavers with intact implant networks but in otherwise poor physical condition, the decision was made to excise the basic spinal interface common to all recovered Jove from such specimens and introduce them to simulacra otherwise following the specification set out in 2.4.1. The implantation procedure took advantage of the similarity to the clone soldier cybernetics alluded to in 2.2.4; while following the lead of the clone soldiers and growing a simulacrum around the interface would have been preferable, constraints on time, resources and understanding of the interface mandated this more direct approach.

With the addition of the manipulators ensuring the simulacra thus treated were aligned both for femoral access and connection to the canopic interface, the physiological elements of the suspension proceeded as already described. However, at the initiation of cardiopulmonary bypass, activity was detected both in the implant infrastructure and the computing module; accompanying this was a series of what have been identified as error messages, although at the time of writing limited comprehension of the canopic firmware prohibits a meaningful interpretation of their contents.

Further, the interface and medical nanites from the canopics themselves acted in conjunction to restructure the brains of the simulacra. Given that they are grown with no capacity for higher functioning, this induced no discernible effects in the subjects, although the introduction of structures identified within the majority of cadavers' brains was noted. It is suggested that such restructuring is an artefact of the canopics' attempts to ensure the neurological integrity of their inhabitants–given the correct interface, simulacra may have been erroneously identified as Jove and their divergent neural structures (or lack thereof) mistakenly interpreted as a flaw to be corrected before interment.

Revival proved successful for this cohort of simulacra; where the testing described in 2.4.1 failed at this final step without immediate resuscitation, the canopic provided a series of impulses to the implant infrastructure that served to bring the process to a successful conclusion.

2.5 Conclusion

It does not take much imagination to see the most immediate application of the technologies here studied; the canopics outstrip the current state-of-the-art for cryonic preservation by most metrics, particularly for long-term storage. Replication of the core technologies involved would allow a range of improvements to current cryochambers, permitting more reliable storage over longer time-scales with a less stressful reanimation for the occupant. The latter would be of particular utility for those suffering from chronic or degenerative illnesses, allowing their suspension until they can safely be transported to a suitable facility for their treatment–or, indeed, until a treatment can be devised.

Similarly, the medical nanites used in the canopics' maintenance units would bear further study. It could well be that the finer details of their function would allow improvements to our current technologies, despite the fact that there is little radically different that stands out in their design.

The possibility that the computing module would catalyse developments in high-performance computing cannot be discounted, but there is a hurdle to overcome here: the computing modules are tightly intertwined with the Enclave interfaces. Without understanding the occupants' implants more thoroughly, it is difficult to meaningfully interpret the computational aspects of the interfaces, and more difficult again to ascertain the precise function and utility of the computing modules.

Appendix A

Acknowlegdements

A full list of pilots that have participated in *Arataka Research Consortium* expeditions to the Drifter Hives up to the date of publication follows.

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Alizabeth
Alizabeth Vea
Alma Begbinnia
Altarica
Amenis Shem
Andtol Funaila
Angelic Tallbrooke
Anoran Seceh
Aramier Ahashion
Ardellia Blumenthal
Aria Jenneth
Arie Solette
Asher Kagen
Avernikas
Ayallah
Azaziel Rei
Bang Chris
Bluey Snuttsoff
Bo Bandit
Brach1
Byrbeglin Alcantar
Cap'n Schmitty
Celestial Ascendant
Chainsaw Plankton
Ciniel
Civ Kado
Cloudfist
Coffeinum
Commander Donut
Counsellor Mallow
cpt yossarian
Crovax Snowden
Cyrillian Voth
Daaaain
Daniels Jelis
Darian en Chasteaux
darkezero
David Trammlers
Debes Sparre
def monk
Demion Samenel
Drak'shala
drake Shiyurida
e wolf
Elinari Rhodan
Erun Talan
Eta Monakh

Eu Phanda
Fasttracks0
Frogsley
Fyodor Ivanov Svoboda
Gathor Musana
GEHERN
General Stargazer
Gina Chen
Gloria Stephson
Gorion Wassenar
Gouzu Kho
H1de0
Haria Haritimado
Ibrahim Tash-Murkon
Idle Hour
isabeau Navaera
Ix Method
Jajuka Cirim
Jaret Victorian
Jean-Luc Cardin
Jekaterine
Jerico Bane
Jim Lopau
Jonathan Banneling
Jonus Falcon
Justine Volontaire
Kaaeliaa
Kailii Severasse
Kaphrah
Katsu Kho
kblocks biggums
Kevin Merkel
Khaprice
Kindzomanjalu Mehrner
King Star
Krzysiek Aivo
Kuro Andedare
Kybernetes Moros
Leto A'treid
Leucippus
li matta
Lizzy Boomsauce
Lord Shrewsberry
Lucas Raholan
Luis Norelius
Magic Park
Magus Askold
Makoto Priano
Maliko Laduko
Mark Fjord
Mark726
Markus Reese
Martin Corwin
Max gengod
Meizu Kho
Melliar
Methea Selenis
Michael Pawlicki
Mobius Chimera
Montgomery Black
mordschoernchen
Morwen Lagann
mrxx7xxmonkey
Mynxee
Naava Edios
Naoko Kanaka
Natsuko Kanami
Nevyn Auscent
Onslaughtor
Onyx Aurelius
Parley Queen
QuickSwipe Collier
Ran Asahi
Rhoxy Runekin
Richard TheLordofDance
Riesuleah Hadah
Rocco Maltea
Ronan McRuffy
Rufis Malone
Saede Riordan
Sahria Bloodstone
salamites
Sar Oggreth
Sarah Elis
Sebastian Thielman
Seradith
Shalmon Aliatus
Shanix Corb
Shun Makoto
Siggy Crendraven
Silvox Lunae
Simarr Cavia

Sirlan Takahi
SJ Macturk
Space Petal
Steffanie Saissore
Subira Hakuli
Super General
Surely Edetson
Suzuha Yamada
Svara Eir
Tedric
tgl3
Thal Duif
TheBigHunt
Tiranius Avetus
Turelus
Turkus Madyrkis
Uriel Paradisi Anteovnuecci
Vezeto Khan Nottingham
Viriel
Xindi Kraid
Zendr Pseudonimous
Zerolaws
Zoe Schereau
Zoras Hansen
Zossek