STAR FLEET
MEDICAL REFERENCE



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This book is gratefully dedicated to Ron, without whose inspiration and constant rescheduling of deadlines it never would have been possible.

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HIPPOCRATIC OATH

I swear by Apollo the physician, by Aesculapius, Hygeia, and Panacea, and take to witness all the gods, all the goddesses, to keep according to my ability and my judgement the following oath:

To consider dear to me as my parents him who taught me this art;

To live in common with him and if necessary to share my goods with him, to look upon his children as my own brothers, to teach them this art if they so desire without fees or written promise;

To impart to my sons and the sons of the master who taught me and the disciples who have enrolled themselves and have agreed to the rules of the profession, but to these alone, the precepts and the instruction.

I will prescribe regimen for the good of my patients according to my ability and my judgement and never to do harm to anyone. To please no one will I prescribe a deadly drug, nor give advice which may cause his death. But I will preserve the purity of my life and my art. I will not cut for stone, even for patients in whom the disease is manifest. I will leave this operation for practitioners (specialists in the art).

In every house where I come I will enter only for the good of my patients, keeping myself from all intentional ill-doing and all seduction, and especially from the pleasures of love with women or with men, be they free or slaves. All that may come to my knowledge in the excercise of my profession or outside my profession or in daily commerce with men, which ought not to be spread abroad, I will keep secret and will never reveal.

If I keep this oath faithfully, may I enjoy my life and practise my art, respected by all men and in all times; but if I swerve from it or violate it, may the reverse be my lot.

HIPPOCRATES, 460-370 B.C.

INTRODUCTION



In modern medical practice and public health care, coordination of effort is the keystone. It is therefore not suprising that outstanding progress has been achieved whenever constructive and consistent effort has been applied to improve the health of a group of beings who have come together for some common purpose - such as exploration, or commerce. In such situations, diseases and other medical problems arise which have to be met with a consistently great degree of sucess, else the explorers never return, or the ships fail to reach their ports.

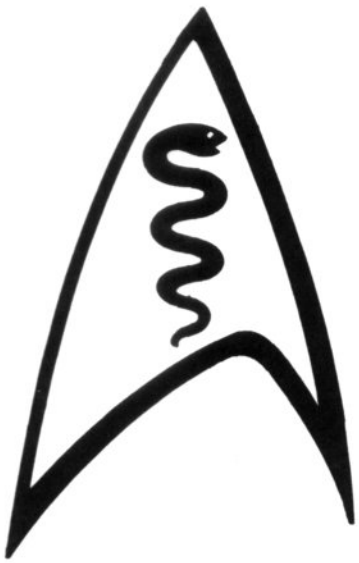
On Earth, as soon as men began to build boats large enough to be decked over and set forth on long voyages, serious problems arose regarding food supply, sanitation, and the care of sick and injured. Records show that medical advisors and physicians often accompanied Phoenician, Norse, Greek and Roman vessels on their voyages of exploration and trade. There is evidence in Homeric writings that medical advisors accompanied the Greek fleets to Troy. The Romans widely employed medical advisors on both vessels of war and those of commerce - Emperor Hadrian encouraged ships to carry a medical officer for each two hundred men. Voyages made by such explorers as Megallan, Columbus and Drake provided for the services of "men skilled in the science of medicine and healing."

The remedies suggested by these practitioners for the ailments they treated were many and diverse, varying from charms and verses to a long list of drugs. This kind of information was either exchanged verbally when the practitioners met ashore, or was written on parchment - such writings comprimised the first medical journals of the maritime industry. Notes selected at random from these records indicate that Arabian physicians advocated the use of mercury to protect against the ravages of lice on their vessels; that Magellan, when he sailed to San Lucar in 1519, took along a large store of vinegar to be used for antiseptic and anti-scorbutic purposes; that an infusion of thyme in a mixture of honey, vinegar and pennyroyal water, and a weak wine containing fine polenta were recommended as cures for seasickness; and that seamen who contracted leprosy were advised to bathe in the blood of sea turtles.

The seventeenth and eighteenth centuries brought little improvement in health conditions and sanitation on board merchant vessels - spoiled food and contaminated water were commonplace. Water was shipped in large tuns of heavy oak, and when it became foul (or "contained too many worms") a bar of glowing iron or a heated 30-pound cannonball was dropped into it. Food was likewise badly handled. Sick seamen were confined to crowded, darkened quarters; lavatory accomodations were non-existent, medicines were inadequate and improperly administered, and sick men recovered only if they "by the grace of God had a strong constitution."

In an attempt to alleviate such conditions, many owners of commercial ships intensified their efforts to have medical advisors travel on board their vessels. While these advisors did not have the advantages of modern facilities and scientific knowledge, they found practical answers to many problems; and they established once and for all the necessity of someone with special training to administer efficient medical services at sea, crystallizing a tradition which is as valid today as it was then.

One of the first Terran books on naval medical practice appeared in 1617. It was called "The Surgeon's Mate," and was written by John Woodall, a surgeon of the British East India Company. It described the most frequent diseases encountered at sea, methods of amputation, care of surgical equipment, and other subjects concerning medical responsibilities aboard merchant vessels.



HISTORICAL

It was through developments such as these that the ship's medicine chest first came into being. Early reference to it is found in a book published in England in 1686, describing the contents and uses of a "Military Chest, Furnished Either for Sea or Land." A characteristic of early medicine chests was that they identified medical preparations by numbers or letters rather than by name - which may have been prompted in part by the apothecary, who naturally wished to supply all the needed replacement medicines to the ship's master himself. This practise was responsible for the classic yarn about the master who read in the book of instructions that the treatment for one of his ill crewmembers was medicine #11; upon inspecting the medicine chest, the master found that bottle #11 was empty. He thereupon, in good faith (or so it is related), gave the unfortunate patient one tablet from bottle #7 and one from bottle #4. What bottles #4 and #7 contained, or what effect the combination had upon the patient, is appropriately enough not a recorded part of the story.

What might be called the beginning of the modern era in ships' medicine is an act of the United States Congress in 1872, reiterating the need for a complete ship's medicine chest. In 1881, the United States Marine Hospital Service published "The Handbook for the Ship's Medicine Chest."

Since those first early steps toward modern medical efficiency, and the initial publication of "The Starship's Medicine Chest and First Aid in Space" in 2105, continuous and intensive effort has been made to improve the health of Federation merchants and Star Fleet crewmen alike. While it will never be practical to carry a practising physician on board every cargo ship, a satisfactory emergency link to trained medical personnel can be made and maintained via subspace radio.

PREHISTORIC -3000 B.C.

Magic and superstition predate medicine. Illness believed to be caused by evil spirits. Human life expectancy is 31 years.

Ancients on Fabrina discover a cure for xenopolycythemia.

Intelligent life on Beta Portalan is destroyed by the flying parasites.

The Kalandan Empire is destroyed by a disease organism.

ANCIENT 3000 B.C.-476 A.D.

Higher standard of living, sanitation systems. True beginnings of medicine. Scientific method emerges as an alternative to magic and religion.

EGYPTIAN ERA, 300-500 B.C. Advances in treatment of disease. Medicine becomes formalized to protect medical secrets.

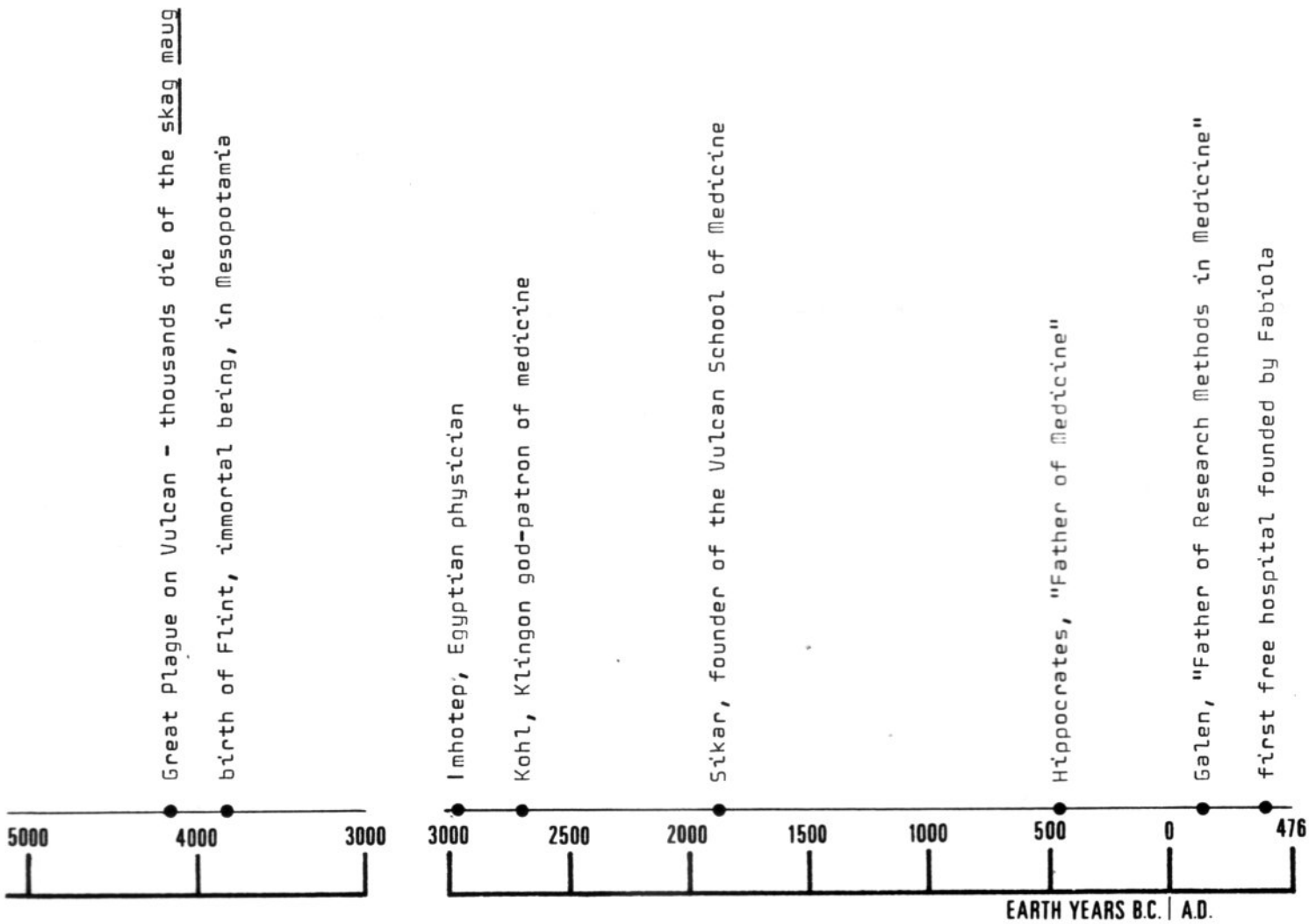
BABYLONIAN ERA, c. 800 B.C. Emergence of specialists - diseases treated by medicine or charms.

CLASSICAL GREECE, c. 400 B.C. Hippocratic Oath, epitome of ideal physician. Caduceus as symbol of medical profession.

HELLENISTIC ERA, c. 300 B.C. First great medical school founded in Alexandria.

ROMAN ERA, 100 B.C.-476 A.D. Many surgical instruments designed. First large, well-planned hospitals erected. Human life expectancy is 36 years.

The surgo-op procedure is developed by the Aquans.



MIDDLE AGES 476-1500 A.D.

DARK AGES. Care of sick becomes a military/religious duty. Arabs made advances in hygiene, chemistry and pharmacy. Human life expectancy in England is 49 years.

AGE OF REASON on Vulcan, many new drugs and treatments developed.

RENAISSANCE 1450-1600

Transitional movement toward the renewal of the arts and sciences. Human anatomy is studied, genesis of artificial limbs.

AGE OF DISCOVERY, 1450-1550. New World explored.

REFORMATION, 1500-1600. Dark Ages of Nursing.

ENLIGHTENMENT 1600-1800

Impetus toward learning in Europe, many scientific and medical discoveries. Human life expectancy in Poland is 51 years, in urban Philadelphia 45 years.

Great Diaspora on Andor, hive medicine diversifies and becomes planet-wide.

INDUSTRIALIZATION 1800-1942

Fields of electronics and radioactives increasingly important. Increasing emphasis on public health and disease prevention. Great technological advancement in diagnosis and treatment of disease. Developments in fields of anesthetics and surgery. World War I (1914-18), 6 million killed. World War II (1939-45), 11 million killed. Human life expectancy (1900) is 60 years.

Great Blight, Saurian virus spreads throughout the known worlds of the galaxy.

Medical progress in the Federation worlds temporarily halted by the Vegan Tyranny.

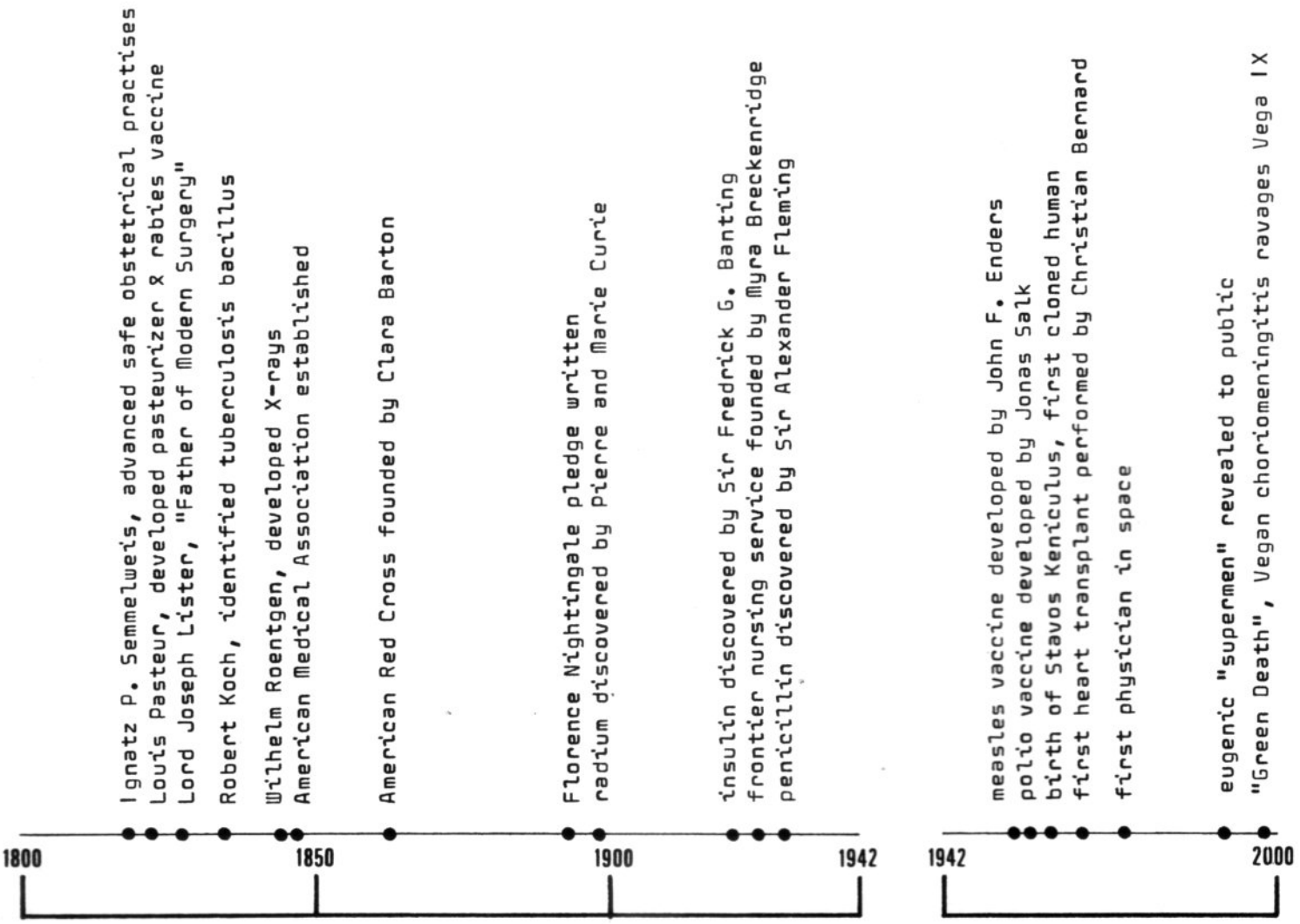
Immunity to disease is developed by Kohms on Omega IV.

ATOMIC AGE 1942-2000

Dramatic discoveries in chemistry, pharmacology, and medical technology. Relationship of medicine to space exploration. Medical sciences centered on eugenic tailoring and life prolongation. Eugenics Wars (1992-96), 37 million killed.

SECOND DARK AGES, 1997-2000.

Life prolongation experiment kills entire adult population on Earth parallel.



SECOND RENAISSANCE
2000-2050

Regrowth of medical sciences. Emphasis on controlling population, improving the quality of life. Col. Green's War (2035), last eugenics scientists.

OUTREACH (Vulcan Years 8650-8700), Vulcan scientists bring medical aid to many primitive societies.

Staphylococcus strain kills most of the population of Phylos.

EXPANSION
2050-

Earth-Vulcan cultural exchange (beginning 2101) produces many new treatments and techniques.

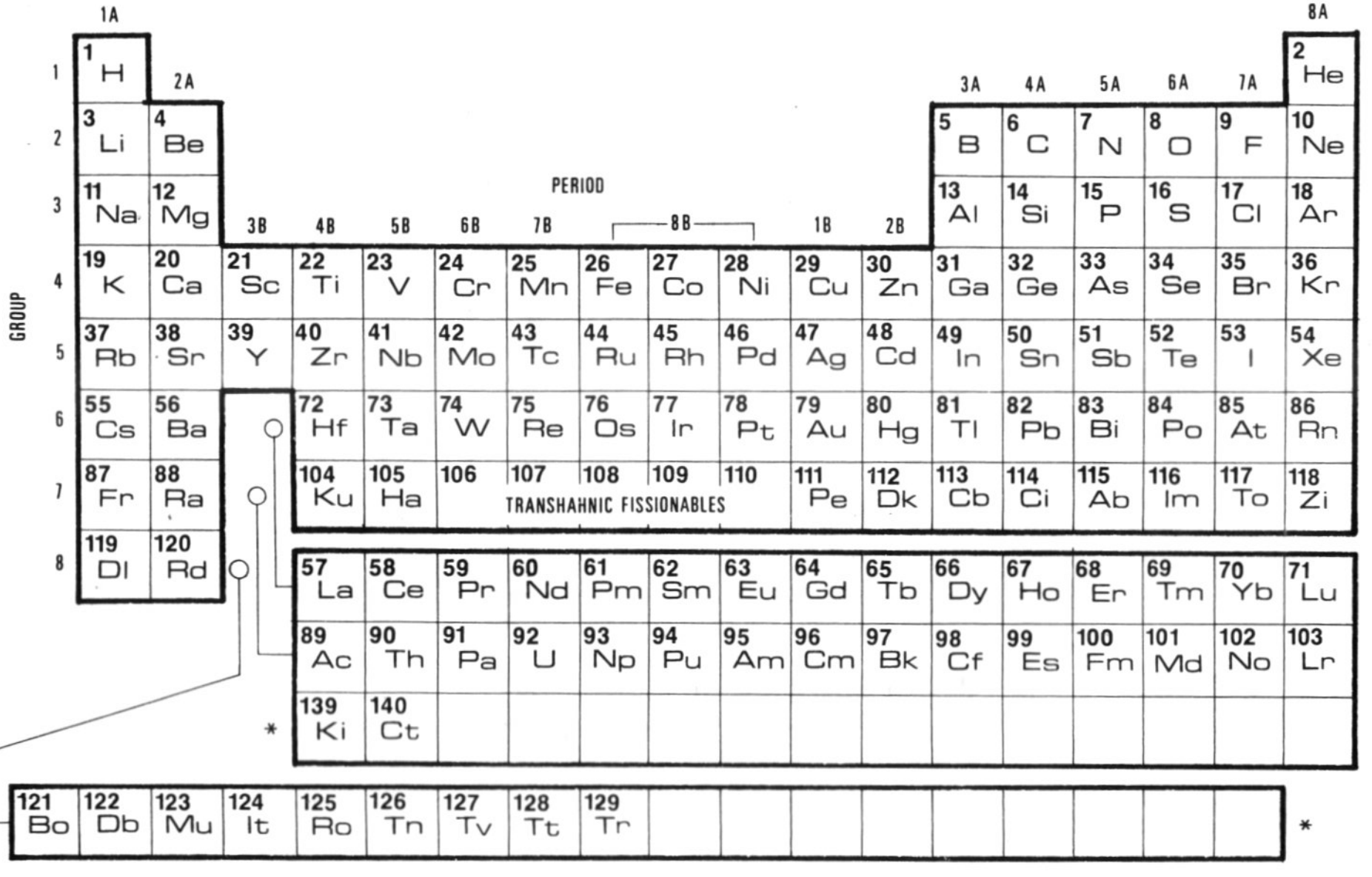
FEDERATION ERA, 2125- . Formation of the United Federation of Planets, many medical aid programs initiated.



MEDICAL

PERIODIC TABLE OF THE ELEMENTS

FIFTH INTERSTELLAR GEOPHYSICAL CONFERENCE STANDARD



GM 7701.25

NAME	SYMBOL	*ATOMIC WEIGHT	ATOMIC NUMBER	PLACE OF DISCOVERY	DATE
Actinium	Ac	(227)	89	France - Terra	1899
Algobarium	Ab	(305)	115	Martian Colony 3	2015
Aluminum	Al	26.9815	13	Denmark - Terra	1825
Americum	Am	(243)	95	United States - Terra	1945
Antimony	Sb	121.75	51	known to ancients on Terra	
Argon	Ar	39.948	18	Scotland - Terra	1894
Arsenic	As	74.9216	33	known to ancients on Terra	
Astatine	At	(210)	85	United States - Terra	1940
Barium	Ba	137.34	56	England - Terra	1808
Berkelium	Bk	(247)	97	United States - Terra	1949
Beryllium	Be	9.0122	4	Germany; France - Terra	1828
Bismuth	Bi	208.980	83	known to ancients on Terra	
Boridium	Bo	(317)	121	known to ancients on Rigel IV	
Boron	B	10.811	5	England; France - Terra	1808
Bromine	Br	79.909	35	France - Terra	1826
Cadmium	Cd	112.40	48	Germany - Terra	1817
Calcium	Ca	40.08	20	England - Terra	1808
Californium	Cf	(251)	98	United States - Terra	1950
Carbon	C	12.01115	6	known to ancients on Terra	
Celebium	Cb	(299)	113	Mercury	2023
Cerium	Ce	140.12	58	Sweden; Germany - Terra	1803
Cesium	Cs	132.905	55	Germany - Terra	1860
Chlorine	Cl	35.453	17	Sweden - Terra	1774
Chromium	Cr	51.996	24	France - Terra	1797
Cobalt	Co	58.9332	27	Sweden - Terra	1737
Colladium	Ci	(302)	114	United States - Terra	1977
Copper	Cu	63.54	29	known to ancients on Terra	
Corbomite	Ct	(361)	140	Star Base 27	2262
Curium	Cm	(247)	96	United States - Terra	1944
Diburnium	Db	(319)	122	known to ancients on Vulcan	
Dikironium	Dk	(300)	112	Vulcan	8810**
Dilithium	Dl	(315)	119	Jupiter V	2049
Dysprosium	Dy	162.50	66	France - Terra	1886
Einsteinium	Es	(254)	99	United States - Terra	1952
Element 106	—	(263)	106	Russia - Terra	1974
Element 107	—	(280)	107	Russia - Terra	1978
Element 108	—	(288)	108	Germany - Terra	1979
Element 109	—	(296)	109	India - Terra	1982
Element 110	—	(296)	110	India - Terra	1983
Erbium	Er	167.26	68	Sweden - Terra	1843
Europium	Eu	151.96	63	France - Terra	1901
Fermium	Fm	(257)	100	United States - Terra	1953
Flourine	F	18.9984	9	France - Terra	1886
Francium	Fr	(223)	87	France - Terra	1939
Gadolinium	Gd	157.25	64	Switzerland - Terra	1880
Gallium	Ga	69.72	31	France - Terra	1875
Germanium	Ge	72.59	32	Germany - Terra	1886
Gold	Au	196.967	79	known to ancients on Terra	
Hafnium	Hf	178.49	72	Denmark - Terra	1923
Hahnium	Ha	(260)	105	United States - Terra	1970
Helium	He	4.0026	2	Scotland; Sweden - Terra	1895
Holmium	Ho	164.930	67	Switzerland - Terra	1878
Hydrogen	H	1.00797	1	England - Terra	1766
Indium	In	114.82	49	Germany - Terra	1863
Indurite	It	(322)	124	Skorr	?
Iodine	I	126.9044	53	France - Terra	1811

NAME	SYMBOL	*ATOMIC WEIGHT	ATOMIC NUMBER	PLACE OF DISCOVERY	DATE
Iridium	Ir	192.2	77	England; France - Terra	1804
Irillium	Im	(305)	116	Asteroid belt	2029?
Iron	Fe	55.847	26	known to ancients on Terra	
Kironide	Ki	(348)	139	Vulcan	8756**
Krypton	Kr	83.80	36	Great Britain - Terra	1898
Kurchatovium	Ku	(260)	104	Russia - Terra	1964
Lanthanum	La	138.91	57	Sweden - Terra	1839
Lawrencium	Lr	(256)	103	United States - Terra	1961
Lead	Pb	207.19	82	known to ancients on Terra	
Lithium	Li	6.939	3	Sweden - Terra	1817
Lutetium	Lu	174.97	71	France - Terra	1907
Magnesium	Mg	24.312	12	England - Terra	1808
Manganese	Mn	54.9380	25	Sweden - Terra	1774
Mercury	Hg	200.59	80	known to ancients on Terra	
Molybdenum	Mo	95.94	42	Sweden - Terra	1778
Murinite	Mu	(320)	123	known to ancients on Rigel IV	
Neodymium	Nd	144.24	60	Austria - Terra	1885
Neon	Ne	20.183	10	England - Terra	1898
Neptunium	Np	(237)	93	United States - Terra	1940
Nickel	Ni	58.71	28	Sweden - Terra	1751
Niobium	Nb	92.906	41	England - Terra	1801
Nitrogen	N	14.0067	7	Scotland - Terra	1772
Nobelium	No	(255)	102	Sweden - Terra	1957
Osmium	Os	190.2	76	England - Terra	1804
Oxygen	O	15.9994	8	England; Sweden - Terra	1774
Palladium	Pd	106.4	46	England - Terra	1803
Pergium	Pe	(292)	111	Mercury	2023
Phosphorus	P	30.9738	15	Germany - Terra	1669
Platinum	Pt	195.09	78	Italy - Terra	1557
Plutonium	Pu	(244)	94	United States - Terra	1940
Polonium	Po	(210)	84	France - Terra	1898
Potassium	K	39.102	19	England - Terra	1807
Praseodymium	Pr	140.907	59	Austria - Terra	1885
Promethium	Pm	(145)	61	United States - Terra	1945
Protactinium	Pa	(231)	91	Germany; England - Terra	1917
Radium	Ra	(226)	88	France - Terra	1898
Radon	Rn	(222)	86	Germany - Terra	1900
Rhenium	Re	186.2	75	Germany - Terra	1925
Rhodium	Rh	102.905	45	England - Terra	1803
Rodinium	Ro	(323)	125	Vega IX	?
Rubidium	Rb	85.47	37	Germany - Terra	1861
Rubindium	Rd	(314)	120	Asteroid belt	2038
Ruthenium	Ru	101.07	44	Russia - Terra	1844
Samarium	Sm	150.35	62	France - Terra	1879
Scandium	Sc	44.956	21	Sweden - Terra	1879
Selenium	Se	78.96	34	Sweden - Terra	1817
Silicon	Si	28.086	14	Sweden - Terra	1823
Silver	Ag	107.870	47	known to ancients on Terra	
Sodium	Na	22.9898	11	England - Terra	1807
Strontium	Sr	87.62	38	Scotland - Terra	1790
Sulfur	S	32.064	16	known to ancients on Terra	
Tantalum	Ta	180.948	73	Sweden - Terra	1802
Technetium	Tc	(97)	43	Italy - Terra	1937
Tellurium	Te	127.60	52	Romania - Terra	1782
Terbium	Tb	158.924	65	Sweden - Terra	1843
Thallium	Tl	204.37	81	England - Terra	1861

NAME	SYMBOL	*ATOMIC WEIGHT	ATOMIC NUMBER	PLACE OF DISCOVERY	NAME
Thorium	Th	232.038	90	Sweden	1828
Thulium	Tm	168.934	69	Sweden	1879
Tin	Sn	118.69	50	known to ancients on Terra	
Titanium	Ti	47.90	22	England	1791
Topaline	To	(306)	117	Ganymede	2021
Tricobalt	Tr	(332)	129	Janus VI	2192
Tritanium	Tn	(323)	125	Argus X	2261
Trititanium	Tt	(328)	128	Motherlode	2184
Trivium	Tv	(328)	127	Denevan asteroid belt	2153
Tungsten	W	183.85	74	Spain	1783
Uranium	U	238.03	92	Germany	1789
Vanadium	V	50.942	23	Sweden	1830
Xenon	Xe	131.30	54	England	1898
Ytterbium	Yb	173.04	70	Switzerland	1878
Yttrium	Y	88.905	39	Finland	1794
Zienite	Zi	(318)	118	known to ancients on Ardana	
Zinc	Zn	65.37	30	Germany	1746
Zirconium	Zr	91.22	40	Germany	1789

*A number in parentheses indicates the mass number of the most stable isotope

All discovery dates are given in old Earth calendar years, except:
(**) Vulcan years post-Surak

RADIATION



Radiation, the emission of waves or particles of radiant energy, is a part of our natural background. It is evident in our radio waves, ultraviolet light, infrared waves and X-rays. When the wave or particle has the property of spontaneously emitting radiant energy we say it is radioactive. Radiation and radioactive substances can be used therapeutically for diagnosis, therapy and research - however, they can also maim and murder. Because of nuclear reactors, cyclotrons, linear accelerators, alternating gradient synchrotrons, cobalt and cesium bombs, production of fissionable material and nuclear propulsion systems and weaponry, the chances for radiation mishaps has greatly increased over the last three centuries. Ionizing radiation can directly or indirectly produce ionization in tissues. Interaction with protoplasmic substances follows, creating biochemical lesions which in turn initiate observable histologic changes and clinical symptoms that vary with the dose of radiation (200-600 rads is lethal to humans, greater than 600 fatal), time after exposure, and distribution of the dose. Effects may become demonstrable within hours or days or may not become manifest for years as a result of storage in the DNA proliferative or non-proliferative cells.

ALPHA RAYS

Alpha rays (as opposed to gamma rays, which are part of the electromagnetic spectrum) are streams of alpha particles: positively-charged helium nuclei (He^{2+} ions), consisting of two protons and two neutrons behaving as a single particle. Alpha particles are emitted by the unstable nuclei of radioactive elements, and although they are given off with high energy levels they rapidly lose energy and can thus be easily stopped. They present no real danger to life forms, with the exception of some lower non-vertebrates that have not built up the necessary resistance: the positively-charged alpha particles can damage cell membranes in these organisms and cause bodily infection. Some semi-intelligent invertebrates in the Pyris and Rigel star systems are also affected by alpha radiation.

BETA RAYS

Beta rays consist of electrons (e^-, also called beta particles) formed by the disintegration of certain radioactive elements. Because of their high energy levels and the fact that they travel at almost the speed of light, they can cause damage to even the largest of living things. The size of the life form can, however, be of great importance in determining the harmful effects of this type of powerful radiation: in humans and other comparatively small life forms, beta rays can cause primary gonad cell disorder that can result in secondary generation mutations. In the large anthropoids of Taurus II, however, beta radiation may only cause damage of the primary and secondary skin cells.

GAMMA RAYS

Gamma rays are waves, or photons, or electromagnetic energy with wavelength between 10^{-10} and 10^{-15} meters (0.1 and 0.000001 Angstroms), formed when a nucleus after radioactive decay is in a high energy state (as when the emission of an alpha or beta particle leaves the nucleus with a higher energy state than that of its most stable form - to rid itself of this excess energy it emits photons in the form of gamma rays). Gamma rays have no electrical charge, and transmutation does not take place. Traveling at the speed of light, a gamma ray loses energy by colliding with an atom of the medium through which it is passing: the level of energy lost depends on the medium's ability to absorb gamma radiation. When gamma rays pass

through a living body, they ionize tissue and radioactively charge the cells to result in radiation poisoning. If excessive radiation poisoning occurs, it can proove harmful to the cells. Although extremely small amounts of gamma rays constantly bombard the surface of most Class M planets, large doses of gamma radiation are dangerous.

Gamma rays are used by industry to preserve foods, vulcanize rubber, and toughen certain insulations for spacecrafts. Medical uses of gamma rays include bone scans, treatment of cancerous rare tumors, detection of irregularities in certain organs of the body, and radioactive bone therapy.

DELTA RAYS

Delta particles are formed when a heavy cosmic particle, such as an alpha particle, strikes matter causing it to give off slow-moving electrons and other secondary particles. These rays can be detected by unexposed chemically-treated celluloid (film): they appear as thin wavy tracks branching off from the tracks made by alpha rays.

Exposure to delta rays can cause severe radiation poisoning and has a delayed effect dermatologically be causing skin atrophy and lesions of the squamous cells of the epidermis forming nodule-like eruptions of the skin. Eventual disintegration of underlying soft tissue increases the scarring and disfiguration. The musculature is also affected, resulting in atrophy, calcification, and a painful myelopathy. Degeneration of musculature from these effects leads to irreversible crippling and loss of moter innervation.

It is essential that the person be removed as quickly as possible from the radiation source. This is true not only for delta irradiation but other forms of radiation as well. Parenteral use of chelating agents may be of value in increasing the excretion rate of the radiation. However, if the results of the contamination are severe enough, the effects are usually irreversable.

Delta rays are a byproduct of matter-antimatter propulsion systems, and due to their crippling effect the engines of a Starship must be heavily shielded. Rupture of a ship's baffle plates can cause disfigurement and death in a matter of minutes.

EPSILON RAYS

Primary epsilon rays are created when delta rays bounce off an ionizing cloud at the edge of a planet's atmosphere (such as an ozone layer) in such a manner that the eletromagnetic radiation produced has a helical rather than wave nature. First detected when the baffle plate was torn off a Woden class freighter during a passage through a comet's radioactive tail in 2083 (old calendar), epsilon rays were later found to be natural to a satellite orbiting the star Cepheus in the Arachna region - the volcanic crystalline formations native to this planet had the effect of plane-polarizing primary epsilon waves with the resulting emission of spiroid (single spiral) epsilon waves. The unusual effects of these rays is that they cause a compression of the DNA helix (apparently reducing intermolecular repulsive forces), and a shrinking of living tissue and other organic substances which can only be reversed by a matter-rearranging process such as the transporter. The complete shrinkage takes about eight years of constant epsilon ray bombardment (half-size time depends somewhat on the ray intensity) at which point the characteristic of immensely small bodies (about 0.16 cm tall for hymans) becomes a genetic trait.

IOTA RAYS

The collision of an alpha particle and a high-energy photon (gamma ray) can produce an iota particle showing characteristics of both a positively-charged and a negatively-charged particle. The structure of an iota particle is believed to be a helium nucleus with an antiproton replacing a proton, but the mechanism for its

formation and the explanation for its stability are unknown. Observed naturally in in the vicinity of some white dwarf stars, the flunctuating charge of iota rays is unpredictable and hence they are of no practical medical use. The only observed effect of iota radiation is a temporary radiation sickness, although iota radiation is apparently not cumulative in its harmful effects.

KAPPA RAYS

Very little is known of the origin or standard properties of kappa radiation, aside from the fact that kappa particles appear to be a subatomic particle unknown to Federation science (all attempts to produce them artificially have been unsuccessful). Kappa radiation seems to affect some naturally-sensitive organisms such as Centaurean empath-worms, and is otherwise extremely difficult to detect. Minute concentrations of kappa radiation are found on planets where the inhabitants have evolved into primary mental energy - examples are Organia, Triskelion, Thasus and Medeusa. It has been suggested by Dr. Miranda Jones that kappa radiation is the slower-than-light product of the disintegration of tachyons (long postulated as the elementary particles of thought).

COSMIC RAYS

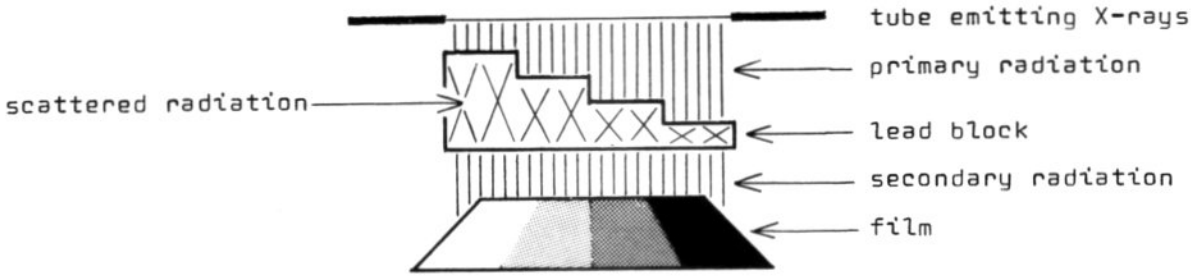
Cosmic rays (streams of charged particles - protons, alpha particles, and a few heavier nuclei) originate in outer space and can be intense enough to penetrate thousands of feet of rock. Cosmic rays present in a planet's atmosphere are secondary cosmic rays - the primary rays bombard the atmosphere from outer space and crash into the nuclei of atoms present in the upper atmosphere, producing mesons and a variety of secondary nuclear particles. These in turn produce still more secondary cosmic particles. The intensity of cosmic rays can therefore be disproportionately high to the number of particles striking a planet. An average human can tolerate a radiation dose of about 0.01 roentgen per day without damage to his body (for Vulcans and Tellerites the maximum dosage is about 0.04 roentgen per day, for Andorians somewhat less than that of humans) - at extremely high altitudes or outside a planet's atmosphere, the dosage can exceed the toleration point and protective armor is necessary. The extremely heavy nuclei of primary cosmic radiation, although very low in intensity, may produce serious biological effects: 10% of mutations in secondary generation life forms are caused by radiation, of which cosmic radiation causes 25%.

X-RAYS

X-rays (like gamma rays) are non-particulate electromagnetic radiation with wavelength between 10^{-7} and 10^{-10} meters (100 and 0.1 Angstroms), created when an electric current of high voltage detatches electrons from the filament of an electronic tube and hurls them with great force against a tungsten plate. X-rays are able to penetrate human flesh and metals, and affect the tissues of living things. When absorbed, they can destroy or burn living cells. Certain types of X-rays can affect certain parts of the body: one type can destroy gonads (sex organs); other types can affect the genes in the germ cells of living things, and can result in mutations.

X-rays can be used to project an image of the denser parts of the body, such as the bone - by adding contrasts, organs can be made "radiopaque", which makes them denser and therefore visible on film. The process by which a part of the body can be X-rayed is as follows: the primary ray (the radiation emitted by the X-ray tube) enters the body and is scattered. Most of the scattered radiation is in the areas of the body of lowest density - if a tungsten plate is placed behind the body, the secondary radiation (scattered radiation leaving the body) can be recorded. Strong secondary radiation appears as a dark area, weak secondary radiation

as a light area. Bone or radiopaque organs also register on the plate as light areas. The following diagram demonstrates how dense body areas register as lighter areas on film:



BERTHOLD RAYS

Berthold rays, first detected near Omicron Ceti and later produced artificially by the Earth scientist Ernst Berthold, are a rare and little-understood emission of certain variable orange stars of spectral class K. Berthold rays have an unknown particle nature (strong in intensity but approximately equal to primary X-rays in energy levels), and cause disintegration of body tissue of most animal life forms within 72 hours. Berthold particles are easily absorbed through inhalation, accounting for its rapid effects.

After bombardment of Berthold rays the victim shows a hypothermic reaction. Several hours later, venules and capillaries lose normal tone, creating a change in hydrostatic pressure. As a result there is a flushed, florid look to the victim in contrast to his complaints of chilliness and low body temperature. Forty-eight hours later putrefecation begins with autolysis (i.e. self-digestion of the cells by cellular enzymes), and changes in osmotic relationships. Tissue disintegration at this point becomes extremely rapid, and this period is often referred to as the agonal period as the toxins create pain, delirium, and finally coma. This period is also referred to as the time of necrobiosis, a contradictory term meaning literally dead body and life, and characterizes the process of death while vital signs continue to function. Microscopic examination of the cell nucleus at this time will show a small, fragmented dark blue mass.

Sporing plant life, notably that of Omicron Ceti III, thrives on this type of radiation and through sporulation can produce immunity in higher life forms without natural protection from the rays. This type of symbiotic relationship may lead to serious and unpredictable side effects, but the action of such spores under Berthold irradiation provides the only known cure for many chronic diseases.

HAKEL RADIATION

Hakel radiation surrounds the twelve planets of the Rigel star system in a single belt extending out to approximately 80 astronomical units (12 billion km), and is most intense in a region 800 to 3000 km from the surface of the Rigel planets depending on the planet's size and mass (comparable to the Van Allen belt on Earth and the Selak belt on Vulcan). Discovered by the female scientist Hakel of Rigel II in the Second Rigellian Epoch, this radiation consists of subatomic particles trapped in the star's powerful magnetic field. Hakel radiation has no practical use in medicine, but is vital to the inhabitants of Rigel in that it shields them from the dense rays of the Rigellian sun (Rigel is blue-white giant 40,000 times brighter than Sol). Exposure to Hakel (classified by Star Fleet with "Dangers in Space") results in immediate radiation poisoning, explaining why space travel in the Rigellian system was developed so late; but the rate of increase in ra-

diation poisoning diminishes with the passage of time.

SETON RADIATION

Seton radiation is a radioactive condition in the upper atmosphere that lessens the intensity of ultraviolet rays from the Vulcan sun. The Vulcan atmosphere is comparatively thin, so in spite of the relative dimness of Vulcan's sun, 40 Eridani A (an orange KO star) and the Vulcan's increased resistance to radioactivity, the Seton ionization layer - similar in nature to Earth's more intense ionosphere, screening out harmful secondary cosmic rays as well as ultraviolet from the sun - serves a vital purpose in reducing incidents of skag cree (a form of skin cancer) and cell mutation among the Vulcan people. Seton radiation was discovered by Seton of Vulcan in Vulcan Year 5459.

VAN ALLEN RADIATION

Van Allen radiation exists in two belts encircling the Earth's atmosphere, consisting of electrons and protons trapped in the Earth's magnetic field. These belts range from 400 to 6500 km (actually the high-intensity zone of a larger band of radiation, the magnetosphere, extending to about 64,000 km) and form a barrier against "solar wind" - charged particles from the sun, which are trapped by the belts. Physicist J. A. Van Allen discovered the belts in 1958 (old calendar).

All Class M worlds surveyed to date have a similar magnetosphere; Earth's is typical of known galactic worlds.

HYPERAGING

Hyperaging is the radiant energy wave named for its effect on the aging process. Recent work with this form of radiation has shown its effect to be on the somatic cells of the body causing irreversable mutations, which in turn curtail cellular function leading to senescence as the mutations accumulate. Cells observed in anaphase show these abnormalities as either bridges or fragments. Cellular function decreases while mutations increase because of the radiation wave's effect on the DNA molecule whose synthesis slows while the molecule becomes polypoid. Fortunately, adrenalin and the synthetic drug hyronalin allow for chromosome healing. As the group of cells undergoes cell division, hyronalin allows the cells containing mutations to be eliminated - keeping the cell line pure, and preventing mutation buildup and aging from continuing.

Hyperaging, the natural result of a comet's tail passing through the atmospheric layer of a Class G planet, was first observed on Gamma Hydra IV.

RADIOACTIVE ELEMENTS

RADIUM - Radium is a silvery-white metal (atomic number 88, atomic weight of the most stable isotope 226), unstable with respect to radioactive decay. Gamma rays given off by radium have proven extremely useful in treating certain forms of cancer, skin diseases, and tumors (radium has recently been proven effective in treating delta radiation poisoning over long periods of time; however, if the patient is past middle-age, treatment with radium may affect the damaged cells amd increase the radiation sickness). Radium can cause severe burns, much like those from X-rays - although it may take several days before the effects become visible after a life form is exposed to radium. Radium taken into the body becomes deposited in the bone marrow - this infected bone is said to have radium poisoning.

URANIUM - Uranium is a silvery metal (atomic number 92, three naturally-occuring isotopes with atomic weights of 238, 235 & 234) also spontaneously decaying by radioactive emission. Like other heavy element, uranium and its compounds are poisonous. Large deposits of this element have been found on geologically recent

worlds like Janus VI; with a half-life of 4.5 billion years, roughly half the uranium on older planets such as Earth have decayed into lead. Biological used of uranium include radiation research, and medical treatment for progressing diseases.

CELEBIUM - Celebium, a trans-hahnic radioactive element (atomic number 113, atomic weight 299) emits a unique type of particle radiation that is fatal to humans. Celebium affects the hemopoietic system through bone marrow degeneration and lymph node atrophy. This atrophy is the result of two distinct processes: killing of radiosensitive cells and inhibition of new cell production. Resultant anemia, susceptibility to infection, and hemorrhagic areas of the skin increase mortality rate. Concommitant to these symptoms are cerebral and gastrointestinal clinical syndromes.

The cerebral aspect of celebium, produced by a high dose of the radiation, is always fatal. Nausea and vomiting is observed, leading to listlessness and drowsiness and finally to a more generalized prostration characterized by tremors, convulsions, and death within a few hours.

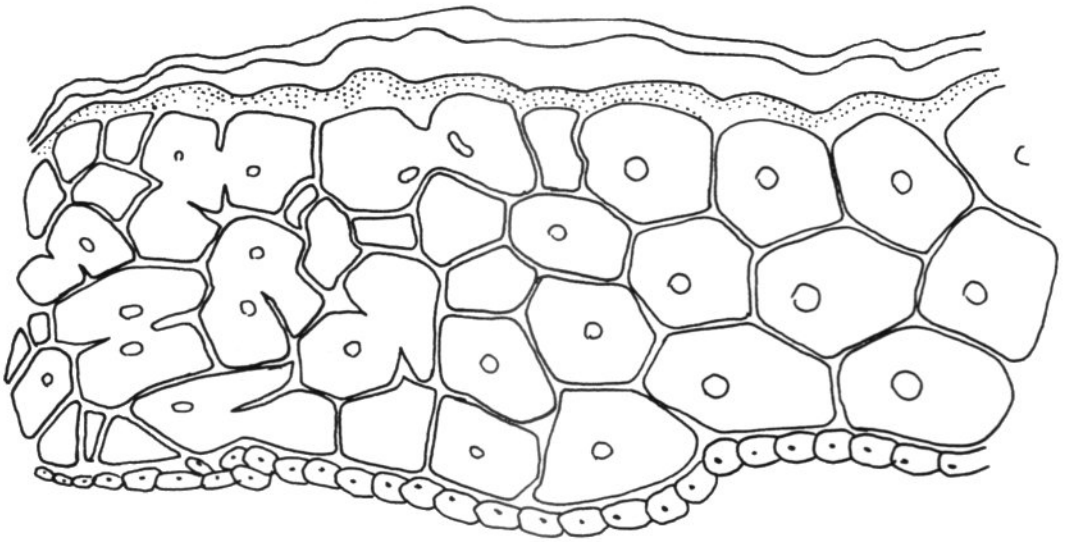
Smaller celebium doses create intractable nausea, vomiting, and diarrhea leading to severe dehydration, diminished plasma volume, vascular collapse, and death.

Resistance to celebium radiation can be increased if sulfhydryl compunds are given prior to irradiation. This, however, is not always feasable. Sedation, anti-emetics, and treatment of acid-base imbalances in addition to antibiotics and blood replacement therapy are essential in attempting to prolong life and reduce the effects of this form of radiation poisoning.

Celebium is found in great quantities on Camus II, where it is evidently the decay product of an ancient thermonuclear war.

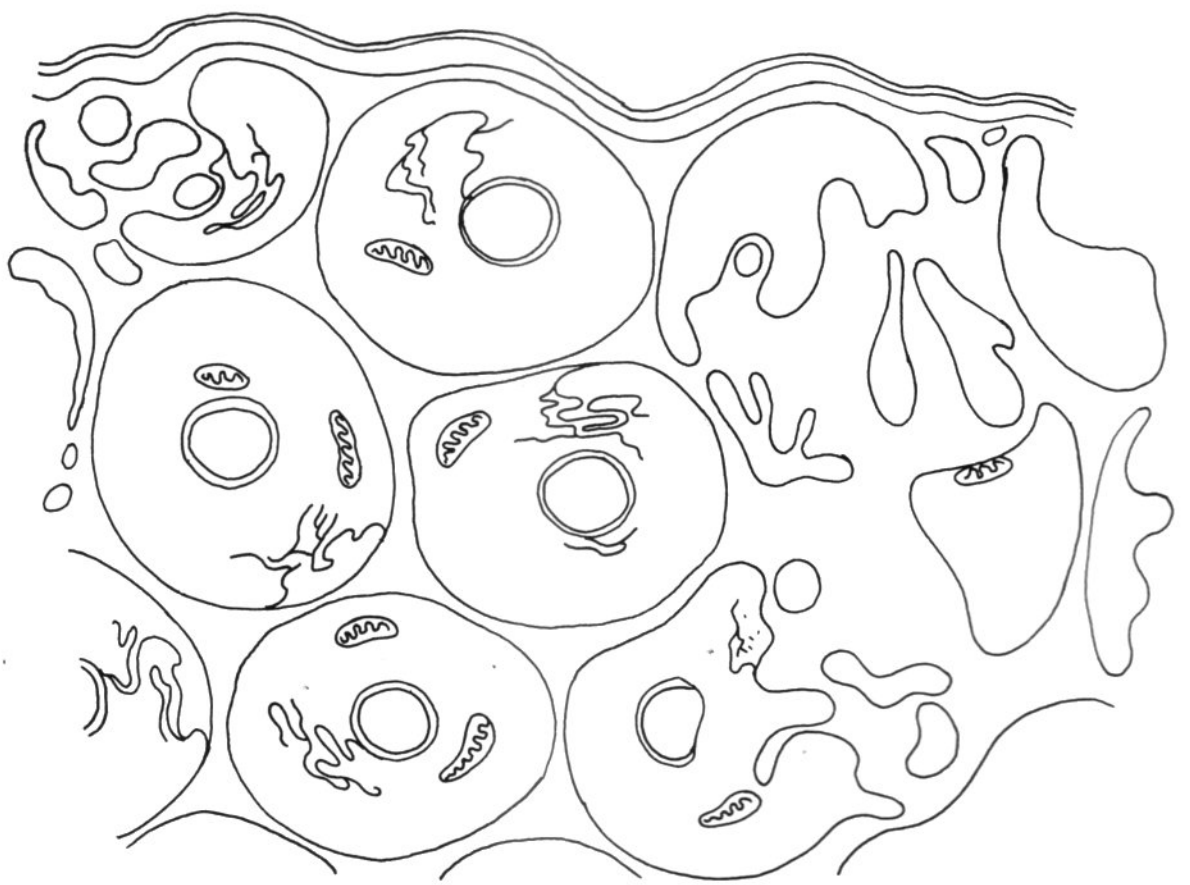
As a final note, one must caution Star Fleet personnel coming into contact with radiation to remember the Inverse Square Law: i.e., the radiation intensity varies inversely as the square of the distance; that the dose of radiation received increases directly with the time of exposure, and that shielding reduces the amount of radiation received.

CELL MUTATION



Cell mutation in hyperaging causes bridges and fragments in the soma, or cell bodies.

Autolytic deterioration of cells affected by radioactivity.

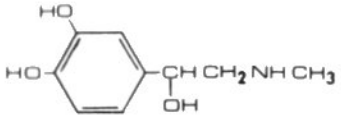
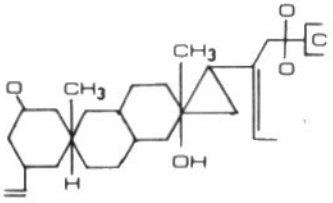


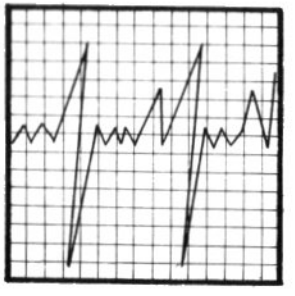


DRUGS

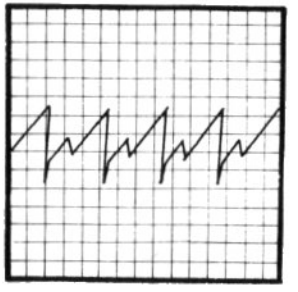
Medications (drugs) are an essential part of patient care. Safe and proper administration of drugs requires sound and current knowledge of their action, side effects, toxicity, onset, and range of dosage. It must be remembered that drugs have the power to help or harm, and the required knowledge of pharmacology involves integrating a careful understanding of many different disciplines, including anatomy, physiology, pathology, microbiology, organic chemistry, sociology and psychology.

Every drug should have a specific use as well as a general classification. Some of the more common classifications or categories of medications are as follows. Autonomic nervous system drugs work on the autonomic nervous system, which regulates many physiologic tasks necessary for the preservation of homeostasis (a constant internal environment), such as digestion of a meal. Cardiovascular drugs are usually used to treat disturbances in cell metabolism and in the circulatory system (veins, arteries, capillaries), and the heart muscle. Central nervous system drugs can act either to increase or to decrease activity of nerve centers and conducting pathways. Psychotropic drugs are usually used in psychiatric treatment and therapy. Anesthetic agents are central nervous system depressants that possess two characteristics: they have an affinity for nervous tissue, and their action is reversible (with cells returning to normal upon elimination of the drug). Antimicrobial agents are drugs which destroy or inhibit bacteria or other harmful microorganisms.

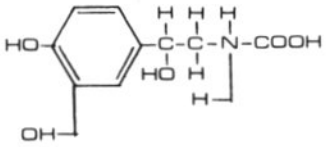
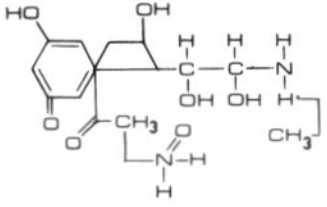
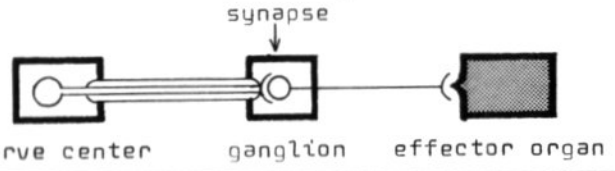
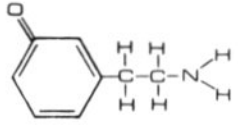
NAME & CHEMICAL COMPOSITION	HISTORY, DERIVATION & ORIGIN	CLASSIFICATION	ACTION	CLINICAL USE	USUAL DOSAGE	SIDE & TOXIC EFFECTS
ADRENALIN 	Terra Adrenalin is produced in the human brain; synthesized from the medullary portion of the adrenal gland of animals, to produce nerve transmission. Used for treatment of radiation poisoning, but later replaced by hyronalin.	autonomic nervous system stimulant	A) Acts on alpha and beta receptors of the brain (myoneural junctions and autonomic synapses) B) Calorigenic effect (increases oxygen consumption) C) Raises blood sugar and increases free fatty acids. Thus, in response to stress (fright, fight, flight response) there can be an abundant supply of fuel and energy in the body	1) Constricts blood vessels, thereby stopping capillary bleeding 2) Vasoconstrictor ability accounts for use of adrenalin to relieve congestion in allergic reactions 3) Isoproterenol effect leads to alterness, and respiratory stimulation	0.1-1 cc (25 µg-1 mg)	tacycardia; palpitations; dyspnea; pulmonary edema; severe headache; pupillary dilation; anxiety; decreased insulin production; death
BENJISIDRINE 	Vulcan Developed to prevent congestive heart failure in Vulcans. This drug was originally synthesized from the Vulcan <u>benjisi</u> plant root. NOTE: This drug is specific only for Vulcanoids	cardiovascular drug	A heart in failure is no longer capable of supplying body tissue with adequate oxygen and nutrients. Most of the signs and symptoms of heart failure are caused by pulmonary and systemic congestion, which is the result of inadequate systolic flow and delayed venous return of copper-based blood. Benjisidrine therefore acts on the heart by increasing the strength of myocardial contractions.	1) Congestive heart failure relief in Vulcans 2) Treatment of atrial fibrillation in the Vulcan heart	0.1 cc	increased blood pressure; increased respiration; increased blood flow, sometimes accompanied by "emotional" anxiety leading to death

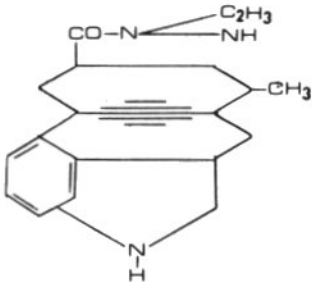
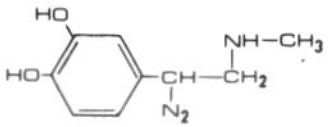
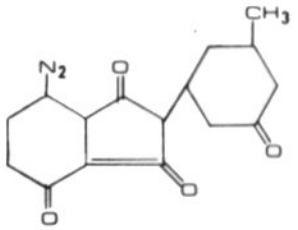


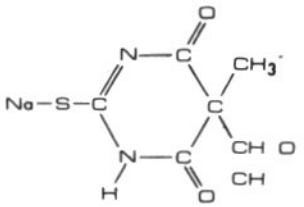
Vulcan heart in failure

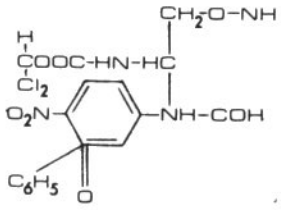


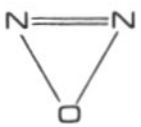
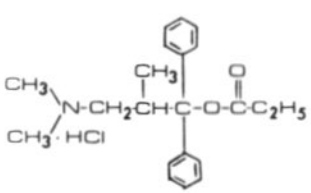
Vulcan heart after administration of benjisidrine

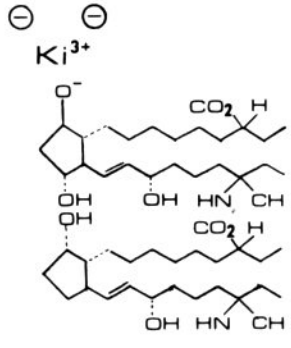
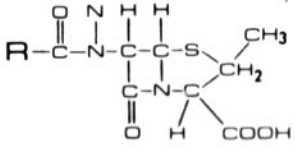
NAME & CHEMICAL COMPOSITION	HISTORY, DERIVATION & ORIGIN	CLASSIFICATION	ACTION	CLINICAL USE	USUAL DOSAGE	SIDE & TOXIC EFFECTS
CORADRENALIN 	Terra - 1986 Developed from adrenalin to treat severe exposure and frostbite. Originally used in cryrogenic laboratories without success.	autonomic nervous system & basal metabolic stimulant	Calorigenic effect stimulates basal metabolism. This helps the body consume more oxygen and produce more heat for frozen cells.	1) Used to treat exposure and severe frostbite 2) Maintains regular blood pressure in hypotension 3) Cardiogenic shock (restores cardiac output) 4) Used in conjunction to O_2	4 cc	edema; subpericardial hemorrhage; tissue necrosis; hepatic necrosis; hypoxia; hypoxemia
CORDRAZINE 	Terra - 1987 Originally used in cyrogenic laboratories to stimulate production of epinephrine and norepinephrine in the brain, thereby allowing nerve transmission to be restored to the frozen body.	autonomic nervous system stimulant	A) Increase in myocardial contraction due to an influx of calcium into fibers. Results in more complete emptying of ventricles and increase in cardiac work plus oxygen consumption B) Stimulates production of naturally occuring epinephrine and norepinephrine at the myoneural junctions and autonomic synapses of the brain	1) Revives nerve impulse transmission in the brain 2) Increases myocardial contractions, Purkinje fiber effect, thereby speeding up the heart's pacemaker action in victims with heart failure or heart flutter 	0.25 cc	elevated blood pressure; dry mouth; tachycardia; restlessness; insomnica; irritablility; increased anxiety; paranoia; death
CORTROPINE 	Omicron Cephei VI Developed as a stimulant. Its purpose and effects are similar to Terran methamphetamine.	stimulant	Stimulates the central nervous system, the cerebral cortex in particular. The effects depend on the mental state and personality of the individual. It may fortify a person for prolonged physical and mental exertion.	Used to treat hyperkinetic behavior in children, and narcolepsy (overpowering desire to sleep). It decreases fatigue and increases willingness to work, alertness, power of concentration and talkativeness.	5 cc	large doses are followed by mental depression; anxiousness; insomnia; irritability; death

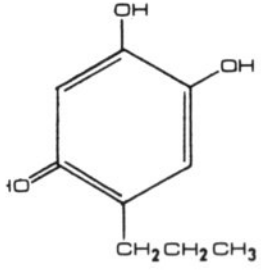
NAME & CHEMICAL COMPOSITION	HISTORY, DERIVATION & ORIGIN	CLASSI-FICATION	ACTION	CLINICAL USE	USUAL DOSAGE	SIDE & TOXIC EFFECTS
FORMAZINE 	Epsilon Carinae IV Exact history of this drug is unknown.	irritant - stimulant	Stimulates the central nervous system and the reticular activating system. It is a sympathetic agent.	Most of the irritant drugs exert a stimulating effect when applied in low concentrations, and are used for healing certain skin diseases such as eczema and psoriasis. In large doses, formazine can act as a stimulant, promoting alertness and lowering fatigue levels.	0.1 cc	severe irritability; depression; dry-mouth; hallucinations and disturbance in perception; tachycardia; overdose can lead to death
HYRONALIN 	Terra Replaced adrenalin for treatment of radiation poisoning because of its quicker action and stronger effects, and its simplicity of production.	autonomic nervous system stimulant	refer to adrenalin	Treatment of radiation poisoning	10 cc	refer to adrenalin
MASIFORM D 	Omicron Edridani III Developed as a regular stimulant. It was later found to be an antitoxin for saplin.	stimulant & antitoxin	Envelops or mixes with the poison and prevents its absorption, soothes and protects tissues and sometimes (depending on the dose) aids in removal of the poison.	Used as an antidote for saplin, curare, and similar drugs	10 cc	stimulation; in Vulcanoids, causes stomach cramps and nausea

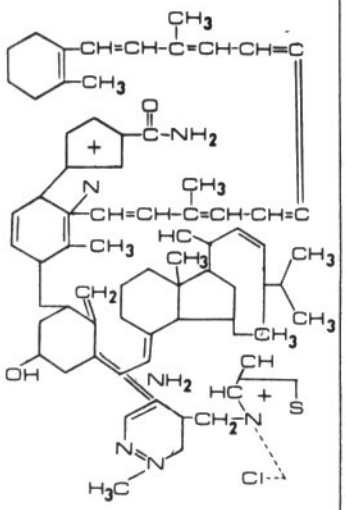
NAME & CHEMICAL COMPOSITION	HISTORY, DERIVATION & ORIGIN	CLASSIFICATION	ACTION	CLINICAL USE	USUAL DOSAGE	SIDE & TOXIC EFFECTS
MELANEX 	Janus III Melanex is an anesthetic, developed by doctors on Janus III.	anesthetic agent	Melanex works in approximately 5 to 10 seconds, and is an ultrashort-acting barbituate. It is rapidly taken up by brain tissue because of its high oil-water solubility. Shortness of action results from the drug being quickly redistributed into the fat depots of the body.	Used as a pre-anesthetic and for mouth surgery. It is never used on Vulcanoids, except in emergency situations, because of embarrassing side effects.	10 cc	turns Vulcanoids bright yellow; leaves patient unconscious for 5 minutes
MONOAMINE OXIDASE INHIBITORS PSYCHIC ENERGIZERS chemical composition unavailable	Terra Psychotherapeutic agents have been used for alleviating depressions since about 1959. Depressive states appear to be unique to humans, and have been classified by psychiatrists as endogenous psychotic depressions and reactive depressions. Reactive depressions are abnormal depressive responses to environmental factors, often experienced by crewmembers aboard Starships. Discovered by accident in the mid-1950s.	psychotropic drugs (antidepressant)	Monoamine oxidase is an enzyme found in the brain, blood platelets, liver, spleen and kidneys, and is responsible for destroying body chemicals such as neurohomones, epinephrine and serotonin. It produces central stimulation indirectly. Monoamine oxidase inhibitors act to increase psychomoter activity, and increase appetite.	Relieves reactive depressions. Given only when suicidal tendencies are present in a patient.		postural hypertension; dizziness; restlessness; insomnia; weakness; anxiety; drowsiness; manic episodes; nausea; vomiting; constipation; headaches; edema; tachycardia; abdominal pain; impotence; blurred vision; chills

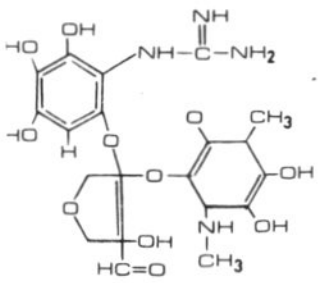
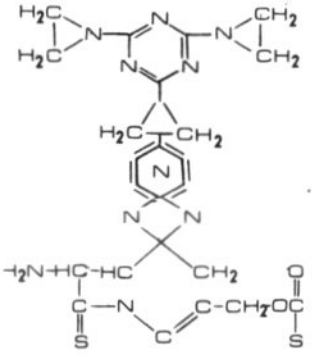
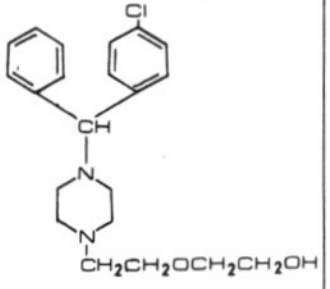
NAME & CHEMICAL COMPOSITION	HISTORY, DERIVATION & ORIGIN	CLASSI-FICATION	ACTION	CLINICAL USE	USUAL DOSAGE	SIDE & TOXIC EFFECTS
NEURAL PARALYZER 	Delta Orionis IV Discovered accidentally by Orion medical students while preparing a Terran synthetic narcotic analgesic.	central nervous system depressent (hypnotic)	Systematically, it depresses the central nervous system and quickly decreases awareness of external stimuli. It acts promptly (within 5 to 10 minutes) and lasts approximately 5 to 20 minutes. It decreases the central nervous system, respiratory system, circulatory and normal body functions, to a subnormal level, making the human subject appear to be dead. Works on the synapses of the brain in the cerebral cortex (upper motor neurons, renshaw cells-inter neurons and lower motor neurons).	Used in preparation for surgery as a pre-anesthetic agent.	5 cc	Death can occur from overdose

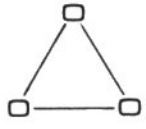
NAME & CHEMICAL COMPOSITION	HISTORY, DERIVATION & ORIGIN	CLASSI-FICATION	ACTION	CLINICAL USE	USUAL DOSAGE	SIDE & TOXIC EFFECTS
NITROUS OXIDE 	Terra - 1772 Discovered by Joseph Priestly, who had not realized the anesthetic properties of the gas. Dr. Crawford Long first used the gas for relief of pain during surgery, but failed to receive full credit for using it as an anesthetic since he did not publish a report of its administration to a patient. In 1846, William Morton, a dentist, sucessfully anesthetized a patient at the Massachusetts General Hospital. Also known as "laughing gas".	anestheric agent	The central nervous system is the only part of the body that reacts to the gas.	As an anesthetic agent and analgesic in dental procedures, brief surgical procedures not requiring muscular relaxation, and obstetrics. It is also used as a pre-anesthetic, but its greatest uses is as a component of balanced anesthesia for prolonged or complicated surgery.	100% nitrous oxide, followed by 100% oxygen; or 35% O_2 to 65% N_2O	mild intoxication; dizziness; confusion; numbness; vivid hallucinations, loss of consciousness; cyanoses; death (as a result of asphyxia); bone marrow depression with prolonged use; severe headaches in Vulcanoids
POWDER, RESTORATIVE chemical composition unavailable	Fabrina History is currently being deciphered.	believed to be a stimulant of vast chemical composition	exact mechanism of the drug is unknown at this time	Appears to cause bodily stimulation, alterness, sense of renewed strength.		unknown
PROPOXYPHENE HYDROCHLORIDE 	Terra A synthetic analgesic compund used popularly in the 1950s and 70s. It is still used for minor pain such as toothache or headache.	central nervous system drug	Works on the cerebrum - no effect on the respiratory system.	Relieves mild to moderate pain.	65 mg	nausea; vomiting; constipation; dizziness; hypersensitivity; overdose can cause coma

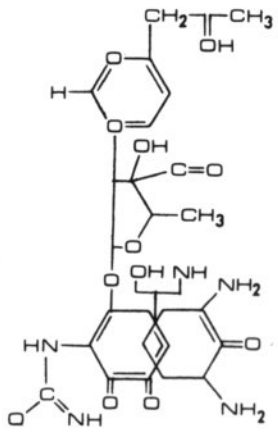
NAME & CHEMICAL COMPOSITION	HISTORY, DERIVATION & ORIGIN	CLASSIFICATION	ACTION	CLINICAL USE	USUAL DOSAGE	SIDE & TOXIC EFFECTS
PITUITARY HORMONE **KIRONIDE COMPOUND** 	Platonius - 5784.2 Discovered by the U.S.S. Enterprise on Platonius, after answering a distress call sent by the Platonians. All the Platonians had psychokinetic ability except for the dwarf jester. It was realized that the element kironide, when broken down by pituitary hormone, promotes psychokinesis.	pituitary hormone (endocrine hormone)	Growth hormone, or somatotropin, is controlled by the anterior pituitary. Hormones are usually natural chemical substances that act after being secreted into the bloodstream. The pituitary body is the size of a pea, and occupies a tiny space in the sella turcica of the sphenoid bone.	No real clinical use. Development of kironide compounds is currenly under study at the Star Fleet Medical Research Center. NOTE: Most hormones are rapidly destroyed, having a half-life in blood of 10 to 30 minutes.	not established	psychokinetic effect
RYETALYN (VRIETALYN) 	Holberg 917G (Omega Discovered by a Terran scientist as a cure for the dreaded bubonic-like plague disease, Rigellian fever. It is found in large quantities on Holberg 917G, but must be refined to form cubes of whitish material.	antitoxin bial agent)	Inhibation of transformation and of protein synthesis, as well as cell wall synthesis (causing cell of microrganism to lyse). NOTE: Ryetalyn must be in pure form to be effective. As little as 1 part irrilium per 1000 parts ryetalyn will render it inert.	Antitoxin for	1-4g	1) Allergic or reactions - may range from mild responses such as a rash or fever to extreme reations such as anaphylactic shock 2) Resistance - the ability of a microorganism previously sensitive to ryetalyn to withstand the effects of the drug 3) Superinfection - may occur when the normal microbial flora of the body is disturbed, allowing entry to an organism that normally would be unable to penetrate

NAME & CHEMICAL COMPOSITION	HISTORY, DERIVATION & ORIGIN	CLASSI-FICATION	ACTION	CLINICAL USE	USUAL DOSAGE	SIDE & TOXIC EFFECTS
STERILITE  	Terra Antiinfectives date back to Ancient Egypt, when such agents were used to preserve the dead. After Pasteur wrote about the germ theory, the use of disinfectants and antiseptic agents became widespread. Sterile is the most effective and versatile of the antiinfectives presently in use.	anti-infective	1) Brings about a change in the structure of protein of the microbial cell (denaturation), which preceeds coagulation of the chemical agent 2) Lowers surface tension of the aqueous medium of the parasitic cell, increasing permeability of the plasma membrane and causing lysis of the cell 3) Interferes with the metabolic processes of microbial cells	Used during surgery or for treatment of wounds, because it produces rapid death of harmful micro-organisms thereby preventing infection.	depends on the wound or type of surgery usually prepared in 100% soln	none (except to parasitical aliens)

NAME & CHEMICAL COMPOSITION	HISTORY, DERIVATION & ORIGIN	CLASSI-FICATION	ACTION	CLINICAL USE	USUAL DOSAGE	SIDE & TOXIC EFFECTS
STOKALINE 	Terra Stokaline is a multi-vitamin compound containing vitamins A, C, D, E, B_1, B_2 (riboflavin), niacin (nicotinic acid), B_6 (pyridoxine), B complex (pantothenic acid), and biotin. Developed as a multiple vitamin compund containing complete daily requirement dosages of the above vitamins, an injection of stokaline need be given only twice a year - no further vitamin supplement is required, other than the vitamins normally acquired in food intake. The name "vitamin" means "vital for life". The only vitamins synthesized in the human body are K (formed by bacteria in the gut) and D (produced by exposure to sunlight).	nutrients & vitamins compund drug	see clinical uses	Used in cases of vitamin deficiencies as well as a vitamin supplement. Each vitamin contained in stokaline has a separate function: A - visual pigments; maintenance of epithelial tissue C - oxidation-reduction; maintenance of connective tissue adrenal function D - absorbtion of calcium E - essential for normal hematopoiesis B_1 - carbohydrate metabolism B_2 - coenzymes for metabolism of respitory proteins B_6 - formation of aminobutyric acid; metabolism of amino acids B complex & niacin - component of coenzyme A biotin - unknown	10 cc	No toxic or side effects. The vitamin deficiency symptoms are as follows: A - nightblindness; corneal softening; hyperkeratosis C - scurvy, swelling of gums; peterchiae; anemia; capillary fragility D - rickets in children; Osteomalacia E - hemolytic anemia B_1 - central and autonomic nervous system disturbances; fatigue; neuritis B_2 - dermatitis; stomatitis niacin - pellagra B_6 - convulsions; hyperirritability; edema B complex - neurologic disturbances; fatigue; irritability; dry, scaly skin; adrenal hypofunction biotin - anorexia; malaise; dermatitis

NAME & CHEMICAL COMPOSITION	HISTORY, DERIVATION & ORIGIN	CLASSIFICATION	ACTION	CLINICAL USE	USUAL DOSAGE	SIDE & TOXIC EFFECTS
STROBOLIN 	Beta Canopus II The only known cure for the fatal Vulcan disease choriocytosis. Strobolin is a rare naturally occuring drug, although there is a less effective artificially produced analog.	antitoxin (antimicrobial agent)	Works on the microorganism which surrounds the Vulcan blood cell and encases it in infection. It disrupts and alters the bacteral membrane's permeability, resulting in leakage of essential bacterial metabolic substances.	Only known cure in the galaxy for choriocytosis: a disease fatal to Vulcanoids, encasing their copper-based blood cells so that the cells can no longer carry oxygen (similar to hypoxia in humans).	500 cc	1) allergic reations 2) resistance 3) superinfection NOTE: see ryetalyn for further details and explanations
THERAGEN 	Klingon Empire History and origin unknown. NOTE: clinical uses of theragen and alcohol discovered by Dr. Leonard McCoy	nerve gas	Deadens the nerves in the autonomic nervous system, including both parasympathetic and sympathetic nerve impulses (in pure form). Theragen + alcohol decreases sensations and impulses in the cerebral cortex.	None in its pure form. However, a derivative of the gas diluted with alcohol deadens the nerve impulses and can cure space warp (interphase) madness.	3 cc diluted with 500 cc alcohol	pure theragen: paralyzing effect; paralyzed nerve endings; difficulty in hearing, sight, smell and taste followed by respiratory failure and death theragen + alcohol: drowsiness; hangover; intoxication; overdose results in death
TRANQUILIZER DIPHENYLMETHANE 	Terra Standard antianxiety drug used aboard Federation starships.	antianxiety drug	Depressive effect on the polysynaptic reflexes of the spinal cord (reduces skeletal muscle tension).	Causes relaxation. Used for symptoms associated with psychoneurotic and psychosomatic conditions, and tension.	50-400 mg	anxiety; sedation; ataxia; drymouth; blurred vision; hypotension; antimetic increased appetite; bradycardia; increased gastric motility or diarrhea

NAME & CHEMICAL COMPOSITION	HISTORY, DERIVATION & ORIGIN	CLASSI-FICATION	ACTION	CLINICAL USE	USUAL DOSAGE	SIDE & TOXIC EFFECTS
TRI-OX COMPOUND 	Vulcan Gamma Cygni II Oxygen was discovered by Priestley in 1772 (old calendar). Lavoisier later described the role of oxygen in the respiratory process. The uses of oxygen as a therapeutic agent were introduced by Beddoes in 18th Century England. Oxygen in its most common form is O_2, a colorless, odorless, tasteless gas that constitutes 20.93% of inspired air, and is essential for maintaining humanoid life. Tri-ox compund was developed by biologists on Vulcan, and is synthesized for Star Fleet use as a respiration compensatory agent on Gamma Cygni II. Tri-ox replaced compressed O_3 cylinders, oxygen masks, nasal catheters, oxygen tents and cannulas - unlike O_2 tri-ox is non-combustible and a liquid at room temperature.	respiratory system drug	Oxygen must be continuously supplied to tissue cells - oxygen chypoxic is necessary for cell survival. The adult human brain consumes 40 to 50 ml of O_2 per minute. Replenishment of O_2 by the blood must be constantly maintained, as lack of O_2 can cause disruption of normal tissue function and irreversible damage (the brain is particularly susceptible). The rate of O_2 consumption by the kidneys is about 0.06 ml per gram per minute, more than most other tissues. O_2 is used by the kidneys primarily for sodium reabsorbtion. In the skeletal muscles O_2 consumption is related to blood flow. Both decrease when muscles are at rest. Myocardial and metabolism are impaired when O_2 supply is inadequate.	Tri-ox compound breaks down into O_2 in the bloodstream, and immediately delivers oxygen to all parts of the body. Used for cardiac arrests, difficulty in breathing, hypoxia, anoxia, collapsed lungs, oxygen deficiencies, Ischemic hypoxia, hypoventilation, increased airway resistance, pneumothorax, respiratory center depression, abnormal ventilation-perfusion ratio, congenital cyanotic heart disease, decreased pulmonary compliance, coronary occulsion, and in oxygen-poor atmospheres.	500 cc	none in humans

NAME & CHEMICAL COMPOSITION	HISTORY, DERIVATION & ORIGIN	CLASSI-FICATION	ACTION	CLINICAL USE	USUAL DOSAGE	SIDE & TOXIC EFFECTS
VENUS DRUG 	Orion IV First produced to increase the desirability of Orion slaves, it became a highly abused drug and is currently illegal. It makes women appear more feminine, and males more masculine (it is not a steroid drug). NOTE: It was made illegal in the Federation sphere of influence after it was discovered that it had a serious hypnotic effect on the opposite sex.	sex hormone (of the pituitary gland) (gonadotropic hormone)	Works on the pituitary gland (anterior pituitary), increasing production of the female hormones naturally occuring in the body (FSH, LH, LTH, progesterone, estrogen). In the male, it increases production of FSH in the seminiferous tubules and ICSH to stimulate formation of androgen. It also promotes additional formation of testosterone, for male secondary sex characteristics (i.e., voice, bodily hair, etc.).	none (drug is currently illegal, although it is sometimes used for cosmetic purposes after radical surgery)	500 cc every 24 hrs	1) Women appear more beautiful, men appear more masculine 2) Psychological effects: depression, irritability, psychological dependency 3) Hypnotic effect on the opposite sex



DISEASES

The body is constantly in contact with pathogenic bacteria, and the ability of an individual to resist these infectious agents is influenced by factors such as racial and familal endowment (heredity), age, sex, nutritional status, physical exertion, metabolic disorders, and environmental conditions (temperature and humidity for example). Obviously, the infectious processes are less likely to occur when an individual is in optimum health. However, should disease, infection or virus strike, the victim should be treated by a physician with current knowledge of the disease, its onset, its symptoms and signs, its prognosis, and its current treatment.

Over the last two centuries, medical knowledge and technology have progressed to the point where most diseases known to medical science are immediately treatable in their native form. Yet it will be several more centuries before effective procedures are developed to eliminate all pathogenic agents from the civilized galaxy. The element of the unknown is a tremendously important one in dealing with disease, and many lives have been lost to unknown agents simply because there was no precedent in treatment. This factor, coupled with the possibility of mutation when a disease agent is introduced into a new environment, makes all too likely the threat of planet-wide or conceivably galaxy-wide plague, which has already scoured the known universe several times (see SLAVERS, KALANDANS, VEGANS) during recorded history.

PATHOLOGY: TREATING THE UNKNOWN, 3RD ED.
BY LEONARD MCCOY, M.D.

NAME & DESCRIPTION	ETIOLOGICAL AGENT	ONSET & INCUBATION PERIOD	SIGNS & SYMPTOMS	PROGNOSIS & TREATMENT
CHORIOCY-TOSIS A disease fatal ro copper-based blood life such as Vulcans. The blood cells become encased by infection and cannot carry oxygen to the tissues or other vital organs. However, the disease manifests itself less severely in humans and iron-based blood life, and is only a temporary nuisance.	Gram-bacteria	Onset is rapid, disease is highly contagious. Incubation period is 24 hours to one week. If left untreated, a Vulcan will die in 24-72 hours.	<u>Iron-based blood</u> 1) aching of joints and muscles 2) slight rise in temperature 3) irritability <u>Copper-based blood</u> 1) restlessness, anxiety 2) extreme fatigue 3) dizziness 4) cyanoisis (check for blue color of nail beds, ear lobes and lips) 5) decreased efficiency 6) shortness of breath, noisy breathing, wheezing, flaring of nostrils 7) increased pulse rate 8) coma 9) death	Without strobolin (a naturally-occuring drug), this disease is fatal to Vulcans and other copper-based blood life, although synthetic drugs can be used to slow the progress of the disease. IPPB respirator should be available, as breathing difficulty can occur; oxygen may be necessary. Strobolin should be administered immediately. In humans and other iron-based blood life, inflammatory and analgesis agents should be used to counteract sumptoms.
COMMON COLD (acute coryza) An acute inflammation of the upper respiratory tract. Experience by all age groups, the common cold has plagued humanity since the beginning of recorded history.	filterable virus	Onset of symptoms is precipitated by lack of immunity, lowered resistance, fatigue, poor nutritional status, and emotional disturbances. The virus is transmitted via droplet infection from one person to another, and is highly contagious. Climatic conditions are influential in the causation of colds.	1) first signs are experienced in the nasopharynx (hot, dry tickling sensations in the pharynx) 2) congestion of nasal passages 3) coughing, sneezing, nasal discharge become manifest (nasal secretions are copious at first) 4) irritability and restlessness 5) conjunctivitis, headache, & mouth-breathing may occur from obstruction of nasal cavities 6) malaise 7) chilliness 8) temperature 9) aching pains in the shoulders, back and limbs Symptoms usually subside in a week, barring any complications such as otitis media, sinusitis, pneumonia or bronchitis.	1) salicylic acid to control aches and fever 2) adequate rest 3) avoid contact with others 4) fluids should be encouraged in addition to adequate nutrition and vitamins NOTE: There is no cure for the common cold, although the Star Fleet Surgeon General's office is presently experimenting with natural immunization agents isolated on Omega IV

NAME & DESCRIPTION	ETIOLOGICAL AGENT	ONSET & INCUBATION PERIOD	SIGNS & SYMPTOMS	PROGNOSIS & TREATMENT
KALANDAN ORGANISM A deadly organism, produced accidentally during the creation of an outpost planet by the Kalandans. It was carried back to the home planet and ultimately spread to other colony worlds by supply ships. NOTE: Since this organism is believed to have destroyed the entire Kalandan race, exact data on the disease is unavailable	believed to be a Gram-negative bacterial organism	believed to be rapid and short-lived	Unknown, but estimated to be similar to those of Rigellian fever (symptoms were probably quite severe and the duration of the disease very brief, since there was apparently insufficient time to develop a cure or warn other outposts of its onset).	No known treatment or cure. Disease believed to be 100% fatal.
OMEGA IV VIRUS A virus native to Omega IV, which dehydrates the body until it is reduced to white crystals - "uremic frost"	filterable virus	Onset is immediate upon removal from the atmosphere of Omega IV. Incubation begins on contact with the Omegan atmosphere, although actual symptoms of the disease may never become apparent.	1) thirst - as soon as body water loss or depletion begins to reduce interstitial fluid levels, mucous membranes become dry, especially superficial ones of the mouth, creating a sensation of thirst 2) concentrated urine - tubular reabsorbtion increases in kidneys 3) loss of weight - fluid losses yield a corresponding decline in body weight 4) poor skin turgor - water loss moves cushioning in skin: skin loses its elasticity and firm appearance 5) sunken eyeballs 6) rise in body temperature - the body depends on an aqueous	The only natural immunity is found on Omega IV (the planet's atmosphere contains an immunization agent). Prolonged stay on the planet results in permanent immunity.

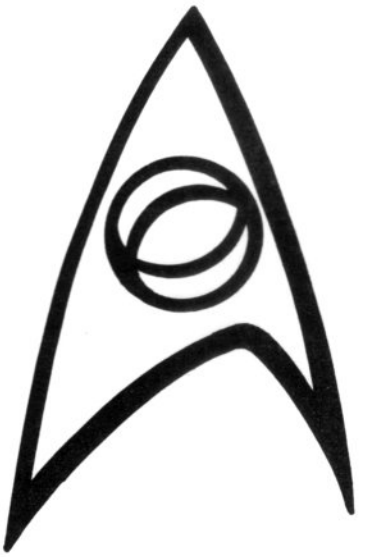
NAME & DESCRIPTION	ETIOLOGICAL AGENT	ONSET & INCUBATION PERIOD	SIGNS & SYMPTOMS	PROGNOSIS & TREATMENT
OMEGA IV VIRUS (continued)			medium to exchange heat with the surroundings. 7) increased pulse & decreased cardiac output - the amount of circulating blood is reduced by dehydration. The plama protein level per fluid volume rises, and heart must pump faster. 8) uremic syndrome - as wastes build up in the body, victim develops renal failure. A crystalline substance forms on the skin in late renal failure - this is referred to as "uremic frost"; it is first visible on the forehead, and then becomes generalized. In the last phases of the virus, the body disintegrates and uremic frost covers the body. After death occurs, the remains of the body are only the dehydrated crystalline substance.	
PSI 2000 VIRUS A virus that relaxes the victim's inhibitions (acts like an intoxicant).	waterborne virus (water is changed to a complex molecule on Psi 2000, promoting spread of the virus through perspiration)	Onset occurs rapidly, within an hour from contact. Incubation begins soon after contact, with a sticky feeling at the site of transmission.	1) relaxes inhibitions 2) reality is distorted - exhilaration is experienced 3) frenzy, fear, visual hallucinations 4) tremors, seizures 5) lack of coordination of motor and sensory activities 6) labile emotions: hysterical crying or laughing, delusions 7) appetite extremes - no interest in food or unusual cravings for sweets 8) victim cannot respond to authority 9) paranoid behavioral tendencies	1) administer antidote (first isolated by Dr. Leonard McCoy, stardate 1704) 2) force victim to excercise will power to counteract symptoms

NAME & DESCRIPTION	ETIOLOGICAL AGENT	ONSET & INCUBATION PERIOD	SIGNS & SYMPTOMS	PROGNOSIS & TREATMENT
RIGELLIAN FEVER A highly contagious, rapidly progressing, acute febrile disease symptomatized by fever and chills followed by swilling of the lymph nodes (forming buboes)	Gram-negative bacillus	Onset is abrupt. Incubation is 2-10 days (3 is average).	1) begins with slight chills or repeated attacks of chilliness 2) Temperature then rises rapidly - usually to 103°F, but it can reach 106°F in severe cases 3) fear and anxiety 4) vomiting 5) thirst 6) unsteady gait 7) generalized pains 8) mental dullness, headache 9) skin becomes hot and dry 10) increased pulse and respiration 11) face becomes edematous and the conjunctiva is infected 12) hearing may be impaired 13) convulsions, stupor or coma sometimes develop 14) splenomegaly often is present 15) involution of kidneys causes oliguria and albuminuria 16) leukocytosis may be pronounced 17) petechiae - "black spots" somewhat resembling those of bubonic plague - appear 3 to 4 hours after onset	Fatal within 24 hours unless ryetalyn is administered. Treat symptoms with fever-reducing and anti-inflammatory agents.
SAKURO'S DISEASE A rare illness resembling leukemia in later stages, characterized by replacement of normal bone marrow by primitive or stem cells of the blood-forming series	thought to be either a virus or bacteria originating on Epsilon Canaris III	1 week to 1 month	1) no discomfort in first stages of disease 2) in later stages, an abrupt onset of high fever occurs 3) secondary infection of mouth, throat or lungs may occur 4) progressive weakness 5) moderate enlargement of liver, spleen and lymph nodes 6) red corpuscle death 7) respiration becomes erratic, blood pressure drops 8) delirium 9) if not treated, death occurs a few hours after critical stage	With treatment, the disease is completely curable before onset of critical stage. Treat symptoms with analgesics.

NAME & DESCRIPTION	ETIOLOGICAL AGENT	ONSET & INCUBATION PERIOD	SIGNS & SYMPTOMS	PROGNOSIS & TREATMENT
SYNTHOCOCCUS NOVAE A bacillus strain, the mutation product of an aseptic, sterilized civilization. It is fatal, and spreads quickly	bacillus strain (diagnosis is confirmed by isolation of microorganism in stool or blood)	Symptoms become apparent within 24 hours. Persons with subclinical cases of the disease may be carriers.	1) nausea, vomiting 2) fever 3) anorexia 4) diarrhea 5) dehydration 6) delirium 7) coma - shortly followed by death	Immunization, vaccine. Treat disease according to symptomatology.
VEGAN CHORIOMENINGITIS An inflammatory condition of the nervous system - more specifically of the meninges (dura mater, pia mater and arachnoid membranes)	bacteriological organisms (examples - pneumococcal pneumococcus, haemophilus influenzae, streptococcus, treponema pallidum)	Anywhere from 4 to 24 hours. Disease can be carried by patients once infected, and transferred to others not immunized through transfusion of blood.	1) <u>headache</u> - primary symptom of most inflammations of the central nervous system, due to an increase in cerebrospinal fluid pressure and stretching of the edematous nerve tissue. Headache is localized frontally or occipitally, or may extend down the back of the neck. It increased in severity with sudden movements. 2) <u>nuchal rigidity</u> - neck becomes rigid and resistant to flexion, due to inflammation at the base of the brain. As the disease progresses, the rigidity becomes more intense. 3) <u>Brudzinski's sign</u> - a positive sign of meningeal irritation. It consists of flexion of the lower limbs on passive flexion of the head on the chest. 4) <u>Kernig's sign</u> - pain and resistance on extending the leg at the knee after flexing the thigh upon the body. It indicates meningeal irritation of the lumbosacral roots. 5) <u>fever</u> - accompanied by chills, rapid pulse and respirations, and may lead to convulsions. 6) <u>opisthotonus</u> - arched body position caused by tetanic spasm.	Immunization is available and suggested. Prognosis is excellent if treated with antibiotic drug therapy. Treat symptoms with pain-relieving and analgesic agents.

NAME & DESCRIPTION	ETIOLOGICAL AGENT	ONSET & INCUBATION PERIOD	SIGNS & SYMPTOMS	PROGNOSIS & TREATMENT
VEGAN CHORIOMENINGITIS (continued)			7) other symptoms might include rash, cranial nerve dysfunction, delirium, cramps, choreoid or athetoid movements, and signs of increased intracranial pressure. If not treated, Vegan choriomeningitis is fatal.	
FILTERABLE VIRUS (order 2250-67A) A virus characterized by rapid aging, senility, irritability, violent insanity, leprous body sores, and death	filterable virus (disease was the result of experiments on life prolongation; the inhabitants of the planet did not contract the virus until reaching puberty, which (because of the virus' life prolonging action, causing the human body to age at a rate of roughly one month for each hundred years of real time) may take several centuries)	Virus becomes malignant at puberty, and requires an incubation period of several weeks. Victims past puberty exposed to the virus will contract the disease immediately unless immunized (the virus is believed to act on the adult hormones, estrogen and testosterone). Once symptoms appear, the disease runs its course in about 7 days. Although Vulcans do not contract the disease, they have been proven to be carriers of the virus.	1) disease begins with pronounced irritability 2) leprous spots appear on the body, accompanied by sores 3) in 5 days to a week, the victim experiences increasing madness and rapid aginf 4) death occurs soon afterward	Disease is fatal unless immunity vaccination (developed by Dr. Leonard McCoy, stardate 2713) is given.

NAME & DESCRIPTION	ETIOLOGICAL AGENT	ONSET & INCUBATION PERIOD	SIGNS & SYMPTOMS	PROGNOSIS & TREATMENT
XENOPOLY-CYTHEMIA A myelo-proliferative disease condition, causing an increase in erythorocytes, myelocytes and thrombocytes; increased viscosity of the blood; increased volume of blood; and severe congestion of all tissues and organs	unknown, but thought to be a malignant form of leukemia or Sakuro's disease (can accompany cardiac and pulmonary diseases)	6 months to 1 year. Onset is insidious; however, once symptoms appear, clinical course is rapid. Thrombotic complications claim lives of 30% of patients, hemorrhage 10-15%.	1) ruddy complexion and dusky redness of mucosa 2) hypertension accompanied by dizziness, headache and a sense of fullness in the head 3) angina, claudication, increased plood pressure, shortness of breath, orthopnea and congestive heart failure 4) thrombus formation, particularly in vessels supplying brain, heart, lungs and lowere extremities; cerebral vascular accidents, myocardial infarction and gangrene of the feet can result 5) bleeding and hemorrhage on the gastrointestinal tract, oropharynx and brain, expecially following minor accidents or surgery 6) enlarged liver and spleen 7) peptic ulcer 8) painful, swollen joints (gout) Also visual disturbances, paresthesia, pruritis, congestion	Formerly, a fatal disease - now 100% curable with an ancient Fabrini compound (discovered stardate 5476). Patient is advised to avoid eating red meats, organ meats (liver, kidney) or foods high in iron; and to undergo phlebotomies of 2-3 months (removal of 200-500 ml of blood). Myelosuppressive agents are also prescribed, in addition to increased activity and fluids. Complications should be treated according to symptomatology.



LIFE SCIENCES



HUMANOID ANATOMY

The humanoid body is a complex organism composed of countless numbers of microscopically tiny units, called cells. These cells are arranged into groups of different sizes, shapes and highly specialized purposes; such groups of cells are called tissues, organs, or organ systems. Thus muscle cells are long, thin, and have a peculiar or special ability to contract and expand, which makes it possible for muscular tissue (muscles) to perform work and to move the different parts of the body. There are bone cells, and skin cells, and many varieties of digestive and nerve and other kinds of cells, which enable the extremely complicated humanoid body to carry on its numerous functions.

The humanoid body made up of its myriads of living cells, its different tissues, organs, and systems, is seperated from the outside world by the skin, just as a starship is isolated by its hull plates from surrounding space. However, neither the body nor the starship is a "closed system." To the contrary, the body is in constant communication with the outside world from which it discharges its waste products - sweat, urine, feces. Hence the well-being of the body, like that of a starship, depends not only upon its internal environment but also upon its external environment.

If emergency treatment is to be administered intelligently, one must be able to recognize disease and injury, which in turn requires some fundamental knowledge of the structure of the humanoid body. The descriptions and directions which appear in this book cannot be properly understood or carried out unless the persons responsible for medical care in space have at least the general knowledge of anatomies given in the following pages.

THE STARSHIP'S MEDICINE CHEST AND FIRST AID IN SPACE
PUBLISHED 2257

ANDORIAN
EPSILON INDI VIII (ANDOR)

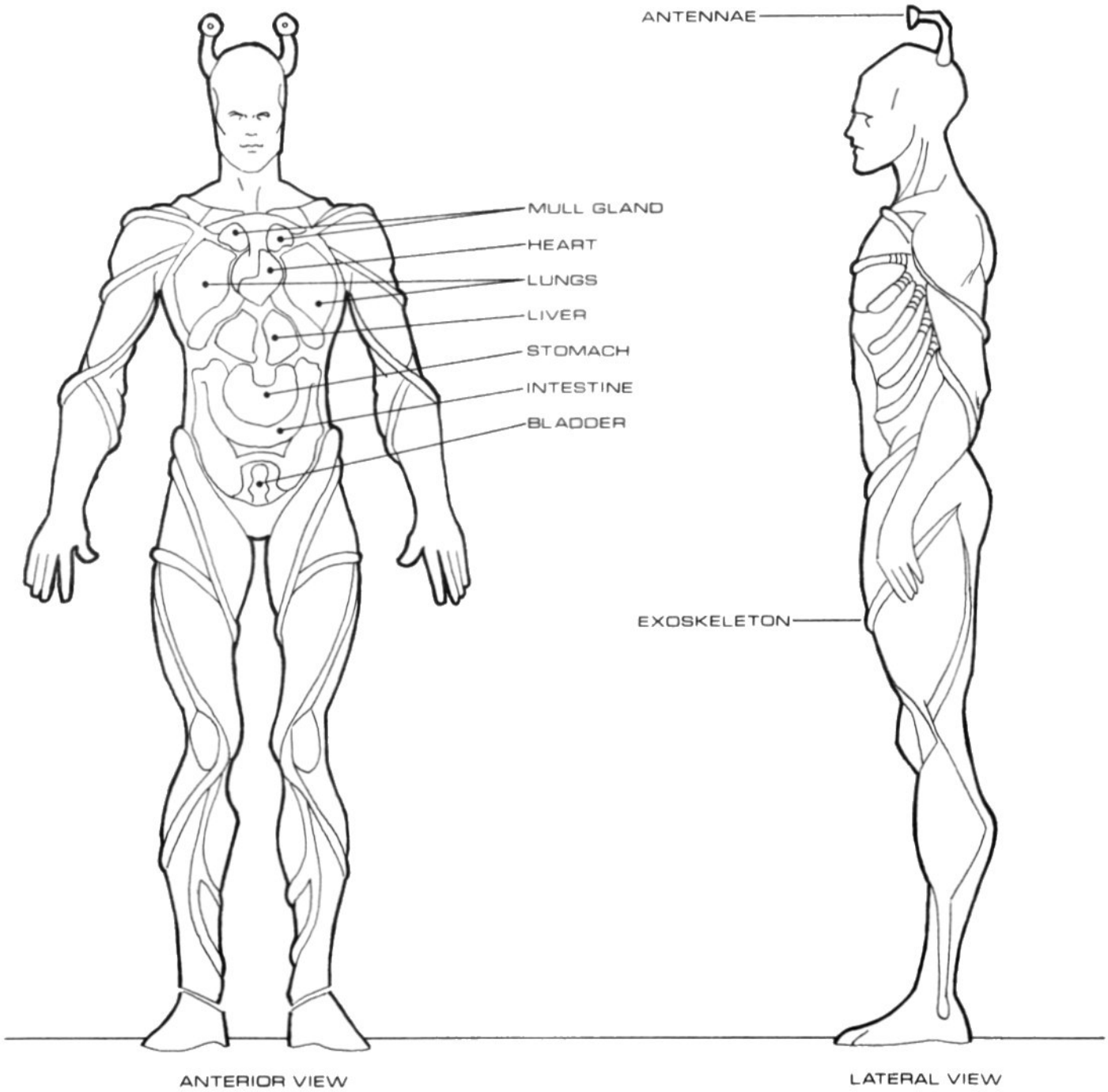
DATA:

AVERAGE HEIGHT:	(male) 2.3 meters (female) 1.8 meters
AVERAGE WEIGHT:	(male) 70 kilos (female) 45 kilos
TEMPERATURE/PULSE/RESPIRATION:	102/110/28
LIFE EXPECTANCY:	(male) 129 years (female) 134 years

The Andorian retina is composed entirely of tone-sensitive rods, and is incapable of discriminating between different wavelengths of light. Therefore, the addition of color to the Andorian's vision is accomplished by the dual antennae which, in addition to being auditory receptors, are made up of a complex network of wavelength-sensitive cones. Owing to the highly directional nature of the antenna, the corona of vision is perceived by the subject in tones of grey. Because of this correlation of four independent light-receptive organs, Andorian vision can be correctly termed "quadroscopic", resulting in relatively (humanoid) superior depth perception. Andorian auditory capacities are highly developed, and Andorians are capable of distinguishing from among a wider range of audio frequencies than is normal for humanoids. Because of the monodirectional antennae, Andorians usually listen with their head tilted slightly downward. Note limited exoskeleton.

ANDORIAN

INSECTOID BIPED (HOMO INDI)



GORN
TAU LACERTAE IX

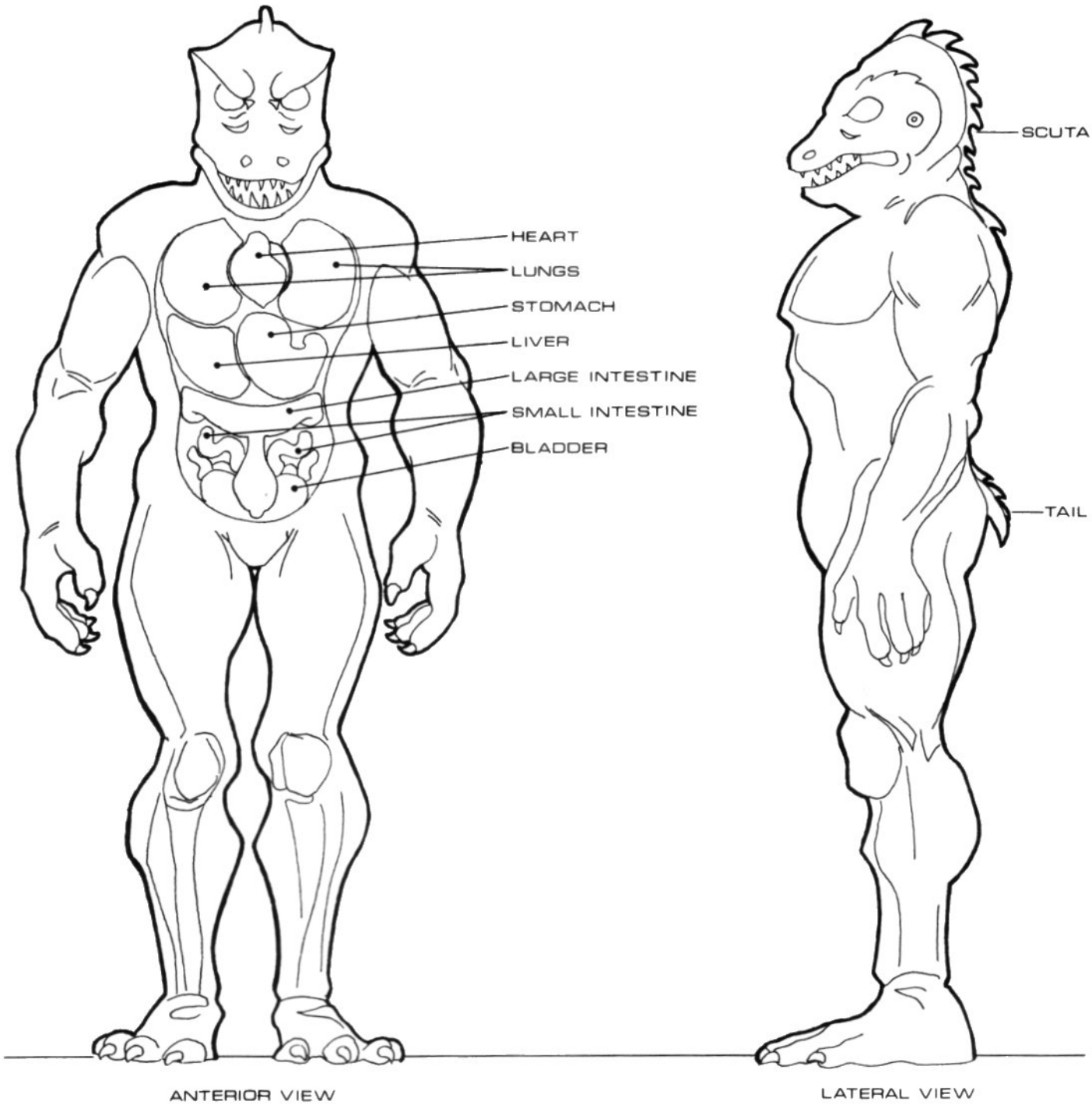
DATA:

AVERAGE HEIGHT:	(male) 2.0 meters (female) 1.4 meters
AVERAGE WEIGHT:	(male) 200 kilos (female) 100 kilos
TEMPERATURE/PULSE/RESPIRATION:	ambient temp./40/10
BLOOD PRESSURE:	(male) 80/50
LIFE EXPECTANCY:	(male) 55 years (female) 21 years

Cold-blooded like all reptiles, the Gorn is found to flourish in a warm, tropical clime. With imperfect respiration providing just enough oxygen to supply tissues and maintain the processing of food and combustion, their temperature can be raised only a few degrees above the ambient. The reproductive system is ovouniparous, with eggs hatching in the oviduct prior to birth. The underdeveloped Gorn cerebellus results in a slowness and simplicity of movement. The Gorn eye is composed of thousands of microscopic facets, each facet with its own independent protective lid. The eye is almost never closed entirely during waking hours; rather, sections of the organ are shut down in conjunction with the dominant light source.

GORN

REPTILOID BIPED (HOMO LACERTAE)



ANTERIOR VIEW

LATERAL VIEW

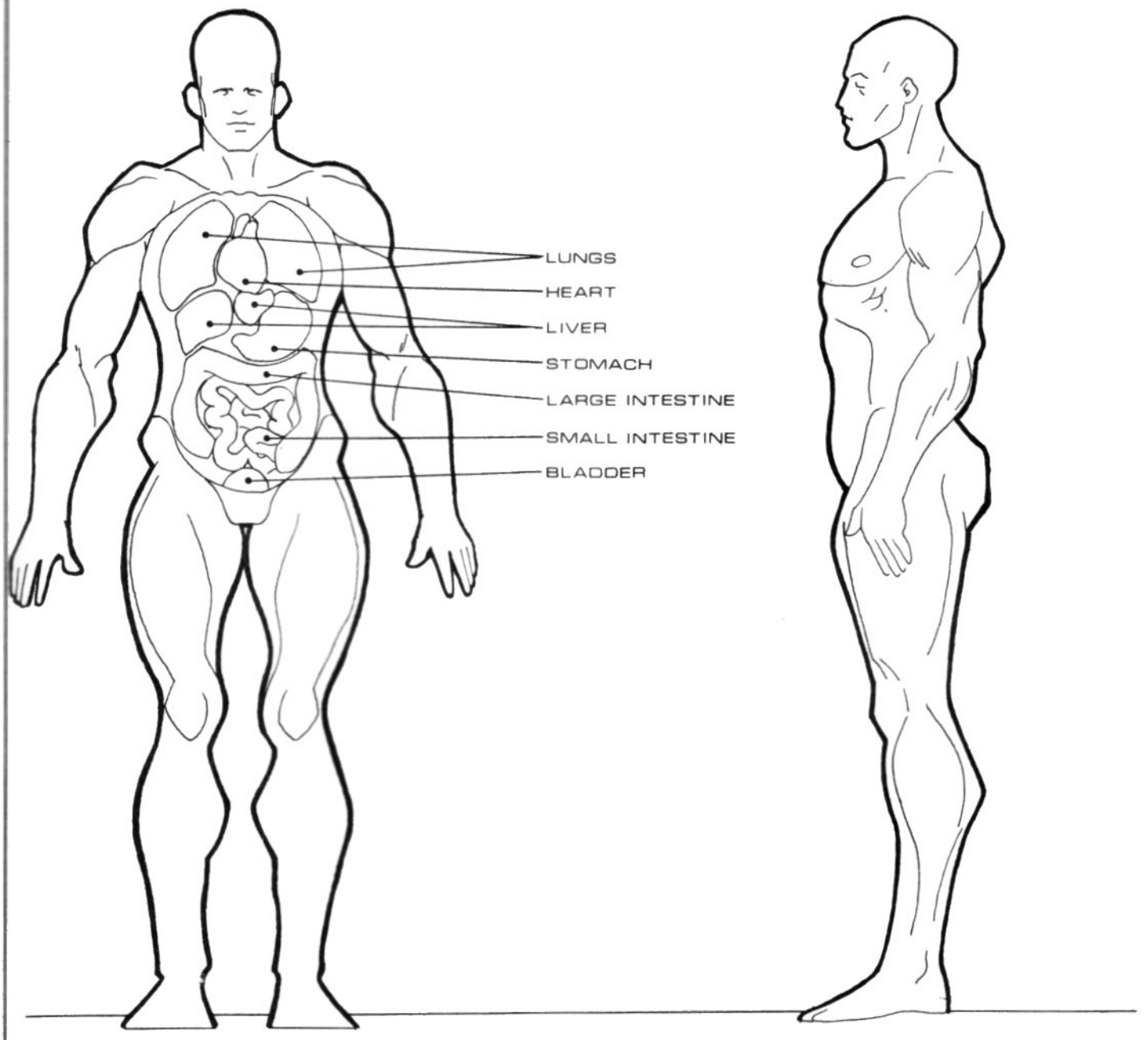
HUMAN
SOL III (EARTH)

DATA:

AVERAGE HEIGHT:	(male) 1.7 meters (female) 1.5 meters
AVERAGE WEIGHT:	(male) 70 kilos (female) 60 kilos
TEMPERATURE/PULSE/RESPIRATION:	(male) 98.6/72.5/16 (female) 98.6/72.5/21
BLOOD PRESSURE:	120/80
LIFE EXPECTANCY:	(male) 115 years (female) 122 years

HUMAN

HOMINID BIPED (HOMO SOL)



ANTERIOR VIEW

LATERAL VIEW

KLINGON
EPSILON SAGITTARII B (KLINGONII)

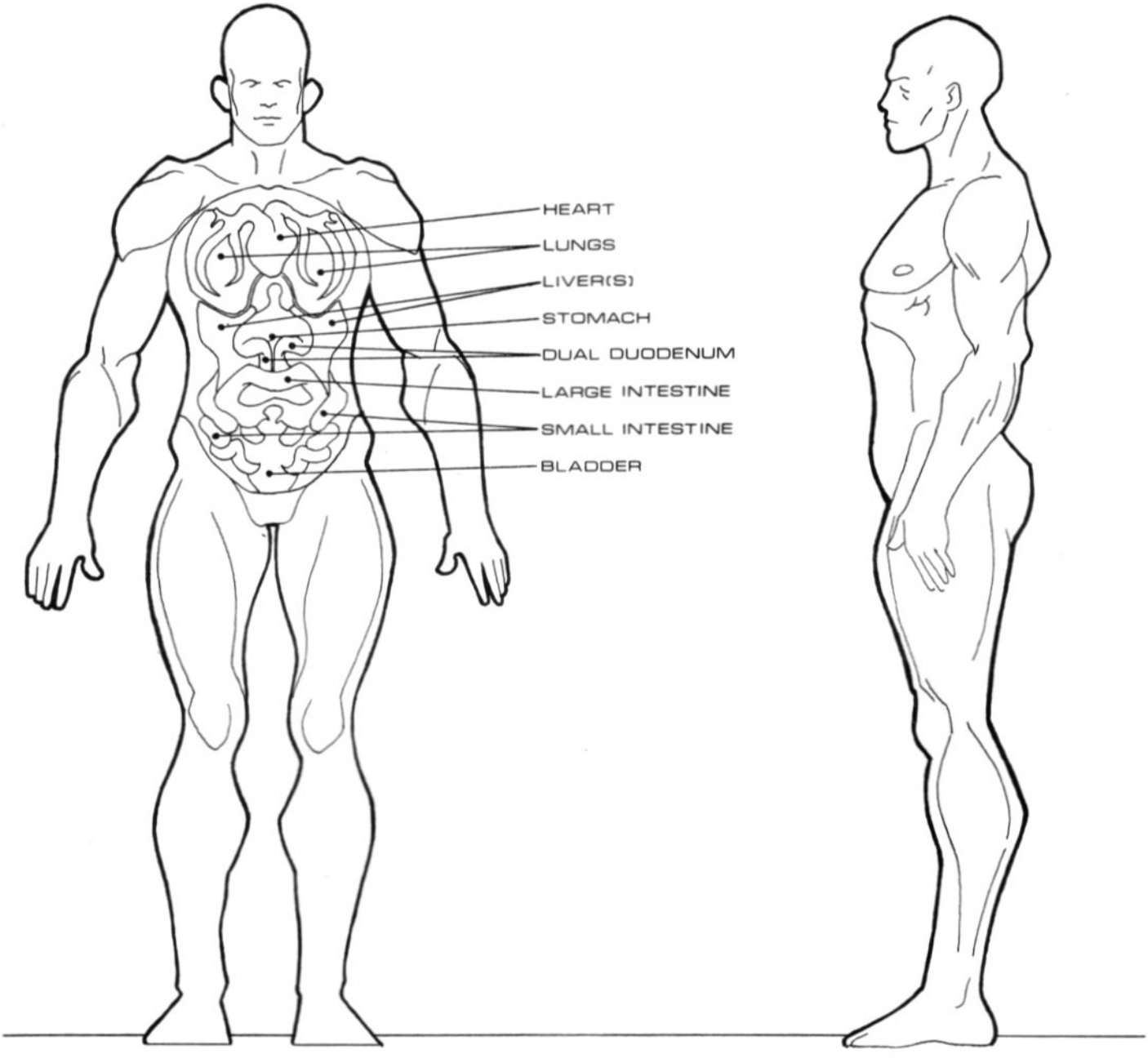
DATA:

AVERAGE HEIGHT:	(male) 1.9 meters (female) 1.7 meters
AVERAGE WEIGHT:	(male) 80 kilos (female) 50 kilos
TEMPERATURE/PULSE/RESPIRATION:	96/60/15
BLOOD PRESSURE:	130/80
LIFE EXPECTANCY:	(male) 82 years (female) 69 years

Products of genetic bio-engineering, Klingons are a race selectively bred for efficiency by way of carefully controlled gene pools and strict government supervision. As a result of the rapid Klingon metabolism, the stomach is equipped with two duodenum which allow for a greater flow of digested material to pass on to the small intestines. Physician take note: the Klingon small intestines are a complex series of highly efficient step-like levels, first descending and then ascending to the large intestine. Also note the two large, independent livers, which result in the higher than average (hominid) body temperature.

KLINGON

KLINGONOID BIPED (HOMO SAGITTARII)



ANTERIOR VIEW

LATERAL VIEW

TELLARITE
61 CYGNI V (TELLAR)

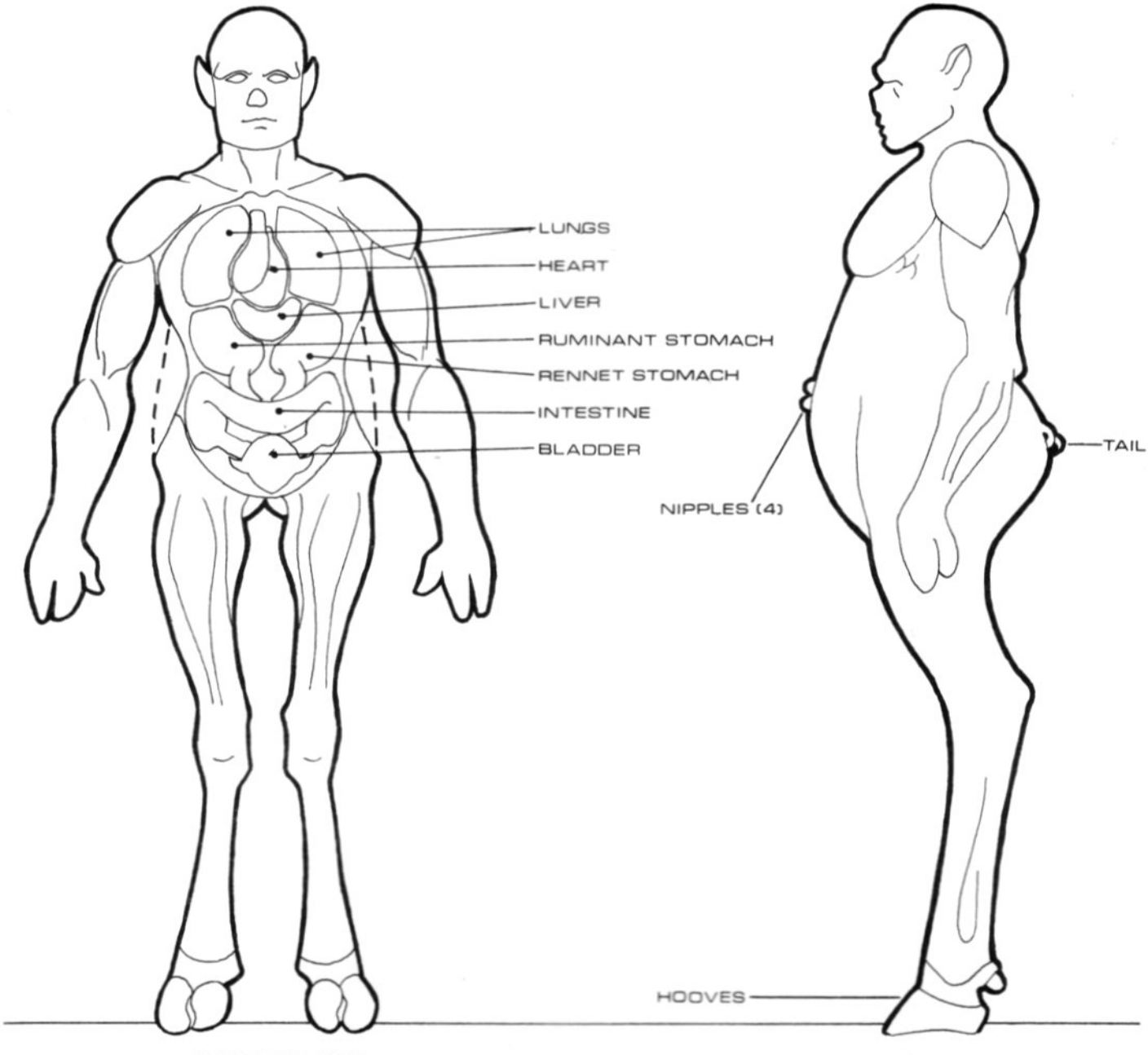
DATA:

AVERAGE HEIGHT:	(male) 1.8 meters (female) 2.2 meters
AVERAGE WEIGHT:	(male) 80 kilos (female) 150 kilos
TEMPERATURE/PULSE/RESPIRATION:	(male) 100.3/90/22 (female) 100.3/100/26
BLOOD PRESSURE	(male) 160/110 (female) 180/120
LIFE EXPECTANCY	(male) 87 years (female) 93 years

The Tellarite is generally rotund-bodied, abdominal mammaries, with reproduction occuring by way of multiple birth. The digestive tract is specially adapted for the digestion of plant materials, a long process in which the food is subjected to bacterial action in the ruminant stomach. Upon regurgitation, the food is passed to the rennet stomach where it is acted upon by gastric juices, ultimately passing into the single, large intestine where absorption occurs. The fibula of the leg is vestigal - also note the complete absence of the third trochanter of the femur. The foot is even-toed and hoofed. Sense of smell and hearing are extremely keen; sight is less developed.

TELLARITE

ARTIODACTYLOID BIPED (HOMO CYGNI)



ANTERIOR VIEW

LATERAL VIEW

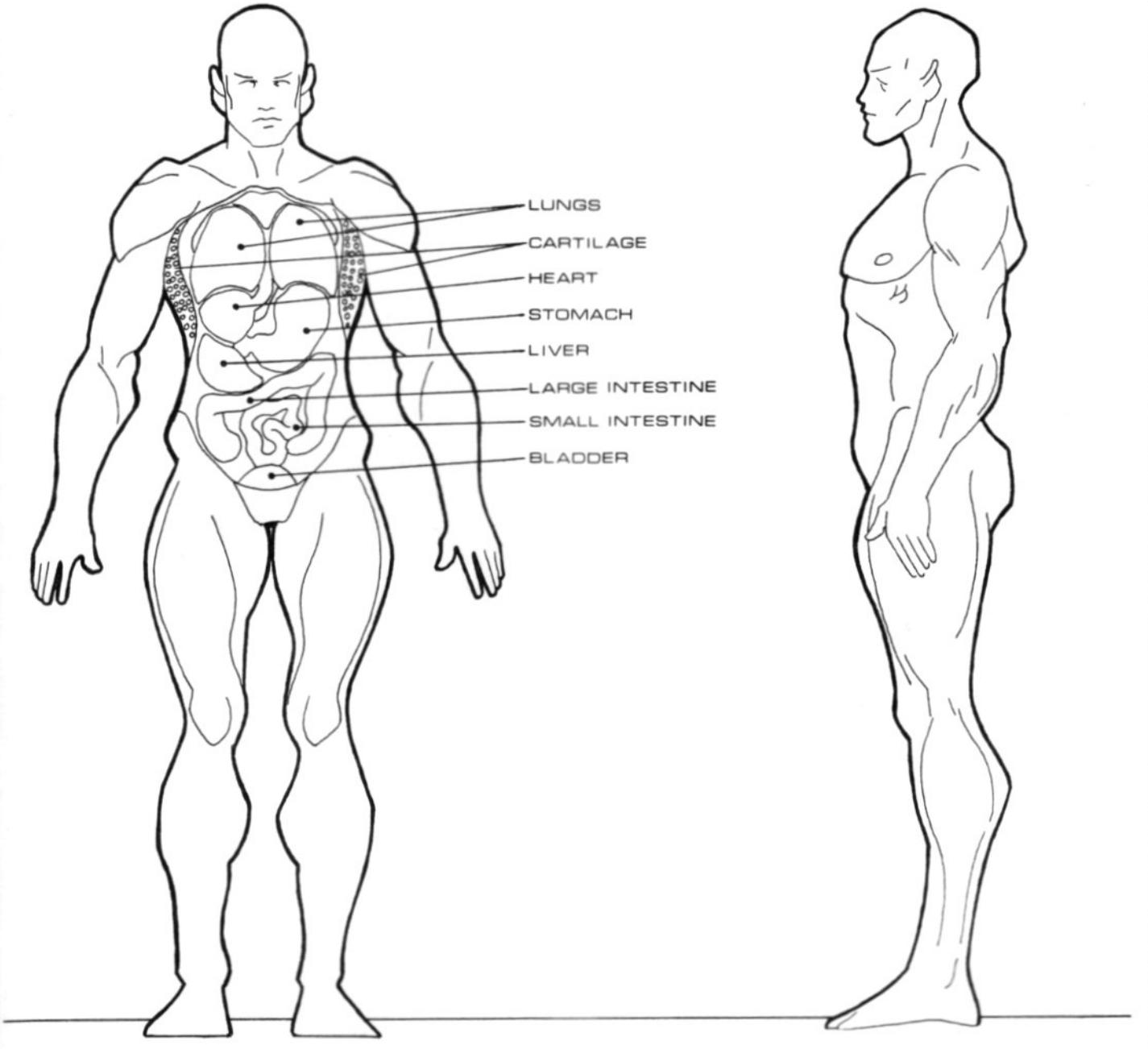
VULCAN
40 ERIDANI A

DATA:

AVERAGE HEIGHT:	(male) 2.0 meters (female) 1.7 meters
AVERAGE WEIGHT:	(male) 70 kilos (female) 50 kilos
TEMPERATURE/PULSE/RESPIRATION:	91/242/61
BLOOD PRESSURE:	80/40
LIFE EXPECTANCY:	250 years

VULCAN

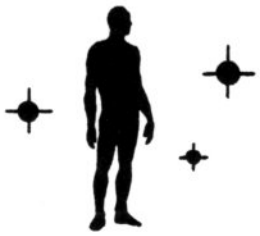
VULCANOID BIPED (HOMO ERIDANI)



ANTERIOR VIEW

LATERAL VIEW

VULCAN PHYSIOLOGY



The Vulcanoid species, comprimising almost one-third of the sentinent life forms in the United Federation of Planets (the Vulcanoid population, excluding Romulan offshoots, was estimated at 21 billion by the galactic census of stardate 5840), is of particular importance to this human-oriented reference work not only because of its obvious similarities to the Terran norm, but because of its many differences as well. Although Vulcans are humanoid, externally almost identical to humans (in itself a remarkable example of Hodgkin's Law of parallel evolutionary development), we can view human physiology in its proper context by examining the subtly different and often highly specialized Vulcan analog.

Like most humanoid bipeds, the Vulcans went through a long period where their precursors were not the dominant species on their planet. However, the most pressing problems for these pre-hominid Vulcanoids were not the flora or fauna of Vulcan, but the living conditions of that planet.

Vulcan is extremely hot and dry, with a lower oxygen content and a somewhat higher gravity than Earth. Thus, the Vulcan had to become adapted to these living conditions, not only to become Vulcan's dominant species, but for simple survival. This is not to suggest the Lamarkian explanation that form adapts to function - no, Vulcan evolution follows standard Darwinian theory. It is simply that conditions on Vulcan were more uniform and harsh than those of Earth so that Vulcans are more specialized and homogenous than Terrans.

On Earth there are diverse physical types, such as the Eskimos and Nilotics, to fit Earth's more varied climatological conditions. The Eskimos have cold weather adaptions such as small nose and ears, and subcutaneous fat deposits. The Nilotic people, in contrast, possess physical adaptions for hot weather. The Vulcans never developed seperate physical or "racial" types because Vulcan's climate and living conditions are more homogenous than Earth's. The comment that "Vulcans all look alike to me" has some basis in fact. Just as all Eskimos share a great deal of physical similarities, so do all Vulcans share a great deal of physical traits, such as:

EYES

The Vulcan eye is protected by a clear inner eyelid that filters out harmful radiation, heat, and dust, all elements present on Vulcan. The eye itself is very similar to the human eye except for its range of color differentiation for high frequency waves (the ultra-violet range) which is less acute, while night vision (low frequency waves in the infra-red range) is more acute.

EARS

The unusual shape of the Vulcan ear has been the subject of much speculation. However, in laboratory tests it was found that its special shape helps to funnel air and intensify sound in the dry, thin air of Vulcan. Thus, the Vulcan ear is, contrary to superstitious belief, not a mark of devilish ancestry, but simply a decibel amplifier.

NOSE

The Vulcan nose is very similar to the Terran nose, but not nearly as efficient an instrument of smell. It is, however, highly adapted to filtering air and passing it on to the lungs. Since 60% of taste is in the sense of smell, Vulcans have a notorious lack of taste sensation. This, however, does not hinder the Vulcan's enjoyment of food (or lack of enjoyment), as the Vulcan is strictly vegetarian.

MOUTH CAVITY

The mouth cavity of a Vulcan is almost identical to that of a human. The one essential difference is that Vulcans have only 28 teeth, as they lack one pair of back molars.

HEAD, SKULL

The Vulcans are an extremely dolecephalic (longheaded) people. Their brain case is approximately 0.2 cm thicker than that of a Terran and the bone itself is harder than the Terran skull. The male Vulcan, however, does not possess the protective supraorbital taurus (bony ridges) above the eye than Terran males often have.

The Vulcan brain is of the same overalll structure and size (1600 cc) as that of the Terran. Only in the midbrain area where telepathic and telekinetic powers originate is the Vulcan brain significantly different. The Vulcan midbrain is somewhat larger and more convoluted than the Terran midbrain, and this in part explains the psionic powers of the Vulcan people.

OVERALL BODY - SIZE AND SHAPE

Vulcans, like Nilotics and Australian aborigines, are a tall, slim people (males average 2 meters in height and 70 kilos in weight, females 1.7 meters and 50 kilos). The arms and legs are long and slim with extremely lengthy and powerful muscles attached to a medium frame. The Vulcans are high-waisted and short-bodied as a rule, and make excellent long distance runners. The size and shape of the Vulcan postulates a convergent evolutionary trend with the Nilotic and the aborigine of arid, hot, and dry lands. Thus, their body structure aids in the dispersion of heat through radiation. Concommitant with this is the lack of sweat glands in the Vulcan, as he uses blood, skin and body structure to cool himself, instead of the Terran way of heat loss through evaporation of perspiration.

SKIN

The Vulcan epidermis, unlike human outer skin, is a two-way moisture-proof shield. Not only does it act as a waterproof barrier allowing cells to live in a fluid environment even in relatively dry air, as does human skin, it also allows available environmental moisture to be extracted for use by the body. In addition, highly specialized cells in the dermis, known as hyalothermonic cells, permit more efficient body heat loss with retention of water than does human skin (because of an absence of these specialty cells). These unique skin properties, along with the absence of sweat glands, are necessary for Vulcan life, and explain the survival of the species in view of the environmental conditions of everyday life on Vulcan.

INTERNAL ORGANS

HEART AND LUNGS

The Vulcan heart beats at the astounding rate of 242 beats per minute. The average blood pressure is 80 systolic, and 40 diastolic. This phenomenon is explained in part by the extremely dilated blood vessels of Vulcans. Large diameter blood vessels are an additional aid in cooling the body, allowing for greater cooling surface.

The Vulcan heart is located where one would expect to find the Terran liver, leaving room for the somewhat larger Vulcan lung assembly. In sonsequence, the cartilage that normally protects the Terran heart extends an extra 3.5 cm downward

in a Vulcan in order to protect this vital organ.

Vulcan blood is a copper-based compund and is green in color. Copper-based life aids in the utilization of oxygen under the low atmospheric pressure, low oxygen conditions on Vulcan. Blood cells are biconvex in contrast to the concave cells of Terrans. This convex shape also aids in cooling individual blood cells, the entire bloodstream, and finally the entire Vulcan body.

Another feature of the Vulcan blood cell is its ability to take in and store large amounts of oxygen in a thin, oxygen-poor atmosphere. A Vulcan can survive for hours under water or in a non-breathable atmosphere due to his unique blood cells.

The Vulcan lung is somewhat larger in size than its human counterpart. The alveoli in the Vulcan lung are 75% more elastic (and are more efficent oxygen procurers) than those in human lungs.

The Vulcan heart is also somewhat large by Terran standards, but well within the normal range for humans. Its increased size relates to the increased work load of the heart. The only unusual or abnormal facet to the Vulcan heart is its extreme muscularity. The heart walls are thinner, but stronger and more flexible than those of the Terran heart, allowing for a greater pulse range and a greater volume of blood.

KIDNEY AND EXCRETORY FUNCTIONS

The kidney is a major part of the superior water retention system of the Vulcan, again a necessary component of life on a hot, dry world. Whereas in humans intake equals output, the Vulcan excretes only 50% of the liquid matter that the kidney processes, the other 50% is purified by the kidneys and recycled throughout the body. Vulcan urine is thus extremely rich in excreted minerals with a high specific gravity, and will kill plant life. It is also extremely thick and viscous, resembling in color and texture freshly-pumped crude oil.

Vulcan feces are dry pellets with all moisture removed. Those familiar with owl feces will quickly recognize that, as with this bird of prey, the Vulcan digestive system completely removes all moisture and nutrients from food, leaving the excrement as a dry, extremely dense, compact mass.

HORMONAL SYSTEM

The ductless glands of the Vulcan are, unlike those of the Terran, under self-control and not autonomous systems. The individual adult Vulcan can regulate the amount of adrenalin and so speed up or slow down their internal systems in response to environmental conditions. The thyroid can also be controlled to change metabolism. By stopping the flow of thyroxin and adrenalin, the Vulcan can go into a state of suspended animation, very much like the trance state of the Indian Fakir. During this state of suspended animation the Vulcan can command bodily resources (blood, lymph, etc.) to repair damage. Thus, the Vulcan can control bodily functions that are considered autonomous by Terrans.

REPRODUCTION

The one gland system that the Vulcan cannot completely control is that of reproduction. The female Vulcan, like other humanoid females, is always capable of being impregnated by the male. The male, however, is only capable of sex approximately once in seven years. This "seven-year itch" is one of the central facts of Vulcan existence. In the prehistoric phase of Vulcan, men fought to the death regularly for the right to mate with females. This kept the population down, and hindered the growth of Vulcan society (as men would not cooperate with others who could soon be their deadly enemies). When the Vulcans decided to outlaw all emotion, they realized that they must first lessen the deadly lust males experi-

enced before mating. At first, each male was forced to control this urge by sublimating and repressing the physical symptoms. But once every seven years, the urge to mate becomes so overwhelming that the Vulcan male must do so or die. At this time the ritualized Pon Farr ceremony is conducted, usually a happy occasion for all concerned. However, when a challenge is issued, the Vulcan male will kill as savagely as any creature in the universe.

The Vulcan is thus a specialized type of humanoid, perfectly suited to living on his home planet. Like Terrans, however, the Vulcan can adapt to live in different environments than that of Vulcan.

BRAIN
DEVELOPMENT



HUMAN



ANDORIAN



KLINGON



GORN

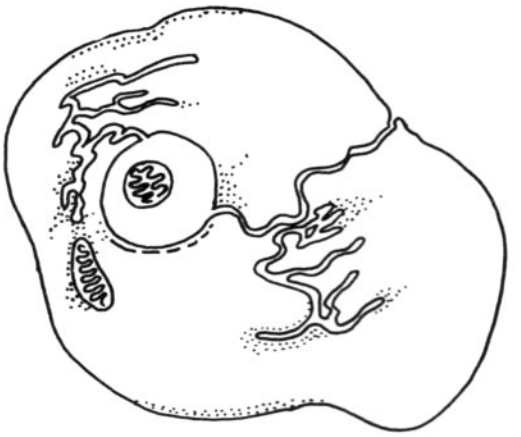


TELLARITE



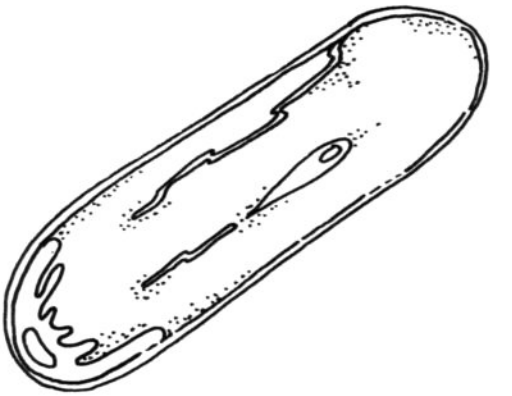
VULCAN

CELL STRUCTURE



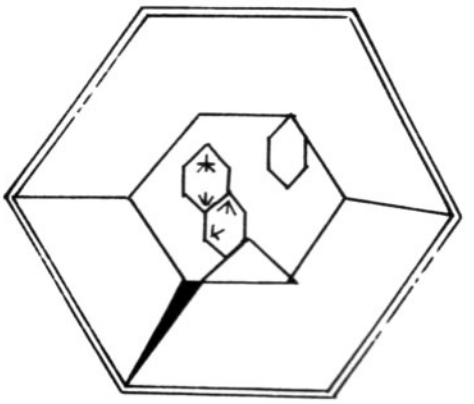
HUMANOID

The basic cell structure found in all humanoids. It contains a centralized nucleus and nucleolus, endoplasmic reticulum (channels), mitochondria and ribosomes.



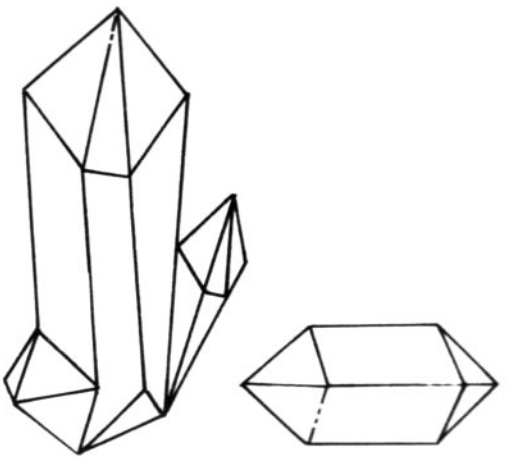
M113 CREATURE

The animal cell of the extinct inhabitants of Planet M113. Note the cell wall and placement of the nucleus near the extremity.



THOLIAN

The crystaloid structure of Tholians. The cell's biological function resemble those of humanoid cells, but each cell nucleus contains an electrical charge.



HORTA

Mineral crystals are the basic building blocks of the Horta.



INTELLIGENT ALIENS

A good physician does not work "by the clock" but holds himself ready at all hours to give any help that is needed. To him all intelligent life needing his services are patients, whether they be human, humanoid, or otherwise. No personal feeling or prejudice should influence his dealings with a patient. In deciding which patients should be attended to first, and which should get the greatest amount of attention, no factors should be considered except the comparative seriousness of each patient's illness and other professional factors associated with the illnesses or injuries confronting him.

THE STARSHIP'S MEDICINE CHEST AND FIRST AID IN SPACE
PUBLISHED 2257

CARBON-CYCLE LIFE FORM

EXCALBIA

Little is known about the chemical nature of the inhabitants of Excalbia. On the evolutionary scale, they are a step below the advanced energy beings of Organia or Thasus (q.v.), having the ability to metamorphose their own bodies. Excalbians normally exist as "living rock", without any apparent organs, but as a mobile mass of lava-like cytoplasm that maintains a constant weight. These beings draw minerals at will from within themselves to form such useful extremities as quartz lenses for seeing or calcium claws for crushing, their anatomical repertoire being virtually boundless. It is known that they prefer to take a shape approximating their anatomy as it was in ancient times, before they acquired their transmutative qualities.

(A) QUARTZ LENS

(B) IGNEOUS DERMA

(C) VENTRICLE

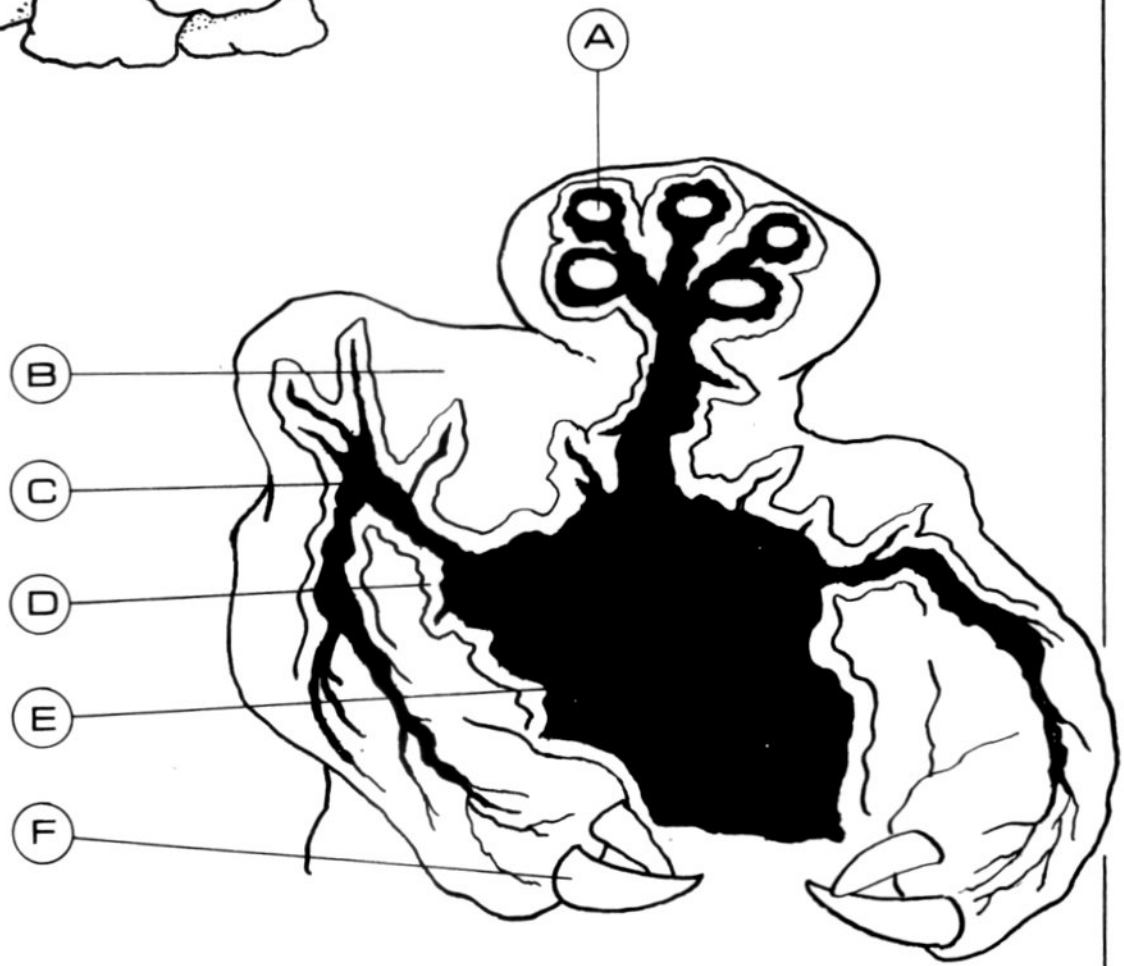
(D) MESOGLEA

(E) CYTOPLASMIC MAGMA

(F) CALCIUM CHELE

EXCALBIA HOMINIDAE





HORTA

JANUS VI

An example of intelligent silicon-based life, the horta moves through solid rock like humanoids move through the air. It secretes a powerful body acid which dissolves the surrounding silica rock, and lives in the tunnels it creates much as does the Terran mole. Hortas are not toolmakers, nor do they posess any sort of conventional technology. Their society is based on the telling and retelling of their history in the form of myths and legends passed on by direct communication. Interestingly, horta generations die out almost completely every sixty thousand years, with the exception of one "mother" which renews the entire race by laying thousands of eggs resembling silicon nodules. The horta's internal structure is similar to that of a geode. At its center lies a molten mass where the eggs develop after having seperated from the block of genetic material that serves as the ovary. Also located at the center is the brain, which is kept at a superheated temperature by the encompassing fluid. Thin veins of flowing magma radiate from the brain and form concentric circles of nervous tissue in the horta's plastic-like mesos, or middle layer.

(A) NERVOUS SYSTEM

(B) CENTRAL NERVOUS SYSTEM

(C) MESOS

(D) CUTIS

(E) ACID JETS

(F) MAGMA DUCT

(G) PROTOS MUSCULUS

(H) FLEXIBLE MANTLE

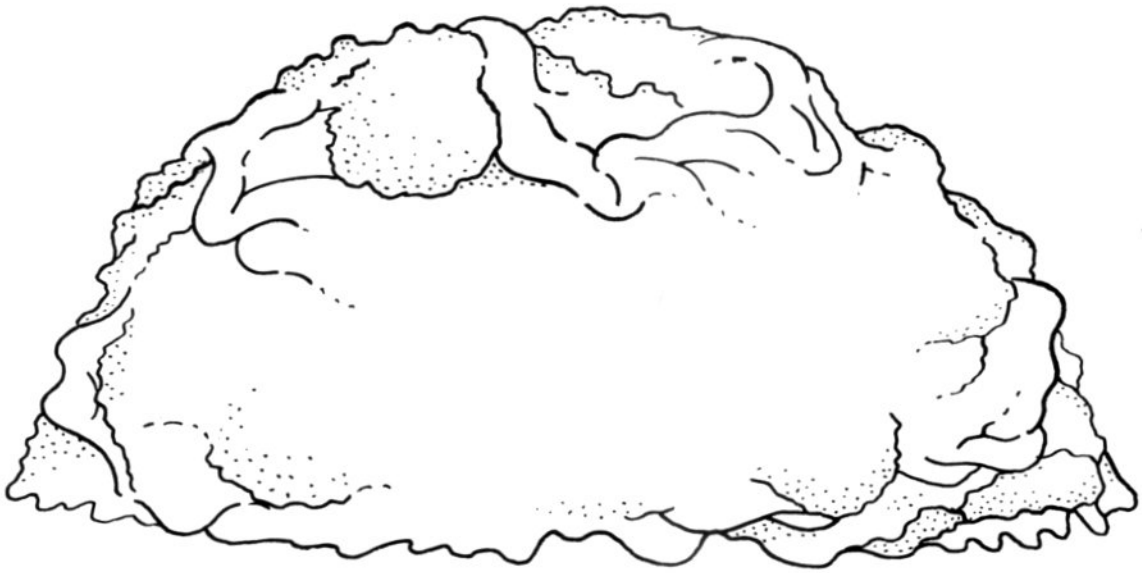
(I) OVARY

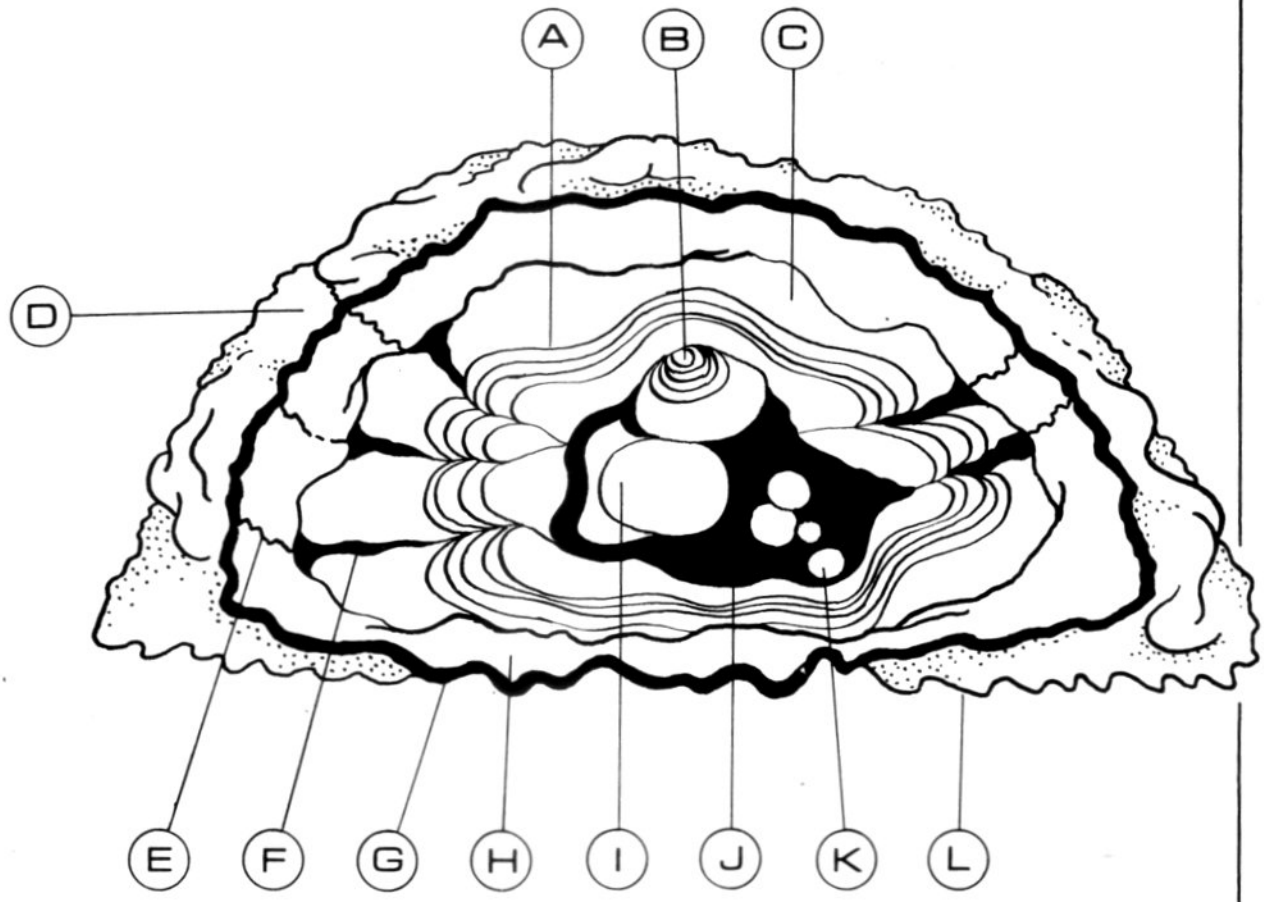
(J) ATRIUM

(K) OVUM

(L) SHAG

JANUS HOMINIDAE





ORNITHOID ALIEN

PYRIS VII

These intelligent aliens fall under the classification of vita xenos, which includes all intelligent life outside our galaxy (very few species of which have been discovered - see also BLASTONEURON, KELVAN). Only the information hastily collected by tricorder is available on the specimens discussed here. The general anatomy suggests no fundamental difference in the structural development of life in other galaxies, as it is comparable to many forms of commonly known life. The particulars are as follows: vita xenos (as encountered on Pyris VII) hail from a cold, dry planet with a gravity approximately one sixth that of Earth and low atmospheric pressure. Strawlike mouths and a simple digestive tract indicate liquids as their primary source of nourishment. Sensory apparatus includes light receptors (eyes) coupled with concave reflectors that capture and focus images. Since this creature is an advanced toolmaker, capable of space travel, its clawlike limbs cannot provide the only source of manual dexterity. Use of its proboscis is therefore suggested.

(A) OPTIKOS

(B) REFLECTOR

(C) GULLET

(D) BRAIN

(E) PULMOS

(F) MATRIX GLAND

(G) PROBOSCIS

(H) HEART

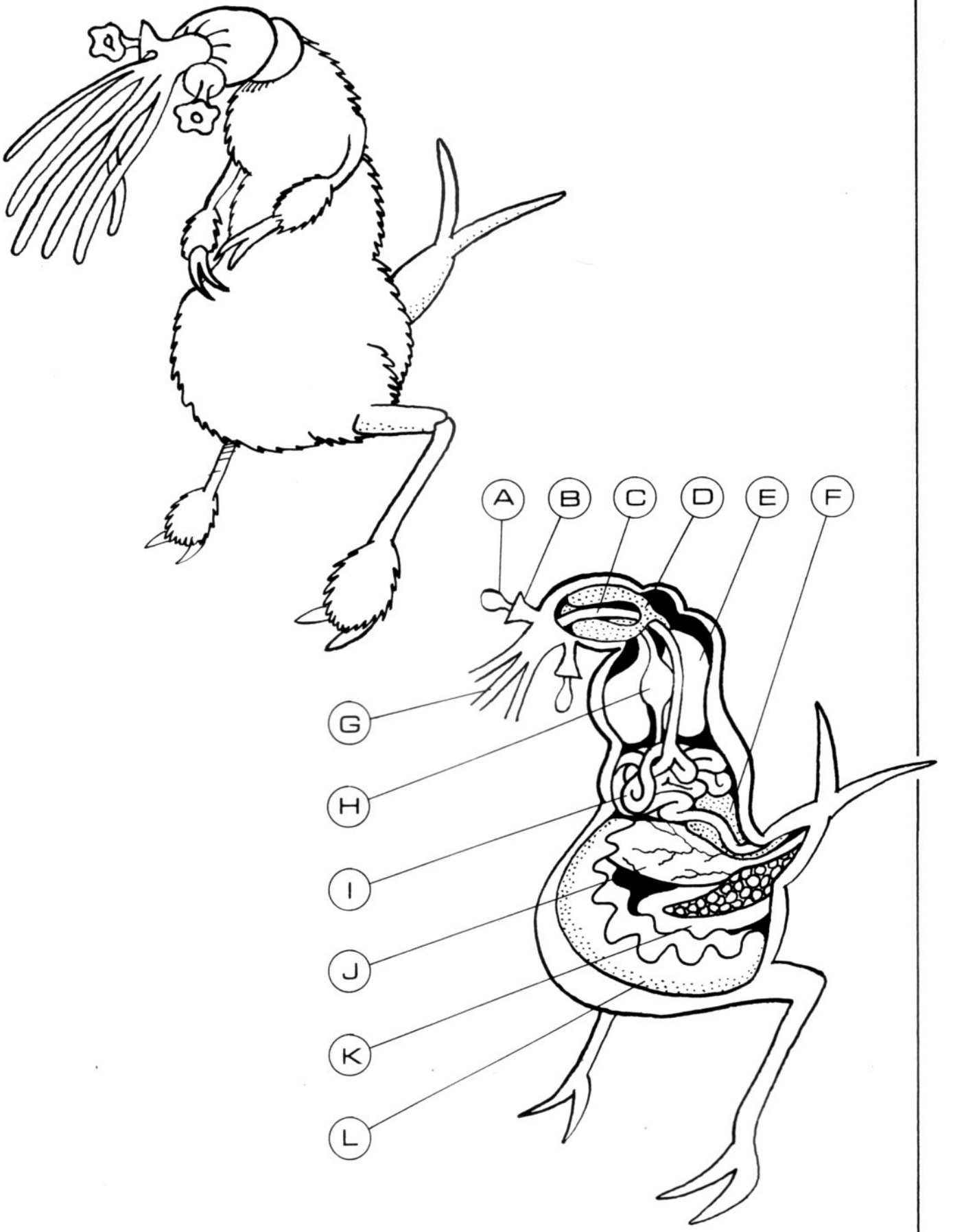
(I) VISCERA

(J) NEPHROS

(K) OVARY

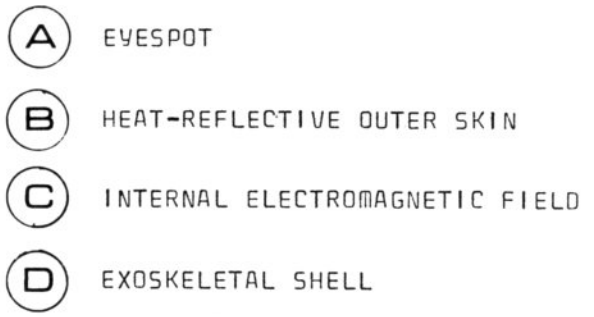
(L) CROP

VITA XENOS

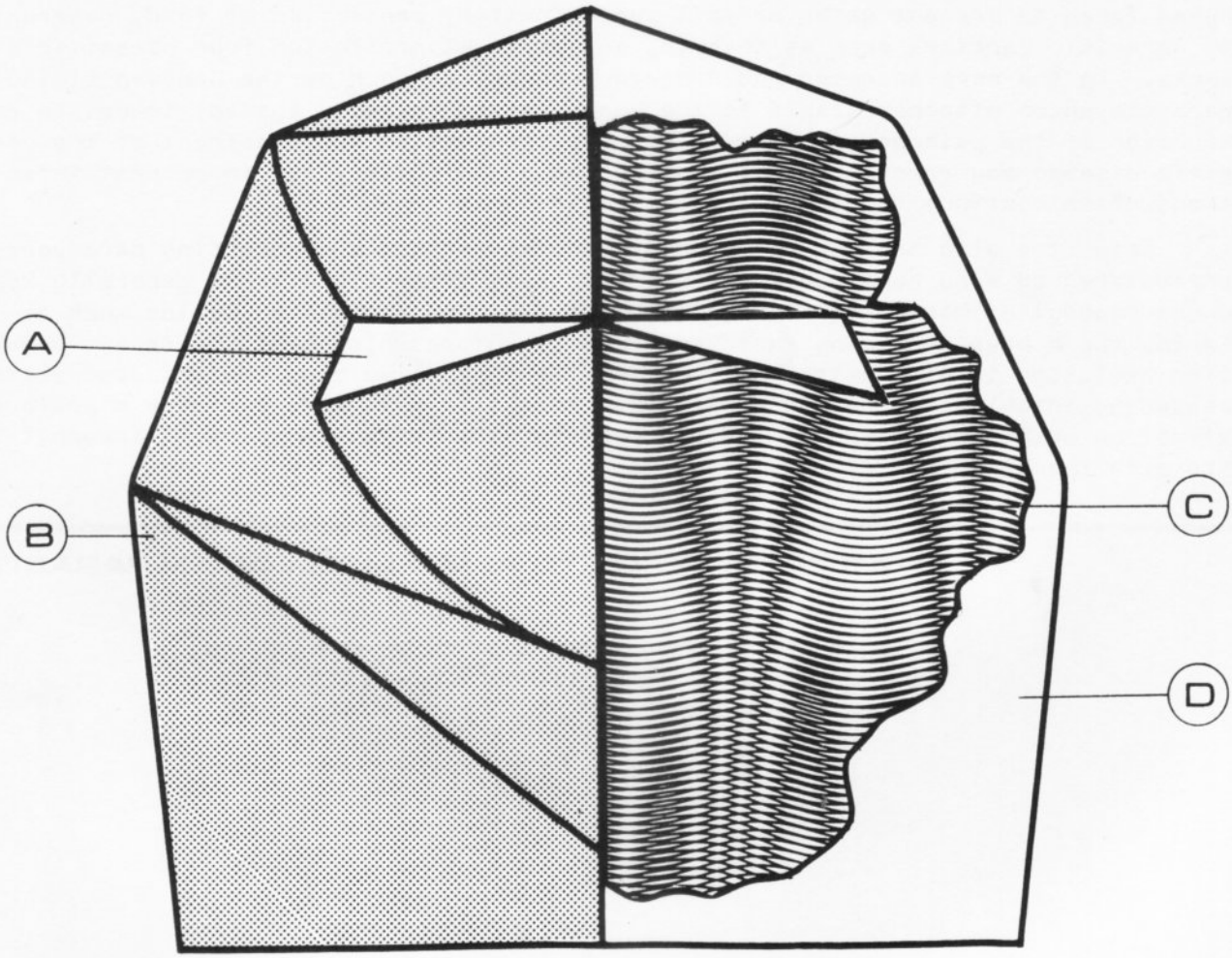


THOLIAN
THOLIA

Tholians are anaerobic, with an average body temperature of 275° Centigrade. The cool, oxygen-based environment of humanoids is unfit for Tholian life, low temperatures threatening to crack a Tholian's crystalline husk, so it is unlikely that humans will be able to come into direct contact with them for medical and investigative purposes. Inhabitants of a small, dense, hot planet, the Tholians are members of a hive culture and possess a hive mind. Each individual member, while retaining a seperate identity, is a highly-specialized creature unable to effectively adapt to radically changing conditions experienced outside the home colony. At present, only specifics on the anatomy of the Warrior class are available, although it is known that other types or castes of Tholians exist. The Tholian soldier appears to have no appendages, and has perhaps adapted itself to work in conjunction with the controls of their defensive space cruisers.



THOLIAN
WARRIOR CASTE

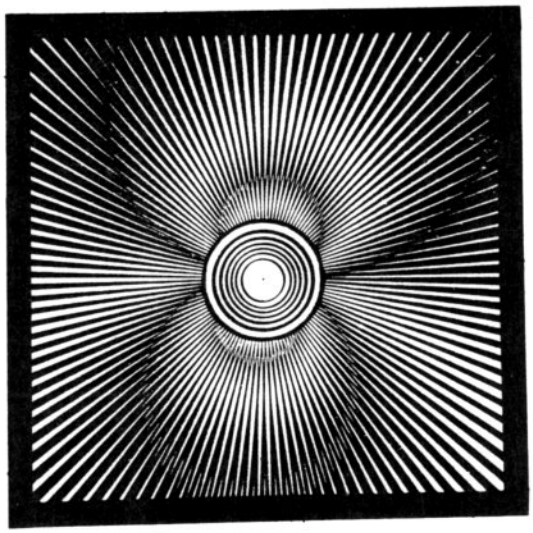


EXTERIOR INTERIOR

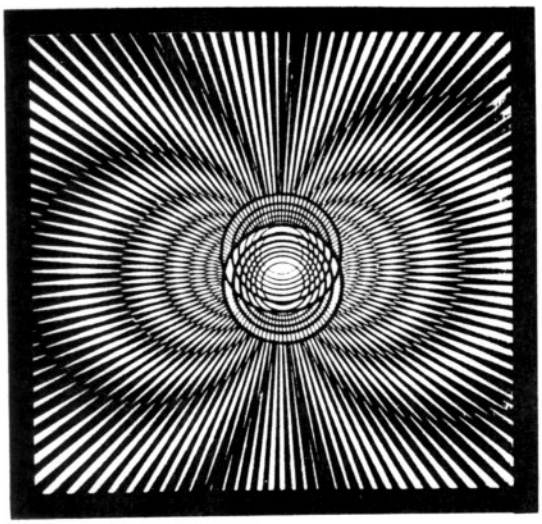
MEDUSAN
XI HYDRAE V

The radioactive nature of the Medusan, a non-corporeal being, best suits it for study by the Hutchinson Radiation Analysis (a graphic representation of any energy source, in this case the life aura of the Medusan which is strongest in the high ultraviolet range, the HRA is a standard readout on most sensor-equipped instruments appearing as a flunctuating moiré pattern). Cases of insanity have been reported when humanoids come into direct contact with Medusans: the synapses of the human brain and the optic nerve are the two organs most notably affected. Humans may complain of a mild apprehension and/or revulsion after exposure to the Medusan, and in the event of close proximity, especially with eye contact, the subject may become incoherent, hysterical, and even violent. Immediate sedation is recommended, followed by hypnotic or telepathic therapy. However, if these methods are not available the patient must undergo more extensive conventional psychiatric treatment. Medusans must be confined to specially shielded containers when among humanoids, and direct communication can be achieved with them only through telepathic channels.

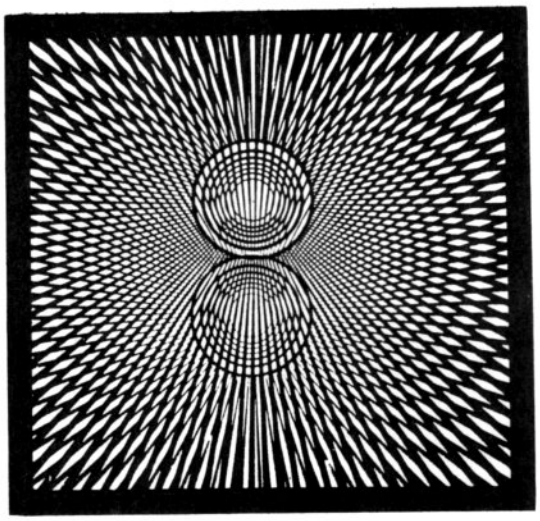
MEDUSAN
HUTCHINSON RADIATION ANALYSIS (LIFE AURA)



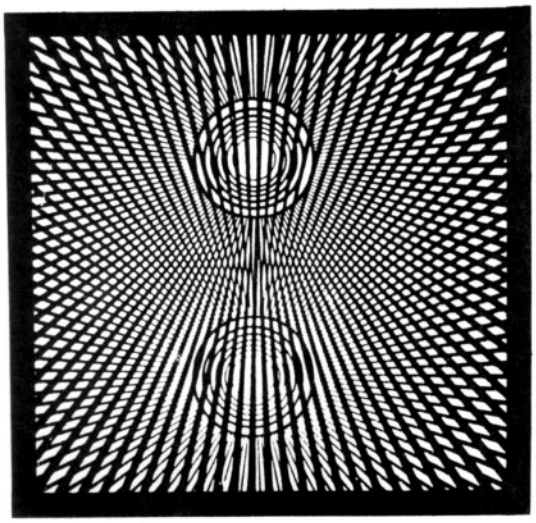
103.2 Å



105.7 Å



109.1 Å



112.0 Å



PARASITES

Organisms that maintain a residence in the bodies of others and derive their nutrients at the expense of their hosts are considered to be parasites. Any organism that cannot survive on dead matter but must have a living host is referred to as an obligate parasite, and organisms that can perform so few functions for themselves that they can survive only within living host cells are known as obligate intracellular parasites. When parasitic organisms damage their hosts sufficiently to disrupt normal functions and cause illness or death, they are said to be pathogens (disease-producing organisms).

The control of parasitic diseases is based upon a knowledge of their life cycles, so that their routes of transfer can be interrupted. Several suggested ways of controlling the spread of simple parasitic infections are by disposal of human feces to prevent water or soil contamination, protection of food, destruction of parasitic carriers such as insects, and personal protection from parasitic attacks. In the more advanced and dangerous parasites such as the Denevan flying parasite which attaches itself to the human central nervous system, immediate destruction of the pathogen is necessary. The recognition and treatment of the parasitic disease may remove some of the sources of infection, but inapparent infections often continue to be disease reservoirs.

Parasites also include the crop-destroying pests and man-hunting carnivores encountered on many human worlds. Although such parasitic life is generally kept under control on modern agricultural planets and industrialized worlds such as Earth, there have been many incidents of pest outbreak (such as the rabbit population explosion in old Australia, the k'nurt blight on Vulcan, and the destruction caused by tribbles on Sherman's Planet). Parasitic outbreaks can have a profound effect on primitive cultures, largely because of an offworld species' incompatability with the planet's ecology.

DENEBIAN SLIME DEVIL

DENEB IV

The planet Deneb IV harbors the carniverous slime devil, an amphibious, fast-moving predator that resides in the swampy seas that cover most of this hot, humid planet. The slime devil usually feeds on Deneb's bountiful stock of native fish life, spearing its prey with forklike foreclaws; but virtually all manner of creatures, including man, have fallen victim to this incredible voracious hunter. Denebia carnivora ranges in size from a few inches to several feet long, and uses a form of natural radar to locate its victims. Long, snorkle-like extensions on its head are used for breathing while partially submerged. The creature's demonic reputation stems from its blank, eyeless head and fang-encrusted grin, as well as a mindless, relentless instinct causing it to attack any life form, even those many times its size.

(A) GONAD

(B) NOTOCHORD

(C) PNEUMATOS

(D) FLOTATION BLADDER

(E) SNORKLE

(F) SIPHON

(G) SKELETOS

(H) AORTA

(I) HEART

(J) PULMONARY

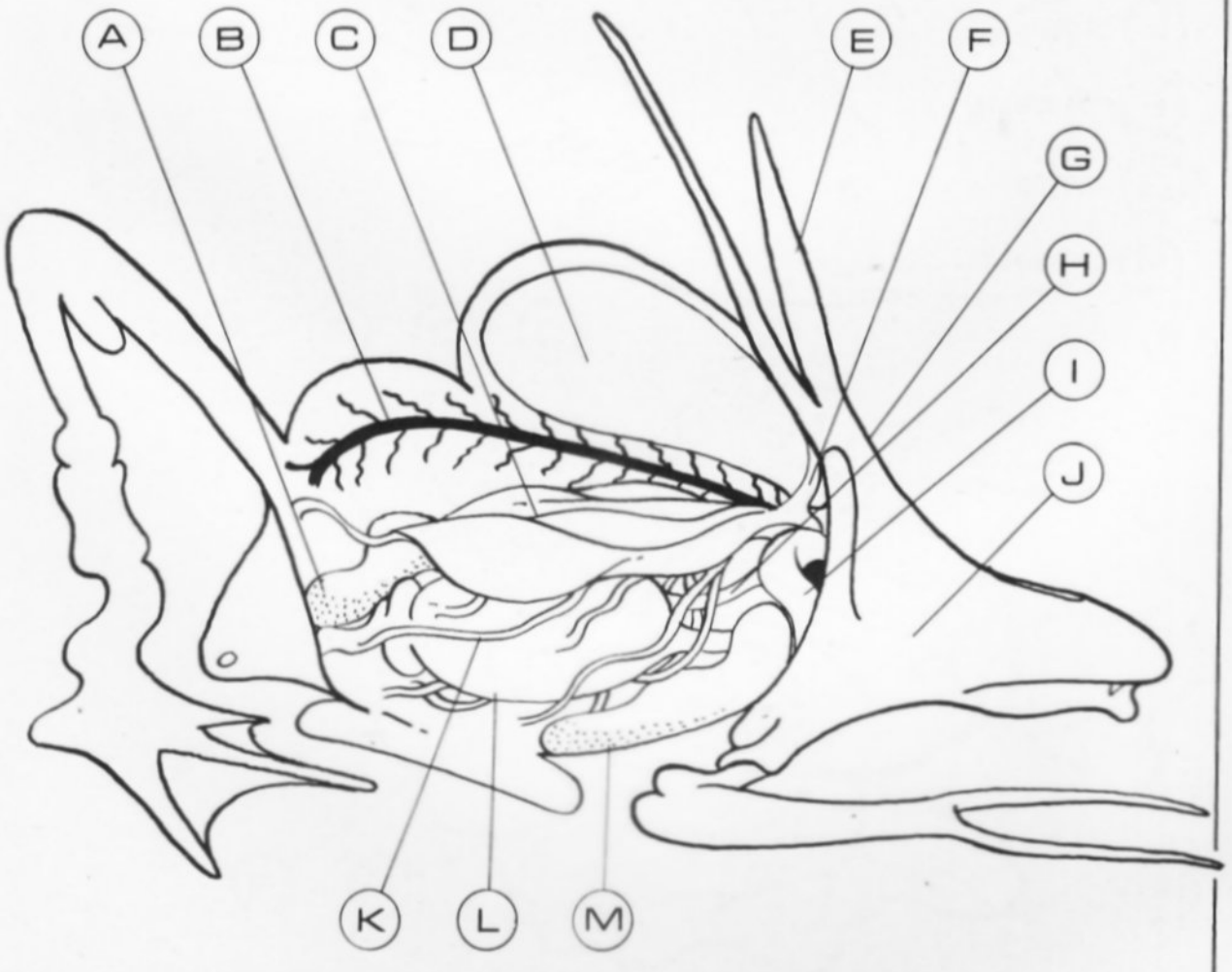
(K) SKULL

(L) STOMACH

(M) LIVER

DENEBIA CARNIVORA





FLYING PARASITE

LARGE MAGELLANIC CLOUD?

Each individual blastoneuron is a single cell of a gigantic collective organism - aside from minor differences in shape and size, blastoneurons contain all of the elements of a lone brain cell: a mass of dendrites, which collect nerve impulses; a cyton, which contains the cell nucleus; and an axon, which transmits the impulses to, in this case, the parasitic host. The parasitic cell's axon is embedded in a horny, knifelike tooth which penetrates the victim's skinn and contacts the spine, causing great pain and transmitting the cell's impulses directly into the victim's nervous system. A large, single lung allows the cell to attach itself to objects by suction. The cell's ability to fly is purely psychokinetic.

(A) CYTOPLASM

(B) TOOTH

(C) LABIA EPIGLOTTIS

(D) AXON

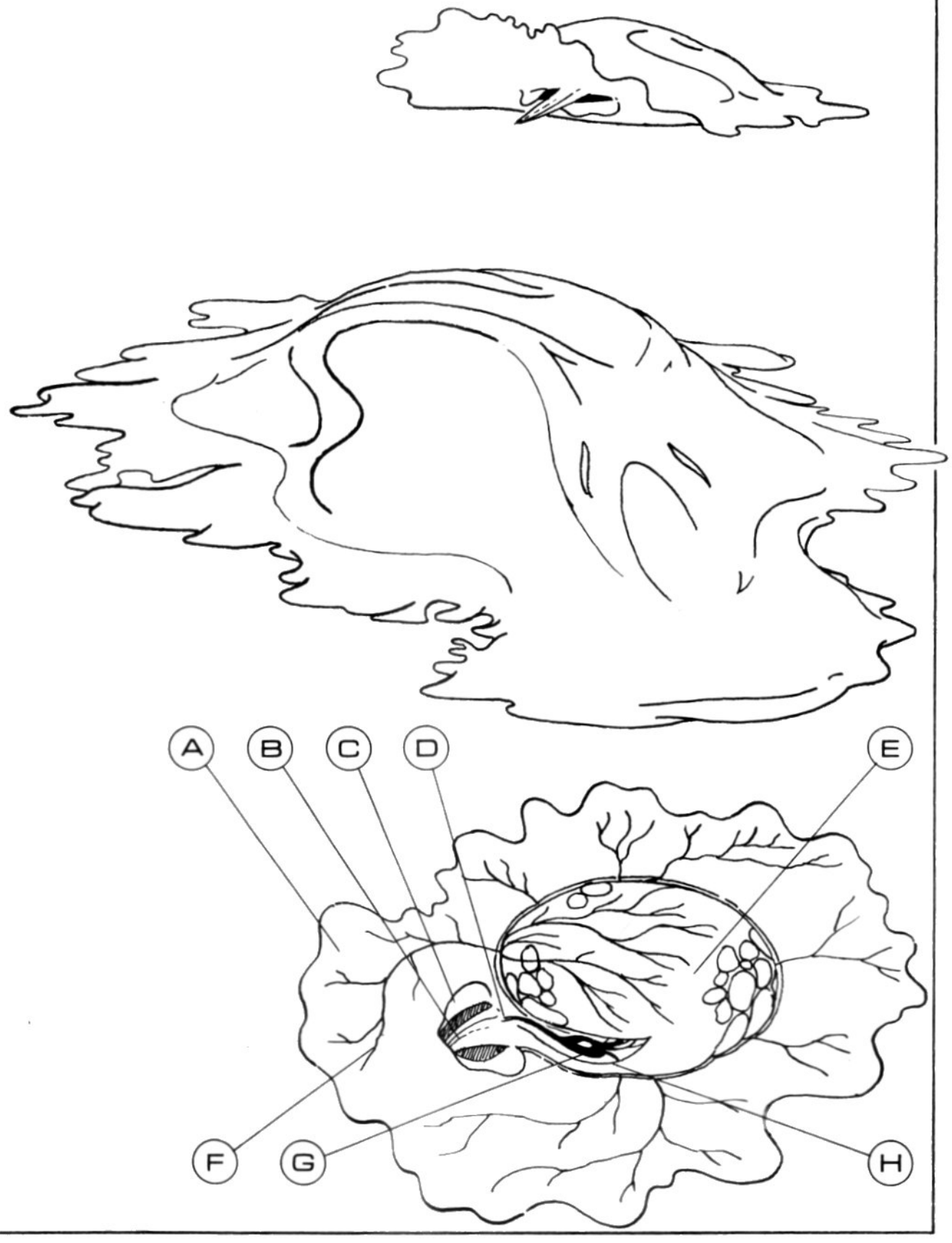
(E) LUNG

(F) DENDRITE

(G) CYTON

(H) TREACHEA

BLASTONEURON



REGULAN BLOODWORM

REGULUS II

The Regulan bloodworm is soft and shapeless, with its circulatory system clearly visible through its whitish, translucent skin. As a protective body insulating against sun and heat, it regurgitates a sticky mucus which emits an extremely powerful and unpleasant odor. Swarming by the thousands in shady cracks and crevasses, the bloodworms, like the Terran leech, attach themselves to their hosts through the use of four mouths located at the ends of mobile tentacles. The smaller variety may be swallowed in drinking water, but because they are aerobic they can survive only if they fasten themselves to the inside of the host's mouth or esophagus.

(A) GULLET

(B) BRAIN

(C) HEART

(D) TENTACLE

(E) ECTODERM

(F) DORSAL BLOOD VESSEL

(G) NOTOCHORD

(H) STOMACH

(I) BODY CAVITY

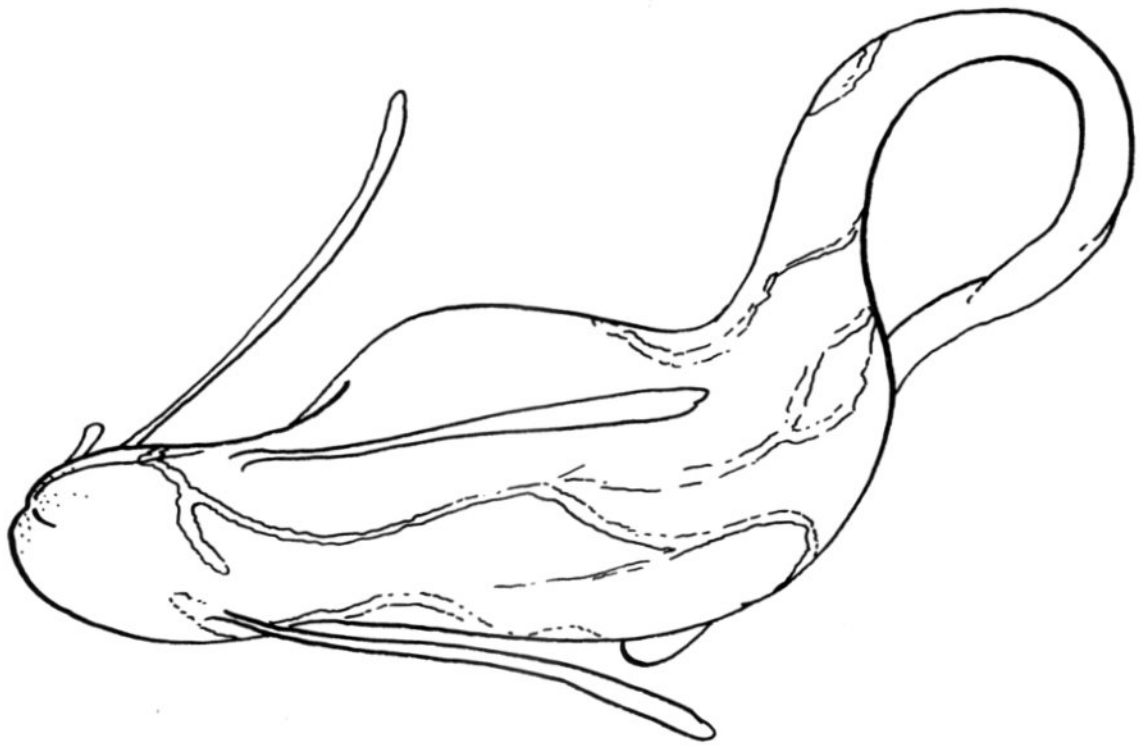
(J) TESTES

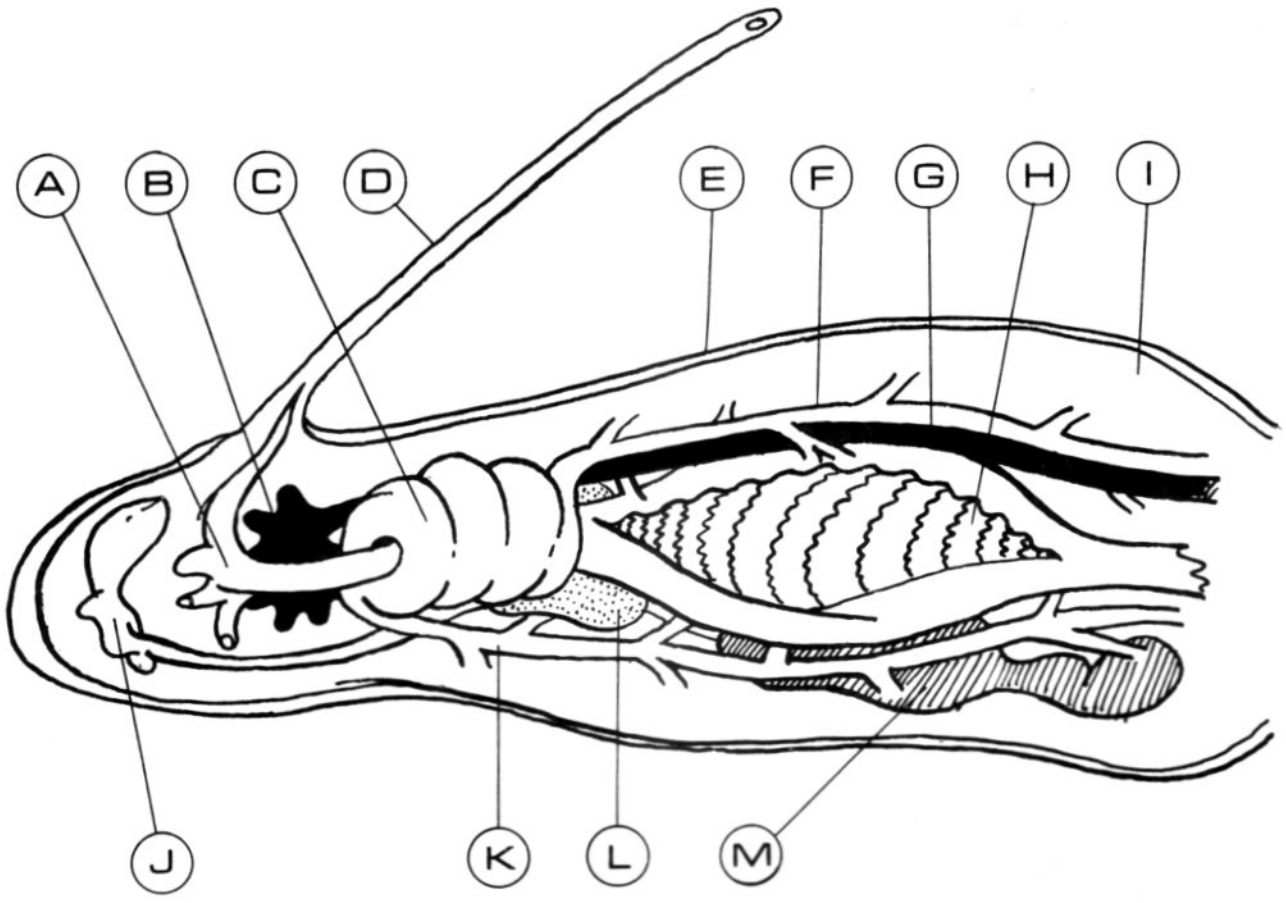
(K) VENTRAL BLOOD VESSEL

(L) GIZZARD

(M) EGG SAC

REGULANI VERMIS





TRIBBLE

IOTA GEMINORUM IV

A polygeminus grex (or tribble) is able to multiply at will, and in fact ninety percent of its metabolism is geared to reproduction. The tribble is a furry monopod and a parasite in that it is able to consume many times its own body weight in food grains each day, a trait that, in combination with its prolific nature, makes it a danger where cereal crops are a commodity. Tribbles thrive, however, wherever humans reside and sometimes form symbiotic relationships, their purring producing a soothing effect on humans. The tribble has a keen sense of smell and is able to distinguish between various species and individuals by scent. Its tiny brain (which is located directly next to the stomach) is connected by thick ganglion to knots of nerve endings surrounding the nostrils, which are extremely sensitive.

(A) GANGLION

(B) EPIDERMIS

(C) SPIRACULUM

(D) UTERUS

(E) LUNG

(F) BRAIN

(G) HEART

(H) KIDNEY

(I) MOUTH

(J) ESOPHAGUS

(K) LIVER

(L) STOMACH

(M) INTESTINES

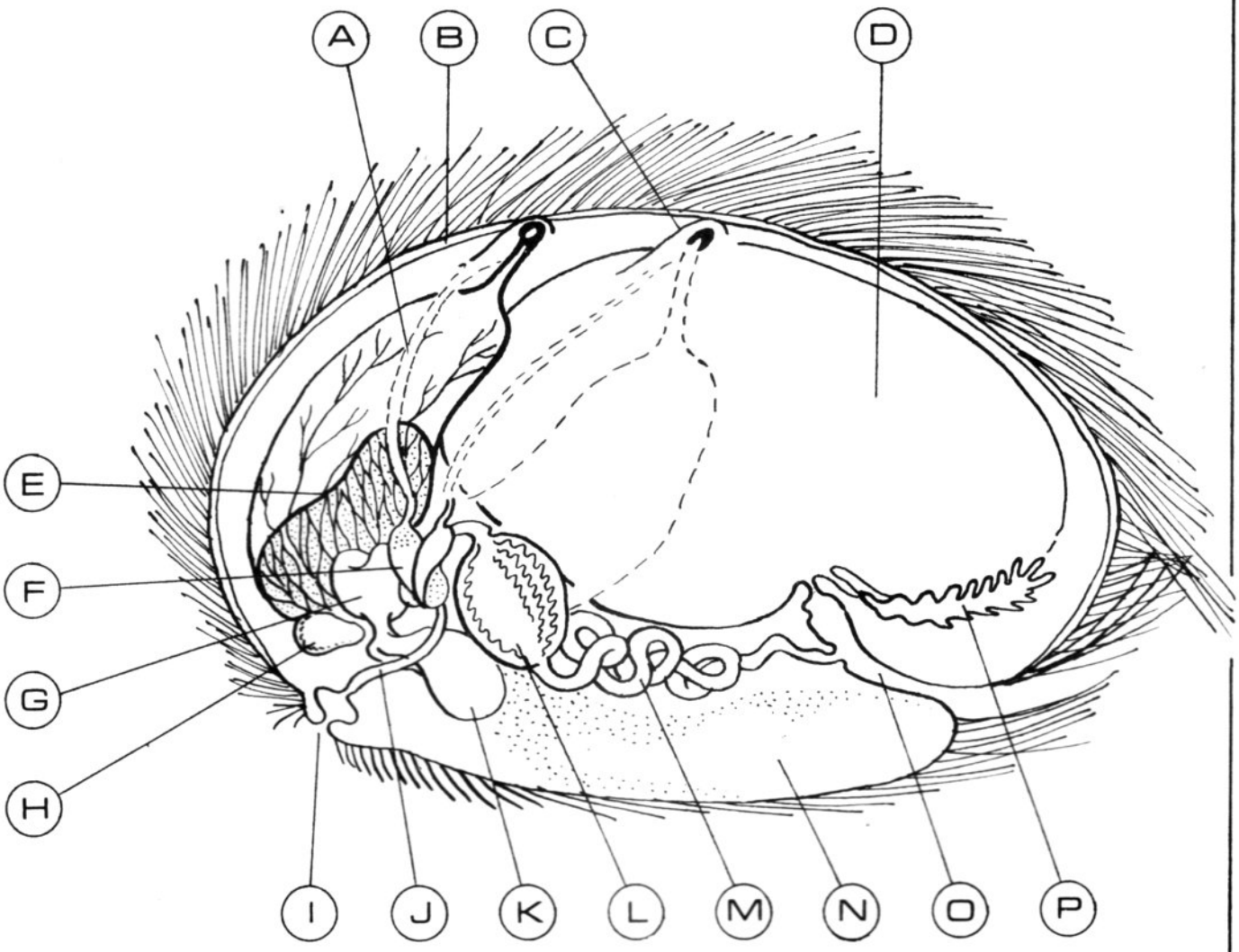
(N) PEDICULUS

(O) CLOACA

(P) GONAD

POLYGEMINUS GREX







PLANTS

In the past, plants were among the chief sources of crude medications on many planets - the leaves, roots, seeds and other parts of many plants may be dried or otherwise processed for medical use. Their therapeutic effects are the result of chemical agents contained in these simple preparations. Examples of pharmacologically-active compounds found in plants are: alkaloids, compounds composed of carbon, hydrogen, nitrogen and oxygen, commonly white crystalline solids; glycosides, active principles that, upon hydrolysis, yield a carbohydrate and another organic compound such as an acid or alcohol; gums, exudates from plants, usually polysaccharides; resins, crude drugs and oils, liquids characterized by their solubility in water and high viscosity.

Although plants can be helpful in promoting healing and good health, they can be toxic as well. The berries of the familiar borgia plant are highly toxic, and if ingested the victim will experience a swift death unless treated immediately. In other cases, plants may be helpful in some ways but harmful in others: the spore plant of Omicron Ceti promotes perfect health, but its side effects include a feeling of well-being to an extent where extreme apathy and lack of ambition take over normal mental processes.

'BEAUREGARD'

ZETA RETICULI A

This unique species is often mistaken for an animal because of its rudimentary nervous system and its ability to move rapidly. A carniverous plant, its "fingers" are camouflaged by a lacelike fringe that resembles a pink flower when the fingers are closed together. On the back of each finger are sensory organs called spines that alert the plant to the movements of insects which are instantly seized and swallowed. Large batlike creatures native to Zeta Reticuli, as well as some ground-traveling animals, can be wrestled into the mouths of the larger plants. Terrestrius manus protects itself from its natural enemies by retreating into its woody trunk - expanding cells in the body of the plant give it the power to raise and lower itself from the trunk interior. The thick roots collect water to fill the underground reservoirs (expansion sacs), and also enclose the plant's reproductive system. Although lacking a brain, it is capable of communicating with others of its kind by producing a chirping sound, usually an alert to danger, by forcing air through a voice box located in the upper digestive tract. The common name of the plant, "beauregard", was suggested by Yeoman Janice Rand (Stardate 1513.1)

(A) PETAL

(B) PALPARES

(C) DENDRITES

(D) SPINES

(E) STOMA

(F) PHARYNX

(G) SUPPORT ROOT

(H) RESERVOIR

(I) RHIZOMES

(J) DIGESTIVE TRACT

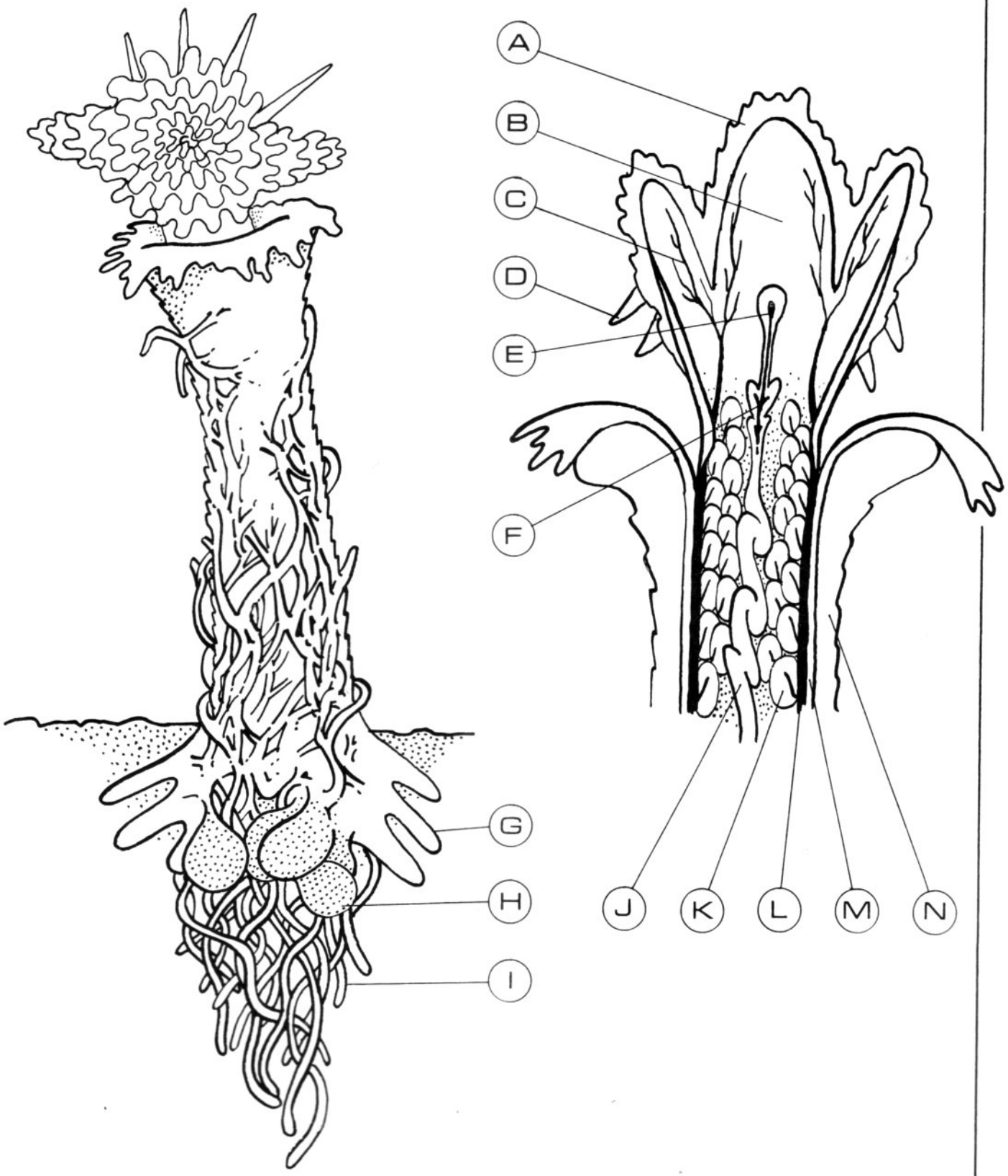
(K) EXPANSION CELLS

(L) GANGLION

(M) FATTY FIBROUS LAYER

(N) CORTEX

TERRESTRIUS MANUS



BORGIA PLANT

PLANET M113

The borgia plant is an example of one of dozens of Earth-type fruit-bearing shrubs that have survived relocation to other worlds and still remain virtually unchanged by the evolutionary processes. Its berries are highly poisonous to most humanoid and animal life, and are extensively utilized by farming worlds to control crop-destroying pests, including insects. In humans, red blotches on the skin and delirium are typical when the fruit is ingested, and unless immediate treatment is available, death. The borgia plant is similar to the nightshade family, and can be recognized by its tiny, yellow-white, three-petaled flowers. Primitive societies use the juice of the berry in a diluted form as an anti-infectant, usually in the form of a salve; fermentation produces an extremely potent liqueur.

(A) FILAMENT

(B) ANTHER

(C) PETAL

(D) OVULE

(E) OVARY

(F) STEM

(G) SEPAL

(H) STIGMA

(I) CALYX

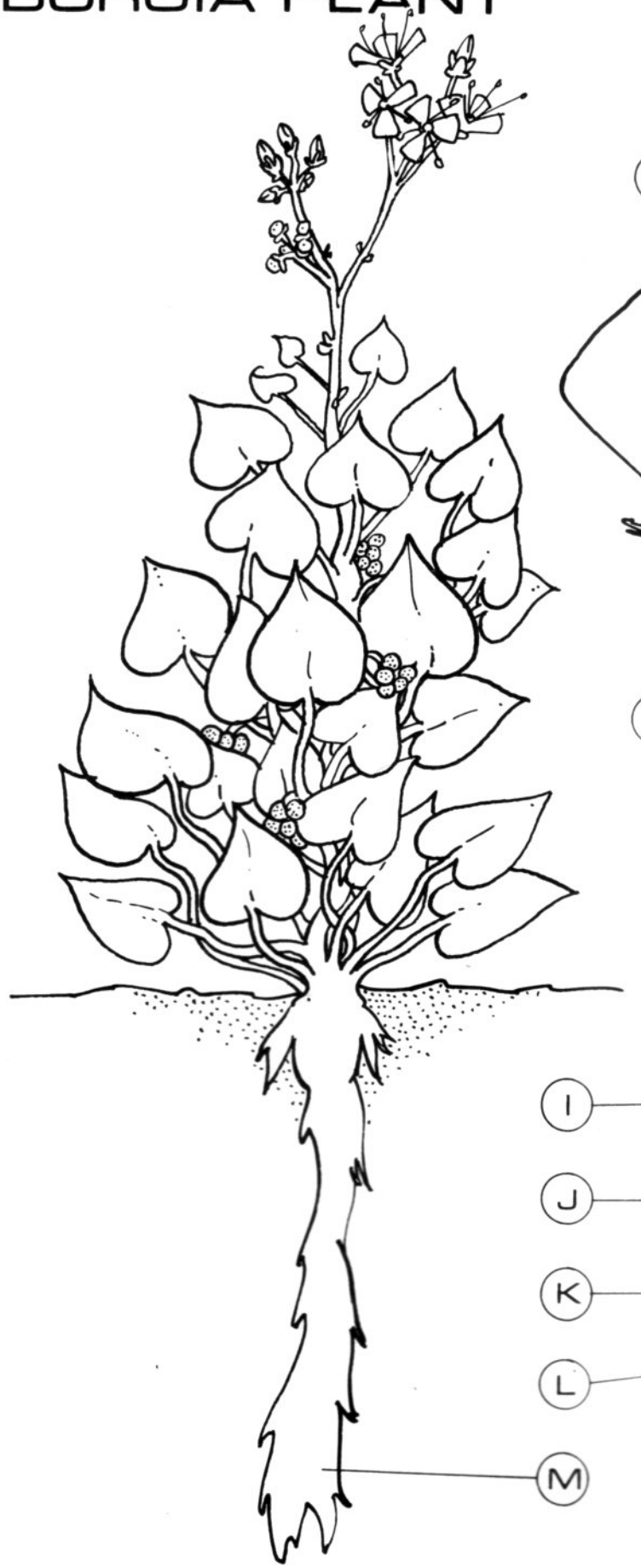
(J) SKIN

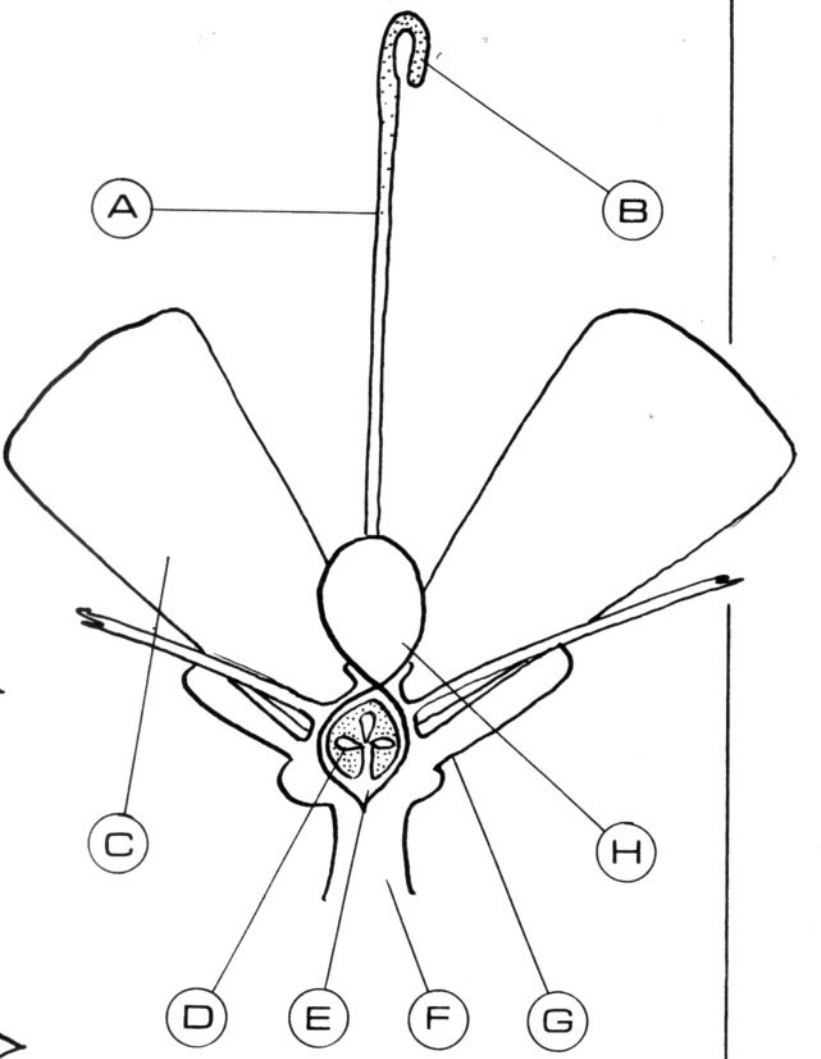
(K) PULP

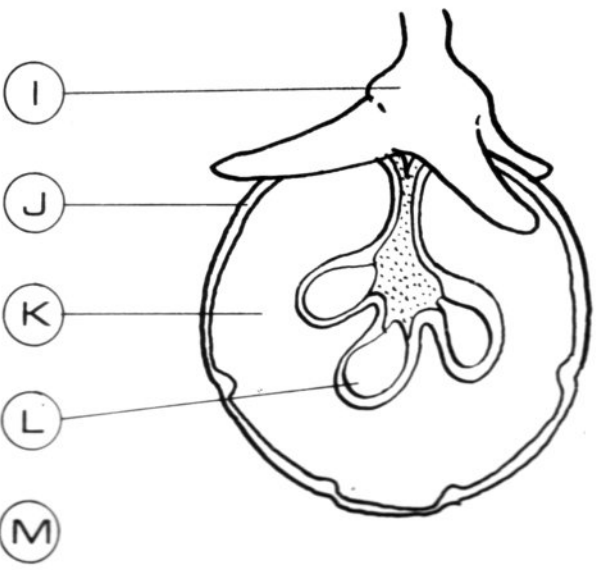
(L) SEED

(M) TAP ROOT

BORGIA PLANT







MAKO ROOT

NEURAL

The young mako root plant consists only of shallow roots, a tightly-packed leaf cluster at its base, and a hairy stem which contains at the tip a tiny seed sheath. This species does not flower, and does not have male and female counterparts, instead depending upon the formation of a mako root (or tuber) for its seed production. Only one large seed is generated by the root during each growing season, and in order to insure germination the tuber becomes heavily laden with foodstuffs including a rich vitamin content which makes it a principal part of the diet of planet Neural's giant mugato. Mako seeds are often dispersed in the droppings of the mugato. In remote areas, colonies of mako growth can cover large areas (their tangled stems creating an impassable mass of thorns), but it is only the newly-formed mako tubers that are useful in medicine. At this time, the root displays the characteristic writhing movements designed to implant into the soil the seed sheath which is located at the head of the tuber. Much superstition surrounds the healing powers of the mako root, although it is primarily the skills of the local "medicine men" or kanutu people from which any miracle cure originates.

(A) NEW PLANT

(B) TUBER

(C) SHEATH

(D) STOLON

(E) FIBROUS ROOTS

(F) LEAF BLADE

(G) EPICARP (SKIN)

(H) PEDICEL

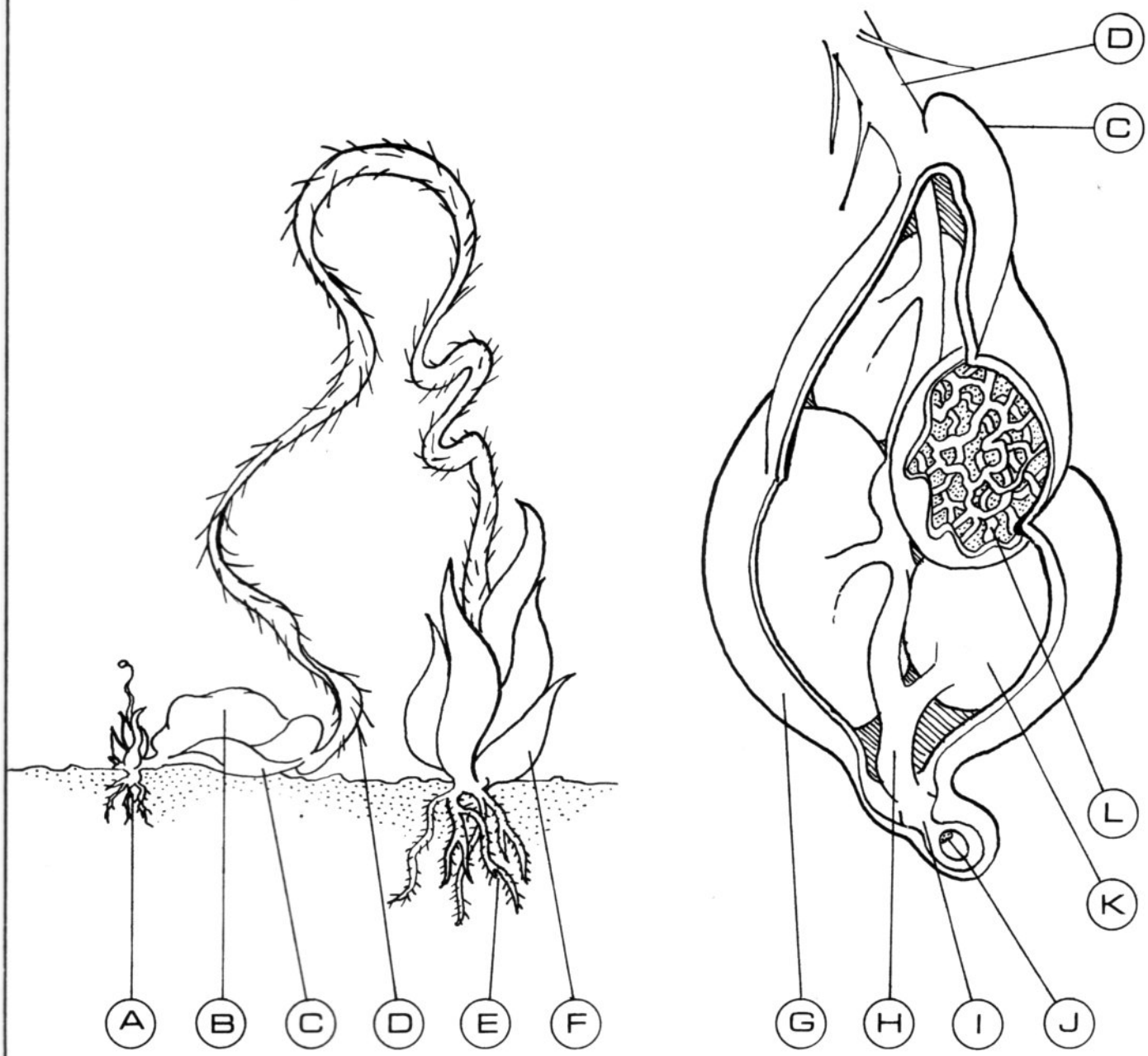
(I) MESOCARP

(J) ENDOCARP (SEED)

(K) ACINUS

(L) MYCELIUM

MAKO ROOT PLANT



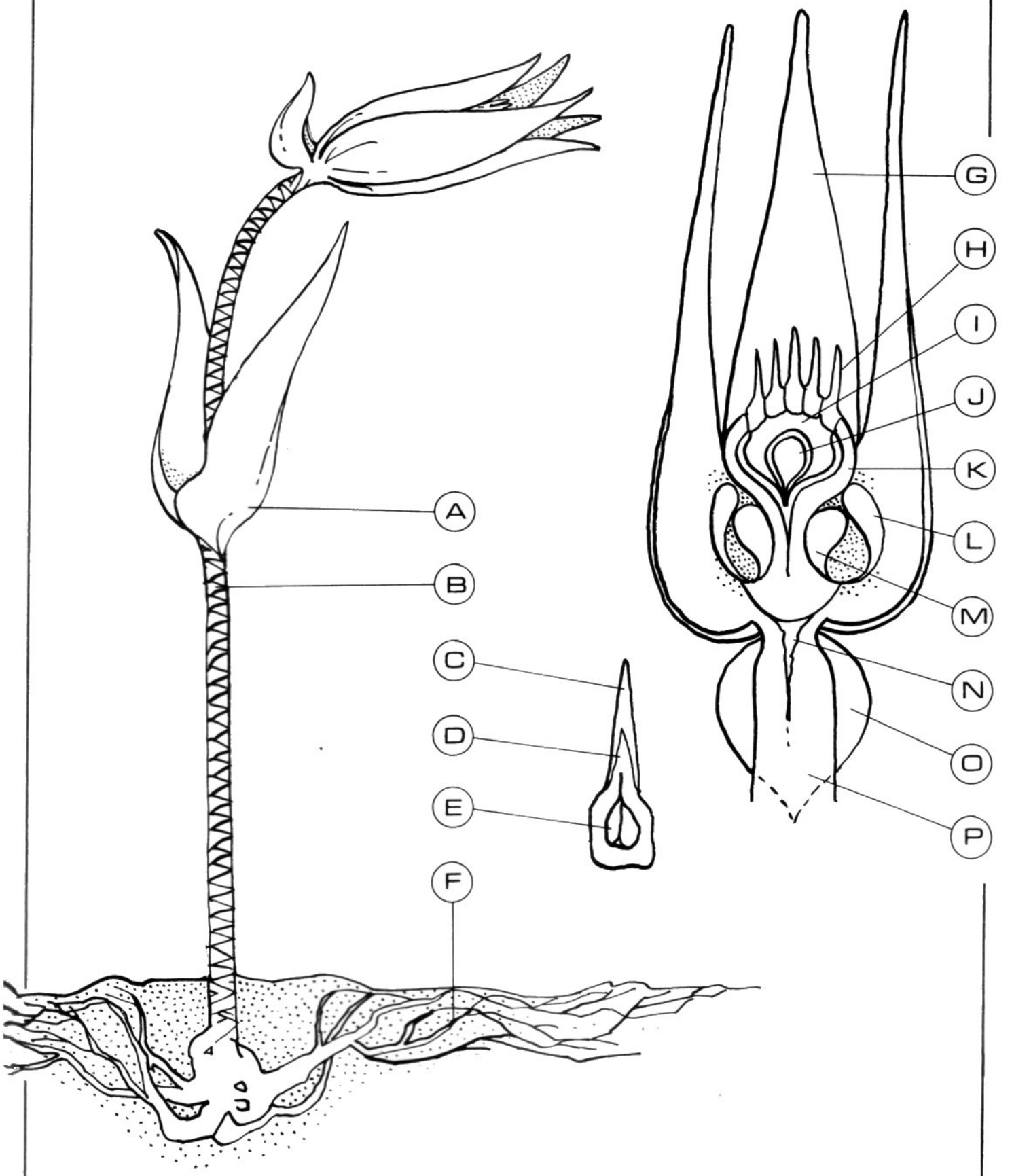
POD PLANT

GAMMA TRIANGULI VI

Native to the super-competitive enviroment of Gamma Trianguli VI, this plant displays a highly agressive life cycle. Its vegetative components contain a minute sap-filled hydraulic system which is utilized in procuring the foodstuffs necessary to its existence. When a victim's weight falls upon the plant's extensive root system which grows close to the surface of the soil, the sap is squeezed by the pressure through the root and stem into the plant's combustion chamber, located between the flower petals. A chemical explosion occurs and the plant's poisonous, aerodynamically-formed thorns are fired at the victim. The saplin-like poison is extremely fast-acting, and within hours the roots have grown up through the ground surface and into the victim's fallen body from which the plant takes nourishment (and in which its thorn-seeds sprout). A period of about five weeks is required for a new set of thorns to be produced, and the plant can live for periods of up to four months without nourishment. Its leaves are not photosynthetic, being typical of a primitive evolutionary period.

- (A) VESTIGIAL LEAF
- (B) ROTATING STEM
- (C) SCALE
- (D) WING
- (E) SEED
- (F) ROOT SYSTEM
- (G) LEATHERY PETAL
- (H) THORN
- (I) COMBUSTION CHAMBER
- (J) ACID SAC
- (K) GYNOECIUM
- (L) STAMEN
- (M) PISTIL
- (N) SAP CANAL
- (O) SEPAL
- (P) PEDICEL

POD PLANT



SPORE PLANT

OMICRON CETI III

This plant is able to survive on most Class M planets, and is equipped with a highly active seed-dispersal system which deposits its regenerative spores upon nearby migratory animal life which unwittingly carries the spores to other areas in their fur or hair. The leaves of the plant are photosynthetic, and oxygen by-products are stored in the leaves' heat-sensitive outer layer. A local stimulus such as a shadow cast upon the surface of the leaf will cause it to suddenly contract and force the stored oxygen into air sacs surrounding the ovary, thus propelling the spores through the style and into the air. A fine algobarium-bearing powder accompanies expulsion of the spores and, when inhaled by humans, is possibly the only known combatant of Berthold rays (see RADIATION SECTION). The powder's side effects are loss of initiative and a general state of euphoria. Extended exposure results in a finely-tuned body metabolism, accompanied by the apparent elimination of scar tissues.

(A) LEAF

(B) STEM

(C) BULB

(D) ADVENTITIOUS ROOTS

(E) ANTHER

(F) FILAMENT

(G) STOMA

(H) STYLE

(I) SPORES

(J) OVARY

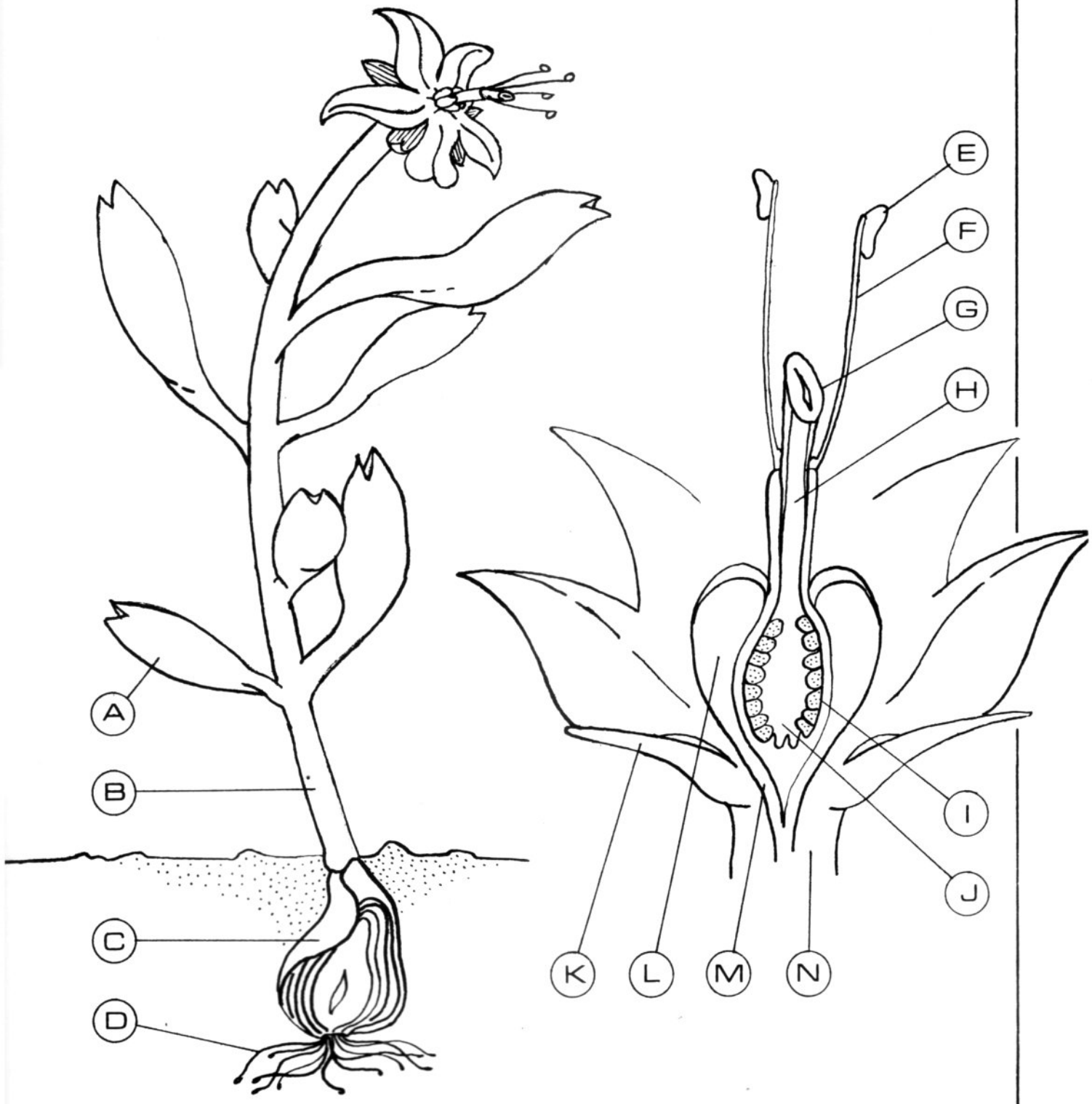
(K) SEPAL

(L) AIR SAC

(M) DUCTS

(N) PEDICEL

SPORE PLANT



PSIONICS



Many cases of psionic power have been reported by the exploration voyages of the United Federation of Planets. It is therefore important for all Star Fleet personnel to understand certain pertinent facts about psionics. Since this text deals primarily with the care of human personnel, we will concentrate on the psionic powers observed in humans.

AURA

The aura, first detected by the Terran scientist Kirlian in the early 20th Century, is a bio-gravitational field that surrounds every living creature. It is the energy of this field that, depending on its intensity, can perform psionic phenomena.

PSYCHOKINESIS

Energy and matter can be influenced by the gravitational field of an individual, just as the gravity well of a star can interact with both energy and matter in its proximity; an altered state of consciousness, usually involuntary, is necessary for this type of phenomenon. However, certain species and some human individuals can be trained to willfully alter their state of consciousness and thereby focus the power of their aura and utilize latent psionic abilities.

PLASMA REORGANIZATION

The process by which humans can command psionic power is conjectured to be similar to the matter-antimatter energy processes of a starship engine. The energy is thought to be the direct result of an exchange between positive blackhole and negative whitehole, interacting to form intense energy patterns. It has been further speculated that the human mind, in conjunction with the adrenal and pituitary glands, can create the plasma reorganization necessary to produce a "mental blackhole" of subnuclear dimensions. Creation of such a blackhole is always paralleled by that of an oppositely-charged whitehole, and the two immediately begin to decay through tachyonic emission. Such faster-than-light particle emissions are the medium through which psychokinetic and other psychoenergetic powers can be focused and applied. Since no human with psionic abilities has ever allowed himself to be tested or dissected, this theory remains unproven.

It has been commonly accepted over the last several centuries that any human being has the power to a lesser or greater degree to mentally control their environment using the focused energy of the aura. However, most humans believe more in the machine than in the human organism, and have forgotten how to truly use what they possess. This is apparent if we consider what would have happened if the Eastern cultures had been dominant on Earth instead of the more technologically-based Western societies. If humans had spent less time on the printing press and more time on the mind and body control of the Buddhist monks or Indian Fakirs, Earth today would be a very different place. In any case, the human of the 23rd Century is a child of both the industrial revolution and the great technoligical Diaspora of the last two centuries, and must work with the situation at hand and make up for five hundred years of increasing dependency on machines.

There have also been cases where humans have been able to enlarge their psionic abilities either through an increase in their aura's power, or because of training by others to recognize and exploit these latent abilities.

In the latter category are Martin of Epsilon Cephei VII and Charlie Evans of Thasus. Both of these individuals were marooned while still very young on planets with an environment hostile to human life, and both were taught by the inhabitants of the planet to use their psionic powers for survival. Martin, an adult at the time of his discovery, decided to remain on Epsilon Cephei - as he quaintly put it, "These twelve-toed lizards is my kind of people." Martin's psionic powers included the ability to draw on the mind of a subject to create a sensory illusion of fantastic depth and detail. 17-year-old Charlie Evans, raised by the non-corporeal Thasians, was the opposite of the "feral children" of 18th and 19th Century Earth - these children, raised by wolves, were never able to become truly human in that their brains never fully developed. They were not able to learn to speak or even stand erect and walk like a human. Charlie, on the other hand, posessed awesome telekinetic powers and yet had had no moral training. He believed that his uniqueness and godlike powers gave him the right to act like a god. There seems to be a relationship between psionic powers and megalomania, a relationship which will be more fully explored later.

A case where chemical additives affected psionic power is that of the inhabitants of Platonius. The Platonians had ingested small amounts of Kironide over many centuries, thus building up an immunity to its toxic effects while gradually increasing their psionic abilities. It is possible for the average human or Vulcan to speed up this process by injecting large amounts of pure kironide directly into the bloodstream; however, this may result in an incurable form of glandular cancer. As a people, the Platonians were found to be childish, cruel and petulant in their behavior to those possessing lesser psionic abilities. Almost to a man, the Platonians were afflicted by the megalomania that seems to come with heightened psionic power, considering themselves to be above any laws of sapient conduct.

This megalomania was also observed in the case of Commander Gary Mitchell and Dr. Elizabeth Dehner of the Starship Enterprise. After passing through the negative matter-energy force field at the galaxy's rim, their auras began to increase tremendously in power (this is believed to have occured because of the unusually high espric capacity - a measurement of latent extrasensory perception - of both individuals). As Mitchell learned to control his new abilities, he became dangerously imbalanced, exhibiting psychotic paranoid behavior. Captain Kirk, then commanding the Enterprise, believed that Mitchell had ceased to consider himself a human being - "He swatted us like flies, he lacked the humility of a man and the forgiveness of a god."

One of the most interesting recent cases of psionic abilities heightened by an external force is that of a being calling himself Apollo after the ancient Greek god. Using a specialized organ in his body, Apollo was able to draw energy from a central generator to increase his aura's power and give him almost unlimited psychoenergetic power. This power was unfortunately coupled with the consistent megalomania. Beings like Apollo seem to bear out the words of Thomas Jefferson: "Power corrupts - absolute power corrupts absolutely."

Star Fleet personnel should be aware that psionic power is a two-edged sword - the good that psionics can do must be weighed against the possibility of unloosing a dangerous megalomaniac.



FIRST AID

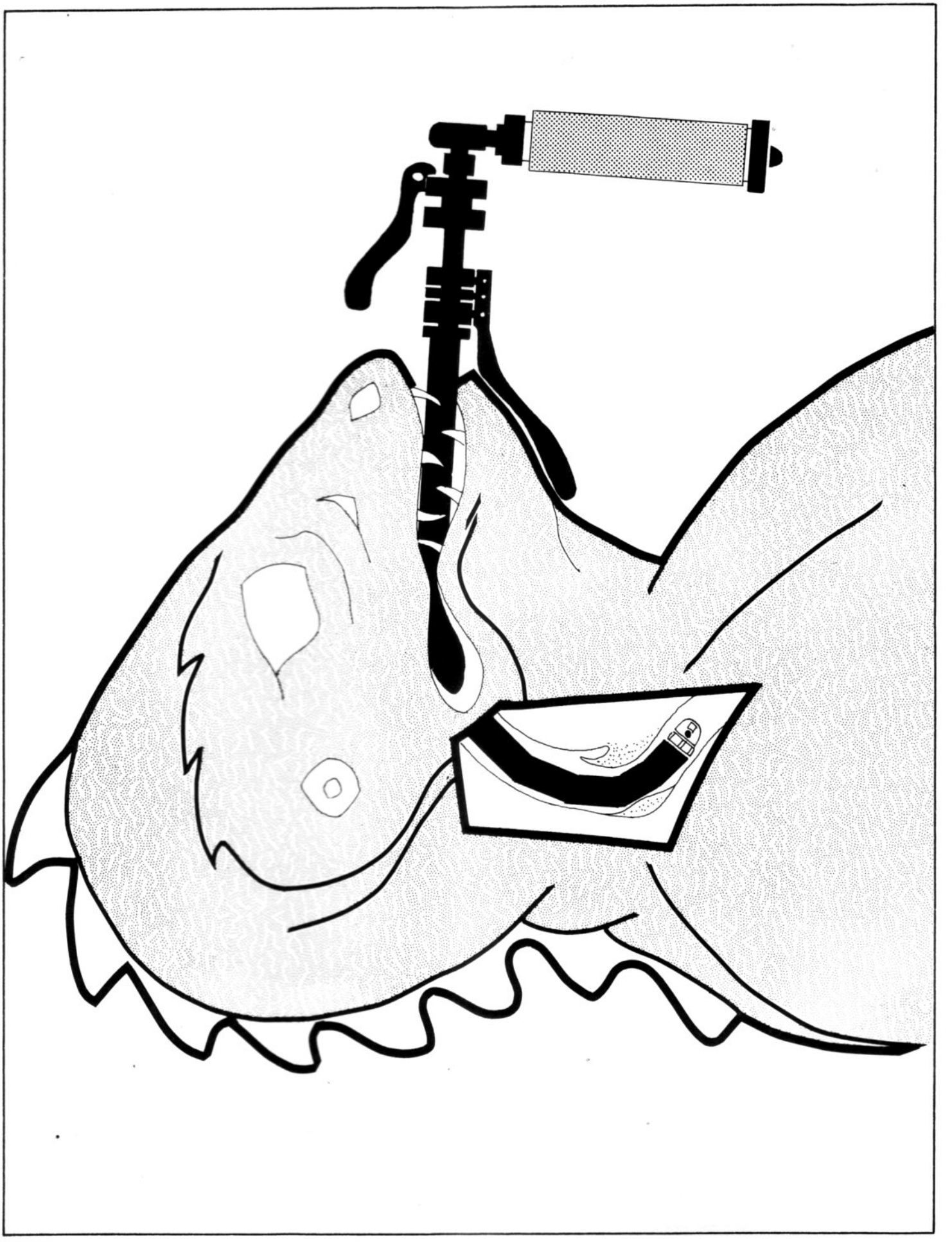
ARTIFICIAL VENTILATION
ASSISTING WITH ENDOTRACHEAL INTUBATION

Clinical signs for intubation:

1) respiratory arrest
2) respiratory insufficiency
3) marked respiratory effort
4) airway obstruction

Action:

1) Select proper size of tube
2) Be sure that cervical spine is not injured. Hyperextend victim's head back, causing an anterior flexion of the neck
3) Push tongue toward the left while looking for the epiglottis
4) Advance tip of tube anteriorly until rim of epiglottis is viewed
5) Insert tube in a continuous motion, and begin intubation



DISLOCATION
OF THE SUPERIOR CORTEX

An injury resulting in complete or partial loss of the victim's color recognition, depth perception, and audio capabilities. The characteristic attitude of the Andorian antenna is an extreme list, accompanied by a protrusion of the superior cortex (see illustration). The victim may experience little or no discomfort, a swelling of the antenna base, and a creeping numbness across the superior surface of the head.

Treatment of the injury is directed toward a reduction of the dislocation. This is accomplished by supporting the base of the antenna between the crotch of the thumb and forefinger, manipulating the organ with the free hand. Usually, a firm, upward pressure will reseat the cortex.



MOUTH-TO-MOUTH
RESUSCITATION

Since there is no reserve supply of oxygen in the humanoid body (the single exception being avians, q.v.), the complete stoppage of breathing for about five minutes can and usually does result in death. Artificial respiration by mouth-to-mouth resuscitation is one means by which O_2 may be supplied to the body of an individual who has stopped breathing:

1) Place palm of your hand over victim's mouth to feel for air movement

2) Place victim in a supine position on a hard floor. Position yourself on the left side of a human, right side of a Vulcan

3) Clear victim's mouth of mucus or other foreign objects

4) Place one hand under victim's neck, the other on victim's forehead. Tilt victim's head as far back as possible

5) Position victim's jaw forward so that lower teeth are in front of upper teeth

6) Pinch victim's nostrils closed. Blow forcefully into victim's mouth with a smooth, steady action until chest rises. Your mouth should be positioned tightly over victim's mouth

7) After blowing, turn your head to one side and watch chest contract. Listen to detect if air is leaving victim's lungs

8) Continue steps 6 and 7 at the rate of 12 to 20 inflations per minute



STEP 6



STEP 7

MUGATO BITE

A variety of anthropoid, the Mugato is native to the planet Neural in the Zeta Bootis star system. Terratorial by nature, the creature is characterized by a single large horn extending from the superior portion of the cranium. Prominent spinal scuta extend to the tip of the large, counterbalancing tail.

Manifestations:

General weakness, rapid pulse, nausea, vomiting, chills, blurring vision, drowsiness, abdominal pain, possible convulsions and development of coma. Reactions from Mugato bite are usually aggravated by acute fear and anxiety.

First Aid:

1) Keep the victim quiet and reassure him

2) Keep the affected part below the level of the victim's heart

3) Apply a constricting band (tourniquet) 10 cm below the bite on the victim's arm or leg (between the wound and the heart). Do not apply tightly - your index finger should be able to slip under the band when it is in place

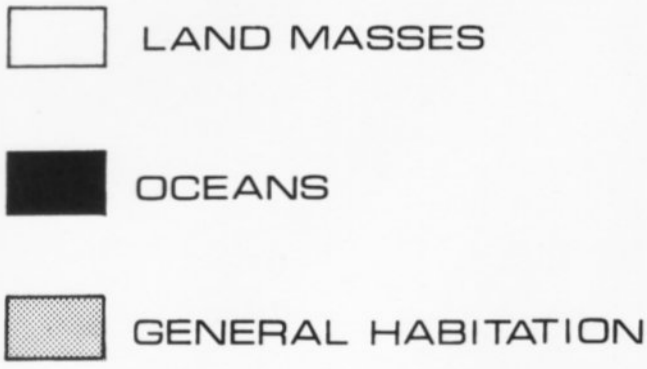
4) Give artificial respiration if indicated

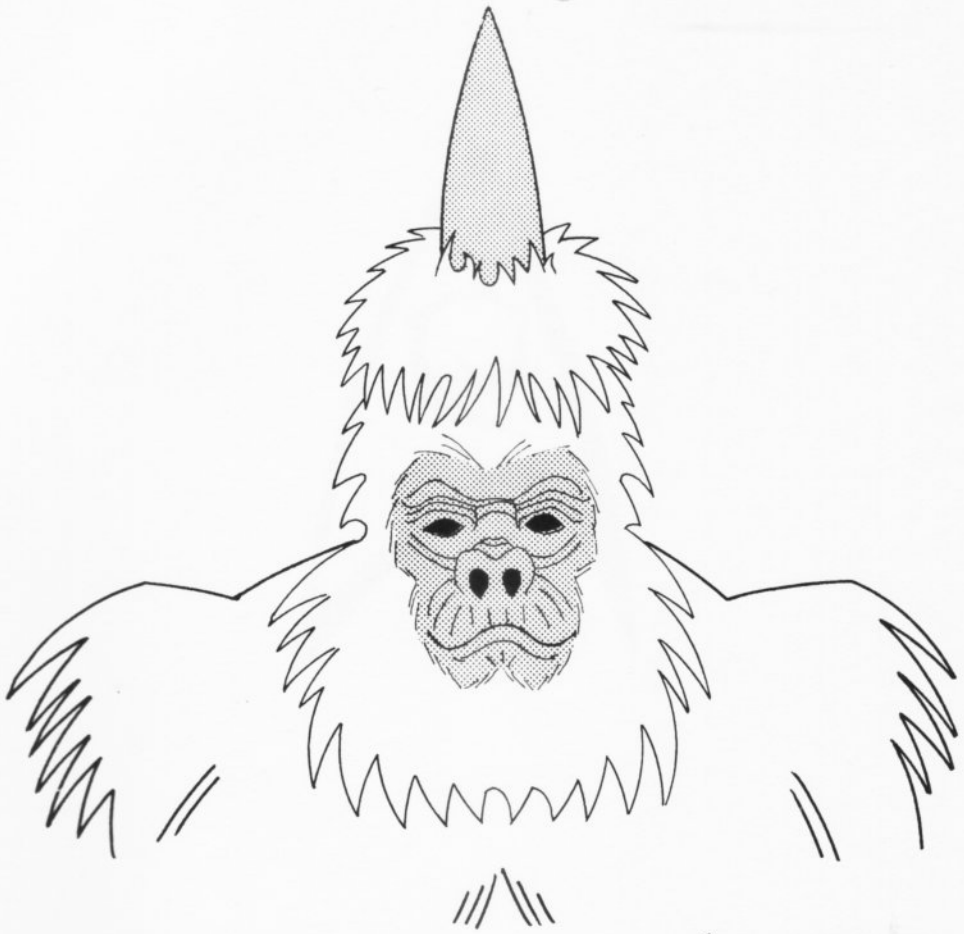
5) Treat victim for shock. Unless nausea and vomiting develop, sips of fluid may be given if the victim can swallow

6) Do not give alcohol in any form

7) The victim should be transported as quickly as possible to a place where proper medical attention can be administered

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EASTERN HEMISPHERE WESTERN HEMISPHERE

NEURAL



EQUIPMENT

MEDIKIT

Fragmentary records from before the Eugenics Wars suggests that elements of the medikit (such as the air-spray hypo) were used as early as the 1970's on Earth, but as with all such records the actual circumstances are questionable. It is known, however, that the medikit was developed by Dr. Sarah April (medical officer aboard the U.S.S. Enterprise) slightly over fifty years ago.

The medikit, a small pouch worn on the utility belt, is standard field equipment for all medical personnel. Containing equipment and drugs necessary for immediate diagnosis and treatment of diseases or injuries encountered on Class M planets, the medikit is designed to administer only temporary aid while the patient is secured for transportation to superior medical facilities. Because of its small size, the medikit contains only those items absolutely essential to field treatment. Many injuries and conditions may ideally require an emergency surgical kit or a complete medipouch, but such equipment is not always available to the physician operating in the field, especially where the prime directive makes viable the risk of "contamination" by introducing extensive medical technology.

SPRAY HYPO - The air-spray hypodermic sringe differs from the traditional model in that it uses a high-velocity jet of air rather than a needle for hypodermic injection. The hypo body contains a colloidal field suspension of as many as six drugs or chemical agents, any one of which may be selected by choosing the appropriate filter aperture (i.e., by turning the grooved ring below the vial attachment). The hypo is normally pressurized with 0.1 cc (one dose) of the following general-utility compounds (see also DRUGS section): cordrazine (a powerful stimulant), masiform D (a stimulant and antitoxin for saplin-like poisons), tri-ox compound (a respiratory system drug breaking down into O_2 in the bloodstream), dylovene (a broad-spectrum antitoxin), sterilite (an antibiotic/antiinfective), stokaline (a nutrient and multivitamin compound), melanex (a general anesthetic agent and neural paralyzer), coradrenalin (an autonomic nervous sytem and basal metabolic stimulant), and hyronalin (a radiation poisoning specific). PHYSICIAN TAKE NOTE: Do not assume that the hypo has been pre-loaded with these substances.

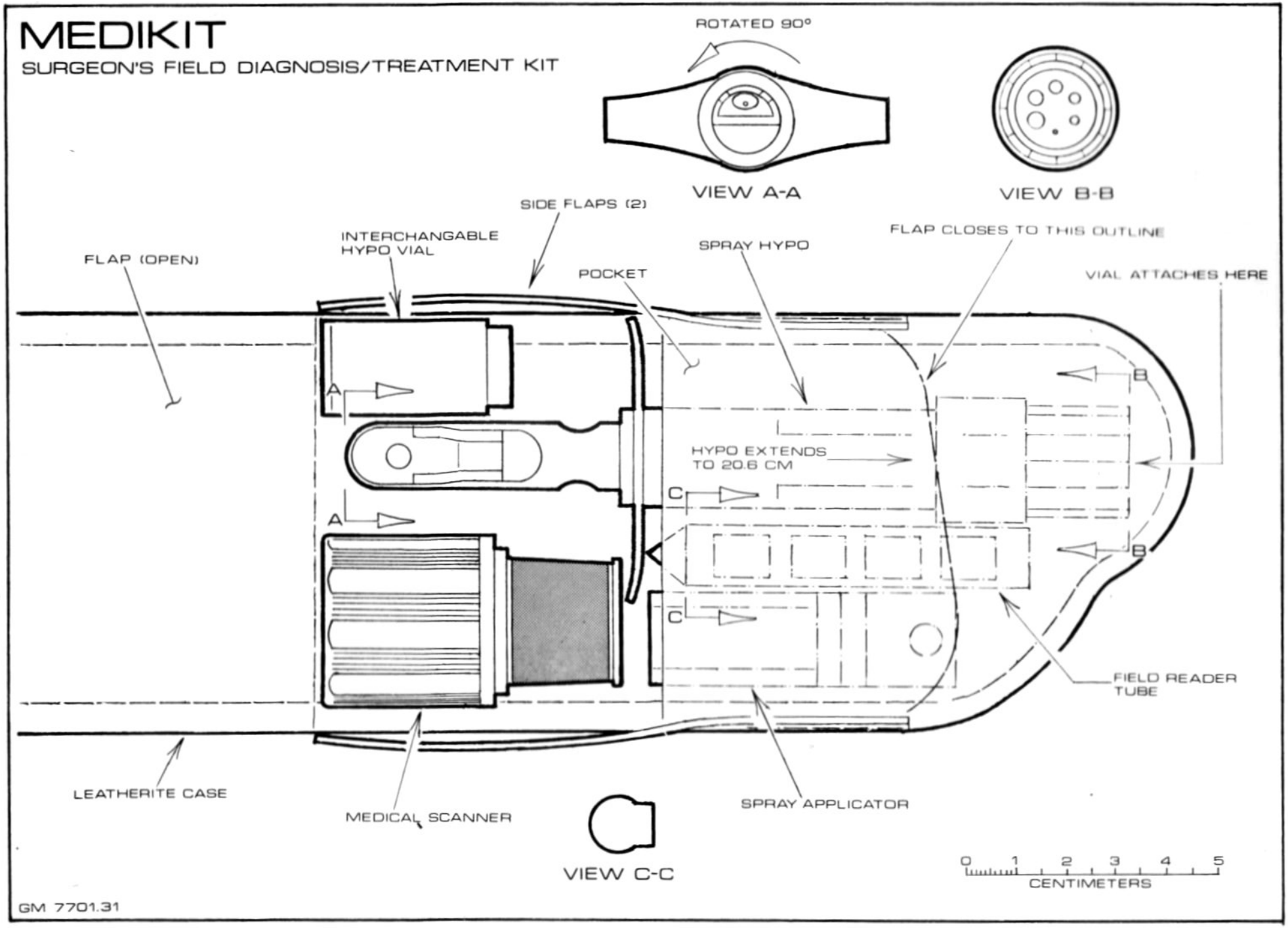
MEDICAL SCANNER - The medical scanner consists of two parts: a rotating scanner head enclosed in a wire mesh sensor network, and the main body which interprets signals received and converts them into a flunctuating audio readout. Programmable for one of ten functions (pulse rate, respiration, body temperature, cell rate, lung capacity, heart activity, blood pressure, basal metabolic rate, brain activity, homeostatic deviation) by twisting the reeded body to the desired position, the scanner functions much as does the sickbay diagnostic scanner - by sensing the physical emanations of an individual in close proximity. NOTE: A physician must undergo extensive training before he is able to "read" information into the sounds emitted by the scanner, and there is no simple method allowing the layman to do the same.

SPRAY APPLICATOR - The spray applicator is a small cylindrical dispenser of epidermal medications. Although it is capable of dispensing a variety of liquids, foams, and gels, for field use it is normally pressurized with an organically-based flesh-colored compound that acts as a coagulant to stop the flow of blood and as an antibiotic to protect against infection. A mild local anesthetic deadens pain in the afflicted area. The applicator contains about 5-10 doses, depending on the amount used.

FIELD READER TUBE - Used when the low-powered scanner can not effectively diagnose a patient's condition (as with furred aliens or species possessing a thick epidermis, such as Tellarites), or when a more empirical evaluation of such signs is required by the physician, the reader tube has four independently-activated lights which indicate through their intensity or period heartbeat (red), pulse rate (blue), blood pressure (yellow), and body temperature (green). The pointed end of the tube must be placed in direct contact with the patient's exposed skin.

MEDIKIT

SURGEON'S FIELD DIAGNOSIS/TREATMENT KIT



GM 7701.31

SICKBAY DIAGNOSTIC SCANNER

Prototypes of the sickbay diagnostic scanner appeared as early as the late 20th Century on Earth and the Seventh Epoch on Aldebaran VI, but true scanners - incorporating all the bodily variables necessary for an informed diagnosis - did not become common until 2145, when they were first installed aboard Archon class survey probe vessels.

The diagnostic scanner, wall-mounted above sickbay and ward beds, serves a passive but vital need by providing accurate and continuously updated readings of life signs and other physiological data. Relying entirely on remote sensing techniques, the scanner supplies the constant flux of information necessary for the physician's appraisal of a patient's condition, without the need for direct contact between doctor and patient. It consists of three elements operating in unison, any one of which requires the other two for maintenance of current readout:

REMOTE SENSOR - In appearance a transluscent white cone about fifteen centimeters long, the remote sensor is illuminated when in operation (when the "ON/OFF" switch is "ON"). Highly directional, the sensor must be tilted downward (usually at an angle of 45^{o}) to avoid picking up the readings of people around it. The remote sensor is responsible for readout of brain activity, lungs, and cell rate.

SENSOR WEB - A network of fine platinum-colored filaments, the sensor web is woven into the xenelon fabric of the bed proper. In direct contact with the patient, it provides constant information on body temperature, blood pressure, pulse rate, heart activity and respiration.

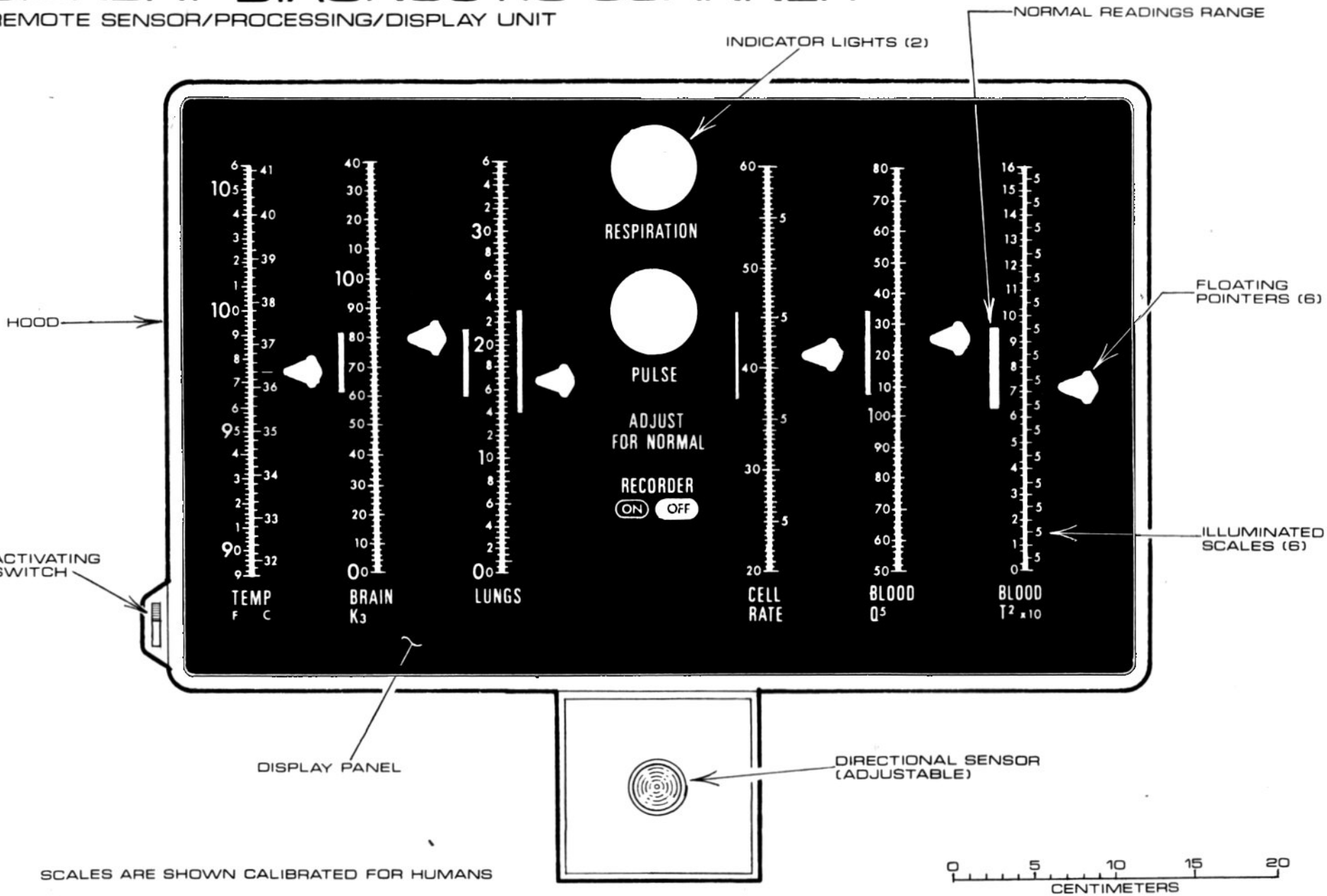
GRAPHIC DISPLAY - The graphic display panel, a visual readout with an internal processor to interpret the signals received from both sensors, provides the dynamic transmission of information to the physician. It contains six illuminated scales (see below), divided into normal (yellow), sub-normal (green), and critical (red) readings ranges; and two indicator lights, which give a real-time representation of RESPIRATION and PULSE through the period of the lights. The display also contains the recorder controls - the internal recorder maintains a copy of a patient's readings for later playback and analysis by physician or computer. Before use on non-humans, the scanner must be recalibrated to take into account species norms (units on the illuminated scales are computer generated). Thereafter, deflection of any scale into the critical region will trigger an alarm, indicating that immediate attention is required.

TEMPERATURE	Displays the body skin temperature in degrees Celcius and Fahrenheit (^{o}C and ^{o}F)
BRAIN K3	Displays the electrical activity of the brain - extreme activity may indicate high levels of pain
LUNGS	Displays the vital capacity of the lungs in liters (dm^3), for use in diagnosing pulmonary disease
CELL RATE	Displays the partial pressure of carbon dioxide in the respiratory system (PCO_2 in mmHg), for use in determining the degree of stimulus of the respiratory system and the oxygen/CO_2 exchange rate at the air/blood interface in the lungs*
BLOOD Q^5	Displays the heart activity, notably its electrical stimulus (beat), which is actually two pumping actions (in count/minute)
BLOOD T^2x10	Displays the mean diastolic blood pressure (in mmHg), for use in diagnosing hyper or hypotension

*lack of CO_2 seriously impairs the breathing operation

SICKBAY DIAGNOSTIC SCANNER

REMOTE SENSOR/PROCESSING/DISPLAY UNIT



GM 7702.1

MEDICAL TRICORDER

Although the technology necessary for such sophisticated miniaturization dates back many centuries to the germanium smiths of Libra, the tricorder is the direct descendant of the primitive binary computers of Old Earth. By utilizing Daystom's duotronics breakthrough, it is able to store thousands of hours of information and carry out functions of remarkable complexity.

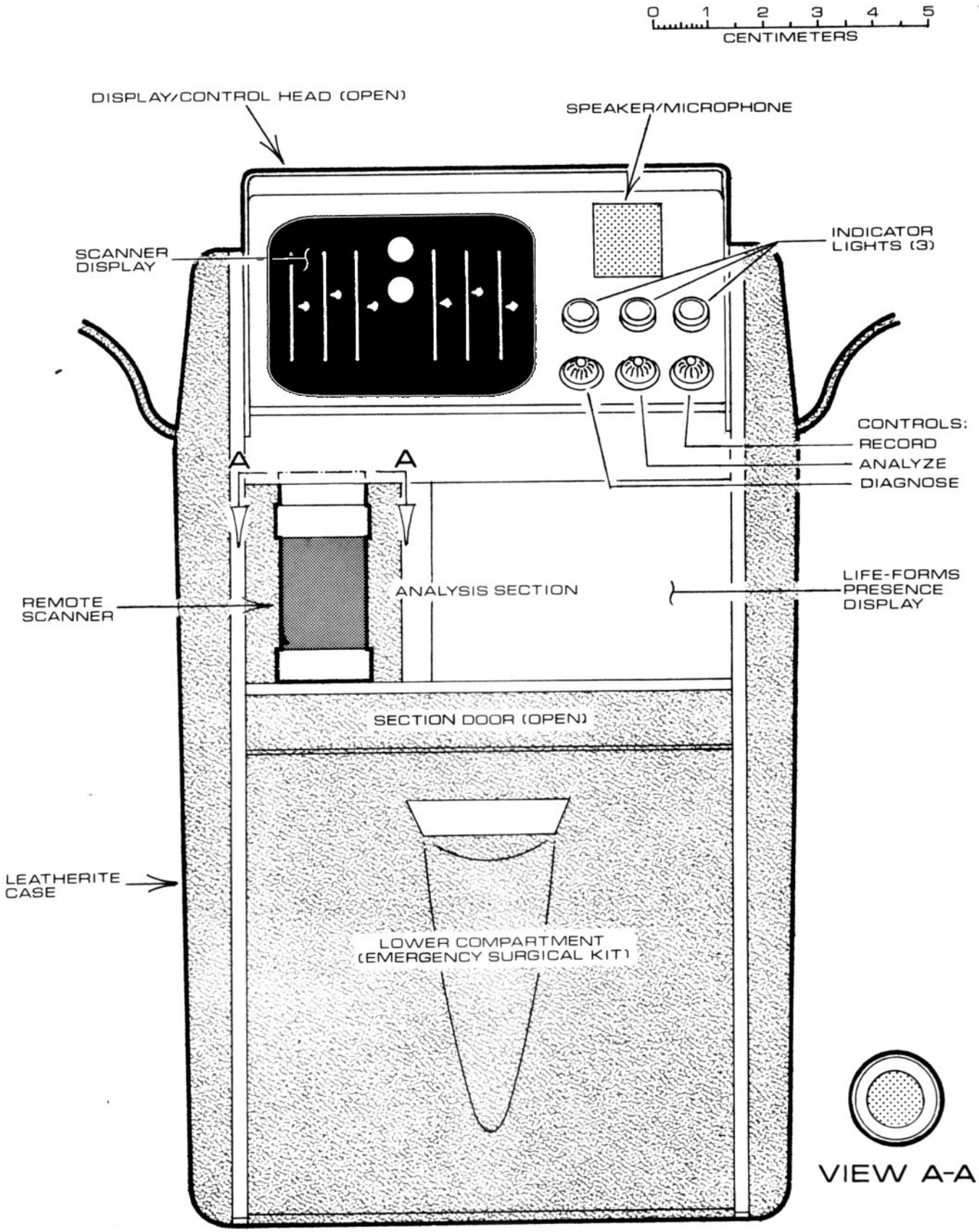
Similar in external configuration to the sciences model, the medical tricorder is designed and programmed to be an effective diagnostic tool in situations (such as field treatment) where more extensive or specialized equipment is unavailable. In practise a small sensor/computer/recorder ("TRI-function reCORDER") with internal power source, drive, memory and logic banks, the medical tricorder acts much as does the processing section of the sickbay diagnostic scanner in that it receives and interprets sensor signals of a patient's condition and converts them into an audio-visual readout.

The DISPLAY/CONTROL HEAD (rotating the head to the open position activates the unit) is identical in control layout to that of the standard tricorder: a visual display with several different overlays, depending on the information desired; a speaker/microphone; and three operating controls. DIAGNOSE puts the unit in the "measure" mode and activates the standard vital signs overlay (identical to that used by the sickbay scanner, q.v.). ANALYZE mode is used for complex and programmable functions, such as analysis of blood composition, identification of a disease organism, etc. - several different visual overlays may be selected by adjusting the control. RECORD activates the internal recorder (the medical tricorder does not have record/play disk capacity, and cannot make a hardware copy of readings), which maintains a real-time copy of a patient's readings. Playback and erase are also operated by this control. The three indicator lights indicate a critical diagnostic reading; positive analysis (matched comparison, as when scanning for a certain element, chemical compound, etc.); and "recording in progress" respectively.

Directly below the display/control head is the ANALYSIS COMPARTMENT, which houses the remote medical scanner and the life forms presence display. The remote scanner, similar to the conventional medical scanner (but smaller, as the processing and audio readout hardware are contained in the tricorder unit), transmits directly to the tricorder and provides a directional sensor input when the tricorder's less sensitive omnidirectional pickup is not satisfactory. The specific sensor function is controlled through the DIAGNOSE control, and when the remote scanner is activated (by removing it from its housing) only one of the scales in the standard overlay is activated at a time. An audio signal identical to that of the conventional medical scanner accompanies the visual readout. The life forms presence display differentiates between general orders of life forms, and indicates general range and direction through intensity and position of the illuminated areas.

The lower compartment contains an emergency surgical kit, supplementing the standard medikit for emergency field surgery. For details, consult the appropriate TECHNICAL DIAGRAM.

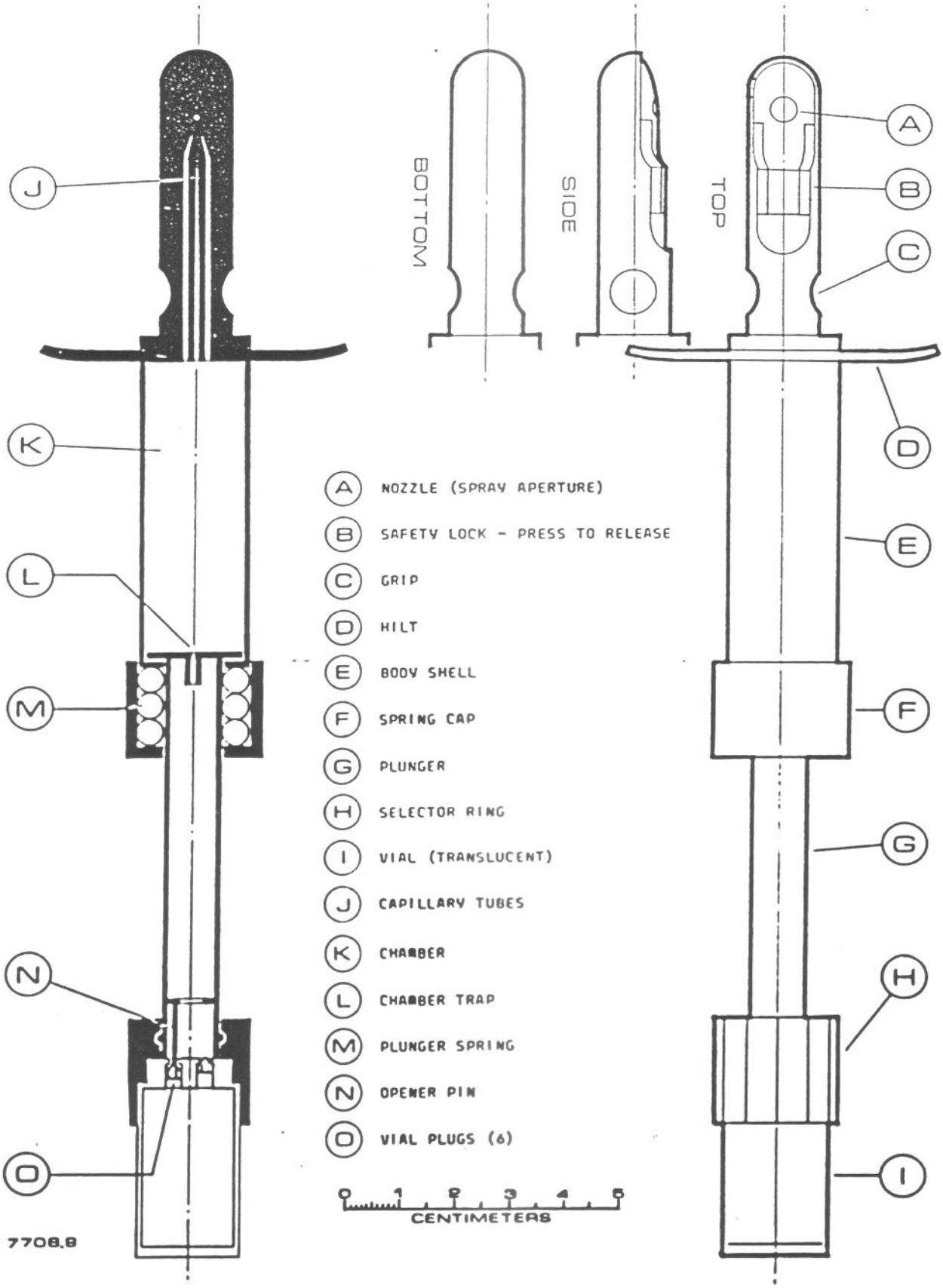
MEDICAL TRICORDER
DIAGNOSTIC SENSOR/COMPUTER/RECORDER



GM 7705.6

SPRAY HYPO

AIR SPRAY ACTION HYPODERMIC SYRINGE



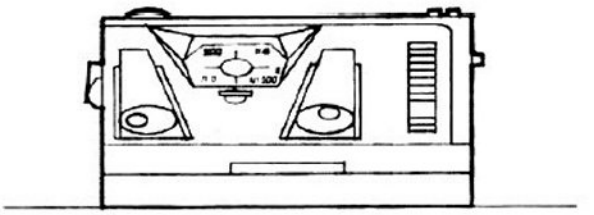
- (A) NOZZLE (SPRAY APERTURE)
- (B) SAFETY LOCK - PRESS TO RELEASE
- (C) GRIP
- (D) HILT
- (E) BODY SHELL
- (F) SPRING CAP
- (G) PLUNGER
- (H) SELECTOR RING
- (I) VIAL (TRANSLUCENT)
- (J) CAPILLARY TUBES
- (K) CHAMBER
- (L) CHAMBER TRAP
- (M) PLUNGER SPRING
- (N) OPENER PIN
- (O) VIAL PLUGS (6)

0 1 2 3 4 5
CENTIMETERS

GM 7708.8

GM 7705.6

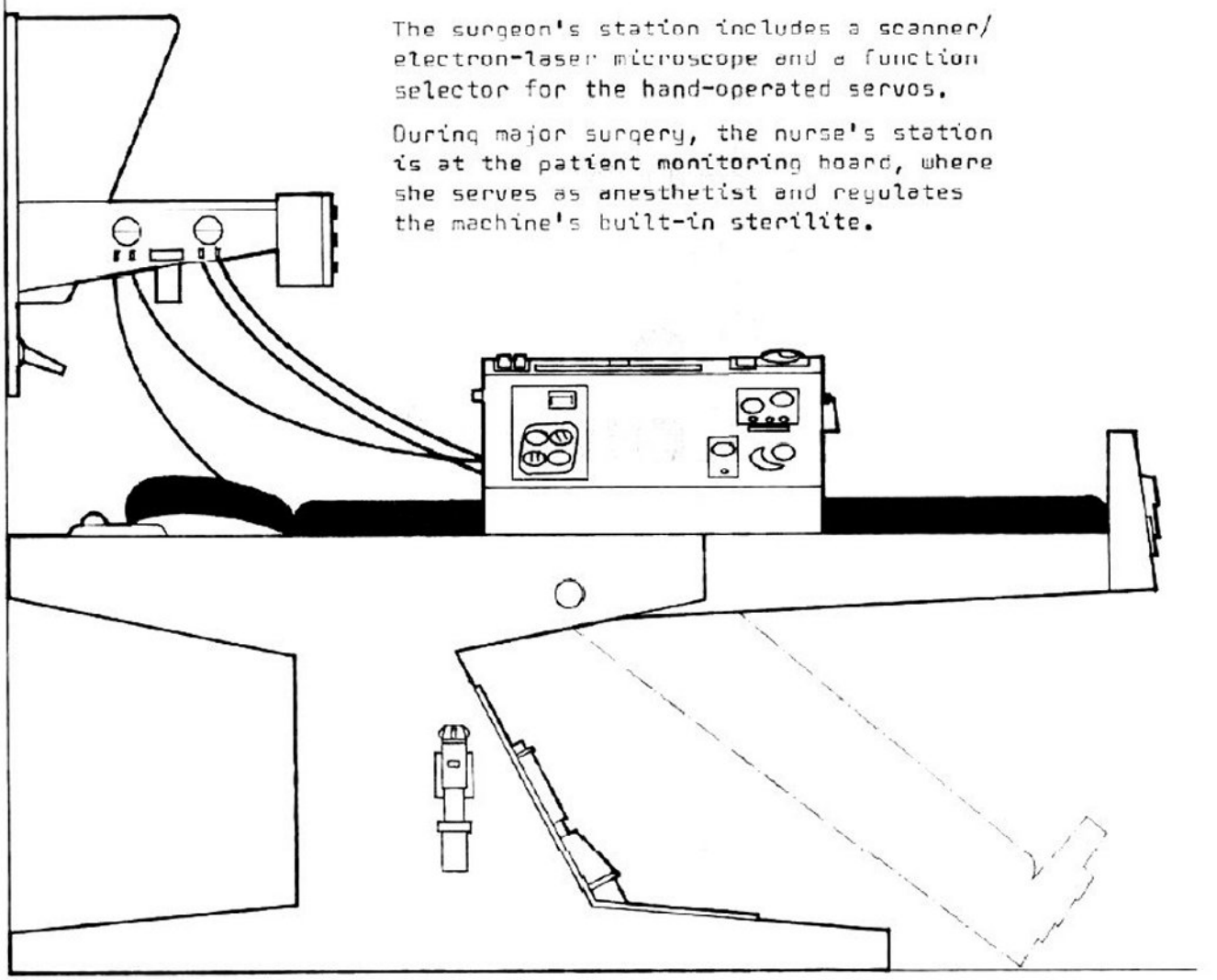
OPERATING TABLE
WITH CRYOSURGICAL FRAME



SURGEON'S VIEW

The surgeon's station includes a scanner/electron-laser microscope and a function selector for the hand-operated servos.

During major surgery, the nurse's station is at the patient monitoring board, where she serves as anesthetist and regulates the machine's built-in sterilite.



The fluid transfer unit (which can transfuse hemoplasm from the medical stores or that of a donor directly into the patient's cardiovascular system) operates in conjunction with the surgical frame's built-in cardiostimulator, permitting complete replacement of the blood volume in approximately 90 seconds. The cryosurgical frame maintains a constant temperature of -27°C during surgery.