

## EXPANDED SKILL LISTS

In **Star Trek: The Role Playing Game**, the list of skills in certain areas was rather sparse. The idea was for the game master to add additional skills to the list. Here in this series of pages is an expansion of some of the critical skills in the game.

The usage of this skill list is a little different from choosing a skill from the *Star Fleet Officer's Manual*. In the pre-academy phase of character generation, if the player selects a skill that has divisions in the Manual, he looks in this booklet and selects a specialty from that division. That specialty and only that specialty will receive the result of the 1d10 roll. In all subsequent phases of character generation, if the player selects a skill that has divisions, he selects a specialty from that division. The specialty selected receives the full amount of the skill rating, for example, Forestry at 10. In addition, all the other specialties in that division receive a skill rating of 5, as some cross training in the other specialties is provided.

### Life Sciences

This group of skills includes the study of living things, both terrestrial and alien plants and animals, bacteria, fungi, and other organisms. All *Star Fleet* officers have some training in one of these sciences, and Science and Medical Officers have training in at least one, with the likelihood of training in more than one and extensive training as well. Separate Skill Ratings must be developed for each type of life science.

### Bionics

Training includes the study of how biological systems and functions can be applied to engineering problems. Included are the physical melding of beings and machinery, such as with artificial organs or electro-mechanically enhanced senses. Bio-engineers can use their skill to create organs and limbs. Bionics skill can be broken down into these specific fields of study.

**Artificial Intelligence:** The subfield of computer science concerned with understanding the nature of intelligence and constructing computer systems capable of intelligent action. It embodies the dual motives of furthering basic scientific understanding and making computers more sophisticated in the service of humanity.

**Bioimplantronics:** The science and technology of biologically implantable and integrable electronic devices. Also refers to intracorporeal electronic devices and systems (designed to be implanted into a biological entity) that accept input signals and provide output signals through direct electrical integration with the entity's central nervous system.

**General Bionics:** The study of living systems with the intention of applying their principles to the design of engineering systems. Drawing on interdisciplinary

research in the mechanical and life sciences, bionics has been used to develop audiovisual equipment based on human eye and ear function, to design air and naval craft patterned after the biological structure of birds and fish, and to incorporate principles of the human neurological system in data-processing systems. Another application has been the development of artificial limbs controlled by recognition of the electrical patterns in muscle tissue.

**Cybernetics:** Science of regulation and control in animals (including humans), organizations, and machines when they are viewed as self-governing whole entities consisting of parts and their organization. Cybernetics views communication and control in all self-contained complex systems as analogous. It differs from the empirical sciences (physics, biology, etc.) in not being interested in material form but in organization, pattern, and communication in entities. Because of the increasing sophistication of computers and the efforts to make them behave in humanlike ways, cybernetics today is closely allied with artificial intelligence and robotics, and it draws heavily on ideas developed in information theory.

**Robotics:** A field of bionics concerned with the development and application of robots, and computer systems for their control, sensory feedback, and information processing. The many types of robotic systems include robotic manipulators, robotic hands, mobile robots, walking robots, aids for disabled persons, telerobots, and microelectromechanical systems.

### Botany

Training includes the study of plants, from simple algae to complex flowering and nonflowering varieties. It also includes such agricultural topics as growth mechanisms, genetics, cross-fertilization, hybridization, and hydroponics (growth without soil). Most botanists can recognize poisonous and edible plants, and from plants under cultivation can deduce information about the technology, metabolism, and life-style of those doing the agriculture. Botany skill can be broken down into these specific fields of study.

**Agriculture:** Agriculture (a term which encompasses farming) is the art, science or practice of producing food, feed, fiber and many other goods by the systematic raising of plants and animals. In actual usage, Agriculture denotes activities essential to food and material production, including all techniques for raising and processing livestock no less than those essential to crop planting and harvesting.

**Ethnobotany:** Ethnobotany is the study of the relationship between plants and people. Ethnobotany studies the complex relations between (uses of) plants and cultures. The focus of ethnobotany is on how plants have been or are used, managed and perceived in human societies and includes plants used for food, medicine, cosmetics, dyeing, textiles,

for building, tools, currency, clothing, rituals, social life, and music.

**Forestry:** Forestry is the art, science, and practice of studying and managing forests and plantations, and related natural resources. Modern forestry generally concerns itself with assisting forests to provide timber as raw material for wood products; wildlife habitat; natural water quality regulation; recreation; landscape and community protection; employment; aesthetically appealing landscapes; and a 'sink' for atmospheric carbon dioxide. A practitioner of forestry is known as a forester.

**Horticulture:** Horticulture is classically defined as the culture or growing of garden plants. Horticulturists work in plant propagation, crop production, plant breeding and genetic engineering, plant biochemistry, plant physiology, and the storage, processing, and transportation of fruits, berries, nuts, vegetables, flowers, trees, shrubs, and turf. They improve crop yield, quality, nutritional value, and resistance to insects, diseases, and environmental stresses. Horticulture involves five areas of study. These areas are floriculture (includes production and marketing of floral crops), landscape horticulture (includes production, marketing and maintenance of landscape plants), olericulture (includes production and marketing of vegetables), pomology (includes production and marketing of fruits), and postharvest physiology (involves maintaining quality and preventing spoilage of horticultural crops).

**Paleobotany:** Paleobotany is the branch of paleontology dealing with the recovery and identification of plant remains from geological contexts, and their use in the reconstruction of past environments and the history of life. A closely related field is palynology, the study of fossil and extant spores and pollen. Paleobotany includes the study of terrestrial plant fossils, as well as the study of marine autotrophs, such as algae.

**Palynology:** Palynology is the science that studies contemporary and fossil palynomorphs, including pollen, spores, dinoflagellate cysts, acritarchs, chitinozoans and scolecodonts, together with particulate organic matter (POM) and kerogen found in sedimentary rocks and sediments. This branch of paleontology is closely related to Paleobotany.

**Soil Science:** Soil science deals with soil as a natural resource on the surface of the earth including soil formation, classification and mapping; physical, chemical, biological, and fertility properties of soils per se; and these properties in relation to the use and management of soils. Sometimes terms which refer to branches of soil science, such as pedology (creation, chemistry, morphology and classification of soil) and edaphology (influence of soil on organisms, especially plants), are used as if synonymous with soil science.

## Ecology

Training includes the study of how living things interact with their environment. Planetary ecologists can determine if a planet is habitable, as well as the probable effects of colonization on the planet's life forms and environment. Ecologists can use their skill to determine which, if any, plants and animals can become part of the food chains of Federation or alien races. Ecology can be broken down further into these specific fields of study.

**Agronomy:** Agronomy is a branch of agricultural science that deals with the study of crops and the soils in which they grow. Agronomists work to develop methods that will improve the use of soil and increase the production of food and fiber crops. They conduct research in crop rotation, irrigation and drainage, plant breeding, soil classification, soil fertility, weed control, and other areas.

**Behavioral Ecology:** Behavioral ecology is the study of the ecological and evolutionary basis for animal behavior, and the roles of behavior in enabling an animal to adapt to its environment (both intrinsic and extrinsic). Outlined in behavioral ecology are the four causes of behavior (development, adaptation, experience, biological processes).

**Biogeography:** Biogeography is the science which deals with patterns of species distribution and the processes that result in such patterns. The patterns of species distribution at this level can usually be explained through a combination of historical factors such as speciation, extinction, continental drift, glaciation (and associated variations in sea level, river routes, and so on), and river capture, in combination with the area and isolation of landmasses (geographic constraints) and available energy supplies.

## Exobiology

Training includes the study of life forms alien to humanoid creatures. It involves the study of non-carbon-based organisms, with life cycles that may not include nitrogen, oxygen, or water. Exobiologists can use their skill to give information about the structure and function of alien creatures and plants, perhaps even determining that what appears to be non-living is in fact alive, but of a structure totally new to the Federation. Exoexobiology can be broken down into these specific subskills.

**Anatomy:** Anatomy is the branch of exobiology that deals with the structure and organization of living things. It can be divided into animal anatomy (zootomy) and plant anatomy (phytotomy). Furthermore, anatomy can be covered either regionally or systemically, that is, studying anatomy by bodily regions such as the head and chest for the former, or studying by specific systems, such as the nervous or respiratory systems for the latter. Major branches of anatomy include comparative anatomy, histology and human anatomy.

**Astroexobiology:** Astroexobiology is an interdisciplinary field, combining aspects of astronomy, exobiology and geology, which is focused primarily on the study of the origin, distribution and evolution of life. It is also known as exoexobiology or xenoexobiology. There are six basic parameters that determine whether an environment is suitable for life as we know it: temperature, pressure, salinity, acidity, water availability, and oxygen content. Advanced life is restricted to a narrow range of these parameters, but primitive microorganisms exist over a much wider range.

**Biochemistry:** Biochemistry is the study of the substances and chemical processes which occur in living organisms. It includes the identification and quantitative determination of the substances, studies of their structure, determining how they are synthesized and degraded in organisms, and elucidating their role in the operation of the organism.

**Bioengineering:** Biological engineering (also biosystems engineering and bioengineering) is a broad-based engineering discipline that deals with bio-molecular and molecular processes, product design, sustainability and analysis of biological systems. Generally, bioengineering encompasses other engineering disciplines when they are applied to living organisms.

**Bioinformatics & Computational Exobiology:** Bioinformatics and computational exobiology involve the use of techniques from applied mathematics, informatics, statistics, and computer science, and chemistry, especially biochemistry to solve biological problems usually on the molecular level. Major research efforts in the field include sequence alignment, gene finding, genome assembly, protein structure alignment, protein structure prediction, prediction of gene expression and protein-protein interactions, and the modeling of evolution.

**Biotechnology:** Biotechnology refers to any technique that is used to make or modify the products of living organisms in order to improve plants or animals, or to develop useful microorganisms. In modern terms, biotechnology has come to mean the use of cell and tissue culture, cell fusion, molecular exobiology, and in particular, recombinant deoxyribonucleic acid (DNA) technology to generate unique organisms with new traits or organisms that have the potential to produce specific products. Biotechnology is further subdivided into red, white, or green sub-fields, dealing with medical, industrial, or agricultural processes respectively.

**Cell Exobiology:** Cell exobiology (also called cellular exobiology or cytology) is an academic discipline that studies cells. This includes their physiological properties such as their structure and the organelles they contain, their environment and interactions, their life cycle, division and function (physiology) and eventual death. This is done both on a microscopic and molecular level, and cell exobiology researches

both single-celled organisms like bacteria and specialized cells in multicellular organisms like humans.

**Conservation Exobiology:** Conservation exobiology is the protection and management of biodiversity that uses principles and experiences from the biological sciences, from natural resource management, and from the social sciences, including economics. Put another way, conservation exobiology is the scientific study of the phenomena that affect the maintenance, loss, and restoration of biological diversity. Much of conservation ecology deals with the problems associated with the small population sizes of rare species.

**Developmental Exobiology:** Developmental exobiology is the study of the process by which organisms grow and develop. Modern developmental exobiology studies the genetic control of cell growth, differentiation and "morphogenesis," which is the process that gives rise to tissues, organs and anatomy. Embryology is a subfield, the study of organisms between the one-cell stage (generally, the zygote) and the end of the embryonic stage, which is not necessarily the beginning of free living.

**Environmental Science:** Environmental science is the study of the interactions among the physical, chemical and biological components of the environment; with a focus on pollution and degradation of the environment related to human activities; and the impact on biodiversity and sustainability from local and global development. It is inherently an interdisciplinary field that draws upon not only its core scientific areas, but also applies knowledge from other non-scientific studies such as economics, law and social sciences.

**Evolutionary Exobiology:** Evolutionary exobiology is a sub-field of exobiology concerned with the origin and descent of species, as well as their change, multiplication, and diversity over time. Evolutionary exobiology is an interdisciplinary field because it includes scientists from a wide range of both field and lab oriented disciplines. For example, it generally includes scientists who may have a specialist training in particular organisms, but use those organisms as case studies to answer general questions in evolution. It also generally includes paleontologists and geologists who use fossils to answer questions about the tempo and mode of evolution, as well as theoreticians in areas such as genetics.

**Immunology:** Immunology is a broad branch of biomedical science that covers the study of all aspects of the immune system in all organisms. It deals with, among other things, the physiological functioning of the immune system in states of both health and disease; malfunctions of the immune system in immunological disorders (autoimmune diseases, hypersensitivities, immune deficiency, allograft rejection); the physical, chemical and physiological

characteristics of the components of the immune system in vitro, in situ, and in vivo.

**Mathematical Exobiology:** The application of mathematics to biological systems. Mathematical exobiology spans all levels of biological organization and biological function, from the configuration of biological macromolecules to the entire ecosphere over the course of evolutionary time.

**Microexobiology:** Microexobiology is the study of microorganisms, which are unicellular or cell-cluster microscopic organisms. This includes eukaryotes (with a nucleus) such as fungi and protists, and prokaryotes (without a nucleus) such as bacteria and viruses (though viruses are not strictly classed as living organisms).

**Molecular Exobiology:** Molecular exobiology is the study of exobiology at a molecular level. The field overlaps with other areas of exobiology and chemistry, particularly genetics and biochemistry. Molecular exobiology chiefly concerns itself with understanding the interactions between the various systems of a cell, including the interrelationship of DNA, RNA and protein synthesis and learning how these interactions are regulated.

**Mycology:** Mycology is the study of fungi, their genetic and biochemical properties, their taxonomy, and their use to humans as a source for medicinals (e.g. penicillin) and food (beer, wine, cheese, edible mushrooms), as well as their dangers, such as poisoning or infection. Mycology is closely related to phytopathology, the study of plant diseases.

**Neuroscience:** Neuroscience is a scientific discipline that studies the structure, function, development, genetics, biochemistry, physiology, pharmacology, and pathology of the nervous system. Traditionally it is seen as a branch of biological sciences. However, recently there has been convergence of interest from many allied disciplines, including psychology, computer science, statistics, physics, and medicine. The scope of neuroscience has now broadened to include any systematic scientific experimental and theoretical investigation of the central and peripheral nervous system of biological organisms.

**Parasitology:** Parasitology is the study of parasites, their hosts, and the relationship between them. As a biological discipline, the scope of parasitology is not determined by the organism or environment in question, but by their way of life. The parasitic mode of life is the most common on the planet, with representatives from all major taxa, from the simplest unicellular organisms to complex vertebrates. Every free-living species has its own unique species of parasite, so the number of parasitic species greatly exceeds the number of free living species.

**Physiology:** Physiology is the study of the mechanical, physical, and biochemical functions of living organisms. Physiology has traditionally been divided into plant physiology and animal physiology but the principles of physiology are universal, no

matter what particular organism is being studied. For example, what is learned about the physiology of yeast cells can also apply to human cells. The field of animal physiology extends the tools and methods of human physiology to non-human animal species. Plant physiology also borrows techniques from both fields. Its scope of subjects is at least as diverse as the tree of life itself. Due to this diversity of subjects, research in animal physiology tends to concentrate on understanding how physiological traits changed throughout the evolutionary history of animals.

**Systems Exobiology:** Systems exobiology is an academic field that seeks to integrate different levels of information to understand how biological systems function. By studying the relationships and interactions between various parts of a biological system (e.g., gene and protein networks involved in cell signaling, metabolic pathways, organelles, cells, physiological systems, organisms, etc.) it is hoped that eventually an understandable model of the whole system can be developed.

**Taxonomy:** Taxonomy was once only the science of classifying living organisms, but later the word was applied in a wider sense, and may also refer to either a classification of things, or the principles underlying the classification. Almost anything, animate objects, inanimate objects, places, and events, may be classified according to some taxonomic scheme.

## Genetics

Training includes the study of heredity and variations in living things from one individual, group, species, or generation to another. Genetic specialists added their skills to projects like constructing the Genesis Device or breeding genetic "supermen" such as Khan Noonian Singh. Genetics has several subfields, detailed below.

**Classical Genetics:** Classical genetics works a little differently than any other field of science. Primarily, instead of beginning with a hypothesis, geneticists try to deduce a conclusion based on initial observations and then later come up with hypotheses (and experiments to test the hypotheses).

**Genetic Engineering:** Genetic engineering involves the isolation, manipulation and reintroduction of DNA into cells or model organisms, usually to express a protein. The aim is to introduce new characteristics or attributes physiologically or physically, such as making a crop resistant to a herbicide, introducing a novel trait, or producing a new protein or enzyme.

**Epigenetics:** Epigenetics is the study of epigenetic inheritance, a set of reversible heritable changes in gene function or other cell phenotype that occur without a change in DNA sequence (genotype). These changes may be induced spontaneously, in response to environmental factors, or in response to the presence of a particular allele, even if it is absent from subsequent generations.

**Genomics:** Genomics is the study of an organism's genome and the use of the genes. It deals with the systematic use of genome information, associated with other data, to provide answers in biology, medicine, and industry. Genomics has the potential of offering new therapeutic methods for the treatment of some diseases, as well as new diagnostic methods.

**Medical Genetics:** Medical Genetics is the application of genetics to medicine. Medical genetics is a broad and varied field. It encompasses many different individual fields, including clinical genetics, biochemical genetics, cytogenetics, molecular genetics, the genetics of common diseases (such as neural tube defects), and genetic counseling. Each of the individual fields within medical genetics is a hybrid. Clinical genetics is a hybrid of clinical medicine with genetics. Biochemical genetics is a hybrid of biochemistry, mainly of amino acids and proteins, with genetics. Molecular genetics is a hybrid of the biochemistry of DNA and RNA with genetics. Cytogenetics is a hybrid of cytology and genetics; it involves the study of chromosomes under the microscope. Genetic counseling is a hybrid of genetics and nondirectional counseling.

**Molecular Genetics:** Molecular genetics is the field of biology which studies the structure and function of genes at a molecular level. Molecular genetics employs the methods of genetics and molecular biology. It is so-called to differentiate it from other sub fields of genetics such as ecological genetics and population genetics. An important area within molecular genetics is the use of molecular information to determine the patterns of descent, and therefore the correct scientific classification of organisms: this is called molecular systematics.

**Phylogenetics:** Phylogenetics is the study of evolutionary relatedness among various groups of organisms (e.g., species, populations). Also known as phylogenetic systematics, phylogenetics treats a species as a group of lineage-connected individuals over time. Phylogenetic taxonomy, which is an offshoot of, but not a logical consequence of, phylogenetic systematics, constitutes a means of classifying groups of organisms according to degree of evolutionary relatedness.

**Population Genetics:** Population genetics is the study of distribution and change under the influence of the four evolutionary forces: natural selection, genetic drift, mutation, and migration. It also takes account of population subdivision and population structure in space. As such, it attempts to explain such phenomena as adaptation and speciation. Population genetics was a vital ingredient in the modern evolutionary synthesis.

## Zoology

Training includes the study of animal life, with particular emphasis on the properties of and characteristics exhibited by an animal, an animal type,

or an animal population. Zoologists can use their skill to recognize predators and prey, and they can determine which animals are likely to be dangerous or beneficial to a landing party.

**Acarology:** Acarology is the study of mites and ticks, the animals in the order Acarina. It is occasionally treated as a specific area of Arachnology.

**Arachnology:** Arachnology is the scientific study of spiders and related organisms such as scorpions, pseudoscorpions, harvestmen, collectively called arachnids. However, the study of ticks and mites is sometimes not included in arachnology, but is called Acarology.

**Cetology:** Cetology is the branch of marine mammal science that studies the approximately eighty species of whales, dolphins, and porpoise in the scientific order Cetacea.

**Entomology:** Entomology is the scientific study of insects. Insects have many kinds of interactions with humans and other forms of life on earth, so it is an important specialty within biology; unlike many other fields however, entomologists including both persons studying insects for their own sake, and those employed by commercial concerns interested in the control of insects. This divides the field into basic and applied entomology.

**Ethology:** Study of animal behavior based on the systematic observation, recording, and analysis of how animals function, with special attention to physiological, ecological, and evolutionary aspects. Laboratory or field experiments designed to test a proposed explanation must be rigorous, repeatable, and show the role of natural selection.

**Herpetology:** Herpetology is the branch of zoology concerned with the study of reptiles and amphibians. Herpetology deals with what are called the cold-blooded tetrapods, that is, those land vertebrates which are ectothermic (deriving their body temperature from their environment) rather than endothermic (deriving their body heat from an independent, internal source).

**Ichthyology:** Ichthyology is the branch of zoology devoted to the study of fish. This includes the bony fish, the cartilaginous fish such as sharks and rays, and the jawless fish. Since there are as many species of fish as all other vertebrates put together, and they have been evolving for a very long time, there is a bewildering variety; while most species have probably been found and described, there is much that is still not known about biology and behavior.

**Mammalogy:** Mammalogy is the study of mammals, a class of vertebrates with characteristics such as homeothermic metabolism, fur, four-chambered hearts, and complex nervous systems. Three major subdivisions of mammals are monotremes, marsupials and placentals. An important characteristic for classifying mammals is their dentition: this is because teeth survive the longest after an animal's death.

**Neuroethology:** Neuroethology is a branch of neuroscience that emphasizes the study of neural mechanisms of 'natural behavior'. This is in contrast to other approaches to neuroscience that study the nervous system in isolation, or in the context of artificial conditions. The term itself is a combination of the words neurophysiology and ethology.

**Ornithology:** Ornithology is the branch of zoology concerned with the scientific study of birds. Several aspects of the study of ornithology differ from closely related disciplines, perhaps because of the high visibility and the aesthetic appeal of birds. Most marked among these is the extent of field studies undertaken by amateur volunteers working within the parameters of strict scientific methodology.

**Paleozoology:** Paleozoology is the branch of paleontology dealing with the recovery and identification of animal remains from archeological (or even geological) contexts, and their use in the reconstruction of past environments and economies. Animal remains are found in the fossil record on Earth from the Cambrian period onwards, although they did not become significant until the Late Devonian period. Animal-derived macrofossils include dinosaurs.

**Paleontology:** Paleontology is the study of the developing history of life on Earth, of ancient plants and animals based on the fossil record, evidence of their existence preserved in rocks. This includes the study of body fossils, tracks, burrows, cast off parts, fossilized feces ("coprolites"), and chemical residues.

## Medical Sciences

This broad group of skills includes everything from first aid to surgery and psychiatry. All Star Fleet personnel are qualified in first aid on themselves and members of their own race; Medical Officers, of course, study further, gaining professional-level skill in several areas of medical science.

Separate Skill Ratings must be gained for each separate race in General Medicine and Psychology. These skills are pre-requisites to all other medical skills. Additional Skill Ratings may be gained in the other medical sciences listed below as examples. Although a character may gain separate Skill Ratings in these medical specialties if he desires, he may choose instead to gain a rating in the skill for his native race and average his skill in General Medicine to determine his Skill Rating for other races.

## General Medicine

This is the anatomy and physiology of the body, its systems, organs, and tissues. Training begins with first aid and continues through diagnosis and treatment of most common disorders, including wounds and diseases. The basics of the skill are given to all Star Fleet personnel, and it is this Skill Rating that is used in determining success in first aid attempts. Professional-level training in this area is required of all practicing physicians and other medical

specialists. All Star Fleet Medical Officers are trained to treat several races. General Medicine can be broken down further, below.

**Anesthesia:** Anesthesia has traditionally meant the process of blocking the perception of pain and other sensations. This allows patients to undergo surgery and other procedures without the distress and pain they would otherwise experience. Forms of anesthesia include general, in which consciousness is lost, local, which affects sensation at the affected area, and regional, which involves blocking nerve impulses from the spine or nerves supplying the region.

**Cardiology:** Cardiology is the branch of medicine dealing with disorders of the heart and blood vessels. The field is commonly divided in the branches of congenital heart defects, coronary artery disease, heart failure, valvular heart disease and electrophysiology.

**Dermatology:** Dermatology is a branch of medicine concerned with diagnosis and treatment of diseases and disorders of the skin. Dermatologists also study the structure and function of the skin, and the relationship between skin pathologies and malfunctions of other organs of the body. Dermatology often overlaps the practice of other medical specialties, e.g., neurology and internal medicine.

**Emergency Medicine:** Emergency medicine is a branch of medicine that is practiced in a hospital emergency department, in the field, and other locations where initial medical treatment of illness takes place. Emergency medicine focuses on diagnosis and treatment of acute illnesses and injuries that require immediate care. While not usually providing long-term care, EM physicians and pre-hospital personnel still provide care with the aim of improving long-term patient outcome.

**Endocrinology:** Endocrinology is a branch of medicine dealing with disorders of the endocrine system and its specific secretions called hormones. Hormones are molecules that act as signals from one type of cells to another. Most hormones reach their targets via the blood. Although every organ system secretes and responds to hormones (including the brain, lungs, heart, intestine, skin, and the kidney), the clinical specialty of endocrinology focuses primarily on the endocrine organs, meaning the organs whose primary function is hormone secretion. These organs include the pituitary, thyroid, adrenals, ovaries and testes, and pancreas.

**Gastroenerology:** Gastroenterology or gastrology is the medical specialty concerned with digestive diseases. Traditionally, these are separated by anatomic or functional category. For example, disorders of the esophagus might be listed under "esophagus" and also included in a description of motility disorders (disorders of motor function.) Diseases of the liver fall under the branch of

hepatology, which is traditionally classified under the umbrella of gastroenterology.

**Hematology:** Branch of medicine concerned with the nature, function, and diseases of the blood. It covers the cellular and serum composition of blood, the coagulation process, blood-cell formation, hemoglobin synthesis, and disorders of all these.

**Intensive Care Medicine:** Intensive Care Medicine or critical care medicine is a branch of medicine concerned with the provision of life support or organ support systems in patients who are critically ill who usually also require intensive monitoring. Patients requiring intensive care usually require support for hemodynamic instability (hypotension), for airway or respiratory compromise and or renal failure, and often all three. Patients admitted to the intensive care unit not requiring support for the above are usually admitted for intensive/invasive monitoring, usually after major surgery.

**Nephrology:** Nephrology is the branch of internal medicine dealing with the study of the function and diseases of the kidney. Most diseases affecting the kidney are not limited to the organ itself, but are systemic disorders. Nephrology concerns itself with the diagnosis of kidney disease and its treatment (medication, dialysis), and follow-up of renal transplant patients. Additionally, most nephrologists consider themselves to be expert in the care of electrolyte disorders and hypertension. Given that most renal conditions are chronic, nephrologists "grow with their patients".

**Neurology:** Neurology is a branch of medicine dealing with disorders of the nervous system. Neurological disorders are disorders that affect the central nervous system (brain, brainstem and cerebellum), the peripheral nervous system (peripheral nerves - cranial nerves included), or the autonomic nervous system (parts of which are located in both central and peripheral nervous system). Neurologists also diagnose and treat some conditions in the musculoskeletal system.

**Obstetrics & Gynecology:** Often abbreviated as OBGYN, this is a medical and surgical specialty concerned with the management of pregnancy and childbirth and with the health of the female reproductive system. Obstetricians confirm pregnancy, diagnose ectopic pregnancy, conduct prenatal care, perform amniocentesis, deliver babies, and perform abortions. Gynecologists do routine pelvic exams, take samples for Pap smears, advise on and prescribe birth control, and treat reproductive system disorders (e.g., endometriosis, hormonal imbalances, problems with menstruation and menopause). They perform surgery to prevent conception (tubal ligation), repair pelvic injuries, and remove cysts and tumours from the uterus, cervix, and ovaries. Both specialties are involved in diagnosis and treatment of infertility.

**Occupational:** Occupational medicine is the branch of clinical medicine most active in the field of occupational health. Occupational health should aim at: the promotion and maintenance of the highest degree of physical, mental and social well-being of workers in all occupations; the prevention among workers of departures from health caused by their working conditions; the protection of workers in their employment from risks resulting from factors adverse to health; placing and maintenance of a worker in an occupational environment adapted to his physiological and psychological equipment and, to summarise, the adaption of work to man and of each man to his job.

**Oncology:** The study of cancer. There are five major areas of oncology: etiology, prevention, biology, diagnosis, and treatment. As a clinical discipline, it draws upon a wide variety of medical specialties; as a research discipline, oncology also involves specialists in many areas of biology and in a variety of other scientific areas. Oncology has led to major progress in the understanding not only of cancer but also of normal biology.

**Pediatrics:** Pediatrics is the branch of medicine that deals with the medical care of infants, children, and adolescents (from newborn to age 18-21). Pediatrics differs from adult medicine in many respects. The obvious body size differences are paralleled by maturational changes. The smaller body of an infant or neonate is substantially different physiologically from that of an adult. Congenital defects, genetic variance, immunology, oncology, and a host of other issues are unique to the realm of pediatrics. Increasingly effective health care also means that diseases such as sickle cell anemia and cystic fibrosis are more often treated by pediatricians.

**Physiatry:** Physiatry is a branch of medicine dealing with functional restoration of a person affected by physical disability. Physical medicine and rehabilitation involves the management of disorders that alter the function and performance of the patient. Emphasis is placed on the optimization of function through the combined use of medications, physical modalities, and experiential training approaches.

**Podiatry:** Podiatry is a field of healthcare primarily devoted to the study and treatment of disorders of the foot, ankle, and sometimes knee, leg and hip (collectively known as the lower extremity). In this regard, the range of disorders of the lower extremity which podiatry can address is largely dependent on the scope of practice as per national, state, and/or provincial jurisdiction.

**Psychiatry:** Psychiatry is a medical speciality whose primary goal is to improve people's mental well-being. This is sometimes done by first doing a thorough diagnostic assessment of the person from a biological, psychological, and social/cultural perspective. An illness or problem can then be treated or managed by medication (usually) or various forms of psychotherapy (sometimes). Psychotherapies assist

people to gain insight into their problem as well as their relationships with others.

**Public Health:** Public health is concerned with threats to the overall health of a community based on population health analysis. The Federation Health Organization, the United Federation of Planets body that sets standards and provides galactic surveillance of disease, defines health as: "A state of complete physical, mental and social well-being and not merely the absence of disease or infirmity." The focus of a public health intervention is to prevent rather than treat a disease through surveillance of cases and the promotion of healthy behaviors.

**Pulmonology:** In medicine, pulmonology (aka pneumology) is the specialty that deals with diseases of the lungs and the respiratory tract. It is called chest medicine and respiratory medicine in some countries and areas. Pulmonology is generally considered a branch of internal medicine, although it is closely related to intensive care medicine when dealing with patients requiring mechanical ventilation.

**Radiology:** Branch of medicine that uses radiation for diagnosis (diagnostic imaging) and treatment (radiation therapy) of disease. Originally, it involved X rays for diagnosis and X rays, gamma rays, and other ionizing radiation for treatment. Diagnostic methods now include isotope scanning (see nuclear medicine), use of nonionizing radiation, as in ultrasound and magnetic resonance imaging, and radioimmunoassay (in which radioactive isotopes in antibodies against hormones detect minute amounts of hormones for diagnosis of endocrine disorders). Radiotherapy now includes, in cancer treatment, radioactive hormones and chemotherapeutic drugs.

**Rheumatology:** Rheumatology, a subspecialty of internal medicine, is devoted to the diagnosis and treatment of rheumatic diseases. Rheumatic diseases are diseases of the joints and connective tissues. Therapy is vital in the treatment of many rheumatological disorders. Occupational therapy can help patients finding alternative ways for common movements which would otherwise be restricted by their disease.

**Toxicology:** Toxicology is the study of the adverse effects of chemicals on living organisms. It is the study of symptoms, mechanisms, treatments and detection of poisoning, especially the poisoning of people. The chief criterion regarding the toxicity of a chemical is the dose, i.e. the amount of exposure to the substance. Almost all substances are toxic under the right conditions.

**Urology:** Urology is the field of medicine that focuses on the urinary tracts of males and females, and on the reproductive system of males. In men, the urinary system overlaps with the reproductive system, and in women the urinary tract opens into the vulva. In both sexes, the urinary and reproductive tracts are close together, and disorders of one often affect the other. The organs covered by urology include the kidneys,

ureters, urinary bladder, urethra, and the male reproductive organs (testes, epididymis, vas deferens, seminal vesicles, prostate and penis).

**Virology:** Study of viruses and their role in disease. Many viruses, such as animal RNA viruses and viruses that infect bacteria have become useful laboratory tools in genetic studies and in work on the cellular metabolic control of gene expression. Because viruses can sometimes carry extra genetic material into host cells, they have been used to experimentally transfer genetic material, specifying a particular enzyme, into nuclei of mammalian host cells that lacked the ability to synthesize that enzyme.

## Pathology

Training involves the study of diseases and the changes caused by them in tissues and organs. It also includes extensive study of tissues, including analysis for trace substances, bacteria, and viruses. Pathologists can use their skill to analyze a tissue sample for poisons or to perform an autopsy. Pathology has a pair of subfields.

**Anatomic Pathology:** Anatomic pathology is the branch of pathology that is concerned with the diagnosis of disease based on the gross and microscopic examination of cells and tissues. Contrary to popular belief, the field mostly concerns the study of tissue obtained from live patients. In fact, almost all tissues removed from a patient for any reason are examined by a pathologist.

**Clinical Pathology:** Clinical pathology is one of the two major divisions of pathology. A clinical pathologist is a specialized medical doctor responsible for the diagnosis of diseases based on the analysis of body fluids like blood, urine, etc. He/she works in close collaboration with medical technologists.

## Psychology

Training involves study of the working of the thinking mind. Observational techniques are taught for use in behavior studies of individuals and groups. Extensive training in this area is given to all Star Fleet Medical Officers, so that they may deal with several races. Psychologists can use their skill to detect patterns that deviate from the norm, gaining information about the state of mind of those under observation. Psychology can be broken down further into the fields shown here.

**Applied:** The basic premise of applied psychology is the use of psychological principles and theories to overcome practical problems in other fields, such as business management, product design, ergonomics, nutrition, law and clinical medicine. Applied psychology includes the areas of industrial/organizational psychology, human factors, forensic psychology, as well as many other areas.

**Biological:** Biological psychology is the scientific study of the biological bases of behavior and mental states. Because biological psychology and



neuroscience both study the nervous system often using the same techniques (such as fMRI and MEG), it is difficult to say whether biological psychology is a branch of neuroscience (or vice versa) or whether they are one and same. Many researchers use the terms interchangeably. Biological psychology is also known as biopsychology, psychobiology, physiological psychology, behavioral neuroscience, and neuropsychology.

**Clinical:** Clinical psychology is the application of psychology to troublesome mental distress in a health and social care context. Clinical Psychologists assess mental health problems; conduct and use scientific research to understand mental health problems; develop, provide and evaluate psychological care and interventions (psychotherapy).

**Cognitive:** Cognitive psychology is the school of psychology that examines internal mental processes such as problem solving, memory, and language. Cognitive psychology is radically different from previous psychological approaches in two key ways. First, it accepts the use of the scientific method, and generally rejects introspection as a valid method of investigation. Second, it explicitly acknowledges the existence of internal mental states (such as belief, desire and motivation).

**Developmental:** Developmental psychology, also known as Human Development, is the scientific study of progressive psychological changes that occur in human beings as they age. Originally concerned with infants and children, and later other periods of great change such as adolescence and aging, it now encompasses the entire life span. This field examines change across a broad range of topics including motor skills and other psycho-physiological processes, problem solving abilities, conceptual understanding, acquisition of language, moral understanding, and identity formation.

**Educational:** Educational psychology is the study of how humans learn in educational settings, the effectiveness of educational interventions, the psychology of teaching, and the social psychology of schools as organizations. Educational psychology is concerned with the processes of educational attainment among the general population and sub-populations such as gifted children and those subject to specific disabilities.

**Evolutionary:** Evolutionary psychology (abbreviated ev-psych or EP) is a theoretical approach to psychology that attempts to explain "useful" mental traits—such as memory, perception, or language—as adaptations, i.e. as the functional products of natural or sexual selection. The purpose of this approach is to bring the functional way of thinking about biological mechanisms like the immune system into the field of psychology, and to approach psychological mechanisms in a similar way. In short, evolutionary psychology is focused on how evolution has shaped the brain.

**Experimental:** Experimental psychology is an approach to psychology that treats it as one of the natural sciences, and therefore assumes that it is susceptible to the experimental method. Many experimental psychologists have gone further, and have assumed that all methods of investigation other than experimentation are suspect. In particular, experimental psychologists have been inclined to discount the case study and interview methods as they have been used in clinical and developmental psychology.

**Industrial/Organizational:** Industrial and organizational psychology (abbreviated as I/O psychology) is the study of the behavior of people in the workplace. Industrial and organizational psychology applies psychological knowledge and methods to aid workers and organizations. Historically, job analysis has been the traditional means for which essential characteristics associated with any particular position are identified.

**Psycholinguistics:** Psycholinguistics covers the cognitive processes that make it possible to generate a grammatical and meaningful sentence out of vocabulary and grammatical structures, as well as the processes that make it possible to understand utterances, words, text, etc. Developmental psycholinguistics studies infants' and children's ability to learn language, usually with experimental or at least quantitative methods.

**Social:** Social psychology is a subfield of psychology concerned with the empirical study of how individuals' behavior, attitudes, and emotions are affected by social situations. Social psychology is an attempt to understand and explain how the thought, feeling, and behavior of individuals is influenced by the actual, imagined, or implied presence of others. By imagined or implied presence, the suggestion is made that the effects of social influence are felt even when there are no other people about.

## Surgery

For each of the specialties below, training includes advanced techniques in the chosen field, includes basic knowledge of anesthetics, and knowledge of organ transplants.

**General Surgeon:** General surgeons can perform most abdominal surgery, some head and neck surgery, and surgery of the soft tissues of the extremities.

**Neurologist:** Neurologists perform surgery of the central nervous system, including the brain and spinal cord.

**Orthopedic:** Orthopedic surgeons perform surgery on diseases of the bones and joints of the body.

**Plastic Surgeon:** Plastic surgeons perform reconstructive and cosmetic surgery.

**Urologist:** Urologists treat diseases of the kidney, bladder, and other components of the urinary tract.

## Physical Sciences

This large group of skills includes the theoretical sciences that govern the behavior of non-living materials solids, liquids, gases, and plasmas. The group also includes mathematics and computer sciences. All Star Fleet cadets are trained in at least one of these sciences, and all Science and Medical Officers have extensive, professional-level training in at least one, if not several. Separate Skill Ratings must be developed in each science, such as the examples listed below.

## Chemistry

Training includes study of the behavior of elements and compounds, their reactions and synthesis, as well as chemical analysis. It also includes practice in standard laboratory techniques and in the interpretation of chemical data from sensor and tricorder scans. Chemists can use their skill to analyze the chemical composition and behavior of unknown substances, both aboard ship and on a planetary surface. This skill can be further specialized as shown below.

**Analytical Chemistry:** The science of chemical characterization and measurement. Qualitative analysis is concerned with the description of chemical composition in terms of elements, compounds, or structural units, whereas quantitative analysis is concerned with the measurement of amount.

**Astrochemistry:** Astrochemistry is the study of the chemicals found in outer space, usually in molecular gas clouds, and their formation, interaction and destruction. As such, it represents an overlap of the disciplines of astronomy and chemistry. Astrochemistry involves the use of telescopes to measure various aspects of bodies in space, such as their temperature and composition.

**Atmospheric Chemistry:** A scientific discipline concerned with the chemical composition of the Earth's atmosphere. Topics include the emission, transport, and deposition of atmospheric chemical species; the rates and mechanisms of chemical reactions taking place in the atmosphere; and the effects of atmospheric species on human health, the biosphere, and climate.

**Biochemistry:** The study of the substances and chemical processes which occur in living organisms. It includes the identification and quantitative determination of the substances, studies of their structure, determining how they are synthesized and degraded in organisms, and elucidating their role in the operation of the organism. Substances studied in biochemistry include carbohydrates (including simple sugars and large polysaccharides), proteins (such as enzymes), ribonucleic acid (RNA) and deoxyribonucleic acid (DNA), lipids, minerals, vitamins, and hormones.

**Chemical Engineering:** The application of engineering principles to conceive, design, develop,

operate, or use processes and products based on chemical and physical phenomena. The chemical engineer is considered an engineering generalist because of a unique ability (among engineers) to understand and exploit chemical change. Drawing on the principles of mathematics, physics, and chemistry and familiar with all forms of matter and energy and their manipulation, the chemical engineer is well suited for working in a wide range of technologies.

**Cheminformatics:** Cheminformatics is the use of computer and informational techniques, applied to a range of problems in the field of chemistry. These in silicon techniques are used in pharmaceutical companies in the process of drug discovery.

**Electrochemistry:** The science dealing with the chemical changes accompanying the passage of an electric current, or the reverse process in which a chemical reaction is used as the source of energy to produce an electric current, as in a battery. Ionic conduction in electrolytes (liquid solutions, molten salts, and certain ionically conductive solids) is a phase of electrochemistry.

**Environmental Chemistry:** Environmental chemistry is the scientific study of the chemical and biochemical phenomena that occur in natural places. It should not be confused with green chemistry, which seeks to reduce potential pollution at source. It can be defined as the study of the sources, reactions, transport, effects, and fates of chemical species in the air, soil, and water environments; and the effect of human activity on these.

**Geochemistry:** A field that encompasses the investigation of the chemical composition of the Earth, other planets, and the solar system and universe as a whole, as well as the chemical processes that occur within them. The discipline is large and very important because basic knowledge about the chemical processes involved is critical for understanding subjects as diverse as the formation of economically valuable ore deposits, safe disposal of toxic wastes, and variations in the Earth's climate.

**Green Chemistry:** Green chemistry is the design of chemical products and processes that reduce or eliminate the use and generation of hazardous substances. Whereas environmental chemistry is the chemistry of the natural environment, and of pollutant chemicals in nature, green chemistry seeks to reduce and prevent pollution at its source.

**Inorganic Chemistry:** Inorganic chemistry is the branch of chemistry concerned with the properties and reactions of inorganic compounds. This includes all chemical compounds except the many which are based upon chains or rings of carbon atoms, which are termed organic compounds and are studied under the separate heading of organic chemistry.

**Materials Science:** Study of the properties of solid materials and how those properties are determined by the material's composition and structure, both macroscopic and microscopic. Materials science grew

out of solid-state physics, metallurgy, ceramics, and chemistry, since the numerous properties of materials cannot be understood within the context of any single discipline. With a basic understanding of the origins of properties, materials can be selected or designed for an enormous variety of applications, from structural steels to computer microchips.

**Medicinal Chemistry:** Medicinal or pharmaceutical chemistry is a scientific discipline at the intersection of chemistry and pharmacy involved with designing and developing pharmaceutical drugs. Medicinal chemistry involves the identification, synthesis and development of new chemical entities suitable for therapeutic use. It also includes the study of existing drugs, their biological properties, and their quantitative structure-activity relationships.

**Nanotechnology:** The science of developing materials at the atomic and molecular level in order to imbue them with special electrical and chemical properties. Nanotechnology, which deals with devices typically less than 100 nanometers in size, allows for significant contributions to the fields of computer storage, semiconductors, biotechnology, manufacturing and energy.

**Nuclear Chemistry:** An interdisciplinary field that, in general, encompasses the application of chemical techniques to the solution of problems in nuclear physics. The discovery of the naturally occurring radioactive elements and of nuclear fission is classical examples of the work of nuclear chemists. It may be broken down further into additional categories. Inorganic deals with the chemistry of radioactive elements and their interactions with equipment and containing materials. Organic deals with the effects of radiation on living creatures and plants. Manufacturing refers to the production and use of radioactive sources in applications where such radioactive sources are required. Investigative is the study and use of nuclear processes to understand other processes.

**Organic Chemistry:** Distinct from Organic Nuclear Chemistry above, this is the study of the structure, preparation, properties, and reactions of carbon compounds. The term organic was early applied to compounds derived from plant and animal sources. These substances from living systems were usually distillable liquids or low-melting solids and were flammable, in contrast to metals, salts, and oxides from mineral sources.

**Organometallic Chemistry:** The study of chemical compounds containing bonds between carbon and a metal. Often this definition is too strict however, since many compounds without such bonds are chemically similar. An appropriate alternative may be "compounds containing metal-element bonds of a largely covalent character". Organometallic chemistry combines aspects of inorganic chemistry and organic chemistry.

**Petrochemistry:** The branch of chemistry that studies the transformation of crude oil (petroleum) and natural gas into useful products and raw materials.

**Pharmacology:** The study of how substances interact with living organisms to produce a change in function. If substances have medicinal properties, they are considered pharmaceuticals. The field encompasses drug composition and properties, interactions, toxicology, therapy, and medical applications and antipathogenic capabilities. Pharmacology can be broken down into a number of sub fields. Chemotherapy is the use of chemicals to destroy invading or mutated organisms. Pharmacotherapy is the use of drugs to restore or replace normal functions in various cells or organs. Pharmacodynamics is the study of the mechanism of action of drugs which may utilize physiological, biochemical, or electrical techniques. Toxicology deals with poisonous effects of chemicals. Psychopharmacology is the study of chemicals on the behavior of beings. Biochemical Pharmacology is the study of the effects of chemicals on living systems and the effects of those systems on the chemicals. Clinical Pharmacology is the study of drug effects on beings.

**Photochemistry:** The study of chemical reactions of molecules in electronically excited states produced by the absorption of infrared, visible, ultraviolet, or vacuum ultraviolet light. Bond making and bond breaking as well as electron transfer and ionization are often observed in both organic and inorganic compounds as a consequence of such excitation.

**Physical Chemistry:** The branch of chemistry that deals with the interpretation of chemical phenomena and properties in terms of the underlying physical processes, and with the development of techniques for their investigation. The term chemical physics is often employed to denote a branch of physical chemistry where the emphasis is on the interpretation and analysis of the physical properties of individual molecules and bulk systems, instead of their reactions.

**Phytochemistry:** Phytochemistry is in the strict sense of the word the study of phytochemicals. These are chemicals derived from plants. In a narrower sense the terms are often used to describe the large number of secondary metabolic compounds found in plants. Many of these are known to provide protection against insect attacks and plant diseases. They also exhibit a number of protective functions for organic beings.

**Polymer Chemistry:** A multidisciplinary science that deals with the chemical synthesis and chemical properties of polymers or macromolecules, which are chemical compounds with high molecular weight consisting of a number of structural units linked together by chemical bonds.

**Solid-state Chemistry:** The science of the elementary, atomic compositions of solids and the transformations that occur in and between solids and between solids and other phases to produce solids.

Solid-state chemistry deals primarily with those microscopic features which are uniquely characteristic of solids and which are the causes for the macroscopic chemical properties and the chemical reactions of solids.

**Sonochemistry:** The study of the chemical changes that occur in the presence of sound or ultrasound. Industrial applications of ultrasound include many physical and chemical effects, for example, cleaning, soldering, welding, dispersion, emulsification, disinfection, pasteurization, extraction, flotation of minerals, degassing of liquids, defoaming, and production of gas-liquid sols.

**Supramolecular Chemistry:** A highly interdisciplinary field covering the chemical, physical, and biological features of complex chemical species held together and organized by means of intermolecular bonding interactions.

**Surface Chemistry:** Study of chemical reactions in which the reactants are first adsorbed (accumulated on the surface of a solid or liquid) onto a surface medium that then acts as a catalyst for the reaction; after the reaction the products are desorbed and the surface is left unchanged.

**Theoretical Chemistry:** Theoretical chemistry is the use of reasoning to explain or predict chemical phenomena. Theoretical chemistry can be broken down into specific branches, although there is some cross pollination of ideas between them. Quantum chemistry is the application of quantum mechanics to chemistry. Computational chemistry is the application of computer codes to chemistry. Molecular Modelling is the methods modelling molecular structures without necessarily referring to quantum mechanics. Molecular dynamics is the application of classical mechanics for simulating the movement of the nuclei of an assembly of atoms and molecules. Molecular mechanics is the modeling of the intra- and inter-molecular interaction potential energy surfaces via a sum of interaction forces. Mathematical chemistry is the discussion and prediction of the molecular structure using mathematical methods without necessarily referring to quantum mechanics. Theoretical chemical kinetics is the study of the dynamical systems associated to reactive chemicals and their corresponding differential equations.

**Thermochemistry:** A branch of physical chemistry concerned with the absorption or evolution of heat that accompanies chemical reactions. Closely related topics are the latent heat associated with a change in phase (crystal, liquid, gas), the chemical composition of reacting systems at equilibrium, and the electrical potentials of galvanic cells. Thermodynamics provides the link among these phenomena.

### Computer Science

Training involves the theoretical basis for computer design and construction, and it includes the analysis of sophisticated computer systems. Extensive guided

practice is given in the construction of experimental computers and in computer linkups with many types of remote sensing devices. Computer scientists can use their skill to analyze software/hardware problems, to build or rebuild computers, and to fathom the functioning of alien computation devices. This skill can be further subdivided as shown below.

**Algorithms:** In computing, an algorithm is a procedure (a finite set of well-defined instructions) for accomplishing some task which, given an initial state, will terminate in a defined end-state. The computational complexity and efficient implementation of the algorithm are important in computing, and this depends on suitable data structures. Algorithms often have steps that repeat (iterate) or require decisions (such as logic or comparison). Algorithms can be composed to create more complex algorithms.

**Hardware:** Computer hardware is the physical part of a computer, including the digital circuitry, as distinguished from the computer software that executes within the hardware. The hardware of a computer is infrequently changed, in comparison with software and data, which are "soft" in the sense that they are readily created, modified or erased on the computer. Firmware is a special type of software that rarely, if ever, needs to be changed and so is stored on hardware devices such as read-only memory (ROM) where it is not readily changed (and is therefore "firm" rather than just "soft").

**Operating Systems:** An operating system (OS) is a software program that manages the hardware and software resources of a computer. A key component of system software, the OS performs basic tasks, such as controlling and allocating memory, prioritizing the processing of instructions, controlling input and output devices, facilitating networking, and managing files.

**Programming Languages:** A programming language is an artificial language that can be used to control the behavior of a machine, particularly a computer. Programming languages, like human languages, have syntactic and semantic rules to define meaning. Programming languages are used to facilitate communication about the task of organizing and manipulating information, and to express algorithms precisely.

**Programming Paradigms:** A programming paradigm is a model style of programming. A programming paradigm provides (and determines) the view that the programmer has of the execution of the program. For instance, in object-oriented programming, programmers can think of a program as a collection of interacting objects, while in functional programming a program can be thought of as a sequence of stateless function evaluations. Just as different groups in software engineering advocate different methodologies, different programming languages advocate different programming paradigms.

**Software:** Computer software (or simply software) is the programs that enable a computer to perform a

specific task, as opposed to the physical components of the system (hardware). This includes application software such as a word processor, which enables a user to perform a task, and system software such as an operating system, which enables other software to run properly, by interfacing with hardware and with other software.

**Theory:** The theory of computation is the branch of computer science that deals with whether and how efficiently problems can be solved on a computer. The field is divided into two major branches: computability theory and complexity theory, but both branches deal with formal models of computation. In order to perform a rigorous study of computation, computer scientists work with a mathematical abstraction of computers called a model of computation.

## Mathematics

Training involves advanced theoretical mathematics, including statistics, various geometries, trigonometries, and algebras, and the structure and behavior of various space configurations. Also stressed is the application of these subjects to practical problems. Mathematicians can use their skill to make statistical sense of a wealth of data, such as that gained from surveys of an alien culture. Characters may specialize in one of the subskills below.

**Algebra:** Algebra is a branch of mathematics concerning the study of structure, relation and quantity. Elementary algebra is often taught in secondary education and gives an introduction to the basic ideas of algebra: studying what happens when numbers are added or multiplied, and how to make polynomials and find their roots. Rather than working directly with numbers, one can work with symbols, variables, or elements of some set. Addition and multiplication are viewed as general operations, and their precise definitions lead to structures such as groups, rings and fields.

**Analysis:** Analysis is a branch of mathematics that depends upon the concepts of limits and convergence. It studies closely related topics such as continuity, integration, differentiability and transcendental functions. These topics are often studied in the context of real numbers, complex numbers, and their functions. However, they can also be defined and studied in any space of mathematical objects that is equipped with a definition of "nearness" (a topological space) or more specifically "distance" (a metric space). Mathematical analysis has its beginnings in the rigorous formulation of calculus (which was developed from algebra and geometry).

**Arithmetic:** Arithmetic is the oldest and simplest branch of mathematics, used by almost everyone, for tasks ranging from simple daily counting to advanced science and business calculations. In common usage, the word refers to a branch of (or the forerunner of)

mathematics which records elementary properties of certain operations on numbers.

**Geometry:** Geometry is a branch of mathematics that is concerned with the properties of configurations of geometric objects - points, (straight) lines, and circles being the most basic of these. Modern geometry is thus a complete abstraction that crystallizes our ideas of the physical world, i.e., to start with. Most of the edifice built on top of the chosen axioms, does not reflect common experiences. Mathematicians who work with the abstract objects develop an intuition and insights into a separate world of abstraction inhabited by mathematical objects.

## Physics

Training is the study of the relationship between matter and energy, including the laws of motion, light, heat, and nuclear phenomena. It involves practice using physical sensing devices and analysis tools. Physicists understand the theory behind warp drive engines, matter/antimatter reactions, and the beamed energy used in phasers and transporters. They can use their skill to determine the physical structure and behavior of unknown substances, the probable effects of unknown radiation sources, and to determine the theory behind alien technology. Subskills of physics are noted below.

**Atomic, Molecular, & Optical:** Atomic, molecular, and optical physics (abbreviated AMO) is the study of matter-matter and light-matter interactions on the scale of single atoms or structures containing a few atoms. The three areas are grouped together because of their interrelationships, the similarity of methods used, and the commonality of the energy scales that are relevant.

**Classical Mechanics:** Classical mechanics is a model of the physics of forces acting upon bodies. It is often referred to as "Newtonian mechanics" after Newton and his laws of motion. Classical mechanics is subdivided into statics (which models objects at rest), kinematics (which models objects in motion), and dynamics (which models objects subjected to forces).

**Condensed Matter:** Condensed matter physics is the field of physics that deals with the macroscopic physical properties of matter. In particular, it is concerned with the "condensed" phases that appear whenever the number of constituents in a system is extremely large and the interactions between the constituents are strong. The most familiar examples of condensed phases are solids and liquids, which arise from the bonding and electromagnetic force between atoms.

**Electromagnetism:** Electromagnetism is the physics of the electromagnetic field: a field, encompassing all of space, which exerts a force on those particles that possess the property of electric charge, and is in turn affected by the presence and motion of such particles.

Electromagnetism encompasses various real-world electromagnetic phenomena.

**Particle:** Particle physics is a branch of physics that studies the elementary constituents of matter and radiation, and the interactions between them. It is also called "high energy physics", because many elementary particles do not occur under normal circumstances in nature, but can be created and detected during energetic collisions of other particles, as is done in particle accelerators.

**Quantum Mechanics:** Quantum mechanics is the branch of mathematical physics treating atomic and subatomic systems and their interaction with radiation in terms of observable quantities. It is based on the observation that all forms of energy are released in discrete units or bundles called quanta. Quantum theory typically permits only probable or statistical calculation of the observed features of subatomic particles, understood in terms of wave functions.

**Relativity Theory:** Broken down into general and special relativity, special relativity theory functions under the assumption that the speed of light in a vacuum is a constant, and that the mathematical forms of the laws of physics are invariant in all inertial systems, leading to the assertion of the equivalence of mass and energy and of change in mass, dimension, and time with increased velocity. General relativity is an extension of special relativity that includes gravitation and related acceleration phenomena.

**Statistical Mechanics:** Statistical mechanics is the application of statistics, which includes mathematical tools for dealing with large populations, to the field of mechanics, which is concerned with the motion of particles or objects when subjected to a force. It provides a framework for relating the microscopic properties of individual atoms and molecules to the macroscopic or bulk properties of materials that can be observed in everyday life, therefore explaining thermodynamics as a natural result of statistics and mechanics (classical and quantum) at the microscopic level.

**Thermodynamics:** Thermodynamics is a branch of physics that studies the effects of changes in temperature, pressure, and volume on physical systems at the macroscopic scale by analyzing the collective motion of their particles using statistics. Roughly, heat means "energy in transit" and dynamics relates to "movement"; thus, in essence thermodynamics studies the movement of energy and how energy instills movement.

### Planetary Sciences

This large group of sciences deal with the structure and function of planetary materials a planet's lithosphere (including its geography and its rocks, minerals, ores, and fuel deposits), its hydrosphere (including its oceans, lakes, and rivers), and its atmosphere (including its weather and climate). All Star Fleet cadets are trained in one of these sciences,

and Science Officers frequently have professional-level training in at least one. Separate Skill Ratings must be developed for each different science, such as the examples listed below.

### Geology

Training involves not only the study of such earth materials as rocks, minerals, ores, and soil, but also the study of such landforms as mountains, valleys, volcanoes, and beaches, and of the processes that create them. It also includes extensive field experience in mineral and fossil identification, in analyzing the geologic history of a region, and in geologic mapping. Geologists can use their skill to determine the presence of a valuable ore or fuel deposit, or to identify likely regions for earthquakes or volcanic activity. Geology skill can be broken down into the following subskills.

**Economic Geology:** Scientific discipline concerned with the distribution of mineral deposits, the economic considerations involved in their recovery, and assessment of the reserves available. Economic geology deals with metal ores, fossil fuels, and other materials of commercial value, such as salt, gypsum, and building stone.

**Engineering Geology:** Scientific discipline concerned with the application of geologic knowledge to engineering problems such as reservoir design and location, determination of slope stability for construction purposes, and determination of earthquake, flood, or subsidence danger in areas considered for roads, pipelines, bridges, dams, or other engineering works.

**Geomorphology:** The study of landforms, including the description, classification, origin, development, and history of planetary surface features. Emphasis is placed on the genetic interpretation of the erosional and depositional features of the planet's surface. However, geomorphologists also study primary relief elements formed by movements of the planet's crust, topography on the sea floor, and applications of geomorphic information to problems in environmental engineering.

**Geochemistry:** A field that encompasses the investigation of the chemical composition of the Earth, other planets, and the solar system and universe as a whole, as well as the chemical processes that occur within them. This field is critical for understanding subjects as diverse as the formation of economically valuable ore deposits, safe disposal of toxic wastes, and variations in a planet's climate.

**Geophysics:** This field uses the principles and practices of physics to study a planet. It is distinguished from the other planetary sciences largely by its use of instruments to make direct or indirect measurements of the parts of the planet being studied, in contrast to the more direct observations which are typical of geology.

**Mineralogy:** The science which concerns the study of natural inorganic substances, whether of terrestrial or extraterrestrial origin, called minerals. Mineralogy is a science that cannot be easily defined. It is most properly a branch of inorganic chemistry, but the discipline concentrates on the origin, description, and classification of minerals. Mineralogy can be broken down further into Crystal Chemistry (the study of the composition and atomic arrangement of minerals), Paragenetic Mineralogy (the study of mineral association and occurrence both in natural and synthetic systems), Descriptive Mineralogy (the study of the physical properties of minerals and the means for their identification) and Taxonomic Mineralogy (the science of mineral classification, systemization, and nomenclature).

**Paleogeography:** Geography of selected portions of the Earth's surface at specific times in the geologic past. The simplest kind of paleogeography is a map showing the locations of ancient lands and seas, but paleogeographic maps may also show the occurrence and distribution of fossil, plant, and animal communities; environments of sedimentation (e.g., deltas, reefs, deserts, or deep-sea basins); areas undergoing uplift and erosion or subsidence and deposition; and major climatic zones.

**Paleontology:** The study of animal history as recorded by fossil remains. The fossil record includes a very diverse class of objects ranging from molds of microscopic bacteria in rocks to unaltered bones of fossil beings in gravel beds formed only a few thousand years ago. Quality of preservation ranges from the occasional occurrence of soft parts (skin and feathers, for example) to barely decipherable impressions made by shells in soft mud that later hardened to rock.

**Petrology:** Petrology is a field of geology which focuses on the study of rocks and the conditions by which they form. There are three branches of petrology, corresponding to the three types of rocks: igneous, metamorphic, and sedimentary.

**Sedimentology:** The study of natural sediments, both lithified (sedimentary rocks) and unlithified, and of the processes by which they are formed. Sedimentology includes all those processes that give rise to sediment or modify it after deposition: weathering, which breaks up or dissolves preexisting rocks so that sediment may form from them; mechanical transportation; deposition; and diagenesis, which modifies sediment after deposition and burial within a sedimentary basin and converts it into sedimentary rock.

**Stratigraphy:** Scientific discipline concerned with describing rock successions and interpreting them in terms of a general time scale. It provides a basis for historical geology, and its principles and methods are applied in such fields as petroleum geology and archaeology. Stratigraphic studies deal primarily with sedimentary rocks but may also encompass layered igneous rocks (e.g., those resulting from successive

lava flows) or metamorphic rocks formed either from such extrusive igneous material or from sedimentary rocks.

**Structural Geology:** The branch of geology that deals with study and interpretation of deformation of a planet's crust. Deformation brings about changes in size (dilation), shape (distortion), position (translation), or orientation (rotation). Evidence for the changes caused by deformation are commonly implanted into geologic bodies in the form of recognizable structures, such as faults and joints, folds and cleavage, and foliation and lineation.

## Hydrology

Training involves the study of a planet's water (or its substitute) as found on the planet's surface, beneath its surface, and in its atmosphere. It deals with the precipitation-river-ocean-evaporation cycle, as well as with the chemical and physical nature of the water itself. It also deals with oceanography and such topics as currents and waves, flooding, and ice sheets and glaciers. Hydrologists can use their skill to help determine the suitability of a planet for colonization, to discover underground water sources, and so on. The skill of Hydrology can be broken down further, as follows.

**Ecohydrology:** This is an interdisciplinary field studying the interactions between water and ecosystems. These interactions may take place within water bodies, such as rivers and lakes, or on land, in forests, deserts, and other terrestrial ecosystems. Areas of research in ecohydrology include transpiration and plant water use, adaption of organisms to their water environment, influence of vegetation on stream flow and function, and feedbacks between ecological processes and the hydrological cycle.

**Hydrochemistry:** The study of the chemical characteristics of water. Water in all forms and modes of occurrence is affected chemically by the materials with which it comes into contact. Often called the universal solvent, water has the ability to dissolve many elements in significant quantities. Chemical hydrology concerns itself with the processes involved and thus includes studies of exceedingly diverse phenomena.

**Hydrogeology:** is the study of the movement of water beneath the earth's surface. This discipline plays an important role in a wide range of issues involving groundwater, such as drainage of excavation sites for subsurface construction, decontamination, site preparation and development for urban areas and industrial sites, too high groundwater levels in the living environment and the consequences of extraction for industry and drinking-water supply.

**Hydroinformatics:** is a branch of hydrology which concentrates on the application of information and communications technologies in addressing the increasingly serious problems of the equitable and

efficient use of water for many different purposes. The numerical simulation of water flows and related processes remains a mainstay of hydroinformatics, which encourages a focus not only on the technology but on its application in a social context.

**Hydrometeorology:** branch of hydrology that deals with problems involving the hydrologic cycle, the water budget, and the rainfall statistics of storms. The boundaries of hydrometeorology are not clear-cut, and the problems of the hydrometeorologist overlap with those of the climatologist, the hydrologist, the cloud physicist, and the weather forecaster. Considerable emphasis is placed on determining, theoretically or empirically, the relationships between meteorological variables and the maximum precipitation reaching the ground. These analyses often serve as the bases for the design of flood-control and water-usage structures, primarily dams and reservoirs.

**Isotope Hydrology:** A field of hydrology that uses isotopic dating to estimate the age and origins of water and of movement within the hydrologic cycle. The techniques are used for water-use policy, mapping aquifers, conserving water supplies, and controlling pollution. It replaces or supplements past methods of measuring rain, river levels and other bodies of water over many decades.

**Surface Hydrology:** A field that encompasses all surface waters of a planet (overland flows, rivers, lakes, wetlands, estuaries, oceans, etc). This field does not concern itself with the atmospheric and ground water sections of the hydrologic cycle. Surface water hydrology relates the dynamics of flow in surface water systems and includes the field measurement of flow (discharge); the statistical variability at each setting; floods; drought susceptibility and the development of the levels of risk; and the fluid mechanics of surface waters.

## Meteorology

Training includes the study of all atmospheric phenomena, including weather (winds, storms, precipitation, temperature, etc.) and climate (the prevailing weather conditions in an area). Meteorologists can use their skill to predict the weather, or to determine the suitability of a planet's climate for colonization, for example. Meteorology skill can further be subdivided into the specialties below.

**Atmospheric Chemistry:** A scientific discipline concerned with the chemical composition of the Earth's atmosphere. Topics include the emission, transport, and deposition of atmospheric chemical species; the rates and mechanisms of chemical reactions taking place in the atmosphere; and the effects of atmospheric species on human health, the biosphere, and climate.

**Atmospheric Physics:** The application of physics to the study of the atmosphere. Atmospheric physicists attempt to model Earth's atmosphere and the atmospheres of the other planets using fluid flow

equations, chemical models, radiation balancing, and energy transfer processes in the atmosphere (as well as how these tie in to other systems such as the oceans). In order to model weather systems, atmospheric physicists employ elements of scattering theory, wave propagation models, cloud physics, statistical mechanics and spatial statistics which are highly mathematical and related to physics.

**Climatology:** Climatology is the study of climate, scientifically defined as weather conditions averaged over a period of time, and is a branch of the atmospheric sciences. In contrast to weather forecasting, which studies short term weather systems lasting up to a few weeks, climatology studies the frequency with which these weather systems occurred in the past. It studies the periodicity of weather events over years to millennia, as well as changes in long-term average weather patterns, in relation to atmospheric conditions.

**Weather Forecasting:** The application of science and technology to predict the state of the atmosphere for a future time and a given location. Human beings have attempted to predict the weather informally for millennia, and formally since at least the nineteenth century. Weather forecasts are made by collecting quantitative data about the current state of the atmosphere and using scientific understanding of atmospheric processes to project how the atmosphere will evolve. There are a variety of uses for weather forecasts. Weather warnings protect life and property by being able to plan ahead to survive adverse weather. Forecasts based on temperature and precipitation is important to agriculture. Temperature forecasts are used to estimate power demand over coming days.

## Social Sciences

This large group of skills deals with the institutions and functions of societies and with the interpersonal relationships between individuals in those societies. Every Star Fleet officer has training in these areas with respect to his own race, planet, and culture, as well as in the laws and history of the Federation. Furthermore, all have skill in at least one other area, and many have training in more than one area. Separate Skill Ratings must be developed for each separate race and for each different field, such as the examples listed below.

## Anthropology

Training involves the study of a race's ancient cultures, their history, and their lifestyles. It includes the study of applicable dead languages as well as practice in making archaeological digs and in identifying and dating relics and ruins. This skill could be used by a character attempting to decipher runes or to determine the use of an alien artifact. Anthropology can be further subdivided as shown below.



**Archaeology:** This is the study of historical cultures through the recovery, documentation, analysis, and interpretation of material culture and environmental data, including architecture, artifacts, biofacts, and landscapes. Archaeology aims to understand a race through these endeavors. Archaeology involves surveyance, excavation and eventually analysis of data collected in order to learn more about the past. There are various different goals to the discipline, including the documentation and explanation of the origins and development of cultures, understanding culture history, chronicling cultural evolution, and studying a race's behavior and ecology, for both prehistoric and historic societies.

**Biological Anthropology:** This is the systematic study of the non-cultural aspects of humanoids and near-humanoids. Non-cultural refers to all of those biological characteristics that are genetically inherited in contrast to learned. Near-humanoid is a category that includes creatures like monkeys, apes, and the other primates as well as their fossil ancestors. The primary interest is to learn how a race's ancestors changed through time to become what they are today. The secondary interest is in understanding the mechanisms of evolution and genetic inheritance as well as variation and adaptations to different environmental stresses, such as those found at high altitudes and in environments that have temperature extremes.

**Cultural Anthropology:** This is the branch of anthropology that examines culture as a meaningful scientific concept. Cultural anthropologists study cultural variation among humanoids, collecting data about the impact of global economic and political processes on local cultural realities. Anthropologists use a variety of methods, including participant observation, interviews, and surveys. Their research is often called fieldwork because it involves the anthropologist spending an extended period of time at the research location, called a field site. These stays usually last one year during graduate studies, but can be as short as a few weeks, or as long as a lifetime.

**Linguistics:** Anthropological linguistics is the study of language through genetics and development. This strongly overlaps the field of linguistic anthropology, which is the branch of anthropology that studies beings through the languages that they use. Where linguistic anthropology studies beings through the languages they use, linguistics studies the written and spoken word itself.

**Social Anthropology:** This is the branch of anthropology that studies how contemporary living humanoids behave in social groups. It also explores the role of meanings, ambiguities and contradictions of social life, patterns of sociality, violence and conflict; and the underlying logics of social behavior. Social anthropologists are trained in the interpretation of narrative, ritual and symbolic behavior, not merely as text, but with communication examined in relation

to action, practice, and the historical context in which it is embedded.

## **Economics**

Training involves the study of the basic laws of supply and demand, as well as the basics of trade, wealth, and the production, distribution, and consumption of goods and services. Many officers in full-time services in the Merchant Marine Command have training in this field, and all private merchants probably do as well. This skill could be used by characters dealing with a race's economy in trade or in determining the social conditions on a world. This skill can be broken down into two subskills, below.

**Macroeconomics:** A branch of economics that deals with the performance, structure, and behavior of the economy of the entire community, either a world, a region, or the entire Federation. It is the study of all the aspects, namely the behavior and decision-making, of entire economies. Macroeconomists study aggregated indicators such as GDP, unemployment rates, and price indices to understand how the whole economy functions. Macroeconomists develop models that explain the relationship between such factors as national income, output, consumption, unemployment, inflation, savings, investment, international trade and international finance.

**Microeconomics:** The study of how households and firms make decisions to allocate limited resources, typically in markets where goods or services are being bought and sold. Microeconomics examines how these decisions and behaviors affect the supply and demand for goods and services, which determines prices; and how prices, in turn, determine the supply and demand of goods and services. One of the goals of microeconomics is to analyze market mechanisms that establish relative prices amongst goods and services and allocation of limited resources amongst many alternative uses. Microeconomics analyzes market failure, where markets fail to produce efficient results, as well as describing the theoretical conditions needed for perfect competition.

## **Law (including Federation Law)**

Training involves the study of the codes, customs, and rules of a society. Security Officers receive advanced training in Federation law, as do officers attending Command School. The skill could be used by characters dealing with a race's legal system or in remembering an obscure law on one of the Federation's member planets. This skill can be broken down further into several broad categories. Within each category many different narrow specializations exist, but are too numerous to mention here.

**Administrative Law:** This is the body of law that governs the activities of administrative agencies of government. Government agency action can include rulemaking, adjudication, or the enforcement of a specific regulatory agenda. As a body of law,

administrative law deals with the decision-making of administrative units of government that are part of a national regulatory scheme in such areas as police law, international trade, manufacturing, the environment, taxation, broadcasting, immigration and transport.

**Conflict of Laws:** An institution of international law that regulates all lawsuits involving a "foreign" law element (e.g. The Klingon Empire) where different judgments will result depending on which jurisdiction's laws are applied. Conflict of laws, firstly, is concerned with determining whether the proposed forum has jurisdiction to adjudicate and is the appropriate venue for dealing with the dispute, and, secondly, with determining which of the competing state's laws are to be applied to resolve the dispute. It also deals with the enforcement of foreign judgments.

**Constitutional Law:** This is the body of law dealing with the distribution and exercise of government power. Constitutional laws may often be considered second order rulemaking or rules about making rules to exercise power. It governs the relationships between the judiciary, the legislature and the executive with the bodies under its authority. One of the key tasks of constitutions within this context is to indicate hierarchies and relationships of power. Constitutions are intended to ensure basic political, social and economic standards that a nation state, or intergovernmental body is obliged to provide to its citizens but many do include its governments.

**Contract Law:** Contract law concerns enforceable promises, and can be summed up in the phrase "agreements must be kept". In contract law three key elements to the creation of a contract are necessary: offer and acceptance, consideration and the intention to create legal relations. A contract intends to formalize an agreement between two or more parties, in relation to a particular subject. Contracts can cover an extremely broad range of matters, including the sale of goods or real property, the terms of employment or of an independent contractor relationship, the settlement of a dispute, and ownership of intellectual property developed as part of a work for hire.

**Criminal Law:** Criminal Law refers to any of various bodies of rules in different jurisdictions whose common characteristic is the potential for unique and often severe impositions as punishment for failure to comply. Criminal punishment, depending on the offense and jurisdiction, may include death, loss of liberty, government supervision (parole or probation), or fines. Criminal law typically is enforced by the government, unlike the civil law, which may be enforced by private parties.

**Equity Law:** This is a body of rules that allowed executive parties to overrule the judge made law if he thought it equitable to do so. This meant equity came to operate more through principles than rigid rules. For instance, whereas neither no law system allows

people to split the ownership from the control of one piece of property, equity allows this through an arrangement known as a trust. Trustees control property, whereas the beneficial ownership of trust property is held by people known as beneficiaries. Trustees owe duties to their beneficiaries to take good care of the entrusted property.

**International Law:** This field of law concerns the structure and conduct of sovereign states and intergovernmental organizations. International law consists of rules and principles of general application dealing with the conduct of states and of intergovernmental organizations and with their relations, as well as with some of their relations with persons, whether natural or judicial. To a lesser degree, international law also may affect multinational corporations and individuals, an impact increasingly evolving beyond domestic legal interpretation and enforcement. International law combines two main branches: the law of nations and international agreements and conventions.

**Property Law:** The area of law that governs the various form of ownership in real property (land as distinct from personal or movable possessions) and in personal property, within the common law legal system. In law, there is a division between movable and immovable property. Movable property roughly corresponds to personal property, while immovable property corresponds to real estate or real property, and the associated rights and obligations thereon.

**Supranational Law:** This is a form of international law, based on the limitation of the rights of sovereign nations between one another. It is distinguished from international law because in supranational law, nations explicitly submit their right to make judicial decisions to a set of common institutions. This forms the basis of Federation Law because each member planet is still a sovereign nation while allowing the Federation courts the ability to make judicial decisions based upon Federation Law.

**Tort Law:** Tort law is a body of law that addresses, and provides remedies for, civil wrongs not arising out of contractual obligations. A person who suffers legal damages may be able to use tort law to receive compensation from someone who is legally responsible, or liable, for those injuries. Generally speaking, tort law defines what constitutes a legal injury and establishes the circumstances under which one person may be held liable for another's injury. Tort law spans intentional and negligent acts.

**Trust Law:** In common law legal systems, a trust is an arrangement whereby property is managed by one person (or persons, or organizations) for the benefit of another. A trust is created by a settlor, who entrusts some or all of their property to people of their choice. The trustees hold legal title to the trust property, but they are obliged to hold the property for the benefit of one or more individuals or organizations, usually specified by the settlor, who hold equitable title. The

trustees owe a fiduciary duty to the beneficiaries, who are the "beneficial" owners of the trust property.

### **Political Science**

Training involves the study of a society's politics and government. It includes study of the way laws and policies are made, in the structure of the government and its institutions, and in the ways political groups gain and control power. The skill could be used by a character attempting to influence a government, possibly modified by his Skill Rating in *Negotiation/Diplomacy*. It also could be used to identify the power groups in an alien society, and to distinguish those who actually wield the power from those who appear to have the power. This skill is broken down into several specialties.

**Comparative Politics:** Comparative politics is a subfield of political science, characterized by an empirical approach based on the comparative method. This particular subfield does not have a substantive focus in itself, but rather a methodological one: it focuses on "the how but does not specify the what of the analysis." In other words, comparative politics is not defined by the object of its study, but rather by the method it applies to study political phenomena.

**International Relations:** This field represents the study of foreign affairs and global issues among states within the international system, including the roles of states, inter-governmental organizations, non-governmental organizations, international nongovernmental organizations, and multinational corporations. It is both an academic and public policy field, and can be either positive or normative as it both seeks to analyze as well as formulate the foreign policy of particular states.

**National Politics:** National politics is a process by which groups of people make decisions. The term is generally applied to behavior within civil governments, but politics has been observed in all human group interactions, including corporate, academic and religious institutions. It consists of "social relations involving authority or power" and refers to the regulation of a political unit, and to the methods and tactics used to formulate and apply policy.

**Political Theory:** This is the study of city, government, politics, liberty, justice, property, rights, law, and the enforcement of a legal code by authority: what they are, why (or even if) they are needed, what makes a government legitimate, what rights and freedoms it should protect and why, what form it should take and why, what the law is, and what duties citizens owe to a legitimate government, if any, and when it may be legitimately overthrown—if ever.

**Public Policy:** Public policy can be generally defined as the course of action or inaction taken by governmental entities (the decisions of government) with regard to a particular issue or set of issues. Public policy can also be defined as a system of

"courses of action, regulatory measures, laws, and funding priorities concerning a given topic promulgated by a governmental entity or its representatives." Public policy is commonly embodied "in constitutions, legislative acts, and judicial decisions."

### **Racial Culture/History (including Federation History)**

Training involves study of the history and culture of a starfaring race. Communications Officers receive advanced training in one or more races, and Command School gives additional training in Federation history. The skill would be used by characters attempting to avoid mistakes in manners or behavior on an alien world, or attempting to make sense out of behavior they are witnessing. There are several specific fields of history shown below, with some of these overlapping each other.

**Archontology:** History would be void and misunderstood without naming its chief actors. There have always been those who held important state, public and party offices, those who wielded absolute power, those who were limited in their actions by law or tradition. This category colloquially known as "rulers" has been an object of studies in scientific chronology for long ages. Archontology is the study of historical offices and important positions in state, international, political, religious and other organizations and societies. It includes chronology, succession of office holders, their biographies and related records.

**Art History:** The academic study of objects of art in their historical development and stylistic contexts, i.e. genre, design, format, and look. This includes the "major" arts of painting, sculpture, and architecture as well as the "minor" arts of ceramics, furniture, and other decorative objects. As a discipline, art history is distinguished from art criticism, which is concerned with establishing a relative artistic value upon individual works with respect to others of comparable style, or sanctioning an entire style or movement; and art theory or "philosophy of art", which is concerned with the fundamental nature of art.

**Chronology:** Chronology is the science of locating historical events in time, and is distinct from, but relies upon chronometry or timekeeping, and historiography, which examines the writing of history and the use of historical methods.

**Cultural History:** Cultural history, as a discipline, often combines the approaches of anthropology and history to look at popular cultural traditions and cultural interpretations of historical experience. It examines the records and narrative descriptions of past knowledge, customs, and arts of a group of people. Its subject matter encompasses the continuum of events occurring in succession leading from the past to the present and even into the future pertaining to a culture.

**Economic History:** Economic history is the study of how economic phenomena evolved from a historical perspective. Analysis in economic history is undertaken using a combination of historical methods, statistical methods and by applying economic theory to historical situations. The topic includes business history and overlaps with areas of social history such as demographic history and labor history.

**Environmental History:** This field is the study of races and nature and their past interrelationships. There are three main strands of environmental history: material environmental history, focusing on changes in the biological and physical environment; cultural/intellectual environmental history, focusing on representations of the environment and what it says about a society; and political environmental history, focused on government regulation, law, and official policy.

**Futurology:** The study of postulating possible, probable, and preferable futures and the worldviews and myths that underlie them. Futurology seeks to understand what is likely to continue, what is likely to change, and what is novel. Part of the discipline thus seeks a systematic and pattern-based understanding of past and present, and to determine the likelihood of future events and trends.

**Maritime History:** This study focuses on understanding a race's various relationships to the oceans, seas, and major waterways of the globe. Maritime history records and interprets past events involving ships, shipping, navigation, and seamen. Subjects within this field include naval history, the history of ships, ship design, shipbuilding, the history of navigation, sea exploration, maritime economics and trade, and the history of aids to navigation.

**Military History:** The study of armed conflict in the history of a race, and its impact on the societies, their cultures, economies and changing intra and international relationships. The essential subjects of military history study are the decision making processes of the belligerents, the society's willingness and ability to economically support war, the methods, strategic, operational and tactical used by the armed forces to achieve goals, and how these changed through a planet's recorded history.

**Paleography:** The study of ancient handwriting and the practice of deciphering and reading historical manuscripts. Palaeography tackles two main difficulties in historical research. First, since the style of a single alphabet in each given language has evolved constantly, it is necessary to know how to decipher its individual characters as they existed in various eras. Second, writers often used many abbreviations, usually so as to write more quickly and sometimes to save space, so the palaeographer must know how to interpret them.

**Political History:** This is the narrative and analysis of political events, ideas, movements, and leaders. It is usually structured around the nation state. Generally,

political history focuses on events relating to nation-states and the formal political process. This contrasts with one, for instance, social history, which focuses predominantly on the actions and lifestyles of ordinary people.

**Psychohistory:** Psychohistory is the study of the psychological motivations of historical events. It combines the insights of psychotherapy with the research methodology of the social sciences to understand the emotional origin of the social and political behavior of groups and nations, past and present. Its subject matter is childhood and the family, and psychological studies of anthropology and ethnology.

**Social History:** An area of historical study that attempts to view historical evidence from the point of view of developing social trends. In this view, it may include areas of economic history, legal history and the analysis of other aspects of civil society that show the evolution of social norms, behaviors and more. It is often distinguished from political history, military history and the history of great men and is sometimes seen as the bridging point between economic and political history.

## Space Sciences

This large group of skills includes the study of space, the stars, planetary motions, navigation, and the application of other sciences to space travel or to deep space. All Star Fleet officers have training in at least two of these sciences, and Science Officers, Helmsmen, and Navigators are given training in one or more of these fields. Separate Skill Ratings must be developed for each different science, such as the examples listed below.

## Astrogation

Training involves all three types of navigation used by Navigators – piloting by dead reckoning, celestial navigation using star fixes, and electronic navigation using pulsars. It includes star mapping and plotting courses and orbits. Navigators receive professional-level training in this skill so that they have the tools needed to determine where a starship is, where it is going, and when it will get there. This skill is used in plotting intercept courses and standard orbits, and it could be used in determining where a ship was if it wandered off course during an ion storm. Astrogation has no subskills.

## Astronautics (Starship Engineering)

Training involves the theory and practice of creating and maintaining starships and other manned space habitats and environments. It encompasses the general areas of starship design and construction – bulkheads, decks, stresses and strains, hull repair, and the like. Development includes extensive training in starship power grids and in the repair of damage to that grid and superstructure. All Engineering Officers

are trained in this skill, and many choose to have advanced training as well. This skill is used by the Engineering Officer in starship combat when attempting to make emergency repairs to the power grid after a hit on the engine room. This skill has several subfields, noted below.

**Astrodynamics:** Astrodynamics is the application of ballistics and celestial mechanics to the practical problems concerning the motion of spacecraft. It is a core discipline within space mission design and control. Astrodynamics focuses on spacecraft trajectories, including orbital maneuvers, orbit plane changes, and interplanetary transfers, and is used by mission planners to predict the results of propulsive maneuvers.

**Control Engineering:** Control engineering is the engineering discipline that applies control theory to design systems with predictable behaviors. It seeks to understand physical systems, using mathematical modeling, in terms of inputs, outputs and various components with different behaviors; use control systems design tools to develop controllers for those systems; and implement controllers in physical systems employing available technology.

**Propulsion:** The study of methods used to accelerate spacecraft and artificial satellites. There are many different methods. Each method has drawbacks and advantages, and spacecraft propulsion is an active area of research. However, most spacecraft today are propelled through the formation and manipulation of a bubble of normal space that surrounds the spacecraft. This is the warp drive.

**Space Environment:** This is a branch of astronautics that seeks to understand and address conditions existing in space that affect the operation of spacecraft. Problems for spacecraft can arise from radiation, atmospheric drag, and electrostatic charging on the hull of the spacecraft. The space environment discipline delves into researching improvements to spacecraft shielding, electronic system hardening, and collision detection and avoidance systems.

**Spacecraft Design:** Spacecraft design is the process by which the various subsystems of a starship are configured to work together and make the sum better than the parts. Spacecraft design comes in four phases described here: pre-design (defining the mission parameters of the starship), design (general plans for the starship are drawn), construction (the starship is built, tested, and launched), and review (the starship's performance is assessed). If the review is satisfactory, the starship will be procured for general production.

## Astronomy

Training involves observations from deep space, including all forms of electro-magnetic radiation (light, radio-frequency emanations, etc.), neutrino scans, gravitics, and so on. It includes study of the theories concerning these observations, as well as guided

practice in making the observations and interpreting them. This skill, which is studied by all Star Fleet officers, could be used by a character to discover a previously unknown black hole or perhaps a star going nova. Astronomy can be further divided into the subskills below.

**Cosmology:** The study of the largest-scale structures and dynamics of the universe. A cosmologist seeks to answer the questions of the universe's formation and evolution. Part of this involves studying the motions of celestial bodies and attempting to discover the "First Cause" behind the universe's formation.

**Galactic:** The study of the Milky Way and its contents. **Extragalactic:** The study of other galaxies and their contents. This field can be further subdivided into near-extragalactic astronomy and far-extragalactic astronomy. The former covers the local group of galaxies, of which the Milky Way is a member. The latter includes objects sufficiently far away that only the brightest phenomena are possible.

**Planetary:** Planetary astronomy is the scientific study of planets, moons, and planetary systems and the processes that form them. It studies objects ranging in size from micrometeoroids to gas giants, aiming to determine their composition, dynamics, formation, interrelations and history.

**Solar:** Solar astronomy is the scientific study of a planetary system's home star or stars and the processes that form them. It aims to determine a star's composition, dynamics, formation, interrelations with other stars, and history.

**Stellar:** This science is the study of how stars are born and how they evolve until their eventual death.

## Astrophysics

Training involves the study of the universe and its parts in an attempt to discover how it works by using physical laws and theories to explain astronomical observations. It includes study of the motions of satellites, planets, stars, and galaxies as well as stellar growth and decay. Navigators are trained in this area. It could be used to determine that a comet or large meteorite is on a collision course with an inhabited planet.

**Observational:** This sub-field of astrophysics is focused on measuring and defining the physical parameters of the universe using various tools and methodologies. In addition, this sub-field is often used to study the star or stars of a home world since they can be observed in a detail unmatched by more distant stars.

**Theoretical:** Using analytical models and simulations, theoretical astrophysicists attempt to discover the mechanics of things. In other words, using models and simulations, they attempt to speculate as to how things in the universe work. Using these models can reveal the existence of phenomena and effects that would otherwise not be seen.